COSNER
V.
UMATILLA COUNTY

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CONSOLIDATED RECORD

VOLUME 4 of 8, Pages 1869 - 2441

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May 3, 2011

To: Commissioner Bill Hansell, Chair
Umatilla County Board of Commissioners
Pendleton, OR 97801

Subject: Setback Standards: (1) Wind turbine towers to rural residences; and (2) Ice throw and debris field distances re setbacks from roads and buildings.

The following statement is a much abbreviated summary of the findings of my investigation of the current status of the global wind energy development process, with special application to conditions and circumstances in Umatilla County, Oregon.

Prior to completing work on my recommendations, I decided it would be appropriate to confer with the Umatilla County Planning Commission. They had made a unanimous recommendation to the County Board of Commissioners in support of a 2-mile setback from rural homes to wind turbines. I wanted to confirm their level of support for what I was about to recommend to the Board of Commissioners after having acted upon the Board's request to assist the Board in developing a final decision concerning the setback issue.

A. PLANNING COMMISSION POSITION CONFIRMED.

At the April 28, 2011 meeting of the Umatilla County Planning Commission, the Planning Commission members were asked to clarify their current level of support for the 2-mile setback standard from wind turbine towers to rural residences, which they recommended to the county Board of Commissioners at the BOC's March 17, 2011 public hearing.

1. The Commission continues their strong support for their recommended 2-mile setback.
2. While the Commission was generally willing to consider options, they strongly stated...
    a. They did not want to diminish their commitment to protect the rights of those home owners who did not want to live close to the wind turbines;
    b. That the community should put a very high priority on protecting the interests of EVERYONE impacted by the wind turbines,

including especially those opposed to living close to the wind towers;
c. That since there is so much money involved, the projects could afford to do so; and
d. That everyone in a community had an equal right to planning program protection of their property rights.

3. The Commission preferred setbacks which...
   a. Allow people opposed to living close to the wind turbines to be able to elect the proposed 2-mile setback protection.
   b. Do not force a shorter setback on those who do not want to sign a noise easement.
   c. Allow persons, at their sole discretion, to negotiate away at least part of any setback, except for a designated minimum setback distance.

4. Public Information – the Commission stated they believed the public should be well informed concerning the global and county status of wind power development; and therefore that
   a. All the material used to investigate the global status of wind power development, from which these recommendations were developed, be entered into the public record -- so that local citizens and persons elsewhere who are following this county's progress with wind power regulation
      i. Might better understand the basis for this county's setback decisions; and so that
      ii. People who might want to verify, or in other ways follow up on the information sources might do so.
   b. The wind power "Toolkit" notebook, containing two major statements (Brazil and New York) concerning all aspects of wind power development be entered into the public record -- especially for the benefit of persons who have limited current information and/or those who might want to expand their understanding of some areas of concern.

5. The Commission's Primary Concerns are...
   a. Protecting the property rights of those who do not want to live close to wind turbines.
   b. Diminished property values due to the presence of wind turbines.
   c. Possible adverse health effects allegedly caused by presence of wind turbines.

6. Other Concerns Identified...

a. Inadequacy of the state Energy Facility Siting Council's (EFSC'S) setback standards, which discourages counties deferring to the state setback standards. Research is needed to assess how satisfactory existing setback distances are in Oregon's established wind development project areas.

If EFSC's ¼ mile setback standard applied only to residences within the noise boundaries of projects, for persons who granted wind tower site leases and/or who signed noise easements, then this ¼ mile setback would be more acceptable – but not as a general setback for all residences near a wind power project.

b. Prospects for using the wind turbine noise projections as the project by project source of setback standards. Chase Whitney (Iberdrola) in a recent email, which will apparently be entered into the public record, indicates that the setbacks generated by the DEQ noise standard for the amended Helix Project will be between 3,800 feet (0.7 miles) and 8,500 feet (1.6 miles), depending on the location of any particular rural residence.

c. Significant need for additional research concerning the alleged adverse health effects caused by living near wind turbines.

B. Status of Oregon's State-wide Wind Turbine Noise Standard.

1. The 36 dBA noise standard established by Oregon's Dept. of Environmental Quality (DEQ) is one of the most protective anywhere in the world.
2. There are other standards as high as 50 dBA.
3. In comparing such standards, one must remember that the dBA standard is logarithmic – which means a ten step increase in the dBA standard (from 35 dBA to 45 dBA, for example) is actually 10 times more noise; a 20 step increase, is not just a small addition of noise, it is 100 times greater noise (10 x 10 = 100). Therefore, a noise standard of 45dBA which is used in several global locations would be about 10 times greater noise level than is allowed in Oregon.

dBA	Noise Level
0	0
10	10
20	100
30	1,000
40	10,000
50	100,000
60	1,000,000

C. **The State Noise Standard Might Serve to Establish Project Setback Distances?** It appears that...

1. If the setback standard were generated on a project by project basis using the state noise standard for wind turbines; and
2. Every wind power development application is required to submit a credible noise projection map for public review prior to issuing the site permit;
3. In many, if not all projects, the state noise standard might be sufficient -- but only if in addition,
4. Local siting authorities on a case by case basis, depending on local terrain features, for example, could recommend modifications in the setbacks so determined by the state noise standard... but,
5. Only if the computer model used to make the projections adequately takes into account terrain, elevation differences, humidity, temperature, natural convection currents in more difficult terrain, cumulative wind turbine effects, etc. – plus maybe broadening the scope of modeled projections, such as providing noise maps targeting the prevailing conditions in the middle of each season to generate more helpful insight.
6. Generally, the public does not appear to trust the computer modeling, without knowing more details about the assumptions built into the model used. Therefore,
7. Continuous on-site monitoring of wind turbine noise might be required if reliance is on the modeling for setback determinations, without at least a minimum regulated setback.

D. Ice Throw vs. Setback Standards.

1. Justifiable wind turbine setbacks from roads and buildings will apparently be about 1,600 feet, or about 3 times the blade tip to ground distance, if the ice throw data from around the world is considered. Consider that the faster turning blade tips are travelling nearly 200 mph; the slower ones still over 100 miles per hour! A chunk of ice with much weight thrown by the momentum of that speed would have a long trajectory, much further than 1.10 times the tower height...
2. A road and buildings setback standard of 1.10 times the blade-tip to ground distance is seriously inadequate.
3. If ice throw information leans toward a "risk management standard" based on probability of outcomes (damage to buildings, personal injury to humans, fatalities, etc.), shorter setbacks will be encouraged – because the ice throw / debris field events causing damage happens so infrequently, thus generating a low probability of occurrence.

4. The literature suggests some wind power developers recommend their own staff stay more than 1-2 times the blade tip to ground height away from the towers, just for general safety concerns.

E. Debris Field vs. Setback Standards.

1. While wind turbine generator, blade and tower failures are infrequent, available data suggests the debris field from such an event can be as far as 3,000 feet, especially if the failure happens in high winds, and involves blade failure as well as generator failure.
2. Considering that the blade tips are traveling between 100 and 200 mph, or more, depending on size and design characteristics, one would expect the trajectory of debris to be a long distance, especially if the failure happened in the face of high wind speeds.
3. While the probability of such a failure is very small, the setbacks from roads and buildings should be given serious attention as to the appropriate safety factor to build into the setback.

F. Recommended Ice Throw and Debris Field Setback.

1. Three (3) times the wind tower height, blade tip to the ground, as justified considering both the risk and probability of damages.
2. Two (2) times the wind tower height, blade tip to the ground, if authorities lean toward the very low probability of damages as the greater consideration.

G. What Is the Appropriate Setback Safety Philosophy?

1. Should the safety standard be based on the extent of damage from a possible threat (a greater setback distance)? Or,
2. The probability of potential damage to humans (or livestock), based on actual reported field experience (a shorter setback distance)?
3. A potential threat avoidance standard would be more like a 1,600 foot distance for ice throw, and 3,000 feet for a debris field.
4. The probability approach would be less protective, and allow a much smaller distance setback standard.
5. Which standard:
    a. "If it seldom happens, why be overly concerned"; Or,
    b. "If it did happen, the damage could be rather extreme."
6. The issue can only be addressed by answering the question: "What risk exposure will we impose on those living close to wind turbines in order to get the maximum number of wind towers built; thus also maximizing potential...
    a. Community mitigation payments;
    b. Property tax payments;
    c. Tower site and facility rental fees; and
    d. Profits produced by the electrical energy generated?"

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7. More bluntly stated: "How many people dare we risk injuring for the public benefit?"

H. Setback Standards Tell the Public How Much those in Authority Value Them as Individuals Relative to "The Project Money".

1. Ultimately, the public benefits aspect must be considered in relation to the costs and burdens imposed upon those persons who do not want to live near the wind turbines.
2. The literature indicates a 2-mile setback from homes to towers is reasonably protective of property values; and
3. A setback of 1.25 miles (2 km) is reasonably protective of human health.
4. A major problem: the public usually has little or no information concerning the possible adverse property value effects and adverse health effects at the time they are asked to sign their personal and property rights over to the wind power developer in exchange for tower site leases or noise easements.
    a. Little or no information concerning the nature of the possible adverse health effects; or
    b. The range of possible symptoms;
    c. No information concerning their personal vulnerability... i.e., whether they or family members might personally be susceptible.

I. The Focal Adverse Health Information Source.

1. The author of this statement has read in great detail, including studying the research model used, the case study data, and the physiological-neurological brain function information provided in the Wind Turbine Syndrome book written by Dr. Nina Pierpont, MD, PhD of New York.
2. The wind power industry discounts the reliability of this book and its contents; and voice opposition much like was evidenced towards those who waved early warning flags relative to the banking, financial services and mortgage crisis of recent years.
3. The author's conclusions at this point, based on information on the Internet from what appear to be reasonably credible sources in multiple countries is this:
    a. The confidentiality provisions included in most land leases and noise easements used by the wind power industry prevent (or at least significantly limit) doing the kind of credible research necessary to more credibly confirm, or deny the alleged adverse health effects.
    b. The public interest in the health effects caused by living near wind turbines is so significant that such confidentiality agreements (relating to health effects) should be prohibited.

c. The medical community has only in the past 5 to 10 years become publicly concerned about the alleged adverse health effects now globally called Wind Turbine Syndrome.
d. The current trend in additional papers and global public support for the Peirpont book's conclusions is mounting, not dissipating.
e. This trend suggests the world is likely indeed seeing an important early public health warning sign, with increasing global attention and support.
f. Ignoring this early warning poses serious political risks, and maybe even some potential financial liability exposure, for
   i. Wind power developers;
   ii. Land owners on whose property wind turbines exist; and
   iii. Agencies issuing siting permits, based on setback distances not adequately protective of property values and especially human health (closely related to property value declines).

Attached to this statement is copy of a paper prepared by Dr. Pierpont explaining in more physiological-neurological-psychological detail how the human brain manages to misinterpret low frequency sounds generated from the wind turbines, and produce the harsh symptoms of the alleged adverse health effects (Exhibit D).

Related information, both pro and con, from other authors and researchers is included in the author's reference notebooks submitted for the record.

Attachments.

Executive Summary – Setback Recommendations, Wind Turbines to Residences

Exhibit A. *The revised medical understanding of the Alleged Adverse Health Effects caused by wind turbines is relatively recent.* 76% of the references listed were published since the year 2000 – and a third of those since 2005.

Exhibit B. *The chronology of Wind Turbine Syndrome Events and references suggests the interest and attention momentum is building, with major events in late 2010 and early 2011.*

Exhibit C. *Global setback recommendations re Alleged Adverse Health Effects suggest an increasing acceptance of a common setback distance.*

The average of all these recommended setback standards is nearly identical to the setback standard of 2 km (1.25 mile) recommended in the Pierpont book, for protection from the alleged adverse health effects.

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Exhibit D. Wind Turbine Syndrome & The Brain. Bu Dr. Nina Pierpont, MD, PhD. November 15, 2010.

Exhibit E. What Happened to Noise? Wind Turbines, Property Values and Adverse Human Health Effects. Clinton B. Reeder, PhD. May 3, 2011

Exhibit F. Determining Impact Mitigation Payments for Residences within 2-Miles of Wind Power Facilities. Clinton B. Reeder, PhD. May 3, 2011

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Executive Summary
Recommended Setback Distances and Associated Siting Permit Requirements: Wind Turbine to Residence

The following setback recommendations are based on the material in the set of information notebooks submitted for the record by Clinton Reeder, PhD (see attached resume). Member, Umatilla County Planning Commission.

A. Adopt the 2-mile setback standard recommended by the County Planning Commission.

1. Doing so honors the unanimous recommendation of the Planning Commission.
2. It provides a setback distance equal to the setback distance the literature indicates is reasonably protective of property values.
3. Associated Recommendations:
   a. Develop an information sheet explaining the possibility of depressed property values inside the 2-mile setback, to protect the county from future allegations such disclosure was not made.
   b. Allow individual property owners to negotiate away a least part of the protective setback distance outside the minimum setback distance stated below.
   c. Allow any individual property owner not wanting to live close to the wind turbines to elect to not sign a noise easement, and have the full protection of the 2-mile setback.
   d. Require a Property Value Guarantee Option, as a siting permit condition (concept derived from the literature):
      i. The wind power developer must provide this guarantee to any person who resides within 2 miles of wind turbine/s and who does not want to sign a noise easement, which assures the property owner that the wind power company will during a period not to exceed two years buy the residence property from the property owner;
      ii. At the property owner's sole discretion;
      iii. If the property owner declares, without any stated reason, they do not want to continue living close to the wind turbines;
      iv. At a price not less than 1.5 times the pre-wind tower appraised value of the property;
      v. In order to compensate fairly and equitably for the multiple economic and non-economic costs and burdens associated with essentially being forced off the property by the wind turbines; resulting in the following public benefits:

1. Allows more wind towers to be built;
2. Provides the property owner time to determine whether they can tolerate the noise without adverse health effects and/or without excess annoyance.

vi. Such an agreement might be part of, or include a limited time noise easement.

AND/OR

B. Adopt a 1-mile setback distance, including all the options stated in "A" above.

1. Develop an information sheet that makes known the alleged adverse health effect issue, in order to protect the county from future allegations such disclosure was not made.
2. Introduce a site permit condition requiring that the developer must release anyone who has, or will sign tower site leases and/or noise easements from any health related confidentiality agreements that would prevent those persons from freely disclosing any and all health related effects experienced living near the wind towers (concept derived from the literature).
   a. Without access to the added health related information from persons living close to the wind turbines, it will be very difficult to confirm, or deny the adverse health effects issue.
   b. The public interest is so great relative to the adverse health effects that the health related confidentiality agreements should no longer be allowed.
   c. The world, including Umatilla County, needs very much the increased verification of
      i. The proportion of the public that is susceptible to the health concerns;
      ii. How best to treat those effects, some of which it appears might not simply be ameliorated by moving away from the wind towers; and
      iii. What the primary risk factors are that increase susceptibility.

AND

ii. Adopt a minimum setback distance, not less than one-half mile.

As a means of...

1. Protecting the public from at least the worst of the potential adverse health effects; and
2. To better protect at least some market value for homes located close to the wind turbines, thus discouraging abandoned rural homes.

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Comments about the notebook Reference Material

The material in the notebooks submitted for the record is the result, for the most part, of a rather random, yet purposeful Internet search. This set of materials was assembled to provide the Planning Commission, the Planning Dept. staff and the county Board of Commissioners (and other interested persons) a broad-brush insight into the current status of the global wind power development process, both pro and con.

As a result, the notebooks contain papers from around the world; materials from "anti-wind power" groups (some of whom appear to just want the "truth" to be known rather than simply being "anti-wind power"); and letters from persons who have directly experienced the alleged adverse health effects; material from government agencies, interest groups, video clip references, etc.

Therefore, there is material that can be lifted from the notebooks to support about any position anyone wishes to take on the matter (although doing so is discouraged). On the other hand, if people review it overall, category by category, they will likely obtain a reasonably accurate picture of the global status of wind power development, both pro and con; plus some more recently identified and increasingly well documented information concerning the alleged adverse health effects.

The social-economic-political uproar in the Middle East arose via Internet "news" and informal organizing efforts after the public experienced being ignored and/or "victimized" for more years than they thought appropriate.

The same dynamic appears to be developing relative to both the property value and adverse health effects issues, on a global scale, relative to wind power development.

There is apparently a world-wide organizing, coordination, collaborative effort afoot to submit research proposals; raise funding to support the research; and make available every news release, piece of testimony, case study, etc. so that the entire world of the Internet is informed about these alleged adverse human health effects caused by wind turbines.

It appears that anyone involved in any way with the development of wind power (and/or other alternative energy development programs) should not ignore the potential adverse economic and political realities that may arise from these global technical-economic-social-political conditions and circumstances, coupled with the enormously effective communication possibilities via the Internet!

I remain committed to arriving at an appropriate, adequate, reasonably sensitive wind power development ordinance in Umatilla County; one that rationally and appropriately protects the interests of all citizens.

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Sincerely,

Clinton B. Reeder, PhD (see attached resume for further credentials)
Member, Umatilla County Planning Commission

Attachments.
Exhibit A. Copyright Year of References Listed in Wind Turbine Syndrome: A Report on a Natural Experiment. By Dr. Nina Pierpont, MD, PhD. 2009
Exhibit B. Time-Line for Wind Turbine Syndrome Awareness and Research.
Exhibit C. Recommended Setbacks, Industrial Wind Turbines to Residential Properties. Dr. Christopher Hanning, MD (UK). Author of Wind Turbine Noise, Sleep and Health. November 2010.
Exhibit D. Wind Turbine Syndrome & the Brain. By Dr. Nina Pierpont, MD, PhD. November 15, 2010.
Exhibit E. What Happened to Noise? Wind Turbines, Property Values and Adverse Human Health Effects. By Clinton B. Reeder, PhD. May 3, 2011.
Exhibit E. Author's Resume

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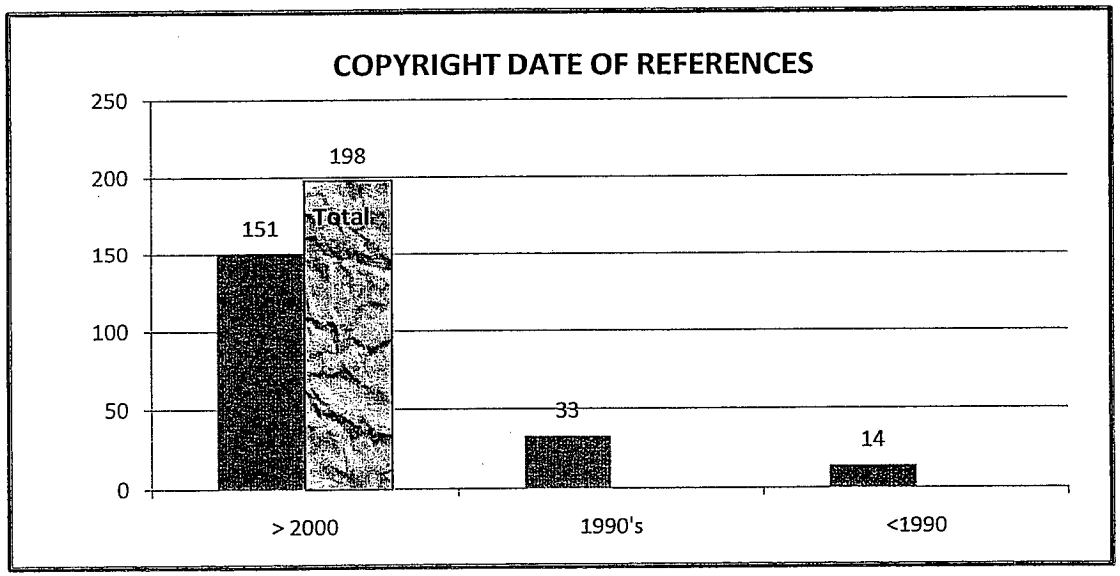
Exhibit A. COPYRIGHT YEAR OF REFERENCES LISTED IN "WIND TURBINE SYNDROME: A REPORT ON A NATURAL EXPERIMENT" (2009). DR. NINA PIERPONT, MD, PhD

Prepared by Clinton B. Reeder, PhD



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Copyright Year	No.	%	
>2005	54	27%	Published since 2005
Total	198	100%	Total references listed
≥ 2000	151	76%	Published since 2000
1990's	33	17%	Published during the 1990's
<1990	14	7%	Published prior to 1990
Age of Reference Material			

Oct 2010	First International Symposium re Wind Power and Human Health, Ontario, Canada
Feb 2011	Australian Federal Parliamentary Senate Inquiry re Wind Energy (> 925 submittals)
Current	International organizing effort to promote research needs and raise funding

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Exhibit B. TIME-LINE FOR WIND TURBINE SYNDROME AWARENESS AND RESEARCH

Developed From An Abbreviated Reference List

Prepared by Clinton Reeder, PhD

Tab No.	Author - Researcher - Event	Credentials	Paper, Book	Topic	Date	Country	Comments
3	Dr. Nina Pierpont	MD, PhD	Wind Turbine Syndrome: Testimony, NY State Legislature Energy Comm.	Health and Setbacks	Mar-06	U.S.A.	
8	Dr. Amanda Harry	M.B.Ch.B, P.G.Dip.E.N.T.	Wind Turbines, Noise and Health	Health	Feb-07	U.K.	
4	Dr. Nina Pierpont (Book now translated into 8 or more languages)	MD, PhD	Executive Summary: Wnd Turbine Syndrome	Health and Setbacks	Dec-09	U.S.A.	Book copyrighted in 2009: Wind Turbine Syndrome: A Report on a Natural Experiment. Contact www.windturbinesyndrome.com
10	Dr. Ben Hoen, et al	MD and/or PhD ?	The Impact of Wind Power Projects on Residential Property Values in the Unites States: a Multi-site Hedonic Analysis [presentaton materials and a paper]	Property Values	Dec-09	U.S.A.	Project Funded by DOE-USA / Pro-wind power / lack of statistical evidence linking view of wind turbines and property values /
11	Wayne Gulden		Critique of Ben Hoen paper	Property Values	Dec-09	U.S.A.	Disagrees with model & conclusions
12	Michael McCann, McCann Appraisals, LLC	CRA, since 1980	Critique of Ben Hoen paper	Property Values	Feb-10	U.S.A.	Disagrees with model & conclusions
15	Dr. Robert McMurtry, et al	MD, FRCS (C), FACS; Chair first international symposium	A Primer on Adverse Health Effects and Industrial Wind Turbines	Health	Mar-10		
9	Michael McCann, McCann Appraisals, LLC	CRA, since 1980	Testimony to the Adams County Board, Quincy, IL	Property Values	Jun-10	U.S.A.	Another similar appraisal is available re Mass.
6	Dr. Calvin Luther Martin	PhD	Your Guide to Wind Turbine Syndrome	Health	Jul-10	U.S.A.	
14	National Health and Medical Research Council		NHMRC Annual Report: wind Turbines and Health	Health	Jul-10	Canada	Pro-wind power development: [no published scientific evidence to support adverse health effects]
2	Jerry Punch,PhD; Richard James, BME; and Dan Pabst, BS		Wind Turbine Noise: What Audiologists Should Know	Health	Jul-10		Pulls traditional acoustics together with current thinking re noise effects
5	Dr. Nina Pierpont	MD, PhD	Wind Turbine Syndrome & The Brain	Health	Nov-10	Canada	Detailed description of inner ear, its functions and communication with the brain; Includes comments by others
13	Chief Medical Officer of Health		The Potential Health Impact of Wind Turbines	Health	2010	Canada	Pro-wind power development" "...some people may find it annoying"

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Exhibit B. TIME-LINE FOR WIND TURBINE SYNDROME AWARENESS AND RESEARCH
Developed From An Abbreviated Reference List

Prepared by Clinton Reeder, PhD

Tab No.	Author - Researcher	Credentials	Paper, Book	Topic	Date	Country	Comments
16	Dr. Christopher Hanning	BSc, MB, BS, MRCS, LRCP, FRCA, MD	Wind turbine Noise, Sleep and Health	Health and Setbacks	Nov-10	U.K.	This paper is regularly updated: www.windvigilance.com
17	Dr. Christopher Hanning	BSc, MB, BS, MRCS, LRCP, FRCA, MD	Last page of above reference: Table II. Recommendations for Setback of Residential Properties from Industrial Wind Turbines.	Setbacks, Turbine Tower to Residence	Nov-10	U.K.	Lists setback recommendation from numerous researchers and authors; identifies their country and the year of publication, with turbine sizes indicated
18	1st International Symposium on the Global Wind Industry and Adverse Health Effects: Loss of Social Justice?		Invitation and Agenda for the Symposium	Health	Oct-10	Ontario, Canada	See Speaker listing and Agenda
19	Australian Federal Senate Inquiry on Rural Wind Farms		Submissions Received by the Committtee: Australian Federal Senate Inquiry on Rural Wind Farms	Health	Feb-11	Australia	> 925 Written submittals -- see listing
7	Testimony - Dr. Sarah Laurie	BMBS, FRACGP, FACCRM	Submission to the Australian Federal Senate Inquiry on Rural Wind Farms	Health	Feb-11	Australia	
	Speaker - Dr. Robert McMurtry, Chair	MD and/or PhD ?			Feb-11		
	Keynote Speaker - Dr. Nina Pierpont	MD, PhD	Defining a Syndrome	Health	Feb-11		Her book and papers are full of medical and technical details; the research model is credible -- book now in 8 or more languages
	Speaker - Orville Walsh		No Global Standards	Health	Feb-11		
	Speaker - John Harrison	PhD	It's Pure Physics	Health	Feb-11	Canada	
	Speaker - Rick James		Acoustics 101	Health	Feb-11		
	Speaker - Dr. Alec Salt	MD and/or PhD ?	Infrasound: Your Ears Hear It, But They Don't Tell Your Brain	Health	Feb-11		
	Speaker - Dr. Arline Bronzaft	PhD	Children: Canaries in the Coal Mine	Health	Feb-11	U.S.A.	
	Speaker - Dr. Christopher Hanning	MD and/or PhD ?	The Torment of Sleep Disturbance	Health	Feb-11		
	Speaker - Dr. Michael Nissenbaum	MD	Deleterious Health Effects are Undeniable	Health	Feb-11	U.S.A.	
	Speaker - Dr. Carl Phillips	MD and/or PhD ?	The Absence of Health Studies Proves Nothing	Health	Feb-11		
	Speaker - Carmen Krogh		A Gross Injustice	Health	Feb-11		

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Exhibit B. TIME-LINE FOR WIND TURBINE SYNDROME AWARENESS AND RESEARCH
Developed From An Abbreviated Reference List

Prepared by Clinton Reeder, PhD

Tab No.	Author - Researcher	Credentials	Paper, Book	Topic	Date	Country	Comments
	Speaker - Eric Gillespie		Social Justice and the Law	Health	Feb-11		
	Speaker - Dale Goldhawk		Media and Pre-emptive Sterotyping	Health	Feb-11		
	Speaker - Dr. Ross McKitricks	MD and/or PhD ?	Coal Kills - Where Are the Bodies?	Health	Feb-11		

Most all field research data is from neighbors to wind tower sites -- most turbine site leases and noise easements (or waivers) include a confidentiality provision which is much like a gag-order -- person granting the lease or easement cannot talk about any negative aspects of the wind power development on their property or referenced in a noise easement. it has been suggested that any confidentiality provisions be prohibited as far as health effects are concerned, to facilitate future health effects research.

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Exhibit C. RECOMMENDED SETBACKS, INDUSTRIAL WIND TURBINES TO RESIDENTIAL PROPERTIES

Source: Dr. Christopher Hanning, MD.(UK) "Wind Turbine Noise , Sleep and Health". November 2010

			Recommended Setback	
Author	Year	Identify	Miles	Kilometers
Horonjeff	2010	US Acoustician	1.5-2	2.4-3.2
Thorne	2010	Aus/NZ Acoustician	1.24	2
Acoustic Ecology Institute	2009	US Noise Engineers	0.93	1.5
NSW General Purpose Standing Comm	2009	Legislators	1.24	2
Kamperman & James	2008	US Noise Engineers	0.62	>1
Kamperman	2008	US Noise Engineer	>1.24	>2
Bennett	2008	NZ Scientist	>.93	>1.5
Adams	2008	US Lawyer	1.55	2.5
Dr. Nina Pierpont	2008	US Physician	1.5	2.4
Frey & Hadden	2007	Scientists Turbines < 2M	>1.24	>2
Dr. Amanda Harry	2007	UK Physician	1.5	2.4
Scottish Executive	2007		1.24	2
Bowdler	2007	UK Noise Engineer	1.24	2
French National Academy of Medicine	2006	French Physicians	0.93	1.5
The Noise Association	2006	UK Scientists	1	1.6
Welsh Affairs Select Committee	1994	Recommendation for Smaller Turbines	0.93	1.5
	Average		1.19 +	1.92
Considering the ">" designations			1.24	2

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WIND TURBINE NOISE, SLEEP AND HEALTH

Dr Christopher Hanning. BSc, MB, BS, MRCS, LRCP, FRCA, MD

November 2010

This paper is based on proofs of evidence produced for several UK Planning Inquiries. As such, it concentrates on the regulatory system in the UK. Other jurisdictions will have different systems.

The aim is to inform those seeking to regulate the siting of wind turbines close to human habitation.

The contents may be used freely without acknowledgement.

The paper will be updated from time to time so please check that you have the latest version from the Society for Wind Vigilance website: www.windvigilance.com

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Exhibit E. WHAT HAPPENED to "NOISE"? WIND TURBINES, PROPERTY VALUES AND ADVERSE HUMAN HEALTH EFFECTS

Clinton B. Reeder, PhD
Member, Umatilla County Planning Commission
May 3, 2011

The title to this paper may seem very, very odd – indeed, "What happened to noise?" While noise itself maybe has not changed, except to the extent noise changes moment by moment, hourly, daily, weekly, monthly with all machines, as bearings and seals wear; as stress and strain cause subtle, and not so subtle decay of materials and engineered structures; as sun and wind and rain and freezing storms alter the landscape and evolve over time.

All professional machine operators drive and operate machinery "by ear", by the sounds it makes, as well as by sight and feel of muscle and tendons and joints; quite literally by a sense of gravity and center of balance (I have been a heavy equipment and truck operator all my life). And sometimes, the noise of entire industries are regulated as a matter of human health and/or safety (hence, the OSHA industrial noise standards, which may now all have to be modified).

The wind power industry may be rapidly approaching an imminent tipping point; one that likely cannot be avoided. The pressure of changing conditions and circumstances and technology is rising, and momentum toward some kind of socio-economic-political nightmare is very real, and might happen unless something is done soon to more productively manage and regulate the potential adverse effects of wind power development.

I am not against wind energy development. But as a fifth generation farmer and land owner, I currently have no plans to have wind turbines on my land. I not want to have them in my upwind backyard, or visible out my front window, between me and our panoramic view of the mountains.

On the other hand, I acknowledge there is a global need for alternative energy sources. My greatest concern is that, as yet, I do not see any particularly focused attention being given to state-wide, regional or national energy policy guidelines that might contribute in a significant way to developing a major productive response to this great need. This is a very pressing need, one that must be addressed in the very near future in an organized manner at the highest levels... and then presented to the general public in a way that energizes national and international resources to accomplish significant investments that contribute positively to the energy dilemma, at every level of society. This policy must also include major attention to efforts to conserve and increase the efficiency of energy supplies currently available.

My life is a living testimony to believing in community; to believing one must invest personally in affairs of state (and local community, as well). Otherwise, the course of events, conditions and circumstances will occur without an individual's input – and that may ultimately be harmful

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to the community. The opinion, judgment and creativity of individuals can be harnessed, all of which is truly unique, to each citizen. As a result, I have been involved in drafting public policy documents and legislation at local, state and federal levels... and involved in the implementation and troubleshooting-amending-rule making and post-implementation monitoring process after adoption.

I believe in the concept of public need, and strongly believe that the public need for alternative energy sources is very acute! Fossil fuels are the result of millions of years of vegetative decay, and we will maybe end up taking that energy supply down to very low levels in less than four hundred years. Life itself is energy-dependent, for all living things – and all non-living things as well, for it is the energy of tides, rain, snowmelt, wind and geological structural shifts that drive even the inanimate changes in the world environment... all of which is "energy-driven". It is a huge challenge, to somehow harness all the energy that ebbs and flows around us each day and night! Due to lack of appropriate cost-effective technology, most all alternative energy sources will need to be subsidized relative to fossil fuel costs, especially in the short term, and especially because fossil fuels will be essential ingredients in developing alternative energy sources, including wind.

Wind power development seems to be approaching a period of more intense public attention, partly driven by state and local budget conditions. It does not appear to me that there is much choice except to face this reality with greater awareness and forthright measures to solve the problem/s. rather than just focusing on making sure the project return on investment, especially return on equity is acceptable and reasonably stable.

As a professional economist, I believe the financial future for wind power is certainly at risk today, and increasingly so, unless my recent investigation is totally wrong. What follows is a brief, not too detailed summary of over 2,500 pages read and/or carefully reviewed for concept and principle, for trend and pace, for potential economic impact and collective political practicality – in addition to reading almost every page of testimony provided to the Umatilla County Planning Commission over the past three years concerning proposed amendments to the county's wind power development ordinance.

A wind power developer sent me a very informative email recently, including great detail and especially, considerable reference to the economic realities associated with wind power development; providing documented community benefits, in millions of dollars. I very much appreciate this email, for it provides me more pertinent facts than any other single piece of information made available by all other developers since this county first issued a wind project permit in 1997. I am not, and have not, nor would I ever deny the positive local beneficial reality of wind power development – in general.

On the other hand, I will not, have not, and will never under-estimate the perceived or real harm being done to some people and their families in our communities by wind power development dynamics. There is another economic reality involved, that of the cost of human suffering due to adverse health effects, lost property value, and unexpected alterations in the lifestyle and daily meaning of life itself for some of our citizens. Communities must be more involved in making the decision as to how such issues might most appropriately be dealt with, if the development of alternative energy sources is to increase and prosper over coming years.

In part, the wind power development process influences and controls the future lifestyle where wind power projects are being built. The projects are being developed in LLC's, partly for management and bookkeeping reasons, but also so they are well packaged and highly saleable "investment merchandise". This means no community knows now who will eventually hold and service their contracts, and meet the negotiated financial commitments to their communities, or whether the investors and/or owners will be nationals and/or foreign interests (not that this makes a lot of difference today). One need not be in such an affected community for long to see and hear people talking about "what is happening", what just happened to the neighbor, etc. – all filled with rumor, suspicion, uncertainty, and a host of emotional elements, both pro and con.

My mission with this paper is to make as reasonably clear as possible, with my limited knowledge of current conditions and circumstances, that the wind power industry faces a dilemma from which they cannot escape, and for good reasons. The dilemma is not all the fault of wind power developers, for it is noise itself that is at the heart of the issue and central concern – noise itself has been, and continues to be re-defined and understood in different ways... and related in increasingly believable ways to the physiology, neurology and psychology of the human person, including how all this might vary from person to person, explaining why the wind turbine effect is not the same for all persons; defining the greater risk factors, and hence, who might be most impacted by wind turbine noise. Failure to recognize and respond appropriately to this reality will create lasting negative impacts to our communities, and the wind power industry. On the other hand, if the industry will join forces, quite literally with local communities and help develop a community-wide response capability, most likely there will be positive benefits for all parties involved.

The other part of this message is that we need not panic; just give more attention to taking appropriate actions today and tomorrow and work together to deal more productively with what is happening to the world of individual people as wind power development proceeds. Indeed, today it may be more important to determine the criteria and standards by which we determine where wind power should NOT be developed, than where it should be developed and encouraged. Oregon now has a bill in the legislature that may help answer this question (SB 554).

Regardless of what some say, there are indeed "victims" of wind power development, and they are getting organized and collectively now telling a story that cannot and should not be ignored. Cumulative effects are a socio-economic-political-technological time-bomb if not appropriately dealt with, in a reasonably timely manner. That is the developing crisis facing the wind power development process and local communities, literally, wherever the wind blows.

Medical Measuring-Monitoring Devices. In recent years there have been a very significant series of medical technology changes. The advent of the CAT scan, the PET scan, the MRI and the EEG -- most of which have been around for many years, but have been continuously upgraded, better understood and adapted to a wider range of applications, including medical applications never before anticipated. These devices now allow doing an interesting and insightful bit of research – we can now hook human body and brain to these

machines and generate a colored picture of how the brain interacts with various sensory organs of human bodies (and similarly for other species, with sensory capabilities similar to humans).

This has permitted a rapid change in the way researchers can now evaluate the effect of noise on the human body. This fact has major repercussions for the wind power industry, in fact most likely for industry of all kinds. And, along with such new capabilities, comes new understanding of many things – like, maybe some now think, Cod (fish) are able to migrate 100's of miles across the sea by "listening" to the low frequency sound of the sea passing over mid-ocean ridges, and surf pounding against distant shores... sounds measured possibly less than 1 decibel!

On the other hand, there is one technical-medical device that has not yet, maybe, been adequately updated – the meters that measure the character and qualities of sound, or collectively "noise" in work places. The common noise meter reads in dBA, that is A-weighted decibels. "A-weighted" means the instrument has been configured to purposefully exclude the effects of low frequency noise, on the traditional assumption that noise that cannot be heard is not worthy of attention in the workplace.

There are a wide range of noise meters, and many today that read both dBA and dBC, the "C-weighting" including, rather than screening out the low frequency noise elements. Some suggest one proxy for measuring the extent of low frequency noise is to subtract the A-weighted meter reading from the C-weighted reading, the difference being at least an estimate of the "amount" of low frequency sound in whatever noise is being measured. The wind power noise standard is generally specified in dBA, meaning that it is likely not including the low frequency sounds appropriately, especially when one considers the extent to which low frequency noise is apparently at the heart of the Wind Turbine Syndrome allegations.

If You Cannot Hear It, Can It Harm You? Historically, it has been thought that noise which the human ear could not hear would not hurt a person. The direct effect of too loud a sound could obviously damage ears and hearing. As a result, factory noise measuring devices focused attention on the noise that could be heard, including speech noise and louder. Today, as well as "yesterday", the wind power developers have assured persons who might live near to wind turbines that they need not worry about the wind turbine noise – that it is for the most part rather quiet (in fact, the literature suggests not louder than the home refrigerator), with a bit of a "swish" thrown in as the blades turn by the wind tower.

The belief that "if noise cannot be heard, it cannot hurt you" has had its day! The new reality it this: NOISE CAN HURT YOU, SERIOUSLY, EVEN IF YOU CANNOT HEAR IT – and maybe even more than what you can hear! Judging from the Internet today, there are abandoned homes in many nations of the world today that testify to this new harsh reality. I talked to a man and his wife today from another nearby county. They and two of their neighbors recently sold their homes to a wind power company. This family is building a new home in a nearby town, so they do not have to live near wind turbines... but will continue farming the same family land.

No Credible Published Material – Increasingly Not True! There is considerable wind power development literature available that states something like this: "There is no published

credible evidence that wind turbine noise has any negative effect on human health". Unfortunately, it appears today that this may be a false statement. Depending on where you look, there is a good deal of such literature available today, written by MD's. PhD's, Engineers and others with a variety of credentials and/or a good mind, a curious attitude and the self-discipline to do a reasonably good job of digging for insight and understanding and sharing it with others.

There is an increasing body of such research and supporting evidence on a global basis today that must not be ignored any longer. Country by country, essentially identical case stories are being documented – with the same or very similar symptoms. We are at a point where wind power developers and land owners upon whose land the wind turbines are being constructed, and maybe even the public agencies that issue site permits may be held liable for supporting-encouraging-owning-permitting-encouraging industrial wind turbine installations that are documented as contributing to serious adverse human health effects, some of which appear maybe to be irreversible (permanent, or at least partially so) even if one moves away from the wind turbines.

One might dismiss all this concern as just "imaginary", "fantasy", a figment of the human mind under stress; an emotional-psychological, psycho-somatic problem, as some might call it, except that now there is research on airplanes, and with air crews, finding health concerns similar to those near wind turbines. Furthermore, there are now office and other high-rise structures that are being declared "sick buildings", maybe a problem one might call "Sick Building Syndrome"; similar to what is now called "Wind Turbine Syndrome". It's no joke! It is a very serious issue; one that I think may greatly increase in significance over the next 5-10 years, with possible implications far beyond what might be expected today.

And what do airplanes, and high-rise buildings have in common: "fans and generators" – a jet engine is just a big fan device; and in high rise buildings with central heating and air conditioning, there are huge fans pushing air throughout the building. What do such devices have in common: they produce massive harnessed and engineered air turbulence with low frequency sound, some of which is beneath the ability of the human ear to "hear". However, those scanning devices mentioned earlier above, if hooked up to human bodies can measure and monitor the effects of such low frequency sound and tell us exactly what part of the brain and body is responding to the low frequency sound. Similar research is also being done with animals – and even fish, which have hearing and balance sensory organs very similar to humans.

Why Be Concerned? Why am I concerned? I am a professional economist, have delivered management training seminars in about half the states. If I have learned anything from that experience, it is to be careful of thinking others who are paying attention to some new information that at first seems simply too weird or "far out" to be real, are just confused or "against something", looking for something to whine about. There were early warning signs of the pending banking and financial services crash – but most people, including the regulators turned a deaf ear and ignored those who waved the caution flags. I know a securities trader who simply told his boss: "I will not trade those kinds of securities – they are junk, and will

come back to haunt us". Later, his boss thanked him for saying "No" to trading in such instruments.

The economic implications of this alleged Wind Turbine Syndrome are enormous, and risk the value of every wind energy project on the books – and jeopardize financing for future projects... and the marketability of such projects. The issue increasingly adds uncertainty and contingent liability to these projects; and the cumulative effect upon people has imminent serious political implications for all global wind power interests, including the general public. It is going to get very costly if developers end up having to purchase every home in a wind project area because the word has gotten around – one can get a new home by just saying NO to noise easements! And even more costly if wind developers one day have to go back and compensate a number of persons for adverse health effects and lost wages, with possible punitive damages included.

The Current Flow of Wind Turbine Syndrome Information. I have prepared a timeline of some recent research which illustrates that most of the research base behind my above comments has been done in the past ten years – with the highest impact work related to wind power development copyrighted in 2009, less than three years ago (*see attached Exhibit __*). This book is, I am told, now translated into at least 8 languages. The author first presented a paper with her thoughts and insights to the New York Legislature in 2006 (at least, that is the first such paper I located. In 2007, a researcher (Dr. Amanda Harry) in the UK released a paper duplicating in part the Pierpont material, which has rather quickly spread around the world. An MD Sarah Laurie, Medical Director for the Waubra Foundation, Australia has written similar material. Since then, other investigations and inquiries have added similar insights and expanded understanding.

In October 2010 the first international symposium dealing with adverse health effects of wind turbines was held in Ontario, Canada – the symposium title included reference to "Social Justice". Dr. Nina Pierpont was the featured speaker. Her work obviously has great credibility and support from the growing number of persons experiencing the adverse health effects of wind turbines.

In February of 2011, the Federal Parliamentary Senate Inquiry re Wind Power was held. Dr. Pierpont submitted a lengthy paper, which is well worth reading, and in large part, is material from her book and/or subsequent papers. This Australian Inquiry brought in over 925 separate written statements, including research material and professional papers. Although it might happen, I have great difficulty understanding how such a massive response can be ignored as having no significant meaning to the future of wind power development.

At the current time, it is increasingly obvious this "noise" vs. human health issue is NOT going to go away. There are multiple Internet web pages dedicated to carrying this material. There is also, I was just recently informed, at least one webpage that is making available links to every paper or article they can locate, on an every-day basis. This means the adverse health effects information will spread rapidly, literally "everywhere"; and the world will study, collate, integrate and material and likely focus faster than many might think possible; quickly coming to know those who present quality research, using credible medical, engineering and related

protocols and procedures; with increased understanding of how the human body responds to various sounds and "noise".

Noise has taken on a whole new dimension for me, now appearing much like a "stew", apparently composed of a multitude of frequencies and other characteristics, to be quite literally "sliced and diced" by the scanning devices listed above, to improve understanding and coping strategies. Noise is claimed by some to be the primary global environmental pollutant!

If we consider that "noise is just noise", and are not aware the there are multiple components of noise, we are apt to not draw appropriate conclusions concerning the health effects of noise. Gear noise is different from bearing noise; new bearing noise is different from worn bearing noise; and some machine operators can identify the separate components and fix things prior to breakdowns in many instances.

Unfortunately, too many of us simply assume: "noise is just noise; that is just the way it is, and little can be done about it!" This mounting noise investment will most likely alter the way society in general copes with, manages and regulates noise, everywhere, all the time. The transition will not be fun in many respects; and will be costly, especially in the short term. I speculate that we will increasingly find that much can be done about noise, and it will save money and significantly enhance the overall human experience, including the effectiveness of our educational system and homes, and preventive maintenance efforts in relation to noise sources and human health.

What Will Likely Come Next? If my understanding is correct, there is now an increasingly focused international organizing effort to improve the collective capacity of professionals and other interested parties to develop research proposals concerning wind turbines and human health, and raise sufficient money to adequately fund them. Early research has been self-financed to a large extent and/or involved considerable voluntary activity. Once public grant funds and other money is attracted to this body of potential research, more than likely, the body of research will grow exponentially, and quite likely as well, will generate some cost effective solutions along the way.

As this global effort gains momentum, the reach of the research effort is likely to become extensive, and to the extent the effort is supported by credible professional and well informed persons, what we know about noise, hearing, and how the human body responds to noise that is below the human ability to hear with awareness will grow materially.

So, what has made this issue such a hot-topic? I think it is the book written by Dr. Nina Pierpont, MD, PhD from New York, USA. The Pierpont book can be obtained from www.windturbinesyndrome.com in paperback. In my opinion, whether or not you agree with the conclusions, it is a book well worth reading (and it has been, and is repeatedly now being peer reviewed)! This book is being quoted and recommended by an international audience that has not only read it but studied it thoroughly, and lived experiences similar to those described in the Pierpont case studies.

New Understanding of the Inner Ear, the Human Balance System and the Associated Brain Functions. Not only has Dr. Pierpont and others recently provided new insight into the wind turbine noise issue, but Dr. Pierpont especially has gone the additional

step of summarizing in considerable detail what is now known about how the ear and human body's sensory systems respond to noise. In the process, she and others have made readers aware that we have four rather than just three balance mechanisms: the (1) eye, (2) the ear, and (3) the balance sensors in joints and muscles, which tell us when we are not in "balance". What Dr. Pierpont has added, is new insight into how the inner-most parts of the ear are sensitive to gravity, vibration, and are linked to the joint and muscle sensors, as well as linked to blood pressure sensors in arteries and veins, plus the balance sensors in the abdominal organs, the diaphragm and the chest.

For example, she makes clear that in fact our breathing mechanism is "open air"; that our breathing and airway into the digestive system can and does carry low frequency noise vibrations quite literally throughout the body. The author explains the physiology of why and how the body can actually "quiver" in sympathetic vibration to the low frequency sound of wind turbines, and how neurologically it transmits to the brain. She further explains that the long, slow low frequency sound wave cycles cannot easily be isolated from people, how such sound literally makes houses vibrate and passes through the walls in ways that increased insulation may not help much.

This investigation leaves me very much more aware that when I am operating a tractor, even with good ear plugs, there is a sound component that remains present; a sound element that I "feel" more than "hear"; and which is, by itself, noticeably fatiguing as the day passes hour after hour. Some days, that "feeling" persists well into the evening, even after I have been off the tractor for maybe as long as one, maybe even two hours. Before buying any replacement tractor or truck in the future, I will drive it with a noise meter on the seat, for I think the overall fatigue level associated with long hours on the equipment may include more low frequency sound effect than I might otherwise be aware. If so, then my earlier speculation about the longer term impact of what is being more recently discovered about low frequency sound will likely be more accurate.

Are We in Motion, or Not? One of the more troubling aspects of the information in this book is the author's explanation of how the low frequency noise can and does, in conjunction with the brain, translate low frequency noise in ways not earlier understood, making the human body think it is in motion, when it is not – thus generating balance symptom such as vertigo, nausea, dizziness. In other words, the low frequency noise is apparently causing the hearing-balance systems to misread signals, with the brain not able to properly discern the confusing neurological messages being sent, with the result being adverse health effects. It is no wonder we have for so long not understood noise, in all its complexity.

Why Am I Having Another More Intense Migraine? Another troubling concern is how the low frequency noise exacerbates migraine, which is not just a headache, but a very complicated neurological disorder that literally disables persons who are affected seriously. Maybe 18% of women (more than males) are affected by migraine, making them very susceptible to more intense, longer lasting migraine episodes if living near wind turbines.

Not Everyone Is Susceptible. A major complication with the adverse health effects associated with wind turbines is that not all people are susceptible to these adverse health effects. This is even true within a given family – some members may experience serious adverse health effects, while others may not. One family may have a different experience from another family just a short distance away. This fact that not all people are susceptible has made it possible to inappropriately assume the problem away, thinking some people just refuse to adapt, or are "weak" emotionally and/or mentally and/or physically.

Identifying in greater detail who composes the susceptible population, and what that proportion of the overall population might be, is one great research need, if society is to more appropriately manage sound and noise in relation to a multitude of industrial and community situations, but especially relative to wind energy development.

Risk Factors. Certain pre-existing health problems do apparently increase susceptibility: prior migraine experience, older age, prior ear damage, previous chemo-treatment for cancer (which can cause some hearing damage), prior experience with tinnitus (ringing-sound in the ears) are among the higher risk factors. The Pierpont book and other materials discuss risk factors at some length; and Dr. Pierpont uses some statistical analysis to eliminate some concerns as risk factors, such as prior mental illness.

"Not Just My Imagination"! One thing that the current research is documenting is that the people complaining about adverse health effects are not just making it up; are not being silly or stupid; are not mentally ill (although the turbine noise can lead to some rather severe mental health concerns). The Adverse Health Effects allegedly associated with wind turbines are not being made up by people – too many have had their symptoms verified by medical professionals for it to be explained away as an international fraud or conspiracy; being carried on by people who do not know any better, or "just have it in for the wind developers".

Memory, Concentration and Learning (For All Ages). Children exposed to wind turbines are prone to certain problems that trouble parents and school teachers. In fact, for some families, the first thing that alerts them to the potential adverse health effects of wind turbines is a note from a teacher alerting the parents that a child's school performance has recently been deteriorating: less alert, memory not as good, decreased ability to concentrate... all of which are symptoms of Wind Turbine Syndrome. When the family cannot keep themselves organized, and are more frequently impatient with each other, they might not be "just having a bad time" but may be experiencing some of the Wind Turbine Effects.

These outcomes are also symptoms of sleep deprivation; adverse health effects are a well documented result of sleep disruption possibly caused by wind turbine noise. The low frequency sound can "alert" people at sleep, without bringing them to full awakeness, and often leaving them without any memory of the sleep disruption – except for the fact they do not feel rested in the morning. Children having difficulty in school is sometimes the major reason parents simply abandon their home (because they are sometimes not saleable if too close to wind turbines, and they refuse to let that handicap their children's school experience).

How Close is Too Close? – Establishing Reasonable Setback Distances

Health Effect Setbacks. Dr. Pierpont and others are recommending a minimum distance from wind turbines of 2km (1.25 miles). Dr. Christopher Hanning in his paper (regularly updated) provides a list of setback distances recommended by various international authors and researchers. This list of setbacks varies, but most are between .8 miles and 1.25 miles; a few more distant. The literature does include some recommended setback distances that are 2 miles or more, with some acknowledging identifiable adverse health symptoms as far away as 5 miles, especially in more difficult rolling or mountainous terrain. A limited number of people are even recommending short term setbacks of 10km (6.25 miles) as a safety measure until more is known about the adverse health effects.

Property Value Setbacks. The literature dealing with property values ranges from some material that claims wind turbines actually increase property values, which is true, but only for (1) land with significant potential for leasing to wind developers; or (2) land that already has wind towers on it, and/or (3) projects close to starting construction. Otherwise, it is for the most part not rational to think that wind turbines close to one's home would increase property value. The available information concerning homes on properties near to wind turbines, but not having them on the home property, indicates property values fall from about 15% to 40%, from 2 miles in closer, until property with wind turbines very close, like 1/4th mile or less, are often not marketable (I have multiple real estate appraisals in my files documenting this reality).

I talked with a man from a neighboring county recently; he plus three other neighbors have recently sold their farm homes to the wind developer. This person and his wife are having a new home built in a nearby town, so they can keep their farm operating without having to live near the turbines. This story can be found happening on an international basis. In these situations, the property value did increase, but only because the owners would not sign noise easements, thus forcing the wind power developer to either buy their home or not install one or more wind turbines. The lesser cost was for the developer to pay more than the value of the homes in order to put up additional towers, which would over time collectively generate substantially more net income than the cost of the homes.

An Economically Driven Division in the Community. One thing is very clear: those most concerned about health issues want more setback distance; those who do not want their property to be devalued by the presence of sight of wind turbines, want more distant setbacks. Those who do not want the view from their property disrupted by the sight of wind turbines, want much more distant setbacks. The city council of one local community in this county has proposed 6 mile setbacks, if the towers cannot be seen; and 15 miles if they are visible in the distance. They fear the future economic development in their community may be too adversely affected by the presence of the wind turbines, and simply do not want to take the risk of maybe jeopardizing future prospects for their community – in part, because they apparently have little confidence that wind power is a major long term solution to the longer term sustainable alternative energy development goal.

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On the other hand, those with the potential of leasing land for wind power facilities; those invested in the wind power companies; those who are managing the wind power projects; and those who manage public entity and taxing district funds supplemented by wind power mitigation fees (all those who have the potential to personally or institutionally benefit financially from the developments), very much (understandably) want the shortest setback distances possible. Public testimony at a recent hearing in this county generated the following summary of setback preferences:

1. Wind power developer's preference, without exception, 1/4th mile.
2. Organized groups, 1.5 – 5 miles.
3. Individuals, 1.25 – 4 miles, mostly 2-4 miles.

Wind power developers understandably much prefer to maximize the number of income generating wind turbines, arrayed in ways that maximize contribution to covering project overhead costs, so they can maintain access to investor financing, bank loans, public subsidy funds and add to net corporate cash flow and equity values, all of which are required to sustain such economic development "financial merchandise" (profitable, marketable projects). Individuals and groups representing them want more distant setbacks, to protect view, property values and/or health, and avoid the "annoyance" of just having them nearby.

Ultimately, Sustainability is Defined by Economics. Economics conveys a very serious lesson: ultimately, it is not generation of electricity that drives this wind energy development process, but rather the generation of steady cash flow, avoidance of legal and public relations nightmares, and thereby significant and stable longer term return on investor equity. This is absolutely NOT meant to be a critical comment; just a statement of the harsh reality of economics and economic development. Unless society chooses to moderate the free pursuit of free markets by imposing reasonably effective "infrastructure-like" regulation, chaos and corruption will permeate such development activity (Infrastructure-like regulation defines the underlying, fundamental ground rules by which the economic game will be played, human health and welfare included; as compared to less effective, more chaotic, often corrupt micro-managing regulations – or little or no regulation at all). This is NOT to say corporations are seldom charitable toward communities, for they are – but that does not change the underlying economic reality, that economic factors are the primary motivator, not "charity". Maintaining a certain level of credible favorable public image is "good long term investment strategy".

Another thing is also reasonably certain: unregulated wind power markets involving only a few very dominant participants cannot be counted on to provide fair and equitable treatment of citizens. Unless citizens demand as a community reasonable regulatory intervention, such as protective setbacks, no market that is dominated by large corporations will ever adequately, on its own, assure fair and equitable treatment of individuals in society – the "public utility" mindset of, "some people must be disadvantaged for the greater good of the community... just a cost of economic development" will likely prevail, unless the community rather aggressively elects to be more charitable about the changes imposed by the development project. There is, to my knowledge, no contrary evidence to this reality anywhere in the world, except maybe in isolated instances, where one or a few individuals in a unique organization have a management

style including more than normal attention to employee working conditions and a fair and equitable sharing of annual earnings, including sharing with the public as well as investors and owners. The concept of being a "good corporate citizen" is not dead, but often a bit difficult to identify as being compatible with local community preferences.

Confidentiality Provisions vs. Public Interest in Health Information. A factor of increasing concern is the confidentiality provisions in the lease contracts and noise easements. These provisions prevent the grantors of wind sites and noise waivers from ever talking about any negative aspects of their experience with the wind turbines (I have several sample contract copies in my files). I think communities might want to ask whether such gag-orders should be allowable, for they will make it much more difficult to appropriately document the adverse health effects of wind turbines. The material list generated by the Australian Inquiry in February 2011 lists some "anonymous" contributors. I am curious whether these might be from people who signed confidentiality agreements earlier, and later decided they should not have done so – but maybe are now willing to risk sharing more publicly their experience.

Confidentiality might appropriately pertain to other aspects of the contracts and easements, but most likely it is not in the public interest to permit the confidentiality provisions to limit the ability of persons living near the wind turbines to share their health related experiences with neighbors, and especially researchers – and public health officials. Public access to the health information may be too important for public benefit to let it be hidden behind confidentiality provisions in lease contracts and noise easement agreements.

Property Value vs. Transaction Disclosure Requirements. Keeping adverse health effects information from the public might be considered cause for terminating the agreements and/or claiming damages for withholding information pertinent to the contractual relationships. If I understand the current real estate regulations appropriately, it is considered a significant violation to not disclose information pertinent to the transaction. My family has had an Estate home for sale in a nearby town for more than a year now, and our disclosure requirements were rather comprehensive. It appears to me that had we withheld any information concerning wind turbines, current or prospective, any sales contract could rather easily have been voided by any buyer. Fraud is another term that might apply, if known pertinent information is withheld, leading to signing of contracts and easements under false and/or misleading information; possibly all connected in a way that would make alleged intimidation and coercion additional factors of concern in any legal proceedings.

The Global Disclosure Consideration. As I study what is now on the Internet, and see the ease with which such information travels "everywhere", it seems clear that it is likely very foolish to ignore the harsh reality that while the percent of the general population that is susceptible to adverse health effects from wind turbines may be relatively small in any given wind power project area, the global cumulative effects reality is that they are adding up to a rather large number of persons willing to share their negative experiences. Withholding or misrepresenting this information, even though it may not yet be adequately documented, may constitute an open invitation to an international class action legal proceedings, maybe in the

World Court, maybe something via the United Nations; or via some kind of coordinated simultaneous legal action in multiple countries most affected by wind power development. I suggest caution in how this information is presented when introducing any new wind power project.

The Public Message Most Likely Needs to Become More Honest. Finally, it appears clear that wind power developers must cease outright assuring the public that there are no adverse health effects associated with wind turbines; and furthermore, the same can be said for information leading people to believe wind turbines will not adversely impact property values. I have talked with three persons just recently who have postponed building new homes or buying an existing rural home, because they do not want to live near the wind turbines. The uncertainty about where the next towers might be built has made the risk of tying up life-savings and then having it devalued by wind turbines too great a risk to take.

What Margin of Safety? There are two primary public concerns relative to the wind power effects: one, the adverse health effects; and second, the potential for property values declining. While the two are closely related, concern over property values includes the very real fact that for some people, the view, the pristine natural landscape, the rural peace and quiet is so valuable, that they will not appreciate even the thought of having that view disturbed by wind towers.

It appears from the literature, that as far as health is concerned, a setback between tower and homes will be between 1 and 1.25 miles, minimum.

If protecting the value of homes is a priority that merits attention, then a setback of 2 miles appears to be reasonably protective, while recognizing that property values for some (many?) people will decline if any tower is in sight within 5 miles, or more, especially if the aircraft warning lights are seen above the horizon at night. Furthermore, wind tower limiting effect of the 2-mile setback can be moderated by allowing property owners to negotiate away part of that setback in exchange for noise easement payments and other mitigation arrangements.

Both the health and the property value risks are imposed upon many rural home owners without towers on their own property. What safety margin is appropriate for public policy to build into wind power development ordinances, relative to health, and relative to property values? Can a single setback distance serve both needs effectively? Can Oregon's state noise standard of 36dBA satisfy both needs effectively, and if so, should early noise modeling maps be required for every state and/or county siting review? And should that noise map be generated with dBA or dBC metering boundaries?

Adverse health effects is such a mean cost to impose; and yet in most cases one will not know in advance who or how many persons might suffer such outcomes. So, if we decide to proceed with less safety margin in order to maximize other economic benefits in the community, what might be the alternative appropriate/reasonable means of compensating those who must pay the heavy price accompanying adverse health effects?

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Multiple Resolution Alternatives are Available – If We Sincerely Seek Them as a Community. It seems reasonable to me to consider that there may be multiple alternatives available: (1) include property value guarantees in contracts with neighboring home owners; or (2) develop agreements that guarantee a price, to be exercised at the home owner's sole discretion on or before some date certain, to provide them some assurance that if they stay, they have a way out if the experience turns out to be less than expected (or promised); (3) have the developer purchase a buildable property where neighbors who want to remain in the community but do not want to live near the turbines might build a new home, at the expense of the wind developer, at a price not to exceed a certain value. The only limit on such possibilities is the creative potential of a community committed to somehow rationally resolving such issues and concerns. My lifetime of experience with community projects suggests rather strongly that, given an opportunity, the typical community will develop multiple solutions to such problems, at least one of which will be economically feasible and generally acceptable.

Identifying Favorable Locations for Wind Energy Development. One thing seems certain: if the wind industry and local authorities do not develop some peaceful, quiet means of dealing with the significant issues, the following will occur: (1) the public relations nightmare for the wind developers will increase, maybe rather dramatically; and/or (2) public authorities, under focused political pressure from wind power victims, will begin imposing a widely variable set of standards upon the wind developments, designed in part to simply discourage the developments and/or to mandate they be placed where they have very minimal adverse effect on local communities – maybe in spite of significant potential economic benefits foregone.

Finally, it seems almost certain that wind power development will, at least to some extent, ultimately depopulate the rural areas in which they exist... unless they evolve into more isolated areas, where the wind power money is more likely to generate new business with fewer adverse community effects; and/or (3) unless more protective setback distances are established, most likely with mandatory minimum setbacks that cannot be changed by noise easements or lease contract provisions. In no other manner can the public protect the longer term rural lifestyle possibilities in areas where wind power potential exists.

Where the wind developments most appropriately belong is a major, fundamental issue – and is closely correlated with the development history of the interstate highway system, which was envisioned as a highly urgent national defense and security system in the days that decision was made.

The optimum locations for wind development would most likely be in less populated areas, but ones with two unique additional qualities. Not only must the wind efficiency be very good (the percent of time the turbines would be operating), but there also must be (1) major electrical grid facilities that not only can carry the additional loads, but assist in spreading the overload on existing systems, all of which must at least terminate where there will be significant markets with the ability to buy the power generated. And (2) there will be a huge need for other stable producers of electrical energy, ones that can reasonably be ramped up and down, in a short period of time, in order to "balance the irregular power generation cycle of wind power; that is, maintain steady primary grid voltage every moment of every day, 24/7.

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This will mean additional large scale electrical generating plants (dams or other water related technologies; and/or natural gas, coal, and/or bio-fuel fired generating plants, or atomic energy plants). This will cost a fortune! But at the time, so too did the Interstate system that today we would be literally lost without in terms of both domestic and export markets. Where might such vast areas be located? Or will they only be developed piece-meal, at higher ultimate cost, and with far greater disruption to local communities?

Do Communities Need Regulations Concerning Abandoned Rural Homes? Maybe, there need to be some "decommissioning" standards for abandoned rural housing units owned by wind power developers, for such sites tend to draw unauthorized "parties" and vandalism. Are houses abandoned by a wind power developer "farm homes" or "non-farm homes"; what is happening to their tax status? How fast can they be depreciated as abandoned homes? What constitutes, legally, abandonment? Are they being properly rezoned if they are declared non-farm homes?

In closing, the issue of what constitutes an appropriate and reasonably protective setback distance is a matter of public concern, broader than just the local community; and needing considerably more open public discussion and debate, with more pertinent credible information being shared.

And the purpose/s of the setback distances needs to be made clearer: health protection; property value protection; empowering the neighbor to a wind power farm; etc. What is it we are trying to accomplish with the setback distances between wind turbines and other rural assets and "values"?

History documents rather well that murdering the messenger has never been very successful in stopping the eventual realities from happening. Hopefully, this writing effort will at least lead to increased collaborative discussion and cooperative efforts to remove some pressing "wrinkles" from the fabric of wind power development in Umatilla County, Oregon and elsewhere.

IN CONCLUSION, I list some factors that may be pertinent in resolving setback issues.

1. General economic benefits to the overall community and county.
2. General economic benefits to local land owners and persons signing noise easements.
3. General economic and related benefits to local persons selling their homes to the wind power developer/s.
4. The potential threat of adverse health effects upon persons exposed to the wind turbine noise.
5. The potential decline in property values likely to be experienced by persons whose property is close to wind turbines.
6. The reality that wind turbines are not favored by a significant proportion of the citizens of the county, especially where they block the view of personally "significant" scenic areas, whether officially acknowledged or not.

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7. The reality that the non-industrialized rural pastoral scene is rewarding in general to the population, and that those who live in rural areas have usually and purposefully elected to continue working and living in the area because of the values provided by the landscape and environment, independent of money earnings or other income sources.
8. The harsh reality that displaced persons the world over experience a global set of adverse emotions when faced with having to move from a site of long pleasure and anticipation of future realities associated with that location, such as having a child continue the family traditions on the land, or having the opportunity to join other family members working the family land... and including being faced with putting children in new schools, changing jobs, making new friends, retraining for jobs different from that learned in prior living, education and experience... experiencing not only a job change, but a cultural shift of possibly major proportions.

Respectfully submitted,

Attachments.

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Exhibit F. DETERMINING IMPACT MITIGATION PAYMENTS FOR RESIDENCES WITHIN 2-MILES OF WIND POWER FACILITIES: A Suggested Impact Mitigation Provision

Clinton B. Reeder, PhD
May 3, 2011

Wind Power Developments Materially Impact EFU/GF Zones. Introduction of wind power development projects in Oregon's EFU/GF zones materially alters the character of the area, and significantly changes the income distribution within the area, which in turn materially alters the comparative advantage those parties receiving wind power related income have relative to property owners not receiving such additional income. Such comparative advantage materially increases the ability of those receiving this additional income to compete for farm land leases and farm land purchases, plus machinery, equipment and other investments essential to operate farm land. In other words, this additional income to certain land owners materially alters the longer term costs of farming to those in the area not receiving such income.

Impacts Imposed Against the Will of Property Owners. Since the impacts of wind power developments are essentially imposed upon those who would prefer not to live near to such developments in the EFU/GF zones, against their will and with negative impacts they do not willing choose to endure, this ordinance provides mandatory minimum means by which those upon whom these negative impacts are imposed may receive reasonable, fair and equitable impact mitigation payment from the wind power developers.

Definitions:

Wind Power Facilities = any above ground turbines, towers, transmission lines, sub-stations, etc. except for service and access roads, fences and gates which are common in EFU/GF zones.

Assumptions and Common Requirements:

1. The noise and other negative effects of having wind power facilities within a 2.mile setback distance from any wind power facilities to a residence is considered to be a trespass upon the neighboring property, and hence subject to a minimum impact mitigation requirement.
2. Once property is under contract for wind power development, as far as the Land Use Planning Program is concerned, that property is "Developed and Committed" to industrial wind power development, which is assumed to be a conflicting land use in the EFU/GF zones.
3. Once EFU/GF property is within land area that is considered to be Developed and Committed, the conflicting use status shall be considered primarily Developed and

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Committed to industrial wind power use until such time as there is no contractual relationship between any wind power developer, owner, investor, lender etc. and the property owner (i.e., the property is entirely, in all respects free from any affects of being subject to wind power development activity, influence or control, including having been restored as required by this ordinance if wind power facilities have been on the property.)

4. Any such property shall be considered, or if necessary actually rezoned into a new and different status, "EFU/GF-Wind Power", which is not intended to alter the deferred tax status of any area of the property that continues or is converted to agricultural or forest practices.
5. Since the total income to any party involved in the wind power development is considered by this ordinance to be a windfall gain, based on "where the wind blows", the impact mitigation payments shall be considered a fair and equitable sharing of that windfall gain with those properties affected by the wind power development but not sharing in the direct payments related to wind power facility options, leases or other payments.
6. If the property owner signs an option or lease to have wind power facilities constructed on their property, any facility site rental payments may be subtracted from any impact mitigation payment requirement, but cannot reduce the impact mitigation payment obligation below zero.
7. Signed noise easements granting wind power developers the right to construct wind power facilities closer than the minimum setback distance shall be required on all properties where wind power facilities will be constructed at distances closer to a residence than allowed by the established setback distance.

Residential Impact Mitigation Payments – Declining Property Values.

Any property within 2-miles of a wind power facility, i.e., inside the Developed and Committed zone, will be subject to minimum mandatory land use conflict mitigation payment requirements.

a. Property within the 2-mile setback boundary shall be assumed, based on currently available real estate research, to be reasonably subject to increasing property value losses from the 2-mile boundary of the zone to the residence, if any, on the property.
b. For such properties, lost property value impact mitigation payment shall be calculated on a linear sliding scale, from zero percent at the 2-mile boundary to 150 percent at the ½ mile minimum setback distance.
c. The property value mitigation payment shall be based on 150% of the pre-wind power facility appraised value of the residence plus five acres of land on the property.
d. The parties to any such agreement may, at their mutual agreement negotiate any other mitigation arrangement they choose, but not less than that required by this provision.
e. The property owner may elect to sign a lease and/or a noise easement allowing wind power facilities to be constructed closer to his residence than

the 2-mile setback distance, but not closer than the minimum setback distance, and receive whatever additional payment might be negotiated, but not less than the mitigation payment required by this formula.

Residential Impact Mitigation Payments – Adverse Health and Annoyance Effects.
It shall be assumed, based on currently available research, that adverse human health effects and/or "significant annoyance" (significant distaste for the conflicting land use) increases materially from inside a 1.25 mile (2 km) boundary from the residence, if any, on the property.

a. It shall be assumed, based on currently available adverse health and annoyance effects research that the persons residing in the residence on this property are subject to experiencing adverse health effects and/or "significant annoyance" inside the 1.25-mile health effects boundary.
b. For such properties, an adverse health and annoyance effects impact mitigation payment shall be required, calculated on a linear sliding scale, from zero percent at the 1.25-mile boundary to 100 percent at the ½ mile minimum setback distance.
c. The per-resident mitigation payment obligation shall be no less than $50,000.
d. The parties to any such agreement may, at their mutual agreement negotiate any other mitigation arrangement they choose, but not less than that required by this provision.
e. The property owner may elect to sign a lease and/or a noise easement allowing wind power facilities to be constructed closer to his residence than the 2-mile setback distance, but not closer than the minimum setback distance, and receive whatever additional payment might be negotiated, but not less than the mitigation payment required by this formula.

Shorter Setback Distances.
If the setback distance from wind power facilities to residences is established to be less than the 2-mile setback distance, this ordinance shall assume the impact mitigation payment obligation from the wind power developer exists as if the effective setback distance were 2-miles, in order to reasonably, fairly and equitable compensate property owners for the negative impacts imposed upon their properties against their will.

The net effect of such an assumption is (1) there will be more wind power facilities built if there are shorter setback distances, without the need for noise easements; and (2) the minimum impact mitigation payments justified by existing property value and adverse health-annoyance impact research will be paid regardless of the setback distance from wind power facilities to residences. In other words, while the wind power development ordinance provisions may be written to encourage construction of more wind power facilities, the ordinance does not assume away the adverse impacts thereof upon property owners for public benefit without reasonable, fair and equitable compensation.

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Categories of Affected Properties

1. Land Owners having signed wind power facility option/s with wind power developer/s.

2. Land Owners having signed wind power facility lease/s with wind power developer/s.

3. Land Owners with wind power facilities under construction and/or operating on their property.

4. Neighboring Property Owners without Wind Power Options, leases or operating wind power facilities on their property, and having signed noise easements.

5. Neighboring Property Owners without Wind Power Options, leases or operating wind power facilities on their property, and refusing to sign noise easements.

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Windpower Development Toolkit

Version 1.0

WINROCK INTERNATIONAL

BRASIL

GEC

GLOBAL ENERGY CONCEPTS

THE Wind Resource

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Toolkit Acronyms

AARI	Annual average rate of increase
AC	Alternating current
AWEA	American Wind Energy Association
ANEEL	Agencia Nacional de Energia Eletrica (Brazil)
BLM	Bureau of Land Management (U.S.)
CPI	Consumer price index
DB	Design build
DBC	Design, build, construct
DBO	Design, bid, operate
DKK	Danish Kroner
DM	Deutsche Mark
DOE	Department of Energy (U.S.)
DSCR	Debt service coverage ratio
DtA	Deutsche Ausgleichsbank
EEG	Erneuerbare-Energien-Gesetz
EIA	Environmental impact assessment
EPC	Engineer, procure, and construct
EPRI	Electric Power Research Institute
FT	Full-time
GCE	Energy crisis management council (Brazil)
GEF	Global Environment Facility
GHG	Greenhouse gas
GWh	Gigawatt-hours (or million kilowatt-hours)
ha	Hectare
Hz	Hertz
IA	Interconnection agreement
IPP	Independent power producer
IREDA	India Renewable Energy Development Agency
IRR	Internal rate of return
ISO	International Organization for Standardization
km	kilometer
KtW	Kreditanstalt für Wiederaufbau
kV	kilovolt
kW	kilowatt (1000 Watts)

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kWh	kilowatt-hours
m	Meter
MACRS	Modified Accelerated Cost Recovery System
MVA	Mega-volt-amperes
MW	Megawatt (or 1000 kW, or million watts)
MWh	Megawatt-hours (or thousand kilowatt-hours)
NFFO	Non Fossil Fuel Obligation
NSP	Northern States Power
O&M	Operations and maintenance
PPA	Power purchase agreement
PROINFA	National Program of Incentives for Alternative Energy
PTC	Production tax credit
REFIT	Renewable Energy Feed-in Tariff
RFP	Request for proposals
RFQ	Request for qualifications
RPS	Renewable portfolio standard
s	Second
SCADA	Supervisory control and data acquisition
SEED	Sustainable Energy and Economic Development Coalition
TVP	Turbine Verification Program
US$	United States dollars
VAR	Volt-ampere reactive
WPA	Wind Powering America
WPS	Wisconsin Public Service

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1. Executive Summary

To address the need for information, materials, tools and references to educate and support parties interested in the development of a sustainable wind energy industry, Winrock International, working in cooperation with Global Energy Concepts (GEC), has developed a Wind Energy "Toolkit." The Toolkit is intended to provide information to key stakeholders and decision-makers in developing country markets regarding a wide range of topics related to large-scale wind energy development.

1.1 Organization of the Toolkit

Each section of the Toolkit addresses a specific subject and summarizes experience and results from the U.S. and other countries that have developed wind energy projects. Topics covered include:

- Policy and Regulatory Options
- Land Option and Lease Agreements
- Procurement of Wind Energy Projects
- Contractual Issues Related to the Sale and Purchase of Wind Energy
- Electric Grid Issues
- Wind Energy Economics and Financing
- Economic Development Impacts

1.2 Highlights of the Toolkit's Main Sections

Section 3: Policy and Regulatory Options summarizes energy policies that developing and developed nations are using to support the inclusion of renewable energy resources such as wind into the electricity market and generation mix. Fundamentally, there are four policy approaches to supporting renewable energy technology:

1. Establishing fixed prices high enough to ensure economical projects
2. Mandating purchase of renewable energy by utilities and other entities
3. Using tax policy or direct subsidies to subsidize project economics
4. A combination of the above

Fixed prices and subsidies, if set appropriately, can be very effective in promoting wind power installations, as demonstrated by Germany and Denmark. Market-oriented combinations of tax policy and mandates have been used in the United States and other developed and developing countries with mixed results. To effectively promote wind power development, an overall system of policies that supports private investment in the energy sector must include:

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- Long-term power purchase agreements backed by a creditworthy organization
- Legal and regulatory environment supportive of private investment
- Stable financial markets
- Access to the electric power grid

Poorly written or constantly shifting policy can impede the development of a wind industry. Conditions that can limit the success of a renewable energy policy include frequent renewal periods for a policy, investment-based rather than production-based incentives, and establishing fixed prices that are too high or too low, or cannot be adjusted based on performance of a project. Such pitfalls can be avoided if industry and government work together to implement policies with specific long-range goals and mechanisms to automatically adjust, reduce, or eliminate the incentives once the goals are obtained.

Section 4: Land Options and Lease Agreements addresses the land acquisition process, including various approaches to accessing and controlling land during different phases of the project development process; common concerns of both the landowner and project developer; and ways in which these concerns can be addressed.

Broadly speaking, developers have two alternatives for acquiring the right to install wind turbines on land: leasing or purchasing. Developers may wish to purchase land outright for wind projects, but this is not very common because it results in an expense that must be added to an already capital-intensive project. Furthermore, because the wind turbines occupy a small portion of the land, and the wind turbines are compatible with most existing land uses, there is no need to acquire all of the land for the wind power project.

Land leases are important parts of project development and lease documentation is required for financing. Many issues beyond price need to be addressed in a lease, including:

- An option period or separate option agreement during the project development phase
- A well-defined long-term period for project operations
- Where wind turbines can be located
- Access for construction, operations, maintenance, and repairs.
- Other approved uses on land surrounding the wind turbines
- Crop protection
- Prevention of other development that would adversely affect the wind power project

Common payment structures include royalties (commonly ranging from 1% to 4% of gross revenues), fixed (or flat-fee), and lump sum payments. Lease Agreements also often allow for mixed-use arrangements so that landowners may continue farming or ranching operations around the wind turbines. A clear understanding of the contract terms can prevent problems between landowners and developers as the project proceeds.

Section 5: Procurement of Wind Energy Projects examines the wind energy procurement process. Wind power projects can be owned by utilities or by others. This section describes various approaches used by utilities to procure wind power, which can be categorized as follows:

- *Power Purchase Agreement (PPA):* A utility may buy *the output of a project* through a power purchase agreement. The wind power project is owned and operated by others, typically private companies.
- *Private Development, Utility Ownership:* A utility may buy *a project* from a private developer, and either operate the project itself or contract with others to operate it. The project is typically built by the developer after winning a competitive solicitation, and purchased after construction is completed, but could also be purchased at an earlier stage of development.
- *Self Development:* A utility may choose to *develop and own a project*, including finding a location, obtaining permits, procuring wind turbines and related equipment, and constructing the project.

Whether a utility seeks to buy power or buy a project or build a project, the tool typically used to select the provider, project, or development services contractor(s) is the Request for Proposals (RFP). Buyers and sellers often have conflicting objectives. Ideally, the RFP, proposal preparation, and proposal evaluation processes can help determine the most appropriate set of compromises, resulting in an acceptable arrangement for both buyer and seller.

Section 6: Contractual Issues Related to the Sale and Purchase of Wind Energy examines issues associated with two major wind energy project documents: the power purchase agreement (PPA) and the interconnection agreement (IA). The PPA and IA define what is being sold and how the project will connect to the electrical grid for delivery of the product. Together, the PPA and IA define responsibilities associated with delivery and purchase of energy from commercial wind projects. Both agreements must be written in ways that will be acceptable to project financing entities.

The intermittent nature of wind energy must be accounted for in the PPA and IA. Sections affected by this characteristic include availability, pricing, purchase amounts, scheduling, force majeure, start up, and interconnection facilities. In some places, transmission operators and regulatory agencies are establishing new protocols for scheduling and pricing wind-generated electricity that acknowledge the intermittent nature of the wind, and provide a reasonable means for wind power projects to use the power transmission grid without undue penalties associated with scheduling an intermittent resource. Treating wind energy as a negative load is the simplest approach.

A sample PPA and sample IA are included in the Toolkit Appendices.

Section 7: Electric Grid Issues discusses grid-related issues unique to wind power projects. Like other electricity generating faculties, wind power projects use the grid to deliver their power to customers. Issues to consider with respect to connecting a wind power project to the electric grid include the following:

- *Transmission system upgrades* may be necessary to reinforce the grid to accept power from a new wind power project. These improvements can be very expensive, and may be necessary if the "best" locations for wind power development in a region are in locations with weak grids.
- The *intermittent nature of wind power* affects the balance of production and consumption much as varying levels of consumption do. A wind power project's output variations need to be considered in the context of power demand variations which occur over the course of hours, days, weeks, and seasons.
- Wind turbines can affect *power quality*, with some of the most significant potential impacts related to whether the wind turbine is fixed speed or variable speed. Potential negative effects associated with reactive power consumption by induction generators and with harmonics from power controls on variable-speed wind turbines can be mitigated. Weak and strong utility grids are currently operating successfully with wind penetration levels in excess of 20% .
- A wind power project's *contribution to system capacity* is the subject of much calculation and debate, but is generally limited to something less than its average output over the long term.

Utilities perform system impact studies to evaluate how a new wind power project will work on the grid, and whether any upgrades to the system are necessary in order to accommodate the new facility.

Section 8: Wind Energy Economics and Financing discusses wind project economics and finance including capital cost components, financing terms, and year-by-year operating costs. A spreadsheet model, included and discussed in an Appendix, can be used to understand the sensitivities of project economics to energy production, project cost, PPA price, incentive structures, and other parameters.

Section 9: Economic Development Impacts discusses the socioeconomic impacts from wind energy projects. Most impacts are positive, particularly the increased employment, economic activity, and income. However, the extent of these impacts will depend greatly on the type of wind power development that occurs and the taxation and employment policies of the region where the developments occur. In the United States, for example, approximately one construction job is created for every 1.25 MW of wind power capacity built and roughly one operations and maintenance job is created for every 5 MW of installed capacity. In developing countries the level of job creation can be double that in the United States.

In addition to direct employment and its indirect multiplier effect, land leases and property taxes paid by wind projects can be important sources of economic activity for a region. Because wind power project construction periods are relatively short, and the number of people employed on an ongoing basis is small relative to the construction period, the increased tax revenue and economic activity generated by a project generally are greater than the costs of additional services required by the projects.

1.3 Intended Use of this Toolkit

The Toolkit is not intended to dictate a "right way" to pursue or support wind energy development but rather to provide reference information that can be used and adapted to address the specific needs of an individual country or region.

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2. Introduction

The formation of a sustainable wind energy industry requires a conducive political, legal, policy, and economic framework in a country or region. To establish such an environment, the public sector must work in cooperation with private sector participants to ensure that the needs of all participants are met. One of the challenges to accomplishing this is the lack of readily-available support information and tools, notably:

- materials to summarize experience and provide guidance on particular topics associated with wind energy development;
- tools to help users understand the perspectives of different wind industry participants; and,
- references to inform and educate interested parties can be difficult to obtain.

To address these needs, Winrock International, working in cooperation with Global Energy Concepts (GEC), has developed a Wind Energy "Toolkit." The Toolkit is intended to provide information to key stakeholders and decision-makers in developing country markets regarding a wide range of topics related to large-scale wind energy development. Each section of the Toolkit addresses a specific subject and summarizes experience and results from the U.S. and other countries that have developed wind energy projects. This document is not intended to dictate a "right way" to pursue or support wind energy development but rather to provide reference information that can be used and adapted to address the specific needs of an individual country or region.

2.1 Scope

This Toolkit provides information and materials designed to answer questions and address issues associated with utility-scale, grid-connected wind power projects. Utility-scale generally refers to commercially-available wind turbines with a rated power over 600 kW, and grid-connected refers to large-scale regional or national grids as compared to community scale isolated mini-grids. Small wind turbines, typically less than 100 kW, are designed for different applications, and, as a result, much of the information in this Toolkit does not apply to small wind technology.

The Toolkit focuses on issues that are unique to wind energy. Although it is not intended to address overall issues associated with developing and supporting an independent power industry, it is generally written assuming that wind energy will be developed within a utility system that supports independent power producers (IPPs). However, in an environment where there are no IPPs, several of the sections will be very useful and relevant to a utility that is developing or purchasing a wind power plant.

2.2 Contents and Structure

Although it is beyond the scope of this document to cover all possible aspects of wind energy development, the Toolkit consists of key topics that were chosen to be of particular value to

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decision-makers and other stakeholders that are in the early stages of encouraging wind energy development. The Toolkit consists of the following sections:

Section 3 summarizes energy policies that developing and developed nations are using to support the inclusion of renewable energy resources, such as wind, into the electricity market and generation mix. The strengths and weaknesses of different policy options are discussed, and examples of effective and ineffective policies are provided.

Section 4 addresses the land acquisition process. It includes discussion of various approaches to accessing and controlling land during different phases of the project development process, highlights common concerns of both the landowner and project developer, and identifies ways in which these concerns can be addressed.

Section 5 examines the wind energy procurement process. The benefits and drawbacks to various models for acquiring wind energy resources are described. Guidelines for developing a successful procurement process under each of the acquisition models also provided.

Section 6 examines issues associated with two major wind energy project documents: the power purchase agreement (PPA) and the interconnection agreement (IA). The differences between a PPA and IA for wind energy and typical PPAs and IAs for other generation resources are discussed. Important terms and conditions for a wind energy PPA and IA also are highlighted and discussed.

Section 7 discusses grid-related issues unique to wind power projects. Technical issues associated with different types of wind turbine generators operating in both strong and weak grids are described. Approaches to dealing with these issues, and examples of successful integration of wind into national and local grids also are provided.

Section 8 discusses wind project economics and finance including capital cost components, financing terms, and year-by-year operating costs. (A spreadsheet model that can be used to understand the sensitivities of project economics to energy production, project cost, PPA price, incentive structures, and other parameters is included in Appendix F.)

Section 9 discusses the socioeconomic impacts from a wind energy project. The potential for job creation from wind energy projects as well as from a wind energy industry are quantified. The potential social impacts of developing a wind energy industry also are discussed.

Appendices to the Toolkit provide additional information on land requirements for wind power projects (Appendix A) and a series of model documents that can be used as a starting point by those developing wind energy-related contract documents. The model documents include:

- Land Lease (Appendix B)
- Request for Proposals for Wind Projects or Energy (Appendix C)
- Power Purchase Agreement (PPA) (Appendix D)
- Interconnection Agreement (IA) (Appendix E)

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Appendix F contains a sample economic spreadsheet model and a discussion of the assumptions and approaches for conducting an economic and financial analysis of a commercial wind project.

2.3 Additional Sources of Information

The material in this Toolkit is intended to provide a starting point from which effective policy and practices can be developed. The intended audience includes government officials, technical personnel, investors and financial institutions, developers, transmission system operators, and landowners. Users may find some sections of the Toolkit more helpful than others, depending on their knowledge and specific circumstances. References and sources of additional information are noted throughout the document.

Because wind technology continues to advance and the wind industry is growing at a rapid rate, the use of current information is important. The following Internet websites provide information about wind energy, and may be helpful to obtain the latest information on a particular issue, or to explore certain topics in more depth:

www.ewea.org: European Wind Energy Association
www.awea.org: American Wind Energy Association
www.windpower.org: Danish Wind Industry Association

A significant amount of additional information on the technology, specific country programs, current policies, and other topics is also available through the Internet.

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3. Policy and Regulatory Options

This section of the Toolkit examines a number of different policies that have been put into place in various countries to encourage commercial wind energy development, as well as other renewable energy technologies. These policies generally are intended to promote the development of private sector renewable energy projects, as many of the countries discussed are moving, or have moved, to a competitive energy market structure. Because the best choice of strategies depends on each country's or region's unique goals and priorities, this discussion focuses on the effects of various approaches to encouraging wind development and provides a framework for assessing the effectiveness and limitations of individual strategies on achieving policy objectives.

Some policy and regulatory elements, such as a well-defined and stable legal framework that supports and protects private investment, are beneficial for all energy technologies. Other policy and regulatory elements, that take into account specific attributes of wind power, are even more effective in promoting the development of a wind power industry. For example, some of the most effective policies and regulations to promote the use of wind energy consider the environmental benefits of wind energy when comparing its costs to conventional power sources such as coal or nuclear.

In general, wind energy development may be supported by employing a variety of incentives in an attempt to spur the market, or by providing a market to guarantee that wind development will occur. The examples provided in this section illustrate one or both of these strategies. One way to stimulate wind development is to lower costs by tax incentives or buy-down programs. But lowering the costs may not result in expanded development if there are no buyers for the electricity. Mandates and other purchase requirements create a market for the output from wind projects without necessarily reducing the costs. Examples of policies and regulations currently used by governments to support wind power generation include:

- government purchases of wind energy,
- government-supported financing for construction costs of wind power projects,
- fixed purchase price programs,
- fixed-quantity (installed capacity) mandates,
- renewable portfolio standards (requiring a minimum amount of energy to be generated from renewable sources),
- grant and award funding, and
- tax incentives/refunds.

There are other, indirect approaches to supporting wind development, such as incentives to attract manufacturing facilities or research and development policies to support the technological advances in wind turbines. However, this section focuses primarily on market development strategies for commercial wind energy projects.

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Individual country and local characteristics need to be considered when adapting these mechanisms to specific situations. Political, economic and infrastructure situations are unique, and governments make policy decisions for different reasons. Therefore, no particular approach is right for every situation. For example, the primary goal of one country might be to meet carbon dioxide emissions reduction obligations, while another country might be seeking to diversify its manufacturing sector and create jobs. Fostering the creation of a domestic wind energy industry would achieve both of these goals, but the incentives to meet them could be structured very differently. In addition, incentives that would be appropriate for a relatively small country (in terms of population and geography) with few indigenous traditional generation resources and a strong electric cooperative sector, for example, may be very different than those that would work for a larger country with significant petroleum and natural gas reserves and a vertically integrated state-run utility.

The following sections discuss policy initiatives designed to promote wind energy development in Europe and the U.S. Specific examples of legislative and regulatory actions are presented and discussed in terms of their impact on the wind industry in each country.

3.1 European Examples

A number of European countries have instituted progressive renewable energy policies over the past two decades. This section provides brief accounts of policy initiatives in Germany, Denmark, and the United Kingdom, which may provide ideas for policy implementation in other countries. These initiatives include fixed pricing, federal funding, ownership-based incentives, regulated energy taxes, renewable portfolio standards, and a separate competitive renewable energy market tied to mandated use of renewable energy.

The fundamental force driving much of the wind energy policy in Europe is global climate change and the commitments made by European countries towards reduction in carbon dioxide emissions.

3.1.1 Germany

In the past decade, Germany has taken the lead in wind power manufacturing and installations as a result of initiatives in three areas of policy: price setting, investment subsidies, and federal financing. During this time, installed wind capacity in Germany increased from 1,132 MW in 1995 to 4,442 MW in 1999 to 11,968 MW in 2002. Germany has a total of about 115,000 MW of installed electric generating capacity, with about 60% of electricity generated by fossil fuels (mostly coal), 30% from nuclear fission, and 5% from wind. Germany intends to phase out nuclear power over the next two decades.

Germany's policy incentives for renewable energy were driven by widespread public support for environmental issues, including concerns regarding nuclear power safety after the Chernobyl accident and regarding climate change associated with carbon emissions from fossil fuels.

The Renewable Energy Feed-in Tariff (REFIT), as part of the 1991 Electricity Feed Law, set the price paid to wind generators at 90% of the average electric utility rate paid per kWh at retail delivery, which averaged about €0.085/kWh from 1991 to 2000. REFIT did not apply to projects

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in which the federal or state government, or a public utility, owned more than a 25% share. Wind power development was concentrated in the northern coastal areas of Germany, and in response to concerns that the relatively high prices paid under REFIT were unfairly burdening utilities in the north, REFIT was amended in 1998 to cap a utility's obligation at 5% of its total deliveries in a year.

REFIT was replaced in 2000 by a new national renewable energy law, Erneuerbare-Energien-Gesetz (EEG), which requires the operators of Germany's electricity network to purchase energy from each specified form of renewable energy (including wind) for 20 years, for a minimum fixed price. In 2003, the starting price for new wind generation was €0.089/kWh for the first five years. After year 5 the rate drops to €0.06/kWh and holds constant for 15 years. For projects starting after 2003, the high (first five years) and low (years 6 to 20) reference prices decrease by 1.5% each year. If a project's energy generation is below 150% of the reference turbine performance,[1] the higher fixed price period is extended in two-month increments, with the length of the extension proportional to how far below 150% of the reference turbine performance actual project performances have been. The intent of this system is to provide support for projects in lower wind sites while not providing "excessive" subsidies to projects in windy sites.

The key to an effective fixed-price policy is price setting. Prices set too low will not spur development while prices set too high can hurt public and political support of the policy. To ensure that the prices in Germany are appropriate, EEG requires re-evaluation of the price structure every two years to address electricity market changes, technological developments, and the market penetration of renewable technologies. Any changes to the EEG pricing structure would apply to new installations; projects which are already operating have "locked-in" their long-term pricing according to the EEG pricing structure at the time of their installation, thus providing price confidence to those contemplating an investment in a project.

The second German policy area, investment subsidies, started in 1989 as the "100 MW Wind Programme" and was expanded in 1990 as the "250 MW Wind Programme." This program was phased out from 1996 to 1998. Under the program, projects received subsidies of 200 DM/kW (about 120 US$/kW), with a maximum limit of DM100,000 per project for projects less than 1 MW, and a maximum of DM150,000 per project for projects over 1 MW. Depending on project size and capital cost, this could result in a subsidy of up to about 10 to 15 percent of capital costs.

The third policy area, federal funding, offers German renewable energy projects below-market financing through a federal funding institution, Deutsche Ausgleichsbank (DtA), in cooperation with the European Economic Recovery Program fund and the environmental fund program of Kreditanstalt für Wiederaufbau (KtW). The loans cover approximately 75% of project costs, have a fixed interest rate of 1% to 2% below commercial rates, and up to a 5-year grace period during which interest payments are required but the principal amount of the loan remains the same. The federal funding is combined with financing from other sources, such as local bank loans (12% to 15%) and grants (5%), and equity contributions of 5% to 8% of project capital costs. The ready availability of loans covering the majority of the project cost, coupled with

[1] The reference turbine is a series of turbine types operating at an average wind speed of 5.5 m/s at 30-m hub height, using an approved power curve [4].

favorable long-term feed-in tariffs, have made it relatively easy to identify investors interested in wind power projects.

As noted previously, the German system has been very effective in stimulating wind power development. The stable source of revenue at prices sufficient to provide an acceptable return, combined with relatively low cost loans and subsidies to address the capital-intensive nature of the technology, have resulted in high growth rates. In response to this success, an amendment to the EEG, proposed in September 2003 by the German environmental ministry, seeks, among other things, to reduce incentives to wind power projects by:

- reducing the maximum length of time that projects in low-wind locations can extend their "high rate period pricing" to 10 years (for a total of 15 years from project start, including the base 5-year period)
- reducing the "low rate period price" applicable in years 6 to 20 at high-wind sites by €0.005/kWh (i.e., for projects completed in 2004, pricing in years 6 to 20 would be €0.054/kWh instead of the €0.059/kWh provided by current law).

3.1.2 Denmark

An early leader in wind energy technology, Denmark also has been effective in encouraging wind power development. In 1995, Denmark had 637 MW of installed wind capacity. This had increased to 2,880 MW in 2002. Denmark has a total of about 13,000 MW of installed electric generating capacity, with about 80% of electricity generated by fossil fuels, none from nuclear fission, and 18% from wind.

Denmark's policy structure historically has differentiated incentives based on ownership type: wind energy cooperatives (co-ops), private ownership, and utility ownership. Denmark's wind power infrastructure favors local project ownership (either by individuals or cooperatives) of small, distributed projects.[2] This structure has tended to increase costs (due to a lack of economies of scale) but has reduced local opposition to project development because the projects were small, had local supporters, and maximized the local economic benefits.

Until recently, co-ops and private owners were eligible for long-term power purchase agreements with utilities, at 85% of the retail electricity price, or about 0.25 to 0.35 DKK/kWh (about 0.04 to 0.05 US$/kWh). Co-ops and private owners also received a refund of the energy tax (0.17 DKK/kWh in 1996 or about 0.02 US$/kWh), and refund of the carbon dioxide tax (0.10 DKK/kWh in 1996, or about 0.01 US$/kWh). Payments from these three sources totaled approximately 0.5 to 0.6 DKK/kWh (about 0.07 to 0.09 US$/kWh). These revenue sources reduce the financial risk to investors and lenders because the project will have a guaranteed revenue stream, which in turn, enhances the project's ability to generate net revenues to repay loans and provide a return on invested monies.

Over 150,000 Danish families own wind turbines, either outright or through co-ops, and this ownership represents a strong political force in the country. Also, the Danish Wind Turbine

[2] Originally, co-op members had to live within 3 km of their wind turbines. This location requirement was progressively liberalized in the mid-1980's (to 10 km) and through the 1990s (with requirements to live or work in the same or neighboring borough as the wind turbines).

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Owners Association publishes monthly operating statistics by wind turbine type, including success stories and problems. This public reporting provides strong incentives for wind turbine manufacturers to produce a quality product and to provide support during the operations period.

Another policy element that has affected the Danish wind power industry is the requirement for turbine certification. The Danish government established the Risø Test Station for Wind Turbines, and wind turbines have to be certified to receive government subsidies, and (more recently) to connect to the electric power grid.

Through the 1980s, Denmark provided an investment subsidy of 30% of a wind turbine's cost. Denmark largely avoided problems associated with investment subsidies that occurred in the U.S. (discussed below) because of the Risø certification requirement and the relatively modest amount of the subsidy compared to the U.S., among other things.

Because of the emphasis on local ownership and the tax structure, utilities have had very few incentives to build projects of their own. They were not eligible for the energy tax refund or any preferential tax treatments. However, they could apply for refunds of the carbon dioxide tax when utilizing renewable energy. Utilities were required to pay for any grid reinforcement that may be required to accept energy from wind projects. Increased costs were added to the utilities' rate base and passed along to all consumers. Utilities may play a larger role in future wind power growth in Denmark as available space for new projects on land is depleted (and more new projects move to larger-scale offshore sites), and as a means of meeting increasing renewable power generation targets.

Recent changes in Denmark's policy have replaced the 85% of-retail-prices feed-in tariff for new projects. Power purchase agreements signed from 2000 to 2002 receive two forms of payment for the electricity: a fixed minimum price of 0.33 DKK/kWh for 10 years (about 0.05 US$/kWh) plus a "green certificate" which will trade at a market-based price, with a legislated minimum value of 0.10 DKK/kWh and a maximum value of DKK 0.27 DKK/kWh (a range of about 0.015 to 0.040 US$/kWh). After ten years of operation, the system is intended to become fully dependent on market prices.

Because Denmark was an early leader in grid-connected wind power, many wind turbines there have reached the end of their design lives. A replacement certificate system has been established to promote removal of old equipment (below 100 to 150 kW rated capacity) and installation of new equipment. A certificate holder is awarded a higher price for electricity produced from new turbines up to a maximum of two or three times the replaced capacity (depending on the replaced turbine). As a result, in 2002, 300 new turbines totaling almost 300 MW have replaced approximately 1,300 old turbines with a total capacity of about 100 MW. Danish wind turbine installations in 2002 totaled 526 MW, so the replacement program represented over half of 2002's installations.

The recent transitions in Denmark's wind power policy illustrate an important point: consistent, long-term policy helps increase development of wind power projects, and uncertainties about future policies decrease development. Table 3-1 shows the recent history of wind turbine installed capacity in Denmark. Growth in wind power capacity was fairly steady in the late

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1990s, and then peaked at approximately twice the recent annual average in 2000, when the last installations with power purchase agreements under the previous (85% of retail pricing) feed-in tariff were constructed. In 2001, growth was low, and then was high again in 2002, in part due to the wind turbine replacement program described above. The low in 2001 was in part due to uncertainties that affected the industry from 1999 to 2001 as significant changes to Danish government leadership and wind power policy were considered and initiated, as well as from the completion of projects in the development process which were "pushed forward" so they could qualify for more desirable power purchase arrangements before the eligibility period ended.

Table 3-1. Recent Danish Wind Power Installed Capacity[1]

Year	Year End Installed Capacity, MW	Growth from Previous Year, MW
1997	1,116	259
1998	1,420	304
1999	1,738	318
2000	2,341	603
2001	2,456	115
2002	2,880	424
2003 (estimated)		250

[1] Source: BTM Consult *World Market Updates*

Denmark's early and relatively steady policy support for wind power has made it an industry leader, both in terms of electricity market penetration (roughly 20% of Denmark's electricity is expected to come from wind in 2003) and wind turbine manufacturing (with Danish companies controlling about 50% of the world market). Evolution of Denmark's policies to a more market-based approach introduced uncertainties in the marketplace, but current policies appear to be again leading to significant increased growth in Danish wind power.

3.1.3 The United Kingdom

The United Kingdom has a total of about 73,000 MW of installed electric generating capacity, with about 70% of electricity being generated by fossil fuels (mostly coal and natural gas), 20% from nuclear fission, and less than 1% from wind.

The United Kingdom's electric utility industry was deregulated gradually over the 1990s. One part of the deregulation process was the Non Fossil Fuel Obligation (NFFO) program. The NFFO program was originally designed to protect the nuclear energy industry in a deregulated market, but the law allowed for the participation of renewable energy technology and eventually was used solely for renewable energy. The NFFO established semi-annual new electric capacity goals for non-fossil fuels, and further evolved to subdivide these goals by technology (i.e. wind, biomass, landfill gas). Renewable power project developers compete economically within their technology market for power purchase agreements with the regional electric utilities. The power purchase agreements in the first two rounds of the program were for up to about 8 years;

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subsequent rounds were for 15-year agreements. The program promotes competitively priced bids and creates both economically driven technological improvements and research and development efforts.

Table 3-2 summarizes the results of the five NFFO auctions. As shown in the table, prices were reduced significantly from Rounds 1 and 2 (with short-term power purchase agreements that ended in 1998), and subsequent rounds (with 15-year power purchase agreements). Other factors which likely contributed to the decrease in bid prices were improved wind turbine equipment, increased developer efficiency gained from experience, and increased investor familiarity with the technology, which should lower required loan interest rates or investor requirements for return on their investment.[3] Note that Table 3-2 indicates the amount of wind power capacity that was awarded contracts under the NFFO; many of the projects winning NFFO contracts will not be constructed due to difficulty in obtaining local permits, lack of transmission line access, financing difficulties, or other factors.

Table 3-2. Summary of NFFO Auctions (England and Wales)[1]

Year	NFFO Round	Wind Power Capacity, MW[2]	Bid Prices (GBP/kWh)	Bid Prices (approx US$/kWh)
1990	1	28	0.058 – 0.100	0.092 – 0.160
1991	2	196	0.064 – 0.110	0.102 – 0.176
1994	3	385	0.040 – 0.060	0.064 – 0.096
1997	4	793	0.031 – 0.050	0.050 – 0.079
1998	5	856	0.024 – 0.046	0.039 – 0.074

[1] A similar process was used in Scotland and Northern Ireland.
[2] MW of installed wind power capacity. References to capacity in NFFO documentation are often made in "declared net capacity" which for wind is defined by UK regulation as 43% to account for the intermittency of wind. Values in this table have been divided by 0.43 to arrive at the capacity noted.

Any difference between the NFFO premium price and the electric utility's average monthly power pool purchasing price is reimbursed from the Fossil Fuel Levy fund. The Fossil Fuel Levy was initially created (like the NFFO) to subsidize nuclear power, and will continue through 2014. However, part of this subsidy went to renewable energy once the NFFO began being used for renewables. The levy has changed over time, and has ranged from slightly over 10% to less than 1% of the retail price of electricity.

While the NFFO was expected by many to support a vigorous wind power industry in the United Kingdom, through 2001 only 525 MW of capacity had been installed, which is far less than in Denmark or Germany. The primary reason for this shortfall is difficulty in obtaining permits in a timely fashion. Furthermore, power transmission constraints appear to be limiting wind power development in the United Kingdom. Broadly speaking, the UK grid operates with excess generation in the north (where wind resources are best, but power demand is relatively light), and power flows over constrained transmission lines to the south (where wind resources are lower,

[3] Additional discussion of risk and project financing is found in Section 8 of this Toolkit.

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and power demand is relatively heavy). Therefore, wind power development in the north tends to exacerbate transmission limitations, rather than help alleviate them.

In 2002, the United Kingdom switched from the NFFO contract system to a renewable obligation system. This system follows the basic premise of the renewable portfolio standard system used by some states in the United States (see discussion below). The British renewable obligation requires electricity retailers to source 3% of their electricity from renewable resources in 2003, rising to 10% by 2010. This obligation requires roughly 1,250 MW of new renewables to be installed each year. While applications for renewable projects have increased significantly, the Renewable Power Association expects only approximately 565 MW of renewable projects to become operational in the year ending March 2004. Wind power will likely have a large role in this increased development, with approximately 325 MW expected to be developed in both 2003 and 2004, with increased emphasis on off-shore development in the future.

Early stage development activity appears to be significantly increased in response to the renewable portfolio standard, with published reports indicating 6,000 MW of new on-shore wind power capacity being submitted for government approvals during 2004 and early 2005.

Approximately 700 MW of off-shore projects have been approved in Round 1 of the government's off-shore approvals process, with another 4,000 to 6,000 MW expected to be applied for in Round 2. The Round 1 process included relatively small projects within about 12 miles of the mainland (in UK territorial waters), with 22-year leases. The first utility-scale UK offshore project, the 60 MW North Hoyle facility, a Round 1 project, was completed in November 2003. The Round 2 process includes much larger projects beyond territorial waters, with 40-year leases.

3.2 United States Examples

The United States has instituted several different policy mechanisms at the federal and state levels to encourage the growth of the renewable energy industry, with varying degrees of success. The United States has a total of about 850,000 MW of installed electric generating capacity, with about 70% of electricity generated by fossil fuels (mostly coal and natural gas), 21% from nuclear fission, and less than 1% from wind.

3.2.1 Investment Tax Credits

During the 1970s and 1980s, the federal government established several investment-based tax credits intended generally to stimulate the economy. These investment tax credits included specific provisions for renewable energy resources such as wind, partly in response to the 1973 embargo by Arab oil producers which caused widespread economic disruption. The investment tax credit allowed wind project owners to reduce their taxes based on the amount invested in qualifying projects. Soon afterwards, California offered a similar tax credit at the state level, resulting in a nearly 50% tax credit on the cost of the wind technology[4] that could typically be claimed in the first one to two years.

[4] For more information, see Bird, L. et. al. (2003) *Policies and Market Factors Driving Wind Power Development in the United States*. National Renewable Energy Laboratory. Contract No.: DE-AC36-99-GO10337. Available at <http://www.nrel.gov/docs/fy03osti/34599.pdf> p. 6-11.

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In the same general timeframe, the State of California required utilities to offer power purchase agreements to renewable power projects at what turned out to be very favorable rates. These power purchase agreements typically were for 30 years, with fixed pricing during the first 10 years that was based on an escalating forecast of power prices. The contracts included both an energy and a capacity payment. Energy payment prices started at about 0.05 US$/kWh in the early 1980s and increased to about 0.13 US$/kWh in the 1990s; capacity-based payments increased the average price paid per kWh by another cent or more.

The combination of tax credits and high price power purchase agreements led to a flurry of wind development in California in the 1980s. As a result, throughout the 1980s, more than 90% of the world's wind energy capacity was installed in California. However, because the tax credit was an investment tax credit, a project had only to be complete and connected to the grid by the end of the tax year. In other words, there was no incentive to operate the projects, just to install them. In addition, there was significant pressure to install projects in a hurry, especially in years when the tax credit was set to be reduced or expire.

With progressively higher fixed energy prices and a very lucrative tax credit, financing of projects could be arranged where investors were able to achieve favorable returns on their investments from tax credits and accelerated depreciation alone, whether or not the projects actually produced much energy. Frequently this financing included bank debt secured by the projects. This combination of policies resulted in a number of projects that were poorly sited and used unproven turbine technology. Many of these projects did not perform as expected, and banks, insurance companies, and some investors suffered significant losses. Although the investment tax credits and high-priced power purchase agreements did result in significant amounts of wind power capacity being installed, the economic fallout of those policies still influences financing decisions today. United States banks are generally skeptical about wind technology because of these early failures, and exhibit reluctance to re-enter the wind power lending market. In recent years, most loans for U.S. projects come from European or Canadian institutions.

3.2.2 Production Tax Credit

The conditions noted above led to approximately 1,000 MW of wind power being installed in California through 1986. However the investment tax credit was not renewed in 1987, and from 1987 through 1991 only about 500 MW of new wind power was installed in California, using undeveloped capacity which remained on some of the power purchase agreements with high prices that had been obtained in the early 1980s. By 1991, the cumulative installed wind power capacity in the United States totaled 1,600 MW.

In 1992, a federal Energy Policy Act was put into place that included a renewable energy production tax credit (PTC). Based on production rather than investment, the provision encouraged the development of wind projects which focused on long-term operation. From 1992 through 2002, 3,100 MW of new utility-scale wind power capacity was added across 15 states. Other factors, such as technology development which lowered the cost of energy produced from wind power, growing political support for clean power, and state mandates resulting from utility deregulation legislation also helped increase demand for wind energy.

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Currently, the PTC is the primary U.S. federal policy that supports wind power development. A similar provision, the Renewable Energy Production Incentive (REPI), is available to public power entities or others that do not pay federal income tax. Because the REPI requires federal fund appropriations each year, it is more limited than the PTC and the value may be reduced if more applicants request funds than have been allocated.

The PTC applies to energy generated during the first 10 years of the project's operation. This federal tax credit started at US$0.015 per kWh in 1994 and has since been adjusted annually for inflation (approximately US$0.018 in 2003). Because it represents "after-tax" monies to investors, the effective "pre-tax" rate of the PTC is currently equal to about US$0.025 per kWh.[5]

The credit, as currently implemented, has two main drawbacks: short-term implementation and non-transferability. The PTC originally expired in 1999, and after expiring, was renewed to 2001. After expiring in 2001, the PTC was again renewed to December 31, 2003. Since wind power projects typically need at least a two-to-three year development timeline, the short-term renewals are not sufficient to guarantee the PTC will be in place when needed (a project qualifies by being completed and operational before the expiration date). Since the PTC must be renewed every few years and renewal is never certain, it has created a boom-bust development cycle in the United States. Table 3-3 shows the installed wind capacity in the U.S. relative to the expiration of the PTC. As previously discussed, the lack of long-term, consistent policy has been detrimental to the growth of the U.S. wind industry.

Table 3-3. U.S. Wind Power Development and the PTC[1]

Year	PTC Status	Year End Installed Capacity, MW	Growth from Previous Year, MW
1997		1,611	21
1998		2,141	530
1999	Qualifying projects must be complete by June 30; extended December 1999 so that projects completed through 2001 qualify	2,445	304
2000		2,610	165
2001	Qualifying projects must be complete by December 31; extended March 2002 so that projects completed through 2003	4,245	1,635
2002		4,674	429
2003	Qualifying projects must be complete by December 31	6,361	1,687

[1] Source: BTM Consult *World Market Updates,* except for 2003 growth, which is from Global Energy Concepts.

Another drawback to the PTC is that it represents a non-transferable tax credit, not a direct payment to project owners. To fully benefit from the PTC, project owners must have a

[5] This equivalent pre-tax rate (2.5) is obtained by multiplying the after-tax rate (1.8) by the effective tax rate, assumed to be about 40% taxation: 2.5 = 1.8 X 1.40.

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significant and continuing federal tax liability.[6] This limits the number of participants, and favors large, profitable companies as owners of wind power projects in the United States. Recent market disruptions in the electric utility and other sectors (which have caused some companies to not be profitable, and thus not owe tax against which the PTC would be credited), and application of the Alternative Minimum Tax (in which tax may still be owed under certain conditions) make the PTC less valuable to some potential project owners. With limited participants, there is limited competition and the financial returns demanded by equity investors for wind power projects in the United States is high relative to the equity returns demanded in Europe.

3.2.3 Accelerated Depreciation

Accelerated depreciation on invested assets is also provided by the United States tax code, and helps improve the after-tax return on investment in wind power projects. Depreciation is based on measuring the loss in value of an asset over its useful life. Depreciation is considered an expense and is listed on an income statement (and for purposes of income tax calculation) as an expense.

Depreciation would normally occur over the useful lifetime of the equipment, which for wind turbines is about 20 years. A normal "straight-line" depreciation of wind turbines would thus allow for a taxable income deduction of 5% of the cost of the equipment each year, for 20 years. However, with accelerated depreciation, much more of the investment can be deducted for income tax calculation purposes early in the life of the project, thus increasing the economic value of the project to the owner. In 2003, accelerated depreciation provisions applicable to new wind power projects include depreciation of 60% of the cost of the equipment in the first year, 16% the second year, and 10% in the third year, with full depreciation by the end of the sixth year. As with the PTC, to fully benefit from depreciation, the project owner must have a substantial federal tax obligation that can be reduced through the depreciation expense deduction.[7]

3.2.4 Government Purchase Mandates

The United States government is the largest single energy user in the nation, representing about 2% of electricity use. State and local governments also consume large amounts of electricity. As a result, government mandates can represent large incentives to the wind power industry. Executive Order 13123, signed in 1999, is a general directive to federal agencies to increase their use of renewable energy. Because there are no incentives for compliance (or penalties for non-compliance), response to this order has varied between agencies and geographic regions. Goals have been set by several agencies and significant purchases have been made by the Department of Energy, the Environmental Protection Agency, and the Department of Defense, among others.

[6] The owner of a 50 MW wind power project would receive a PTC benefit of roughly $2.8 million per year (2003 $). While unused benefits can be rolled forward, they would be less valuable to the owner in subsequent years due to the time value of money.

[7] When considering income tax issues, it is important to understand the differences between tax credits (such as the PTC) and tax deductions (such as depreciation expense). A tax credit is much more valuable than a tax deduction, because a tax credit is subtracted after tax is computed rather than before.

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In New York State, the governor's Executive Order 111, signed in 2001, requires all state agencies to purchase at least 20% of their energy needs from renewable energy sources by 2010. Since the government often represents a large electricity user, its renewable energy purchases can spur immediate development and economies-of-scale. To date, these mandates have not had a substantial impact on installed capacity in the United States, but this is expected to change.

3.2.5 Renewables Portfolio Standards and Other Mandates

As utilities in the U.S. are deregulating, a number of individual states have implemented some form of renewable energy mandates as part of their deregulation legislation. One of the more popular forms of mandate is known as a Renewables Portfolio Standard (RPS). With an RPS, retail suppliers of electricity are required to purchase a minimum percentage of electricity from renewable sources.[8] A retailer can meet its obligations by building and operating its own renewable power projects, buying energy directly from a renewable energy producer, or by buying through a broker. This system is expected to utilize competitive market forces that will minimize the prices paid for renewable energy.

As with any policy, the structure of RPS legislation affects its impact. Key elements to success include:

- Compatibility with the local electric market structure to ensure each participating utility can meet their obligations in the most cost-effective manner
- Support for existing renewables if needed
- New renewables requirement
- Strong penalties for non-compliance that cost more than complying
- Flexible structure to allow adjustments for technology advances and other market developments
- Precise and clear wording

There are several key decisions to be made in developing an appropriate RPS requirement. First, legislators should determine the overall renewable energy development goal. They must also weigh the renewable energy potential of the policy-affected area against the historic and projected energy/electricity consumption and generation mix to determine an appropriate development goal.

Second, legislators must decide which technologies qualify or "count" toward fulfillment of the RPS goal. For example, in areas with significant hydroelectric generating capacity, the allowed RPS technologies may not include any existing hydroelectric units, may limit existing hydroelectric plants to a maximum capacity in order to qualify, or only allow for new and/or small-scale hydroelectric capacity. Depending on these restrictions, an RPS might not encourage any new development because its goal could already be met with existing resources. For example, in the State of Maine, the RPS requirements are lower than the existing hydroelectric generating capacity. As a result, the legislation in that state is ineffective in promoting additional

[8] Retail suppliers of electricity would typically be the local utility, or in situations where electricity sales have been restructured or "deregulated," one of the companies that competes for a customer's business.

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renewable energy generation. The determination of qualifying technologies should account for types of renewable energy resources already in the region, as well as technological advances.

A third key decision is specifying obligations for electricity sellers. This decision also requires a definition of which sellers are subject to the requirement. Some RPS implementations exclude very small utilities, cooperatives, and municipal utilities. Obligations can be based on energy (i.e., number of kWh delivered) or capacity (i.e., kW amount of electrical generating assets) and can either be a fixed goal or be tied to a percent of electricity sales.

While there is no federal RPS in the US, approximately 13 states have passed RPS legislation by 2003.[9] Table 3-4 illustrates the RPS requirements for each of these states. Most of the state goals represent a significant increase in renewable power generation, and most have interim goals to promote incremental increases in renewable power generation on the way to meeting the long-term goal.

Table 3-4. RPS Requirements for States in the U.S.

State	% Renewable and Date	Applies to . . .
Arizona	1.1% by 2007	All
California	20% by 2017	3 largest utilities (which deliver about 75% of electricity in the state)
Connecticut	13% by 2009	Switched customers, muni/coops exempt
Iowa	2.6% by 1999	2 utilities
Maine	30% by 2000	All except muni/coops
Massachusetts	4% by 2009	All except muni/coops
Minnesota	10.5% by 2006	1 utility (which delivers about 70% of electricity in the state) [1]
Nevada[2]	15% by 2013	All except muni/coops
New Jersey	6.5% by 2012	All except muni/coops
New Mexico	10% by 2011	All except muni/coops
Pennsylvania	Varies by utility	All except muni/coops
Texas	3% by 2009	All except muni/coops
Wisconsin	2.2% by 2011	All

[1] Other utilities make good-faith effort to generate or procure 10% from renewable resources by 2015. No penalty for not making effort or meeting goal.
[2] 5% of the 15% goal is allocated to solar generation.
Source: Deyette, J., S. Clemmer, and D. Donovan, *Plugging in Renewable Energy: Grading the States*

The goals shown in Table 3-4 can be misleading and difficult to compare without additional detail. Although Maine's and Connecticut's RPS goals are high, the policies do not encourage new renewable energy development to meet growing demand. Maine already receives 45% of its electricity from existing hydroelectric and bioenergy resources. Furthermore, hydroelectric

[9] Additional detail on the various state RPS goals and implementation can be obtained from the Union of Concerned Scientists at www.ucsusa.org/documents/State_Renewable_Energy_Standards.pdf.

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power generated outside the state can also be used to meet the Maine RPS requirements. In Connecticut, unclear language has hurt implementation of the RPS. The state public utilities commission, which regulates electric utilities, determined that the RPS requirements only applied to those customers who switched from their incumbent (monopoly) electricity supplier to a competitive supplier. Since few customers have switched providers, this effectively reduced the RPS requirement below a meaningful level.

Texas provides one of the best examples of the impact of an RPS on wind development. Passed in 1999, the Texas RPS resulted in rapid wind energy growth in the state, with about 915 MW of new wind generation installed in 2001. The market continues to grow, with an additional 300 to 500 MW of new wind expected to be installed by December 2004. Retail sellers of electricity are required to buy a set percentage of their sales in either renewable energy generation or Renewable Energy Credits (RECs) annually. This has created a wind energy boom and an active RECs trading market.

The California RPS should facilitate the development of 11,000 MW of additional renewable energy generation. The California RPS only applies to the state's largest three investor-owned utilities, which account for approximately 75% of the electric consumption within the state. However, even municipal utilities like the Los Angeles Department of Water and Power, which are exempt from the RPS legislation, are receiving political pressure to increase their renewables portfolio. The California RPS also has the following key elements, which support people's expectations for its success:

- Requires a 1% per year increase from current level for each affected utility until they reach the 20% goal.
- The 20% goal represents an increase from current levels for all three utilities.
- Requires in-state (or very near the state border) generation.

Nevada's RPS is also likely to create a large market for wind energy. Since its 1997 implementation, the goals have been refined and expanded from the initial requirements for all suppliers to provide 0.2% of sales in 2001 from renewables, growing to 1% in 2009 to its current levels requiring the state's two utilities to use 15% by 2013. The Nevada RPS also recognizes the solar potential of the state by allocating 5% of the state's 15% goal (i.e. 0.75% of electricity) to solar generation.

Mandates for renewable energy have also been put into place by other legislative or regulatory actions. In Minnesota, for example, the regulatory commission required the largest utility in the state to install over 400 MW of wind energy as part of an agreement that allowed them to store nuclear waste within the state. Regulators also have required renewable energy development mandates as part of utility merger agreements.

3.2.6 System Benefit Funds and Public Goods Charges

Another renewable energy policy initiative to come out of deregulation legislation is the creation of funds to be used to support renewable energy programs within states. Program funds are typically collected through a small increase from ratepayers of the state's investor-owned utility companies. These funds are then used for a variety of renewable technology research, education

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and outreach activities, or direct support of renewable energy projects. Approximately 15 states have some type of public benefit fund for renewable energy projects.

For example, California provides incentive funding for new renewable electricity projects through a production incentive based on a competitive solicitation process, with a cap of 1.5¢/kWh, paid over a five-year period after the project begins generating electricity. Funding is allocated through the auction bidding process where bids are ranked in order of lowest incentive request (price per kWh) to highest. Beginning with the lowest request, bids were accepted as winners until available funds were depleted or all bids were accepted. Competitive auctions were held in 1998, 2000, and 2001. Approximately 1,300 MW of projects (75% for wind power) were awarded funding at prices ranging from 0.26 to 1.35¢/kWh (US$0.0026 to US$0.0135 per kWh). By the end of 2003, more than 750 MW of renewables funded through the incentive program will be operational.

As another example, Illinois created a Public Benefit Program through its 1997 electric utility restructuring law. As part of this program, the Renewable Energy Resource Trust Fund was established and collects a US$0.50 per month residential customer fee (higher fees for industrial and commercial customers). Revenue from this fund is expected to amount to approximately US$50 million per year for at least 10 years. The fund will provide grants, loans, and other incentives for renewable energy projects.

3.3 Developing/Transition Country Examples

Although the majority of wind energy development has occurred in the U.S. and Europe, some of the best wind resources in the world are located in developing countries. A few countries, such as India and Brazil, have taken steps to implement broad policies to encourage wide-spread development of wind energy within their countries. Brazil has documented excellent wind resources in many locations throughout the country. India, on the other hand, has only moderate wind resources but an aggressive set of development incentives. A more detailed discussion of the experiences in these two countries is provided later in this section.

Other countries have initiated activities to increase awareness of the wind energy potential and demonstrate the technology. Such activities are often precursors to policy development. For example, many countries have developed detailed wind resource maps to quantify their wind energy potential in targeted regions or across the country. The U.S. National Renewable Energy Laboratory has recently developed maps for Mexico, Philippines, Sri Lanka, and parts of China – each showing hundreds of MW of potential wind development. A number of countries have installed wind energy projects with the assistance of international aid funds. Some of these projects are small demonstration projects such as the 3 MW wind project in southern Sri Lanka , and others are fairly significant in size, such as the 50 MW project in Huitingxile in Inner Mongolia, China. The results and experience with such projects are intended to encourage legislators to implement additional incentives for wind development.

Even if strong policies or incentives are not in place, a number of countries have installed commercial wind projects, often at higher costs than other generating options. Such decisions are driven by a variety of factors including an interest in gaining experience with the technology and the operation of intermittent generating resources, a desire to diversify energy portfolios or use

indigenous resources, or as a hedge against future projected fuel increases. Costa Rica has granted power purchase agreements to several wind projects to take advantage of its excellent wind resources (annual averages of 10 m/s). A small demonstration project was installed in Mexico in the early 1990s and the national utility is currently developing a solicitation for a 50 MW project with expansion potential to 100 MW in the same region as their pilot project.

Morocco has an ambitious program to develop solar, wind, and other renewable energy sources to reduce its dependence on imported fuel. In 2001, the first large wind farm, with 50 MW of capacity, was constructed by a joint venture of Electricite de France and Vestas Wind System A/S of Denmark. In late 2003, bids for constructing two new projects totaling 200 MW, to be located near Tangier and Tarfaya, were being evaluated.

A number of other countries are working to increase the amount of electricity generated from renewable sources. Guatemala passed a renewable energy incentives law in late 2003 which provides economic and fiscal incentives for the development of solar, small hydro, biomass, geothermal and wind energy. The effectiveness of this legislation will become apparent in coming years. Some countries have been able to develop a fairly solid wind industry infrastructure in tandem with wind power project development. A study by the Global Environment Facility (GEF) of project work conducted in developing nations found three key issues in the success of developing a renewable energy market:

- First, create a favorable investment climate for private projects.
- Second, create a regulatory framework for independent power producers.
- Third, determine the optimal way to cover the price difference between wind power and established (often conventionally-fueled) technologies.

Fundamentally, these requirements need to be met for an effective renewable energy policy any place in the world.

The experience with implementation of wind power policies in India and Brazil are outlined in more depth in the sections below. As previously discussed, India experienced a significant amount of wind power development in the mid 1990s due to an aggressive set of incentives. After a development lull and some modifications to their policy strategies, India has experienced additional growth in the last few years. Brazil has set high market penetration goals for wind energy and is in the midst of implementing new programs. If effective, the new policies will launch a significant commercial wind energy industry in the country.

3.3.1 India

India has a total of about 120,000 MW of installed electric generating capacity, with about 82% of electricity being generated by fossil fuels (mostly coal) and 3% from nuclear fission, and less than 1% from wind. India has set a goal of 10,000 MW from renewables by 2012, of which about half is expected to come from wind power.

India has the most developed wind industry among the developing/transition countries. To foster private development, India established tax credits. These were investment-based at first, but have since been switched to production-based credits because the investment-based incentive lead to

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projects that did not perform well, and because the marginal corporate tax rate has been reduced from 55% to 35%. The investment-based incentive had a similar effect as the investment tax credits in the state of California, described above. With much of the return on investment tied to the capital cost but not the long-term performance of the project, some Indian projects use inferior equipment, though eligibility and commissioning rules were used to address these shortcomings. Also, numerous projects were built in a short time period, with limited opportunity to work out technical and operational difficulties, nor time to properly complete wind resource assessments or develop sufficient local services and support sectors. Many projects built in the mid 1990s have been plagued with component failures, communication system failures, and a relatively weak power grid.[10] These problems, coupled with economic weakness, caused the wind industry in India to shrink from 550 MW of new capacity installed between 1994 and mid-1996 to 215 MW of new capacity installed between 1997 and 1999. This in turn, caused economic harm to many investors who had invested in facilities to manufacture wind turbines and components in India.

However, the Indian government has developed new policies to facilitate the development of a more solid and long-term industry. These policies include energy market rules and regulations, which aid the participation of renewable energy projects in the energy market. Some of these rules include publicly-available power purchase tariffs, transmission wheeling,[11] third-party sales, and power "banking."[12] Power wheeling has allowed for growth in the independent power producer (IPP) sector. IPPs can use the different state electric board transmission lines, for a fee, to deliver power directly to a customer. Wind generators also can "bank" excess power delivered to the grid during the windy monsoon season, when power generation is high but electrical demand is low, and apply it later when demand increases.[13] The Indian government also guarantees local utility PPAs. These new policies helped to significantly increase wind power development in India: by March 2003, total installed capacity was 1,870 MW, an increase of 850 MW since the end of 1999.

Project financing in India is facilitated by the India Renewable Energy Development Agency (IREDA)[14] as well as other financial institutions. IREDA, a public limited government company, has financed approximately 360 MW of wind power projects along with 1,300 MW in other renewable technologies.

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[10] See Section 6 of this toolkit for a discussion of grid issues, including discussion of the meaning of "weak grid."

[11] Transmission wheeling occurs when power generated in location A is sent across (wheeled through) transmission lines in location B, for delivery to location C. Wheeling is a financial transaction, as the physical electrons will travel the path of least resistance towards the closest demand center.

12 Power banking is similar to making a deposit or withdrawal from a bank. A utility can bank excess renewable energy purchases in one time period against the potential of under purchase in a future period.

[13] This use of the power grid for "banking" wind energy from one season to the next would require another power generator to lower its production when the wind power project is "storing" power, and to increase its production when the wind power project is "withdrawing" power. This may be difficult to implement depending on the type of other power plants on the grid, and how they are owned and operated.

[14] More information on IREDA's wind program is available at http://ireda.nic.in/main_wind.htm.

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Many state-level policies also affect wind development in India, and these policies vary from state to state. Examples of such policies include standardized power purchase agreements, tax incentives, and financing assistance. Specific examples include:

- In Karnataka, the state government set grid charges at 20% of power sales for wheeling electricity to customers, far in excess of the federal government's Ministry of Non-conventional Energy Sources guidelines stating these fees should be 2%. The wind power purchase price in Karnataka has been set at approximately US$67 to 70 per MWh.
- The proposed wind power purchase price in Maharashtra is approximately US$76 per MWh, with provisions related to wheeling, banking, and third-party sales expected to be part of the final regulatory package.
- Gujarat has offered state-owned land for wind development.

3.3.2 Brazil

Brazil has a total of about 75,000 MW of installed electric generating capacity, with about 83% of electricity being generated from water (hydroelectric generation), 4% from nuclear fission, and less than 1% from wind.

Brazil's wind industry is in its infancy, with approximately 20 MW of wind capacity installed as of 2003. Potential for further development remains high due to the country's large size, growing demand for electricity, existing manufacturing base, and significant efforts expended to evaluate the best locations for wind power development by both the government and the private sector. In 2002, Brazil adopted a law known as the National Program of Incentives for Alternative Energy (PROINFA) to increase the generation of electricity from wind, biomass, and small-scale hydroelectric power. Main elements of PROINFA include the following:

- Wind, biomass, and small-scale hydropower systems to supply 10% of electric power consumption within 20 years.
- In its first phase, Eletrobrás, the state-owned national electric utility holding company, is to sign 15-year PPAs with 3,300 MW of IPP developed renewable energy capacity, with a preference for awarding contracts to "autonomous" IPPs not affiliated with companies involved in Brazil's conventional electricity generation, transmission, or distribution.
- In its first phase, PPA prices are based on reference prices specific to generation technologies.
- In its second phase, Eletrobrás will sign 15 year PPAs in equivalent capacity to make up for at least 15% yearly energy market increase with renewable energy from wind, biomass, and small-scale hydropower systems.
- In the second phase, prices under the PPAs shall be based on competitive prices from a combination of gas-fired combined cycle power plants and large scale hydroelectric plants. The difference between competitive prices and specific technologies will be compensated by a special account called CDE (Energy Development Account) which is to be funded by consumer mandatory contributions.

PROINFA introduces a notable change in Eletrobrás' role, which has traditionally focused on system planning, financing, and expansion. With PROINFA, Eletrobrás will serve as the power buyer but will leave to the private sector the role of investing in the generating assets.

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Implementation of PROINFA has been delayed because many important issues, such as power pricing and PPA terms, are still being developed. Preliminary prices, which were published in July 2003, varied depending on location and expected production levels (with lower prices going to facilities with higher winds). They ranged from about US$62 per MWh for a facility with a capacity factor[15] greater than 44% in the north and northeast regions, to US$79 per MWh for a capacity factor of less than 34% elsewhere.

PROINFA is only one of many laws and regulations governing the overall energy policy environment in Brazil. Other issues relating to electric power, monetary policy, taxation, and land use (at the federal, state, and local level) need to be considered to gain a complete understanding of the regulatory and policy situation in Brazil. Previous efforts affecting the promotion of wind power in Brazil include:

- Decree 2003 (1996), which defined what an IPP is, and guaranteed access to the electric grid for IPPs.
- Law 9.648 (1998), changed several previous laws and promoted restructuring of Eletrobrás.
- ANEEL[16] Resolution 112 (1999), defined how wind power projects would be registered or authorized by the federal electric power regulating agency.
- ANEEL Resolution 261 (1999), required that electric utilities invest 1% of their operational income for research and development, and conservation, which could include renewable energy technologies.
- Decree no 3.827 (2001), exempted wind power equipment from the industrial products tax through 2002.
- GCE[17] resolution 24 (2001), created the emergency wind power program with a goal of 1,050 MW installed wind power capacity by 2003.
- Law 10.438 (2002), created the PROINFA incentive program discussed above.

Some of these policies were effective only for a short time (not long enough to help with long-term wind power development efforts), while others are relatively new, with key implementation steps now underway.

As of June 2002, ANEEL had authorized approximately 4,200 MW of wind power projects pursuant to Resolution 112. However, implementation of many of these projects may be slowed because two companies, SIIF and ENERBRASIL, own more than 80% of the authorized projects, but are considered "non-autonomous" IPPs because they also own utilities in Brazil.

[15] Capacity factor is calculated by dividing the energy produced during a year (or other time period) by the amount of energy that would have been produced if the facility operated at full output for the entire year (or other time period).

[16] ANEEL is the Agencia Nacional de Energia Eletrica, the regulator of the electric industry in Brazil.

[17] GCE is the Brazilian energy crisis management council created in 2001 to manage the electricity crisis which resulted from rising electricity demand, droughts which reduced hydropower generation, and a lack of investment in new generating capacity.

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Thus, the projects owned by SIIF and ENERBRASIL may not obtain PPAs from Eletrobrás because of the "autonomous" provisions within PROINFA.

Also, regulatory changes that promote wind power are occurring while Eletrobrás and the electric power industry in Brazil are being restructured to decrease government ownership and increase private ownership. With changes in government leadership, there is some doubt both inside and outside of Brazil that this industry restructuring would continue as planned. This political uncertainty makes investment in capital-intensive wind power projects less favorable.

Additional issues facing wind power developers in Brazil include high inflation, limited sources of financing, the expense of importing wind turbines from Europe or the United States due to weak Brazilian currency, and import tariffs.

Brazil's long-term prospects for wind power appear good. Significant challenges related to changes in government leadership and electric utility privatization have lead to many policy changes which have yet to produce significant wind power development. The ongoing implementation of PROINFA may provide the right combination of policies to allow the wind power sector to grow significantly in Brazil.

3.4 Overview of Policy Considerations

Table 3-5 summarizes the various policies discussed in this section.

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Table 3-5. Summary of Policies Discussed

Policy Type	Examples Where Used[1]	Comments
Investment tax credits, investment subsidies, and accelerated depreciation	Germany, Denmark, USA, California, India, Mexico	Combined USA/California credits meant long-term energy generation was not critical to investor returns; potential for abuse without proper oversight and equipment certification. Should be used carefully (with proper oversight and equipment certification) and should be balanced with operating-period incentives to promote operation.
Tax refunds, exemptions, and production tax credits	Denmark, USA, India, Brazil, Mexico	Favored over investment subsidies because tied to successful operation, not just based on capital investment. Reduces overall risk by providing a portion of the revenue stream needed to repay investment. Repeated expiration and subsequent renewal of production tax credit in USA has led to boom-and-bust cycles. As implemented in USA, owner must have substantial tax obligation in order to benefit from the incentive, thus restricting ownership structure of projects
Feed-in tariffs (price setting)	Germany, Denmark, California, various Indian states, Brazil	Price should be high enough to support development, but not too high as to over stimulate or to be too expensive for ratepayers; may be desire to "levelize" benefit in less windy areas (adjustment formulas can be complicated, and need/fairness of such adjustments is debatable). Mechanism needed to re-assess price as technology develops and markets change
Minimum capacity goals & renewable portfolio standards	United Kingdom, various USA states, Brazil, China	Allows market-based mechanisms to be used in fulfilling goal, such as auctions and competitive bid/proposal processes. Not all award winners will necessarily construct a project, particularly if competition results in under-market pricing.
Government purchases	USA (federal and New York state)	May require transmission wheeling or retail product offering by serving utility (or tradable renewable energy certificate market) to be possible.
Government financing	Germany, India	
Government guarantees of contracts	India	Government guarantee of power purchase agreement likely necessary to obtain financing if power buyer itself is not deemed credit-worthy.
Government land offered for wind development	USA, India	
Public goods charge	California, United Kingdom	Can be used to collect revenues for application of other programs such as production incentives (such as the UK's Fossil Fuel Levy to fund the Non Fossil Fuel Obligation). Charge must not be too high, and any revenues should be fairly used.
Wind turbine certification requirement	Germany, Denmark	In Denmark, required for eligibility for subsidies and, more recently, for grid connection. Helps ensure that technology receiving public funds is viable.
Transmission access requirements	Denmark, India, Brazil, Mexico	Can include many issues, such as transmission grid access and upgrade cost policies (whether paid by project or spread over all ratepayers), power banking policies, power wheeling policies, definition of Independent Power Producer.
Turbine replacement incentives	Denmark	Higher price awarded to new projects that replace older equipment. Has increased redevelopment of old projects, and increased installed capacity.

[1] Note that most of these policies have been used in places other than described here. As such, this list is illustrative, not exhaustive.

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Note that each country and state reviewed in this section has taken its own approach to renewable energy policy. Germany and Denmark have used fixed prices and subsidies, while the United States uses a market-oriented combination of tax policy and mandates. The United Kingdom, India and Brazil have used various combinations of (mostly) market-oriented approaches but have installed less wind power than Germany, Denmark, or the U.S. – generally because some other element of the overall policy framework was missing or inappropriate for wind power development. To effectively promote wind power development, an overall system of policies that supports private investment in the energy sector must include:

- Long-term power purchase agreements backed by a creditworthy organization
- Legal and regulatory environment supportive of private investment
- Stable financial markets
- Access to the electric power grid (see Section 6 for detailed discussion of grid-related issues)

Poorly written or constantly shifting policy can impede the development of a wind industry. Conditions that can limit the success of a renewable energy policy include frequent renewal periods for a policy (like the two- to three-year renewal periods for the United States production tax credit), investment-based rather than production-based incentives, and establishing fixed prices that are too high or too low, or cannot be adjusted based on performance of a project. Such pitfalls can be avoided if industry and government work together to implement policies with specific long-range goals and mechanisms to automatically adjust, reduce, or eliminate the incentives once the goals are obtained.

For any policy to be truly effective, the policy makers need to know the local market: its structure, the demand level, growth in demand, suppliers, existing resources (generation and support infrastructure), and potential for renewable energy development. Policy makers also need to have a clear and precise goal to create a functioning policy. When these needs are not addressed, the policy can have unintended consequences or not produce the desired goal.

3.5 Additional Sources of Information

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4. Land Option and Lease Agreements

This section of the Toolkit addresses the issues that need to be considered when acquiring land for a wind energy project. Wind power developers typically obtain long-term leases on land for use by the project.[18] Often, this is done in two steps: an option phase and a long-term lease phase. To determine whether a parcel of land has a strong wind resource, the developer must gain access to the land to install wind monitoring equipment. This short-term access often is gained through an Option Agreement. If testing reveals a good wind resource and other factors indicate the project is feasible, the developer would normally exercise the option, and the long-term lease would be completed. If not, the option can expire. It is also possible for the short-term option phase and longer-term lease agreement to be included in a single agreement.

There are a number of elements to consider when preparing a wind power project land lease or option agreement. These include payment structures, pricing, terms, and land use issues. The perspectives and interest of landowners and project developers are discussed in this section as well as the typical ways in which the needs of the participants are met by the agreements. Appendix B contains an example of a Lease Agreement.

The legal tool used to obtain the rights to develop and operate a wind power project on another person's land will vary depending on local laws and customs. There are several common but legally different methods of obtaining these rights, including leases, easements, and land trusts. For the purposes of this document, the word "lease" is being used despite the fact that leases, easements, and land trusts are legally different.

4.1 Background

4.1.1 Reasons for a Landowner to Participate

Often land suitable for wind power projects is owned by rural landowners or by communal or government (federal, state or county) entities. Landowners may be interested in leasing their land to wind power projects for any of these reasons:

- ***Increased Income*** – Leasing the wind rights on windy land to a wind power developer can provide valuable additional income. At the same time, most of the leased land remains available for farming or ranching around the turbines, which in typical multi-turbine projects occupy less than 5% of the land on which the project is located.
- ***Income Diversification*** – Whether a farmer's fields lay fallow or are in production, a farmer will receive payments from a wind power lease.
- ***Economic Development for the Local Community*** – Wind energy development can bring a boost to the local economy through the creation of skilled jobs, including

[18] Frequently, wind power projects are located on land leased from a third party, rather than on land purchased specifically for the wind power project and owned by the wind power project owner. Reasons for this arrangement are discussed in Section 3.1.3.

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manufacturing turbines or building and operating wind power projects, and through increased taxes to the local government.

- ***Cleaner Air and Water*** – Wind energy is one of the cleanest electric power sources available. It does not pollute the air or water, nor does it produce waste that must be stored or disposed. Wind power can be used on a large scale for years to come, without damaging the health of local residents or affecting future generations.

4.1.2 Site Identification and Assessment

Before entering into land use agreements, wind power developers need to understand whether a particular site is suitable for a wind power project. The power in the wind varies greatly from one location to another, and only data gathered at a specific location can demonstrate how it blows at that location. Developers use wind power maps, knowledge of an area, and data they obtain from wind monitoring equipment to understand how hard, in which direction, and when the wind tends to blow at specific locations. Appendix A contains additional discussion of how developers identify land suitable for wind power development and the amount of land typically required for a project.

4.1.3 Leasing versus Purchasing

Broadly speaking, developers have two alternatives for acquiring the right to install wind turbines on land: leasing or purchasing. Sometimes developers purchase land outright for wind projects, but this is not very common. Most land purchases occur when electric utilities own a project or for research projects (i.e., not in a competitive, commercial environment). Land purchase is uncommon because it results in an expense that must be added to an already capital-intensive project. Furthermore, because the wind turbines occupy a small portion of the land, and are compatible with most existing land uses, there is no need to acquire all of the land for the wind power project.

Land ownership does have the advantage of providing a wind power developer with long-term control of the project site, which would allow for new projects to be constructed after the useful life of the original project without the need to negotiate a new lease. Though not common, in the United States, electric utilities that own their wind power projects[19] are the most likely to own the underlying land. Land ownership gives the utility the benefits of long-term control of the power-generating asset, and the land purchase can often be included in the utility's rate base (investments and expenses the utility is allowed to recover from customers).

Leasing the land or obtaining easements from the landowner is the most common type of arrangement made by wind power project developers. For non-utility independent power producers (IPPs), a leasing agreement is more beneficial to the cash flow of the project because land lease payments are usually spread out over the life of the project and therefore do not have a disproportionate impact on the project's financial returns at the beginning of the project. For

[19] The distinction here is between utilities that own a wind power project (and thus the power produced by the project) versus utilities which buy the power produced from a wind power project owned by others using a power purchase agreement (PPA). Ownership alternatives are discussed in Section 4, and PPAs are discussed in Section 5.

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wind projects that are only marginally profitable, the land payment arrangement can make a meaningful difference in the project cash flow and economic viability.

Another reason that land leasing is the most common approach is that wind turbines occupy only a small portion of the overall land used for a project and wind developers have no use for the remaining land. Wind energy development is compatible with a number of existing land uses, such as grazing and crop cultivation.[20] Leasing the land for wind energy development provides the landowner with additional revenue without significantly interrupting existing operations. Wind project developers—whether utilities or IPPs—generally are not interested in expanding their business to take over agricultural pursuits; therefore, a leasing agreement is beneficial to both parties. Lastly, land purchase is uncommon because many farmers or ranchers are simply unwilling to sell land that may have been in their families for generations. Supplementing their income with lease payments from wind developers allows them to retain their property, continue with their long-established activities, and maintain a lifestyle with which they are comfortable.

4.1.4 Land Uses and Mixed-Use Arrangements

In the United States most wind power project development on private land has been on agricultural land already used for crops or ranching. A few projects have been sited on forested ridges. Wind power projects are fully compatible with such uses, and few restrictions apply.

In the case of farmland, land can continue to be farmed in close proximity to the turbines. A small amount of dirt or gravel surrounds the base of the tower and usually serves as the only buffer. A typical rule-of-thumb is that a 750 kW turbine takes up approximately 0.1 hectare (ha) of land including its access road, and a 1.5 MW turbine about 0.2 ha.[21] Wind turbine access roads tend to be dirt or gravel roads built at the same level as the surrounding farmland, making it easy for a farmer to cross the road with any farming equipment used. Cables and wires are usually buried underground. Farm animals such as cows and horses can be let to pasture in the surrounding fields without being affected by the wind turbines.

4.1.5 Option Agreements

Once potential sites are identified, the developer will enter into an Option Agreement with the landowners to gain access to the land for testing and to secure the rights to the land if the project goes forward. The developer normally needs to obtain at least six months to two years worth of hourly wind data at a specific location to evaluate the wind resource.

To allow sufficient time to procure testing equipment and test the resource, the option period typically lasts three to five years. The term may be extendable. Before the term is over, the developer can either exercise the option to lease the land, request an extension, or let the option expire. This way, both the landowner and developer are protected if, during that option period, it is decided that the wind project development will not be carried out. If the project does not go forward, the expiration of the option means the developer is not tied to unwanted property and payments, and the landowner can potentially lease the land to another developer.

[20] Multiple use issues are discussed at greater length later in this section.

[21] This does not include the much greater amount of land required between turbines for turbine spacing, as discussed in Appendix A.

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During the option period, the developer often pays modest fees to landowners for the right to place the wind resource measurement equipment (i.e., meteorological towers with anemometers to measure wind speed and other instruments to measure wind direction and temperature) on the site, and sometimes pays fees to compensate for construction-related disruptions. In the United States, these fees can amount to a few hundred dollars per year, and vary depending on the wind resource and the desirability of the land.

4.2 Major Issues to be Addressed in a Lease

Leases should be carefully developed so that they clearly address issues important to the project developer and landowner at the time the lease starts, as well as years later during project operations. In many cases, the people who originally negotiate a lease will not be involved later in the operating period of the project, so it is important that any understanding between the parties be properly addressed in the written lease to prevent future misunderstandings.

A well-executed lease is an important part of the project development process. Before allowing wind turbines to be purchased and installed, investors will want to be sure the lease provides clear, unimpeded rights to use of the land over the long term.

The most important portions of the land lease are the length of the agreement (term), what other uses are acceptable on the land surrounding the wind turbines, and the payment structure. These and other major land lease provisions are described below.

4.2.1 Term

Wind power leases generally have terms of 20 to 50 years, often with an option for extending the lease. A typical wind power project has a useful life of 15 to 25 years, and, as discussed in Section 7, requires at least 10 to 15 years to achieve desired financial returns for owners and investors. A term of 20 years allows one project to be developed and operate for its useful life, while a term of 40 or 50 years would likely cover two project cycles (one project, and then a second project on the same site at the end of the useful life of the first project). Some contracts include clauses specifying the conditions under which either party has the right to terminate the contract. These termination clauses need to be reasonable so that the risk of installing the wind turbine equipment and having the lease terminated is low and manageable.

4.2.2 Area Leased

The lease should clearly state where wind turbines, roads, construction storage areas, and operations and maintenance areas can be located. Any desired setbacks from residences and property lines should be stated. Because construction and major repairs require more activity on the land than routine operations, the lease should include a provision for temporary land use during such periods for equipment storage, cranes, and other construction, operations, and maintenance activities.

The developer will want to the right to install wind turbines and infrastructure anywhere on the property (taking into account required and desired setbacks) and may find it difficult when the lease is written to be specific about where turbines will be located, and what size they will be.

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The location and size of individual turbines will depend upon detailed wind studies throughout the project site and typically includes many landowners for one project.

A typical lease would state that "Developer shall determine the size, type, manufacturer and exact location of wind turbines at its sole discretion, but developer will not locate, position or place any wind turbines within 150 meters of an occupied residence that exists on the effective date of the lease without the land owner's prior written consent."

4.2.3 Approved Uses

The lease should clarify what land uses the landowner reserves for the land around the turbines. The landowner typically reserves the right to continue to grow crops, raise cattle or otherwise use the land. Most rural land uses are compatible with wind power projects; however, there can be some restrictions. For example, in the case of a wind power project in Texas, the developer asked that hunting be restricted in the area around the turbines, for fear that bullets would damage expensive equipment. Sugar cane burning may be a problem, as it generates high levels of heat and smoke that can damage the equipment and affect performance. In these cases, it is possible that the income a landowner can earn from leasing his or her land for wind power project development can more than offset any income that might be lost by switching to another land use. Developers also will be concerned with any uses that could affect the wind in the area of the turbines. Tree crops or large structures could be restricted.

4.2.4 Access

The wind power facility needs to be accessible both by road and via electrical cabling. Easements are frequently used for this purpose.[22] Additional payments may be made for these items, particularly if a different landowner owns the land where the roads or cables cross. For these types of arrangements, smaller fixed payments are common and the amount is typically based on comparable local land values.

4.2.5 Upwind Blockage

Developers have an interest in protecting the project site from any future upwind development that could adversely impact the wind resource on the project site. If the same landowner owns the upwind land, the lease should include provisions addressing this issue. The developer will want an easement that prohibits any development within the upwind property that might impact the wind at the turbine sites. The extent of this potential problem depends on the topography of the land and the wind characteristics. The extent to which upwind development affects a project is depends on the distance to the project. While properties more than 2 km away usually are not of concern, the appropriate distance of concern depends on the size of the upwind project and atmospheric conditions.

4.2.6 Noise and Other Disturbances

Wind turbines generally are unobtrusive neighbors. However, land owners may want to include provisions to ensure that residents, animals, and others are not adversely affected by the wind

[22] An easement is a non-possessory interest in land which only entitles the easement holder to a limited use of the land, such as for crossing the land with vehicles from time to time, or for running a power line over or under the land.

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power project. This may include noise standards for the wind turbines (measured at the turbines themselves or at nearby homes), and noise standards for construction activities, including reasonable construction hours. Noise and other disturbances can be difficult and expensive to measure. If such provisions are included, care must be taken in writing them so that they can be interpreted unambiguously and not used unfairly by one party against the other.

4.2.7 Access Control

Wind power projects often involve the construction and use of new roads to access the wind turbines. Provisions for signs, gates, locks, and security patrols should be included in leases as appropriate.

4.2.8 Crop Protection

Normally wind turbines can operate in productive fields with minimal interference. However, there are situations when crop damage may occur, and the lease should address how this will be handled. Typical lease provisions require developers to use best efforts to minimize damage, but allow for the possibility that damage may occur, and subject the party causing the damage to paying appropriate compensation. For example, if a wind turbine suffers damage to a blade from lightning during the growing season, it may be necessary to bring a crane in to remove the blades, place them on the ground, and install a new blade. This activity would typically require some crop areas near the turbine to be flattened so the blades could be placed on the ground. Typically a land owner would receive payment from the wind power project for such crop damage calculated as the lost amount of product multiplied by the market price for such crops in the season in which the crop was damaged or destroyed.

4.2.9 Road Maintenance

The lease should identify responsibilities for maintenance of existing and new access roads. Generally the wind power developer is responsible for such maintenance.

4.2.10 Decommissioning

Leases should include provisions for "decommissioning" the project at the end of its useful life. This includes: removing wind turbines, transformers, wiring which penetrates above-ground, and the top part of foundations, and returning the land as nearly as is practical to its original condition. The lease should also address the timely removal or disposal of damaged equipment. In practice, this typically means that:

- Turbines, blades, towers, transformers, and transformer foundations are removed from the site.
- Turbine foundation hardware and protrusions such as anchor bolts and tower levelers will be removed, but foundations will remain completely in place, or be removed to a specified distance (for example, 1 meter) below ground level.
- The project substation generally becomes the property of the utility purchasing the power and, therefore, is not removed by the developer.
- Underground electrical wiring remains in place because removing them after the project's life will create more disturbance than leaving them in place.
- Access roads are left in place.

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4.2.11 Taxes

Responsibility for payment of property taxes should be clearly specified in the lease. The wind power project developer generally assumes responsibility for any increases in property taxes associated with the wind power project, and these costs should be accounted for in the developer's evaluation of project economics.

4.2.12 Compensation

A key reason for allowing wind power development on one's land is the payment received. Leases should clearly identify how payments are calculated, and when payment needs to be made. Payment structures and typical payment amounts are described in section 3.3, below.

4.2.13 Other Common Terms

In addition to the issues described above, there also are standard terms that the developer will need for the lease to be binding and financeable. These terms include, but are not limited to:

- ***Liens and tenants*** – in which the lessor warrants that there are no liens, encumbrances, leases, mortgages, deeds of trust, fractured interests, mineral or oil and gas rights or other exceptions to the title of ownership except as disclosed in a title report or other writing delivered to the project developer
- ***Encumbrances: Required Notices to Mortgagees*** – including the right to encumber and covenants for the project lender's benefit
- ***Assignment*** – granting the developer the right to sell, assign, encumber, transfer or grant easements under the lease without the land owner's consent
- ***Termination*** – granting either party the right to terminate the lease for non-performance and defining the events of non-performance which constitute default
- ***Force Majeure*** – excusing either party from fault to perform under the agreement due to acts of God or other uncontrollable circumstances
- ***Ownership of installed property*** – defining the installed property as owned by the project developer
- ***Memorandum*** – assuring that the lease will be legally executed and recorded.

4.3 Typical Payment Structures and Rates

The land lease payment structures and rates described below are derived primarily from United States experience.

4.3.1 Typical Land Lease Payment Structures

Royalties: The most common structure is the royalty payment. In royalties arrangements, the developer pays the landowner a percentage of the revenue received from the electricity produced by the turbines. This percentage is negotiated between the landowner and the developer. Royalties ensure an on-going economic relationship between the developer and the landowner and guarantee benefits for the landowner (provided the turbines generate the expected power). Royalties fluctuate with production, which varies with the seasonal and yearly wind resource, and can also fluctuate if the price at which the electricity is sold by the wind power project is

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variable. Revenue can be measured by gross receipts or metered production multiplied by the price of power paid to the project. One well-accepted option is for the developer and wind power project operator to provide a summary of gross receipts along with each payment (quarterly, annually, or other payment period agreed to in the contract), with developers allowing owners access to the data upon request.

Royalty and guaranteed minimum payment combination: Often, lease payments based on a percentage of gross revenue are supplemented by a guaranteed minimum payment. Minimum payments essentially serve as a floor price and guarantee that landowners receive some revenue, even if the wind turbines have significant reliability problems or if winds are lower than expected in any given year, producing less energy and generating less revenue than expected.

Flat- or fixed-fee: In a flat- or fixed-fee arrangement, the developer and landowner(s) agree on a fixed fee—per turbine or per unit of land or per MW of installed capacity—to be paid by the developer on a monthly or yearly basis, reflecting the total amount of land made available by the landowner(s) for meteorological towers, turbines, turbine spacing requirements, access roads, and control and maintenance buildings. The land requirements for a wind project can range from as little as 7.7 hectares per megawatt (ha/MW) to as many as 76.8 ha/MW.[23] This type of payment arrangement ensures transparency and clarity of understanding, and provides both landowner and project developer with certainty regarding future income or payment streams.

One-time, lump-sum payment: This type of contract is the least common arrangement, but may be satisfactory to both parties if the landowner is in need of immediate cash and is willing to forego the prospect of a steady income stream, and the developer has the ability to release a large amount of cash upfront. This arrangement generally is not optimal since it removes the ongoing economic agreement between landowner and developer, and because of potential problems if ownership of the land is transferred without economic benefits flowing to the new landowner.

The principal advantages and disadvantages of each lease payment structure are summarized in Table 4-1. Based on a review of 23 actual contracts, the most frequent payment structures were royalties (13) and flat or fixed fee (7). In general, most of the larger projects (>25 MW) employed the royalty type of contract arrangement. All of the royalty structure leases reviewed based payments on *gross revenue,* not on *net income* or *profit*. Gross revenue is defined as the amount of energy (kWh[24]) delivered times the power purchase price (price per kWh). The gross revenue is equivalent to the amount the project developer is paid by the local utility (or other power purchaser) for delivering electricity. Because gross revenue is determined before any other project expenses are considered, it is fairly easy to verify and document through the official transactions and payment records between the buyer and operator of the project.

Most of the cases that used a flat-fee structure were for smaller wind projects (e.g., 2 to 5 turbine range, usually small demonstration or test projects). When a flat fee is used, it is usually because of its simplicity and the fact that the overall amounts are fairly small. In addition, because many

[23] For more detailed information on wind power project land use requirements, see Appendix A.

[24] One kWh (kilowatt-hour) is a unit of energy, equal to a 100-Watt light bulb burning for 10 hours, or a 1,000 Watt heater running for one hour. A 900 kW wind turbine operating at full output (i.e., in relatively high winds) would produce 900 kWh in one hour or 9,000 kWh in 10 hours.

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of these smaller projects are not financed, the relationship between land lease payments and project revenue is less important to the project's economic feasibility. Although industry representatives mention that payments can also be based on a fixed amount per MW per year, the agreements sampled did not yield any contracts of this type. However, two examples of larger projects (25-50 MW, and >50 MW) use a fixed or flat payment per turbine, which suggests that a fixed payment (per turbine or hectare or MW installed) also are reasonable approaches for larger projects.

Additional royalty payment considerations: The discussion above assumes that royalties are paid on a per turbine production basis, which does not have to be the case. Royalties can be paid based on the average turbine production across the project (overall project generation divided by the number of turbines in the project), which is easier for the developer to determine and account for, and is more advantageous to the landowner because it reduces risk and it is easier to verify. The advantage of this arrangement versus payment on output of a specific turbine is that the pooling arrangement takes into account the production of the entire project and reduces the effects of variability of individual turbine production or the possibility that one turbine could suffer from operations problems.

The above discussion also focuses on lease payments for locations where wind turbines are located. However, land typically also is needed for other project facilities such as anemometers (wind measuring stations), wiring, and the electrical substation, and these landowners must be compensated for those land uses as well. Sometimes separate leases are created for the other project facilities, and sometimes they are included in the same leases used for the wind turbines.

Consider this example: Landowner 1 has two wind turbines on his or her land, while Landowner 2 has only electrical collection wiring (and no turbines) and Landowner 3 has the project substation (and no turbines). All three landowners are vital to the project. However, with separate leases, it would be common for Landowners 2 and 3 to receive an upfront flat fee payment while Landowner 1 would receive an annual royalty payment based on the production of the project. Given the ultimate project design, this might result in Landowner 1 being rewarded more, even though each landowner was expected to be equally valuable to the project at the time the leases were created.

One approach which has been designed to fairly compensate landowners is a shared "project pool" lease. In a project in Mexico which involves hundreds of small landowners, all of whom are important for project success, the developer used a contract where all of the landowners within the "project area" pool and split the royalties, independent of what project infrastructure, if any, is located on their individual plots of land (turbines, wires, substation, or nothing). The royalty is calculated and then paid out to individual landowners on a per hectare basis. This allows for all landowners to be a part of the project and will minimize infighting based on turbine locations. Ultimately, all of the landowners involved will want the project to be a success whether or not they have wind turbines on their land.

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Table 4-1. Advantages and Disadvantages of Different Payment Structures

Arrangement	Advantages	Disadvantages

Royalties	• General:
	  • Take into account varying productivity
	  • Give landowner incentive to work with developer to place the turbines on the most productive locations
	  • Give landowners and developers incentives to ensure continuous power generation
	  • Easy to verify if based on gross revenue
		• Landowner: Difficult to verify electricity and revenue generated by each turbine:*
		  • Individual turbine generation information is hard to get
		  • Individual monitors on turbines do not reflect the energy sold because they do not account for energy losses in the electrical system.
		  • Developers generally do not like to share turbine productivity data

Royalty/Minimum Guarantee combination	• Same as above, with additional benefits from an up-front fee or a minimum guarantee	• Same as above

Flat or Fixed Fee (per turbine or per hectare or per MW installed)	• Landowner:
	  • Provides steady, predictable income stream
	  • Protected in years of low power generation and/or revenue
	• Developer: Does well in high-production/revenue years
	• General:
	  • Can be used to compensate a landowner for use of land for an access road crossing the property, even if there is no turbine installed on the land
	  • Clarity and transparency: Easy to verify
		• Landowner: Forgoes potentially higher, if fluctuating, level of income associated with royalty payments
		• Developer: Expenses are harder to bear in years of low power generation and/or revenue
		• General:
		  • Payments do not mirror actual revenue generated
		  • Eliminates the economic incentive for the landowner to cooperate with the developer to ensure maximum power generation

Lump sum	• Landowner: Source of immediate cash • Developer: Does not have to provide payments in subsequent years	• Landowner: Does not provide steady income stream • Developer: Must provide lump sum up-front • Both: Bad "fit" to have financial transaction complete but physical use ongoing over many years
* In the United States, information about the amount of power generated by a facility is often publicly available from grid operating managers or the utility purchasing the power. Even so, such information does not indicate how much is generated by individual wind turbines within a project.		

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4.3.2 Prices Paid for Leased Land

As discussed above, the arrangements most often found in the projects reviewed (from the United States) were the flat-/fixed-fee arrangement and the royalty arrangement, with the royalty arrangement often supplemented by a minimum guaranteed payment. Tables 4-2 (a) and (b) present a summary of the prices paid under different payment arrangements in the contracts reviewed. Presentation of payment information as dollars per MW is useful because it "normalizes," or corrects, for the variation in turbine size. Tables 4-2 (a) and (b) do contain a few "outliers" that represent unique circumstances and are not considered to be typical.

Royalties and Combined Royalty/Minimum Guarantee Arrangements: Today in the United States, wind power project land leasing royalties tend to be within the range of 1% to 4% of gross revenue, with the majority being between 2% and 3% of gross revenue. In most cases, the percentage is a fixed number throughout the term of the lease.

In some cases, the royalty percentage escalates over time. In California, for example, an escalating payment was common in early wind projects because some of the contracts had escalating prices for power, allowing the inclusion of escalating clauses in the lease contracts. For most leases with escalating payments, the percentage tends to be fixed at a lower rate in the initial years of operation, escalating to a higher fixed rate in later years as the loan on the equipment is repaid. For two Latin American projects reviewed, the lease payments for one were 2% for the first 20 years and 4% thereafter, and for the second, 3% for the first 10 years and 6% thereafter. In one of the medium-sized U.S. cases, the royalty rate was 2% for the first 15 years, and 4% thereafter. A project in Mexico reports paying a 1% royalty to a large group of landowners on or nearby the project site.[25]

Flat-/Fixed-Fee Arrangements: Without considering the outliers, the average of the fixed payment lease agreements reviewed was US$2,200 per MW, with values ranging from US$1,200 to US$3,800 per MW. The average rate equates to a fixed payment of approximately US$3,300 for a 1.5 MW wind turbine per year.

Other sources of data support the figures presented above. For example, the Wind Powering America (WPA) program of the United States Department of Energy (DOE) provides materials on rural economic development of wind, citing annual revenue to farmers of US$1,500 per turbine. Although a turbine size is not mentioned in the WPA documents, the most commonly deployed turbine size in the Midwest region of the United States during the preparation of the WPA documents is in the 600-750 kW range. Normalizing the WPA's data to a per-MW price suggests that payments range from US$2,000 to US$2,500, which is consistent with the average $2,200 per MW figure presented above.

[25] In many cases, project names and specific locations cannot be provided because land lease terms are considered confidential by many project participants. Because there are relatively few projects in Latin America, naming the country these projects are in would potentially identify the project.

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Table 4-2(a). Summary of Prices Paid in Project Leases Reviewed – Royalty Arrangements

Project Size (MW)	Type	Initial Annual Rate	Escalation	Minimum Payment	Other Payment Agreements	Annual $ per MW
<10	royalty (% of gross revenue)	3%	No	Unknown	Construction fee, amount unknown	*
<10	royalty (% of gross revenue)	3%	Yes	Yes	Additional per acre quarterly payment	*
<10	royalty ($ per MWh)	$5,000	Yes	Yes	Set annual fee	$2,222
10-25	royalty (% of gross revenue)	2%	Yes	Unknown	Initial rate first 20 yrs, 4% for next 20 yrs	*
10-25	royalty (% of gross revenue)	2%	unknown	Unknown		$2,660
10-25	royalty (% of gross revenue)	3%	Yes	Unknown	Initial rate first 10 yrs, 6% next 10 yrs; initial down payment, amount unknown	*
Multiple Projects (~40)	royalty (% of gross revenue)	2%	No	No		**
25-50	royalty (% of gross revenue)	2%	Yes	Yes	Initial rate first 15 yrs, 4% subsequent; $1,500 minimum; $5,000 one-time easement fee	$1,657
>50	royalty (% of gross revenue)	6%	No	Unknown		$5,463
>50	royalty (% of gross revenue)	3%	No	Yes	Minimum of $1,000/MW	$3,046
>50	royalty (% of gross revenue)	3%	No	Unknown		$4,284

* Capacity factors or power purchase rates for these projects were not available, so it is not possible to calculate the effective land payment per MW.

** This one contract example was actually applied to approximately 40 different projects on land owned by the U.S. Federal Bureau of Land Management (BLM). BLM used a standard land lease contract for all 40 projects, based on 2% of gross revenues. Due to variations in the 40 projects' capacity factors and power purchase agreements, it is not possible to estimate the payment per MW.

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Table 4-2(b). Summary of Prices Paid in Project Leases Reviewed – Fixed-Fee Arrangements

Project Size (MW)	Type	Initial Annual Rate	Escalation	Minimum Guarantee	Other Payment Agreements	Annual $ per MW
<10	fixed fee (per turbine)	$2,500	Yes	Yes	5-yr inflation adjustment by index	$3,788
<10	fixed fee (per turbine)	$400	No	Yes	Per turbine fees paid regardless of production	$6,235
<10	fixed fee (per turbine)	$1,270	Yes	Yes	Minimum $1,500; $7,500 construction	$2,117
<10	fixed fee (per year)	$500	No	Yes	No payment info available	$500
25-50	fixed fee (per turbine)	$1,000	unknown	Yes	Per turbine fees paid regardless of production	$1,111
>50	fixed fee (per turbine)	$1,500	No	Yes		$2,145
Unknown	fixed fee (per turbine)	$1,500	unknown	Unknown		$2,000

Another source of comparable data for the numbers cited above is the Turbine Verification Program (TVP), a U.S. DOE and Electric Power Research Institute (EPRI) program, in which cost-share or "risk-share" funds were provided to several utilities to develop and operate wind projects. While the data generated by the TVP program are not directly comparable to that of wind power projects developed without government aid, they help corroborate the data presented in Tables 4-2 (a) and (b). Table 4-3 summarizes several data for TVP wind power projects comprising a wide range of effective payment per MW values. Three projects (Fort Davis, Glenmore and Algona) are within or near the above-mentioned range. However, some of the projects are outside the norm. The Kotzebue project, for example, has an unusually high per-MW payment because it is based on a per-turbine amount and small turbines are used in the project (10 turbines at 50 kW each). The Springview project's payment per MW is exceptionally low because the project was promoted as a small-scale demonstration project. In addition, the land was not being used for any other purpose and there was a significant amount of similar land in the region with comparable wind resources. Finally, several of these projects required no spacing between rows because they required only a single row of turbines.

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Table 4-3. Land Requirements and Payments for TVP Projects

Project Location	Land Use/ Type	Total Land Area Leased (ha)	Hectares Leased per/ Turbine and (per MW)*	Leased Land Occupied by the Turbines	Annual Land Cost/ Hectare Leased	Approximate Payment Per MW (US$ per year)
Fort Davis, TX	Ridge tops/ ranch land	30.4	2.6 (4.6)	5.0%	$657	$3,022
Searsburg, VT	Heavily forested ridgeline	14.2	2.6 (2.3)	9.8%	$282	$648
Kotzebue, AK	Treeless coastal tundra	60	6 (120)	0.3%	$67	$8,000
Glenmore, WI	Agricultural plains	1	0.5 (.8)	34.2%	$2,613	$2,090
Algona, IA	Cropland	21.1	7 (9.4)	2.8%	$237	$2,228
Springview, NE	High plain/ ranch land	13.4	6.7 (20)	2.9%	$37	$740
Big Spring, TX	Ranch land/ mesa tops	2,886	62.7 (84.6)	0.3%	unknown	unknown

* In some cases, the ha/MW figure appears low. This is likely because land for turbine spacing between rows was not needed and leased, because several of these small projects had only one row of turbines.

Other Pricing Considerations: In addition to the base lease amounts, an upfront or initial payment is fairly common but not universal. Upfront payments generally are in the range of US$1,000 to US$3,000 per turbine. A lump-sum payment may also be made during the construction period, particularly in cases where the landowner is inconvenienced or loses other short-term revenues due to the construction activities. For example, during construction, additional land may need to be removed from crop cultivation and used for equipment storage areas.

In cases where land is leased from multiple landowners for one project, developers typically take one of two approaches: 1) they make payments based on the electricity output of the specific turbines located on each individual land parcel; or 2) they make payment based on the average output of all turbines in the project multiplied by the number of turbines located on each individual land parcel. The second approach is easier to document and verify, and poses less risk to landowners, who will receive payment as long as the project generates electricity, regardless of whether the turbines on their individual parcels produced electricity.

Lease payment terms also depend on alternative uses for the land, the local market for wind energy, and the availability of similar land with comparable development potential, as shown by these two U.S. examples. In the Altamont Pass area of California, leases were negotiated to escalate to fairly high rates because the land was being sought for residential development in a rapidly growing area near San Francisco. In the Midwest, lease rates generally are fixed at lower rates over the lease period because of the remoteness and/or the low land values of the areas being considered for wind development. In addition, many locations possess an abundance of

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equally good wind areas, and the ability of a developer to move on to another landowner can drive down the lease price.

On the other hand, a number of examples exist where lease rates were escalated because of an action that established a short-term market for wind. For example, the Bonneville Power Administration, a federal power agency in the northwest United States, announced an intention to buy a significant amount of wind energy and issued a request for proposals (RFP) in 2001. Developers attempting to sign leases with landowners and prepare proposals in response to the RFP created a "land rush." In such cases, property owners with known wind resources, or even better, documented wind resource information, are in a position to negotiate with multiple developers and shop for the highest rate. Of course, there also are many examples of landowners who have signed leases with developers or companies that do not submit competitive bids. As a result, the landowner does not receive any revenue because the project is not developed. To avoid this situation, it is advisable for landowners to insist that the Option Agreement include a provision that permits them to withdraw from the agreement if the developers do not begin constructing a project within a certain number of years.

When considering royalty payment amounts, it is important to consider what they are based on, and the extent to which project owners financially benefit by means which are not included in the calculation of the royalty payment. For example, the gross revenues used as the basis for the royalty payment typically are based on the power sales revenues, but they may or may not include revenues from other sources, such as "green premium" revenues or government incentives. In particular, tax credits (such as the PTC in the United States) generally are not included in any calculation of royalties. Because the PTC effectively allows project developers to offer lower power purchase prices, which the royalty is typically based upon, they can offer landowners a higher percentage of revenue since energy sales prices represent only a portion of their financial benefit from the project.

Consider these two examples of 20 MW projects generating 60,000 MWh per year. A project in the United States might have an energy sales price of 35 $/MWh, for gross power sales revenues of $2.1 million per year. A 2% royalty on this amount would provide the landowners with $42,000 per year, or $2100 per MW installed per year. In a country with a mandated energy sales price of $70/MWh, a 1% royalty on the same project would result in about the same annual project royalty payment (and payment per MW installed). A per MW installed payment of around $2000-2500 is approximately the current industry standard. This is lower than for projects that were built ten years ago, as a result of increased competition, industry consolidation, and technological advances which have lowered the cost of energy production.

Regardless of industry norms or market conditions, actual land lease payment amounts will have to be negotiated between developer and landowner, and many unique possibilities exist as to both the methods of calculating payments, and the payment amounts.

4.4 Additional Sources of Information

Land, N. and Grant, W. *Landowner's Guide to Wind Energy in the Upper Midwest*. Izaak Walton League, 2001.

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National Wind Coordinating Committee. *Permitting of Wind Energy Facilities, A Handbook.* 2001. Available at www.nationalwind.org.

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5. Procurement of Wind Energy Projects

Wind power projects can be owned by utilities or by others, and the tool typically used to select which projects to buy (or to buy power from) is the Request for Proposals (RFP). This section describes various approaches used by utilities to procure wind power, which can be categorized as follows:

- ***PPA:*** A utility buys *the output of a project* through a power purchase agreement (PPA). In this arrangement, the wind power project is owned and operated by others, typically private companies. Section 6 describes PPAs, and this section describes the process of competitively selecting the project with which to enter into a PPA.
- ***Private Development, Utility Ownership:*** A utility buys *a project* from a private developer, and either operates the project itself or contracts with others to operate it. This section describes the process of competitively selecting a project to buy. The project is typically built by the developer after winning a competitive solicitation, and purchased after construction is completed, but could also be purchased at an earlier stage of development.
- ***Self Development:*** A utility *develops and owns a project*, including finding a location for the project, obtaining permits, procuring wind turbines and related equipment, and constructing the project. The utility could hire consultants and contractors for various parts of the development process, but would be the project owner throughout the development process.

Other classifications are possible, including hybrid methods that do not fit into the three classifications used above. Each major procurement alternative is further discussed below, as well as the major issues typically found in a request for proposals (RFP), which is often used to solicit proposals from private wind power developers. A sample RFP is provided in Appendix C.

5.1 Options for Buying Wind Power

Whether a utility seeks to contract for delivery of wind power or to purchase a wind power plant, the utility's objectives include:

- The best possible purchase price (for energy or for the project), assuming quality and other requirements and objectives are all met
- Projects that will help the utility meet any required minimum amounts of wind power required by applicable regulations
- Projects that will begin delivering power according to a particular schedule (i.e., to meet peak season generating needs, or to qualify for a particular tax credit or other incentive with an expiration date)

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- Projects that have a high probability of being constructed and delivering the expected amount of energy for the entire contract period (i.e., with minimum potential for financial, permitting, or technical problems)
- Good integration with the utility's electrical system, both in terms of where power is delivered and when deliveries tend to be made based on the specific wind resource at the project location

Whether wind power developers seek to sell power to a utility or to sell a wind power project to a utility, the prospective seller's objectives include:

- A good price (high enough to make the development economically feasible and to offer sufficient profit or return on investment)
- A long-term (in the case of power sales) or firm (in the case of a project sale) commitment from a creditworthy buyer to ensure that the project is financeable
- A reasonable proposal process that does not require them to expend undue resources to prepare and submit a proposal
- A fair chance at being selected as the winning proposer

In either case, the desires of buyers and sellers can conflict with each other. Ideally, the RFP, proposal preparation, and proposal evaluation processes can help determine the most appropriate set of compromises, resulting in an acceptable arrangement for both buyer and seller.

5.1.1 The Power Purchase Agreement

In the situation where a utility seeks to buy wind energy power, a well-designed RFP process should provide the information necessary for the project developer (seller) to make the best proposal possible to the power buyer (the utility) and allow the buyer to objectively judge and rank proposals.

Ideally, each seller is able to present its project and show that it is the most desirable to the buyer in terms of price, amount of wind energy delivered, location, timing and risk mitigation (financial, permitting, technical, etc). In addition to the objectives listed above, companies proposing to sell their wind power want a utility that is able to purchase the power on relatively simple terms, ideally by taking possession of the power at the wind power project location, and paying on a relatively simple basis such as a flat price per MWh delivered over the course of each month.[26]

From the utility's perspective the process of selecting projects for PPAs can include:

- Combinations that seek the best balance of location, project size, pricing, etc., often with a weighted proposal scoring method.

[26] Sellers generally want to avoid more complicated measures, such as requiring the involvement of third-party power transmission providers, use of potentially complicated power scheduling arrangements, and pricing which varies over different time periods.

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- Fixed amounts, where a known amount of wind power is solicited at competitively determined pricing.
- Fixed-price arrangements, where a reference price is known ahead of time, and the best projects from a technical perspective are selected.
- First-come, first-served arrangements, where developers are free to enter into standardized contracts with a utility.

Pricing for wind power is most often based on a price per unit of energy – such as dollars per kWh or MWh – actually delivered by the project during operations. Other scenarios, such as pricing based on the MW of generating capacity installed, are rarely used. Compromises, generally focused on which party will take which risks, are frequently negotiated during the short list and PPA process.

5.1.2 Buying a Wind Power Project

Similarly, utilities that intend to buy wind power projects developed by others should issue RFPs so that developers can competitively propose their projects and pricing. In this case, in addition to the general utility objectives listed above, the buyer is interested in projects with low ongoing costs such as land payments, operations and maintenance contracts, warranties, and property taxes.

Companies proposing to sell their projects need (in addition to the objectives listed above) a clear definition of what they need to construct in order to meet the utility's specifications.

Once again, the RFP, proposal preparation, and proposal evaluation processes can help determine the most appropriate set of compromises, resulting in an acceptable arrangement for both buyer and seller. Because of the many issues that will vary from project to project, the process of selecting projects for utilities to purchase typically is based on criteria that seek the best balance of location, project size, timing, and pricing, often with a weighted proposal scoring method.

Pricing for a project purchase typically is based on a cash purchase amount at the time construction is completed, but could involve payments during the development process, utility financing of construction costs, payments spread over the life of the project, or other mutually acceptable arrangements. Also, instead of purchasing a completed project, utilities can purchase a project that is still in one of the development stages, and then complete the project itself.

5.2 Self Development

Some utilities may already own land suitable for wind power development, or may have an institutional preference to develop, own and/or operate power-generating facilities themselves. The wind power project development process consists of many stages, including:

- ***Site Prospecting:*** identifying potential sites for additional study to determine whether a project is feasible. Key factors are high winds and proximity to power transmission lines.

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- ***Site Control:*** signing land lease, easement, or option agreements with landowners in the area, including provisions for wind resource assessment
- ***Wind Resource Assessment:*** installing anemometers on the sites and collecting six months to two years of wind data at the sites, and obtaining long-term reference data
- ***Feasibility Study:*** evaluating economic and technical factors to determine whether a project is feasible
- ***Project Permitting:*** obtaining permissions necessary to construct and operate the project from applicable regulatory agencies, including all environmental studies and permits.
- ***Project Detailed Design:*** engineering the project's details based on site control and permitting requirements, including turbine locations, foundations, wiring, control systems, collection systems, roads, and utility interconnection facilities.
- ***Equipment Procurement:*** contracting for the purchase of wind turbines, transformers, electrical substation, control systems, and the construction of the project
- ***Financing:*** obtaining sufficient funds (loans and equity investments) for equipment procurement, project construction, working capital, reserves, and repayment of development costs
- ***Construction:*** installing roads, turbine foundations, wiring, transformers, and wind turbines
- ***Commissioning:*** starting up and testing wind turbines and other equipment

Some of these tasks may be performed by the utility's own personnel, while others may be performed by consultants with expertise in surveying, geotechnical engineering (subsurface conditions), civil engineering (for roads, foundations), electrical engineering (for wiring, transformers, controls), and wind power (resource assessment, project design, turbine specifications).

Table 5-1 compares how the various wind power project development steps are handled under the various procurement alternatives discussed above.

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Table 5-1
Project Development Steps Under Differing Procurement Options
(table indicates typical responsible party under each procurement option)

Development Step	PPA	Buy Project	Self Development
Site Prospecting	Developer	Developer	Utility
Site Control	Developer	Developer	Utility
Wind Resource Assessment	Developer	Developer	Utility
Feasibility Study	Developer	Developer	Utility
Project Permitting	Developer	Developer or Utility(1)	Utility
Project Detailed Design	Developer	Developer or Utility(1)	Utility
Equipment Procurement	Developer	Developer or Utility(1)	Utility
Financing	Developer	Developer or Utility(1)	Utility
Construction	Developer	Developer or Utility(1)	Utility
Commissioning	Developer	Developer or Utility(1)	Utility
Operations & Maintenance(2)	Developer	Utility	Utility

(1) Depending on when in the development process the project is purchased by the utility.
(2) Actual site operations and maintenance activities are most commonly conducted by the wind turbine manufacturer during the wind turbine warranty period, and by service companies after the warranty period.

5.3 Engineering and Construction Alternatives

A wind power project developer or utility company involved with implementing a wind power project may choose among several alternative engineering and construction methods. These alternative methods include design, bid, construct (DBC); engineer, procure, and construct (EPC); design, build (DB); or design, build, operate (DBO). The major differences between these approaches are summarized in Table 5-2.

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Table 5-2. Summary of Engineering and Construction Alternatives

Approach	Design & Engineering	Bidding	Procure Major Equipment	Construction & Commissioning	Operation
Design, bid, construct (DBC)	Owner hires engineers	Owner with support from engineers	Owner contracts with suppliers	Contractor hired by owner	Owner or contractor (typically wind turbine supplier during warranty period)
Design, build (DB)	DB firm	DB firm	Owner contracts with suppliers	DB firm	Owner or contractor (typically wind turbine supplier during warranty period)
Engineer, procure, construct (EPC)	EPC firm	EPC firm	EPC firm	EPC firm	Owner or contractor (typically wind turbine supplier during warranty period)
Design, build, operate (DBO)	DBO firm	DBO firm	DBO firm	DBO firm	DBO firm

Design, bid, construct: The traditional approach, DBC, is to design the project, specify components such as wind turbines, wiring, and power transformers, and hire a general contractor to build the project. The general contractor could be hired based on a negotiated contract with a trusted business partner, or as a result of a competitive bidding process.[27] Furthermore, the project owner may choose to directly procure certain components (such as wind turbines, which typically account for more than half of the overall project cost), or leave some or all equipment procurement up to the general contractor. A general contractor typically performs much of the construction work with its own forces, but hires subcontractors to perform specialty work such as concrete foundations, crane operations, and electrical wiring. The general contractor also is responsible for the overall construction process, and for coordinating the efforts of the various subcontractors. While this traditional approach provides more decision-making control to the owner, it can result in slower project schedules, involves more risk for the owner, and can result in inefficiencies because the various parties may seek to blame other parties if things go wrong during construction.[28]

Engineer, procure, construct (EPC) and Design Build (DB): Alternative approaches seek to reduce the number of responsible parties involved in the design and construction process. With the EPC or DB approaches, the project owner need only contract with one party to both design and construct the project. The major difference between an EPC and DB arrangement is that the

[27] Construction bids are often submitted in response to a Request for Bids (RFB), which is similar to an RFP.

[28] For example, if the wind turbine tower foundation bolts do not match the tower holes, it may be difficult to determine who is responsible for the costs and delays associated with fixing this problem, and the project owner may be damaged as a result. While this same problem can occur with the EPC, DB, and DBO approaches, the owner is less likely to be damaged as a result because the contracting entity would need to solve this problem internally.

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EPC contractor, rather than the project owner, also is responsible for procuring major equipment for the project. The DBO method is a further evolution of this practice.

Design, build, operate: DBO is a non-traditional approach to project implementation wherein proposers compete for a contract that includes design, construction, and long-term facility operation. The DBO procurement process differs substantially from typical contracting, where general contractors are asked to bid on a detailed design and the lowest responsive bidder is selected. The DBO method would have the operator be the same party that was responsible for design and construction. The DBO approach provides a contractor with a natural incentive to construct the project correctly so that long-term operations go according to plan. However, in the wind power industry, traditional and EPC/DB approaches are relatively common, while DBO approaches are less common.

In contrast to traditional contracting, DB, EPC, and DBO procurement processes typically involve creation of performance specifications that describe desired outcomes and then ask proposers to develop their own concepts on how best to achieve those outcomes. With a DB or EPC approach, the completed project would be turned over to the owner at completion, and the owner could operate the project itself, or hire a third party to manage operations. (However, it is normally the case that the wind turbine manufacturer operates the project during the warranty period – typically two to five years – as a condition of the warranty obligation.)

These alternative approaches, if properly managed, offer significant advantages in scheduling and risk, but can reduce an owner's control over the project. Investors and lenders tend to favor EPC contracts because they provide a single point of management control during the period when large amounts of money are spent on design, equipment procurement, and construction.

5.4 Major Issues in an RFP

RFPs for wind power projects should address the following issues, which are typically relevant whether the RFP is soliciting proposals for sale of wind energy (with continued ownership of the project by a non-utility owner) or for the sale of the wind power project itself (for utility ownership).

Background: The RFP should explain the reason for the RFP and provide any related documents, such as a utilities resource plan. In addition, since the project developer needs an investment grade power purchaser, counterparty or guarantor to finance the project, the issuer of the RFP should indicate its credit rating and what it can offer for credit support in the event it is not investment grade (such as a letter of credit).

Project Size: The RFP should state a range of project sizes or production levels desired. In some cases, a minimum or maximum size may be specified (i.e., projects up to 100 MW of installed capacity or capable of delivering at least 200,000 MWh of electricity per year).

Project/Energy Delivery Date: The RFP should clearly state if there is a date by which the utility wants the project built and energy delivered. Some time requirements may be general (i.e., in the next three years) and others may be specific (by December 31) in order to meet deadlines associated with legislative mandate requirements such as an RPS or tax credit expiration dates.

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Project Location and Site Design: In some cases the general or specific project location will be identified in the RFP;[29] in other cases proposers can identify their own sites. The RFP should require a description of the site location and land use, land ownership and the status of site control, and show how wind turbines will be arranged on the site.

Wind Data: Proposers should be required to demonstrate the wind resource at their proposed sites.[30] The demonstration should include an explanation of the source of data, period of record, data quality, correlation to long-term reference sites, and methodology. The utility will want to evaluate the methods and results of the wind study to ensure a proposer's energy generation projections are reasonable, and to understand how power output will vary over time.

Energy Production Calculation: The RFP should request information on annual, monthly, and diurnal energy production, both gross and net.[31] Assumed losses should be specified.

Interconnection Point and Requirements: Proposers should identify the project interconnect point and discuss the status of the interconnection process (queue, studies, and results). To the extent they are known, the proposer should indicate the technical characteristics of the interconnection as well as methods and costs associated with tying the proposed project into the electric utility grid and whether or not those costs are included in the power price or project purchase price. To the extent they are known, interconnect points acceptable to the utility should be specified. Electrical characteristics of the interconnect point and requirements for the project at the interconnect point must also be specified.

Environmental Review and Permit Status: Proposers should be required to demonstrate that they understand the permitting requirements for the site, specify which permits are already obtained and present a reasonable plan for obtaining any remaining permits required for project construction and operation.

Project Pro Forma Economic Projections: Proposers should be required to demonstrate the expected economic performance of their projects, using a discounted cash flow model such as is provided in Section 7 of this Toolkit.

Financing Plan: Proposers should be required to present their experience financing wind energy projects and propose a plan for financing to construct the project.

Project Schedule: Proposers should present a full project schedule including status and timeline of all activities from predevelopment through financing, construction, and commissioning. Utilities need to know that proposers understand the development and construction process, and

[29] In certain cases, the utility may already own or control the proposed project site, whether the utility is seeking to buy the energy from the project or the project itself.

[30] Or, if the utility owns the site, the utility should publish the wind data in the RFP.

[31] Gross power is the amount produced at each wind turbine. Net power accounts for losses such as array effects within the wind power facility, equipment unavailability, losses during power transmission, and losses due to transformers.

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have reasonable timelines that fit with the buyer's needs. Proposals should also describe the types of tests that will be conducted, and procedures for testing and commissioning.

Operations and maintenance: The RFP should require proposers to submit an operations and maintenance (O&M) plan, to name the entities responsible for O&M, and include a spare parts list, including estimated component service lives and pricing for additional spare parts purchases.

Pricing: The RFP and proposals should clearly state what is included in proposed costs and how long offered pricing is valid (i.e., when the proposal expires). In the case of power purchase using a PPA, the RFP and proposals should also clearly state the desired term of the PPA (generally 15 or 20 years), whether the price includes electric power only, or electric power and "green" attributes associated with the generation of power in an environmentally preferred way. Issues related to transmission scheduling, imbalances from schedules, and wind and power forecasts requirements also should be clearly stated. For proposals involving purchase of projects, the terms should be clear with regard to whether spare parts, warranties, operations manuals, control systems, offices, maintenance facilities, project drawings, etc., are included in the transaction.

Equipment Technical Specifications: The RFP should clearly identify minimum specifications for equipment so that the purchaser is not induced to buy lower quality products or services. The RFP should also identify the required technical information, including, but not limited to, turbine specifications, power curves, tower type, hub height, design class, expected service life, and operating experience of the proposed wind turbine.

Proposer Qualifications: The RFP should require proposers to demonstrate their technical and operational experience with similar projects and their financial strength, both of which are important factors in ensuring a successful project.

Evaluation Criteria and Scoring: The RFP should clearly state the methods by which proposals will be evaluated and ranked. Proposals may be ranked on a combination of price, location, transmission availability, implementation schedule, proposer qualifications and experience, risk, and fit with existing resource portfolios. The RFP should also identify how cost and non-cost issues will be combined in the evaluation to determine "winning" proposals.

Draft PPA or Draft Purchase Agreement: The RFP should include proposed drafts of these agreements to define the desired details of the transaction from the buyer's perspective. This helps proposers understand the transaction, and allows proposers to identify comments or exceptions early in the process. The RFP should ask proposers to identify, as part of their proposal recommended changes to the draft agreements, including the rationale for the recommended change, and the effect on pricing and specifications if the buyer accepts the change.

Schedule: The RFP should include a schedule for proposal submission, evaluation, clarifications, and follow-on tasks such as contract negotiations, board approvals, and commencement of services.

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Contact Person: The RFP should include a contact person at the company issuing the RFP, and specify a question-and-answer procedure for use during proposal preparation.

Right to Refuse Award: The RFP should also include a statement regarding the RFP issuer's right to halt the process if necessary due to changing circumstances or if no suitable proposals are obtained. RFP issuers should carefully consider whether including such a clause is necessary, and, to avoid wasted effort, should not issue RFPs unless they have a real interest in buying wind power or a wind power project.

To help make proposals complete and easier to compare, the RFP document should clearly state the format for bidders to use (including a table of contents for the proposals), what information should be included in each section, and what additional documents are required in addition to the proposal itself.

5.5 Other RFP Considerations

Utilities have many options to consider when conducting an RFP process. Some of these factors are discussed below:

Draft RFP for Comment: Utilities should consider posting and/or circulating a draft RFP to the public and to prospective proposers before formally issuing it, so that any unreasonable or unfair provisions in the RFP can be addressed early in the process. However, this should be handled carefully as this extra step has the potential to delay the procurement process.

How and to Whom to Release the RFP: Many RFPs are posted on the Internet for any interested party to read, while others require payment or a free registration process in order to obtain the RFP. Some RFPs are mailed to potentially interested parties, while others are sent only to parties who have expressed an interest. Regardless of the method of publishing, utilities should at least notify potentially interested parties using methods such as press releases and letters to trade associations.

Minimum Qualifications of Proposers and Projects: Some RFPs have specific qualifications requirements for proposers, such as prior project development experience, minimum financial strength, or requiring projects to have already achieved certain development targets (such as requiring the project to have site control or to have completed interconnection studies).

Pre-qualification Step: Some utilities separate the RFP process into two steps, with the first step a "pre-qualification" step involving a request for qualifications (RFQ), a qualifications submittal from interested parties, and a review of submittals to determine which parties are qualified. The second step involves an RFP issued only to those proposers which were determined to be qualified in the first step. This method typically reduces the number of proposals, but results in higher-quality proposals from qualifying parties.

Proposal Fee or Bid Bond Requirements: Some utilities require a proposal fee or bid bond to be submitted with proposals. In some cases these fees or bonds are refundable to proposers after they have been screened-out by the utility, while in other cases the fees are non-refundable. Another less-common method is to charge a fee to parties interested in obtaining a copy of the

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RFP. Fees or bonds work to reduce the number of casual or non-serious proposals, and can help offset the cost of evaluating proposals. However, if fees or bonds are set too high, they can work against the utility's interests by unnecessarily limiting submission of proposals.

Time Period for Proposal Preparation: Utilities should carefully consider the amount of time allowed for proposal preparation and submission, including time to distribute the RFP, time for questions and answers related to the RFP, and time for pre-proposal meetings and site tours if a site has been selected by the utility. Utilities must carefully balance the goal of moving forward quickly with a project or power purchase, and the need to allow adequate time for proposers to evaluate the RFP, and then produce and submit a quality proposal.

5.6 Weighing Procurement Options

Most wind power development is based on the PPA method. The utility ownership and self-development methods, though less common, offer utilities more management control over a wind power project, and can provide longer term participation for the utility (i.e., a utility which owns a wind power facility can repower and upgrade the facility after each equipment life cycle, rather than being limited to a 20-year term of one PPA). Utility ownership and/or development typically involves more risk for the utility compared to buying a project's output using a PPA, and may mean that the utility is less able to use expertise available in the private wind power development business. However, the costs of utility ownership can be lower if the utility has access to low-cost, long-term financing or if its cost structure is competitive.

Traditional (DBC) or innovative (EPC, DB, DBO) approaches are used to engineer and construct wind power projects, and the projects can be operated and maintained by contractors or directly by the owner. Cost, schedule, and the allocation of risk between the owner and the contractor(s) vary with the different approaches.

In countries with government-owned utility structures, the self-development method has been favored. Recent experience in the United States indicates the private development / utility ownership model has become more popular in part because utilities want control of the project as a fuel-price-independent power generating asset, for the long term (30 to 50 years), not just over the 15- to 20-year term of a typical wind power purchase agreement.

Whether the wind power project is owned by a utility or by another party, RFPs commonly are used by utilities to select which projects to buy power from, or which projects to buy for their ownership. Whatever the object of the RFP, the procurement process should be fair, open, efficient, and competitive. A fair and open process builds trust among participants, and is more likely to survive challenges from those not selected to participate. A fair and open process also helps make any future selection processes more effective because all parties will learn from the earlier experiences. An efficient process can help reduce unnecessary effort by those submitting proposals and those evaluating proposals, and can help speed project implementation. A competitive process can result in additional wind power development because a fixed amount of funding can be used to procure more wind power if the unit cost is lower.

6. Contractual Issues Related to the Sale and Purchase of Wind Energy

There are a number of different contracting mechanisms involved in the development of a wind energy project including land leases, contracts for construction services, equipment purchase agreements, warranties, O&M agreements, and others. This section of the Toolkit focuses on the Power Purchase Agreement (PPA) and the Interconnection Agreement (IA), which together define responsibilities associated with delivery and purchase of energy from commercial wind projects.

Appendix D contains an example of a PPA, and Appendix E contains an example of an IA.

6.1 Power Purchase Agreement

The PPA defines the seller and buyer, what is being purchased (i.e., energy, capacity, "green credits"), how much is being purchased, and what prices are to be paid for the purchases. A long-term (15 to 20 years) PPA with a creditworthy party is essential to financing a wind power project because it ensures a revenue stream for power produced by the facility, as opposed to operating the project in a "merchant" environment where sales are not guaranteed.[32] A long-term PPA reduces financial risk in the eyes of the financier(s). Wind PPAs ordinarily involve the sale of energy (measured in kWh or MWh) over monthly and annual periods, not the sale of capacity (how many kW or MW of generating capacity is installed) or the amount of power (measured in kW or MW) generated at any moment in time.

6.1.1 Standard Clauses in a Power Purchase Agreement

PPAs are contracts that customarily require the seller to produce power and the buyer to pay for it. Beyond those basic principles, many other issues must be addressed in the PPA, including how and when power is to be delivered, how and when payments are to be made, what happens if deliveries or payments are not made, how long deliveries are to be made, how the price paid may change over time, and communications between the parties. If a project has multiple purchasers, then separate PPAs will be written for each purchaser, and may reference the other PPAs. Similarly, the PPA may contain references to the IA and construction-related documents and guarantees. A parent company of the seller or buyer may also be a party of the PPA due to guarantor responsibilities.[33]

The following paragraphs highlight the major sections and clauses in a PPA and explain the purpose of each. The discussions are for a general PPA regardless of energy production technology. Issues specific to wind power PPAs are discussed in Section 5.1.2.

[32] A "merchant" plant operates without a long-term PPA and seeks to sell into the open market on a short-term basis in order to maximize revenues. With perhaps a few exceptions depending on how "merchant" and "finance" are defined, no utility-scale wind power projects are known to have been financed on a merchant power sales basis.

[33] Financiers often require strong project backing to reduce the risk of loan payment default.

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Definitions: This section provides detailed definitions for common terms used throughout the PPA such as effective date, contract year, and delivery point. These terms are usually boldfaced or capitalized throughout the document indicating to the reader that more information is provided in the definitions section. Some definitions define a date or a word while others provide detailed contractual provisions. For example, force majeure[34] events might be listed under the definitions, while the mechanisms for claiming a force majeure event will be in another section of the PPA. An example definition in a PPA is:

> Delivery Period: Beginning on the completion date of the last wind turbine described and included in the Project (regardless of its rated capacity) and ending on December 31, 2018.

Term, Termination, Renewal: This section contains clauses regarding the initial contract length (term), termination at the end of the contract, early termination, and contract renewal. PPAs normally begin when a new facility is completed (a time which is commonly defined as the "Commercial Operation Date"), but can have other timing depending on project-specific circumstances. Contract lengths vary from 5 years to 20 years, or even longer for certain technologies. The length is determined, in part, on the type of market in which the plant will operate. The end of contract termination clause relieves the parties of any further obligations. Most contracts also outline the steps to take for early termination or contract renewal. The early termination clause specifies how to meet final obligations and may include a termination fee. Contract renewals often are for short time periods (one to five years), and may come with adjusted price structures and different options involving which party (buyer, seller, or both) can elect to renew the contract and when such renewal must occur.

Default Events: The seller and buyer could each take actions that could cause a default event. Each action is specifically listed for each party, as well as remedies for the other party in event of a default. Typical defaults may include, but are not limited to, non-payment, bankruptcy, and failure to cure material breach within the allowed cure period.

Cure Provisions: Cure provisions provide a defined route for the buyer and seller to resolve default events without more drastic events such as termination of the agreement or litigation. This section outlines the cure timeline and definition of reasonable effort on the part of the defaulting party to cure the default. Cure periods customarily last between 60 and 90 days and may contain extension provisions.

Availability/Performance: Project availability is usually linked to generator availability, with separate provisions for fuel unavailability, which are handled in the fuel supply agreement. For technologies like combustion turbines or boilers, manufacturers can easily adjust ISO[35] ratings to site-specific conditions and guarantee performance at those specific conditions. This ability to guarantee performance allows for availability or performance guarantees in the PPA. Section 6.1.2 discusses how a wind project PPA handles availability.

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[34] Force Majeure means "greater force" and is typically defined as events that are beyond the control of the buyer and seller, such as natural disasters, labor interruptions, and accidents.

[35] International Organization for Standardization. All electric turbine manufacturers provide specifications at ISO ratings, and then adjust those rates for site-specific conditions such as temperature or elevation.

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Scheduling Maintenance: In general, the plant operator must submit for approval a maintenance schedule for each calendar or contract year.[36] Provisions defining when maintenance can be scheduled, giving consideration to utility needs as well as fuel availability and cost considerations, frequently are included. Provisions covering advance notice of changes to the schedule as the year progresses are typical.

Price: This section states the price to be paid for the products purchased, which could include separate prices for energy, capacity, and environmental credits. Energy prices may be a flat rate, or may vary by season and/or time of day. For example, deliveries could be priced at a flat annual rate of $50/MWh or a seasonal rate of $30/MWh for winter months and $60/MWh for summer months. If seasonal/time-of-use pricing is used, the periods will be defined in the Definitions section. The prices may remain the same or escalate annually at either a defined rate (such as 2% per year) or with some index like the consumer price index (CPI), which would be determined each year. Annual prices may be adjusted based on market prices instead. Some projects may receive capacity payments for having project capacity available for use even if it is not used. Capacity payments are typically expressed as $/MW and energy payments as $/MWh. Environmental credits may or may not be available for a particular project, depending on the type of plant built, the fuel used, and the policies of the locality, region, or nation. If credits are to be purchased, their purchase may be lumped together with the energy purchase or it may be a separate transaction. The price section may also include pricing for excess generation, which might have a spot-market-based price for deliveries above the amount at the contract price.

Amount Purchased – Base, Excess/Shortfalls, Delivery Point: In general, contracts specify the amount of base energy to be purchased plus or minus a fixed percentage. For any shortfall greater than the allowed range, the seller pays a penalty to the buyer. Provisions for excess production also must be included. Either the buyer will accept the excess at an agreed-to price or sales to a third party will be allowed. This section also will include discussion of the buyer's inability to take the base energy. The buyer may be charged for the full amount of base energy (take-or-pay style contract), or the seller may be allowed to sell the energy on the spot electric market. Many of these clauses are typical for a fossil-fueled power plant, but are relatively rare for a wind power facility because of the intermittent nature of wind.

This section also includes clauses for taking test energy, taking project expansion energy, and the energy delivery point. Depending on how the commercial operation date is defined, the buyer may take energy as each turbine is completed, or take test energy. Test energy is energy produced by operational turbines during the construction period.

Energy Scheduling/Interconnection: Arranging for interconnection with a transmission provider is most often the responsibility of the seller. This section discusses any energy scheduling issues, and may reference the IA. Energy schedules are routinely submitted 24 hours in advance. Advanced scheduling allows transmission operators to make sure enough capacity exists on the lines so that reliability can remain high. For an "as-available" resource such as

[36] A 12-month period defined in the PPA.

wind, scheduling becomes more difficult. Section 5.3 discusses how this is currently being handled in some wind PPAs.

Metering: Although the PPA may specify base delivery amounts or annual generation, meters track the actual amount of energy delivered. The metered amounts form the basis for payments under the PPA. Therefore, meters need to be calibrated and checked for accuracy regularly. Most PPAs specify annual testing. If the meter is within an acceptable error range (usually ±2% or less), then the meter will pass. If it tests outside this range, then it must be fixed or replaced as specified in the PPA and affected bills revised. The metering section also describes where the meter(s) will be located, who is responsible for maintaining them, whether there will be back-up meters, how often the meters will be read, and access to the site to read the meters.

Billing/Dispute/Dispute Settlement: This section outlines how often the buyer will be billed, on what date the bill will be sent, and when the bill is due. Customarily, projects bill monthly, and buyers have 10-15 days after receipt to make payment. The seller may have specific requirements on how and where the bill must be paid. The section also describes the steps for filing a dispute, and payment while a bill is under dispute. If a payment dispute cannot be settled between the buyer and seller, an arbitrator may be used, with the final decision of the arbitrator binding. Interest charges typically will accrue on unpaid bills depending on the outcome of the dispute.

Force Majeure: If not already listed within the definition, this section lists all events that are out of the control of either party and may cause the project to curtail deliveries or stop operation. Typical events include, among others, political upheaval, acts of God, terrorism, war, and atypical natural events (i.e., tornados, severe storms). The section also defines the process for reporting a force majeure event, acceptance by the other party, and the ability to cure the event. If the event cannot be cured, then early termination provisions may be activated. Wind projects may have specific weather conditions that can cause force majeure. These conditions are discussed further in Section 6.1.2.

Limitations of Liability: This section contains the standard limits of liability of each party.

Assignment: This section tells whether or not a party can assign the agreement to a third party or another branch of a party's company. If it can be assigned to another entity, then the requirements for government approvals and other provisions are outlined.

Construction: If the PPA includes a construction section, it usually references the buyer's access to the site for construction monitoring purposes, the seller's responsibility to obtain permits, and the buyer's responsibility to facilitate permitting efforts. If construction is tied to a government incentive, which could affect the ultimate size of the project, details for handling project size changes will be included in this section.

Tax Provision: This section states which party is responsible for taxes and defines such taxes as are known at the time of the agreement.

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Sufficient Financial Standing: In this provision the buyer agrees to maintain sufficient financial standing (creditworthiness as defined in the definitions section) throughout the course of the agreement. If the buyer's creditworthiness falls below a defined threshold, the buyer is typically obligated to obtain a parent company guarantee or post a letter of credit to support its obligations under the agreement. The guarantee or letter of credit is related to the amount of expected purchases over the remaining life of the agreement, and can have provisions for annual reductions (provided there has been no default by the buyer) to reflect payments already made under the agreement.

Governing Law: This section states the country and/or state laws by which the parties will abide for the interpretation, performance and enforcement of the agreement

Governing Language: This section indicates which language governs the agreement. Although a translation may be included for illustration purposes, one specific language is typically indicated to officially interpret the agreement.

6.1.2 Special Features of a Wind Power Purchase Agreement

The previous section laid the foundation for the types of clauses contained within a PPA. Within that discussion, some wind-specific issues were highlighted. This section provides more detail on issues that are unique to wind power projects and development of a wind PPA.

Product Definition: Any PPA needs to clearly define the product(s) being sold. In a wind project, the product choices expand to include "green premiums," "renewable energy credits," and/or "environmental credits." The PPA also needs to define whether the energy will be "as available" (as produced at any given moment by the project) or a firmed or shaped product (which involves supplementing the energy from the project with other power from the grid from time to time). Wind power developers usually do not have ready access to the resources needed to provide firming and shaping services. It is usually more efficient for the receiving utility to provide these services than for the wind energy project developer to arrange for them. Therefore, it is generally preferable for wind energy PPAs to be "as available" contracts, metered at the project substation.

Availability: Availability is defined as the amount of time a wind turbine (or group of wind turbines) is available to produce power. A good wind project will routinely have an availability of 95% to 97%. Wind project PPAs generally do not include availability commitments, since the wind power project owner has a strong incentive to have a high availability in order to generate power and income, but those PPAs that do have an availability commitment are usually expressed as minimum project availability over a year, a rolling 12-month average or some other acceptable term. Any concerns regarding availability of the project are usually covered in a minimum performance clause as discussed below.

Some PPAs go beyond equipment availability requirements, and require minimum energy production guarantees, which combine equipment availability and wind resource issues. However, any minimum energy guarantee needs to include provisions for a "low resource" wind year(s) and needs to provide credit for above average wind resource years. Contracts that include this language usually address this issue by using multi-year rolling averages and allowing

relatively large deviations from the expected levels (over 25%). Since the wind power plant is a non-dispatchable resource and the contracts usually only require payment for energy delivered, the largest problem underperformance causes the buyer is the need to identify and procure other sources of energy, at potentially higher prices. Contracts that do have an underperformance clause sometimes base the penalties for underperformance on the difference between the contract price and the price the buyer has to pay for the replacement energy.

Scheduling Maintenance: The schedule should show that maintenance is performed during seasonal low-power-demand periods and/or low-wind resource periods.

Pricing: Although many PPAs include time-of-delivery pricing, wind projects usually have simple price structures such as a flat price per MWh of energy delivered, regardless of when the delivery is made. This approach greatly simplifies the project financing process. At the end of each month, the rate is applied to the total MWh delivered to determine the monthly payment. Pricing can be a flat rate or escalating with an inflation-related index. Another approach is to escalate the price at a fraction of the inflation index (perhaps 50%). This approach recognizes the fact that most wind energy costs are capital-related, but protects the developer against unmanageable operations and maintenance costs if inflation should be higher than expected during the contract period. Long-term (15-20 years), pre-defined pricing usually is a requirement for financing a wind power project. In addition to needing a long-term PPA, financial markets must also perceive the buyer of the energy to be creditworthy to finance a wind energy project.

Capacity Purchase: Since wind is an "as-available" resource that cannot be called upon to deliver power at a specific time in the future, wind PPAs normally do not include a capacity purchase. An example capacity purchase would be US$1,000 per month per MW of wind power installed at a project, regardless of how much energy was delivered from that capacity.

In some situations, electric utilities must demonstrate to regulators or grid operators that they have sufficient installed or purchased electric capacity to meet certain reliability criteria. The effective capacity that a wind power project delivers to the electric grid can be statistically determined to help address how a wind project (or wind PPA) can help the utility meet such minimum capacity criteria.

Delivery Guarantee: As stated earlier, delivery guarantees are most common for fossil-fuel technologies. The difficulty of obtaining accurate hourly wind resource forecasts makes project deliverable guarantees risky. Most wind power PPAs simply allow for varying deliveries, with some assurances for the deliveries falling into a certain amount over months and years, but rarely have specific requirements for hourly deliveries.

Energy Scheduling: With wind generation, a provision is needed to make hour-ahead adjustments to the day-ahead power delivery schedules (if such schedules are required where the project is operated). This section may also require that the seller contract with a wind forecasting company to provide day-ahead and hour-ahead wind forecasts to facilitate energy scheduling. Such forecasts would typically include an hourly update of anticipated deliveries over the next 36 hours, so that the best available information can be used for upcoming day-ahead and hour-ahead schedules and adjustments to schedules. Section 5.3, below, discusses how this is currently

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being handled in some wind PPAs. Penalties for failing to meet the scheduled energy deliveries are not included in wind energy PPAs because they are likely to make a project unfinanceable. The wind project and power buyer need to work together to develop the best possible forecasts and recognize that there is uncertainty in hour-ahead forecasts, which increases with day-ahead or 36-hour-ahead forecasts.

Force Majeure: Aside from the standard force majeure events, wind project PPAs may include events tied to the wind turbine design environment. For example, in climates where icing can occur, severe blade icing might be included as a force majeure event due to concerns over ice shedding or mechanical failures. Severe icing occurs when more ice than the blades are designed to handle accumulates on the blade in a short time period. In other cases, PPAs may not include a specific reference to icing as a force majeure event because icing is considered as any other factor (such as lack of wind) that contributes to the intermittent nature of wind power generation. To the extent possible, the force majeure clause should be tied to the wind turbine's design environment. For example, if the wind turbines are designed to withstand wind speeds up to 60 meters per second and a 70 meter per second wind damages them, this would be considered force majeure, but a 59 meter per second wind would not.

Project Size and Startup Issues: Wind projects normally consist of multiple wind turbines, and the size and number of turbines can change between the creation of the PPA and the completion of the project. Wind project PPAs often contain project capacity flexibility to account for the potential difference between initial planned capacity and actual installed capacity. The actual number and size of turbines may be impacted by permit conditions, changes in the types of equipment commercially available, or by a policy expiration date, such as the U.S. Renewable Energy Production Tax Credit, which historically has expired and then been renewed.

Frequently the first turbines installed on a project are able to begin delivering energy before the entire project is completed. A wind energy PPA usually includes clauses allowing for these pre-completion deliveries, sometimes at prices different from the prices to be paid once the project is completed.

6.1.3 Relationship of Power Purchase Agreement to Other Project Agreements

The PPA works in tandem with the wind turbine supply agreement, construction contracts, Interconnection agreement (IA), and other project agreements, which together document to lenders and potential investors how a wind power project will be constructed and operated.

6.1.4 Standardized Agreements

Some countries and regions have adopted standardized PPAs. For example, the California Public Utilities Commission adopted a standard set of PPAs that were used for almost all wind power development in California in the 1980s. A standardized agreement, if carefully drafted to provide a fair arrangement for each party, can help facilitate more wind power development by reducing the need to separately negotiate agreements (or at least certain major portions of the agreements) for each project. Standard provisions might also help provide a more balanced negotiation process when relatively weak wind power developers seek to negotiate agreements with large, dominant utilities. Also, standardized PPAs can help improve the feasibility of small projects that otherwise might not be able to absorb the cost of separately-negotiated agreements.

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While standardized PPAs can help facilitate project development, they require diligent efforts from affected parties (buyers and sellers) in order to make workable standards and they may not be useable in each situation. Furthermore, a standardized PPA developed for one region may not easily be adaptable to other regions because of differences in laws, grid management practices, market conditions, and other factors.

6.2 Interconnection Agreement

The IA is ordinarily a separate process and agreement from the PPA. However, failure to enter into an IA could be grounds for early termination or non-execution of a PPA. The IA deals with the physical interconnection of the facility with the transmission system, and covers the responsibilities for obtaining the necessary interconnection hardware and the transmission line capacity. A typical wind power project interconnection includes a transformer or transformers[37] to step-up the project's power deliveries to the voltage of the transmission lines, disconnect hardware and controls to safely isolate the facility from the transmission lines when necessary, and communications and metering equipment to properly account for actual deliveries to the grid (both for billing purposes and for proper operation of the grid).

6.2.1 Transmission System Impact Study

Before entering into an IA, a party to the PPA will execute a Transmission System Impact Study. Through this study, the transmission provider evaluates the impacts of interconnecting the potential project with their current and planned line uses to determine if the line has sufficient capacity and voltage support, if an upgrade would make the interconnection feasible, or if the interconnection is not feasible. In general, the party requesting the study reimburses the transmission provider's cost of conducting the study.

6.2.2 Major Provisions of the Interconnection Agreement

The project developer negotiates an IA with the transmission owner and/or operator. Many major provisions of the IA are similar to the PPA, including definitions, term, termination, breach of contract, cure remedies, default, force majeure, metering, billing, disputes, assignment, liability, insurance, and miscellaneous. The IA, though, does contain some different terminology, references, and sections.

Definitions: Some definitions found in an IA include the transmission owner's and generating facility's interconnection facilities, the interconnection point, and the system protection facilities. The IA lists all the required parts and specifications for both parties' interconnection facilities. System protection facilities include equipment that protects the wind facility from surges from the transmission line and vice versa.

[37] Transformers are used to change electricity from one voltage to another. Generally, higher voltages transmit power over longer distances more economically than lower voltages. An example of transformer use in a wind power project is: the wind turbine generates power at 690 volts, which is transformed to 34,500 volts (34.5 kV) at a transformer located near the wind turbine for the wiring within the wind power project. Another transformer would then be used to change the 34.5 kV on-site power system to 115 kV for interconnection to the utility's 115 kV transmission line.

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Amount: Whereas PPAs may contain provisions to handle additional project capacity or project energy, an IA is built around a set amount of interconnection capacity. Therefore, if a project expects to add additional capacity, the project owner may either negotiate for an amount including the future capacity or enter into a separate IA later during the planning stages of the expansion.

Standard Transmission Tariffs: Often, the transmission provider has set transmission tariffs for various voltage levels. Many sections of the IA, including pricing and obligations, will reference these tariffs instead of re-creating them in the IA. Note that the intermittent nature of a wind energy resource makes transmission pricing important. A transmission pricing policy that does not include multiple wheeling charges across a transmission system (known as "rate pancaking"), and does not penalize wind for its intermittency, facilitates economical development of the technology.

Facility Interconnection Cost and Responsibilities: This section specifies the responsibilities of both parties with respect to their interconnection facilities, including complete facility descriptions and electrical wiring diagrams, computerized reporting and control system specifications, protection procedures, frequency and voltage specifications, site access, and metering. The transmission provider is sometimes responsible for the design, construction, operation, and maintenance of the provider interconnection facilities, while in other cases the project owner is responsible for constructing these facilities and then deeding them to the transmission provider upon completion. Since these facilities are only constructed to serve the project, it is typical for the project to reimburse the transmission provider for associated costs, but this may vary depending on the specific tariff. Depending on the local/regional/federal policies at the project location, or if transmission upgrades benefit other entities, some or all costs may be spread across several users or all users. Depending on the extent of upgrades and associated costs, the IA may offer a levelized payment schedule for the reimbursement of one-time facility upgrade costs, in which case the amortized one-time upgrade costs are added to any recurring operations and maintenance costs to obtain one combined monthly interconnection charge payable by the wind power project. The wind power project must also install and maintain interconnection facilities on its side of the delivery point, which typically will be paid for entirely by the wind power project.

Data Transfer: The transmission provider will need data from the project to monitor such items as voltage levels and instantaneous power deliveries. The IA may require the wind power project to install and operate communications equipment to make the project "visible" to the utility's grid operation center so that the transmission operator can receive data in real time and automatically disconnect the project from the transmission system in the event of an emergency.

System Disturbances or Emergency: Transmission system disturbances may happen on either the transmission owner's end or at the wind power facility. Typically, neither party is liable for damages to the other's system from system disturbances unless it results from willful action. Sometimes emergency situations occur in the transmission system, requiring the transmission owner to have the ability to disconnect the project immediately, such as if there is a short-circuit within the wind power facility, or if the wind power facility is otherwise thought to be contributing to a problem on the electric grid.

Emergency situations should be defined in the definitions section of the agreement and are different from project curtailment in operationally constrained periods or other situations where the utility buyer chooses to curtail the project for economic reasons. In cases other than emergency situations, the seller should be paid for what it would have generated in the event of shutdown resulting from constrained operations or economic curtailment.

Credit Protection: The IA also may require that the wind power project ensure that the transmission provider will be reimbursed for the interconnection facilities to the extent that the project pays for these improvements over time rather than as they are incurred by the transmission provider. The credit assurances can take the form of a letter of credit, an escrow account, or some other means agreed to by the parties.

Regulatory: Depending on regional or federal requirements, the IA may require submittal to and acceptance by one of these authorities, such as the Federal Energy Regulatory Commission in the United States. Future policies may also impact the IA. Therefore an IA will need to include provisions in the force majeure or early termination sections to handle this occurrence, if the IA cannot be satisfactorily re-negotiated.

6.3 Power Scheduling Issues for Wind Projects

Scheduling of power deliveries is usually made days and hours ahead of the actual deliveries to ensure that adequate power transmission capacity is available, and to make adjustments to deliveries to the extent that sufficient transmission capacity is unavailable. Scheduling of wind power deliveries is complicated by the fact that it can be difficult to know exactly how the wind will blow at specific hours in the future.

Scheduling requirements vary considerably from region to region. In the past, scheduling responsibility has often lain with the energy purchaser, but the responsibility has been shifting towards the energy seller since the seller has the best knowledge of the project and the wind resource.

From an administrative and policy perspective, and from the perspective of the wind power industry, by far the easiest and most financeable way to handle scheduling of wind energy is to treat it as a negative load and not schedule it. Although utilities have a forecasted load curve, customers do not have to report deviations from that plan every time they turn on a light, run air conditioning, or operate a factory. Wind generation readily can be handled in a similar manner, at least until "as-available" resources account for about 10% to 30% of the market.

Because wind is an "as available" resource, scheduling protocols designed around dispatchable resources can be difficult for wind projects. Typical system designs that are problems for wind energy include:

- Limited non-firm transmission available
- Day-ahead scheduling, without adjustments
- Significant penalties for over- or under-production

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Limited non-firm transmission forces most wind projects to operate within the firm transmission market. The industry is rapidly improving its ability to produce hourly and day-ahead forecasts. Such forecasts are still imprecise and carry no guarantees, unlike natural gas or coal fuel supply contracts that can contain such guarantees. Therefore, an inability to adjust the day-ahead schedule significantly disadvantages wind projects because the wind resource will inevitably vary, causing a deviation from the transmission schedule. The wind project may then suffer significant penalties for over- or under-production. These penalties can be so expensive as to prohibit the development of wind energy.

Some transmission systems have found ways to reduce the disadvantage for "as-available" resources like wind power. These methods include periodic true-ups, settlement in the spot market, or not requiring transmission scheduling. For example, the California Independent System Operator's Eligible Intermittent Resource Protocol allows hourly forecasts with average monthly imbalance settlements. This netting of imbalances at the average spot price reduces the overall penalty and cost risk due to short-term price spikes in the transmission market. The New York Independent System Operator tariff exempts intermittent resources (solar and wind generation) from imbalance charges. This is limited to all existing intermittent resources as of November 18, 1999, up to an additional 500 MW of installed capacity.

Imbalances could also be settled in the spot market. The spot market acts in the non-firm transmission arena and would allow wind projects access to that limited resource, allow for energy delivery and revenue, and enable wind projects to avoid penalties. However, this type of spot settlement brings uncertainty about what prices the wind power project would need to pay to make up for shortages associated with under-deliveries (delivering less than scheduled) or would be paid for over-deliveries (delivering more than scheduled). This uncertainty can make it substantially harder to finance the project.

6.4 Contract Issues Related to Financing

The PPA and IA must be written in ways that will be acceptable to entities financing the project. Key issues that must be addressed to have a financeable project include:

- Long term (15-20 year) with defined prices
- Creditworthy buyer or acceptable guarantee, security, or other assurances
- Adequate allowance for deviation for expected performance to account for variability in the wind resource
- No penalties for failure to meet time-of-day or season deliveries (preferably no time-of-day or seasonal pricing)
- Recognition of the intermittent nature of the resource and the challenges of forecasting the output of a project.

To the extent possible, the institutions that will be financing proposed projects should be consulted regarding the terms of these documents prior to finalizing them.

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7. Electric Grid Issues

This section of the Toolkit describes the basic operation of an electrical power grid and discusses the impacts of integrating an intermittent generation source such as wind energy into the grid.

The electric power grid connects generating stations with power users. It consists of high-voltage transmission lines which cover long distances, substations which convert one voltage to another, lower voltage distribution lines which serve neighborhoods and individual customers, and safety and control systems to keep the grid operating safely. The grid is sometimes called a power network. Grids are increasingly interconnected across large regions (frequently internationally) to promote reliability and the sale and purchase of power between regions.

Figure 7-1 shows a typical grid-connected wind power project and its relation to the power grid. Like other power plants, a wind power project will affect the grid it ties into, which will have certain limits as to capacity, ability to reliably operate, etc. In some cases, new or improved power lines must be added to accommodate a new wind power project, while in other cases existing capacity on the grid can absorb the new project. In either case, the impact of the new project must be carefully evaluated.

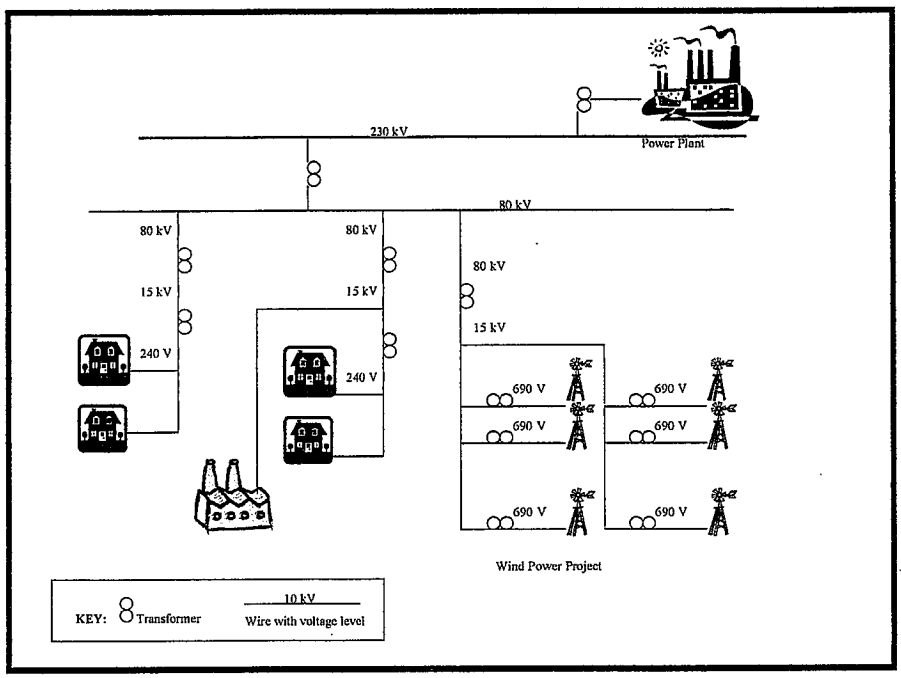

Figure 7-1. Power Grid Schematic

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7.1 Power Grid Fundamentals

Most of the power delivered to typical power grids comes from large central power stations with capacities of roughly 50 to 2000 MW each, with fuel sources which allow the generation to be controlled up or down, and if necessary, to remain steady for long periods. Wind power projects differ in that the individual units are much smaller (roughly 200 kW to 3 MW), wind is an intermittent resource, and wind power projects use different types of electrical generator hardware from many other power plants.

The grid carries power at different voltages depending on how much and how far the power must travel. Within households and businesses, typical voltages are 120 or 240 volts. Commercial and industrial users typically require power at 120 to 600 volts. Neighborhoods and large industrial users are served at 10 to 50 thousand volts (kilovolts, or kV), while still higher voltages (100 kV to 500 kV) typically carry power between cities and from large power stations.

Utility-scale wind turbines typically generate power at 690 volts. This voltage typically is stepped up to 20 to 50 kV for collection in underground wires within the wind farm, and potentially to a higher level at a substation located at or near the project for transmission to power users.

Only in limited cases can wind turbines connect directly to a power distribution line such as would serve a farm, school, or factory. For commercial-scale turbines or groups of large turbines in a wind power project, a separate substation for transforming the voltage to a higher voltage used on distribution or transmission lines is necessary. Table 7-1 shows the approximate voltage levels typically used for various wind power project sizes.

The choice of voltage at a wind power project is based largely on the voltage of nearby power lines and on economics; higher voltages can use a smaller wire size, but require more expensive equipment and more space.

Table 7-1. Project Size for Different Interconnection Voltages

Approximate Voltage Level at Utility Interconnection	Size of Wind Power Project
1 kV	Individual, ~ 200 kW
10 kV	Small, ~2 MW
50 kV	Medium, 2 - 40 MW
100 kV	Large, 20 - 100 MW
250 kV	Very large, 80 - 300 MW

Depending on proximity to transmission lines, power stations, and substations, a particular location on a grid can be considered "strong" or "weak." A weak location would tend to be served by lower voltage lines, and be at or near the "end" of the system. All other things being equal, power generating stations and large customers would want to be located at a "strong" point on the grid. A factor known as the short circuit power level, measured in mega-volt-

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amperes (MVA), can be used to measure how robust the grid is at any given point.[38] The following general ranges can be used to evaluate whether a proposed wind power project is located at a strong or weak point on the grid relative to the wind project size:

- A strong grid will have a short-circuit level more than 20 to 25 times the size of the wind power project.
- A weak grid will have a short-circuit level less than 8 to 10 times the short-circuit level.

It is sometimes necessary to build or upgrade a transmission line to reinforce the grid to accept power from a new wind power project. These improvements can be very expensive, and may be necessary if the "best" locations for wind power development in a region are in locations with weak grids.

One distinctive feature of electricity is that it cannot be stored.[39] At any time on a grid, there is an instantaneous balance between production and consumption. When a customer turns on a light or appliance, a power station somewhere on the grid must slightly increase its output to accommodate the increased load. Almost no power users schedule their consumption, so grid and power plant operators routinely vary power production to match the consumption. Wind power is produced when the wind blows, and affects the balance of production and consumption in much the same way that varying consumption does.

A unit of wind power produced saves a unit of power generated from other power plants operating on the system: typically coal, natural gas, oil, hydroelectric, or nuclear, depending on the mix of power plants on the grid, and how the plants are being operated.

Wind power projects usually run whenever they can and when they come on line they displace the so-called "load following" plants which are loaded and unloaded to follow fluctuations in power demand. In many parts of North America and Europe, the load following plants are coal-fired. In small or isolated grids, wind would tend to displace diesel or gas-fired generation.

7.2 Wind Turbine Generator Issues

Wind turbines can be classified as fixed speed or variable speed. Fixed-speed wind turbines (which may operate at one or two fixed speeds) are the simpler technology, and commonly use induction generators. Variable-speed wind turbines are becoming more common, despite their added complexity, but offer advantages in overall machine design, power control, and increased energy production. Variable-speed wind turbines can adapt rotor speed to best capture the energy in the wind, and use inverter systems to change the variable-frequency alternating current from the rotor to convert power to the constant frequency demanded by the grid.

[38] The grid owner or operator can indicate what the short-circuit level is at any particular location. For purposes of discussion in this document, MVA can be considered similar to MW.

[39] "Electricity storage" technologies do not store electricity itself; they always convert the electricity to other forms for storage (chemical reactions in batteries, gravity storage in the case of pumped storage, etc.).

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At the local level, voltage variations are the main problem associated with wind power. Normal static tolerances on voltage levels are plus or minus 10% from the target level. However, fast, small variations become a flicker nuisance at levels as low as 0.3% and in weak grids, such as often are found in remote areas where the wind conditions are otherwise favorable for wind power development. This can be the limiting factor on the amount of wind power that can be installed without the need for costly grid improvements.

Wind power projects typically operate at a lower average capacity factor (25% to 40%) compared to many other power generating stations. Conventional technologies can range from 25% to 30% for peaking plants, to 80% to 90% for base loaded machines. Transmission lines used by wind power projects must be sized to meet the peak output, even though this output is only achieved periodically, so wind power projects may need to pay proportionally more for transmission on a unit of energy produced than other power plants.

Induction generators commonly used by fixed-speed wind turbines are relatively simple and inexpensive, and no synchronization device is required. The disadvantages of induction generators are high starting currents, which usually are smoothed by electronics within the wind turbine controller, and their demand for reactive power. The reactive power that induction generators draw from the grid requires careful consideration of electrical power flows. Other equipment, however, is commonly used to condition the electrical output (both from individual wind turbines, and with central systems for wind power projects) and to provide a controllable power factor.

In variable-speed wind turbines, the generator is connected to the grid by an electronic inverter system. The inverter system can introduce harmonics into the grid, and control of these harmonics needs to be carefully considered during project evaluations.

7.3 Power Quality and Wind Turbines

Ideally, the grid provides electric power continuously to consumers and never varies from target voltage, frequency, and other setpoints. The term "power quality" refers to the extent to which this ideal is achieved. Key power quality issues that may be affected by wind turbines are discussed below.

Voltage: 110 or 240 V is a typical standard for household use. Voltage can sag below target levels or flicker up and down when, for example, large motors start or arc welders are used. In a house, this may be noticed when lights flicker when a refrigerator or air conditioner starts. Similar disturbances can happen when wind turbines start and stop, but wind turbines use "soft-start" power electronics to address this issue.

Frequency: Power grids use alternating voltages and currents (AC systems), in which the voltage constantly changes between positive and negative polarity and the current changes its direction. The number of changes per second is designated the frequency of the system with the unit Hertz (Hz). Two common world standards are 50 Hz and 60 Hz. The frequency of the system is proportional to the rotating speed of the synchronous generators operating in the system and they are all essentially running at the same speed; they are synchronized with the grid. Increasing the electrical load in the system tends to slow the generators, making the

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frequency fall. The frequency control of the system then increases the torque on some of the generators until equilibrium is restored and the frequency is restored to 50 or 60 Hz again.

Harmonics: Higher order frequencies (i.e., multiples of the standard 50 or 60 Hz frequency level) cause "noise" on power lines and are caused by different equipment, including wind turbine power electronics. Harmonic noise causes increased currents and possible destructive overheating of power components such as capacitors and transformers. In wind power projects, harmonics can be generated by the power electronics on variable-speed wind turbines, but are generally not an issue with inductive generators.

Reactive Power: Reactive power is produced in capacitive components (capacitors, cables) and consumed in inductive components (e.g., transformers, motors, fluorescent lights). Synchronous generators can either produce reactive power (the normal situation) or consume reactive power, depending on how the generator is controlled at any moment. Induction generators consume reactive power. Reactive power is not useful for anything, and if not controlled within an acceptable range, it increases losses on power transmission lines just as if active ("useful") power was being transmitted. To minimize such losses it is necessary to keep the reactive power low and this is accomplished with capacitor banks within the wind turbines themselves and with centralized capacitor banks which can be incorporated into the wind power project substation.

Protection and Safety: The grid is operated with the goal of harming no people or property, and has numerous monitoring and switching systems to isolate parts of the system when disturbances such as over- or under-voltage, over- or under-frequency, may cause damage. Wind turbines have similar protective systems to isolate themselves from the grid if parameters fall outside of identified levels.

7.4 Variability and Grid Penetration Rates

The variable nature of wind is often considered a challenge, but in practice it poses few problems. When balancing supply and demand on a power grid, a wind power project's output variations need to be considered in the context of power demand variations which occur over the course of hours, days, weeks, and seasons. Above a certain amount of wind power on a grid – about 30% or more of demand – the challenges become more significant and other grid control strategies and load-following tools may be necessary. Some isolated and remote grids operate with high proportions of wind energy, well in excess of 30%.

Power grids and power generation capacity typically are sized for peak demand, so that customers can use power whenever they want to.[40] A key issue, therefore, is the ability of a wind power project to contribute to peak demand. Some utilities question whether any capacity benefit can be attributed to wind power projects because of the intermittent nature of the wind. However, no power plant is 100% reliable, and the ability of a utility's system to serve peak demand is based on a statistical evaluation of the resources on the system. While the exact determination of a wind power project's contribution to system capacity is the subject of much calculation and

[40] However, it is common for large power users to control their usage during peak times in exchange for better pricing, and peak load reduction programs for industrial and non-industrial power users is a significant factor in offsetting the need to construct additional power plants which would only serve limited "peak" periods.

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debate, it is generally less than the capacity factor of the wind power project, so a 100 MW project which operates at an average of 35% would likely have a capacity contribution of less than 35 MW.

Depending on how peak wind generation seasons align with peak power demand, this capacity will tend to increase or decrease. Also, as the amount of wind power on a grid increases, the incremental addition to capacity decreases because of the intermittent nature of the wind. Figure 7-2 shows capacity contribution levels for eight European countries.

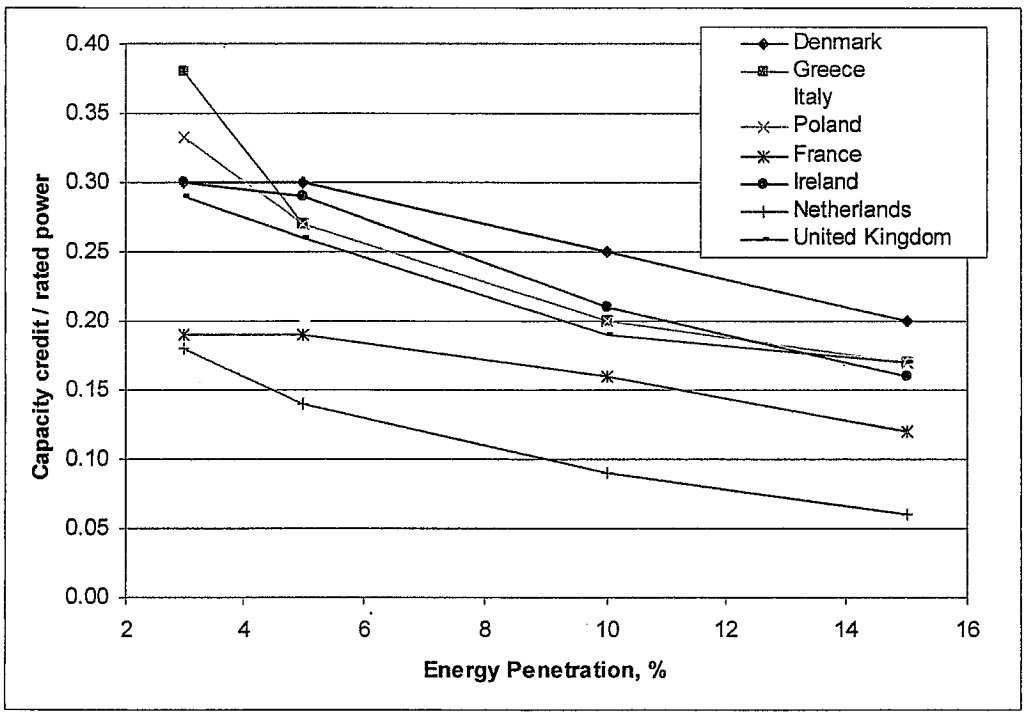

Figure 7-2. Capacity Contribution in European Countries

Note that some of the capacity contributions shown in Figure 7-2 are generally in the range of the capacity factors for wind power plants in Europe and at low penetrations exceed these levels. Differences between countries and regions will depend on many factors including how many different wind resource areas the wind facilities are in and how consistent the wind resource is. In some regions, having widely dispersed wind power plants may allow a higher capacity credit than if the same capacity were all located in the same wind resource because the output of the dispersed power plants would be less likely to be closely correlated.

Utility system operators frequently are concerned with the variability in output from a wind power plant and how it will affect their system. Because the power plant is made up of multiple turbines dispersed over a site, the output of the overall plant is substantially less variable than the output of an individual turbine. Multiple studies have examined the characteristics of wind power

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stations and their impact on the utility grid. Additional information on this subject is available in the references.

7.5 System Impact Studies

Regardless of the size of the facility or the type of fuel used to produce power, there are several technical questions that must be answered before a new power plant can be connected to the grid. These questions include:

- How will the proposed plant affect the operation of the electrical grid?
- Will the proposed facility affect the utility's ability to honor commitments for capacity, reserve, and firm power transfers?
- Are there special protection requirements or operating constraints required for grid stability or safety?

A system impact study is designed to address these questions, given a range of supply and demand scenarios, including:

- High wind, low system power demand
- High wind, high system power demand
- Low wind, low system power demand
- Low wind, high system power demand

Usually conducted by the power line owner, the study evaluates these scenarios, and perhaps others based on the assumed operational status of other nearby power plants and large power users.[41] System impact studies typically use computer programs to simulate various operating conditions; to evaluate the anticipated magnitude of voltage fluctuations, flicker, system frequency disturbances, and harmonics resulting from the new plant's addition to the grid; and to recommend measures to mitigate any potentially adverse impacts.

7.6 Additional Sources of Information

Wind Turbine Grid Connection and Interaction, Deutsches Windenergie-Institut GmbH, Tech-wise A/S Denmark, and DM Energy United Kingdom. ENERGIE (European Commission program), 2001. Available at europa.eu.int/comm/energy/res/sectors/doc/wind_energy/maxibrochure_final_version.pdf.

Wind turbine generator systems – Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines. IEC 61400-21, 1st Ed., 2001.

[41] Note that the power line owner usually conducts the system impact study, but the obligation to pay for the study often (but not always) falls on the project developer.

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Poore, R. and Randall, G. "Characterizing and Predicting Ten Minute and Hourly Fluctuations in Wind Power Plant Output to Support Integrating Wind Energy into a Utility System." *Windpower 2001 Conference Proceedings*. American Wind Energy Association, June 2001.

Parsons, B.; Milligan, M.; Zavadil, B.; Brooks, D.; Kirby, B.; Dragoon, K.; Caldwell, J. (2003). *Grid Impacts of Wind Power: A Summary of Recent Studies in the United States*; Preprint. 28 pp.; NREL Report No. CP-500-34318. Available at www.nrel.gov/publications.

Brooks, Daniel L., et al. *Assessing the Impact of Wind Generation on System Operations at Xcel Energy –Bonneville Power Administration*. Available at http://www.uwig.org/operatingimpacts.html.

Dragoon, K.; Milligan, M. (2003). *Assessing Wind Integration Costs with Dispatch Models: A Case Study of PacifiCorp*; Preprint. 15 pp.; NREL Report No. CP-500-34022. Available at www.nrel.gov/publications.

Electrotek Concepts, Inc. *We Energies Energy System Operations Impacts of Wind Generation Integration Study.* ETK-2044, March 2003. Available at http://www.uwig.org/operatingimpacts.html.

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Hirst, E. *Interactions of Wind Farms with Bulk-Power Operations and Markets*. Prepared for Project for Sustainable FERC Energy Policy. September 2001. Available at http://www.ehirst.com/publications.html.

NWCC Transmission Issue Briefs, *Wind Energy Interconnection; Implications of Energy Scheduling Requirements for Wind; Wind Energy Congestion Management and Transmission Rights*, 2003. National Wind Coordinating Committee. Available at www.nationalwind.org.

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8. Wind Energy Economics and Financing

The purpose of this section of the Toolkit is to provide a basic understanding of wind power economics and introduce the concepts associated with project financing. As a companion to this section, a representative 20-year economic model for a typical commercial wind project is included and described in Appendix F. The appendix contains copies of a spreadsheet model along with a discussion of typical assumptions, calculation methods, and interpretation of the results. Although the example model is a simplified version of the cash flow models used for actual projects, it provides a basis for understanding the economic concepts important to wind energy development and can serve as a foundation for more detailed analyses.

8.1 Wind Energy Cost Components

The costs associated with a wind energy project can be divided into two categories: the initial capital costs incurred to install the project and the recurring annual costs incurred to operate the project.

8.1.1 Capital Costs

Capital costs include:

- All planning and project development activities
- Equipment and material purchases
- Construction and installation activities
- Commissioning (initial start-up and testing)

Development costs include wind resource assessment and analysis, permitting and environmental studies, legal and technical consulting, design and engineering, and financing costs. Equipment and construction costs include the on-site electrical power collection system and may or may not include the cost of the substation, depending on whether the facility is dedicated to the project and on the policy and practices of the local utility. Lease fees or usage charges may be imposed by the utility if the substation is not included in the project costs. Transmission lines costs may also apply. The capital costs also include the cost of maintenance buildings to support the project, an initial inventory of spare parts, control and data acquisition systems, and specialized maintenance tools.

Figure 8-1 shows a breakdown of capital cost components for a typical commercial wind energy project.

The capital costs of wind projects have decreased from more than US$2,500/kW installed in the early 1980s to a current range of approximately US$900/kW to US$1,200/kW. The cost for a specific project depends on the size of the installation, the complexity of the terrain, the type of equipment, and other factors.

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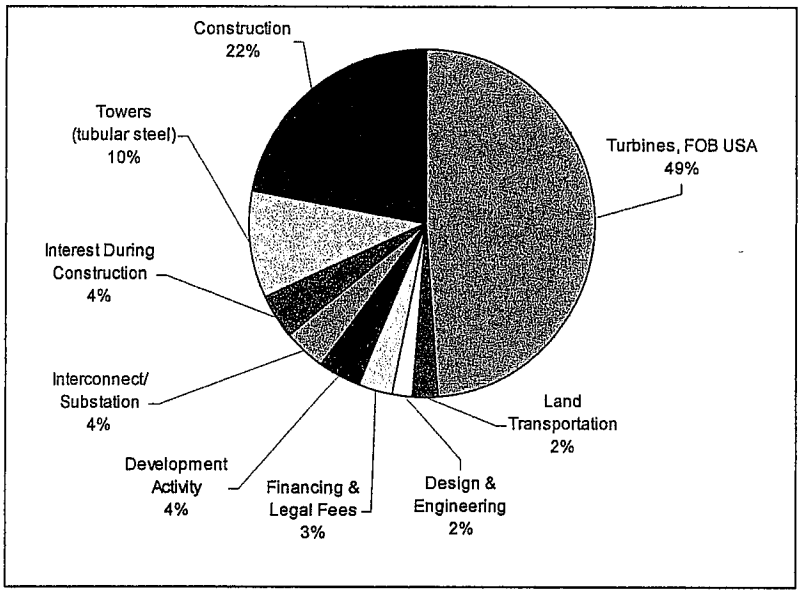

Figure 8-1. Breakdown of Capital Cost Elements of a Wind Turbine

8.1.2 Annual Costs

Annual, recurring costs for a commercial wind project include the following:

- Land lease payments
- Insurance
- Property and other taxes
- Management fees
- Operation and administrative costs
- Transmission or interconnection fees
- Maintenance costs including parts, labor, equipment, and materials for scheduled maintenance, unscheduled repairs, and major overhauls

The values of these annual cost elements vary depending on a number of factors. Land, insurance, and tax costs vary significantly from country to country and also between different locations within a country. Leases, transmission and interconnection agreements, and management fees are based on specifically-negotiated arrangements.

Operations and maintenance (O&M) costs vary significantly depending on the O&M strategy employed and the roles and responsibilities of the equipment manufacturer in providing service and warranty repairs. O&M costs generally are divided into the following three categories:

1. Scheduled, preventive maintenance on the wind turbines and other equipment (e.g., routine oil changes)

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2. Unscheduled maintenance including activities ranging from simple fault resets to major component repairs
3. Periodic component overhauls and scheduled replacements

The first two categories occur during the course of each year and the third occurs at periodical intervals over the life of the project.

When compared to conventional fossil-fuel power plants like coal, nuclear, or natural gas, wind energy projects have higher initial capital costs and lower annual operating costs (primarily because, for fossil-fuel plants, the fuel costs dominate the annual costs). As a result, wind project economics work much better with low-cost access to borrowed money, and offer long-term stability in the cost of energy produced because projects lack fuel cost risk. By contrast, fossil-fuel plants are less sensitive to the cost of borrowed money, yet have long-term risk associated with the cost of fuel.

8.2 Fundamentals of Economic Analysis

Some institutions differentiate between a financial analysis and an economic analysis. In such cases, an economic analysis is one that is conducted without any consideration of country- or project-specific financial parameters such as taxes, inflation, or financing rates. A financial analysis takes into account the financing structure of the project including the debt and equity investments, as well as inflation, import taxes, and other parameters. For the purposes of this document, the discussion of economic analysis includes both economic and financial evaluations. The economic evaluation of a wind power project includes:

- A large up-front investment to purchase equipment, develop the project, and complete construction.
- Relatively small amounts of money spent each year to operate, maintain, and repair the wind turbines; make land lease payments; and pay recurring expenses like insurance and property tax.
- Revenue received each year from the sale of the wind energy.
- Periodic repayment of any loan obtained as part of the project financing.
- Analysis of returns on the invested capital.

The relative size and timing of the power sales revenue compared to the one-time and recurring costs of the project determine whether the project is economically attractive. Additional details about economic analysis approaches and methodologies are included in Appendix F.

A typical approach to evaluating project economics is to use a discounted cash flow model to determine the return on investment. Discounted cash flow theory is based on the presumption that a dollar held today is worth more than one promised next year given the risk of not getting the funds next year, inflationary devaluation of next year's dollars, and the fact that one could do something useful with a dollar now (e.g., invest it, spend it).

8.3 Sources of Financing for Wind Projects

Investors in a wind project include both equity and debt participants:

- ***Equity participants*** are associated with ownership of the project and expect at least a reasonable return on the investment, typically in the form of monthly, quarterly, or annual payments from project cash flows. If an investor perceives the risk is higher than putting the money in a bank or investing in other types of projects, the expected return should be higher. Individual investors and companies typically have a target or "hurdle rate" which the expected investment must exceed. In the U.S., typical hurdle rates in recent years have ranged from 12% to 15% or higher, as measured by the after-tax return on the investment. International experience will vary considerably depending on industry, currency, political, inflation, and other risks.

- ***Debt participants*** are associated with loans to the project and expect to get their money back, with interest. Lenders typically take precautions, such as requiring minimum debt service coverage ratios and reserve accounts, to be sure that the loan gets repaid, and they also typically cover their initial costs, and perhaps some profit, with loan fees. Lenders may also take a security interest in certain project assets; however, they often are not in the best position to remedy issues associated with the project that cause repayment problems.

The debt/equity ratio describes the relationship between the debt and equity investments. Equity investors typically want as large a loan as possible to reduce their required cash investment, while banks and other debt providers want to limit the loan value so that a reasonable amount of equity is "at risk," thus ensuring the project is managed correctly. Both depend on the project to work properly to obtain a return on their investment, but the risk and reward profiles are different.

Project developers put the various pieces of a project together by finding and studying a suitable location, arranging utility interconnections, negotiating for the sale of the electricity, designing the project, obtaining financing, procuring equipment, and contracting for construction and operations. Project developers may or may not keep an equity interest in a project after it is completed.

There are a wide variety of financial structures and approaches that have been used to obtain financing for commercial wind projects and most of the deal structures are proprietary. Although it is beyond the scope of this document to provide an exhaustive list of financing opportunities, potential sources of project financing include the following:

- ***Private Finance Sources:*** Private companies assist project developers in securing financing for energy and environmental projects in the U.S. and abroad. These include direct finance sources as well as some organizations that assist project developers indirectly by identifying and facilitating communication with possible finance sources. Private sources include but are not limited to traditional banks (debt), multinational petroleum companies (equity), finance companies (debt or equity), insurance companies

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(debt), and small investment funds which specialize in clean energy developments (debt and equity). In some industries equipment manufacturers have finance subsidiaries which work alongside the equipment seller to integrate the product and financing for the product, but this is not yet common in the wind power industry.

- ***Multilateral, National, and Non-Profit Institutions:*** These organizations offer either debt or equity (or both) to finance projects that are consistent with environmentally sound energy sector development, balanced natural resource management, sustainable development, and other criteria. Examples include the World Bank (through its Asia Alternative Energy and Energy Sector Management Assistance Programs) and World Bank affiliates: the Asian Development Bank, the Inter-American Development Bank, International Finance Corporation and the Global Environment Facility (which provides cost-sharing grants and concessional funding for projects and programs). Financing also is available through national development and export agencies such as the Canadian International Development Agency, the Japan International Cooperation Agency, the Industrial Development Corporation of South Africa, KfW (which operates as a development bank on behalf of the German government), the U.S. Overseas Private Investment Corporation, the U.S. Trade and Development Agency, and the U.S. Export-Import Bank; and through quasi public-private sources such as CDC Capital Partners (a public private partnership in the United Kingdom), and the European Investment Bank.

- ***Greenhouse Gas Emissions Brokerages:*** A world market for greenhouse gas (GHG) emissions reductions (often referred to as carbon credits or emissions reduction credits) has emerged and is growing. Ongoing sale of GHG emissions reductions may be another source of capital for a wind power project.

- ***State and Local Governments:*** Various state and local governments provide incentives to attract new businesses and for existing businesses to expand their facilities. Examples of these incentives include loans, grants, or reduced taxes. These provisions typically are available through state and local economic development authorities, industrial development authorities, enterprise zone tax credits, and other similar functions.

Two categories of financing commonly discussed with wind power projects include recourse and non-recourse financing. Non-recourse financing means that any loans to the project company would be paid back by cash flows generated by the project itself and not by the project's sponsor companies. With recourse financing, the companies developing or owning the projects typically provide additional support to secure repayment of any loans obtained by the project.

Other sources of equity not described above are nationalized projects (projects owned by the government itself), individual and co-operative ownership as is common in Denmark, and electric utility ownership, where a wind power project becomes one of the various generation sources owned by an integrated electric utility which generates and delivers power to customers.

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8.4 Additional Sources of Information

Additional information on wind power economics, and economic evaluation in general, is available from the following resources:

RETScreen International – (Renewable Energy Project Analysis Software), free software and related information available from Natural Resources Canada, at http://www.retscreen.net/.

RETFinance – a cost-of-energy model which simulates a detailed 20-year cash flow for renewable energy projects including project earnings, cash flows, and debt payment to calculate a project's levelized cost-of-electricity, after-tax nominal Internal Rate of Return, and annual Debt-Service-Coverage-Ratios. See http://analysis.nrel.gov/retfinance/login.asp.

Fundamentals of engineering economics textbooks:

- *Engineering Economy*, DeGarmo, Paul E. et. al. Ninth ed., Prentice Hall, 1993.
- *Contemporary Engineering Economics*, Park, Chan S., Third Edition, Prentice Hall College Div., 2001.
- *Risk Analysis in Engineering and Economics*, Ayyub, Bilal M., Chapman & Hall, 2003.

Economic fundamentals on the Internet:

- http://www.ncedr.org/tools/othertools/costbenefit/module2.htm
- http://www.sbbc.co.uk/reports/laggan/economics1.htm

Wind power development process:

- http://www.eere.energy.gov/windpoweringamerica/pdfs/wind_development_process.pdf
- http://www.ceere.org/rerl/events/ne_islands_2002/Wed_Rogers_Community_Scale_Wind_Technology_12_02.pdf

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9. Economic Development Impacts

This section of the Toolkit reviews and quantifies the social and economic impacts resulting from the development of wind energy projects in a region or country. Any business development in a region has both a direct and an indirect effect on the local and regional economies. A new wind project directly affects an area through purchase of goods and services, generation of land use revenue, taxes, and employment. Secondary or indirect effects of wind energy development within a region are more difficult to quantify but include increased spending power, economic diversification, and the use of indigenous resources.

9.1 Direct Impacts

Direct economic effects from the development of a wind project include land owner revenue, revenues to local governments from property or other taxes, the creation of jobs, and the use of local services.

9.1.1 Land Owner Revenue

Land leases and land owner revenue was discussed in detail in an Section 4 of the Toolkit. The development of a wind project increases the productivity of the land and provides an additional source of income to rural land owners from leasing and royalty agreements. Wind turbines occupy 4% or less of the land area required for a wind power project, and because only a fraction of the land is utilized by physical plant structures and roads, the previous use of the land (e.g., ranching or farming) typically continues alongside the wind power facility.

Depending on the spacing requirements of the wind power project and the distribution of landowners, the project may directly benefit one or more landowners. In addition to direct benefits to the landowners who host a wind power project, the broader community will also benefit from multiplier effects associated with the landowners' increased income and from long-term stability of landowners who have diversified their sources of income.

9.1.2 Property Taxes

Property taxes, or annual payments in lieu of taxes, from a wind power project also significantly impact the community. In many locations, wind projects can be among the highest paying property tax entities. In the state of California, wind projects have paid US$10 to 13 million in annual property tax payments. These funds represent a significant boost to the tax base and are used for a variety of social support purposes, such as schools, roads, hospitals, and police and fire departments.

9.1.3 Job Creation

As with most business ventures, wind energy projects create jobs. In general, the employment opportunities associated with a wind power plant are in construction, operations and maintenance, and manufacturing. Compared to conventional generation options, wind development creates more jobs per dollar invested and per kWh generated. A study conducted by

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the New York State Energy Office found that 10 million kWh of electricity produced by wind energy generates 27% more jobs in the state than the same amount of energy produced by a coal plant and 66% more jobs than a natural gas combined-cycle power plant. For fossil-fuel power plants, a significant portion of the annual cost represents the cost of fuel rather than labor.

9.1.3.1 Construction Employment

Construction-related employment for a wind power project usually involves short-term assignments during the construction of the project. Construction time for a large wind project depends on the size and location of the project, but averages six months. In the United States, a 50-MW wind project will create the equivalent of 40 full-time jobs during the construction period. A typical arrangement will be for the developer or turbine manufacturer to hire (or serve as) a general contractor familiar with building wind projects. Responsible for overall project construction activities, the general contractor hires subcontractors experienced in civil work (grading, excavation, and concrete), electrical work, and mechanical assembly. Typical personnel requirements include construction management, electricians, heavy equipment operators, security personnel, and general laborers for assembly and civil work. The number of positions that might be filled by local personnel depends on the skill base of the local population, and the policies and location of the construction or contracting company. For example, Suzlon, a major wind turbine manufacturer and developer in India, utilizes domestic Indian labor for virtually all of its construction activities and labor local to the project for approximately 25% of the construction workforce.

9.1.3.2 O&M Employment

The number of people employed by a wind power project during commercial operation depends primarily on the project size, the project's administrative structure, and the country's labor practices. Small projects of less than 10 turbines generally are remotely operated and bring in maintenance personnel only when maintenance is required. Larger projects will have a full-time staff, the size of which depends on the project size, turbine type(s), and local labor practices. Economies of scale are realized in both turbine size and quantity. Larger projects and turbines generally are less expensive to operate and maintain. For instance, a 10-MW project composed of 10 1-MW turbines will require fewer maintenance hours than a 10-MW project composed of 100 100-kW wind turbines. Although some of the maintenance activities on the larger wind turbines may require more time or different equipment to complete the repair, many maintenance activities require approximately the same level of effort regardless of the turbine size. Wind turbines typically have regular maintenance scheduled every six months. In the United States, each scheduled service typically requires two people for one 8-hour period for turbines in the 500 kW to 1000 kW (1 MW) size range.

An analysis of the staffing levels for the projects in the United States Department of Energy's Turbine Verification Program (TVP) project is shown in Figure 9-2, indicating the full-time (FT) personnel-to-turbine ratio. The data suggest each technician can service 11 turbines. Since the majority of TVP project turbines are sized between 500 kW and 750 kW, the analysis suggests that approximately 1 full-time job is created for every 5 MW of installed capacity. If the same level of effort were required regardless of turbine size, fewer jobs per MW of installed capacity would be expected with larger turbine sizes such as the now common 1.5 to 2.0 MW (1500 to 2000 kW) class of turbines

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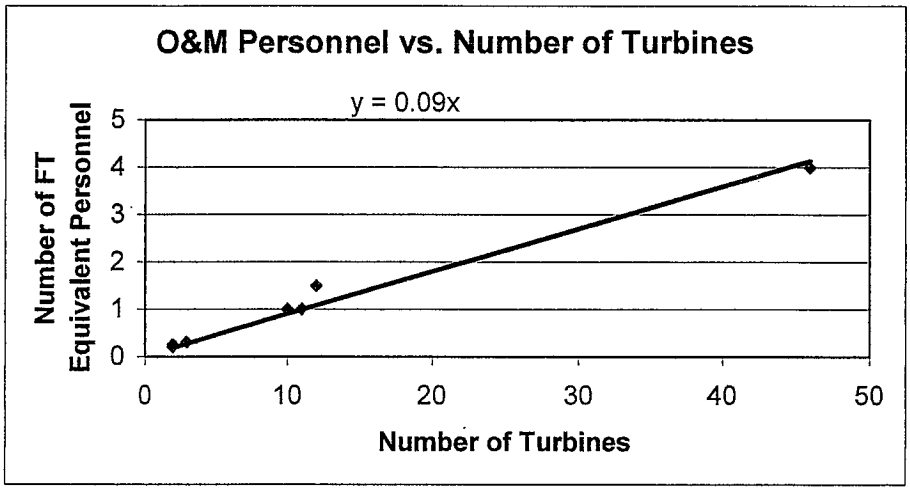

Figure 9-2. TVP Project Staffing Levels

Staffing levels at other projects generally confirm the TVP data. Specifically, for six large projects in the United States (between 25 and 100 MW) with turbines of 750 kW or greater, approximately 1 full-time job was created for every 5 to 8 MW of installed capacity.

For wind projects in developing countries, the staffing levels are generally much higher due to varying labor practices, lower cost of labor, and the level of communication technology used. For example, in India, the staffing rate is approximately 4 people per 25 turbines due to low-cost labor and limited means for communication, resulting in a more labor-intensive operation. This is roughly twice as many as used in projects in the United State where labor costs are higher and supervisory control and data acquisition (SCADA) systems are the norm.

Skills Required: Wind projects usually are staffed with primarily local personnel, with an experienced supervisor or facility manager supporting the locally hired employees. The number of local employees hired will depend on the available skills and training. Skills that project managers and operators must have include computer literacy, inventory management, job and equipment scheduling, performance record-keeping, statistical trend analysis and data processing.

Maintenance personnel generally need to be proficient mechanics or electrical/electronic technicians. With these skills they can readily be trained in wind power mechanical and electrical systems and maintenance equipment. Skills in each of the following areas need to be available to successfully maintain a wind power project.

- Hydraulics
- Rotating machinery
- Cranes and other heavy lifting equipment
- Composites repair (i.e., fiberglass)
- Electronic controls

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- Power electronics
- Medium- and high-voltage electrical
- Safe climbing and maintenance procedures

Specialized turbine training often is provided by the turbine manufacturer, and may consist of classroom work, practical experience on the wind turbine assembly line, and field experience on installed turbines. An additional and effective training component is to have personnel who will be maintaining the project participate in the installation of the local project. It is not necessary or common for all maintenance personnel to receive the specialized, turbine-specific training. Commonly, the remaining staff learns the specialized skills on the job from those who attended the training.

Once the project begins operation, the majority of the maintenance activities require climbing the tower and working within the confines of the nacelle and hub. This type of physical activity requires agility and strength, similar to the skills of an electric utility lineman. This is physically demanding work and finding and retaining the proper combination of people who can both tolerate the physical demands and have the skills required to maintain modern turbines can be challenging. The physical demands of the job can result in high turnover.

9.1.3.3 Manufacturing Employment

The majority of commercial wind turbines are manufactured in Europe and the U.S.; however, the use of the term "manufacturing" is somewhat misleading. Although some turbine manufacturers build many of their own components, others are better described as "assemblers" because the major components of their turbines are produced by other companies and then assembled into their wind turbine model. The American Wind Energy Association (AWEA) estimates that wind turbine and component manufacturers directly contribute to the economies of 44 states. These companies manufacture and market towers, gearboxes, blades, monitoring equipment and other wind energy-related equipment. Individual components are often manufactured in countries other than that of the turbine manufacturer.

A number of countries are encouraging wind turbine manufacturers to build local assembly plants in their countries as part of their strategies to develop a wind energy industry. Established turbine manufacturers generally are interested in this approach only if a stable long-term market exists in a country. Manufacturers sometimes source individual components locally, depending on the local skills and resources. Towers, for example, are difficult and expensive to transport. As a result, towers frequently are the first turbine component to be manufactured locally in a developing wind power market. Tower fabrication requires capabilities similar to that required for manufacturing large steel storage tanks and towers for other purposes, increasing the probability that local businesses can grow into tower manufacturing with minimal new investment in plant, equipment and training. Cabling, transformers, concrete, and other project components also may be easily sourced locally.

Several countries including India, Spain, and China have encouraged the construction of local wind turbine manufacturing facilities through import duties, mandates or other mechanisms. While these mechanisms have resulted in the construction of domestic manufacturing plants,

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their success in generating lasting economic activity depends on the presence of a stable long-term market for wind turbines.

India and Brazil both have established domestic capability in turbine assembly, blade manufacturing, tower manufacturing, and casting production. Some turbine manufacturers conducting business in India still import castings and other domestically available parts from European facilities. Brazil produces wind turbine castings and blades for the world market.

The employment resulting from component manufacturing can be significant. For example, a wind turbine tower manufacturing facility located in Mexico producing 100 65- to 75-meter towers annually is estimated to create employment for 100 factory workers, roughly 1 job per tower per year.[42]

The number of manufacturing jobs created will depend on the manufacturing capabilities of the country, the incentives provided, and the size of the market, among other factors.

9.1.4 Development of Regional Cooperatives

Wind power projects can provide economic opportunities for local residents not only through royalty payments and jobs, but also through community investment in locally-owned wind cooperatives that develop wind power projects and sell the electricity to a utility. The cooperative development and ownership of wind power plants has proven successful in countries such as Denmark but has not been practiced widely in the United States.

Under the right circumstances, cooperatives can provide a way for local communities to gain additional economic benefits from wind energy development by retaining the return on investment and energy sales profits that might otherwise go to a private developer. Wind turbines under cooperative ownership could either be located in clusters or distributed widely across many wind energy farms. In Denmark, approximately two-thirds of the turbines are owned by individuals or cooperatives.

9.2 Indirect Effects

The construction and operation of a wind project results in the purchase of local goods and services such as construction materials, construction equipment, maintenance tools and supplies and maintenance equipment, and manpower essentials such as food, clothing, safety equipment and other articles. As previously mentioned, support services such as accounting, banking and legal assistance also are required. Rental of local equipment for maintenance is common. The Kern County Wind Energy Association, based in California, estimates that approximately $11 million is paid annually to local businesses for goods and services as a result of wind power projects in Tehachapi, California.[43] This equates to US$22,000 per MW or US$3,667 per wind turbine.

[42] This estimate of employment in tower manufacturing in Mexico is based on discussions by Winrock staff with tower manufacturing firms.

[43] Tehachapi, California, is one of the three main wind development areas in the state of California. The first wind turbines in the area were installed in the mid-1980s; however, new wind projects and "re-powered" projects continue to be installed today. (Re-powering refers to the replacement of older, smaller wind turbines with newer, larger

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While a wind power plant can have a substantial impact on the region, it has a minimal impact on the local and state infrastructure because of the high capital-to-labor ratio of the plant's operation. Additional employment and property taxes add value to the local economy without creating a substantial burden on the existing water and sewer system, transportation network, or on emergency, education or other public services.

Because businesses within a local economy are closely linked by business and personal purchasing patterns, direct benefits also have an indirect effect on the economy. The direct effects spur rounds of spending in the local and state economy, increasing the overall benefit to the area. Increased taxes from a wind power project will result in additional government spending on local, state and federal services. Another secondary impact, referred to as the induced effect, comes from additional household earnings from employment growth that results in increased household spending on goods and services.

Additional value to local economies also results from increased diversification of the county and state economic bases. Economic diversification ensures greater stability to the economy by minimizing financial high and low cycles associated with a specific industry. This effect is particularly important in rural areas that tend to have a one-dimensional economy. Single dimension economies result in limited business interaction; therefore, more goods and services are imported and more dollars leave the region.

Individuals also can gain indirect benefits through a municipal government that owns a wind power project. For example, a municipally-owned project located on a harbor in northern Europe uses the project revenues for harbor improvements. A number of wind projects are owned by public utilities in the U.S. and most of these enjoy strong public support.

9.3 Social Impacts

Development of a wind power industry or construction of a wind power project also can have social impacts on a country or community. Social impacts include impacts to the local culture/customs, land use, infrastructure (i.e., water, sewage, waste removal, roads, housing), emergency personnel and systems, and education. The extent of the potential impacts depends on the scope of the industry and the project(s). Because wind energy projects tend to be located in rural areas, these may be more significantly impacted than urban areas.

Rural areas tend to be more culturally homogenous than urban areas. For projects or industry in rural areas, the addition of skilled labor from outside the area may put pressure on the local community due to cultural differences. Non-local workers relocating to the project area potentially bring different social attitudes, norms, and practices. In areas where the size of the development is small and limited to wind power projects, these cultural stressors are usually minimized since wind power project construction lasts an average of six months and ongoing operations and maintenance activities can frequently be filled by local personnel.

models). Wind development in Tehachapi includes approximately 500 MW of wind capacity and more than 3,000 wind turbines, ranging in size from approximately 100 kW to more than 1 MW. Tehachapi is also the location of the company headquarters and/or the central operations and maintenance facilities for several developers.

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The amount of non-local labor will also impact short-term housing availability. For projects located in remote areas, the project developer may need to provide temporary or permanent housing. Suzlon's projects in India have all been in remote locations. To accommodate the personnel brought to the area to build the project (who work in 4- to 6-week cycles, 16 hours per day), Suzlon builds hostels and hires local labor to provide cooking, laundering, and maintenance services for the workers. Typically, long-term housing for permanent employees is not a problem. Usually the facility manager and possibly one other staff member would be hired from outside the local community because of their expertise in operating wind power projects. All other staff positions would normally be filled, if possible, with skilled local labor.

The need for construction vehicles and equipment can create impacts on local communities, with a greater effect in rural areas than in urban areas. Any road development or widening and paving would result in permanent infrastructure changes to the local community, and generally are viewed as positive. The positive effects might be turning a dirt road into a paved road, which would allow for future development, or a wider road may make general travel along the road safer. However, some people living along an access road may not want the road widened, fearing a general increase in traffic. Concerns regarding traffic usually are addressed in a traffic study completed as a part of the project development process, with the developer offering mitigation measures, if necessary.

As is the case for any significant construction activity, a wind power project has the potential to increase the load on police, fire, medical and similar services. Although major events such as fires are rare in the construction and operation of a wind project, industrial accidents do happen and must be planned for. Typically the construction general contractor and operations and maintenance manager will work with the local and surrounding communities to determine the ability of local services to handle potential events, and to put in place mitigation measures as necessary.

Wind power projects, particularly in rural areas, also can change the visual character of an area by introducing large-scale machinery into previously undeveloped areas. The large-scale machinery includes the wind turbines themselves, as well as the support equipment like cranes and service trucks.

The above-mentioned social impacts tend to be minimal because of wind projects' "high capital-to-labor ratio" during operation. Wind power projects infuse positive and significant cash flows into the local community while placing minimal strain on local services. The overall social impacts, particularly in rural areas, are often viewed as positive because wind power projects build missing infrastructure or reinforce existing infrastructure and contribute significant economic activity to the local economy.

9.4 Additional Sources of Information

Northwest Economic Associates. *Assessing the Economic Development Impacts of Wind Power*, February 2002. Available at www.nationalwind.org.

00002002

The Effect of Wind Energy Development on State and Local Economies, in Wind Energy Series, N.W.C. Council, Editor. 1997, NWCC.

Conover, K. *Planning Your First Wind Power Project, A Primer for Utilities*. Electric Power Research Institute, TR-104398. 1994.

Sanghi, A.K. *Economic Impacts of Electricity Supply Options*. New York State Energy Office: New York. 1992.

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Appendix A: Wind Power Project Land Requirements

This Appendix provides additional detail on the type and amount of land required for wind power projects. It provides additional details on how wind power developers identify land they may want to include in the Option Agreements or Lease Agreements described in Section 3.

A.1 Site Identification

Before entering into an option to lease, developers need to determine where to focus their efforts on areas with potentially strong wind resources. The power in the wind varies greatly from one location to another, and only data gathered at a specific location can demonstrate how it blows at that location.

In some cases, the wind resource of a region or country has been mapped. While such maps can help developers focus attention on certain areas, the resolution and quality of such maps can vary widely, and field verification and measurement are almost always required to support a specific project because the computer models used to create the maps are not accurate enough for most project investors.

Frequently, developers start with data regarding climate and topography, and may have access to wind speed data from airports and research stations. They know that certain areas, due to weather patterns or land features such as ridge tops, mesas, mountain passes, or canyons, have better winds than others. Natural indicators such as trees or vegetation whose growth is affected by high winds, and social evidence such as place names or dwelling construction patterns can also help. If a site appears promising after the initial assessment, the next step is to install monitoring devices and take measurements over a period of time, typically a minimum of six months to two years.

Wind speed is one of the most important factors to consider when evaluating a site. Wind speed varies from year to year, month to month, over the course of a day, and with height above ground. Because the power in the wind has a cubic relationship to wind speed, winds blowing at 10 meters per second contain almost twice[44] as much power as winds blowing at 8 meters per second. However, a wind energy project with an average annual wind speed of 10 meters per second will not generate twice as much energy as a project with an average annual wind speed of 8 mps. This is because the turbine's controller limits the peak output of the turbine to the turbine's rating, so all the available energy is not converted to electricity.

The best method of assessing wind speed is to install anemometers placed at several locations on a tower or towers whose height is the same as the tower height of the planned wind turbines. Several anemometers mounted at different heights provide information on how the wind changes above ground level. Often short-term (six months to two years) data gathered at a site can be correlated to a nearby longer-term reference to help reduce the uncertainty associated with the short-term data. The longer the record of accurate and high-confidence wind speed

[44] 10^3 divided by 8^3 equals 1.95, or almost a factor of two.

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measurements is, the lower the uncertainly in the energy estimates is and the easier it is to finance a project.

Other information that is important when assessing a wind resource includes:

- *Direction:* Knowledge of which way the wind is blowing is important when deciding on where wind turbines should be located within a site.
- *Speed distribution*: Ideally, the wind blows steadily rather than with very high winds and very low winds.
- *Daily and seasonal wind cycles:* Ideally, the wind will be stronger during the times of day and seasons when electricity demand or shortages peak (daily pattern and seasonal pattern).
- *Wind shear:* Wind shear is the increase in wind speed at greater heights above ground. Shear should be understood so that an appropriate tower height is selected.
- *Obstacles:* Buildings, trees, and other obstacles disturb wind flow, and wind turbines should be placed where the influence of obstacles is minimized.

A.2 Land Area Required

The amount of land required for wind power projects varies significantly from project to project. The objective of a wind project design is to locate the wind turbines in the best wind sites to maximize energy production. Wind turbines are typically laid out in rows perpendicular to the prevailing wind direction. The direction of prevailing winds and the complexity of the terrain are two of the more important drivers that dictate turbine placement within a project site.

The distance between wind turbines (between turbine rows and between turbines within a row) is commonly described in terms of rotor diameters. For example, if a project design is described as having 3 by 10 spacing, it means that the turbines are generally spaced 3 rotor diameters apart within rows, and the rows are spaced 10 rotor diameters apart (Figure A-1). For a project using wind turbines with a 60-meter rotor, this would mean spacing the turbines 180 meters apart within a row, and 600 meters apart between rows.

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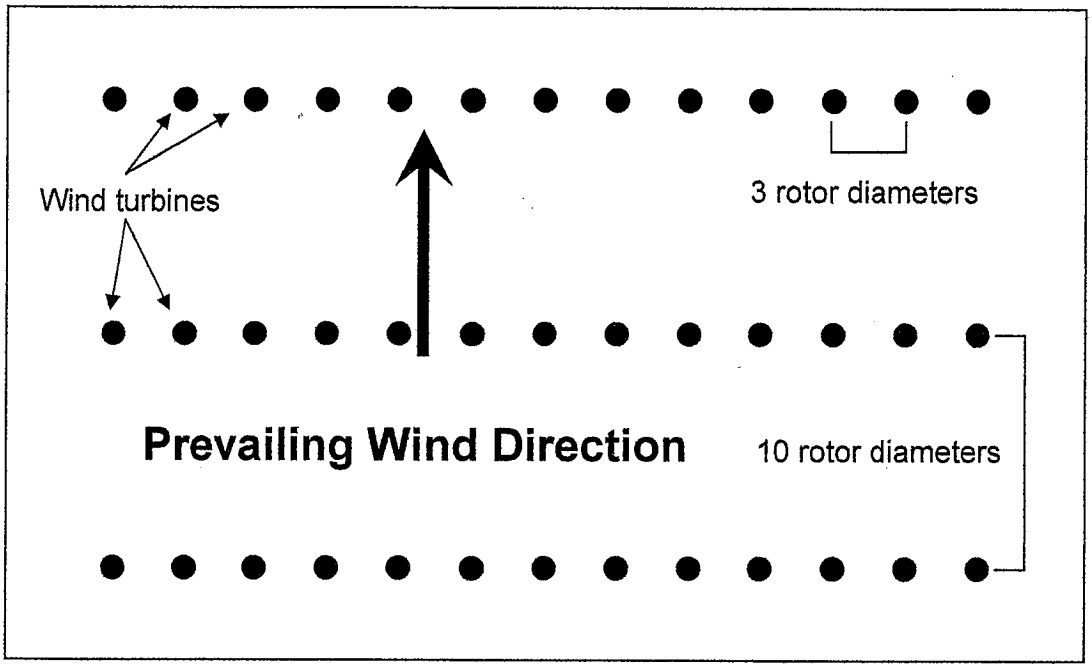

Figure A-1. Illustration of Turbine Spacing (example: 3 x 10 spacing)

The interference of one wind turbine on the wind experienced by a downwind turbine is called the "wake effect" or "array effect." Turbines that are closely spaced will experience higher wake-effect-induced energy losses. Because wide spacing between wind turbines generally maximizes energy production but increases infrastructure requirements (i.e., land, cabling and roads), cost considerations must be analyzed before finalizing turbine locations. For example, a cost trade-off exists between optimizing the turbine locations for energy production (through wide spacing) while maintaining a reasonably compact project site to have reasonable land, cabling and road costs, all of which tend to increase with wider turbine spacing.

The distance between rows in complex terrain is typically dictated by the terrain characteristics (i.e., turbines will be placed on ridgelines in hilly terrain to take advantage of the better wind exposure, and the layout will be dictated by the location of the ridgelines). On flat terrain, turbine rows are spaced depending on the in-row spacing between turbines. The objective is to optimize the balance between the higher wake effects and lower costs associated with tighter spacing.

Within rows, the spacing is dictated by wind direction. In unidirectional environments (i.e., most of the energy-producing winds come from the same direction), turbines can be placed closer together within rows. Multi-directional winds (i.e., half of the time it comes from the north and half of the time it comes from the east), necessitates greater spacing.

Typical spacing for unidirectional winds or a site with two predominate directions 180° apart is 3 diameters between turbines in the row by 10 diameters between rows. Typical spacing in omni-

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direction winds regimes or regimes with 2 predominate directions 90° apart is 5 to 6 diameters between turbines and 7 to 8 diameters between rows. A turbine manufacturer may require or permit tighter or looser pacing depending on the characteristics of their turbine and the wind characteristics at the site.

Table A-1 illustrates the turbine spacing requirements for six different wind power projects in the United States. Table A-2 illustrates the land requirements for wind power projects in different terrain and wind regimes.

Table A-1. Typical Turbine Spacing

Project Location	Land Use and Type	Turbine Layout	Turbine Spacing (rotor diameters)
Fort Davis, Texas	ridge tops/ranch land (hilly)	2 offset, parallel, north-south rows	2.5 BETWEEN TURBINES WITHIN SAME ROW
Searsburg, Vermont	heavily forested ridgeline (hilly)	1 northeast-southwest row on ridgeline	variable (1.5 to 3.5) between turbines
Kotzebue, Alaska	treeless coastal tundra (flat)	3 parallel north-south rows	5 between turbines within same row; 17 between rows
Glenmore, Wisconsin	agricultural plains (flat)	1 north-south row	3.6 between turbines in the row
Algona, Iowa	cropland (flat)	1 north-south row	5.7 between turbines in the row
Springview, Nebraska	high plain/ranch land (flat)	1 northwest-southeast row	3.7 between turbines in the row
Big Spring, Texas	ranch land/mesa tops (flat)	5 east-west rows on 3 mesa tops	2.5 to 3.0 between turbines within same row; 10 between rows
Source: Turbine Verification Program (TVP), a program from the Department of Energy (DOE) and the Electric Power Research Institute (EPRI).			

As the tables show, the spacing of turbines will vary with terrain and wind direction characteristics. Corresponding land requirements thus vary greatly as well.

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Table A-2. Example Land Requirements for Wind Projects Based on Terrain and Wind Direction

Wind Direction/Terrain Type	Turbine Spacing (rotor diameters)	Row Spacing (rotor diameters)	Land Area		ha/MW	ha/Wind Turbine
			m^2	Hectares		
Multidirectional/ Flat terrain	8	10	184,320	18.4	20.5	18.4
Multidirectional/ Rolling hills	10	15	345,600	34.6	38.4	34.6
Multidirectional/ Mountain ridges	15	20	691,200	69.1	76.8	69.1
Unidirectional/ Flat terrain	3	10	69,120	6.9	7.7	6.9
Unidirectional/ Rolling hills	4	15	138,240	13.8	15.4	13.8
Unidirectional/ Mountain ridges	4	20	184,320	18.4	20.5	18.4
Assumes a turbine rotor diameter of 48 m and a turbine rating of 900 kW. The estimated area in the table is based on one turbine within an array of turbines. The turbines on the perimeter of an array require less space because the buffer (or setback) around the outside of the array is less than the spacing required between turbines and rows. Generally a buffer of only one rotor diameter is required around the outside of the turbine array.						

The data in Table A-2 assume that a 900 kW wind turbine was used for the project. Table A-3 illustrates how much land is required based on using different wind turbine sizes while holding terrain and wind characteristics constant. The land area required between wind turbines (ha/turbine) increases with the diameter of the turbine; however, the land area required per MW is relatively constant (i.e., 7.7 to 10.4 ha/MW). The variation in this figure is dependent on the relationship between turbine rating and rotor diameter. It is not solely dependent on rating or diameter.

Table A-3. Estimated Land Requirements for Unidirectional Wind and Flat Terrain

Rotor Diameter (m)	72	60	54	48	52	50	47
Turbine Rating (kW)	1500	1300	1000	900	850	800	660
Hectares per MW	10.4	8.3	8.7	7.7	9.5	9.4	10.0
Hectares per turbine	15.6	10.8	8.7	6.9	8.1	7.5	6.6
Assumes 3 x 10 spacing. Based on the land required by a turbine inside the turbine array.							

Appendix B: Model Land Lease Agreement

This appendix contains a model Land Lease Agreement based on a lease for a wind power project in the United States in which an individual owns land where the project company wants to site the project. Language that would identify the project has been deleted.

Many issues are common to any lease such as price, term of agreement (years), and how payments are made. This lease is an example of a fixed payment price structure. This lease also makes reference to several exhibits, which are not included in this example lease.

This model lease is presented as an example only. Readers are urged to consult their own legal counsel to ensure that their objectives will be achieved and their legal interests will be protected before entering into any binding agreement.

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WIND ENERGY LEASE AGREEMENT

This WIND ENERG LEASE AGREEMENT ("Lease") is made by and between [Landowner] ("Lessor") and [Project Company] ("Lessee").

1. **Lease.** Lessor hereby leases to Lessee, and Lessee hereby leases from Lessor, that real property located in [_____], and more particularly described in Exhibit A attached hereto (the "Leased Property"). The Leased Property is graphically depicted in the drawings attached hereto as Exhibit B. Lessee shall have the right to use the Leased Property for the operation of a wind-powered electrical generating facility for the conversion of wind energy into electrical energy. In connection with such use, Lessee shall have the right to construct and place on the Leased Property, and to operate, one or more wind turbine generators (each, a "Turbine"), the associated electrical transmission lines and related surface and subsurface equipment, collection and transmission grid, power conditioning equipment, transformers, telecommunications equipment, and other related facilities, equipment and improvements (collectively, the "Wind Power Facilities"). Lessee shall at all times retain title to the Wind Power Facilities. Lessee shall have the right of ingress to and egress from the Wind Power Facilities over and across the Leased Property and, if necessary, over and across any adjacent property owned by Lessor, by means of existing roads or by routes with Lessee or Lessor may construct, whether located on the Leased Property or elsewhere. Lessor, at Lessor's risk as to loss of crops and compaction by reason of Lessee's use, may use the Leased Property for purposes of cultivation and other agricultural uses that do not interfere, in Lessee's sole determination, with Lessee's use of the Leased Property.

2. **Construction and Wind Easements.** Lessor shall sign and deliver to Lessee the Construction, Access, and Transmission Easement attached hereto as Exhibit C (the "Construction Easement") and the Wind Non-Obstruction Easement attached hereto as Exhibit D (the "Wind Easement"), each of which shall be recorded in the [County] Records. If more than one Construction Easement and/or Wind Easement is required in order for Lessee to construct and operate the Wind Power Facilities (either because the property of several different owners is involved, or because separate easements are needed for separate portions of the Wind Power Facilities), as determined by Lessee in its sole discretion, then Lessor shall cooperate with Lessee in obtaining all of such easements. These easements shall be appurtenant to this Lease. Lessee shall pay Lessor a one-time fee of [_____] per acre for the Construction Easement and a one-time fee of [_____] per acre for the Wind Easement. These one-time fees shall be due and payable on the Commencement Date.

3. **Lease Term.**

3.1 Commencement Date. The term of this Lease (the "Term") shall commence on that date (the "Commencement Date") by which the last of the conditions set forth in Section 3.2 shall have been satisfied, and shall end on the twenty-fifth (25th) anniversary of the Commencement Date, unless renewed or terminated as provided in this Lease. This Lease shall be effective when executed by all parties. Upon execution of this Lease, Lessee shall pay Lessor the sum of [_____].

3.2 Condition Subsequent. Lessee shall have the right to terminate this Lease at any time prior to the satisfactory occurrence, as determined by Lessee, of all of the following:

(a) Lessee's receipt of consultants' reports confirming that there are no environmental conditions on the Leased Property which would interfere with the Wind Power Facilities or cause Lessee to incur any liability.

(b) Lessee's receipt of all zoning and land use approvals, and all other permits and approvals, required for the construction and operation of the Wind Power Facilities.

(c) Lessee's receipt of all easements described in Section 2 above, including, without limitation, a Wind Easement from Lessor and each adjoining property owner, the Construction Easement, and any other easements required in connection with the installation of the Wind Power Facilities (including, without limitation, any easement required for the construction and operation of, and/or the connection to and use of, an electrical substation).

(d) Lessee's satisfaction as to the economic viability of individual Turbines.

(e) Lessee's approval of title to the Leased Property and the legal description and survey of the Leased Property.

(f) Lessee's receipt of nondisturbance agreements from all holders of liens and other encumbrances affecting the Leased Property, and from all landlords under any master leases or underlying leases.

(g) Lessor's approval of acceptable areas on the Leased Property where Turbines may be constructed, operated, and maintained.

3.3 Renewals. The Lease shall be automatically renewed for additional, consecutive twenty (20) year terms ("Renewal Terms") unless and until Lessee give written notice of termination, which notice shall be given not more than twelve (12) months nor less than four (4) months prior to the expiration of the then current Term or Renewal Term. Each Renewal Term shall begin on the expiration date of the Term or previous Renewal Term. The same terms and conditions contained in this Lease shall govern the Renewal Terms, except that the rent for each Renewal Term shall be the then-current market rate. If the parties cannot agree on the rent on or before ninety (90) days prior to the commencement of the Renewal Term, then they shall conduct an arbitration pursuant to Section 3.5 below.

3.4 Arbitration Demand. If the parties are unable mutually to agree upon the fair market rent, then the fair market rent initially shall be determined by Lessee by written notice ("Lessee's Notice") given to Lessor promptly following the 90-day deadline set forth in Section 3.3. If Lessor disputes the amount of fair market rent set forth in Lessee's Notice, then, within ten (10) days after the date of Lessee's Notice, Lessor shall send Lessee a written notice ("Lessor's Notice") which clearly (i) disputes the fair market rent set for in Lessee's Notice, (ii) demands arbitration pursuant to this Section 3.4, and (iii) states the name and address of the

person who shall act as arbitrator on Lessor's behalf. Lessor's Notice shall be deemed defective, and not given to Lessee, if it fails strictly to comply with the requirements and time period set forth above. If Lessor does not send Lessor's Notice within ten (10) days after the date of Lessee's Notice, or if Lessor's Notice fails to contain all of the required information, then the fair market rent for the Renewal Term in question shall be the amount specified in Lessee's Notice. If the arbitration is not concluded prior to the commencement of the Renewal Term, then Lessee shall pay rent at 110% of the rate payable immediately prior to the commencement of the Renewal Term. If the fair market rent determined by arbitration differs from that paid by Lessee pending the results of arbitration, then any adjustment required to adjust the amount previously paid shall be made by payment by the appropriate party within ten (10) days after the determination of fair market rent.

3.5 Arbitration Procedure. The arbitration shall be conducted in [_____] in accordance with the then-prevailing rules of the [_____] Arbitration Association (or its successor) for the arbitration of commercial disputes, except that the procedures mandated by such rules shall be modified as follows:

(1) Each arbitrator must be a real estate appraiser with at least five (5) years of full-time commercial appraisal experience who is familiar with the fair market rent of property leased for the operation of wind-powered electrical generating facilities in [_____]. Within ten (10) business days after receipt of Lessor's Notice, Lessee shall notify Lessor of the name and address of the person designated by Lessee to act as arbitrator on Lessee's behalf.

(2) The two arbitrators chosen pursuant to Paragraph 1 above shall meet within ten (10) business days after the second arbitrator is appointed and shall appoint a third arbitrator possessing the qualifications set forth in Paragraph 1 above. If the two arbitrators are unable to agree upon the third arbitrator within five (5) business days after the expiration of such ten (10) business day period, the third arbitrator shall be selected by the parties themselves. The three arbitrators shall decide the dispute, if it has not been previously resolved, by following the procedures set forth in Paragraph 3 below. Each party shall pay the fees and expenses of its respective arbitrator and both shall share the fees and expenses of the third arbitrator. Each party shall pay its own attorneys' fees and cost of witnesses.

(3) The three arbitrators shall determine the fair market rent in accordance with the following procedures. Each of Lessee's arbitrator and Lessor's arbitrator shall state, in writing, his or her determination of the fair market rent, supported by the reasons therefor, and shall make counterpart copies for the other arbitrators. All of the arbitrators shall arrange for a simultaneous exchange of the proposed resolutions within ten (10) business days after appointment of the third arbitrators. If either arbitrator fails to deliver his or her own determination to the other arbitrators within such ten (10) business day period, then the determination of the other arbitrator shall be final and binding upon the parties. The role of the third arbitrator shall be to select which of the two resolutions proposed by the first two arbitrators most closely approximates his or her own determination of the fair market rent.; The third arbitrator shall have no right to propose a middle ground or any modification of either of the two proposed resolutions. The

resolution he or she chooses as that most closely approximating his or her determination of the fair market rent shall constitute the decision of the arbitrators and shall be final and binding upon the parties; provided, however, that if the first two arbitrators independently arrive at the same fair market rent, then such fair market rent shall be the rent for the Renewal Term in question. However, the arbitrator selected by Lessee and the arbitrator selected by Lessor shall not attempt to reach a mutual agreement of the fair market rent; such arbitrators shall independently arrive at their proposed resolutions.

(4) The arbitrators shall have the right to consult experts and competent authorities for factual information or evidence pertaining to a determination of fair market rent, but any such consultation shall be made in the presence of both parties with full right on their part to cross-examine. The arbitrators shall render the decision in writing with counterpart copies to each party. The arbitrators shall have no power to modify the provisions of this Lease. In the event of a failure, refusal or inability of any arbitrator to act, his or her successor shall be appointed by him or her, but in the case of the third arbitrator, his or her successor shall be appointed in the same manner as that set forth herein with respect to the appointment of the original third arbitrator.

3.6 Lessee's Right to Terminate. Lessee shall have the right to terminate this Lease as to all or any part of the Leased Property, or as to any Turbine, at any time and from time to time, upon thirty (30) days' prior written notice to Lessor.

4. Rent.

4.1 Rent. Commencing on the Commencement Date, Lessee shall pay rent for the Leased Property in the amount of [__] [per installed Turbine or per installed MW of generating capacity] per "Lease Year." As used herein, the term "Lease Year" means the 12-month period commencing on the Commencement Date (including as the first "month" in the first Lease Year any partial calendar month at the beginning of the Term), and each successive 12-month period thereafter during the Term. Lessee shall pay rent within thirty (30) days after the commencement of each Lease Year. Rent for any partial Lease Year will be prorated based on a 365-day year. If any Turbine is removed in the middle of a Lease Year or prior to the end of the Term, rent shall be reduced (and refunded to Lessee, if a Turbine is removed in the middle of a Lease Year) on a pro-rata basis. Rent shall end on the last day of the Term or upon physical removal of the Wind Power Facilities in accordance with Section 4.3.

4.2 Increases in Rent. Rent shall be adjusted (but never decreased) at the beginning of each Lease Year to reflect the increase, if any, in the "CPI" (as defined below). The "Adjustment Dates" shall be the first day of each Lease Year. The "Adjustment Index" shall be the CPI published most recently before the applicable Adjustment Date. The "Comparison Index" for the first CPI adjustment shall be the CPI published most recently before the applicable Commencement Date; the "Comparison Index" for each subsequent CPI adjustment shall be the Adjustment Index which was used for the immediately preceding CPI adjustment. On each Adjustment Date, the Rent payable immediately prior thereto shall be adjusted by multiplying such Rent by a fraction, the numerator of which is the applicable Adjustment Index and the denominator of which is the applicable Comparison Index. As used herein, the term "CPI" means

the Consumer Price Index for the [_____] area published by the Bureau of Labor Statistics of the United States Department of Labor. If the Base Year of the CPI is changed, then the foregoing calculation shall be made using the appropriate conversion factor published by the Bureau of Labor Statistics (or successor agency) to correlate to the Base Year of the CPI herein specified.

4.3 Removal of Wind Power Facilities. Lessor shall have no ownership or other interest in any Wind Power Facilities installed on the Leased Property, and Lessee shall have the right, at any time and in its sole discretion, to remove one or more Turbines or other Wind Power Facilities. If Lessee removes a Turbine, then there shall be a corresponding reduction in the rent. Lessor expressly waives any statutory or common law landlord's lien to which Lessor might be entitled. In the even that Lessee removes any portion of the Wind Power Facilities, that portion shall be removed to a depth of 42 inches below the natural surrounding grade.

4.4 Payment for Crop Damage. On the terms set forth below, Lessee shall pay Lessor for crop damage occurring on the Leased Property in [year] as a direct result of Lessee's activities on the Leased Property. If Lessee damages Lessor's crops on the Leased Property in [year Lease is signed], then Lessee shall pay Lessor damages calculated pursuant to the following formula: Damages=Price x Yield x Percentage of Damage x Acreage. The price for a damaged crop shall be the arithmetic average of (1) the [_____] Board of Trade's price for that crop on the most recent previous March 1 and (2) the [_____] Board of Trade's price for that crop on the most recent previous September 1. Yield will be the average of the previous three (3) years' yields according to the Lessor's records for the smallest parcel of land which includes the damaged area. If Lessor does not have yield records available, then the parties shall use FSA records or other commonly used yield information available for the area. The parties shall try in good faith to agree on the extent of damage and acreage affected. If they cannot so agree, then the extent of damage and acreage affected shall be determined by an impartial party selected by Lessee, such as a crop insurance adjuster or an extension agent. In no case shall Lessee be required to pay more than a single total crop loss in one year. Lessee shall make payment to Lessor not later than thirty (30) days after determining the amount of the payment due. Lessee shall not be required to pay for crop damage occurring after calendar year [year Lease is signed] unless such damage is a direct result of construction activities of Lessee on the Property. No damages shall be payable for soil compaction, as opposed to crop damage, on the Leased Property in [year Lease is signed] or any other year.

5. Taxes. Lessee shall pay any increase in the real property taxes on the Leased Property which is directly attributable to the installation of the Wind Power Facilities. Lessee shall not be liable for any taxes or assessments of any type levied or assessed against the Leased Property; provided, however, that Lessee shall pay, during the Term, any increase in ad valorem real property taxes attributable to Lessee's installation of the Wind Power Facilities. To receive reimbursement under this Section, Lessor must submit the tax bill to CWP, together with documentation showing Lessee's liability for the increase in ad valorem taxes, within thirty (30) days after Lessor receives the bill from the taxing authority and at least ten (10) days prior to the due date. The parties agree to fully cooperate to obtain any available tax refunds or tax abatements.

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6. Lessee's Representations, Warranties and Covenants.

6.1 Construction of Wind Power Facilities. Prior to Lessee's construction of the Wind Power Facilities, Lessee shall consult with Lessor for informational purposes only, but Lessor shall not have the right to approve any portion of the Wind Power Facilities. Lessee will obtain Lessor's approval as to removal of excavated materials from and disposition of excavated materials on the Leased Property. All topsoil will be reserved and replaced on the Leased Property unless otherwise agreed in advance by the parties. Lessor shall not unreasonably withhold or delay any required approvals.

6.2 Insurance and Indemnity. Lessee shall maintain liability insurance insuring Lessee against loss caused by Lessee's use of the Leased Property under this Lease, in an amount not less than [_____] of combined single-limit liability coverage, and shall provide certificates of this insurance coverage to Lessor upon Lessor's written request. Lessee shall indemnify Lessor against liability for injuries and claims for direct physical damage to the extent caused by Lessee's exercise of rights granted in this Lease, the Construction Easement or the Wind Easement. This indemnity does not cover losses of rent, business opportunities, crop production, profits and the like that may result from Lessor's loss of use of the Leased Property. This indemnity also does not extend to, and Lessor expressly waives and releases any claims for: (a) property damage or personal injuries attributable to risks of known and unknown dangers associated with electrical generating facilities, or (b) claims of nuisance based on the construction, operation, maintenance or removal of the Wind Power Facilities.

6.3 Requirements and Governmental Agencies. Lessee shall comply in all material respects with valid laws applicable to the Wind Power Facilities, but shall have the right, in its sole discretion and at its sole expense, in its name or Lessor's name, to contest the validity or applicability to the Leased Property and/or the Wind Power Facilities of any law, ordinance, order, rule or regulation of any governmental agency or entity. Lessee shall control any such contest and Lessor shall cooperate with Lessee in every reasonable way in such contest, at no out-of-pocket expense to Lessor.

6.4. Mechanics' Liens. Lessee shall not permit any mechanics' liens arising out of Lessee's use of the Leased Property pursuant to this Lease to be filed against the Leased Property. If Lessee wishes to contest any such lien, Lessee shall, within sixty (60 days after it receives notice of the lien, provide a bond or other security Lessor may reasonably request, or remove such lien from the Leased Property pursuant to applicable law.

6.5 Hazardous Materials. Lessee shall indemnify Lessor against Lessee's material violation on the Leased Property of any applicable law or regulation relating to any substance, material or waste classified as hazardous or toxic, or which is regulated as waste.

7. Lessor's Representations, Warranties and Covenants. Lessor hereby represents, warrants and covenants as follows:

7.1 Lessor's Authority. Lessor is the sole owner of the Leased Property and has the unrestricted right and authority to sign this Lease and to grant Lessee the rights granted in this

Lease. When signed by Lessor, this Lease constitutes a valid and binding agreement enforceable against Lessor in accordance with its terms.

7.2 No Interference. Lessor agrees that Lessee shall have the exclusive right to convert all of the wind resources of the Leased Property. Lessor's activities and any grant of rights Lessor makes to any third party, whether located on the Leased Property or elsewhere, shall not, now or in the future, interfere in any way with Lessee's use of the Leased Property, the rights granted under this Lease, the Construction Easement or the Wind Easement. Lessor shall not interfere with the wind speed or wind direction over the Leased Property by engaging in any activity on the Leased Property or elsewhere that might cause a decrease in the output or efficiency of the Wind Power Facilities. Lessor reserves the right to erect buildings for ordinary agricultural use, except that Lessor must consult with and obtain Lessee's prior written approval as to the location and dimensions of all structures. Approval shall be based on whether, in Lessee's sole and absolute discretion, the proposed structures might interfere with wind speed or wind direction over any portion of the Leased Property, or cause a decrease in the output or efficiency of the Turbines, or interfere in any other way with Lessee's operations on the Leased Property.

7.3 Liens and Tenants. Lessor shall provide Lessee with a current abstract of title or preliminary title report for the Leased Property, showing all liens and other exceptions to title to the Leased Property. Lessor shall cooperate with Lessee to obtain a nondisturbance agreement from each lienholder (recorded or unrecorded) which provides that the lienholder shall not disturb Lessee's possession or rights under this Lease or terminate this Lease so long as Lessor is not entitled to terminate this Lease under its terms.

7.4 Requirements of Governmental Agencies. Lessor shall assist and fully cooperate with Lessee, at no out-of-pocket expense to Lessor, in applying for (including signing in Lessor's name, if necessary), complying with or obtaining any land use permits and approvals, building permits, environmental impact reviews or any other approvals required for the financing, construction, installation, replacement, relocation, maintenance, operation or removal of the Wind Power Facilities.

7.5 Indemnity. Lessor shall indemnify, defend, protect and hold Lessee harmless from and against all damages, losses, costs, expenses (including reasonable attorneys' fees), liabilities, injuries and claims arising out of or caused by the operations or activities of Lessor or its invitees, employees, agents, contractors or other tenants.

7.6 Hazardous Materials. Lessor hereby represents and warrants to Lessee that, to the best of Lessor's knowledge: (i) there are no abandoned wells, solid waste disposal sites, hazardous wastes or substances, or underground storage tanks located on the Leased Property, (ii) the Leased Property does not contain levels of petroleum or hazardous substances which require remediation; and (iii) the Leased Property is not subject to any judicial or administrative action, investigation or order under any applicable environmental laws or regulations. Lessor warrants that it has done nothing to contaminate the Leased Property with hazardous substances or wastes. Lessor shall indemnify, defend, protect and hold Lessee harmless from and against all damages, losses, costs, expenses (including reasonable attorneys' fees), liabilities, injuries and

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claims resulting from violation of any applicable environmental laws, except those violations resulting from Lessee's activities on the Leased Property.

7.7 Negative Covenant. Lessor shall not grant, convey, assign or provide any easement, license, permit, lease or other right for access across the Leased Property, or for generation or transmission of power on or across the Leased Property, to any third party in connection with the construction or operation of electrical generating or transmission facilities.

8. Assignment and Subletting; Easements and Licenses. Lessee may assign this Lease or sublet all or any part of the Leased Property or the Wind Power Facilities without obtaining the consent of Lessor. Without limiting the generality of the foregoing, a foreclosure and sale by a Leasehold Mortgagee pursuant to Section 9 shall be a permitted assignment. In the event of an assignment of Lessee's entire interest in this Lease, Lessee shall be released of all further liability under this Lease. If Lessee shall have subleased all or a portion of the Leased Property or the Wind Power Facilities, no such sublease shall be affected by a cancellation or termination of this Lease, and Lessor shall recognize the rights of the subtenant thereunder, provided only that such subtenant attorn to Lessor upon its request. Lessor shall enter into a nondisturbance and attornment agreement, in form and substance reasonably acceptable to Lessee, upon the request of the subtenant under any sublease. Lessee also shall have the right to grant easements, licenses or similar rights (however denominated) to one or more persons or entities, without obtaining the consent of Lessor.

9. Leasehold Financing.

9.1 Mortgage by Lessee. Lessee may, from time to time, hypothecate, mortgage, pledge or alienate the Wind Power Facilities and/or Lessee's leasehold estate and rights under this Lease. Each holder of any such lien is hereinafter referred to as a "Leasehold Mortgagee." A Leasehold Mortgagee or its assigns may enforce such lien and acquire title to the leasehold estate in any lawful way and, pending foreclosure of such lien, the Leasehold Mortgagee may take possession of and operate the Leased property, performing all obligations performable by Lessee. Upon foreclosure of such lien by power of sale, judicial foreclosure or acquisition of the leasehold estate by deed in lieu of foreclosure, the Leasehold Mortgagee may, upon notice to Lessor, sell and assign the leasehold estate. Notwithstanding anything herein contained to the contrary, the Leasehold Mortgagee and/or any person or entity acquiring the leasehold estate shall be liable to perform the obligations imposed on Lessee by this Lease only to the extent arising during the period during which such person or entity has ownership of the leasehold estate or possession of the Leased Property.

9.2 Rights of Leasehold Mortgagees.

(a) The right of a Leasehold Mortgagee to receive notices and to cure Lessee's defaults pursuant to the provisions of this Section 9.2 shall be available only to those Leasehold Mortgagees which shall have notified Lessor in writing of their name and address, or whose lien is recorded in the official records of the County in which the Leased Property is located, regardless of whether the specific provision in question expressly so states. When giving notice to Lessee of Lessee's default under this Lease, Lessor shall also serve a copy of such

notice upon each Leasehold Mortgagee. No such notice shall be effective against a Leasehold Mortgagee unless and until served on such Leasehold Mortgagee. If Lessee shall default in the performance of any of its obligations under this Lease, then Lessor shall give each Leasehold Mortgagee a second written notice of such default and each Leasehold Mortgagee shall have the right, within thirty (30) days after the expiration of the cure period which this Lease provides to Lessee for curing such default, to cure such default and Lessor shall accept such performance as though the same had been done or performed by Lessee.

(b) In the case of a default by Lessee in the payment of money, Lessor shall take no action to terminate this Lease unless such default shall have continued beyond the cure period which this Lease provides to Lessee for curing such default, and then only after Lessor shall have given each Leasehold Mortgagee a second written notice of such default and an additional thirty (30) days, in addition to and after the expiration of Lessee's cure period, within which to cure such default.

(c) In the case of a non-mandatory default by Lessee, Lessor shall take no action to terminate this Lease unless such default shall have continued beyond the cure period which this Lease provides to Lessee for curing such default, and then only after Lessor shall have given each Leasehold Mortgagee a second written notice of such default and an additional thirty (30) days, in addition to and after the expiration of Lessee's cure period, within which to elect:

(i) to commence and diligently proceed to cure such default, if such default can be cured by the Leasehold Mortgagee without obtaining possession of the Leased Property; or

(ii) to commence and diligently proceed to obtain possession of the Leased Property (including possession by a receiver) in order to cure such default, in the case of a default which can be cured only after the Leasehold Mortgagee has obtained possession of the Leased Property; or

(iii) to institute and diligently pursue foreclosure proceedings or otherwise proceed to acquire Lessee's interest under this Lease. A Leasehold Mortgagee shall not be required to continue such possession or continue such foreclosure proceedings if the default which prompted the service of such notice shall have been cured. A Leasehold Mortgagee shall have no obligation to cure any default in the payment of money which has occurred more than sixty (60) days before its receipt of notice of such default, in order to preserve its interest under its mortgage or to exercise any of the rights granted to it under this Lease. A Leasehold Mortgagee shall have no obligation to cure any default which is not reasonably susceptible of being cured by the Leasehold Mortgagee.

(d) If this Lease is terminated by Lessor on account of any default, or terminates for any other reason, then Lessor shall give prompt written notice thereof to each Leasehold Mortgagee. Each Leasehold Mortgagee, within sixty (60) days after receipt of written notice from Lessor, shall have the right to elect to enter into a new lease of the Leased Property as described below. Within thirty (30) days after receiving a Leasehold Mortgagee's written

request therefor, Lessor shall execute and deliver a new lease of the Leased Property to such Leasehold Mortgagee or its nominee or to the purchaser, assignee or transferee, as the case may be, for the remainder of the Term of this Lease, containing the same covenants, agreements, terms, provisions and limitations as are contained in this Lease, provided that the Leasehold Mortgagee shall pay to Lessor, simultaneously with the delivery of such new lease, all unpaid rental due under this lease up to and including the date of the commencement of the term of such new lease and all expenses, including reasonable attorneys' fees, disbursements and court costs, incurred by Lessor in connection with Lessee's default, the termination of this Lease and the preparation of the new lease. After execution of the new lease, the Leasehold Mortgagee shall commence and diligently proceed to cure all defaults which reasonably can be cured by the Leasehold Mortgagee.

(e) As long as there is a Leasehold Mortgage, neither the bankruptcy nor the insolvency of Lessee shall operate to terminate, nor permit Lessor to terminate, this Lease as long as all rent and other charges payable by Lessee continue to be paid in accordance with the terms of this Lease.

(f) The time available to a Leasehold Mortgagee to initiate foreclosure proceedings as aforesaid shall be extended by the number of days of delay occasioned by judicial restriction against such initiation or occasioned by other circumstances beyond such Leasehold Mortgagee's reasonable control.

(g) During the period that a Leasehold Mortgagee shall be in possession of the Leased Property and/or during the pendency of any foreclosure proceedings instituted by a Leasehold Mortgagee, the Leasehold Mortgagee shall pay or cause to be paid all rent and other charges payable by Lessee which have accrued during said period and are unpaid. Following the acquisition of Lessee's leasehold estate by the Leasehold Mortgagee or its designee, either as a result of foreclosure or acceptance of an assignment in lieu of foreclosure, the Leasehold Mortgagee or party acquiring title to Lessee's leasehold estate shall commence performing all of Lessee's obligations under this Lease thereafter arising, whereon Lessor's right to terminate this Lease based upon the default in question shall be deemed waived. Any default not susceptible of being cured by the Leasehold Mortgagee or party acquiring title to Lessee's leasehold estate shall be, and shall be deemed to have been, waived by Lessor upon completion of the foreclosure proceedings or acquisition of Lessee's interest in this Lease by any purchaser (who may, but need not be, the Leasehold Mortgagee) at the foreclosure sale, or who otherwise acquires Lessee's interest from the Leasehold Mortgagee or by virtue of a Leasehold Mortgagee's exercise of its remedies. No such purchaser, or successor to such purchaser, shall be liable to perform the obligations imposed on Lessee by this Lease incurred or accruing after such purchaser or successor no longer has ownership of the leasehold estate or possession of the Leased Property.

(h) If two or more Leasehold Mortgagees exercise their rights hereunder and there is a conflict which renders it impossible to comply with all such requests, then the Leasehold Mortgagee whose Leasehold Mortgage would be senior in priority if there were a foreclosure shall prevail. If any Leasehold Mortgagee pays any rental or other sums due hereunder which relate to periods other than during its actual ownership of the leasehold estate,

such Leasehold Mortgagee shall be subrogated to any and all rights which may be asserted against Lessor with respect to such period of time.

(i) Upon the reasonable request of any Leasehold Mortgagee, Lessor and Lessee shall amend this Lease to include any provision requested by such Leasehold Mortgagee to implement the protective provisions contained in this Lease for the benefit of such Leasehold Mortgagee or to allow such Leasehold Mortgagee reasonable means to protect or preserve the lien of its Leasehold Mortgage on the occurrence of a default under this Lease; provided, however, that Lessor shall not be required to amend this Lease in any way which would affect the Term or rental hereunder or otherwise in any material respect adversely affect any rights of Lessor under this Lease.

10. Default and Termination.

10. Remedies Upon Lessee's Default. Lessee shall be in default under this Lease if: (i) Lessee shall have failed to perform any of Lessee's covenants under this Lease (other than the payment of rent or other charges) and such failure shall have continued for a period of thirty (30) days after written notice from Lessor (or if such failure is not reasonably capable of being cured within thirty (30) days, if Lessee shall not have commenced to cure the same within said 30-day period and/or shall not have diligently prosecuted the same to completion); or (ii) Lessee shall have failed to pay rent or other charges herein required to be paid by Lessee and such failure shall have continued for a period of fifteen (15) days after written notice from Lessor. If Lessee shall be in default after the expiration of the cure period set forth above, then Lessor shall be entitled, at its election, to terminate this Lease, reenter the Leased Property and take possession thereof (subject, however, to the rights of sublessees pursuant to Section 8 and Leasehold Mortgagees pursuant to Section 9) or, so long as Lessor does not terminate Lessee's right to possession of the Leased Property, keep this Lease in full force and effect and collect rent and other charges from Lessee as and when due under this Lease, with Lessor having the obligation to mitigate damages. If Lessor shall elect to terminate this Lease, then all rights and obligations of the parties shall terminate, except that Lessor shall have the right to sue for and collect all rents and other amounts with respect to which Lessee shall then be in default, and all damages to Lessor by reason of such default, Lessor having the obligation to mitigate damages, and Lessee shall surrender the Leased Property to Lessor. Upon the termination of this Lease, Lessee shall (a) upon written request by Lessor, execute and record a quitclaim deed of Lessee's right, title and interest in and to the Leased Property, and (b) as soon as reasonably practicable thereafter, remove all Wind Power Facilities from the Leased Property. If Lessee fails to remove the Wind Power Facilities within twelve (12) months after termination of this Lease, then Lessor may do so, in which case Lessee shall reimburse Lessor for the reasonable costs of removal (less salvage) incurred by Lessor.

10.2 Remedies Upon Lessor's Default. If Lessor shall at any time be in default of any of its covenants under this Lease and such default shall continue for a period of thirty (30) days after written notice to Lessor (or if such default is not reasonably capable of being cured within thirty (30) days, if Lessor has not commenced to cure the same within said 30-day period and/or has not diligently prosecuted the same to completion), then Lessee shall be entitle to exercise concurrently or successively any one or more of the following rights, in addition to all other

remedies provided in this Lease or available at law or in equity: (a) to bring suit for the collection of any amounts for which Lessor may be in default, or for the performance of any other covenant or agreement of Lessor, without terminating this Lease; and/or (b) to terminate this Lease upon thirty (30) days' written notice to Lessor, without waiving Lessee's rights to damages for Lessor's failure to perform its obligations hereunder.

11. Miscellaneous.

11.1 Force Majeure. If performance of this Lease or of any obligation hereunder is prevented or substantially restricted or interfered with by reason of an event of "Force Majeure" (as defined below), the affected party, upon giving notice to the other party, shall be excused from such performance (except payment of rent) to the extent of and for the duration of such prevention, restriction or interference. The affected party shall use its reasonable efforts to avoid or remove such causes of nonperformance and shall continue performance as soon as such causes are removed. "Force Majeure" means, fire, earthquake, flood, tornado, or other acts of God and natural disasters; strikes or labor disputes; war, civil strife or other violence; any law, order proclamation, regulation, ordinance, action, demand or requirement of any government agency or utility; or any other act or condition beyond the reasonable control of a party.

11.2 Confidentiality. Lessor shall maintain in the strictest confidence, for the sole benefit of Lessee, all information pertaining to the terms and conditions of this Lease, including, without limitation, the financial terms of, and payments under, this Lease, Lessee's site design and product design, methods of operation, methods of construction, power production or availability of the Wind Power Facilities, and the like, whether disclosed by Lessee or discovered by Lessor, unless such information is in the public domain by reason of prior publication. Lessor shall not use such information for its own benefit, publish or otherwise disclose it to others, or permit its use by others.

11.3 Successors and Assigns. This Lease shall burden the Leased Property and shall run with the land. This Lease shall inure to the benefit of and be binding upon Lessor and Lessee, and their respective heirs, successors and assigns.

11.4 Memorandum. Lessor and Lessee shall execute in recordable form and Lessee shall record, a memorandum of this Lease satisfactory in form and substance to Lessee and Lessor. Lessor consents to the recordation of the interest of any Leasehold Mortgagee or assignee of Lessee's interest in this Lease.

11.5 Notices. All notices pursuant to this Lease shall be in writing and shall be sent only by the following methods: personal delivery; mail (first-class, certified, return-receipt requested, postage prepaid); or delivery by an overnight courier service which keeps records of deliveries (such as, by way of example but not limitation, Federal Express, United Parcel Service, and DHL). For purposes of giving notice hereunder, the respective addresses of the parties are, until changed as hereinafter provided, the following:

Lessor:
[address]

Lessee:
[address]

Any party may change its address at any time by giving written notice of such change to the other party in the manner provided herein. All notices shall be deemed given on the date of personal delivery or, if mailed by certified mail, on the delivery date or attempted delivery date shown on the return-receipt.

11.6 Entire Agreement/Amendments. This Lease and the attached Exhibits constitute the entire agreement between Lessor and Lessee respecting its subject matter, and replace and superseded any prior agreements. This Lease shall not be modified or amended except in a writing signed by both parties or their lawful successors in interest.

11.7 Legal Matters. This Lease shall be governed by and interpreted in accordance with the laws of the State in which the Leased Property is located. The parties agree to first attempt to settle any dispute arising out of or in connection with this Lease by good-faith negotiation. If the parties are unable to resolve amicably any dispute arising out of or in connection with this Lease, then each shall have all remedies available at law or in equity. Each party waives all right to trial by jury and specifically agrees that trial of suits or causes of action arising out of this Lease shall be to the Court. The parties agree that any rule of construction to the effect that ambiguities are to be resolved in favor of either party shall not be employed in the interpretation of this Lease. In any dispute arising out of or in connection with this Lease, a party that obtains an award substantially the same as the award sought therein shall be entitled to payment of its reasonable attorneys' fees in connection with the action. Time is of the essence with regard to the terms and conditions of this Lease.

11.8 Partial Invalidity. Should any provision of this Lease be held, in a final and unappealable decision by a court of competent jurisdiction, to be invalid, void or unenforceable, the remaining provisions hereof shall remain in full force and effect, unimpaired by the holding. Notwithstanding any other provision of this Lease, the parties agree that in no event shall the Term (or a Renewal Term, if applicable), the Construction Easement or the Wind Easement be for longer periods than permitted by applicable law.

11.9 Tax Credits. If under applicable law the holder of a lease becomes ineligible for any tax credit, benefit or incentive for alternative energy expenditure established by any local, state or federal government, then, at Lessee's option, Lessor and Lessee shall amend this Lease or replace it with a different instrument so as to convert Lessee's interest in the Leased Property to a substantially similar interest that makes Lessee eligible for such tax credit, benefit or incentive.

11.10 Estoppel Certificates. From time to time, each party, within fifteen (15) days after written request from the other party, shall execute and deliver an estoppel certificate certifying as to the status of this Lease and each party's performance thereunder.

11.11 Quiet Enjoyment. Lessor covenants and warrants that Lessor is the true and lawful owner of the Leased Property, subject only to those matters shown on the title report or abstract provided to Lessee pursuant to Section 7.3 above, and has full right and power to lease the same. Lessor agrees that Lessee shall quietly and peaceably hold, possess and enjoy the Leased Property for the Term of this Lease, and any extension thereof, without any hindrance or molestation. Lessor shall defend title to the Leased Property and the use and occupancy of the same against the claims of all persons, except those claiming by or through Lessee. Lessor shall not enter into or modify any documents, including any declarations, easements, restrictions or other similar instruments, that are or may be recorded against the Lease Property, or otherwise affect the Leased Property, or the rights and/or obligations of Lessee, without first obtaining the prior written consent of Lessee, which consent may be withheld in Lessee's sole and absolute discretion.

11.12 Brokerage Commissions. Each of Lessor and Lessee warrants and represents to the other that there are no brokers' commissions, finders' fees or any other charges due to any broker, agent or other party in connection with the negotiation or execution of this Lease, or on behalf of either of them. Lessor shall pay all brokerage commissions and other amounts owning to Broker and shall indemnify, defend, protect and hold Lessee harmless from and against all damages, losses, costs, expenses (including reasonable attorneys' fees), liabilities and claims in connection with such obligation and any claim by Broker for payments. Each party shall indemnify, defend, protect and hold the other party harmless from and against all damages, losses, costs, expenses (including reasonable attorneys' fees), liabilities and claims with respect to any claims made by any other broker or finder based upon such broker's or finder's representation or alleged representation of such indemnifying party.

11.13 Transfer Taxes. Lessor shall pay any transfer tax or other tax payable to any governmental taxing authority, including the County in which the Leased Property is located, by reason of the execution of this Lease and/or the recordation of a memorandum thereof.

IN WITNESS WHEREOF, the parties hereto have executed this Lease on the dates set forth below.

Lessee:

[Project Company]

By: _____

Name: _____

Title: _____

Date: _____

Lessor:

[Lessor Name]

By: _____

Name: _____

Title: _____

Date: _____

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Appendix C: Model Request for Proposals

This appendix contains a model Request for Proposals (RFP). It is based on a recent RFP for wind power projects in the United States in which an electric utility seeks to either buy the output of new wind power projects or to own wind power projects developed by others. Language which would identify the utility has been deleted.

Many issues in this model RFP are common to any RFP. However, often there are issues which are unique to a particular project that get included in an RFP. For example, some of the language in the model RFP concerns the Production Tax Credit (PTC). The PTC is an important factor in wind power economics in the United States, and at the time the RFP was written, it was uncertain when or how the PTC would be renewed past 2003. While issues related to the PTC may not be of concern to projects outside the United States, the PTC language has been left in the model RFP to provide an example of how this specific issue was handled in the RFP. There may be other factors unique to other projects which can use the PTC language in the model RFP as an example of how to handle uncertainties at the time the RFP is written.

This model RFP is presented as an example only. Readers are urged to consult their own advisors to ensure that their objectives will be achieved and their interests will be protected before entering into any binding agreement.

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Wind Power

Request for Proposals

[issuer]

[date]

1. Introduction

This document constitutes a Request for Proposals (RFP) from qualified third parties (developers) to supply electricity to [utility] from wind-powered generation. [Utility] seeks approximately [___] MW of nameplate capacity from wind power resources. This level will aid [utility] in meeting its goal of meeting up to [___]% of its resource needs through renewable resources. [Utility] reserves the right to acquire more than [___] MW if such acquisitions are deemed beneficial.

Proposals will be received from developers for purchased power agreements and/or arrangements whereby [utility] would acquire an ownership interest in the project with energy delivered on an "as-produced" or "integrated" (shaped) basis. A proposal must offer a minimum of [___] MW of nameplate capacity to be eligible for evaluation by [utility].

Proposals submitted will be evaluated using a two-stage process. In the first stage, proposals will be screened to identify the most desirable wind resources on a standalone basis as measured against criteria such as cost, location and other thresholds. In the second stage, the most beneficial proposals identified in the first stage will be further evaluated as part of [utility]'s overall portfolio to identify those which perform best (from a cost effectiveness, environmental, technical integration, risk and other bases) in relation to [utility]'s existing and future resource mix. This two-stage evaluation process is further described in Section 6. Those proposals that best meet [utility]'s needs may then, depending upon the outcome of the above evaluations, be carried forward for further discussion and eventually negotiations of potential agreements (Definitive Agreements). There is no commitment by [utility] to enter into negotiations for or to ultimately acquire by contract or other means, any resource proposal received as part of this RFP process although the intent is for that to be the ultimate outcome. For any resource proposal that [utility] does ultimately acquire, it is expected that the ultimate Definitive Agreements will embody terms and conditions substantially as described in the prototype power purchase agreement and term sheet (if applicable) that are attached to and made part of this RFP.

This RFP is part of a multi-part and multi-stage resource acquisition program to acquire a diverse mix of new resources as [utility]'s electric resource need grows over time. As part of such strategy, [utility] anticipates that it will release additional RFPs for other electric resources as may be periodically revised and [utility]'s electric resource needs over time.

2. Products Requested

This RFP seeks wind electrical generation proposals under two different contracting scenarios: (1) Power Purchase Agreements or (2) [utility] ownership arrangements. [Utility] will also

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entertain arrangements that are combinations of the two scenarios. Two different energy delivery scenarios also are sought: (1) as produced or (2) integrated (shaped).

The "Power Purchase Agreement" scenario anticipates a proposal pursuant to which the developer would acquire, construct and retain ownership of the wind resource assets along with operating responsibilities with [utility] purchasing all of the output (energy and capacity) and environmental attributes at an agreed upon delivery point. A prototype power purchase agreement that would be used in this scenario (and a combination of the two scenarios) is included as Exhibit 1 to this RFP.

The [utility] ownership arrangement scenario anticipates a proposal pursuant to which [utility] would ultimately own the resource. This may be accomplished at various stages of development and using a variety of approaches such as joint development by the developer and [utility], development by the developer and then transfer to [utility], initial purchase of power by [utility] with transfer of ownership later, or other approaches which may be mutually beneficial. Although [utility] is willing to consider a wide range of arrangements, the term sheet included as Exhibit 2 to this RFP presumes that [utility] would acquire its ownership interest in the project prior to the commencement of construction and would fund its ownership share on a pro rata basis.

The first energy delivery scenario assumes that energy is delivered to [utility] at the time that it is produced by the project. Under the second scenario, two options are envisioned, although [utility] would welcome additional creative proposals from developers. Under the first option, energy is provided in the general shape in which it was produced but is firmed and delivered after an agreed upon time period; e.g., one day or one week later. In this way the energy can be prescheduled as firm energy. Under the second option, seasonal shaping would be offered such that energy deliveries from the generation project would more closely match [utility]'s seasonal resource requirements.

3. Eligible Developers

This RFP will accept proposals from all third party project developers that meet the project requirements and comply with the process guidelines described herein.

Affiliated generating companies of [utility] are not eligible to respond to this RFP. However, [utility] will consider proposals from other utilities or utility subsidiaries. [Utility] believes that consideration of proposals from other utilities and/or their affiliates may increase the number of qualified developers and thus increase the overall creativity and competitiveness of responses to this RFP.

4. Proposal Requirements

Proposals shall include the following information:

4.1 Project Summary. Describe the product(s) being offered in response to the RFP. Proposals must clearly specify the contract type (Power Purchase Agreement and/or [utility] ownership) and energy delivery type (as produced or integrated) being offered. Any proposal that contemplates a Power Purchase Agreement shall indicate the commencement and length of the agreement term. For [utility] ownership the proposed date of transfer shall be indicated. Include a brief description of the proposed delivery schedule, its relationship to the actual production of the project, and, if an integrated (shaped) resource, the means by which the resource would be shaped. Briefly summarize the project, including key elements such as the location, total

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nameplate capacity (in megawatts), expected annual output (in megawatt-hours), expected monthly output, type of turbines to be used, source and duration of wind data, interconnection plan, transmission arrangements (if applicable), environmental issues, zoning and land use issues, permitting status along with known or probable challenges to permits, planned financing, financing commitments, proposed construction schedule, other participants in the project (such as owners of the project for tax purposes, other output buyers for project expansions, if any), and current status and schedule for completion of development and construction.

4.2 Project Description. The proposal should include a detailed description of the project including the project's features and the development work completed to date. Include the following information and indicate if requested information is not known:

- Project location. Identify the site where the project will be located. Provide a map showing the location of key facilities. Provide information regarding the status and terms of leases, easements, and/or other ownership documents that demonstrate that the developer has control of the intended project properties and the legal rights to construct, interconnect and operate the project as described.
- Project size, in acreage and megawatts. If the project can be expanded, please describe the potential scope and conditions.
- Project layout, showing anticipated placement of wind turbines and other project facilities.
- Description of the land area controlled relative to the locations of the turbines and the potential for additional wind energy development.
- A description of the site including flora and fauna, proximity to inhabited structures, proximity to areas that may be sensitive from an environmental, cultural, commercial, security or other perspectives.
- The description, size, number and manufacturer of wind turbines that will be used. Provide a summary of the commercial operating experience of the turbine chosen. If a final wind turbine selection has not been made, list the candidates under consideration and the status and schedule of the selection process and any commitments by the manufacturer. For each turbine under consideration, provide the following information:
    - Technical specifications
    - Tower type and proposed hub height
    - Design life
    - Level of certification achieved
    - IEC design wind class (I or II)
    - Power Curve at sea level and average project site air density in 0.5 m/s increments (Excel spreadsheet and in written proposal)
    - Summary of performance guarantees and warranty provided

4.3 Energy Projections

4.3.1 Wind Data: Include in the proposal any wind resource assessment report, summarized data and underlying source data that have been used to project the energy production of the project. These should include:

- The source and basis of the wind speed data and the wind speed data used in the development of the energy projections for the project.
- The purpose and location of the wind speed data collection, period of record, number of on-site and off-site meteorological stations used, data quality assurance procedures, levels of measurements and seasonal data recovery, and the organization responsible for the data collection and analysis.
- The name, address and contact information for all meteorological consultants.
- The methodology used to develop the estimated long-term annual and monthly wind speed, hub-height, average annual wind speed and wind speed frequency distribution for the project site.
- Monthly and annual representative hub-height wind frequency distributions at intervals of 0.5 m/s. Provide these tables in the written proposal and separately as an Excel file.
- Distribution of expected annual and monthly output (in megawatt-hours) of the project. A graph showing the monthly and annual output is suggested as well as tabular values and an Excel spreadsheet.
- Typical hourly energy production from the project for a one-year period in electronic format. This will be used to evaluate the hourly variability of the resource.

4.3.2 Energy Calculation. Provide the analysis used to estimate the annual, monthly, and diurnal energy output of the project. This analysis should include as a minimum:

- Determination of wind speed for individual turbines in the project, to the extent available from micro-siting efforts.
- Calculation of gross energy production using wind speed frequency distribution and turbine power curve.
- Calculation of energy losses with a list and quantification of all sources of losses considered and the basis for the quantification.
- Calculation of net energy output.
- If the proposal is for an integrated (shaped to [utility] needs) product, the method and type(s) of resource to be used to shape the energy production, a description of any contractual arrangements necessary to effect such integration or shaping, and the status of such arrangements.
- Provide the as-produced and, if applicable, integrated delivery schedule (see Exhibit 7).

4.4 Experience and Qualifications of the Project Team. The proposal should contain the following minimum information indicating the qualifications of the proposed project team to implement and execute a proposal in response to this RFP:

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- The organizations and key personnel responsible for implementing the project including identification of the project manager, his/her tenure, and scope of responsibility.
- A legal entity organization chart.
- A managerial organization chart
- Existing projects owned, developed and/or operated by the developer
- The personnel or organizations responsible for the following areas:
    - Project wind resource assessment and energy projections
    - Project financing
    - Project design, engineering, procurement and construction specifications
    - Interconnection and substation design
    - Project environmental assessments
    - Project land use and zoning approval
    - Permits and related approvals
    - Regulatory compliance
    - Project construction and commissioning
    - Risk management and insurance
    - Project operations
    - Project maintenance
- A brief description of relevant experience of the key personnel and organizations for their responsibility area listed above.
- Contacts and references (name, title, address, telephone, e-mail and fax numbers) knowledgeable about the previous wind project experience of the key participants in the project.

4.5 Legal & Financial. The proposal should contain the following information as a minimum:

- A description of the structure and status of the project financing, the significant conditions on which the financing depends and the milestones that need to be achieved to secure both construction and term financing (as required) to support the project schedule.
- Identification and contact information for all legal advisors, financial advisors and capital providers (debt and equity) for the project to the extent now known or anticipated.
- Financial statements (as of [date]) for the legal entities described in Section 4.4 above and for any other individuals or entities that may provide credit support, credit enhancement, surety bonds, guarantees, and security plus the most recent audited financial statements, if available.
- A description of the project structure and capitalization during the development, construction and commercial operation phases. Describe all anticipated credit support

arrangements and appropriate parental, subsidiary and venture relationships pertinent to proposal to the extent known.

- Commitment letters or letters of undertaking from corporations, investment bankers and/or commercial bankers indicating that the project has or is able to obtain the construction and permanent financing it will require. Describe any caveats and conditions to financing commitments such parties may have described.
- The qualifications of such parties to provide, arrange or assist in obtaining necessary financing and credit support arrangements.
- Audited financial statements, if available, or other financial statements for the most recent 12-month period for all entities, including affiliates involved in the proposed transaction. This information is intended to provide an indication of the ability and willingness of the developer to negotiate in good faith (and to cause its lenders and equity partners to do the same). The types of financial and control requirements [utility] may require are listed in Section 9.4.
- A summary of the major project capital and operating expenses and documentation to support the reasonableness of the estimate s including an itemized budget with a breakdown of projected capital costs, and operating and maintenance costs and a breakdown of all costs associated with site acquisition and improvement, permitting, project construction, testing and commissioning, compliance with environmental and other applicable federal, state, or local regulations, security, and routine operations and maintenance activities in accordance with Exhibit 6.
- Pro forma financial projections showing the project cash flow, income statement, and balance sheet, sources and uses of funds, construction draw schedule, and including all financing assumptions. At a minimum the pro forma should include the following:
    - Annual energy production and assumed revenue
    - Annual operating expenses including turbine and balance-of-plant operations and maintenance costs, general and administrative expenses, asset management fees, land leases, property taxes, insurance and other expenses
    - Transmission and ancillary services costs (if any)
    - Debt service requirements
    - Debt coverage ratios (highest year, lowest year, average)
    - Depreciation (tax and book)
    - Income taxes and tax credits
    - Other taxes
    - Working capital requirements
    - Net income
    - Book rate of return to average equity
    - After tax unlevered internal rate of return to capital

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- After tax levered internal rate of return to capital

The pro forma should be provided in an Excel spreadsheet file as well as in the proposal.

4.6 Interconnection Point, Control Area, and Point of Delivery. [Utility] will accept delivery of project energy and capacity at the developer proposed Interconnection Point or at [utility]'s system. [Utility] will, in its evaluation of proposals excluding delivery to [utility]'s system include a quantification of the delivery charges necessary to transport project energy to [utility] on a firm basis. Proposals should include a clear statement of the proposed Interconnection Point, whether or not the proposal contemplates delivery to [utility], and the proposed entity to manage electric grid control area responsibilities. For purposes of this RFP, the term "Interconnection Point" shall refer to the point at which the project is connected to the high voltage transmission system. Include all details of planned electrical interconnections and related transmission services, including:

- Planned interconnection point, including status of
  - Interconnection requests
  - System impact studies
  - Facility studies
  - Interconnection agreement(s)
  - A communication plan in support of control area responsibilities
  - Potential alternatives to interconnection arrangements, if any
  - Contacts at the interconnecting utility that may be contacted by [utility]

  Plans for metering including a detailed description of how the metering of actual output of the project shall be determined.
- Planned transmission services, if any, to be included with proposal, including cost for firmed energy and status of
  - Transmission services secured and/or requested by developer
  - System impact studies
  - Facility studies
  - Expected availability of the transmission
  - Detailed costs estimates of transmission services with supporting detail
  - Contact information for representatives of the transmission provider that may be contacted by the review team concerning such transmission arrangements.

Include copies of any completed System Impact Studies performed by transmission providers, and all other information/correspondences obtained from transmission providers as a result of interconnection and transmission requests and discussions that have been made to date. In the absence of official studies, any information available concerning the transmission/interconnection costs and reliability should be provided with as much supporting documentation as possible

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4.7 Project Development Status and Schedule. The proposal should provide the following information concerning the status of project development activity.

4.7.1 Schedule. Provide, in a format such as a Gantt chart, the best schedule estimates available on the various project activities covering the period from the initiation of site control and on-site wind resource measurements on site through the project's proposed commercial operation date. Include a schedule item for each significant project development, interconnection and construction activity including receiving formal notice to proceed from utility when awarded. Provide any additional time lines applicable to the project that will demonstrate its status and plans. Indicate what actions have been taken or will need to be taken to ensure the schedule is met (such as placing orders for equipment with long lead times) and potential opportunities to improve the schedule.

4.7.2 Site Control. Provide status of site control, including wind rights, access road, and transmission corridor easements needed to construct, interconnect, operate, and maintain the facility in terms of percent complete and a schedule for finalizing the work. Example easement, lease or lease option agreements with landowners and other documents that demonstrate the extent of site control and the legal rights to execute the project as described may be included as attachments.

4.7.3 Environmental Review. Discuss known environmental issues relative to the development and operation of the project, including visual impacts, avian issues and baseline noise levels. Provide copies of all wildlife or other environmental studies and assessments that have been performed related to the site and the project. Describe methodologies for such studies and identify the person(s) or firm(s) who conducted and completed the work. If such studies are in progress, describe the scope and schedule for completion and identify the person(s) or firm(s) doing the studies and methodologies to be employed. Describe measures that will be taken to minimize the potential for avian mortality, noise, and visual impacts of the project. Discuss plans to engage community and environmental stakeholders to support the proposed project.

4.7.4 Permits. Identify all project permits with special emphasis on the key permits (such as a conditional use permit or site certificate) required to build and operate the project. Discuss the current status of applications and proceedings, the schedule for obtaining key permits and approvals, and the approach to be used. Outline the process planned to involve local residents, and other affected parties in the planning/permit process.

4.7.5 Interconnection/Transmission Construction Requirements. Based on the identified interconnection point discuss all related construction plans, status and schedule for:

- New pole lines
- Line upgrades
- Switchyards and substation work required to complete the interconnection
- Metering and communications, both by the developer and the interconnecting utility
- Easements, rights of way, or property controlled for any new transmission facility or otherwise to interconnect the wind project

Include the status of control over required right of ways for any new transmission facility required. Include information on ownership and maintenance responsibility, and the availability

of long-lead time electrical equipment, such as transformers, that will be required to support the project. Metering information should include a detailed description of how the metering of actual output of the project shall be determined and how the metering configuration was included in the determination of project output.

4.7.6 Construction. Describe arrangements and commitments (contracts, letters of intent, memoranda of understanding) that have been made, if any, for the construction of the project.

4.7.7 Testing. Summarize the testing planned to be conducted prior to acceptance of the turbines from the manufacturer and completion of the project and the testing to be conducted prior to commercial operation of the project. Possible tests should include power performance for the turbines and the project, availability tests, SCADA acceptance, distribution system acceptance, and others that demonstrate performance of the project and associated facilities in accordance with applicable laws, regulations, permits and the power purchase agreement.

4.7.8 Operation & Maintenance. The proposal should clearly describe the operations and maintenance plan for the project including the identity of the entities or persons responsible for key activities and a listing of initial spare parts and their approximate value, the procedures to assure the availability of spare parts and other operations, maintenance and logistics issues.

5. Price Proposal(s). [Utility] envisions several potential options for project pricing. For Power Purchase Agreements, these include:

- A fixed price per kWh for energy and Environmental Attributes produced.
- Fixed annual or monthly payments to the project to offset operations, maintenance and ownership costs.
- Fixed plus variable cost payments.
- A combination of the above or other suitable alternatives that may be proposed.
- All other things being equal, [utility] prefers a pricing structure that closely mirrors the actual cost structure of the project. In this way, the developer's and [utility]'s interests with respect to power scheduling and dispatch are aligned.

For [utility] ownership arrangements, alternative purchase terms may include:

- Purchase by [utility] of the development rights at the completion of the development stage with design, procurement and construction being the responsibility of [utility] with the possibility of a limited continuing role for the developer.
- Outright purchase and operation of the project by [utility] at the date of commercial operation or at the end of the wind turbine warranty period (developer to provide training to [utility] operating personnel)
- Joint development and ownership by [utility] and the developer.
- Purchase of the project by [utility] with developer having principal responsibility for continued development and operation.
- Purchase of the project by [utility] at commercial operation with operation by the developer (or the developer's designee, such as the wind turbine manufacturer) for a

specified time period during which time developer would provide training to [utility] operating personnel.

- A combination of the above or other alternatives that may be proposed by the developer.

Price proposals must specify fixed and variable payments, escalation rates to be applied if any, and all other pricing information necessary for [utility] to fully evaluate the proposal. In all cases, proposers should contemplate in their price proposal that the prototype power purchase agreement and term-sheet for [utility]'s purchase of an interest in the project as applicable, attached to this RFP will be the basis for any potential Definitive Agreement with [utility].

6. Environmental Attributes

All proposals must state that any and all Environmental Attributes associated with the project will accrue to the ownership and beneficial use of [utility].

7. Other Requirements

7.1 Signature and Certifications. The proposal must contain the signature of a duly authorized officer or agent of the developer submitting the proposal. The developer's duly authorized officer or agent shall certify in writing that:

- The developer's proposal is genuine; not made in the interest of, or on behalf of, any undisclosed person, firm, or corporation; and is not submitted in conformity with an agreement of rules of any group, association, organization, or corporation.
- The developer has not directly or indirectly induced or solicited any other developer to submit a false or sham proposal.
- The developer has not solicited or induced any other person, firm, or corporation to refrain from proposing.
- The developer has not sought by collusion to obtain for himself/herself any advantage over any other developer.

7.2 PTC Risk not Borne by [Utility]. All proposals shall acknowledge and state that [utility] disclaims and shall not assume any risk associated with the potential expiration of the Federal Production Tax Credit (PTC) on December 31, 2003, or the developer or other project entity's ability to utilize the PTC.

7.3 No Reassignment. All proposals shall state that in the event developer and [utility] negotiate and execute Definitive Agreements based on developer's proposal, the Definitive Agreements and obligations thereunder shall not be sold, transferred or assigned or pledged as security or collateral for any obligation without the prior written permission of [utility].

7.4 Conflict of Interest Disclosure. All developers shall disclose in their proposal any and all relationships between themselves, the project and/or members of their project team and [utility] or its employees.

7.5 Validity and Deadlines. All proposals shall specify the date through which the proposal is valid. Proposals must also state the dates by which Definitive Agreements must be completed and approved by the board of directors or other management body of [utility] and developer to support the proposed project schedule.

8. Credit Requirements.

[Utility] reserves the right to require adequate credit assurances which may include, but not be limited to, a corporate parental guaranty and/or a letter of credit in a form, amount, and from a corporate parent or a financial institution acceptable to [utility]. In the event [utility] anticipates that additional credit assurances may be required from a developer, [utility] reserves the right to request that the developer reply in writing regarding its intent to provide such credit assurances prior to the beginning of negotiations on any Definitive Agreement. "Adequate credit assurances" shall include, but not be limited to, the value associated with market-based liquidated damages for failure to perform, delays in construction, failure to meet minimum wind turbine availability levels and/or other forms of default or non-performance. Please see Section 9.2.5 of this RFP regarding the Evaluation Process for matters that [utility] will consider in evaluating the structural and financial risk associated with project proposals. The developer should be aware that [utility] may require negative control in addition to any that may be included in the prototype power purchase agreement (Exhibit 1) or prototype term sheet (Exhibit 2) in any or all Definitive Agreements that developer or [utility] might execute in connection with developer's proposal.

9. Evaluation Process

Those eligible proposals which meet the initial threshold size requirement of [__] MW of nameplate capacity, will be subject to one or both stages of the following two stage evaluation process:

9.1 First Stage Evaluation. In stage one, eligible proposals will be examined and evaluated by [utility] according to the following criteria:

- Resource price ranking as compared to [utility]'s estimated avoided costs for generic wind power resources (see Exhibit 3 to this RFP). The particular set of avoided costs used will depend upon whether the proposal contemplates a power purchase agreement, [utility] ownership, or some combination. All transaction costs such as taxes and risk transfer will be included in the evaluation.
- Project Size & Monthly Production: Individual proposals must offer at least [__] MW of nameplate capacity. [Utility] prefers resources of larger size and which provide monthly energy well matched to its load requirements as illustrated in Exhibit 4 to this RFP. An initial evaluation of the quality of the wind resource data submitted by developer will be made during this stage.
- Whether the proposal is for a new or recently completed project: One of the objectives of this RFP is to aid in the development of new wind resources and thus to aid in a sustained and viable wind industry. To that end, and given other considerations, [utility] will prefer new resources to resources already existing.
- Proximity and availability of transmission and the status and schedule for completion of the necessary transmission agreements. The developer shall be responsible for arranging for the transmission interconnection with the high voltage transmission system and for projects located outside of [utility]'s control area, transmission to agreed to point(s) on [utility]'s transmission system.

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- Status and schedule for completion of development of the project including financial resources of the developer and progress made in securing necessary permits, land, hardware and other factors necessary for a completely commercially operational project.
- Proposed date of commercial operation and full availability of the project. To help ensure maximum benefits to [utility]'s customers, [utility] prefers proposals that provide substantial assurances that the project will be on-line by [_____]. This is to capture the benefit of a bonus tax depreciation schedule that will result in lower cost to [utility]'s customers. However, projects with later on-line dates will be evaluated.
- The type of proposal, e.g., power purchase agreement or [utility] ownership, or combination. All other factors being equal, ownership is of significant interest to [utility] and long-term power purchase agreements (up to 20 years or longer) are preferred over short-term
- Experience and successful history of development of similar wind projects.
- Project Location: Must be located in [_____], with preference given to sites within [utility]'s service area that contribute to economic development of the host community consistent with local community preferences.

Those proposals that best meet, in [utility]'s sole judgment, the above criteria and provide a sufficient amount of resource will then be subject to a second stage evaluation.

9.2 Second Stage Evaluation. In stage 2, [utility] will evaluate proposals within [utility]'s portfolio of existing and anticipated future resources. The following criteria will be used in stage 2:

9.2.1 Portfolio Analysis. [Utility]'s evaluation of wind power proposals submitted in response to this RFP will include an analysis of the net impacts of each proposal on cost and risk for [utility]'s overall electric resource portfolio. This analysis will go beyond evaluation of proposals on a stand-alone basis. The portfolio analysis for a given proposal will assess how the proposed resource (including proposal costs, transmission costs, integration costs, seasonal shape of generation, etc.) would interact with other existing and planned resources in [utility]'s overall portfolio and with [utility]'s retail electric loads. The analysis will also take into account imputed debt effects associated with power purchase agreements, end-effects for resources with different lives, and other factors. The results of the portfolio analysis will include impacts on 20-year net present value of costs for the overall portfolio and impacts on portfolio risk (measured as variability in portfolio costs).

An estimated integration cost will be included in the portfolio analysis which will quantify, to the extent known, the cost of integrating the wind resource into [utility]'s system on a real-time and other bases. Integration costs will be based upon [utility]'s best estimate at this time but it is recognized that the information to analyze integration cost are not currently well known and will constitute [utility]'s best estimate only. [Utility] intends to continue with its acquisition of wind resources through this RFP process and will further evaluate and refine the integration costs as [utility] gains experience with wind resources and the integration of wind resources into its electric resource portfolio and system.

9.2.2 Risk. An important component of the analysis of proposals will be consideration of risk to [utility] and its customers. [Utility] will evaluate risk in two ways: 1) Cost uncertainty, price

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volatility, production uncertainty and other such factors which can be included into the Portfolio Analysis in Section 9.2.1 above; 2) Other uncertainties which will be evaluated but do not lend themselves to numerical analysis. These include such things as uncertainties or other risk associated with technology, performance, operations, transactional, vendor support, construction, project completion, schedule, capital cost, and others.

9.2.3 Ability of Project to Deliver as Proposed. The third evaluation criterion within stage 2 will be a more detailed assessment of the project's ability to deliver the level of energy expected over the proposed term of the project. This will be assessed using some or all of the following criteria:

- Probability of meeting the proposed commercial operation date
    - Reasonableness of project schedule
    - Permit status and difficulty
    - Long lead time equipment commitments
    - Reasonableness of project budgets and pro forma
    - Probability of financing
    - Feasibility of interconnection and status of process
    - Ability to document proposed financial transaction within schedule requirements
- Confidence in long-term energy projections
    - Quality and quantity of on-site data
    - Long-term reference data
    - Experience of the parties making the energy projections
    - History of proposed turbines
    - Written opinion and analysis of a nationally recognized meteorological consultant as to the reasonableness of the amount and shape of energy production.

9.2.4 Experience of the project team. This evaluation criterion will consider the factors listed in Section 4.4 of this RFP.

9.2.5 Guarantees, Security and Credit Worthiness. This evaluation criterion will include an assessment of the credit-worthiness of developer and any person that would provide any guarantees and security offered to [utility] in the proposal.

9.2.6 Environmental and Public Purpose. This criterion will include an assessment of the magnitude of potential environmental impacts, the thoroughness of the plan to identify and mitigate those impacts regardless of whether the proposal results in a new wind resource being added, and level of support or opposition from external stakeholders.

9.3 Results of Stage 2 Evaluation. At the completion of the stage 2 evaluation, [utility] will select proposals for further discussion with the developer(s) and potentially move forward with negotiations of the terms and conditions of Definitive Agreements.

10. Post-Proposal Negotiations and Awarding of Contracts

It is [utility]'s intent to negotiate both price and non-price factors during any post-proposal negotiations with a developer whose proposal is selected for further discussions at the completion of the stage 2 evaluation. It is also [utility]'s intent to include any additional factors that may impact the total cost of a project and to continually update its economic and risk evaluation until such time as [utility] and developer might execute Definitive Agreements. As part of the continuing evaluation of the proposal, [utility] may require the developer to fund the fees and cost of a third party selected by [utility] to review and verify the wind resource and energy estimates.

Definitive Agreements, if any, would be based on the outcome of these continuing evaluations and negotiations. [Utility] has no obligation to enter into a Definitive Agreement with any developer responding to this RFP and may terminate or modify this RFP at any time without liability or obligation to any developer. This RFP shall not be construed as preventing [utility] from entering into any agreement that it deems prudent at any time before, during, or after this RFP process is complete. [Utility] reserves the right to negotiate only with those developers and other parties who propose transactions that [utility] believes, in its sole opinion, to have a reasonable likelihood of being executed substantially as proposed.

11. RFP Schedule

The RFP process will occur in accordance with the following schedule:

- [_____] Issue Draft RFP
- [_____] [utility] Public Meeting on Draft RFP
- [_____] End of 60-day comment period on Draft RFP
- [_____] Regulatory Approval of RFP
- [_____] Issue Final RFP
- [_____] Hold Pre-Proposal Conference
- [_____] Responses Due
- [_____] Select Short-Listed Proposals, Notify Developers
- [_____] Execute Letter(s) of Intent

The above schedule is subject to adjustment based upon regulatory review.

12. Contact Information and Submission of Proposals

A sealed original of the proposal, along with all attachments and electronic files shall be submitted via mail, courier service, or hand delivery to [utility] at the address listed below. All responses must be received by no later than [time and date]. Questions and requests for additional information should also be directed to the individual and address listed below. All costs to participate in this RFP process, including preparation of proposals, negotiations, etc. are the responsibility of the developer.

Contact for proposal submittals, questions and requests:

- [name], [title], [phone], [fax], [email]
- Address for mail: [_____]

- Address for courier or hand delivery: [_____]

13. Confidentiality and Disclosure

Except as required under law or for regulatory purposes, [utility] will maintain confidentiality of the information contained in submitted proposals. Only [utility] employees, legal counsel, financial advisors or other contractors who are directly involved in this RFP process, or who have need to know for business reasons, will be allowed to view submitted proposals.

Developers shall clearly identify portions of their proposals that they do not want revealed to third parties by marking those portions of the proposal "Confidential" on every page. If [utility] is requested to provide such information, developer shall be responsible for defending the confidential status of the information. The developer shall be responsible for legal and all other costs incurred to protect their confidential information.

As required by law, [utility] will make available to the public a summary of all proposals received and the final ranking of all such proposals. All information supplied to [utility], or generated internally by [utility], shall remain the property of [utility] and shall not be available to any entity before, during, or after this RFP process unless required by law or regulatory order. Proposal and all related material will not be returned to developers. [Utility] will retain all information pertinent to this RFP process for a period of at least 7 years or until [utility] concludes its next general electric rate case, whichever is later.

Additionally, the models and data used by [utility] in its evaluation process will not be provided to developers or other third parties unless required by law, regulatory order, or business need.

A standard Confidentiality Agreement is included as Exhibit 5 to this RFP. Developers must sign the Confidentiality Agreement and include two signed originals with their proposal. [Utility] will countersign the Confidentiality Agreement and return one fully executed agreement to the developer.

14. Exhibits

1. Prototype Power Purchase Agreement
2. Prototype Ownership Term Sheet
3. Avoided Cost Schedule
4. [Utility] Monthly Resource Need
5. Mutual Confidentiality Agreement
6. Template for Financial Pro Forma
7. Template for Energy Delivery Schedule

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Appendix D: Model Power Purchase Agreement

This appendix contains a model Power Purchase Agreement (PPA). It is based on a recent PPA for a wind power project in the United States in which a private company owns the wind power project and an electric utility company buys the power. Language which would identify the project has been deleted.

Many issues are common to any PPA, such as price, term of agreement (years), and how payments are to be made.

However, often there are issues which are unique to a particular project that get included in a PPA. For example, some of the language in the model PPA concerns the Production Tax Credit (PTC) and whether all of the project's wind turbines would be installed before the PTC expires at the end of 2003. The PTC is an important factor in wind power economics in the United States, and at the time the PPA was written, it was uncertain when or how the PTC would be renewed past 2003. While issues related to the PTC may not be of concern to projects outside the United States, the PTC language has been left in the model PPA to provide an example of how this specific issue was handled in the PPA. There may be other factors unique to other projects which can use the PTC language in the model PPA as an example of how to handle uncertainties at the time the PPA is written.

This model PPA is presented as an example only. Readers are urged to consult their own legal counsel to ensure that their objectives will be achieved and their legal interests will be protected before entering into any binding agreement.

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[Project Name]

POWER PURCHASE AGREEMENT

Between

[Buyer Name]

as Buyer

and

[Seller Name]

as Seller

Dated as of _____, 2003

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POWER PURCHASE AGREEMENT

This POWER PURCHASE AGREEMENT (this "Agreement") is made as of this [____] day of [_____], 2003, by and between [Buyer Name], a [corporation / limited liability company / individual / etc.] ("Buyer") and [Seller Name], a [corporation / limited liability company / individual / etc.] ("Seller"). Buyer and Seller are each individually referred to herein as a "Party" and collectively as the "Parties."

WITNESSETH:

WHEREAS, Seller intends to develop, on a site or sites located [_____], a wind power electrical generation facility having an initial aggregate nameplate capacity of approximately [_____] MW;

WHEREAS, Seller desires to sell, and Buyer desires to purchase and receive, electric energy at wholesale from the Wind Project (as defined hereinafter), on all the terms and conditions set forth herein; and

WHEREAS, Buyer is a public utility / power engaged in the generation, supply, transmission, distribution and retail and wholesale of electric power and energy in [_____].

NOW, THEREFORE, the Parties hereto, for good and sufficient consideration, the receipt of which is hereby acknowledged, intending to be legally bound, do hereby agree as follows:

ARTICLE 1
DEFINITIONS

1.1 ***Definitions.***
Unless otherwise required by the context in which any term appears: (i) capitalized terms used in this Agreement shall have the meanings specified in this Article 1; (ii) the singular shall include the plural and vice versa; (iii) references to "Articles," "Sections," "Schedules," "Annexes," "Appendices" or "Exhibits" (if any) shall be to articles, sections, schedules, annexes, appendices or exhibits hereof; (iv) all references to a particular entity shall include a reference to such entity's successors and permitted assigns; (v) the words "herein," "hereof" and "hereunder" shall refer to this Agreement as a whole and not to any particular section or subsection hereof; (vi) all accounting terms not specifically defined herein shall be construed in accordance with generally accepted accounting principles in the United States of America, consistently applied; (vii) references to this Agreement shall include a reference to all appendices, annexes, schedules and exhibits hereto, as the same may be amended, modified, supplemented or replaced from time to time; and (viii) the masculine shall include the feminine and neuter and vice versa. The Parties collectively have prepared this Agreement, and none of the provisions hereof shall be construed against one Party on the ground that such Party is the author of this Agreement or any part hereof.

"Affiliate" shall mean, with respect to any Person, (i) each Person that directly or indirectly, controls or is controlled by or is under common control with such designated Person; (ii) any Person that beneficially owns or holds ten percent (10%) or more of any class or voting securities of such designated Person or ten percent (10%) or more of the equity interest in such designated Person; or (iii) any Person of which such designated Person beneficially owns or holds ten percent (10%) or more of the equity interest. For the purposes of this definition, "control" (including, with correlative meanings, the terms "controlled by" and "under common control with"), as used with respect to any Person, shall mean the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of such Person, whether through the ownership of voting securities or by contract or otherwise.

"After-Tax Basis" shall mean, with respect to any payment received or deemed to have been received by any Party, the amount of such payment (the "Base Payment") supplemented by a further payment (the "Additional Payment") to such Party so that the sum of the Base Payment plus the Additional Payment shall, after deduction of the amount of all taxes required to be paid by such Party in respect of the receipt or accrual of the Base Payment and the Additional Payment (taking into account any current or previous credits or deductions arising from the underlying event giving rise to the payment, the Base Payment and the Additional Payment), be equal to the amount required to be received. Such calculations shall be made on the assumption that the recipient is subject to Federal income taxation at the highest applicable statutory rate applicable to corporations for the relevant period or periods, is subject to state and local income taxation at the highest applicable statutory rates applicable to corporations doing business in [_____] and shall take into account the deductibility (for Federal income tax purposes) of state and local income taxes.

"Alternates" shall have the meaning set forth in Section 2.10.

"Applicable Law" shall mean, with respect to any Party, all laws, statutes, codes, acts, treaties, ordinances, orders, judgments, writs, decrees, injunctions, rules, regulations, governmental approvals, licenses and permits, directives and requirements of all regulatory and other governmental authorities, in each case applicable to or binding upon such Party or, in the case of Seller, the Wind Project.

"Authorized Representative" shall have the meaning set forth in Section 2.10.

"Base Contract Rate" shall have the meaning set forth in Section 2.2.

"Business Day" shall mean every Day other than a Saturday, Sunday or any Day on which banks in [_____] are permitted or required to remain closed.

"Commercial Operation Date" shall mean the date on which all of the Turbines in the Wind Project are put into operation in compliance with this Agreement, as such date is designated by Seller by written notice given to Buyer; *provided, however,* that testing of Turbines in accordance with the Turbine manufacturer's recommendations under various

wind conditions which is not performed prior to the Commercial Operation Date will not delay the Commercial Operation Date.

"Contract Year" shall mean the Days from January 1 through December 31, inclusive, of any given year. The first Contract Year shall commence on the first January 1 occurring after the Commercial Operation Date.

"Contract Energy Amount" shall mean [_____] kWh per Contract Year.

"Construction Commencement Date" shall mean the Day that the concrete of the first foundation will be poured on which a wind turbine tower forming part of the Wind Project shall be erected.

"Day" shall mean a period of 24 consecutive hours beginning at 00:00 hours [time zone] on any calendar day and ending at 24:00 hours [time zone] on the same calendar day.

"Delivery Point" shall mean the point, more specifically described in Exhibit B, where Seller's Interconnection Facilities connect to the Transmission Provider's Transmission Facilities.

"Disclosing Party" shall have the meaning set forth in Section 8.1.

"Energy" is a term used to represent electrical energy generated by the Wind Project.

"Event of Default" shall have the meaning set forth in Section 3.6.

"Extension Enactment" shall mean the enactment of legislation by the United States of America having the effect of extending the date beyond December 31, 2003, by which electric generation projects must be placed in service in order to be eligible to receive production tax credits under Internal Revenue Code Section 45.

"EWG" shall mean an "exempt wholesale generator" as defined in the Public Utility Holding Company Act of 1935, as amended, and the regulations promulgated thereunder.

"Force Majeure Event" shall mean an event which wholly or partly prevents or delays the performance of any obligation arising under this Agreement, but only if and to the extent (i) such event is not within the reasonable control, directly or indirectly, of the Party affected, (ii) such event, despite the exercise of reasonable diligence, cannot be or be caused to be prevented, avoided or removed by such Party, (iii) the Party affected has taken all reasonable precautions and measures in order to avoid the effect of such event on such Party's ability to perform its obligations under this Agreement and to mitigate the consequences thereof, (iv) such event is not the direct or indirect result of a Party's negligence or the failure of such Party to perform any of its obligations under this Agreement, and (v) such event is within one or more of the following categories: (a) acts of God or the public enemy, terrorism, war, whether declared or not, blockade,

insurrection, riot, civil disturbance, public disorders, rebellion, violent demonstrations, revolution, or sabotage; (b) any effect of unusual natural elements, including fire, subsidence, earthquakes, floods, lightning, tornadoes, unusually severe storms, or similar cataclysmic occurrence or other unusual natural calamities; (c) environmental and other contamination at or affecting the Wind Project; (d) explosion, accident or epidemic; (e) governmental action or inaction, (f) general strikes, lockouts or other collective or industrial action by workers or employees, or other labor difficulties; (g) the breakdown of the Wind Project or other plant breakdown or equipment failure; (h) accidents of navigation, perils at sea or breakdown or injury of vessels, accidents to harbors, docks, canals or other assistance to or adjuncts of shipping or navigation, or quarantine; (i) air crash, shipwreck or train wrecks; and (j) the existence or effect of a condition described in (a), (b), (d), (e), (f) or (i) that results in or causes the Transmission Provider's Transmission Facilities or the Transmission Provider's Transmission System to be unavailable or limited with respect to the transmission of Energy; *provided, however*, that neither the lack of money nor changes in market conditions, including, without limitation, Buyer's inability to sell, market or re-market Energy, whether at retail, wholesale, or otherwise, shall constitute Force Majeure.

"Forecasting Agreement" shall have the meaning set forth in Section 8.21.

"***Forced Outage***" shall mean an unplanned component failure or other condition that requires the Wind Project or Seller's Interconnection Facilities (or substantial portion thereof) to be removed from service immediately.

"Government Agency" shall mean any federal, state, local, territorial, tribal or municipal government and any department, commission, board, bureau, agency, instrumentality, judicial or administrative body thereof having jurisdiction over the Wind Project, Buyer or Seller, as the case may be.

"Information" shall have the meaning set forth in Section 8.1.

"Initial Rate" shall have the meaning set forth in Section 2.2.

"Interconnection Agreement" shall mean the mutually agreed interconnection agreement between the Transmission Provider and Seller pursuant to which Seller's Interconnection Facilities and the Transmission Provider's Interconnection Facilities will be constructed and operated and maintained during the term of the Agreement.

"Kilowatt-hours" or ***"kWh"*** shall mean a unit of Energy equal to one kilowatt of power supplied or taken from an electric circuit for one hour.

"Lender" or "Lenders" shall mean any and all Persons or successors in interest thereof lending money or extending credit as follows: (i) for the construction, term or permanent financing of the Wind Project; (ii) for working capital or other ordinary business requirements of the Wind Project (including the maintenance, repair, replacement or improvement of the Wind Project); (iii) for any development financing, bridge financing,

credit support, credit enhancement or interest rate protection in connection with the Wind Project; or (iv) for the purchase of the Wind Project and the related rights from Seller.

"***Maintenance Outage***" shall mean the removal of the Wind Project or Seller's Interconnection Facilities (or substantial portion thereof) from service to perform work on specific components that can be deferred, but which nevertheless requires the Wind Project to be removed from service before the next Planned Outage. Maintenance Outages may occur any time during the year, have flexible start dates, and may or may not have predetermined durations.

"Maximum Hourly Energy Delivered" shall mean [___] MW.

"Meter" shall mean an instrument or instruments meeting applicable electric industry standards used to measure and record the volume and other required delivery characteristics of electrical energy delivered hereunder.

"***MW***" shall mean megawatt.

"Network Upgrades" shall mean additions, modifications and upgrades to the Transmission Provider's Transmission System beyond the Delivery Point to accommodate the interconnection of the Project to the Transmission Provider's Transmission System as my be further defined in the Interconnection Agreement.

"Operating Procedures" shall have the meaning set forth in Section 2.10 hereof.

"Parent Guarantor" shall mean [_____].

"Partial Commercial Operation Date" shall mean the Day following the date on which the Seller's interconnection facilities and the Transmission Provider's Transmission Facilities are installed and tested, and one (1) or more of the Turbines in the Wind Project are able to reliably produce and deliver Energy to the Delivery Point.

"Party" shall have the meaning set forth in the first paragraph of this Agreement.

"Person" shall mean an individual, partnership, corporation, business trust, joint stock company, trust, unincorporated association, joint venture, governmental authority, limited liability company or any other entity of whatever nature.

"Planned Outage" shall mean the removal of all or a substantial portion of the Wind Project or Seller's Interconnection Facilities from service to perform repairs that are scheduled in advance and have a predetermined duration such that the aggregate portion of Total Capacity that is unavailable for production of Energy as the result thereof is equal to or in excess of ten percent (10%) of the Total Capacity.

"Post December 31, 2003, Turbines" shall have the meaning set forth in Section 2.2.

"Prime Rate" shall mean the interest rate (sometimes referred to as the "base rate") for large commercial loans to creditworthy entities announced from time to time by Citibank, N.A. (New York), or its successor bank, or, if such rate is not announced, the rate published in The Wall Street Journal as the "Prime Rate" from time to time (or, if more than one rate is published, the arithmetic average of such rates), in either case determined as of the date the obligation to pay interest arises, but in no event more than the maximum rate permitted by Applicable Law.

"Prudent Operating Practices" shall mean the practices, methods and standards of professional care, skill and diligence engaged in or approved by a significant portion of the electric generation industry for facilities in the United States of similar size, type, and design that, at a particular time, in the exercise of reasonable judgment, in light of the facts known at such time, would have been expected to accomplish results consistent with law, regulation, reliability, safety, environmental protection, applicable codes, and standards of economy and expedition.

"Purchased Energy" shall have the meaning set forth in Section 2.1 of this Agreement.

"Buyer Parent Guarantee" shall mean the Guarantee of the Parent Guarantor, dated as of the date of execution of this Agreement in the form set forth in Exhibit D hereto.

"Buyer's Transmission Service" shall mean Buyer's transmission service rights over the [_____] kV line that connects the [_____] Station with the [_____] Station.

"Receiving Party" shall have the meaning set forth in Section 8.1.

"Requested Maximum Operating Level" shall have the meaning set forth in Section 2.7 (b).

"Seller's Interconnection Facilities" shall mean the interconnection facilities, control and protective devices and metering facilities required to connect the Wind Project with the Transmission Provider's Transmission System in order to effectuate the purposes of this Agreement up to, and on the Seller's side of, the Delivery Point.

"Shortfall Amount" shall mean for any Contract Year, the amount that the Purchased Energy plus the amount of Purchased Energy that would have been delivered to Buyer hereunder but for curtailments arising under Section 2.7 hereof is less than the Contract Energy Amount for such Contract Year.

"Site" shall mean the real property located in [_____] on which the Wind Project is or will be located, as such property is generally described in Exhibit C attached hereto.

"Tariff" shall mean the Buyer's Open Access Transmission Tariff, dated _____.

"Term" shall have the meaning set forth in Section 3.3 of this Agreement.

"Total Capacity" shall mean: (i) prior to the Commercial Operation Date, the aggregate nameplate capacity of all Turbines that Seller expects to install in the Wind Project prior to the Commercial Operation Date, as set forth in a written notice from Seller to Buyer on or prior to the date that Seller delivers to Buyer its initial statement for Purchased Energy pursuant to Section 2.4 and (ii) on and after the Commercial Operation Date, at the time of any determination thereof, the aggregate nameplate capacity of all Turbines that have been installed in the Wind Project, in each case expressed in kilowatts; *provided, however*, that Seller shall not deliver more than [____] MWh of Energy under this Agreement in any single hourly period during the Term.

"Transmission Credit" shall mean any transmission credit, transmission right, fixed right or similar benefit required by the Tariff or any Applicable Law to be provided to Seller as compensation for the costs of Network Upgrades.

"Transmission Provider" shall mean [_____] or any successor to the Transmission Provider's Transmission System.

"Transmission Provider's Interconnection Facilities" shall mean the interconnection facilities, control and protective devices and metering facilities required to connect the Transmission Provider's Transmission System with the Wind Project up to, and on the Transmission Provider's side of, the Delivery Point.

"Transmission Provider's Transmission System" shall mean the facilities for the transmission of Energy from the Wind Project's Delivery Point to Buyer's retail electric distribution system or to Buyer's wholesale customers, as the case may be.

"Turbine" shall mean a single wind turbine generating system, including the tower, pad, transformer and controller system.

"Wind Project" is all of Seller's proposed electrical plant and equipment used to generate electricity utilizing renewable wind power located at the Site, including Seller's Interconnection Facilities, and further described in Exhibit A, and any and all additions, replacements or modifications.

ARTICLE 2
SALE AND PURCHASE OF ENERGY

2.1 ***Purchase and Sale.***
In accordance with the terms and conditions hereof, and subject expressly to the provisions of Section 2.3 hereof, commencing on the Partial Commercial Operation Date and continuing throughout the Term hereof, Seller agrees to sell and deliver to Buyer and Buyer shall purchase and accept from the Seller at the Delivery Point the Energy produced by the Wind Project and delivered to the Delivery Point; *provided, however*, that Seller shall not deliver more than [__]

MWh of Energy under this Agreement in any single hourly period during the Term (the "Purchased Energy").

2.2 ***Purchase Price.***
Seller will sell and Buyer will purchase Purchased Energy pursuant to the terms of this Agreement (i) during the period commencing on the Partial Commercial Operation Date through the date on which Turbines having an aggregate nameplate capacity equal to fifty percent (50%) of the Total Capacity are installed and producing Energy at the rate of [_____] ($_____) per kWh (such rate, the "Initial Rate") and (ii) commencing on the Day after the date on which Turbines having an aggregate nameplate capacity equal to fifty percent (50%) of the Total Capacity are installed and producing Energy and continuing thereafter during the remainder of the Term at the rate of [_____] ($_____) per kWh (the "Base Contract Rate") (plus any additional amount required pursuant to the concluding paragraph of this Section 2.2).

Notwithstanding the foregoing, the Parties agree that December 31, 2003, is the date on which electric generation projects must be placed in service in order to be eligible to receive production tax credits under Internal Revenue Code Section 45. The Parties hereby agree to cooperate to ensure that all of the Turbines in the Wind Project are placed in service on or before December 31, 2003. In the event that less than one hundred percent (100%) of the Turbines in the Wind Project are placed in service by December 31, 2003, Buyer shall purchase and Seller shall sell an amount of Energy equal to one hundred percent (100%) of the Energy produced by those Turbines which are placed in service by December 31, 2003, at the Base Contract Rate or the Initial Rate, as the case may be, (plus any additional amount required pursuant to the concluding paragraph of this Section 2.2). Seller shall have no obligation to install Post December 31, 2003, Turbines at the Wind Project.

Further in the event that less than one hundred percent (100%) of the Turbines in the Wind Project are placed in service by December 31, 2003, as aforesaid, and Seller plans to install Post December 31, 2003, Turbines within sixty (60) Days thereafter, Seller will offer in writing to sell to Buyer one hundred percent (100%) of the Energy from the Turbines in the Wind Project that are not placed in service by December 31, 2003, but which are placed in service at the Wind Project on or before a date subsequent to December 31, 2003 ("Post December 31, 2003, Turbines") as may be mutually agreed by the Parties under the following terms:

(i) in the case of Post December 31, 2003, Turbines where no Extension Enactment has occurred, at a commercially reasonable price established by the Seller (plus any additional amount required pursuant to the concluding paragraph of this Section 2.2). Buyer shall accept or decline such offer in writing within thirty (30) Days of receipt of the offer. If Buyer has not accepted such offer within thirty (30) Days, Seller may offer to sell the one hundred percent (100%) of the Energy from such Post December 31, 2003, Turbines to third parties; *provided, however*, that Seller shall not offer to sell such Energy to third parties at any time during the ninety (90) Day period next following the end of the thirty (30) Days referenced in the preceding clause at a price which is more favorable to such third party than the price offered to Buyer under this subparagraph; and

(ii) in the case of Post December 31, 2003, Turbines where an Extension Enactment has occurred, at the Base Contract Rate or the Initial Rate, as the case may be, (plus any additional

amount required pursuant to the concluding paragraph of this Section 2.2). Buyer shall accept or decline such offer in writing within thirty (30) Days of receipt of the offer. If Buyer has not accepted such offer within thirty (30) Days, Seller may offer to sell the one hundred percent (100%) of the Energy from such Post December 31, 2003, Turbines to third parties; *provided, however*, that Seller shall not offer to sell such Energy to third parties at any time during the ninety (90) Day period next following the end of the thirty (30) Days referenced in the preceding clause at a price which is more favorable to such third party than the price offered to Buyer under this subparagraph.

Notwithstanding any provision hereof to the contrary, in the event all of the Turbines in the Wind Project are not placed in service by December 31, 2003, due to a Force Majeure Event and an Extension Enactment has occurred, should Seller thereafter place Post December 31, 2003, Turbines in service Buyer shall purchase and Seller shall sell an amount of Energy equal to one hundred percent (100%) of the Energy produced by those Post December 31, 2003, Turbines at the Base Contract Rate or the Initial Rate, as the case may be, (plus any additional amount required pursuant to the concluding paragraph of this Section 2.2).

Other than the right and obligation to buy Purchased Energy from Seller in accordance with the provisions of this Agreement, this Agreement shall not be interpreted to create in favor of Buyer, and Buyer hereby disclaims, any right, title or interest in any part of the Wind Project.

In addition to the amounts otherwise payable by Buyer in accordance with this Section 2.2, Buyer shall pay (and shall indemnify and hold Seller harmless on an After-Tax Basis from and against) all gross receipts, use, excise, transfer and other similar taxes ("Transfer Taxes"), but excluding in all events taxes based on or measured by net income, which Transfer Taxes are imposed by any taxing authority arising out of or with respect to the purchase or sale of the Purchased Energy (regardless of whether such Transfer Taxes are imposed on Buyer or Seller), together with any interest, penalties or additions to tax payable with respect to such Transfer Taxes.

2.3 ***Offsets, Allowances and Credits.***

Except as provided on Schedule 1 to this Agreement, Buyer shall be entitled to and shall retain all rights, titles and interests in any offsets, allowances, renewable credits, or other credits earned by or attributable to (A) the Wind Project and (B) the Purchased Energy, including, without limitation, the Federal Clean Air Act (including, but not limited to, Title IV of the Clean Air Act Amendments of 1990) and any state or federal acts, laws or regulations that provide offsets, allowances, or credits related to emissions.

2.4 ***Billing and Payment.***

Billing and payment for the Purchased Energy sold and purchased under this Agreement and any other amounts due and payable hereunder shall be as follows:

(a) Seller shall calculate the amount of Purchased Energy from recordings produced by the Meter(s) for the Wind Project at or near the last Day of each calendar month and on the last Day of the final Contract Year. No later than the tenth (10th) Day of each month or ten (10) Days after the end of the final Contract Year: (i) Seller shall deliver to Buyer a proper invoice showing the amount of Purchased Energy delivered to Buyer by Seller pursuant hereto and any

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other amounts due and payable hereunder during such billing period and Seller's computation of the amount due Seller in respect thereof, and (ii) not less than fifteen (15) Days after receipt of such invoice (unless such Day is not a Business Day, in which case such payment shall be due on the next succeeding Business Day), Buyer shall pay to Seller, by wire transfer of immediately available funds to an account specified in writing by Seller or by any other means agreed to by the Parties in writing from time to time, the amount set forth as due in such invoice. Seller shall also have the right to invoice Buyer for payments due Seller under Section 8.5 hereunder as the result of Buyer's entry into arrangements to sell Purchased Energy in mitigation of the effects of a "Force Majeure Event."

(b) Within three hundred and sixty-five (365) Days after receipt of any invoice, Buyer may provide written notice to Seller of any alleged error therein. If Seller notifies Buyer in writing within thirty (30) Days of receipt of such notice that Seller disagrees with the allegation of error in the invoice, the Authorized Representatives of the respective Parties shall meet, by telephone conference call or otherwise, within ten (10) Days of Seller's response for the purpose of attempting to resolve the dispute. Should the Authorized Representatives not be able to resolve the dispute, within ten (10) Days of after the end of the ten (10) Day period referenced in the preceding sentence the senior executive officers of the respective Parties shall meet, by telephone conference call or otherwise, for the purpose of attempting to resolve the dispute. If the Parties are unable to resolve the dispute within thirty (30) Days after the initial meeting between Authorized Representatives as aforesaid, either Party may proceed to seek resolution of the dispute in accordance with Section 8.12 hereof.

(c) All payments hereunder shall be made without set-off or deduction. Any payment not made within the time limits specified in this Section 2.4 shall bear interest from the date on which such payment was required to have been made through and including the date such payment is actually received by the Seller. Such interest shall accrue at an annual rate equal to the Prime Rate then in effect plus two percent (2%).

(d) Statements or invoices shall be sent to Buyer by mail or facsimile to the address or facsimile number designated in Section 8.4. Buyer may change the address or facsimile number by providing written notice to Seller.

2.5 ***Title and Risk of Loss.***

Title to and risk of loss with respect to Purchased Energy provided to Buyer by Seller in accordance with this Agreement shall pass from Seller to and rest in Buyer when the same is made available by Seller at the Delivery Point. Until title passes, Seller shall be deemed in exclusive control of the same and shall be responsible for any damage or injury caused thereby. After title to the Purchased Energy passes, Buyer shall be deemed in exclusive control of such Purchased Energy and shall be responsible for any damage or injury caused thereby.

2.6 ***Seller Curtailment.***

(a) Seller may curtail deliveries of Purchased Energy if Seller reasonably believes that curtailment is necessary to construct, install, maintain, repair, replace, remove or inspect any of its (A) Turbines and related equipment or (B) electrical equipment located at the Wind Project, including without limitation, any of the Seller's Interconnection Facilities. In connection

with a curtailment undertaken by Seller in accordance with this Section 2.6 (a) where Seller reasonably determines that the aggregate portion of Total Capacity that is unavailable for production of Energy at any point in time as the result of such curtailment is or shall be equal to or in excess of ten percent (10%) of the Total Capacity, Seller shall communicate by telephone to Buyer as promptly as possible as to the nature and extent of such curtailment and shall coordinate the delivery or resumption of delivery of Purchased Energy with Buyer in connection therewith.

(b) Seller shall curtail deliveries of Purchased Energy if notified by the Transmission Provider pursuant to the Interconnection Agreement to curtail deliveries, or if deliveries are otherwise curtailed by the Transmission Provider.

(c) Seller shall curtail deliveries of Purchased Energy for each Planned Outage arising in each Contract Year pursuant to the Operating Procedures.

(d) Seller shall promptly provide to Buyer an oral report of any Forced Outage of the Wind Project or Seller's Interconnection Facilities which report shall include the amount of capacity of the Wind Project that will not be available because of such Forced Outage and the expected return time and date of generation of such capacity, and shall update such report as necessary to advise Buyer of changed circumstances in connection with such Forced Outage.

(e) If during the Term Seller needs to schedule a Maintenance Outage of the Wind Project, Seller shall, at least five (5) Days prior to such outage or such shorter period as to which Buyer shall consent in light of then outstanding existing wind conditions (which consent shall not be unreasonably withheld), notify Buyer of such proposed Maintenance Outage and the Parties shall plan such outage of capacity to mutually accommodate the reasonable requirements of Seller and service obligations of Buyer. Notice of a proposed Maintenance Outage shall include the expected start date of the outage, the amount of capacity of the Wind Project that will not be available and the expected completion date of the outage, and shall be given to Buyer at the time the need for the Maintenance Outage is determined by Seller. Buyer shall promptly respond to such notice and may request reasonable modifications in the schedule for the outage. Seller shall use all reasonable efforts to comply with such a request to reschedule a Maintenance Outage. Seller shall notify Buyer of any subsequent changes in such capacity not available to Buyer or any subsequent changes in such Maintenance Outage completion date.

(f) Seller shall resume deliveries of Purchased Energy as soon after curtailment as is reasonably possible, safe, and in accordance with Prudent Operating Practices.

2.7 ***Buyer Curtailment.***

(a) Buyer shall be permitted to request that Seller curtail the amount of Energy generated at the Wind Project only if, at the time such request for curtailment is made, the Wind Project is utilizing Buyer's Transmission Network Service for the transmission of Purchased Energy.

(b) Provided that the circumstances set forth in Section 2.7 (a) exist, at the request of Buyer provided in the manner hereinbelow prescribed, Seller shall not deliver more than an hourly specified amount of Energy (for purposes of this Section 2.7(b), the "Requested

Maximum Operating Level") provided that (i) Buyer gives telephonic notice to Seller at the Wind Project as to the Requested Maximum Operating Level requested by Buyer (expressed in kW) not less than ten minutes prior to the Required Maximum Operating Level taking effect for the immediately following hour, which notice is to be further outlined in the Operating Procedures; and (ii) Buyer's notice as aforesaid does not stipulate nor require, and Seller shall not be under any obligation to cause, the Requested Maximum Operating Level requested by Buyer pursuant to this Section 2.7 (b), to be decreased from the Requested Maximum Operating Level at any time during that one-hour period following of such Requested Maximum Operating Level taking effect. To the extent that the Parties establish Operating Procedures as referenced in Section 2.10, the Buyer and Seller may explore Operating Procedures that provide Buyer with additional operating flexibility in establishing the Requested Maximum Operating Level more frequently than once every hour.

(c) During any period of curtailment noticed in accordance with Section 2.7(b), Buyer shall pay Seller the sum of (i) the applicable price for Purchased Energy provided in Section 2.2 with respect to the Purchased Energy that would have been provided but for such curtailment based upon the Base Contract Rate or Initial Rate, as the case may be, (calculated in the manner provided in Section 2.7 (d) below) *plus* (ii) an additional amount equal to the dollar value of the lost production tax credits under Section 45 of the Internal Revenue Code which, but for such curtailment, would have been earned by Seller and for this purpose calculated by and with respect to Seller (or its Affiliates which utilize such production tax credits as the case may be) in accordance with the last sentence of the definition of "After Tax Basis" herein.

(d) Seller shall calculate the sum due pursuant to the provisions of Section 2.7(c)(i) in the following manner. During any period of curtailment requested by Buyer pursuant to Section 2.7(b), Seller shall first determine the amount of Energy (expressed in kWh) generated by operating Turbines (e.g., Turbines not subject to curtailment as requested by Buyer) during such period. Seller shall then determine the aggregate amount of Energy that would have been generated during such period by all Turbines at the Wind Farm by dividing the sum determined in the preceding sentence (expressed in kWh as aforesaid) by the number of operating Turbines and then multiplying the resulting amount by the total number of curtailed Turbines at the Wind Project. If a more accurate method for determining curtailed Energy becomes available (SCADA calculated or otherwise), the Parties may mutually agree to such calculation method in lieu of the calculation outlined above.

2.8 ***Transmission; Transmission Credits.***
Buyer shall be responsible for arranging and paying for all charges for, any and all transmission services (including, without limitation, all ancillary service charges, any Open Access Same Time Information Systems (OASIS) fees, and any direct assignment of local congestion clearing costs), transmission or wheeling services, balancing, control area services, transaction charges and line losses on Transmission Provider's side of the Delivery Point required to effectuate Buyer's purchase of Purchased Energy hereunder. Buyer will be responsible for handling any OASIS, tagging, transmission scheduling or similar protocols with the Transmission Provider during the Term hereof. Seller and Buyer agree that, promptly following the execution of this Agreement and the Interconnection Agreement, they will in good faith seek to negotiate an amendment to this Agreement that will set forth certain obligations under the Interconnection Agreement addressing the Parties' performance of duties and obligations arising hereunder in

connection with the Interconnection Agreement. If, due to Buyer's failure to obtain all transmission services required to effectuate Buyer's purchase of Purchased Energy, Seller is unable to deliver the Maximum Hourly Energy Delivered of the Wind Project to the Transmission Provider's Transmission System, Buyer shall pay Seller at the Contract Rate or the Initial Rate, as the case may be, for all Energy that Seller was, as a result of Buyer's failure, unable to deliver to the Transmission Provider's Transmission System; *plus* an additional amount equal to the dollar value of the lost production tax credits under Section 45 of the Internal Revenue Code which, but for such failure, would have been earned by Seller and for this purpose calculated by and with respect to Seller (or its Affiliates which utilize such production tax credits as the case may be) in accordance with the last sentence of the definition of "After Tax Basis" herein. Buyer's performance of its obligations hereunder to take Purchased Energy at the Delivery Point shall only be excused by a Force Majeure Event.

As payments are made by Buyer for transmission service with respect to the Project under the Tariff, Buyer shall purchase and Seller shall sell, on a dollar-for-dollar basis, Transmission Credits. The aggregate amount of Transmission Credits purchased shall be the amount Seller paid to the Transmission Provider for Network Upgrades plus (x) interest, (y) any tax gross-up, and (z) any other tax-related payments. If five (5) years after the Network Upgrades are placed in service (or after the expiration of such longer period of time as may be set forth in the Interconnection Agreement) Buyer has not purchased all available Transmission Credits, the Parties (provided that the Transmission Provider is not an affiliate of the Buyer) shall be released from all obligations arising under this paragraph of Section 2.8. The purchase price for such Transmission Credits shall be due following the receipt of the economic benefit of such credits by Buyer in the form of reduction in payments for transmission services or otherwise. Buyer agrees to pay over to Seller within ten (10) Days following the end of each month in which any such economic benefit is received by Buyer an amount equal to the Transmission Credits used and the economic benefit received by Buyer therefrom.

2.9 ***Expansion of the Wind Project; New Wind Projects.***
Each Party and its Affiliates shall provide to the other Party from time to time prior to the end of the Term hereof reasonable opportunity to evaluate and enter into investments on a mutually agreeable basis between the Parties (or their respective Affiliates) and in accordance with Applicable Law with respect (i) to an expansion of the Wind Project resulting in or proposed to result in an increase in the Total Capacity of the Wind Project or (ii) construction of additional wind power electrical generating facilities, which increase in the Total Capacity of the Wind Project or additional wind power electrical generating facilities, as the case may be, is interconnected at any point within twenty-five (25) miles from the Point of Delivery. In the event Buyer or its Affiliate shall undertake to expand the Wind Project or construct additional wind power electrical generating facilities as aforesaid where Seller (or its designated Affiliate) has declined to participate following a reasonable opportunity to evaluate such undertaking, Buyer shall not proceed with such undertaking unless the following conditions are satisfied:

(a) at Buyer's expense, the proposed action to expand the Wind Project or construct additional wind power electrical generating facilities shall be submitted in detail to review by an independent engineering firm having national or international expertise in the evaluation of wind power electrical generating facilities, and interconnection and transmission of energy produced by such facilities, reasonably acceptable to the Seller in order to determine whether the proposed

action will have an adverse impact on the Wind Project or the efficient and unimpaired transmission of energy therefrom in the manner contemplated in this Agreement. Buyer shall cause copies of all information submitted to or received from the independent engineering firm to be sent to the Seller simultaneously with submission or receipt by Buyer or its Affiliate;

(b) if the independent engineering firm determines that the proposed action (or resulting effect of the proposed action) will have no adverse effect on the Wind Project or the efficient and unimpaired transmission of Energy therefrom in the manner contemplated in this Agreement, Buyer may proceed at its own expense with the proposed action; *provided, however,* that Buyer or its Affiliates shall not undertake such proposed action, directly or indirectly, under any form of joint venture, management agreement, joint operating agreement, loan agreement or other form of financial, management, investment or operating arrangement with any Person which, at the time Buyer or its Affiliates determined to proceed with such proposed action, owns (in whole or in part) or operates wind power electrical generating facilities capable of generating MW in excess of [___] MW in the aggregate;

(c) if the independent engineering firm determines that the proposed action (or resulting effect of the proposed action) will have an adverse effect on the Wind Project or the efficient and unimpaired transmission of Energy therefrom in the manner contemplated in this Agreement, the Buyer and its Affiliates shall abandon the proposed action without further demand of Seller and without recourse to Seller.

2.10 ***Operating Procedures; Communication.***
Seller and Buyer will endeavor to develop written operating procedures ("Operating Procedures") before the Commercial Operation Date, which Operating Procedures will only be effective if made by mutual written agreement of the Parties; *provided, however,* that the Parties' failure, or any Party's failure to develop such Operating Procedures shall not be deemed an Event of Default hereunder. The Parties agree that the Operating Procedures they will endeavor to establish will cover the protocol under which the Parties will perform their respective obligations under this Agreement and will include, but will not be limited to, procedures concerning the following: (1) the method of day-to-day communications; (2) key personnel lists for Seller and Buyer; and (3) Forced Outage, Maintenance Outage and Planned Outage reporting.

Seller will install a dedicated direct communication circuit (which may be by common carrier telephone) to Buyer or such other communication equipment as the Parties may agree. Seller shall provide telemetering equipment and facilities capable of transmitting to Buyer instantaneous MW output at the Delivery Point or other forms of "real time" output data relating to Purchased Energy.

As a means of securing effective cooperation and interchanges of information and of providing consultation on a prompt and orderly basis between the Parties in connection with various administrative, commercial and technical issues which may arise during the performance of this Agreement, the Operating Procedures will also provide that each of the Parties will both appoint an authorized representative (with respect to each Party, the "Authorized Representative") and an alternate representative (with respect to each Party, the "Alternates") to act in its Authorized Representative's absence. The Authorized Representatives and Alternates shall be managers well-experienced with regard to matters relating to the implementation of the Parties' rights and

obligations under this Agreement with full authority to act for and on behalf of the Parties appointing them. Each Party will notify the other in writing of its Authorized Representative and Alternate and these appointments will remain in full force and effect until written notice of substitution is delivered to the other Party.

Without limiting the provisions of Section 8.1 hereof, the Parties agree that all Information delivered to or received by any Party in connection with or pursuant to the Operating Procedures shall be confidential and proprietary subject to the provisions of Section 8.1 (c).

ARTICLE 3
CONDITIONS PRECEDENT, TERM, TERMINATION AND DEFAULTS

3.1 *Conditions to the Obligations of Seller*

Seller's obligations under this Agreement are subject to the satisfaction of the conditions set forth in subsections (b), (c) and (d) on or before [_____], 2002, satisfaction of the condition set forth in subsections (e) on or before [_____], 2002 and, in the case of subsections (a), subject to Buyer's performance on the date of execution of this Agreement, and in the case of subsection (f) below Buyer's continuous satisfaction at all times after the date of execution of this Agreement and prior to the Commercial Operations Date, of the following conditions:

(a) Buyer shall cause the Buyer Parent Guarantee to be executed and delivered to and for the benefit of Seller, any Lender and its or their respective assignees by the Parent Guarantor.

(b) Seller shall have secured and received financing for the development of the Wind Project in the amount of Seller's aggregate development and construction costs related to the Wind Project.

(c) Seller shall have entered into a binding definitive agreement satisfactory in form and content to Seller to purchase from [_____] a number of wind turbine generators sufficient to produce the Total Capacity.

(d) Seller shall have received from the owners of the [_____] a written consent, estoppel, and non-disturbance agreement in form and substance satisfactory to Seller and its Lender (if any), which consent, estoppel, and non-disturbance agreement shall be prepared by Seller and reviewed by Buyer prior to execution thereof by such owners and shall authorize the interconnection of the Wind Project to the [_____].

(e) Approval of Seller's performance of the duties and obligations on its part to be performed under this Agreement by the Board of Directors of Seller or Seller's Affiliate.

(f) Buyer shall have a long-term local issuer credit rating or a senior unsecured long-term debt rating "Credit Rating," as applicable, from one (if only one of the following agencies issues such a rating) or both (if both of the following agencies issue such a rating) of BBB- or higher (in the case of a rating issued by Standard & Poor's Rating Group or any successor thereto ("S&P")) and Baa3 or higher (in the case of a rating issued by Moody's Investor Service, Inc., or any successor thereto ("Moody's")).

Any condition under this Section 3.1 may be waived, by written notice to Buyer, by the Seller in Seller's sole discretion, without the consent of the Buyer.

Notwithstanding any provision hereof to the contrary, this Agreement may be terminated by the Seller upon written notice to the Buyer, and the transactions contemplated hereby shall thereupon be abandoned if all of the conditions set forth in Section 3.1 (except for the condition that the credit-worthiness of the Buyer shall be evidenced in the manner set forth in Section 3.1 (f) at the times therein required) shall not have been satisfied, or waived by Seller, on or before [_____], 2002 (with respect to the condition set forth in subsection (e) or on or before [_____], 2002 (with respect to the conditions set forth in subsections (b), (c) and (d)), or such later date as mutually agreed upon in writing between the Parties. Further notwithstanding any provision hereof to the contrary, this Agreement may be terminated by the Seller upon written notice to the Buyer, and the transactions contemplated hereby shall thereupon be abandoned if the Buyer shall fail to maintain the conditions of credit-worthiness specified in Section 3.1 (f) at all times therein specified.

3.2 ***Conditions to the Obligations of Buyer.***
Buyer's obligations under this Agreement are subject to the satisfaction of the conditions set forth in subsection (a) on or before [_____], 2002 and to the satisfaction of the condition set forth in subsection (b) on or before [_____], 2002 as follows:

(a) Buyer shall have received from the owners of the [_____] a written consent authorizing the interconnection of the Wind Project to the [_____].

(b) Approval of Buyer's performance of the duties and obligations on its part to be performed under this Agreement by the Board of Directors of Buyer.

Notwithstanding any provision hereof to the contrary, this Agreement may be terminated by the Buyer upon written notice to the Seller, and the transactions contemplated hereby shall thereupon be abandoned if all of the conditions set forth in subsection (a) shall not have been satisfied, or waived by Buyer, on or before [_____], 2002 or if the condition set forth in subsection (b) shall not have been satisfied on or before [_____], 2002 (or such later date as mutually agreed upon in writing between the Parties).

3.3 ***Term/Extensions.***
The Parties' obligations pursuant to Section 2.1 of this Agreement shall commence upon the Partial Commercial Operation Date and continue until the date that is twenty (20) years following the Commercial Operation Date (the "Term"). All other provisions hereof shall commence upon the date hereof and continue until the end of the Term.

3.4 ***Regulatory Approval.***
This Agreement is further subject to Seller being determined to be an EWG by the Federal Energy Regulatory Commission. Seller shall have applied for such status not later than the date that is sixty (60) Days following execution of this Agreement.

3.5 ***Early Termination.***

(a) In addition to termination of this Agreement as permitted under Section 3.1 hereof by Seller, Seller may terminate this Agreement prior to the expiration of the Term as specified below:

(i) By Seller if an Interconnection Agreement in form and substance satisfactory to Seller, in its sole discretion, is not executed on or before [_____], 2002; *provided* that Seller gives Buyer written notice of termination within fifteen (15) Days after such date; or

(ii) By Seller in the event that Seller has not obtained the necessary fee, leasehold or other title to or interest in the Site and all zoning approvals, permits, licenses and other governmental approvals necessary to construct and operate the Wind Project in the manner contemplated by this Agreement and which are final and no longer subject to appeal or legal challenge, by [_____], 2002, *provided* that Seller gives Buyer written notice of termination within fifteen (15) Days after such date; or

(iii) By Seller in the event that Seller determines in good faith that it will be unable to place in service fifty percent (50%) or more of the Turbines to be installed in the Wind Project by December 31, 2003, *provided* that Seller gives Buyer written notice of termination within fifteen (15) Days after such determination is made by Seller.

(b) Notwithstanding any provision of this Agreement to the contrary, in the event of termination pursuant to this Section 3.5, the Parties shall be released and discharged from any obligations arising or accruing hereunder from and after the date of such termination; *provided, however*, that termination shall not discharge or relieve either Party from any indemnity obligations under Article 6 or the provisions of Section 8.1 hereof, which provisions shall survive any termination of this Agreement.

3.6 ***Defaults and Remedies.***

(a) Each of the following shall constitute an "Event of Default" hereunder:

(i) a failure by a Party to pay any amount due hereunder, where such failure is not cured within five (5) Days of the date due;

(ii) Buyer shall fail to accept delivery of Purchased Energy tendered at the Delivery Point (other than by reason of Force Majeure Event);

(iii) Buyer or its successor by operation of law or assignment effected in accordance with the terms hereof shall be in default of any obligation arising under this Agreement;

(iv) Parent Guarantor shall (A) be generally not paying its debts as they become due, (B) file, or consent by answer or otherwise to the filing against it of, a petition for relief or reorganization or arrangement or any other petition in bankruptcy, for liquidation or to take advantage of any bankruptcy or insolvency law of any

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jurisdiction, (C) make an assignment for the benefit of its creditors, (D) consent to the appointment of a custodian, receiver, trustee or other officer with similar powers with respect to it or with respect to any substantial part of its property, (E) be adjudicated insolvent or (F) take corporate action for the purpose of any of the foregoing;

(v) At any time, either (A) for any reason, the Buyer Parent Guarantee is not in full force and effect, enforceable against the Parent Guarantor in accordance with its terms, or (B) there is any failure by the Parent Guarantor to perform its obligations under the Buyer Parent Guarantee and continues beyond any cure period applicable thereto as provided in the Buyer Parent Guarantee;

(vi) any other material default that has a material adverse impact on the non-defaulting Party if such default has not been cured by the defaulting Party within thirty (30) Days after receiving written notice from the non-defaulting Party setting forth, in reasonable detail, the nature of such material default; *provided, however,* that, in the case of a material default that is not reasonably capable of being cured within the thirty-Day cure period, the defaulting Party shall have additional time to cure the default if it commences to cure the default within such thirty-Day cure period, it diligently pursues such cure, and such default is capable of being cured by the defaulting Party within no more than one hundred eighty (180) Days after receiving such notice.

(b) Upon the occurrence of an Event of Default by a Party, the non-defaulting Party shall have the following rights:

(i) to terminate this Agreement by written notice to the other Party pursuant to this Section 3.6 and, in the case of an Event of Default by Buyer under Section 3.6(a)(ii), Seller shall have the right, but not the obligation, to enter into a replacement long-term power supply agreement with a third party;

(ii) to suspend performance of its obligations and duties hereunder upon written notice to the defaulting Party and, incident thereto Seller shall have the right, but not the obligation, to enter into a replacement short-term power supply agreement with a third party for the period of the suspension; and

(iii) to pursue any other remedy given under this Agreement; *provided however*, that in the case of an Event of Default by Seller, Buyer shall provide the Lenders (if any), at an address provided in writing by the Lenders or by the Seller to Buyer, with notice of such Event of Default and the Lenders shall have the right (but not the obligation) for ninety (90) Days after receipt of such notice either to cure the Event of Default on behalf of Seller, or, upon payment to Buyer of amounts due from Seller but not paid by Seller, to assume, or cause its designee or a lessee or Buyer of the Wind Project to assume, all of the rights and obligations of Seller under this Agreement arising after the date of such assumption. In the event that any Lender, its designee or any such lessee or Buyer of the Wind Project assumes this Agreement in accordance with this Section 3.6: (i) Seller shall be released and discharged from any obligations to Buyer arising or accruing hereunder from and after the date of such assumption; (ii) Buyer shall continue this Agreement with such Lender, its designee or any such lessee or Buyer of

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the Wind Project, as the case may be, substituted in the place of Seller hereunder; and (iii) if the assuming party is any of the Lenders, such party shall not be personally liable to Buyer for the performance of its obligations hereunder except to the extent of the total interest of the Lenders in the Wind Project; *and provided further, however*, that in the case of the occurrence of an event, which with the giving of notice or the passage of time, or both, would constitute an Event of Default by Buyer, commencing with the occurrence of such event and continuing at all times thereafter (unless cured by Buyer within the time and in the manner herein provided), including without limitation, at all times after termination of this Agreement by Seller as permitted hereunder, Buyer shall promptly pay or cause to be paid, all charges, tariffs or other sums necessary so that Seller shall be given access to the Buyer's Transmission Service and to all ancillary services for the transmission of Energy from the Wind Project. Buyer expressly acknowledges that payment of the sums referenced in the preceding sentence in order to insure Seller's continuing access to the Buyer's Transmission Service and to all ancillary services for the transmission of Energy from the Wind Project shall expressly survive termination of this Agreement and shall be guaranteed as to payment thereof by the Parent Guarantor pursuant to the Buyer Parent Guarantee.

ARTICLE 4
MEASUREMENT AND METERING

4.1 ***Metering Equipment.***

(a) Seller shall:

(i) as part of the Wind Project, provide and install, at no cost to Buyer, appropriate Meters and associated measuring equipment necessary to permit an accurate determination of the quantities of the Purchased Energy delivered under this Agreement; and

(ii) exercise reasonable care in the maintenance and operation of any such Meters and equipment located on the high side of the transformer so as to assure to the maximum extent reasonably practicable an accurate determination of such quantities. Seller's Meters shall be located on the high side of the transformer. Except as provided in Section 4.2, Seller's Meters shall be used for quantity measurements under this Agreement.

(b) Buyer, at its sole expense, may install and maintain check Meters and all associated measuring equipment necessary to permit an accurate determination of the quantities of Purchased Energy delivered under this Agreement; *provided, however*, that such equipment shall be operated and maintained in a manner that does not interfere with the installation, maintenance and operation of Seller's Meters and associated measuring equipment or Seller's Interconnection Facilities.

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4.2 ***Measurements.***

(a) Readings of Seller's Meters shall be conclusive as to the amount of Purchased Energy delivered to Buyer hereunder; *provided, however*, that in the event any of Seller's Meters is out of service or is determined, pursuant to Section 4.3 hereof, to be registering inaccurately, measurement of Purchased Energy delivered hereunder shall be determined by:

(i) Buyer's check Meter, if installed and registering accurately; or

(ii) in the absence of an installed and accurately registering check Meter belonging to Buyer by the computer monitoring system for each Turbine that is part of the Wind Project, using a mathematical calculation determined by Seller in advance to adjust the output thereof to account for electrical losses in the gathering system and the Turbine transformers and substation transformers; or

(iii) if the computer monitoring system described in clause (ii) above is unavailable or unreliable, by making a mathematical calculation if upon a calibration test of Seller's Meter a percentage error is ascertainable; or

(iv) In the absence of an installed and properly registering check Meter belonging to Buyer, the computer monitoring system described in clause (ii) above, and an ascertainable percentage of error, by estimating by reference to quantities measured during periods of similar conditions when Seller's Meter was registering accurately.

(b) if no reliable information exists as to the period over which such Meter was registering inaccurately, it shall be assumed for correction purposes hereunder that such inaccuracy began at a point in time midway between the testing date and the last previous date on which such Meter was tested and found to be accurate, but not to exceed six (6) months prior to the testing date.

4.3 ***Testing and Correction.***

(a) The accuracy of each of Seller's Meters shall be tested and verified by Seller at least annually. Seller hereby grants Buyer access, with reasonable notice to Seller, and at reasonable times, to Seller's Meters in order to test and verify the accuracy of such Meters' measurements and recordings. Such inspections and verifications shall be at Buyer's sole expense.

(b) If Buyer has installed check Meters in accordance with Section 4.1 hereof, Buyer shall test and verify each such Meter at least annually.

(c) Each Party shall bear the cost of the annual testing of its own Meters.

(d) Each Meter shall be accurate within a one-half of one percent (0.5%) variance.

(e) If either Party disputes a Meter's accuracy or condition, it shall:

(i) Notify the owner of the Meter in writing.

(ii) The owner of the Meter shall, within fifteen (15) Days after receiving such notice, advise the disputing Party in writing as to its position concerning the Meter's accuracy and reasons for taking such position.

(iii) If the Parties are unable to resolve their disagreement through reasonable negotiations, then either Party may submit such dispute to an unaffiliated third-party engineering company mutually acceptable to the Parties to test the Meter. Should the Meter be found to be registering within the permitted one-half of one percent (0.5%) variance, the disputing Party shall bear the cost of inspection; otherwise, the cost shall be borne by the owner.

(iv) Any repair or replacement shall be made at the owner's expense as soon as practicable, based on the third-party engineer's report. If, upon testing, any Meter is found to be accurate or to be in error by not more than the permitted one-half of one percent (0.5%) variance, previous recordings of such Meter shall be considered accurate in computing deliveries hereunder, but if in error, such Meter shall be promptly adjusted to record correctly.

(v) If, upon testing, any Meter shall be found to be in error by an amount exceeding the permitted one-half of one percent (0.5%) variance, then such Meter shall be promptly adjusted to record properly and any previous recordings by such Meter shall be adjusted in accordance with Section 4.2 hereof.

(vi) If, upon testing, any of Seller's Meters is found to be in error by more than the permitted one-half of one percent (0.5%) variance, the payments for Purchased Energy made since the previous test of such Meter shall be adjusted to reflect the corrected measurements determined pursuant to Section 4.2 hereof. If the difference of the payments actually made by Buyer minus the adjusted payment is a positive number, Seller shall pay the difference to Buyer; if the difference is a negative number, Buyer shall pay the difference to Seller. In either case, the Party paying such difference shall also pay interest at the Prime Rate and such payment (including such interest) shall be made within thirty (30) Days of receipt of a corrected billing statement.

4.4 ***Maintenance and Records.***

Seller shall provide Buyer on a monthly basis reports indicating Seller's daily delivery of Purchased Energy. Except with respect to meter readings, each Party shall have the right to be present whenever the other Party reads, cleans, changes, repairs, inspects, tests, calibrates, or adjusts the equipment used in measuring or checking the measurement of the Purchased Energy delivered hereunder. Each Party shall give at least forty-eight (48) hours' notice to the other Party in advance of taking any such actions. The records from the measuring equipment shall remain the property of Seller or Buyer, respectively, but, upon request, each Party will submit to the other its records and charts, together with calculations therefrom, for inspection, verification and copying, subject to return within ten (10) Days after receipt thereof.

ARTICLE 5
REPRESENTATIONS, WARRANTIES AND COVENANTS

5.1 ***Seller's Representations and Warranties.***

(a) Seller represents and warrants as follows:

(i) Seller is a [_____], duly organized, validly existing, and in good standing under the laws of [_____];

(ii) Seller has the power and authority to enter into and perform this Agreement and is not prohibited from entering into this Agreement or discharging and performing all covenants and obligations on its part to be performed under and pursuant to this Agreement;

(iii) The execution and delivery of this Agreement, the consummation of the transactions contemplated herein and the fulfillment of and compliance by Seller with the provisions of this Agreement (provided that Seller shall not have procured all permits and consents necessary for the construction and operation of the Wind Project as of the date of execution and delivery of this Agreement) will not conflict with or constitute a breach of or a default under or require any consent, license or approval that has not been obtained pursuant to any of the terms, conditions or provisions of any law, rule or regulation, any order, judgment, writ, injunction, decree, determination, award or other instrument or legal requirement of any court or other agency of government, the documents of formation of Seller or any contractual limitation, restriction or outstanding trust indenture, deed of trust, mortgage, loan agreement, lease, other evidence of indebtedness or any other agreement or instrument to which Seller is a party or by which it or any of its property is bound and will not result in a breach of or a default under any of the foregoing;

(iv) Seller has taken all such action as may be necessary or advisable and proper to authorize this Agreement, the execution and delivery hereof, and the consummation of transactions contemplated hereby;

(v) There are no bankruptcy, insolvency, reorganization or receiverships pending or being contemplated by Seller, or to its knowledge threatened against Seller; and

(vi) To the Seller's knowledge, there are no actions, proceedings, judgments, rulings or orders issued by, or pending before any court or other governmental body that would materially adversely affect Seller's ability to perform its obligations under this Agreement.

(b) This Agreement is a legal, valid and binding obligation of Seller enforceable in accordance with its terms, except as limited by laws of general applicability limiting the enforcement of creditor's rights or by the exercise of judicial discretion in accordance with general principles of equity.

5.2 ***Buyer's Representations and Warranties.***

(a) Buyer represents and warrants as follows:

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(i) Buyer is a [_____] duly organized, validly existing and in good standing under the laws of [_____];

(ii) Buyer has the power and authority to enter into and perform this Agreement, is not prohibited from entering into this Agreement or discharging and performing all covenants and obligations on its part to be performed under and pursuant to this Agreement and is not required to receive, apply for nor obtain any prior, concurrent or subsequent approval of or certificate of necessity for this Agreement under any Applicable Law;

(iii) The execution and delivery of this Agreement, the consummation of the transactions contemplated herein and the fulfillment of and compliance by Buyer with the provisions of this Agreement will not conflict with or constitute a breach of or a default under or require any consent, license or approval that has not been obtained pursuant to any of the terms, conditions or provisions of any law, rule or regulation, any order, judgment, writ, injunction, decree, determination, award or other instrument or legal requirement of any court or other agency of government, the documents of formation of Buyer or any contractual limitation, restriction or outstanding trust indenture, deed of trust, mortgage, loan agreement, lease, other evidence of indebtedness or any other agreement or instrument to which Buyer is a party or by which it or any of its property is bound and will not result in a breach of or a default under any of the foregoing;

(iv) Buyer has taken all such action as may be necessary or advisable and proper to authorize this Agreement, the execution and delivery hereof, and the consummation of transactions contemplated hereby;

(v) There are no bankruptcy, insolvency, reorganization or receiverships pending or being contemplated by Buyer, or to its knowledge threatened against Buyer; and

(vi) To the Buyer's knowledge, there are no actions, proceedings, judgments, rulings or orders issued by, or pending before any court or other governmental body that would materially adversely affect Buyer's ability to perform its obligations under this Agreement.

(b) This Agreement is a legal, valid and binding obligation of Buyer enforceable in accordance with its terms, except as limited by laws of general applicability limiting the enforcement of creditor's rights or by the exercise of judicial discretion in accordance with general principles of equity.

5.3 *Seller's Covenants*

Seller covenants that (i) from the Commercial Operation Date through the expiration of the Term or termination hereof, the Wind Project and the Seller's Interconnection Facilities shall be operated and maintained in accordance with this Agreement, Prudent Operating Practices and Applicable Laws, and (ii) it shall require its employees to comply with the Occupational Safety and Health Act, and the rules promulgated thereunder by the U.S. Department of Labor, and all applicable state statutes and regulations affecting job safety. Seller covenants not to support, and

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to cooperate with Buyer in opposing, any action of any regulatory body having jurisdiction thereover that could result in the vitiation of any of the terms or conditions hereof or have any other material adverse effect on this Agreement.

5.4 *Buyer's Covenants.*

Buyer covenants: (i) that from the Commercial Operation Date through the expiration of the Term or termination hereof, Buyer shall comply with this Agreement and Applicable Laws, including, without limiting the generality of the foregoing, paying the Contract Rate for Purchased Energy to Seller when due hereunder, and (ii) not to support, and to cooperate with Seller in opposing, any action of any regulatory body having jurisdiction thereover that could result in the vitiation of any of the terms or conditions hereof or have any other material adverse effect on Seller, the Wind Project or this Agreement.

ARTICLE 6
INDEMNIFICATION AND INSURANCE

6.1 *General Indemnity.*

Each Party hereby protects, defends, indemnifies and holds harmless (on an After-Tax Basis) the other Party, its directors, officers, employees and agents, from and against all claims, demands, causes of actions, judgments, liability and associated costs and expenses, including reasonable attorney's fees, arising from property damage, bodily injuries or death suffered by any person (including, without limitation, employees of Buyer) related to, arising from, or connected to the performance of the indemnifying Party hereunder, or Energy to be delivered hereunder. This indemnity provision shall apply notwithstanding the active or passive negligence of the indemnitee, but the indemnitor's liability to indemnify the other Party shall be reduced proportionately to the extent that an act or omission of the indemnitee may have contributed to the loss, injury or property damage. Further, neither Party shall be indemnified hereunder for its loss, liability, injury and damage resulting from its sole negligence, fraud, or willful misconduct. The indemnitor, upon the other Party's request, shall defend any suit asserting a claim covered by this indemnity and shall pay all costs, including reasonable legal fees, that may be incurred by the other Party in enforcing this indemnity. Each indemnity in this Agreement is a continuing obligation, separate and independent of the other obligations of each Party and survives termination hereof. It is not necessary for a Party to incur expense or make payment before enforcing a right of indemnity conferred by this Agreement.

6.2 *Patent Indemnity.*

Each Party hereto protects, defends, indemnifies and holds harmless (on an After-Tax Basis) the other Party, its directors, officers, employees and agents, from and against all claims, demands, causes of actions, judgments, liability and associated costs and expenses, including reasonable attorneys' fees, arising from the infringement by the indemnifying Party of any patent relating to the Wind Project or the Seller's Interconnection Facilities. Without limiting the generality of the foregoing, Seller shall indemnify and hold harmless (on an After-Tax Basis) the Buyer with respect to any all claims, demands, causes of actions, judgments, liability and associated costs and expenses, including reasonable attorneys' fees, arising from an assertion that Seller's development or operation of the Wind Project infringes upon any patent held or claimed to be held by any Person other than a Party.

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6.3 ***Insurance.***

(a) Each Party, at its own cost and expense, shall maintain and keep in full force and effect from the date hereof through the later of the date of expiration or termination hereof, the following insurance coverage:

(i) Workers' Compensation Insurance for statutory obligations imposed by state laws, and Employer's Liability Insurance with a minimum limit of One Million Dollars ($1,000,000) for disease and injury to employees; and

(ii) Commercial General Liability Insurance on an occurrence (not claims-made) form, including premises and operations, personal injury, broad form property damage, products/completed operations, contractual liability and independent contractors protective liability all with minimum combined single limit liability of Five Million Dollars ($5,000,000).

(b) Any insurance required by this Article to be maintained by either Party may be maintained in the form of self-insurance. All insurance polices required to be obtained hereunder shall provide insurance for occurrences from the date hereof through the later of the expiration or termination hereof. All insurance coverage, other than self-insurance, required by this Agreement if not self-insurance shall be issued by an insurer with a Best's Rating of not less than "A-" or such other insurer as is reasonably acceptable to both Parties.

(c) Each Party shall require its insurer(s) to notify the other Party of any material change in, or cancellation of, the insurance required by this Article at least thirty (30) Days prior to the effective date of such change or cancellation. Upon the request of either Party, each Party shall provide to the other Party and thereafter maintain with the other Party a current certificate of insurance or evidence of self-insurance verifying the existence of the insurance coverage required by this Agreement.

ARTICLE 7
GOVERNMENT APPROVALS

7.1 ***Government Approvals - Seller's Obligation.***
Except with respect to governmental approvals, licenses and permits which may be required to allow Buyer to perform its obligations hereunder (all of which shall be obtained and maintained by Buyer at its sole cost), Seller shall secure and maintain at no cost to Buyer all governmental approvals, permits (including environmental permits), licenses, easements, rights-of-way, releases and other approvals necessary for the construction and operation of the Wind Project.

7.2 ***Buyer's Assistance.***
At Seller's request, Buyer shall use best efforts to assist Seller in obtaining and retaining such permits, licenses, easements, rights-of-way, releases and other approvals as are necessary for the design, construction, engineering, operations and maintenance of the Wind Project. Seller shall reimburse Buyer for out-of-pocket costs reasonably incurred by Buyer in assisting Seller under this Section 7.2.

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ARTICLE 8
MISCELLANEOUS

8.1 ***Confidential Information.***

(a) The Parties have and will develop certain information, processes, know-how, techniques and procedures concerning the Wind Project that they consider confidential and proprietary (collectively, the "Information"). Notwithstanding the confidential and proprietary nature of such Information, the Parties (each, the "Disclosing Party") may make this Information available to the other (each, a "Receiving Party") subject to the provisions of this Section 8.1; *provided, however*, that certain data constituting Information hereunder shall be identified "Confidential" by the Disclosing Party prior to making same available to Receiving Party hereunder in accordance with the provisions of the Operating Procedures.

(b) Upon receiving or learning of Information, the Receiving Party shall:

(i) treat such Information as confidential and use reasonable care not to divulge such Information to any third party except as required by law, subject to the restrictions set forth below;

(ii) restrict access to such Information to only those employees, subcontractors, suppliers, vendors, and advisors whose access is reasonably necessary in developing the Wind Project and for the purposes of this Agreement and who shall be bound by the terms of this provision;

(iii) use such Information solely for the purpose of developing the Wind Project and for purposes of this Agreement; and

(iv) upon the termination of this Agreement, destroy or return any such Information in written or other tangible form and any copies thereof.

(c) The restrictions of this Section 8.1 do not apply to:

(i) release of this Agreement to any governmental authority required for obtaining any approval or making any filing pursuant to Section 3.4 hereof; *provided, however*, that each Party agrees to cooperate in good faith with the other to maintain the confidentiality of the provisions of this Agreement to the extent permitted by Applicable Law;

(ii) information which is, or becomes, publicly known or available other than through the action of the Receiving Party in violation of this Agreement;

(iii) information which is in the possession of the Receiving Party prior to receipt from the Disclosing Party or which is independently developed by the Receiving Party, *provided, however,* that the person or persons developing such information have not had access to any Information;

(iv) information which is received from a third party which is not known (after due inquiry) by Receiving Party to be prohibited from disclosing such information pursuant to a contractual, fiduciary or legal obligation; or

(v) information which is, in the reasonable written opinion of counsel of the Receiving Party, required to be disclosed pursuant to Applicable Law (including any Freedom of Information Act request); *provided, however,* that the Receiving Party, prior to such disclosure, shall provide reasonable advance notice to the Disclosing Party of the time and scope of the intended disclosure in order to provide the Disclosing Party an opportunity to obtain a protective order or otherwise seek to prevent, limit the scope of, or impose conditions upon such disclosure.

(d) Notwithstanding the foregoing Seller may disclose Information to the Lenders (if any) and any other investors expressing an interest in providing equity or debt financing or refinancing and/or credit support to Seller, and the agent or trustee of any of them so long as the Lenders or such other investors agree to abide by confidentiality provisions which are substantially similar to those set forth in this Section 8.1.

(e) Neither Party shall issue any press or publicity release or otherwise release, distribute or disseminate any information with the intent that such information will be published (other than information that is, in the reasonable written opinion of counsel to the Disclosing Party, required to be distributed or disseminated pursuant to Applicable Law, *provided, however,* that the Party distributing or disseminating such information has given notice to, and an opportunity to prevent disclosure by, the other Party as provided in this Section 8.1) concerning this Agreement or the participation of the other Party in the transactions contemplated hereby without the prior written approval of the other Party of any such press or publicity release, which approval will not be unreasonably withheld or delayed.

(f) This Section 8.1 shall not prevent the Parties from releasing information which is required to be disclosed in order to obtain governmental permits, licenses, releases and other approvals relating to the Wind Project or which is necessary in order to fulfill such Party's obligations under this Agreement.

(g) The obligations of the Parties under this Section 8.1 shall remain in full force and effect for three (3) years following the termination of this Agreement.

8.2 ***Successors and Assigns; Assignment.***

(a) This Agreement shall inure to the benefit of and shall be binding upon the Parties and their respective successors and assigns. This Agreement shall not be assigned, assumed or transferred, in whole or in part by Buyer (whether by contract, operation of law, or as the result of corporate merger, consolidation, divestiture, split up, split off, spin off or similar transaction by which a resulting Person, whether an Affiliate of a Party or otherwise, purports to be entitled to the benefits and to performance of the obligations of this Agreement) without the prior written consent of the Seller, which shall not be unreasonably withheld or delayed. This Agreement shall not be assigned, assumed or transferred, in whole or in part by Seller without the prior written consent of the Buyer, which shall not be unreasonably withheld or delayed.

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(b) Notwithstanding the foregoing, no consent shall be required for:

(i) any assignment or transfer of this Agreement by Seller to an Affiliate of the Seller; and

(ii) any assignment to any Lenders as collateral security for obligations under the financing documents entered into with such Lenders; and

(iii) any assignment or transfer of this Agreement in whole or in part by Buyer to an Affiliate of the Buyer. Any assignment or transfer of this Agreement in whole or in part by Buyer to an Affiliate of Buyer pursuant to Section 8.2(b)(iii) shall be ineffective unless and until such Affiliate shall have received all Government Approvals required under Applicable Law with respect to such assignment or transfer and unless and until the Parent Guarantor has confirmed in writing and in advance of such assignment to Seller that the Buyer Parent Guarantee shall continue to be in full force and effect subsequent to such assignment. Any assignment or transfer of this Agreement in whole or in part by Buyer to an Affiliate of Buyer pursuant to Section 8.2(b)(iii) shall be ineffective in the event, by reason of such assignment or transfer, access to transmission rights by Buyer and its assignee is, in the opinion of the Seller exercised in a commercially reasonable manner, less favorable than that which existed prior to the effective date of the proposed assignment. Any assignment or transfer of this Agreement in whole or in part by Buyer to an Affiliate of Buyer pursuant to Section 8.2(b)(iii) shall be conditioned upon Buyer and such Affiliate executing an amended Power Purchase Agreement with Seller identical in terms to this Agreement; *provided however,* that such amended Power Purchase Agreement shall allocate purchase of Purchased Energy (and all obligations arising hereunder related thereto) between Buyer and such Affiliate as determined by Buyer.

(c) Buyer acknowledges that upon an event of default under any financing documents relating to the Wind Project, any of the Lenders may (but shall not be obligated to) assume, or cause its designee or a new lessee or Buyer of the Wind Project to assume, all of the interests, rights and obligations of Seller thereafter arising under this Agreement.

(d) If the rights and interests of Seller in this Agreement shall be assumed, sold or transferred as herein provided, and the assuming party shall agree in writing to be bound by and to assume, the terms and conditions hereof and any and all obligations to Buyer arising or accruing hereunder from and after the date of such assumption, Seller shall be released and discharged from the terms and conditions hereof and each such obligation hereunder from and after such date, and Buyer shall continue this Agreement with the assuming party as if such person had been named as Seller under this Agreement; *provided, however,* that if any of the Lenders assume this Agreement as provided herein, Buyer acknowledges and agrees that such Persons shall not be personally liable for the performance of such obligations hereunder except to the extent of the total interest of the Lenders in the Wind Project. Notwithstanding any such assumption by any of the Lenders or a designee thereof, Seller shall not be released and discharged from and shall remain liable for any and all obligations to Buyer arising or accruing hereunder prior to such assumption.

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(e) The provisions of this Section 8.2 are for the benefit of the Lenders as well as the Parties hereto, and shall be enforceable by the Lenders as express third-party beneficiaries hereof. Buyer hereby agrees that none of the Lenders, nor any bondholder or participant for whom they may act, shall be obligated to perform any obligation or be deemed to incur any liability or obligation provided in this Agreement on the part of Seller or shall have any obligation or liability to Buyer with respect to this Agreement except to the extent any of them becomes a party hereto pursuant to this Section 8.2.

8.3 ***Financing Liens.***

(a) Seller, without approval of Buyer, may, by security, charge or otherwise encumber its interest under this Agreement for the purposes of financing the construction and/or operation of the Wind Project and the Seller's Interconnection Facilities.

(b) Promptly after making such encumbrance, Seller shall notify Buyer in writing of the name, address, and telephone and facsimile numbers of each Lender to which Seller's interest under this Agreement has been encumbered. Such notice shall include the names of the account managers or other representatives of the Lenders to whom all written and telephonic communications may be addressed.

(c) After giving Buyer such initial notice, Seller shall promptly give Buyer notice of any change in the information provided in the initial notice or any revised notice.

(d) If Seller encumbers its interest under this Agreement as permitted by this Section 8.3, the following provisions shall apply:

(i) the Parties, except as provided by the terms of this Agreement, shall not modify or cancel this Agreement without the prior written consent of the Lenders, which consent shall not be unreasonably withheld, delayed or conditioned;

(ii) the Lenders shall have the right, but not the obligation, to perform any act required to be performed by Seller under this Agreement to prevent or cure a default by Seller and such act performed by the Lenders shall be as effective to prevent or cure a default as if done by Seller;

(iii) Buyer shall upon request by Seller execute statements certifying that this Agreement is unmodified (or, modified and stating the nature of the modification), in full force and effect and the absence or existence (and the nature thereof) of defaults hereunder by Seller and documents of consent to such assignment to the encumbrance and any assignment to such Lenders; and

(iv) upon the receipt of a written request from Seller or any Lender, Buyer shall, at Seller's reasonable cost and expense, execute, or arrange for the delivery of, such certificates, opinions and other documents as may be reasonably necessary in order for Seller to consummate any financing or refinancing of the Wind Project or any part thereof and will enter into reasonable agreements with such Lender, which agreements provide that Buyer recognizes the rights of such Lender upon foreclosure of the Lender's security interest and such other provisions as may be reasonably requested by any such

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Lender, *provided, however,* that any such agreement shall not constitute a modification hereof unless Buyer otherwise agrees in its sole discretion.

8.4 ***Notices.***

Each notice, request, demand, statement or routine communication required or permitted under this Agreement, or any notice or communication that either Party may desire to deliver to the other, shall be in writing and shall be considered delivered when received by the other Party by certified mail, facsimile or reputable overnight courier addressed to the other Party at its address indicated below or at such other address as either Party may designate for itself in a notice to the other Party.

If to Seller: [address]
[contact]
Telephone:
Facsimile:

If to Buyer: [address]
[contact]
Telephone:
Facsimile:

8.5 ***Force Majeure.***

Except for accrued obligations to pay money and other accrued rights and obligations, the performance of any obligation required hereunder shall be excused during the continuation of any Force Majeure Event suffered by the Party whose performance is required in respect thereof, and the time for performance of any obligation that has been delayed due to the occurrence of a Force Majeure Event; *provided, however,* (a) that the Party experiencing the delay shall notify the other Party of the occurrence of such Force Majeure Event and the anticipated period of delay within ten (10) Days after the commencement of the Force Majeure Event; (b) the suspension of performance shall be of no greater scope (in the manner in which it affects Seller's delivery of Energy or other obligations arising hereunder, or in the manner in which it affects Buyer's obligation to purchase Energy or other obligations arising hereunder) and of no longer duration than is reasonably required by the Force Majeure Event; and (c) the affected Party shall use all reasonable efforts to continue to perform its obligations hereunder and to correct or cure the event or condition excusing performance; *and provided further, however* if Buyer shall claim a Force Majeure Event under subclause (j) of the definition of "Force Majeure Event," and should Buyer, following such "Force Majeure Event," nevertheless enter into one or more arrangements to sell Purchased Energy to Persons in mitigation of the effects of such "Force Majeure Event," Buyer shall be obligated to notify Seller in accordance with Prudent Operating Practice as to the terms and conditions of such arrangements and pay to Seller not less frequently than once every thirty (30) Days during the term of the "Force Majeure Event" an amount equal to forty percent (40%) of the gross revenue received by Buyer under such arrangements. Each Party suffering a Force Majeure Event shall take, or cause to be taken, such action as may be necessary to void or nullify or otherwise to mitigate in all material respects the effects of any such Force Majeure Event.

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8.6 ***Amendments.***
This Agreement shall not be modified nor amended unless such modification or amendment shall be in writing and signed by authorized representatives of both Parties.

8.7 ***Waivers.***
Failure to enforce any right or obligation by any Party with respect to any matter arising in connection with this Agreement shall not constitute a waiver as to that matter nor to any other matter. Any waiver by any Party of its rights with respect to a default under this Agreement or with respect to any other matters arising in connection with this Agreement must be in writing. Such waiver shall not be deemed a waiver with respect to any subsequent default or other matter.

8.8 ***Waiver of Consequential Damages.***
Notwithstanding any other provision of this Agreement (except to the extent indemnification payments are made pursuant to Section 6.1 as a result of a third party being awarded special, indirect, incidental, punitive or consequential damages), neither Buyer nor Seller (nor any of their Affiliates, contractors, consultants, officers, directors, shareholders, members or employees) shall be liable for special, indirect, incidental, punitive or consequential damages under, arising out of, due to, or in connection with its performance or non-performance of this Agreement or any of its obligations herein, whether based on contract, tort (including, without limitation, negligence), strict liability, warranty, indemnity or otherwise.

8.9 ***Survival.***
Notwithstanding any provisions herein to the contrary, the obligations set forth in Section 8.1 and Article 6, and the limitations on liabilities set forth herein shall survive (in full force) the expiration or termination of this Agreement.

8.10 ***Severability.***
If any of the terms of this Agreement are finally held or determined to be invalid, illegal or void, all other terms of the Agreement shall remain in effect; *provided, however,* that the Parties shall enter into negotiations concerning the terms affected by such decision for the purpose of achieving conformity with requirements of any Applicable Law and the intent of the Parties.

8.11 ***Governing Law.***
This Agreement shall be interpreted and enforced in accordance with the laws of [_____] without regard its conflicts of laws provisions.

8.12 ***Resolution of Disputes.***
All disputes between the Parties arising under this Agreement that are not first able to be resolved in the manner otherwise provided in the preceding provisions of this Agreement shall be settled by arbitration in accordance with the Commercial Arbitration Rules of the American Arbitration Association in Houston, Texas. One independent arbitrator shall be selected by the each of the Parties, and the third arbitrator shall be chosen by the first two arbitrators chosen. The cost and expense of arbitration shall be shared equally by the Parties to the arbitration, regardless of which Party or Parties prevail, except that each Party shall bear the cost of its attorneys. The arbitration shall be conducted in accordance with the following time schedule unless otherwise mutually agreed to in writing by the Parties: (i) Parties to the arbitration proceeding shall each appoint their respective arbitrator within fifteen (15) Days after the end of

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the date of the other Party's notice of dispute; (ii) the appointment of the third arbitrator shall occur within five (5) Days thereafter; (iii) within ten (10) Days after the appointment of the third arbitrator, Parties to the arbitration proceeding shall provide all documents, records and supporting information reasonably necessary to resolve the dispute; and (iv) within thirty (30) Days (or as soon thereafter as reasonably practicable) after the date the above records are due, the arbitrators shall render their decision. The decision or award of the arbitrators shall be final and binding upon the Parties hereto to the same extent and to the same degree as if the matter had been adjudicated by a court of competent jurisdiction and shall be enforceable under the Federal Arbitration Act.

8.13 ***Waiver of Trial by Jury.***
Each of the Parties knowingly, voluntarily and intentionally waives the right any of them may have to a trial by jury in respect of any litigation based hereon, or arising out of, under or in connection with this Agreement and any agreement contemplated to be executed in conjunction herewith, or any course of conduct, course of dealing, statements (whether verbal or written) or actions of any Party hereto. This provision is a material inducement for the Parties entering into this agreement.

8.14 ***No Third-Party Beneficiaries.***
This Agreement is intended solely for the benefit of the Parties hereto. Except as set forth in Article 6 and in Sections 8.2 and 8.3, nothing in this Agreement shall be construed to create any duty to, or standard of care with reference to, or any liability to, or any benefit for, any person not a Party to this Agreement.

8.15 ***No Agency.***
This Agreement is not intended, and shall not be construed, to create any association, joint venture, agency relationship or partnership between the Parties or to impose any such obligation or liability upon either Party. Neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act as or be an agent or representative of, or otherwise bind, the other Party.

8.16 ***Cooperation.***
The Parties acknowledge that they are entering into a long-term arrangement in which the cooperation of both of them will be required. If, during the Term hereof, changes in the operations, facilities or methods of either Party will materially benefit a Party without detriment to the other Party, the Parties commit to each other to make reasonable efforts to cooperate and assist each other in making such change.

8.17 ***Further Assurances.***
Upon the receipt of a written request from the other Party, each Party shall execute such additional documents, instruments and assurances and take such additional actions as are reasonably necessary and desirable to carry out the terms and intent hereof. Neither Party shall unreasonably withhold, condition or delay its compliance with any reasonable request made pursuant to this Section 8.17.

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8.18 ***Captions; Construction.***
All indexes, titles, subject headings, section titles, and similar items are provided for the purpose of reference and convenience and are not intended to affect the meaning of the content or scope of this Agreement. Any term and provision of this Agreement shall be construed simply according to its fair meaning and not strictly for or against any Party.

8.19 ***Entire Agreement.***
This Agreement shall supersede all other prior and contemporaneous understandings or agreements, both written and oral, between the Parties relating to the subject matter of this Agreement.

8.20 ***Counterparts.***
This Agreement may be executed in several counterparts, each of which shall be an original and all of which together shall constitute but one and the same instrument.

8.21 ***Forecasting Service.***
Seller shall use commercially reasonable efforts to enter into an agreement (the "Forecasting Agreement") with a wind forecasting provider to provide hourly wind speed and hourly Energy predictions for the Site. The forecast will be provided twice daily (once in the morning and once in the afternoon) for each hour of the immediately following Day. Precise delivery times will be set forth, in coordination with the Buyer, in the Forecasting Agreement. Such predictions shall commence on the Commercial Operation Date and end on the last Day of the Term. Subject to the terms and conditions of the Forecasting Agreement, the twice daily predictions produced pursuant to the Forecasting Agreement shall be made available by the Seller to the Buyer in a mutually agreed upon manner at no cost to the Buyer. Seller shall have no liability to Buyer for inaccuracies in predicted wind speed and predicted Energy production or delivery. If requested by Seller, Buyer shall enter into an agreement among Buyer, Seller and the wind forecasting provider whereby Buyer agrees to treat the forecast data received as confidential and proprietary Information within the meaning of Section 8.1 of this Agreement.

IN WITNESS WHEREOF the Parties have executed this Agreement in the manner appropriate to each on the date set forth above.

[SELLER]	**[Buyer]**
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____

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SCHEDULE 1 TO MODEL PPA

CREDITS RETAINED BY SELLER

Any and all production tax credits available to generators of wind energy pursuant to the Internal Revenue Code Section 45, as the same may be amended, or any successor or similar provision

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EXHIBIT A TO MODEL PPA

DESCRIPTION OF WIND PROJECT

EXHIBIT B TO MODEL PPA

DESCRIPTION OF DELIVERY POINT

The delivery point is the high side of the transformer at a to be constructed [____] kV / [___] kV substation located in [_____].

EXHIBIT C TO MODEL PPA

DESCRIPTION OF SITE

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EXHIBIT D TO MODEL PPA

BUYER PARENT GUARANTEE

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Appendix E: Model Interconnection Agreement

This appendix contains a model Interconnection Agreement (IA). It is based on a standard IA used by a North American utility for interconnection with new power projects.

This model IA is presented as an example only. Readers are urged to consult their own legal counsel to ensure that their objectives will be achieved and their legal interests will be protected before entering into any binding agreement.

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TRANSMISSION INTERCONNECTION AGREEMENT

BETWEEN

[IC Provider]

AND

[GENERATOR NAME]

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SCHEDULE A – POINT OF INTERCONNECTION
SCHEDULE B - PROJECT INTERCONNECTION REQUIREMENTS ("PIR")

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THIS INTERCONNECTION AGREEMENT is dated _____, 200_.

BETWEEN:

[Interconnection Provider]

("IC Provider")

AND:

_____,

_____

(the "Generator")

WHEREAS:
(A) IC Provider owns and operates electrical generation and transmission and distribution facilities
in [_____]; and

(B) The Generator owns and operates certain electrical generation and transmission facilities in [_____] and wishes to interconnect with IC Provider transmission facilities; and

(C) IC Provider and the Generator enter into this IA to govern operational matters pertaining to the
interconnection of their respective facilities;

NOW THEREFORE THIS AGREEMENT WITNESSES THAT in consideration of the mutual agreements between the Parties and for other good and valuable consideration, IC Provider and the Generator agree as follows:

1. INTERPRETATION
1.1 Definitions
In this Agreement, the following words and terms will have the meanings ascribed to them in this Section 1.1, unless the context requires otherwise:

1.1.1 "Agreement" means this Interconnection Agreement, including the following Schedules (whether attached hereto at the time of execution or subsequently by agreement of the Parties), as the same may be amended from time to time in accordance with this Agreement or otherwise by agreement of the Parties:
(a) Schedule A: Point of Interconnection;
(b) Schedule B: Project Interconnection Requirements; and

1.1.2 "IC Provider System" means the generation, transmission, distribution, protection, control and communication facilities owned and operated by IC Provider in [_____], and includes all additions and modifications thereto and repairs or replacements thereof.

1.1.3 "Emergency" means any condition where, whether by reason of a forced outage or concern for a forced outage, or otherwise, there is an imminent risk of equipment failure, or of danger to personnel or to the public, or a risk to System security or reliability.

1.1.4. "Force Majeure" means any act of God, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, order, regulation or restriction imposed by governmental military or lawfully established civilian authorities, or any other cause, which are beyond a Party's reasonable control. A Force Majeure event does not include an act of negligence or intentional wrongdoing or lack of money or credit or economic hardship.

1.1.5 "Generator System" means the generation, transmission, protection, control, and communication facilities owned and operated by the Generator and includes all additions and modifications thereto and repairs or replacements thereof.

1.1.6 "Good Utility Practice" means any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method or act to the exclusion of all others, but rather to be acceptable practices, methods or acts generally accepted in [_____].

1.1.7 "Interconnection" means the facilities and procedures as described in this Agreement to permit the flow of electrical power from one Party's System to the other Party's System.

1.1.8 "Interconnection Requirements" means IC Provider's published "69 kV to 500 kV Interconnection Requirements for Power Generators" (January 2002), as the same may be amended from time to time.

1.1.9 "kV" means kilovolt or kilovolts.

1.1.10 "Operating Committee" has the meaning set out in Section 4.1.1 of this Agreement.

1.1.11 "Operating Order(s)" means the practices and procedures as agreed to and amended in accordance with Section 5.3.

1.1.12 "Party" means either IC Provider or the Generator as the context requires, provided that "Generation," as defined in Section 1.2 below, shall be deemed not to be a Party to this Agreement whether or not owned or operated by IC Provider; and "Parties" means both IC Provider and the Generator.

1.1.13 "PIR" or "Project Interconnection Requirements" means the specific requirements, contained in Schedule B as may be amended from time to time, for the Interconnection of the Generator's System to the IC Provider System which are based on the Interconnection

Requirements as well as on all plant-specific information provided by the Generator to IC Provider.

1.1.14 "Point of Interconnection" means the physical point of connection between the Generator System and the IC Provider System or such other point as the Parties may agree, as more fully described in Schedule A.

1.1.15 "System" means the IC Provider System or the Generator System as the context requires; and "Systems" means both the IC Provider System and the Generator System.

1.2 Interpretation
In this Agreement, except as otherwise expressly provided or as the context otherwise requires:

(a) headings and captions are for convenience only and are not intended as a guide to interpretation of this Agreement or any portion thereof;

(b) the word "include" or "including," when following any general statement or term, is not to be construed as limiting the general statement or term to the specific items or matters set forth or to similar items or matters, but rather as permitting the general statement or term to refer to all other items or matters that could reasonably fall within its broadest possible scope;

(c) words importing the singular number, where the context requires, include the plural and vice-versa and words importing the masculine gender include the feminine gender and the neuter and vice-versa, as appropriate;

(d) unless otherwise noted, a reference to a Section, Clause or Schedule means a Section, Clause or Schedule of this Agreement; and

(e) a reference to an entity includes any successor to that entity.

1.3 Severability
Wherever possible, each provision of this Agreement will be interpreted in such a manner as to be effective, valid and enforceable under applicable law. If any provision of this Agreement is or becomes illegal, invalid or unenforceable under applicable law, such provision will be deemed severed from this Agreement to the extent of such illegality, invalidity or unenforceability and its illegality, invalidity or unenforceability will not affect the legality, validity or enforceability of the remaining provisions of this Agreement, unless such illegality, invalidity or unenforceability materially or adversely affects the spirit or intent of this Agreement.

2. GENERAL

2.1 System Title/Risks/Responsibility
Each Party continues to have title to, and risk and responsibility for, its own System and the other Party assumes no proprietary interest in, or risk or responsibility whatsoever for that System under this Agreement. Nothing in this Agreement or its performance will affect the independent rights and duties of each Party to have at all times responsibility for and actual

physical control and possession of its System. Except as required by this Agreement, each Party will retain the right to independently plan, operate, and maintain its System to meet its obligations.

2.2 Rights of Both Parties
This Agreement does not limit any rights of either Party to enter into contracts or transactions with third-parties, provided such contracts or transactions will not require that Party to act in a manner which is inconsistent with its obligations under this Agreement or adversely affect the performance of such obligations.

2.3 System Costs
2.3.1 Any and all work, including all additions, modifications, replacements, operation, maintenance and repair carried out by a Party in respect of its System will be at its own cost, except as expressly provided in this Agreement or any other agreement between the Parties.

2.3.2 If the Generator changes any of the information provided for the development of the PIR, as described in Section 5.2.2 of this Agreement and, if as a result, IC Provider determines, acting reasonably, that it is necessary to amend the PIR to reflect the changes in the information, all IC Provider and Generator costs associated with such changes will be the responsibility of the Generator.

2.3.3 If IC Provider issues amended Interconnection Requirements, as described in Section 5.2.2 of this Agreement, and if as a result it may be necessary for IC Provider to change the PIR to reflect the amended Interconnection Requirements, all IC Provider and Generator costs associated with such changes will be the responsibility of IC Provider.

2.4 Changes to System
2.4.1 Subject to Section 2.4.2, the Generator will notify IC Provider of any addition, modification, repair or replacement of all or a portion of its System when such addition, modification, repair or replacement may alter or affect the operation of its System or the Interconnection.

2.4.2 Where any such additions, modifications, repairs or replacements can reasonably be expected to affect the IC Provider System or the Interconnection, the Generator will not undertake them without first submitting the proposed addition, modification, repair or replacement to IC Provider and obtaining the written consent of IC Provider to proceed, such consent not to be unreasonably withheld.

2.4.3 Notwithstanding any review or consent by IC Provider, the responsibility for any such additions, modifications, repairs or replacements will reside entirely with the Generator and any review or consent by IC Provider will not constitute an assumption of liability by IC Provider or relieve the Generator of any liability in respect of the additions, modifications, repairs or replacements and their effect on the IC Provider System and the Interconnection.

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2.5 No Other Services

2.5.1 This Agreement is applicable only to the Interconnection and does not obligate either Party to provide, or entitle either Party to receive, any service not expressly provided herein. Each Party is responsible for making the arrangements necessary for it to receive any other service that it may desire from the other Party or any third-party.

2.5.2 For certainty, the execution of this Agreement does not constitute a request for, nor the provision of, any transmission delivery service under IC Provider's standard tariffs or any local distribution service.

3. TERM AND TERMINATION

3.1 Term

This Agreement will commence and continue in force from the date first referenced at page one of this Agreement until terminated in accordance with this Agreement.

3.2 Termination

3.2.1 The Generator may terminate this Agreement after giving IC Provider thirty (30) days prior written notice.

3.2.2 If for any reason the Generator System is disconnected from the IC Provider System for an extended and prolonged period of time, and the Generator is not diligently pursuing efforts to reconnect, then without prejudice to either Party's rights, IC Provider may terminate this Agreement by providing sixty (60) days prior written notice to the Generator.

3.2.2 In addition, and notwithstanding the foregoing, this Agreement may be terminated in accordance with Sections 5.11.2 or 8.4, or by mutual agreement of the Parties.

3.3 Effect of Termination

3.3.1 The Parties acknowledge and agree that upon termination of this Agreement there will be no further obligation to remain interconnected and either Party will be entitled to disconnect its System from the other Party's System at any time thereafter. Notwithstanding the termination of this Agreement, all costs required to effectuate such disconnection will be borne by the terminating Party, unless such termination resulted from the non-terminating Party's default or breach of this Agreement in which case the non-terminating Party will bear all such costs.

3.3.2 Remaining interconnected after termination of this Agreement without execution of an agreement to replace this Agreement, will be under the terms and conditions of this Agreement until execution of a replacement agreement, but will not be considered or construed as an affirmation that either Party agrees that the terms and conditions of this Agreement are appropriate for a replacement agreement.

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4. OPERATING COMMITTEE

4.1 Constitution

4.1.1 The Parties will establish a committee (the "Operating Committee") composed of two (2) representatives from each Party to carry out the administration and operational aspects of this Agreement. Each Party will advise the other in writing of its initial appointment to the Operating Committee, and each Party will advise the other in writing of any replacements. Decisions regarding administration and the operation of the Interconnection under this Agreement will be made by mutual agreement between representatives of the Parties on the Operating Committee. Either Party may request the participation of a third-party at an Operating Committee meeting to provide advice and input on operational matters, provided always that the Parties both consent to such participation.

4.1.2 The Operating Committee will:
(a) exist for the duration of this Agreement;
(b) meet by mutual agreement, such agreement not to be unreasonably withheld or delayed;
(c) keep a written record of its meetings and determinations;
(d) require a minimum of one (1) representative from each Party to conduct a meeting;
(e) conduct its meetings at a mutually acceptable location or via telephone conference call; and
(f) act reasonably, and use all reasonable efforts to expeditiously resolve issues for which the Operating Committee is responsible.

4.2 Limited Authority of Operating Committee

4.2.1 The Operating Committee will:
(a) perform such functions as the Parties direct including preparing, reviewing, amending, issuing and commenting on the Operating Order(s) pursuant to Section 5.3, reviewing the PIR and recommending amendments pursuant to Section 5.2.2(b) and resolving and advising the Parties on other technical issues; and (b) make all reasonable efforts to resolve metering disputes as provided in Section 5.7.3.

4.2.2 Any technical advice provided by the Operating Committee will be in accordance with Schedule B and the Interconnection Requirements, provided that where such technical requirements do not anticipate a particular circumstance that arises, the technical advice provided will be in accordance with Good Utility Practice.

4.2.3 Except as expressly provided in this Agreement, the Operating Committee has no authority to amend this Agreement or to determine any matter which affects the ownership of either of the Systems or the rights of IC Provider and the Generator, at all times, to have actual physical control and independent possession of their respective Systems.

5. INTERCONNECTION OPERATION

5.1 Interconnection

5.1.1 Each Party will interconnect its facilities with the other's facilities at the Point of Interconnection in accordance with the terms and conditions of this Agreement. For certainty, as a condition of interconnecting, Generator must comply with commissioning procedures as determined by IC Provider.

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5.1.2 Each Party will maintain and operate its System, including its respective portions of the Interconnection, in accordance with Good Utility Practice and the provisions of this Agreement, or cause the same to be so maintained and operated.

5.1.3 Subject to the provisions of this Agreement, and in accordance with Good Utility Practice, the Parties will operate their Systems so that they remain interconnected at the Point of Interconnection.

5.2 Interconnection Requirements

5.2.1 Generator agrees to perform its obligations under, and to adhere to, the PIR as provided by this Agreement.

5.2.2 If at any time IC Provider issues amended Interconnection Requirements which impact the Interconnection or the Parties' respective Systems, or amendments are made by the Generator to the plant-specific information on which the PIR are based, then:

(a) IC Provider will provide the Generator with timely notice of any such amendments, or Generator will provide IC Provider with timely notice of any amendments to the plant-specific information, as the case may be;
(b) the Parties will seek recommendations from the Operating Committee and, based on such recommendations, will agree on any amendments to the PIR, as necessary, to reflect such changes; and
(c) the Generator will make reasonable efforts to adhere to any such amendments to the PIR in a timely way.

5.2.3 The Parties recognize that the PIR may not be fully complete at the execution of this Agreement. IC Provider will identify any information outstanding, which is required to complete the PIR, and the Generator will provide any such outstanding information to IC Provider in a timely manner.

5.3 Operating Order(s)

5.3.1 IC Provider and Generator will jointly develop, review and amend as necessary, through the Operating Committee as provided in Section 4, the Operating Order(s) with respect to the operation of the Interconnection. Any amendments to Operating Order(s) must be consistent with this Agreement and must be in writing.

5.3.2 The Operating Order(s) will, without limitation, establish operating authority boundaries and isolation procedures for the Generator System and the IC Provider System to ensure safe and consistent operation of those portions of each System, which are part of, or affect, the Interconnection. The Operating Order(s) may include the following items, as applicable:
(a) General information;
(b) Normal operation;
(c) Maintenance/forced outages;
(d) Force majeure/emergency operation;
(e) Operating authority;

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(f) Operating restrictions;
(g) Switching;
(h) Synchronizing;
(i) Protection;
(j) Metering;
(k) Station service/black start;
(l) Safety;
(m) Operating personnel;
(n) Contacts; and
(o) Retention of records.

5.3.3 Each Party will operate its portion of the Interconnection in accordance with all applicable Operating Order(s). In the event Operating Order(s) do not address a particular circumstance that arises, or an event of Force Majeure prevents the Parties from following an Operating Order, the Parties will act in accordance with Good Utility Practice.

5.3.4 IC Provider and Generator agree to provide each other a reasonable amount of time to adhere to any Operating Order(s) as may be amended in accordance with Section 5.3.1 and will make reasonable efforts to adhere to the amendments in a timely manner.

5.4 Planned Equipment Outages

5.4.1 The Parties will, to the extent it is reasonably practical and consistent with Good Utility Practice, coordinate planned equipment outages in the respective IC Provider and Generator Systems. A Party requesting a planned equipment outage will make reasonable efforts to ensure that such outages will be of minimal duration and cause minimal inconvenience to the other Party's System and will not impair the safe and reliable operation of the other Party's System.

5.4.2 Each Party will give the other Party reasonable prior notice of planned equipment outages and, in connection with each such planned equipment outage, either Party may disconnect, or require the disconnection of, its System from the other Party's System so that the employees, contractors or agents of the Party may construct, maintain, repair, replace, remove, investigate or inspect its System in accordance with the terms of this Agreement and Good Utility Practice.

5.5 Control of System Disturbances

Each Party will maintain and operate its System in accordance with Good Utility Practice so as to minimize the likelihood of creating a disturbance, which may cause impairment to the operation of the other Party's System. Each Party will take appropriate action to reduce the transfer of any disturbance to the other Party's System to within the limit prescribed by Good Utility Practice without delay after commencement of such disturbance.

5.6 Reactive Power

The Generator will adhere to the reactive power requirements of the PIR. IC Provider may request that the Generator adjust the var output of its generation facilities from time to time depending on system conditions. The Generator will use reasonable efforts to comply with all such requests that are within the range of such reactive power requirements.

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5.7 Metering

5.7.1 Standards, Testing and Access: Meters required to be installed under this Agreement will meet the standards set out in the *Electricity and Gas Inspection Act*, R.S.C. 1985, Ch.E-4, and any regulations made thereunder, as the same may be amended or replaced from time to time (the "*EGIA*"). Each Party will, at its own cost, test such meters as frequently as required pursuant to the *EGIA*. If requested to do so by one Party, the other Party will make additional tests or inspections of its metering equipment. The requesting Party will pay for such additional tests and/or inspections provided that, in the event that the additional tests or inspections find that a meter registers an error greater than one (1) percent, such additional tests and/or inspections will be at the expense of the other Party. Each Party will give the other Party reasonable notice of the time when any test or inspection pursuant to this Section 5.7.1 is to be made, and the other Party will have the right to have a representative present at such test or inspection.

5.7.2 Meter Failure: If any meter installed under this Agreement fails to register, or if any meter registers an error greater than one (1) percent, the inaccurate meter will be immediately repaired or replaced by the Party owning it.

5.7.3 Dispute: Notwithstanding Section 10, in the event of a dispute with respect to this Section 5.7, the Parties will resolve such dispute by reference to the Operating Committee, as described in Section 4.

5.8 Exchange of Information

5.8.1 Exchange of Information: IC Provider and the Generator will exchange, in a timely manner, all information reasonably required for the coordinated operation of the Interconnection, including such further information as may be reasonably required to meet obligations to any organization of which one or both Parties are members and which imposes upon it or them an obligation to collect information for submission to that organization.

5.8.2 Cost of Providing Information: Each Party will be responsible for the costs incurred by it in providing any information reasonably required under this Agreement.

5.8.3 Liability for Data: Each Party will use reasonable efforts to provide accurate information pursuant to this Section 5.8. However, any information provided for submission to an organization of which one or both Parties are members will be relied on by the recipient at its sole risk and the providing Party will have no liability for any inaccuracy in the information provided.

5.9 Site Access

If IC Provider requires access to any part of the Generator's System related to the Interconnection, then it will deliver prior notice to the Generator and the Generator will reasonably provide such access.

5.10 Immediate Disconnection

5.10.1 Notwithstanding any other provision of this Agreement,

(a) in an Emergency, either Party will be entitled to take such action, including disconnection, as it may reasonably determine to be appropriate; and

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(b) IC Provider may disconnect, or require the disconnection of, the Generator System from the IC Provider System if IC Provider discovers material deficiencies in the quality of electricity relative to the requirements of this Agreement, which, in accordance with Good Utility Practice, require the
disconnection of the Generator System to protect the IC Provider System, equipment and/or customers.

5.10.2 The Party requiring the disconnection will notify, in a timely manner, the other Party of the disconnection, and such notice will, as reasonably possible, be given in advance. The disconnecting Party will give the other Party the reasons for such disconnection.

5.10.3 The Generator System will be reconnected to the IC Provider System as soon as reasonably practicable, provided that any deficiencies are rectified to the reasonable satisfaction of IC Provider.

5.11 Failure to Comply with Section 5 Requirements

5.11.1 If the Generator fails to comply with any requirement of this Section 5 and, in the reasonable opinion of IC Provider, such non-compliances requires the disconnection of the Generator's System in order to protect IC Provider's System, equipment and/or customers, IC Provider will have the right to disconnect, or require the disconnection of, its System from the Generator's System, provided that:

(a) IC Provider first gives the Generator written notice of its intent to disconnect and the Generator fails to comply with the applicable requirements of this Section 5 to the reasonable satisfaction of IC Provider within thirty (30) days after such notice is given; and,
(b) such right to disconnect will be suspended as long as the Generator is diligently pursuing corrective action in accordance with Good Utility Practice.

5.11.2 If IC Provider disconnects the Generator in accordance with Section 5.11.1 and the Generator has not demonstrated compliance within one (1) year from the disconnection, IC Provider may terminate this Agreement upon no less than sixty (60) days prior written notice to the Generator.

6. LIMITATION ON LIABILITY

6.1 Consequential Damages

Neither Party, nor its employees or agents, will be liable to the other Party, or its employees or agents, under or in relation to this Agreement, for any indirect or consequential damages, injury or loss suffered by that other Party or its employees or agents, including loss of profits, loss of revenue, cost of capital, cost of purchased or replacement capacity or energy, and loss of use of any facilities, property or equipment. For certainty, this limitation on liability applies only to this Agreement and shall not be interpreted as extending to any other agreement which may exist between the Parties.

7. FORCE MAJEURE

7.1 Performance Excused for Force Majeure

Neither Party will be considered in default as to any obligation under this Agreement to the extent it is prevented from fulfilling the obligation due to an event of Force Majeure. However, a

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Party whose performance under this Agreement is hindered by an event of Force Majeure will make all reasonable efforts to perform its obligations under this Agreement and make all reasonable efforts to remedy the Force Majeure with reasonable dispatch, provided that settlement of strikes, lockouts and other labor disturbances will be wholly within the discretion of the Party involved.

7.2 Notice

If there is a Force Majeure event affecting a Party's ability to perform its obligations under this Agreement, the affected Party will promptly notify the other Party of the occurrence of the Force Majeure event, identifying the nature of the event, its expected duration and the particular obligations affected. The affected Party will furnish to the other Party reports with respect to the Force Majeure event at such intervals as the other Party may reasonably request during the continuance of the Force Majeure event.

7.3 Termination for Extended Force Majeure

If an event of Force Majeure continues uninterrupted for a period which exceeds 180 continuous days, then either Party may terminate this Agreement by giving the other Party no less than sixty (60) days prior written notice of its intention to terminate this Agreement. Notwithstanding the foregoing, this Agreement will not be terminated if an event of Force Majeure is of a nature that is reasonably correctable, and the Party claiming Force Majeure is making all reasonable efforts to end or alleviate the Force Majeure event.

8. REGULATORY APPROVALS

8.1 Obtaining and/or Maintaining Approvals

The obligations of the Parties under this Agreement are subject to each Party obtaining and maintaining regulatory approvals, if any, necessary for performance of this Agreement. The Parties agree to use all reasonable efforts to obtain and maintain such regulatory approvals and to cooperate with and assist one another as reasonably necessary in seeking the necessary approvals.

9. DISPUTE RESOLUTION

9.1 Notice of Disputes

In the event any dispute, claim, question or difference (a "Dispute") arises with respect to this Agreement or its performance, enforcement, breach, termination or validity, such Dispute will be resolved in accordance with this Section 9. The Party claiming a Dispute will provide written notice to the other Party.

9.2 Amicable Resolution

The Parties will make reasonable efforts through or by their respective senior executives to amicably resolve any Dispute within sixty (60) days of receipt of the notice provided under Section 9.1.

9.3 Arbitration

In the event the Parties are unable to resolve a Dispute in accordance with Section 9.2, the Dispute will be referred to and finally settled by arbitration by a single arbitrator agreed to by the

Parties. The arbitration will be in accordance with the [_____] , as the same may be amended or replaced from time to time, and will take place at [_____]..

9.4 Performance During Dispute Resolution
While attempts are being made to resolve a Dispute, the Parties will continue to perform all obligations under this Agreement with due diligence and will continue to comply with all terms of this Agreement and neither Party will commence any proceedings whatsoever against the other Party in connection with respective rights or liabilities under this Agreement.

9.5 Costs of Dispute
Each Party will be responsible for all costs (except the fees of the arbitrator, which will be apportioned between the Parties as determined by the arbitrator) incurred by it in resolving any Dispute under this Section 9.

10. NOTICES
10.1 Method of Service
Except for any notices or information given or exchanged in connection with the Operating Committee or notice relating to Emergencies or Force Majeure events which will be given in a more expedient manner by telecommunication (including, telephone conversation, facsimile transmissions, or internet e-mail), such telecommunication to be promptly confirmed in writing, any notice, approval, direction or request required or permitted to be given hereunder will be in writing and will be given by hand delivery, facsimile, or by registered letter, postage fully prepaid, addressed to:

10.1.1 If to IC Provider:
[address]
Attention:
Facsimile No.:

10.1.2 If to the Generator:
[address]
Attention:
Facsimile No.:

10.2 Deemed Receipt
Notice by mail will be deemed received on the date of actual delivery. Notice by facsimile or hand delivery will be deemed to have been received by the close of the business day on which it was transmitted or delivered (unless transmitted or delivered after the close of the business day in which case it will be deemed received at the close of the next business day).

11. GENERAL PROVISIONS
11.1 Confidentiality
11.1.1 The PIR, any information disclosed related to the PIR and any information disclosed pursuant to Section 5.8.1 of this Agreement will be considered confidential, whether expressly designated as such or not, and will be kept confidential by the Parties. Such confidential information will not be disclosed by a Party (the "Disclosing Party") to any third-party, except:

(a) to consultants or other advisors of the Disclosing Party on a need to know basis;
(b) if such information has entered the public domain (other than through the actions of the Disclosing Party) or if such information is the Disclosing Party's own confidential information;
(c) as required by law or any authority having jurisdiction;
(d) with the prior written consent of the other Party; or
(c) as the Parties may otherwise agree.

11.1.2 If either Party receives a request from any third-party for any such confidential information, that Party will promptly notify the other Party of the request and will protect the other Party's confidential information using a reasonable degree of care.

11.2 Governing Law
This Agreement and all questions arising under it will for all purposes be governed by and construed in accordance with the laws of [_____].

11.3 Assignment
No Party will assign this Agreement, in whole or in part, unless it obtains the prior written consent of the other Party. Such consent will not be unreasonably withheld or delayed.

11.4 Non-Waiver
No waiver by any Party of any breach of any of the covenants, provisos, conditions, restriction or stipulations contained in this Agreement will take effect or be binding upon that Party unless the same be expressed in writing under the authority of that Party's duly authorized representative, and any waiver so given will extend to the particular breach so waived and will not limit or affect any rights with respect to any other or future breach. No failure by any Party to take action in the event of any breach of any of the covenants, provisos, conditions, restriction or stipulations contained in this Agreement will be construed as a waiver of that Party's right to take such action as this Agreement or the law permits and will not limit or affect any rights with respect to any other or future breach.

11.5 Enurement
The provisions of this Agreement will enure to the benefit of and be binding upon the Parties and the successors and permitted assigns of each Party.

11.6 No Partnership
Nothing contained in this Agreement will be construed as creating a partnership, joint venture or agency between the Parties.

11.7 Amendments
Except as otherwise expressly provided in this Agreement, this Agreement may only be amended by written agreement of the Parties.

11.8 Further Assurances
During the term of this Agreement, each Party will execute, acknowledge and deliver such other instruments and will take such other action as may be necessary to carry out its obligations under

this Agreement, and to allow the other Party to carry out its obligations and rights under this Agreement.

11.9 Entire Agreement
This Agreement constitutes the entire agreement between the Parties with respect to the operation of the Interconnection and supersedes and replaces any and all prior agreements, negotiations, understandings, or representations with respect to the subject matter of this Agreement.

11.10 Conflicts
Should any term or provision of this Agreement conflict with the language of any other agreement between the Parties, the terms and provisions of this Agreement will govern with respect to any operational issues related to the Interconnection.

11.11 Execution in Counterparts
This Agreement may be executed in any number of counterparts, each of which when delivered will be deemed to be an original and all of which together constitute one and the same document and agreement.

IN WITNESS WHEREOF, each signatory having been appropriately authorized to enter into this Agreement on behalf of the Party for whom they sign, the Parties have caused this Agreement to be executed by their respective duly authorized representatives.

[IC Provider]	[Generator]
Per: _____	Per: _____
Title: _____	Title: _____
Date: _____	Date: _____

00002097

Appendix F: Generic Wind Power Project Economic Model

A wind energy economic model may be used by different entities in a number of ways.

- ***Utilities:*** to understand the cost of energy produced by a wind power project, and to evaluate whether to own a project or participate by purchasing the energy a project produces.
- ***Governments:*** to understand the implications that various tax policies or financial incentives have on project feasibility, and to evaluate what power purchase prices are necessary to provide reasonable financial returns to project investors.
- ***Equity Investors and Banks[45]:*** to evaluate their expected return on investment, to examine "what if" scenarios to test their returns if certain unplanned events occur, and to examine what combination of equity investment, loan amount, and loan interest rates result in an acceptable financing package.
- ***Project Developers[46]:*** to evaluate project feasibility early in the development process, and to refine the feasibility assessment as additional cost and revenue details become known.

F.1 Model Overview

A sample model has been developed as part of this Toolkit to illustrate the fundamentals of wind project economics. The model includes simplified assumptions and represents only one potential approach to evaluating project economics. Also, the model is based largely on U.S. experience; it may be appropriate to modify it for different conditions, or to simply put "0" in any assumption that does not apply.

The spreadsheet model was created in Microsoft Excel, and is usable in versions 95, 97, 2000, and 2002. In the spreadsheet, entries in blue are considered inputs to the model. In other words, these cells contain numerical assumptions that may be changed to evaluate alternative scenarios. Cells in black are calculations based on the model inputs in blue. Black cells are not intended to be modified and should be changed only if the user is altering the overall structure of the model.

The model is divided into three sections: Input Assumptions, Intermediate Calculations and Results, and Pro Forma Operating Results. Each of these sections is described below.

[45] Equity investors pay money for ownership of the project, while banks loan money to projects. Equity investors typically want the biggest loan they can get (to reduce their required cash investment), while banks considering a loan on a project typically want to limit the loan amount so that a reasonable amount of equity is "at risk" to ensure the project is managed correctly. Both depend on the project to work properly to obtain a return on their investment, but the risk and reward profiles are different.

[46] Project developers put the various pieces of a project together by finding and studying a suitable location, arranging utility interconnections, arranging for sale of the power, designing the project, arranging financing, buying wind turbines, and contracting for construction and operations. Project developers may or may not keep an equity interest in a project after it is completed.

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F.1.1 Input Assumptions

Eighteen basic assumptions "drive" the analysis. Each assumption is described in Table F-1. Some assumptions describe the project (size in MW, capacity factor), while others address costs (construction costs, operations costs, land lease costs), revenues (power sales, government incentives), financing (loan amount, interest rate), and tax considerations.

In evaluating an actual project, some of the inputs to the model may be defined early in the development process, while others will only become known after significant effort and expenditure of resources for the specific project. For example, a land lease may be negotiated with a landowner with provisions to pay 2% of gross revenues to the landowner each month (thus defining the proper input at Row 8), but the gross revenue may not be calculated until (1) wind data is collected and analyzed, (2) specific turbine models are chosen, (3) project layouts are developed, (4) energy losses are calculated, (5) net energy estimates and capacity factors for the project are developed, and (6) the power purchase prices are established.

Model assumptions and inputs can be determined with additional certainty only as development steps are completed. The development process includes:

- Site identification
- Negotiation of land lease (typically) or land purchase (less typically)
- On-site meteorological studies
- Site layout and basic design
- Local land use permitting
- Negotiation of power purchase agreement (PPA)
- Negotiation of utility interconnection agreement (IA)
- Negotiation of wind turbine supply and warranty agreements
- Negotiation of project operations and maintenance agreement
- Final design of facility
- Negotiation of construction contract
- Awarding of any government grants or incentives to the project
- Additional knowledge as to proper application of depreciation and tax issues
- Construction

00002039

Table F-1. Discussion of Model Input Assumptions

Row	Name	Starting Assumption	Typical Range	Comments
4	Project capacity	80 MW	15 to 200	80 MW could consist of 40 wind turbines at 2 MW each, or 121 at 750 kW each
5	Average capacity factor	34%	25% to 40%	Typically derived from studying the wind resource at the site and the type of wind turbine to be used. Capacity factor is calculated by dividing the energy produced during a year (or other time period) by the amount of energy that would have been produced if the facility operated at full output for the entire year.
6	Turnkey construction cost	US$1050 per kW of installed capacity	900 - 1250	Includes site identification, feasibility studies, engineering, permitting, legal fees, loan fees, wind turbine and balance-of-plant equipment, utility interconnection, construction, startup, loan origination fees.
7	Operations, maintenance, management cost	US$40 per kW of capacity per year	Can vary widely	Includes labor, parts, insurance, property taxes, utilities, administration. Ideally, this entry should be built up from individual components, as shown in Table F-2.
8	Land lease cost	2% of gross revenues	1% to 4%	Sometimes based on a flat fee per year, or formulas more complex than a percentage of gross revenues.
9	Energy sales price	US$49 per MWh	35 – 60	US$49 per MWh is equal to 4.9¢/kWh. Assumed to continue for 20 years with inflation each year per next Row's assumption.
10	Annual increase in energy sales price	1.0% per year	0% - 3%	No inflation (0%) common. May also be tied to other indices, or have a stepped pricing structure.
11	Government incentive or other sales price	US$8 per MWh	0 – 25	Typical of subsidies provided by state or local government, or from the sale of environmental attributes.
12	Years of government incentive or other sales	10 years	0 – 10	
13	Income tax rate	35%	Varies	Applied to net earnings of the project after deducting interest and depreciation. Assumes any credit from a negative taxable income is valued to the taxpayer in the current year, not carried forward to the next year, which is less valuable.
14	Percent of project cost financed by loan	65%	33% - 67%	Remainder of project cost assumed funded by cash (equity).
15	Loan interest rate	8.0%	Varies	Can vary widely based on perceived risk, market conditions, inflation, term of loan, debt service coverage ratios, and other factors.
16	Loan term	15 years	15 – 20 years	

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Row	Name	Starting Assumption	Typical Range	Comments
17	Assumed rate of cost inflation	2% per year	Varies	Project operations, maintenance, and management costs assumed to increase by this amount each year.
18	Asset depreciation term	20 years, straight line	Varies	Although wind power projects typically have a useful life of 15 to 30 years, various accelerated depreciation methods may be applied, depending on applicable tax law. For example, a project may qualify for a 5-year Modified Accelerated Cost Recovery System (MACRS) depreciation schedule, which allows for 20%, 32%, 19%, 12%, 12%, and 6% depreciation over 6 tax years, rather than the 5% per year with the 20-year, "straight line" depreciation assumed. Accelerating depreciation generally increases the value of the project.
19	Wind energy tax credit	US$0 per MWh (i.e., no tax credit assumed)	Varies	This tax credit is applied to reduce the income tax owed by the project owner. It is assumed that any tax credit is usable in the current year to offset any other taxes owed by the project owner. If this is not the case, the tax credit would generally be carried forward to the next year, and thus be less valuable to the project owner.
20	Annual increase in wind energy tax credit	1.5%	Varies	
21	Years of wind energy tax credit	10	Varies	

It should be noted that many of the assumptions and calculations in this particular model are based on typical industry experience and are appropriate for use only in generalized economic evaluations. For actual project evaluations, more detailed assessment of individual cost components are required to obtain realistic results. For example, operations, maintenance, and management costs in the model (Row 7) assume an expense of US$40/kW per year, escalated each year by 2% (Row 17). Thus, the first-year cost for an 80 MW project would be $3,200,000, and the second year cost would be $3,264,000. Table F-2 shows an example of a more detailed cost breakdown that would be developed for the analysis of an actual proposed project.

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Table F-2. Cost Breakdown for Annual Operations, Maintenance and Management of an 80 MW Wind Project
(representative example)

	Year 1	Year 2	Year 3
Operations, scheduled maintenance, warranty	$1,500,000	$1,600,000	$1,700,000
Replacement parts	300,000	320,000	350,000
Insurance	400,000	410,000	420,000
Property taxes	650,000	573,000	460,000
Interconnection fees	150,000	154,000	159,000
Utilities	120,000	125,000	130,000
Administration	80,000	82,000	85,000
Total	3,200,000	3,264,000	3,304,000
Total US$/kW	40.00	40.80	41.30

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F.1.2 Intermediate Calculations and Results

Table F-3 shows the calculations that are automatically made by the Excel spreadsheet based on the input assumptions discussed above. It includes a row-by-row description of both the calculations and the key results.

Table F-3. Description of Intermediate Calculations and Results

Row	Name	Initial Calculated Value	Formula	Comments
24	Project capital cost	$84,000,000	(Row 4) X (Row 6) X 1000	Project capacity X Turnkey construction cost X 1000
25	Amount of loan	$54,600,000	(Row 24) X (Row 14)	Project capital cost X Percent of project cost financed by loan
26	Amount of equity invested	$29,400,000	(Row 24) - (Row 25)	Project capital cost - Amount of loan
27	First year operations, maintenance, management	$3,200,000 per year	(Row 7) X (Row 4) X 1000	Operations, maintenance, management cost X Project capacity X 1000
28	Annual energy production	238,272MWh per year	(Row 4) X (8760) X (Row 5)	Project capacity X 8760 hours per year X Average capacity factor
29	First year energy sales revenue	$11,675,000 per year	(Row 28) X (Row 9)	Annual energy production X Energy sales price
30	Minimum debt service coverage ratio	1.37	Minimum of (Row 57) in pro forma	Does not consider value or "monetization" of any tax credits. Typically must be at least 1.20 to 1.40.
31	Average debt service coverage ratio	1.54	Average of (Row 57) in pro forma	Does not consider value or "monetization" of any tax credits. Typically must be at least 1.30 to 1.50.
32	Before tax unleveraged return on investment	10%	Calculated based on the Internal rate of return (IRR) of (Row 50) in pro forma	Pre-tax rate of return assuming entire project is paid for with cash (does not consider the loan)
33	Before tax leveraged return on investment	13%	Calculated based on the Internal rate of return (IRR) of (Row 66) in pro forma	Pre-tax rate of return considering affect of loan
34	After tax leveraged return on investment	9%	Calculated based on the Internal rate of return (IRR) of (Row 85) in pro forma	After-tax rate of return considering affect of loan, tax liabilities, and tax credits.

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F.1.3 Pro Forma Operating Results

This section describes the calculations and results of the year-by-year pro forma, or the projected operating results of the project. In the model, these results, except for ratios and percentages, are expressed in thousands of dollars. Table F-4 summarizes the results of the example pro forma.

Table F-4. Discussion of Pro Forma Results

Row	Name	Comments
37	Year	20-year project evaluation assumed. Year 0 is the year of construction, year 1 is the first year of operations.
38	Energy sales inflation factor	Applies the assumed energy sales price inflation rate (Row 10) each year. For example, a factor of 1.04 means that prices are 4% higher than the first year.
39	Cost inflation factor	Applies the assumed cost inflation rate (Row 17) each year.
40	Tax credit inflation factor	Applies the assumed tax credit inflation rate (Row 20) each year.
42	Revenues and expenses	Revenues are denoted as positive numbers, expenses as (negative numbers).
43	Energy sales	Calculated as First year energy sales revenue (Row 29) X Energy sales inflation factor (Row 38).
44	Government incentive or other sales	Calculated as Annual energy production (Row 28) X Government incentive or other sales price (Row 11). Becomes 0 after the number of years assumed at (Row 12).
45	Operations, maintenance, management	Cost of operating and maintaining the facility. Calculated as First year operations, maintenance, management (Row 27) X Cost inflation factor (Row 39).
46	Land lease payment	Payment made to landowner. Calculated as Sum of Energy Sales (Row 43) and Government incentive or other sales (Row 44) X Land lease cost (Row 8).
47	Net revenue before loan payments	Calculated as the sum of revenues less expenses.
49	Pre-tax unleveraged return on investment	Calculation of the internal rate of return (IRR) of the project, assuming no loan and no tax considerations.
50	Cashflow	The Project capital cost (Row 24) is incurred in year 0. Then, each year's Net revenue before loan payments (Row 47) is applied.
51	Rate of return	Calculated as the 20-year rate of return on the investment, considering the cost in year 0 and the revenues in years 1 to 20.
53	Loan payments	This section covers the amortization of the principal and interest on the loan. It is assumed that the loan is "level amortized" such that the total payment is the same each year, and that calculations are made once per year.
54	Principal amount, start of year	Amount of loan owed at the start of the year.
55	Interest paid	Interest payment due. Calculated as Principal amount, start of year (Row 54) X Loan interest rate (Row 15).

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Row	Name	Comments
56	Principal paid	Amount that the outstanding principal owed on the loan is reduced. Calculated as Total loan payment (Row 57) – Interest paid (Row 55).
57	Total loan payment	Total of principal plus interest paid. Calculated using the spreadsheet payment function given the interest rate, number of years to complete payments, and the initial principal amount.
59	Principal amount, end of year	Amount of loan owed at the end of the year. Calculated as Principal amount, start of year (Row 54) - Principal paid (Row 56).
61	Debt service coverage ratio	The amount of cash available to pay debt service divided by required payment. This is an indication of how much "cushion" is available to make the required payment. Calculated as Net revenue before loan payment (Row 47) divided by Total loan payment (Row 57).
63	Net revenue after loan payment	Cash available after paying expenses and loan payments. Calculated as Net revenue before loan payment (Row 47) – Total loan payment (Row 57)
65	Pre-tax leveraged return on investment	The internal rate of return (IRR) of the project, considering the effects of the loan but not tax considerations.
66	Cashflow	The Project capital cost (Row 24) minus the Amount of loan (Row 25) is incurred in year 0. Then, each year's Net revenue after loan payment (Row 63) is applied.
67	Rate of return	The 20-year rate of return on the investment, considering the cost in year 0 and the revenues in years 1 to 20.
69	Tax considerations	This section addresses tax implications for the investment. Taxes to be paid represent a loss of revenue to the project owner. Tax credits represent additional income to the project owner. (In any year, a tax credit generated by the project is assumed to reduce the tax liability of the project owner due to other income-producing activities.)
70	Net revenue before loan payments	(Row 47).
71	Interest deduction	Interest paid (Row 55); assumed to be deductible from income taxes.
72	Depreciation deduction	Project capital cost (Row 24) divided by Asset depreciation term (Row 18). Becomes 0 after the assumed depreciation term (Row 18).
73	Income tax basis	Calculated as Net revenue less interest deduction less depreciation deduction. Positive number means net income for which tax will be due. (Negative number) means loss for which a credit against other taxes due will be assumed.
75	Income tax credit or (paid)	Income tax basis (Row 73) X Income tax rate (Row 13). Positive number means a credit to the project owner. (Negative number) means a tax payment which the project owner must make to the taxing authority.

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Row	Name	Comments
76	Wind energy tax credit	Credit against income tax for owners of wind energy facilities, calculated as Wind energy tax credit, first year of sales (Row 19) X Tax credit inflation factor (Row 40). Becomes 0 after the number of years assumed at (Row 21).
77	Net income tax credit or (paid)	Calculated from (Row 75) and (Row 76). Positive number means a credit to the project owner. (Negative number) means a tax payment which the project owner must make to the taxing authority.
79	After-tax income calculation	This section combines the pre-tax income with the tax considerations, to determine the project owner's net after-tax results.
80	Pre-tax income	(Row 66).
81	Income tax credit or (paid)	(Row 77).
82	After-tax income or (loss)	Sum of (Row 80) and (Row 81). Positive number means the project owner "made money" that year. (Negative number) means the project owner "lost money" that year.
84	After-tax leveraged return on investment	Calculation of the internal rate of return (IRR) of the project, considering the effects of the loan and taxes.
85	Cashflow	The Project capital cost (Row 24) minus the Amount of loan (Row 25) is incurred in year 0. Then, each year's After-tax income (or loss) (Row 82) is applied.
86	Rate of return	Calculated as the 20-year rate of return on the investment, considering the cost in year 0 and the revenues in years 1 to 20.

Potential participants in a project will tend to focus their attention at the following sections of the economic analysis:

- ***Equity investors (partial owners of the project):*** The amount of equity invested (Row 26) and rate of return (Rows 51, 67, and 86, also repeated at Rows 32, 33, and 34). Equity investors want to balance the risk associated with their investments against their returns.
- ***Lenders:*** Annual debt service coverage ratio (Row 61), minimum and average debt service coverage ratios (Rows 30 and 31), percent of project cost financed by loan (Row 14), and amount of equity invested (Row 26). Lenders want to ensure a high likelihood of getting the loan repaid. Government-associated development banks may also invest for economic development, social good, and other factors, but they still examine the economic fundamentals of a prospective project.
- ***Government participants:*** Project capacity (Row 4) and project capacity factor (Row 5). For whatever consideration offered by a government entity, government participants typically are motivated to install a certain amount of capacity, and to have that capacity, once installed, generate the most amount of energy.

When examining economic results, it is important to consider that models generally use average values for each year in a project's life. However, large deviations from these averages are likely

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in any given year because of variation in factors such as annual average wind speed (high and low wind years) or in project availability due to equipment failures, accidents, or acts of nature.

F.1.4 Pro Forma Sensitivity Case Results

Economic modeling generally includes a "base case" set of results and assumptions based on the most likely scenarios and inputs. However, to account for uncertainties in the assumptions, additional modeling commonly is performed to determine the sensitivity of the base case results to changes in the assumptions. The spreadsheet model allows for easy performance of sensitivity studies in addition to the base case evaluation. This section discusses and provides examples of sensitivity cases. Consider the following scenarios:

- In the base case Toolkit example, no wind energy tax credit (Row 19) was included. If a wind energy tax credit is assumed to be US$18 per MWh for 10 years (and no other changes are made to input assumptions), the after-tax leveraged return on investment changes from 9% (base case) to 24% (sensitivity case). If an investor required a 12% after-tax return on investment, this could be obtained (through trial and error) by lowering the first-year energy sales price (Row 9) to US$35 per MWh,[47] and by reducing the percent of project cost financed by the loan (Row 14) to 50%. In this case, the portion of project costs funded by the loan had to decrease in order to keep cash flows positive after payment of the loans. However, the minimum debt service coverage ratio (Row 30) is lower than typical standards, so it may be difficult to obtain such a loan without further reducing the loan amount, increasing the power purchase price, or making other changes to the assumptions.

- The base case assumed a capacity factor of 34% (Row 5). If the project operated at a capacity factor of 30% instead, the model shows 8% and lower returns on investment (Rows 32, 33, 34), and it is unlikely that such an investment would be made unless other changes, such as reduced costs, or higher power sales prices, were obtained.

- The base case assumed 20-year depreciation of project assets for tax purposes (Row 18). If this is changed to 5 years, the after-tax leveraged return on investment changes from 9% (base case) to 16% (sensitivity case). For many investors, this relatively simple change in tax treatment takes a project that is unattractive and makes it attractive.

- The base case assumed a loan at 8% interest over 15 years (Rows 15 and 16). If financing were available at 6% interest over 20 years instead, the after-tax leveraged return on investment changes from 9% (base case) to 13% (sensitivity case). This shows that, all other things being the same, provision of lower cost loan programs, such as may be available from government development banks, may make a project economically attractive to private investors.

Many other sensitivity cases, or combinations of sensitivity cases, can be evaluated. For example, scenarios could be developed to examine:

[47] This demonstrates how a tax credit could lower the effective cost of energy purchased by a utility if such a tax credit were applicable to a project.

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- The impact of changing monetary exchange rates on the cost of equipment and construction. A weaker local monetary unit will tend to drive up prices for hardware sourced elsewhere, and thus, all other things being equal, force higher power purchase prices or lower investor returns.
- The impact of higher required investor returns for emerging market investments. Since there may be more perceived risk for investments in developing market wind power projects, raising the after-tax leveraged returns requirement to 12% from 9% would, all other things being equal, force higher power purchase prices, and impact debt/equity proportions and debt service coverage ratios.

F.2 Model Limitations

It should be noted that the model included in the Toolkit has the following limitations in evaluating actual proposed wind projects:

- The model is based on U.S. dollars; other currencies, or a blend of currencies, may or may not be appropriate for a given situation.
- The model is set up for certain tax structures, which may or may not represent those of a particular project.
- Depreciation is assumed to be straight-line (the same amount per year, over whatever number of years is assumed). Accelerated depreciation schedules often are available and tend to offer more favorable results.
- Debt service is assumed to be levelized. Custom debt amortizations, variable interest rates, and other features generally are available to better fit project economics and lender preferences.
- The model is based on an annual evaluation. Often 6-month or 3-month versions are created to better understand a project.
- Operations, maintenance, and management expenses are treated very simply, with a single first-year cost for all expenses (except the land lease) that inflates each year. Often an evaluation will separately consider entries for labor, parts, insurance, administration, property taxes, etc., and have different treatment of the various expenses over time. For example, parts costs may go up much faster than insurance costs, and personal property taxes may decrease over time as the book value of the asset declines.
- The model has fairly rigid structures for energy prices and government incentives. Actual conditions may require different arrangements than the model currently allows, such as a power purchase price that is fixed for 10 years then re-sets according to a negotiated formula, or one price for a certain amount of energy with a different market-based price for any excess.
- The model does not consider state or local tax issues, and their potential interaction with federal taxes

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Generic Wind Power Project Economic Analysis

Input Assumptions (change any blue entry below to make "what if" assumptions)

	Value	Units	Comments
Project capacity	80	MW	Typical utility-scale projects range from 25 to 200 MW
Average capacity factor	34%		Typical range 25% - 40%
Turnkey construction cost	1050	US$/kW	Typical range 900 - 1250 US$/kW of installed capacity
Operations, maintenance, management cost	40	US$/kW/year	First year, then increases with inflation. Includes labor, parts, insurance, property taxes, utilities, administration.
Land lease cost	2.0%		Percent of gross revenues paid to landowner. Typical range 1% - 4%.
Energy sales price, first year of sales	49	US$/MWh	First year; assumed to increase with inflation assumption below. Typical range 35 - 60 US$/MWh. Assumed continues for 20 years.
Annual increase in energy sales price	1.0%	per year	
Government incentive or other sales price	8	US$/MWh	Typical range 0 - 25 US$/MWh; assumed not to inflate over time.
Years of government incentive or other sales	10	years	Typical range 0 - 10 years
Income tax rate	35%		As percent of net earnings, after deducting interest and depreciation
Percent of project cost financed by loan	65%		Typical range 33% to 67%.
Loan interest rate	8.0%		
Loan term	15	years	Typical range 15 - 20 years
Assumed rate of cost inflation	2.0%	per year	
Asset depreciation	20	years	Assumes "straight line" depreciation; more aggressive scenarios are often possible.
Wind energy tax credit, first year of sales	0	US$/MWh	Typical range 0 - 25 US$/MWh; assumed to not inflate over time.
Annual increase in wind energy tax credit	1.5%	per year	
Years of wind energy tax credit	10		Typical range 0 - 10 years

Intermediate Calculations and Results

Project capital cost	84,000	1000 US$	Calculated as [project capacity] X [turnkey construction cost]
Amount of loan	54,600	1000 US$	Calculated as [project capital cost] X [percent of project cost financed by loan]
Amount of equity invested	29,400	1000 US$	Calculated as [project capital cost] - [amount of loan]
First year operations, maintenance, management	3,200	1000 US$/year	Calculated as [operations, maintenance, management cost] X [project capacity]
Annual energy production	238,272	MWh	Calculated as [project capacity] X [8760 hours per year] X [average capacity factor]
First year energy sales revenue	11,675	1000 US$	Calculated as [annual energy production] X [energy sales price]
Minimum debt service coverage ratio	1.37		Calculated in pro forma on next page. Does not consider value or "monetization" of any tax credits. Typically must be at least 1.20 to 1.40.
Average debt service coverage ratio	1.54		Calculated in pro forma on next page. Does not consider value or "monetization" of any tax credits. Typically must be at least 1.30 to 1.50.
Before tax unleveraged return on investment	10%		Calculated in pro forma on next page.
Before tax leveraged return on investment	13%		Calculated in pro forma on next page.
After tax leveraged return on investment	9%		Calculated in pro forma on next page.

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Generic Wind Power Project Economic Analysis (continued)

35	**Pro Forma Operating Results**	US$1000 unless noted																			
36																					
37	Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
38	Energy sales inflation factor		1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.20	1.21
39	Cost inflation factor		1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20	1.22	1.24	1.27	1.29	1.32	1.35	1.37	1.40	1.43	1.46
40	Tax credit inflation factor		1.00	1.02	1.03	1.05	1.06	1.08	1.09	1.11	1.13	1.14	1.16	1.18	1.20	1.21	1.23	1.25	1.27	1.29	1.31	1.33
41																						
42	Revenues and expenses																					
43	Energy sales		11,675	11,792	11,910	12,029	12,149	12,271	12,394	12,518	12,643	12,769	12,897	13,026	13,156	13,288	13,420	13,555	13,690	13,827	13,965	14,105
44	Government incentive or other sales		1,906	1,906	1,906	1,906	1,906	1,906	1,906	1,906	1,906	1,906	0	0	0	0	0	0	0	0	0	0
45	Operations, maintenance, management		(3,202)	(3,264)	(3,329)	(3,396)	(3,464)	(3,535)	(3,604)	(3,676)	(3,749)	(3,824)	(3,901)	(3,979)	(4,059)	(4,140)	(4,222)	(4,307)	(4,393)	(4,481)	(4,570)	(4,662)
46	Land lease payment	2.0%	(272)	(274)	(276)	(279)	(281)	(284)	(286)	(288)	(291)	(294)	(258)	(261)	(263)	(266)	(268)	(271)	(274)	(277)	(279)	(282)
47	Net revenue before loan payments		10,110	10,160	10,211	10,261	10,311	10,360	10,410	10,459	10,509	10,559	8,738	8,785	8,835	8,882	8,930	8 977	9,024	9,070	9 116	9 161
48																						
49	Pre-tax unleveraged return on investment																					
50	Cashflow	(84,000)	10,110	10,160	10,211	10,261	10,311	10,360	10,410	10,459	10 509	10,559	8,738	8,785	8,835	8,882	8,930	8 977	9,024	9,070	9 116	9 161
51	Rate of return 10%																					
52																						
53	Loan payments																					
54	Principal amount, start of year		54,600	52,589	50,417	48,072	45,539	42,803	39,846	36,657	33,211	29,489	25,469	21,126	16,439	11,375	5,906	0	0	0	0	0
55	Interest paid 9.0%		4,368	4,227	4,033	3,846	3,643	3,424	3,188	2,933	2,657	2,359	2,036	1,690	1,315	910	473	0	0	0	0	0
56	Principal paid		2,011	2,172	2,346	2,533	2,736	2,955	3,191	3,446	3,722	4,020	4,341	4,688	5,064	5,469	5,906	(0)	(0)	(0)	(0)	(0)
57	Total loan payment		6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	6,379	0	0	0	0	0
58																						
59	Principal amount, end of year	54,600	52,589	50,417	48,072	45,539	42,803	39,848	36,657	33,211	29,489	25,469	21,126	16,439	11,375	5,906	0	0	0	0	0	0
60																						
61	Debt service coverage ratio		1.58	1.59	1.60	1.61	1.62	1.62	1.63	1.64	1.65	1.66	1.37	1.38	1.38	1.39	1.40	na	na	na	na	na
62																						
63	Net revenue after loan payment		3,731	3,781	3,832	3,882	3,932	3,982	4,031	4,081	4,130	4,179	2,359	2,405	2,456	2,503	2,551	8 977	9,024	9,070	9 116	9 161
64																						
65	Pre-tax leveraged return on investment																					
66	Cashflow	(29,400)	3,731	3,781	3,832	3,882	3,932	3,982	4,031	4,081	4,130	4,179	2,359	2,405	2,456	2,503	2,551	8 977	9,024	9,070	9 116	9 161
67	Rate of return 13%																					
68																						
69	Tax considerations																					
70	Net revenue (before loan payments)		10,110	10,160	10,211	10,261	10,311	10,360	10,410	10,459	10 509	10,559	8,738	8,785	8,835	8,882	8,930	8 977	9,024	9,070	9 116	9 161
71	Interest deduction		(4,368)	(4,227)	(4,033)	(3,846)	(3,643)	(3,424)	(3,188)	(2,933)	(2,657)	(2,359)	(2,036)	(1,690)	(1,315)	(910)	(473)	(0)	(0)	(0)	(0)	(0)
72	Depreciation deduction		(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)	(4,200)
73	Income tax basis		1,542	1,733	1,977	2,215	2,468	2,736	3,022	3,327	3,652	3,998	2,501	2,895	3,319	3,772	4,257	4 777	4,824	4,870	4 916	4,961
74																						
75	Income tax credit or (paid)	35%	(540)	(514)	(692)	(775)	(864)	(958)	(1,058)	(1,164)	(1,278)	(1,399)	(875)	(1,014)	(1,162)	(1,320)	(1,490)	(1 672)	(1,688)	(1,704)	(1 721)	(1 736)
76	Wind energy tax credit		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	Net income tax credit or (paid)		(540)	(514)	(692)	(775)	(864)	(958)	(1,058)	(1,164)	(1,278)	(1,399)	(875)	(1,014)	(1,162)	(1,320)	(1,490)	(1 672)	(1,688)	(1,704)	(1 721)	(1 736)
78																						
79	Aftertax income calculation																					
80	Pre-tax income		3,731	3,781	3,832	3,882	3,932	3,982	4,031	4,081	4,130	4,179	2,359	2,405	2,456	2,503	2,551	8 977	9,024	9,070	9 116	9 161
81	Income tax credit or (paid)		(540)	(514)	(692)	(775)	(864)	(958)	(1,058)	(1,164)	(1,278)	(1,399)	(875)	(1,014)	(1,162)	(1,320)	(1,490)	(1 672)	(1,688)	(1,704)	(1 721)	(1 736)
82	Aftertax income or (loss)		3,191	3,268	3,140	3,107	3,068	3,024	2,973	2,916	2,852	2,779	1,484	1,394	1,294	1,183	1,061	7 305	7,335	7 365	7 395	7 425
83																						
84	Aftertax leveraged return on investment																					
85	Cashflow	(29,400)	3,191	3,268	3,140	3,107	3,068	3,024	2,973	2,916	2,852	2,779	1,484	1,394	1,294	1,183	1,061	7 305	7,335	7 365	7 395	7 425
86	Rate of return 9%																					

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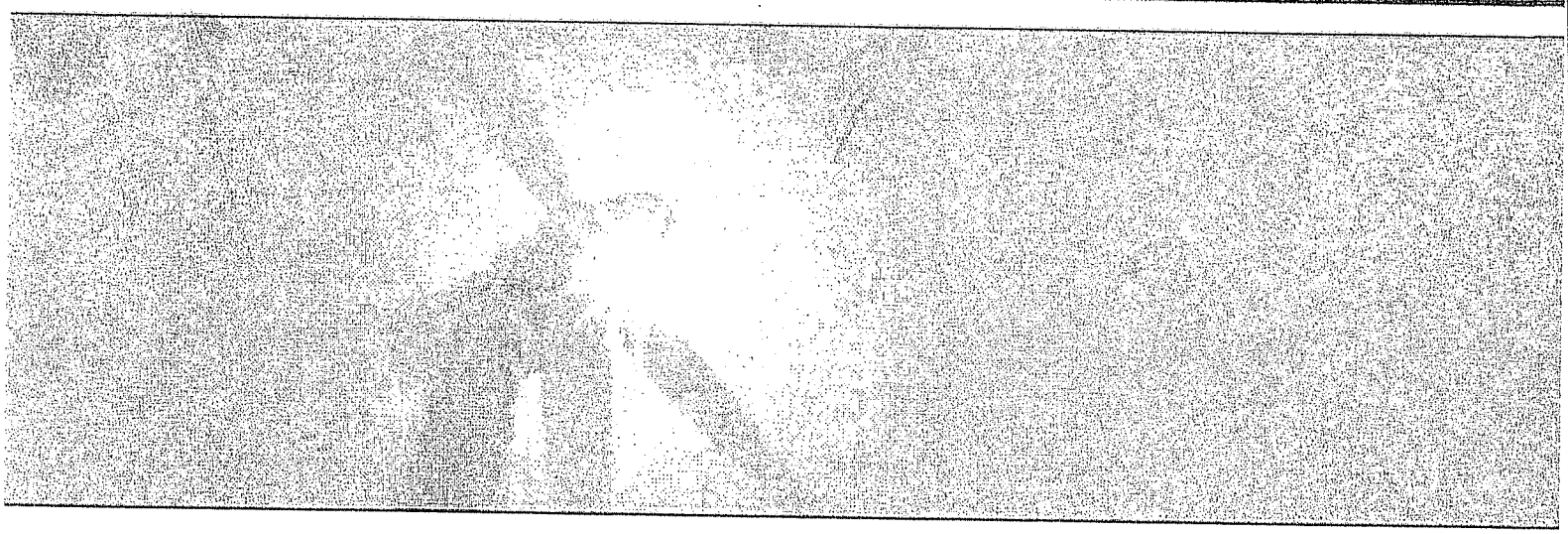

NEW YORK STATE

WIND ENERGY TOOLKIT

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17 Columbia Circle
Albany, NY 12203-6399
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NYSERDA
New York State
Energy Research and
Development Authority

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AWS Truewind, LLC

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Foreword

The current version of the Wind Energy Toolkit was developed under the New York State Energy & Research Development Authority (NYSERDA) PON 995, Agreement 9998.

This publication was created by AWS Truewind, LLC to update relevant information in the toolkit documents and compile a more comprehensive document.

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NEW YORK STATE

WIND ENERGY TOOLKIT

Overview

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Prepared by:
AWS Truewind, LLC

NYSERDA
New York State
Energy Research and
Development Authority

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1. Introduction

The Wind Energy Toolkit was developed for the New York State Energy Research & Development Authority (NYSERDA) by AWS Truewind, LLC, to provide information on the various aspects of wind energy development. The document's intended audience includes communities in New York State preparing for wind energy development, both by a developer and a community sponsored project.

New York State has an abundance of land suitable for wind development and a mandate to increase use of renewable energy. Depending on the wind resource throughout the State, wind energy projects may be planned near the landowner's community. The decision on whether or not to have a wind farm sited in a community resides within the locality, as New York is a home rule state. Therefore, it is important that local officials become familiar with all aspects of wind development.

In addition to serving communities that may be affected by a utility scale wind farm, the toolkit provides information to communities that are interested in installing one or multiple turbines. Community wind projects are becoming increasingly popular throughout the country and New York's available wind resource can make community wind projects attractive. The toolkit provides links to relevant information to help communities plan and initiate a community wind project to better serve localities within the State.

The information in this toolkit is intended to provide information necessary for everyone concerned with wind development in a community – from the farmer or landowner who want to lease their land – to the town officials charged with zoning, planning and permitting – to interested members of the public – to towns/groups that are interesting in beginning a community wind project. This toolkit is not a policy or regulatory manual, nor is it a collection of guidelines - it is information about the process for siting wind energy facilities in localities in New York State, and all the considerations that go into the decision-making effort.

Please read, download, and distribute these materials as needed and consult NYSERDA if additional information or assistance is required. (www.powernaturally.org)

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2. Wind Energy in New York State

2.1. Market Drivers

Rural areas in the Northeast, such as those in Upstate New York, are receiving increased attention from wind energy proponents and developers. New York's geographic location and relative proximity to major load centers, combined with its good wind resources, the high costs of electrical energy in the Northeast, concerns over regional air quality, federal tax incentives, and legislative mandates in New York and neighboring states, has resulted in renewed interest in wind energy development in New York. Some specific factors that are driving the market for wind energy in New York include the following:

- New York State is ranked 15th in annual wind energy generating potential (7080 MW or approximately 62 billion kWh)—more than California or any state east of the Mississippi and the largest potential of any state in the Northeast.[1]
- Renewable energy purchase mandates or renewable portfolio standards (RPS) in New York and neighboring states are driving the demand for new renewable resources in the region, particularly wind energy. The current New York State RPS calls for an increase in renewable energy used in the state from its current level of about 19% to 25% by the year 2013. Additionally, there has recently been increased discussion in the state government of increasing the state RPS to 30% and adding a 15% reduction in electricity consumption. This plan, called the 45 by 15 plan, would significantly increase New York's commitment to renewable energy and would put it far ahead of other states. Wind energy is expected to supply a significant portion of the RPS requirement. This effectively creates a stable, long-term market for the retail sale of wind energy in New York.
- Being located downwind from the major industrial centers of the Upper Midwest, New York has a long history of working to reduce emissions from fossil fuel combustion sources to help reduce acid rain, improve air quality, and curb the emission of greenhouse gases. New York is a member of the Regional Greenhouse Gas Initiative, or RGGI, a cooperative effort by Northeastern and Mid-Atlantic states to reduce carbon dioxide emissions, such as those from fossil fuel-burning power plants.
- In 2001, Governor George Pataki issued an Executive Order requiring all state agencies to purchase 10% of their electricity from renewable energy sources by 2005 and 20% by 2010. In March 2008, Governor David A. Paterson continued the executive order.
- Funding incentives available to project developers and green power marketers through NYSERDA's NY EnergySmart℠ Program are helping to promote the technology by reducing some of the initial capital costs for selected wind projects and providing incentives for consumers to purchase green power at the retail level.
- The American Recovery and Reinvestment Act passed in February, 2009 provides an additional 3 year extension of the Production Tax Credit (PTC) through December 31, 2012 and introduced additional incentive options including an Investment Tax Credit (ITC) and grant program.
- New York State consumers are free to choose retail electricity service providers. Research shows that given the choice, consumers often select services that offer some renewable energy content.

[1] American Wind Energy Association

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2.2. Installed Utility-Scale Projects

Although wind energy research and wind resource assessment projects had been previously conducted in New York, commercial development activities were not seriously initiated in the state until the late 1990s. As of June 27, 2009, fourteen utility-scale wind energy projects have been installed in the state. The installed capacity in the state is 1263.8 MW, which ranks New York seventh in the nation with installed capacity. There is one additional project under construction, representing an additional 21 MW of capacity (Bellmont). Several other projects are in the planning stages. Figure 1 shows the location of the utility-scale wind projects in New York and Table 1 provides additional details[2].

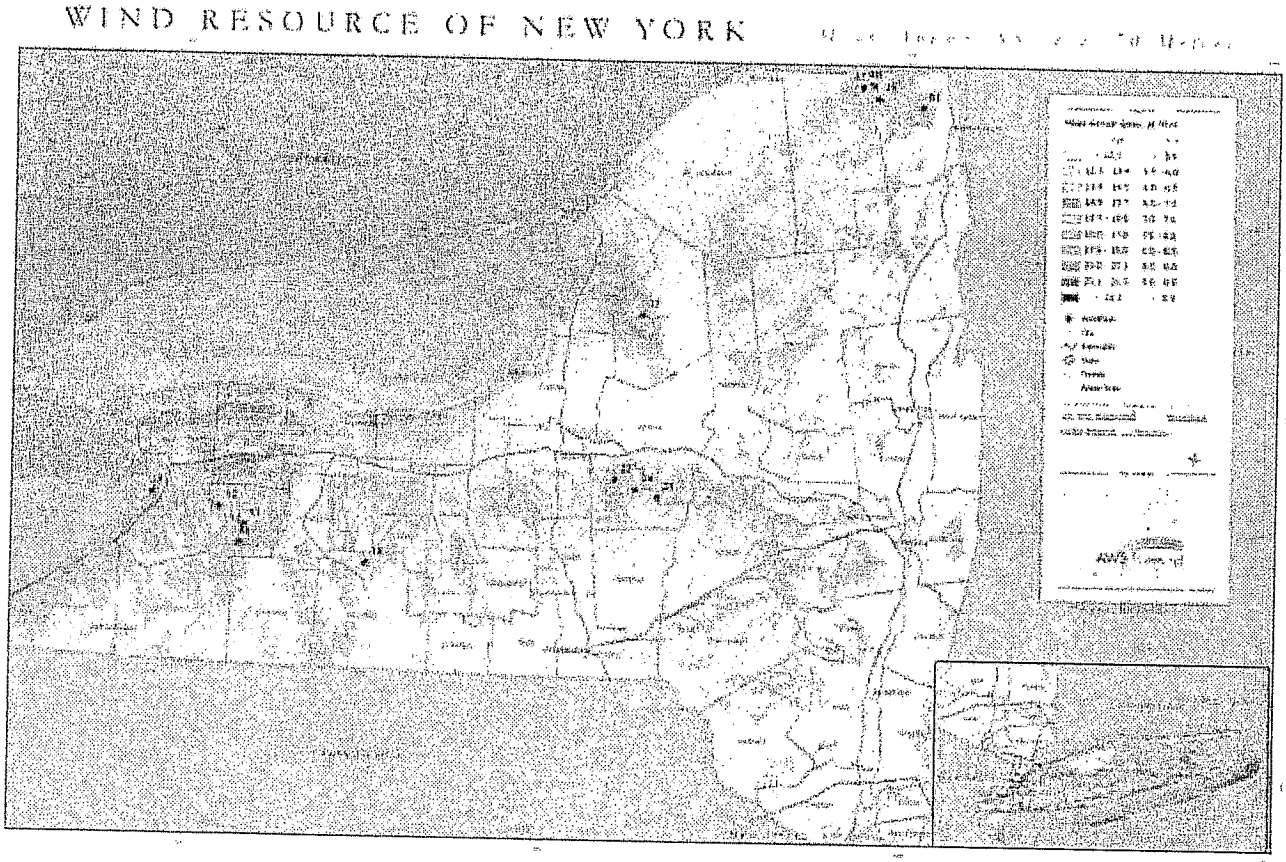

Figure 1 – Wind resource map and location of Wind Projects in New York created by AWS Truewind.

[2] American Wind Energy Association

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Table 1–Wind Energy Projects in New York

Name	ID	County	Developer	Turbines	MW Rated
Altona	51	Clinton	Noble	58	87
Bliss	9	Wyoming	Noble	67	100.5
Chateaugay	47	Franklin	Noble	71	106.5
Clinton	48	Clinton	Noble	67	100.5
Cohocton/Dutch Hill	19	Steuben	First Wind	50	125
Ellenburg	49	Clinton	Noble	54	81
Fenner	22	Madison	Canastota Wind Power	20	30
High Sheldon	12	Wyoming	Invenergy	75	112.5
Madison	25	Madison	Horizon Energy	7	11.5
Maple Ridge	37	Lewis	Horizon/PPM	195	321.8
Munnsville	24	Madison	Airtricity	23	34.5
Steel Winds	1	Erie	BQ Energy	8	20
Wethersfield	11	Wyoming	Western NY Wind Power Partners	10	6.6
Wethersfield	10	Wyoming	Noble	84	126
			Total	789	1263.4

2.3. Potential for Additional Projects

According to the American Wind Energy Association (AWEA), New York has a potential capacity of 7080 MW and is ranked 15th in the United States for wind energy potential. Developers are actively pursuing additional wind projects in a number of other locations in New York. One of the key considerations in development work is the potential wind resource in a location. Good wind resources have been identified along large hilltops in Western, Central, and North-Central Upstate New York. Project proposals from wind energy developers are likely in these areas, assuming other siting considerations are met. There are several companies investigating the feasibility of developing off-shore wind energy projects in the Atlantic Ocean, Lake Erie, and Lake Ontario.

Figure 1 shows the public wind resource map for New York. The wind map shows the estimated annual average wind speeds at a height of 230 ft (70 m) above the ground. They produced similar maps at 30 m, 50 m, and 100 m, as well as an estimated wind power density map at 50 m.

In New York, areas with annual average wind speeds greater than 14.5 mph (6.5 m/s) are considered potentially good for utility-scale wind energy development. Lower wind speeds may be acceptable for on-site use of small-scale wind generation systems. As wind technology improves, sites with lower wind speeds may be favorable for utility-scale development.

Based on the above wind map, criteria necessary for a viable project, and assuming that protected areas within the Adirondacks and Catskills are excluded from development, the following upstate New York counties have potentially developable wind resources:

Allegany	Erie	Madison	Otsego	Wyoming
Cattaraugus	Herkimer	Oneida	Schoharie	Yates
Chautauqua	Lewis	Onondaga	Schuyler	
Delaware	Livingston	Ontario	Steuben	

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3. Wind Energy Applications

Wind generation equipment is categorized into three general classifications based upon their nominal power output:

- Small-Scale – Corresponds to micro- and small-scale turbines (400 watts to 250 kW) intended for remote power, battery charging, or net metering type generation. The small turbines can be used in conjunction with solar photovoltaics, batteries, and inverters to provide constant power at remote locations where installation of a distribution line is not possible or is more expensive. The current NYS net metering program limits the turbine size to 27.5 kW for residential systems, 500 kW for farm-based systems, or 110% of the property's annual consumption (verified by comparing expected annual energy production estimate with annual usage).
- Medium-Scale – Corresponds to medium sized turbines (250 kW to 1000 kW) intended for remote grid production, often in conjunction with diesel generation or load-side generation. Load-side generation produces electricity on the customer's side of the utility meter, which directly offsets their consumption of higher cost grid power and will possibly reduce peak loads. New York State has a net metering program that allows the owner of a renewable energy source, such as a wind turbine, to sell any excess energy back to the utility at retail price. To be eligible for the current net metering program, the size of the system is subject to limitations, a non-residential wind turbine installation is limited to the lesser of the peak load or 2.0 MW.
- Utility-Scale – Corresponds to large turbines (1000 kW and larger) intended to generate bulk energy for sale in power markets. They are typically installed in large arrays or wind energy projects, but can be installed in small quantities on distribution lines, otherwise known as distributed generation. Utility-scale development is the most common form of wind energy development in the U.S.

While discussion of utility-scale turbines is the primary focus of the NYSERDA Wind Energy Toolkit, general information about small-scale and medium-scale turbines is provided in the toolkit for use in planning activities.

3.1. Small-Scale

Small wind turbines can be grid-connected for residential generation or they can be used in off-grid applications such as water pumping or battery charging. These turbines are typically installed as a single unit or in small numbers. The smallest turbines (with power ratings less than 1 kW) are normally used to charge batteries for sailboats, cabins, and small homes. Turbines with power ratings between 1 kW to 20 kW are normally used for water pumping, small businesses, residential power, farm applications, remote communication stations, and government facilities. They are often found as part of a hybrid system that can include photovoltaic cells, grid power connections, storage batteries, and possibly back-up diesel generator sets. Small turbines with power ratings between 1 kW and 20 kW can be connected to single-phase electrical service, which is typical in almost every home.

Turbines less than 1 kW are usually customer installed on short pole-type masts, the electrical connections are made with the help of an electrician. Turbines larger than 1 kW should be installed by a qualified small wind installer. For turbines over 1 kW, tower heights can range from 9.1 m (30 ft) to 42.7 m (140 ft). Rotor diameters range from 1.1 m (3.5 ft) for a 400 W turbine to 15 m (49 ft) for a 50 kW turbine. Figure 2 presents a comparison of small wind turbines with common structures.

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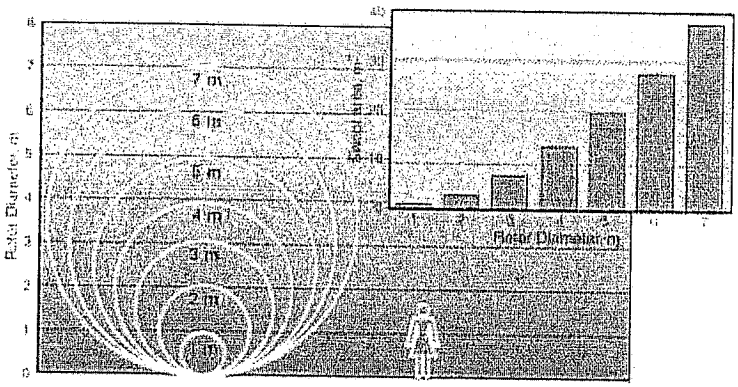

Figure 2 - Small Wind Turbine Size Comparisons (Source: Paul Gipe, Wind Energy Basics)

Grid connected systems may be practical if the following conditions exist:

- The wind resource at hub height averages at least 10 mph over the course of the year.
- Local electrical rates are high – ranging from 10 to 15 cents per kilowatt hour (¢/kWh).
- The local utility requirements for connecting a small wind turbine are not prohibitively expensive.
- Good incentives for the sale of excess electricity or for the purchase of a small wind turbine exist.

The technology utilized in most small turbines is much less sophisticated than that found in utility-scale turbines. Several resources on small wind turbines covering both technical and non-technical information are referenced in the additional resources section at the end of the chapter.

3.2. Medium-Scale

Medium-scale wind turbines can range in size from 50 kW to 250 kW and are typically used in light commercial/industrial and village power applications. These turbines typically utilize rotor diameters between 15 m (50 ft) and 30 m (100 ft) and hub heights between 25 m (80 ft) and 40 m (131 ft). Resulting maximum tip heights can vary from 30 m (100 ft) to 55 m (180 ft). Medium-scale turbines require connection to three-phase electrical power found more typically in commercial and village power applications, as opposed to residential locations. These turbines are installed by construction crews with the guidance of the turbine manufacturer. Electrical interconnection would be guided by the local utility. A link to a case study regarding a medium-scale wind turbine installation at a manufacturing facility in Ontario, New York is provided in Section 3.4: Additional Resources.

3.3. Utility-Scale

Most wind energy projects in the U.S. are commercial facilities that generate electrical energy for delivery and sale on the bulk power system (the grid). In 2008, the average wind energy project size was approximately 83 MW[3]. Most current commercial wind power plants range in size between 10 and 750 MW. The nameplate capacity and number of turbines installed at a particular project depends on a variety of factors, including the wind resource, project area, land use restrictions, and turbine size. Larger wind projects (100 MW or more) have been installed in several locations throughout the U.S. One example of a utility-scale wind project within

[3] 2008 Wind Technologies Market Report, U.S. Department of Energy

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New York State is the Maple Ridge Wind Farm located in Lewis County. The farm became fully operational in January of 2006; with a total of 195 turbines, it is capable of producing a maximum of 320 MW.

While large wind turbines are most commonly deployed in large arrays of multiple turbines, they are also installed in distributed generation applications that consist of a single or a few turbines connected directly to a distribution line. Common examples include installing one large turbine to offset electric purchases at a school, or a municipality or an electric cooperative may wish to install a few large wind turbines to offset electric needs at municipal buildings or to supplement the bulk energy purchases of the cooperative on behalf of its customer-owners. Aspects of community wind projects are explored in greater detail in Section 17: Community Wind Energy Development.

3.4. Additional Resources

- Customer Sited Wind Handbook - A wind energy handbook created by AWS Truewind and NYSERDA that provides a comprehensive overview of small wind turbine technology and siting. (www.powernaturally.org)
- American Wind Energy Association: U.S. Wind Energy Projects – New York. A website that provides information about wind turbine installations across the U.S. (http://www.awea.org/PROJECTS/projects.aspx?s=New+York)
- ***Small windExplorer*** – A website sponsored by NYSERDA that uses an interactive map to provides wind resource and energy production information specifically for small wind installations. (http://windexplorer.awstruewind.com/)
- New York Public Service Commission Website – interconnection requirements for distributed generation systems between 15 and 300 kW. This document includes technical requirements as well as non-technical requirements such as fees, forms, and insurance. (http://www.dps.state.ny.us/)
- California Energy Commission (2002) – Buying a Small Wind Energy System. This document discusses grid connected small systems. (http://www.awea.org/smallwind/documents/WindGuide_final.pdf)
- Mick Sagrillo (2002) – Choosing a home-sized Wind Generator. Mick is a wind energy expert and reviews most wind generators sold and supported in the U.S. and includes technical descriptions of each. (http://www.renewwisconsin.org/wind/Toolbox-Homeowners/Apples%20and%20Oranges.pdf)
- American Wind Energy Association – Small Wind Website: Advice from an Expert. A website hosted by AWEA that includes a collection of articles written by Mick Sagrillo concerning small wind turbines. (http://www.awea.org/smallwind/sagrillo/index.html)
- U.S. Department of Energy, EERE – Small Wind Electric Systems: A U.S. Consumer's Guide. This document includes information on sizing, zoning issues, technical information, how to choose a turbine, connecting a turbine to the grid, insurance, and off-grid applications. (http://www.windpoweringamerica.gov/pdfs/small_wind/small_wind_guide.pdf)
- Harbec Plastics Inc. in Ontario, New York, installed a 250 kW wind turbine to help offset electric purchases. This particular turbine is on a 130 ft (39.5 m) tower and has a rotor diameter of 30 m (100 ft). More information on the Harbec wind turbine is available on the internet at: (http://www.northerndevelopment.com/renewableenergy.html)
- 2008 Wind Technologies Market Report, U.S. DOE. Annual assessment of the wind industry by the DOE. (http://eetd.lbl.gov/ea/ems/reports/2008-wind-technologies.pdf)

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4. Utility-Scale Wind

4.1. Turbine Design

In North America, most commercially available, utility-scale wind turbines from established turbine manufacturers utilize the Danish concept turbine configuration. This design uses a horizontal axis, a three-bladed rotor, an upwind orientation, and an active yaw system. The major components of a utility-scale wind turbine are shown in Figure 3.

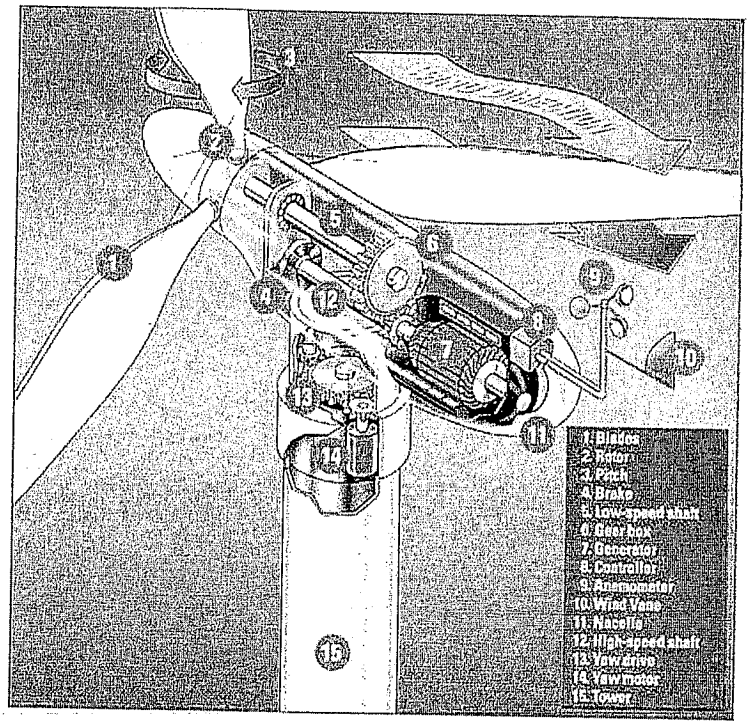

Figure 3 - Major Turbine Components (Source: www.eere.energy.gov)

The rotor consists of the blades and the hub, the mechanical link between the blades and the low-speed shaft. The turbine blades capture the kinetic energy from the wind and convert it into torque that is transmitted to the gearbox through a rotational shaft. The yawing mechanism allows the turbine to rotate about its vertical axis; this system is used to orient the rotor into the direction of the wind. Turbines with an active yaw system have a controller that is linked to a wind vane device; if the wind vane detects a change in wind direction, the yawing system will activate and turn the rotor into the wind, maximizing energy capture.

The turbine's drive train consists of a low-speed shaft connecting the rotor to a 2- or 3-stage gearbox and a high-speed shaft connecting the gearbox to the generator. Using a series of gears, the gearbox converts the low-speed, high torque input from the rotation of the blades, into a high-speed, low torque rotational force that is transmitted to the generator through a high-speed shaft.

The control scheme employed to operate the turbine to produce grid-quality electricity varies among turbine manufacturers. While each has advantages and disadvantages, they all successfully deliver energy to utility

grids. Essentially two types of control schemes can be employed in the design of a wind turbine, fixed- or variable-speed operation. As the name implies, the fixed-speed systems are operated at a constant rotational speed when producing power. Above the turbine's cut-in wind speed, the system makes a connection with the grid; using this connection, the generator is able to hold the turbine at a constant rotational speed. Wind turbine generators are typically asynchronous and operate at 550-690 Volts (AC).

Variable-speed turbines adjust the rotational speed of the rotor to account for changes in wind speed to achieve an optimum tip speed ratio, thereby improving energy capture. These turbines are able to produce power at slightly higher efficiencies over a wider operational range of wind speeds than fixed-speed turbines. The power electronics necessary in variable-speed turbines to produce grid-quality electricity typically consume slightly more energy than the capacitors used to condition the power from constant-speed turbines.

Utility-scale turbines typically have the ability to rotate their blades axially, altering the angle at which the blade intercepts the wind. This system, known as variable-pitch control, is used to optimize output power at low wind speeds and regulate output power during high winds, which prevents over-speeding by shedding excess energy. Some turbines, generally smaller in scale, have a simpler fixed-pitch configuration, meaning that the blade's angle does not adjust to varying wind conditions. To handle excessively high winds, the blades of fixed-pitch turbines are design to induce turbulence on the upwind side of the blade above a given wind speed. This turbulence causes the turbine blades to stall instead of producing lift, so the rotation of the blades is slowed.

Fixed-pitch turbines generally have fewer moving parts and are less complex than variable-pitch turbines, resulting in lower manufacturing costs. Variable-pitch turbines are able to optimize blade pitch and adjust it for changes in air density or blade contamination. For these and other reasons, the energy output from variable-pitch turbines is somewhat higher than fixed-pitch turbines, thus offsetting the higher system costs. In locations with large variations in temperature, and thus air density, fixed-pitch turbines can experience difficulties with excessive power production during periods of high air density if the blades are pitched in a manner that optimizes production throughout the year. The specific wind and climate characteristics at a given site ultimately determine which type of control scheme generates power most cost effectively.

Each turbine used in utility-scale applications is equipped with a transformer to increase the voltage from the generator voltage level to the on-site collection system voltage. The on-site collection system typically operates at medium voltages of 25 to 35 kV. The turbine's major components are housed within the nacelle, which sit atop a tower that is typically around 80 m (262 ft) tall. The vertical distance from the ground to the centerline of the rotor is often referred to as the turbine's hub height.

4.2. Performance Specifications

Rated Capacity and Rotor Size

The rotor diameters and rated capacities of wind turbines have continually increased in the past 10 years, driven by technology improvements, refined design tools, and the need to improve energy capture and reduce the cost of energy. For comparison, the average turbine rating for turbines installed in the U.S. in 2003 was 1,374 kW, while turbines installed in 2007 had an average capacity of 1,650 kW. In 2008, turbines with rated capacities of 1.5 MW to 2.0 MW constitute the vast majority of the turbines sizes installed in North America[4]. Figure 4 shows the evolution of wind turbine size.

[4] 2008 Wind Technologies Market Report, U.S. Department of Energy

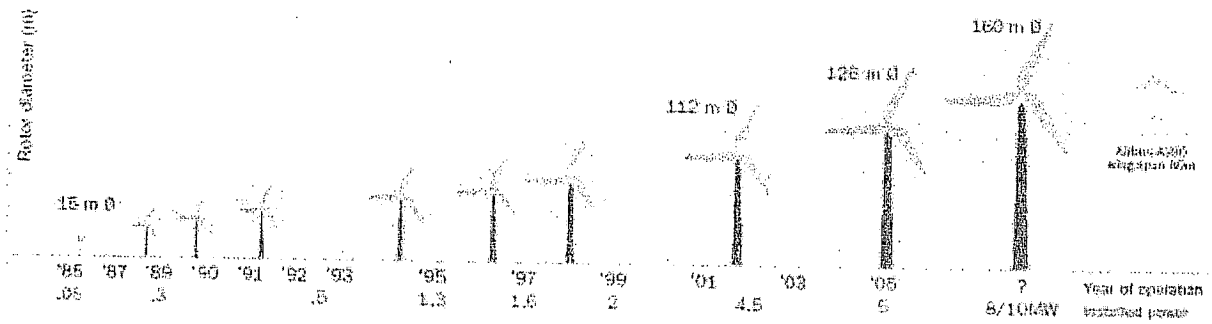

Figure 4 - Wind Turbine Height Comparisons (Source: EWEA)

Specific Rating

The ratio of a turbine's rotor swept area to the rating of the turbine is known as the specific rating. No best relationship between rotor diameter and generator rating exists. Designers of modern turbines appear to have settled on a range of specific ratings from 0.32 – 0.47 kW/m2, as this range presents the best compromise between energy capture, component loading, and costs. Turbines at sites with lower annual average wind speeds (such as below 16.5 mph (7.5 m/s) at hub height) tend to have larger rotors and lower specific ratings to improve energy capture. Turbines at high-wind-speed sites (exceeding 20 mph (9.0 m/s)) tend to have smaller rotors and higher specific ratings. The smaller rotor helps to reduce loads on components and thus improves reliability in these aggressive wind sites.

Power Curve

As shown in Figure 5 of a typical wind turbine power curve, power production from a wind turbine is a function of wind speed. The relationship between wind speed and power is defined by a power curve, which is unique to each turbine model and, in some cases, unique to site-specific settings. The wind speeds are listed on the horizontal axis, in miles per hour (mph) or meters per second (m/s), and the turbine's power output is along the vertical axis in kilowatts (kW).

The cut-in speed, at the lower end of the curve, is the threshold that the hub height wind speed must reach in order for the turbine to begin generating electricity. In general, most wind turbines begin to produce power at wind speeds of about 9 mph (4 m/s). A turbine will achieve its nominal, or rated power at approximately 29 mph (13 m/s), this value is often used to describe the turbine's generating capacity. The turbine will reach its cut-out speed at approximately 56 mph (25 m/s); when the wind speeds exceed this upper limit, the turbine will stop power production in order to protect itself from potentially damaging high speeds. Variability in the wind resource results in the turbine operating at continually changing power levels. At good wind energy sites, this variability results in the turbine operating at approximately 35% of its total possible capacity when averaged over a year.

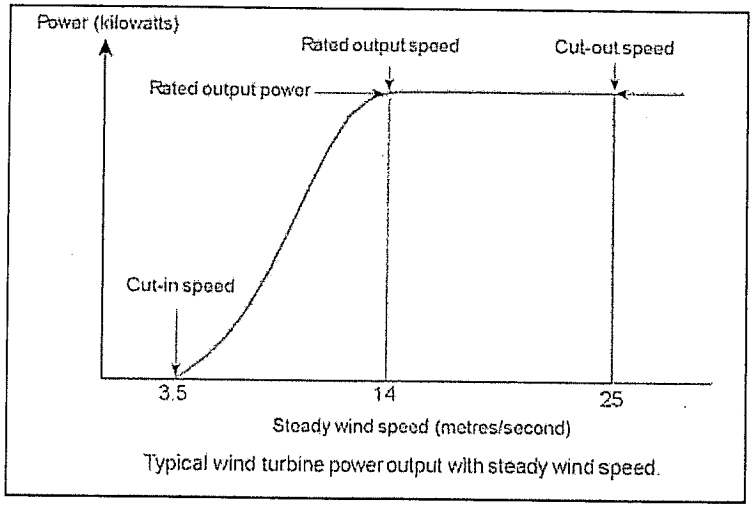

Figure 5 - Relationship of Wind Speed to Power Production (Source: U.S. Department of Energy)

Hub and Maximum Tip Heights

As the rotor diameters and rated capacities have increased, so have the hub heights of the wind turbines. However, no standard hub height or ratio of hub height to rotor diameter exists. Wind resource characteristics, terrain, the availability of turbine models and cranes, as well as visual impacts are but a few critical items that are used to determine the turbine size for a given project. Current utility-scale wind turbines can employ hub heights that range from 50 m (164 ft) to 160 m (525 ft). Hub heights ranging from 78 m (236 ft) to 100 m (328 ft) are most commonly utilized at contemporary wind farm installations.

Maximum tip heights (the highest point of the rotor) depend on the hub height and rotor diameter. As of 2009, the tallest wind turbine in the U.S. had a 100 m (328 ft) hub height and a 90 m (295 ft) rotor diameter with a resulting maximum tip height of approximately 145 m (623 ft). The image in Figure 6 identifies these key physical features of a wind turbine.

Optimum turbine size is heavily dependent on site-specific conditions. In general, turbine hub heights are approximately 1 to 1.4 times the rotor diameter. Project analysis conducted to identify the optimum turbine equipment typically results in a compromise between rotor size, hub height, energy production, component handling logistics, and cost. Table 2 provides an example of the turbine dimensions common in 2008.

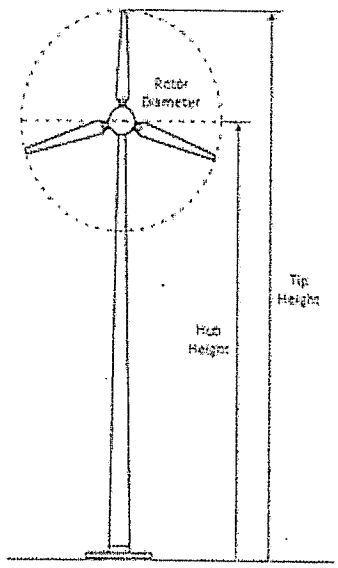

Figure 6 - Wind Turbine Features (Source: Modified image from Natural Resources Canada)

Table 2 - Common Dimensions for Utility-Scale Wind Turbines

Dimension	Multi-Megawatt Turbines	Sub-Megawatt Turbines
Hub Height	80 m (230 ft)	65 m (213 ft)
Rotor Diameter	90 m (295 ft)	47 m (154 ft)
Maximum Tip Height	125 m (410 ft)	88.5 m (290 ft)

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4.3. Project Components

The following sections provide a brief introduction and background to the different components and designs of a typical large scale wind farm.

Turbine Layout

Groups or rows of wind turbines are positioned for optimum exposure to the prevailing winds while accounting for terrain variations. Inter-turbine spacing is selected to maximize production while minimizing exposure to damaging rotor turbulence. Inter-turbine and inter-row spacing vary as a function of the rotor diameter and the wind resource characteristics. Factors such as cost and constructability must be considered when designing the layout of a wind farm. Wide spacing between wind turbines generally maximizes energy production but increases infrastructure costs (e.g., land, transmission, and road building). A trade-off exists between optimizing the turbine location for energy production (through wider spacing) and maintaining reasonable turbine interconnection and road costs, which increase with wider spacing. There is an additional tradeoff between the project's total capacity and the capacity factor. Experience, mathematical analysis, and cost considerations are employed to determine the optimum configuration given all of the existing site conditions and proposed turbine equipment. For more information on turbine spacing and Section 12.3: Land Area Required.

The majority of civil and electrical work required to design and construct a wind power plant is similar to the same activities for other power plants. In addition to the wind turbines and towers, wind power plants contain other components that are necessary for proper operation:

Electrical Power Collection System

Energy produced from the turbines is generally collected in a medium-voltage (approximately 25-35 kV) power collection system consisting of underground cabling within the turbine rows and overhead power lines from the turbine rows to the main substation (see Figure 7). The point of interconnection (POI) with the utility line can be co-located in the substation or it can be physically separated and located adjacent to the utility line. In general, wind energy projects are positioned within 10 miles of a high-voltage transmission line to minimize the costs associated with interconnection. Greater distances may be economically feasible if the wind resource is sufficiently high. With some turbines, a pad-mounted transformer, generally located immediately adjacent to the base of each tower, is used to transform the low-voltage power produced by the turbine to the medium-voltage of the on-site electrical collection system. Some turbine designs incorporate the transformer into the nacelle, rather than placing it at the base of the tower.

Substation and Interconnection

For most wind energy projects, electrical energy produced by the turbines passes through a substation where it is metered and the voltage is increased to match the voltage of the utility grid. Plant isolation breakers, power quality monitors, and protective equipment are present in the substation to protect both the electrical grid and the wind turbines. A system of switches and overhead infrastructure is used to connect the substation to the utility's power lines.

Foundations

In general, the foundation design is based on the weight and configuration of the proposed turbine, the expected maximum wind speeds, and the soil characteristics at the site.

Control and Communications System

In addition to individual turbine control systems, a wind project typically includes a Supervisory Control and Data Acquisition System (SCADA). SCADA systems consist of a central computer with management capabilities for individual turbines and the ability to collect, analyze, and archive time-series data. Communication cables connecting the central computer with the individual turbine controllers are commonly buried in the same trenches as the electrical collection system.

Access Roads

Access roads to each turbine location are typically 6 m wide and consist of compacted crushed rock. In hilly or complex terrain, access roads are constructed to manufacturer specified slopes and turning radii that are necessary to allow delivery of large components such as blades and tower sections. During the construction phase of a project, crane pads (flat, well graded and compacted areas constructed of crushed rock) are installed along the access road and adjacent to the tower foundations. During project operation, the crane pads remain in place in the event that a crane is required to replace large components that cannot be handled by the service crane in the turbine.

Operation and Maintenance (O&M) Facility

O&M facilities for wind power plants generally consist of an office and maintenance shop. These spaces can be located on-site or off-site and in some cases may be in separate locations. An office is necessary for plant management staff, control computers, and communication systems. The maintenance shop is used to store vehicles and spare parts, and provides a work space for the repair of turbine components.

5. Power Grid and Electricity Delivery

The power grid, in its current form, was built through an assembly of much smaller utility systems. Originally, the smaller utility systems were constructed and operated to serve local power needs and were rarely interconnected to other neighboring systems. These small systems were dominated by a large, central generating station that delivered power over a small radial network of high-voltage transmission lines and lower voltage distribution lines. Over time, operators and utilities recognized that reliability improved when systems were interconnected and generation sources diversified. This interconnection of neighboring power systems offered the ability to transfer power on a local or regional basis. However, the system was never designed to transmit large quantities of power over long distances, such as from the Midwest to the Northeast.

Therefore, although vast quantities of wind energy are available in the Midwest and Western states, the existing power grid is incapable of delivering that power to the high load areas of the Northeast in a cost-effective manner. Due to both the capacity on the grid, as well as the losses associated with long transmission distances, it is preferential to have wind farms located relatively close to the load centers they will serve.

The electric transmission and distribution system connects generating stations with power users. Figure 7 shows a simplified view of the transmission and distribution systems and how a wind power facility interconnects with the system. It consists of high-voltage transmission lines, which transmit large quantities of power; substations, which convert electricity from one voltage to another; lower voltage distribution lines, which serve neighborhoods and individual customers; and safety and control systems to keep the grid operating safely.

Most of the power delivered to power grids comes from large central power stations, such as coal- and natural gas-burning plants, with capacities of roughly 50 to 2000 MW. Because they use fossil fuels, these power plants can control how much power they generate by increasing or decreasing how much fuel they burn. Wind power projects differ in that wind is an intermittent resource, which cannot be called on to increase generation from the current level. Individual wind turbine units within a project are much smaller than fossil fuel plants (roughly 200 kW to 3 MW), and wind power projects use different types of electrical generator hardware.

Regardless of their source, once electrons are pushed onto the transmission system, they follow the path of least resistance to ground, eventually moving through distribution lines to be delivered to industrial or residential users. The path from the bulk transmission system to a home includes various step-down transformers that convert electricity from high-voltage transmission lines (100 kV to 765 kV) to lower, usable voltage levels. Distribution substations decrease the voltage to distribution levels of 12.5 kV to 34.5 kV, which serve neighborhoods and large industrial users. Before entering a home, the electricity passes through another transformer that steps the voltage down to a level that appliances and electrical systems can use. Within households and businesses, typical voltages are 120 or 240 volts. Commercial and industrial customers typically use power at 120 to 600 volts (and greater).

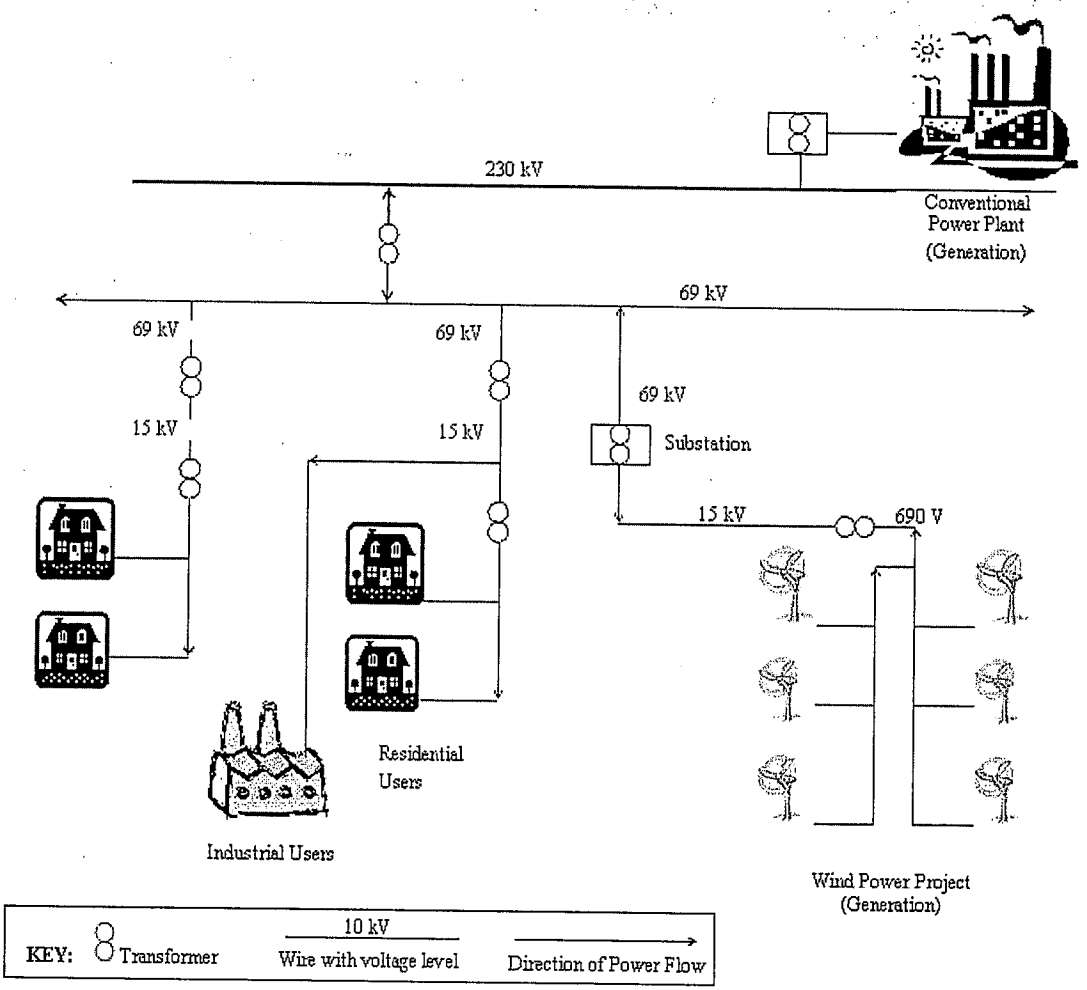

Figure 7 – Power Grid Schematic

Utility-scale wind turbines typically generate power at 690 volts, and this voltage is typically stepped-up to 34.5 kV for collection in underground wires within the wind farm, and potentially to a higher level at a substation located at or near the project for transmission to power users.

Electrons generated by specific energy sources cannot be delivered to specific locations via the power grid. It is impossible to know if the electrons delivered to a home were generated by coal, natural gas, nuclear, hydroelectric or wind power. Instead, electricity from all these sources goes into one big pool, and users draw from this pool. When new wind farms are built, more renewable power flows into the pool, displacing older, dirtier generation sources. More wind farms in a region mean a larger percentage of that region's electricity is from renewable, non-polluting sources. Highly accurate on-site revenue meters used by the utilities and power station owners allow determination of the mix percentages and provide a way to account for all renewable power delivered.

The only way to guarantee that a consumer receives electrons from a renewable energy source is to install that source on the consumer's side of the utility meter. This is known as a direct-delivery system. Figure 8 shows how energy produced by the small wind turbine first serves the load at the house, with any excess sold into the power grid. Power from the grid can supplement energy produced by the wind turbine at times when the wind is not blowing.

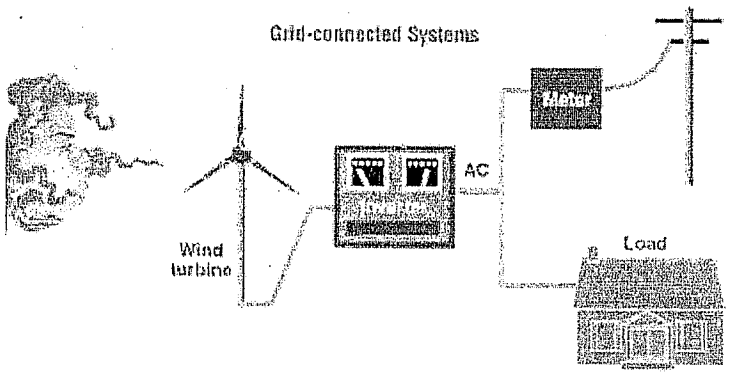

Figure 8- Schematic of Direct Power Delivery to the Home (Source: www.windpoweringamerica.gov)

Although the electric grid cannot selectively deliver renewable energy to a specific home, consumers can help promote the development of renewable energy by purchasing power from renewable sources—that is, through the electric grid, consumers can pay for the generation of electricity that has been certified as renewable under strict accounting practices. Accounting of wind power generation is based on meter readings at the project and at the customer's location. Certification programs such as Green-e (www.green-e.org) have been created to audit and verify that green product suppliers truly deliver the green energy purchased by customers.

5.1. Intermittency

One distinctive feature of electricity is that it cannot be stored[5]. At any time on a grid, an instantaneous balance between production and consumption must be met. When a customer turns on a light or appliance, a power station somewhere on the grid must slightly compensate to accommodate the increased load. Relatively few power users schedule their consumption, so grid and power plant operators routinely (on a sub-hourly basis) vary power production to match the demand.

Similar to the constant fluctuations in electricity demand, wind power production fluctuates. This is because wind projects only produce electricity during certain wind speeds, typically between 4-25 m/s (9-56 mph) at hub height. The variations in wind farm generation output affects the balance of production and consumption in much the same way that varying load consumption does.

The amount of power an electrical generator is capable of providing is referred to as its power capacity. For a 100 MW wind project, the instantaneous capacity could vary between 0 and 100 MW at any given time. This type of delivery is termed intermittent. Because the wind is always blowing somewhere, the more geographical distribution of wind farms there is in a region, the less intermittent the global power generation is likely to be.

It is important to remember that intermittent power is not the same as unreliable power. While wind turbines tend to be highly reliable, a wind power plant will have decreases in output due to seasonal and daily variations in the wind resource. Due to this variation, wind power plants may have a capacity factor of 30%-40%. This represents the ratio of the actual production of the wind farm to the project's rated capacity. The capacity factor will vary depending on the time of year. These variations can be quantified and reasonably predicted based on the seasonal and daily patterns of wind speeds.

[5] "Electricity storage" technologies do not store electricity itself; they always convert the electricity to other forms for storage (chemical reactions in batteries, gravity storage in the case of pumped storage, etc.).

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Figure 9 shows an example of daily capacity factor patterns in New York for three years. The plot is based on actual wind speed data and the modeled operation of 3,300 MW of wind capacity[6]. The Y-Axis shows average capacity factor. Higher capacity factors correlate to higher wind speeds. Wind speeds between 6 p.m. and 10 a.m. result in capacity factors that exceed 40%, while they are lower than 25% during the other hours.

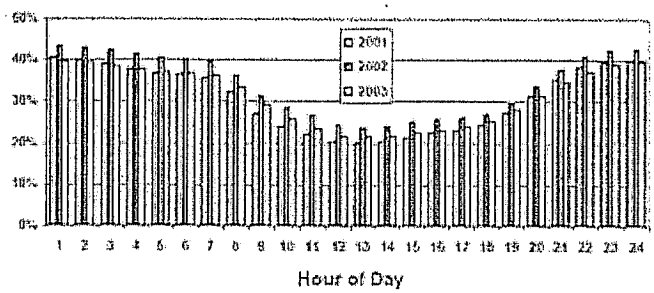

Figure 9 - Hourly Daily Capacity Factor Pattern Averaged over the Year

At the levels of wind energy currently being generated in New York State, the intermittency of wind does not cause a problem for the electrical grid, and it is not necessary to build new thermal generation plants or increase thermal plant spinning reserves to back up wind farms. It is estimated that at least 10% of the state's peak load, or 3,300 MW of installed wind capacity, could be accommodated by the state's power grid with little or no adjustment to existing planning, operating and reliability practices.

NYISO Wind Resource Management System

To reliably integrate wind into the New York electric grid, the New York Independent System Operator (NYISO) has implemented an enhanced Wind Management System[7]. On May 1, 2009, the NYISO put into effect a set of rules that allow wind projects to bid into the system alongside more traditional resources.

Each wind resource will send a day-ahead bid to the NYISO, which will indicate the price of energy the facility will accept. Additionally, they will be allowed to submit real-time revised offers. The NYISO is allowing a tiered bid from wind resources. This bidding strategy is beneficial to wind, because the PTC allows them to bid full output at negative energy prices. This helps to prioritize wind energy over fossil fuel-based energy sources and thereby reduces the number of curtailment orders wind projects will receive. For example, a 50 MW wind resource will send the NYISO a bid stating that if the market price of energy is above $-20 per MWh, the facility will produce at full output (i.e. a maximum of 50 MW); however, if the price is between $-30 and $-20 per MWh, the facility would like to reduce a maximum of 20% of output (i.e. a maximum of 10 MW). If the price of energy falls below $-30 per MWh, the wind resource would like to be reduced to 0 MW.

For some reliability concerns, price of energy will be ignored and the facility that alleviates the system constraint will be reduced or eliminated. Wind resources will be treated as dispatch-down, which means that the generator cannot be increased as needed, but can be reduced as needed. The new rules allow the NYISO to send output level information to the wind generators and set Wind Output Limits[8] during times of reliability

[6] Figure is from the NYSERDA study, *The Effects of Integrating Wind Power on Transmission System Planning, Reliability, and Operations,* prepared by GE Wind Energy (2005), p.7.2. The study is available on the NYSERDA website.
[7] Edelson, David. "NYISO Wind Resource Management" Presentation. NYISO Market Issues Working Group Meeting, November 3, 2008.
[8] NYISO Market Service Tariff and Tariff Attachment B.

concern. Thus, should the wind resource be generating too much power on the grid, the NYISO will send them a signal to reduce generation, which will maintain grid reliability.

NYISO Collection of Meteorological Data from Wind Facilities

The NYISO requires all wind facilities to submit to the forecast vendor on-site meteorological data every 5, 10 or 15 minutes. The most accurate forecasting will be available if the facilities submit data from at least one permanent hub height meteorological tower and turbine-mounted sensor data; however, in the absence of a met tower, turbine-mounted sensor data alone will fulfill the requirement. Each set of data is required to include wind speed, wind direction, ambient air temperature, ambient air dew point, ambient air relative humidity, and barometric pressure. The facility owner is responsible for the installation and maintenance cost for all data collection, as well as their allocated portion of the forecasting fees pursuant to the NYISO Service Tariff.

Currently, the NYISO is undergoing the stakeholder procedure to change these data requirements. The current stakeholder proposal[9] would require each facility to submit data from on-site hub height met towers that are within 5 km of each turbine. The frequency of submission will change to 30 second intervals transmitted to the NYISO, with submission from the NYISO to the vendor on 1 or 5 minute intervals, which would increase the forecast model accuracy and allow the NYISO to develop internal operator alert tools.

5.2. Additional Resources

- How Stuff Works Website: How Power Grids Work. This source provides a very simple explanation with pictures of power plants, generators, the transmission grid, the distribution grid, and interconnection with a home. (http://science.howstuffworks.com/power.htm)
- Green-e: An independent consumer protection program created to audit and verify that green product suppliers truly deliver the green energy purchased by customers. (http://www.green-e.org)
- Utility websites often provide an interactive section (usually geared towards teachers and children) that provides an explanation of how power is generated and delivered to the home.
- Thomas P. Hughes, Networks of Power: Electrification in Western Society 1880-1930. John Hopkins University Press, Baltimore and London, (1983) 1993, 3rd Edition. Chapters 2 and 8 focus on the historical development of the electric grid in the U.S.
- Edelson, David. "NYISO Wind Resource Management" Presentation. NYISO Market Issues Working Group Meeting, November 3, 2008. http://www.nyiso.com/public/webdocs/committees/bic_miwg/meeting_materials/2008-11-03/WindResourceMgmt.pdf
- NYISO Market Service Tariff and Tariff Attachment B. http://www.nyiso.com/public/webdocs/documents/tariffs/market_services/services_tariff.pdf; http://www.nyiso.com/public/webdocs/documents/tariffs/market_services/att_b.pdf
- Edelson, David. "Collection of Meteorological Data from Wind Resources" Presentation. NYISO Market Issues Working Group Meeting, November 3, 2008. http://www.nyiso.com/public/webdocs/committees/bic_miwg/meeting_materials/2008-11-03/WindMetData.pdf

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6. Project Lifecycle

The major steps associated with the lifecycle of a utility-scale wind energy project can be summarized into the following broad tasks:

- Wind Resource Assessment and Site Selection
- Permitting
- Financing
- Construction
- Operation
- Decommissioning

In general, it requires two to three years for project development to proceed from initial site prospecting to construction completion and operation. The time frame may vary in a region or state that does not have a history of wind energy development or that has more restrictive permitting and environmental assessment requirements. The construction activities are short when compared to those of a fossil fuel plant; a 50 MW wind project can be installed in less than a year. The most time-consuming steps of the development process are the wind resource assessment and the permitting tasks. At least a full year of wind data is typically recommended to obtain an accurate representation of the wind resource.

Figure 10 presents a graphical summary of project lifecycle for a utility wind energy project.

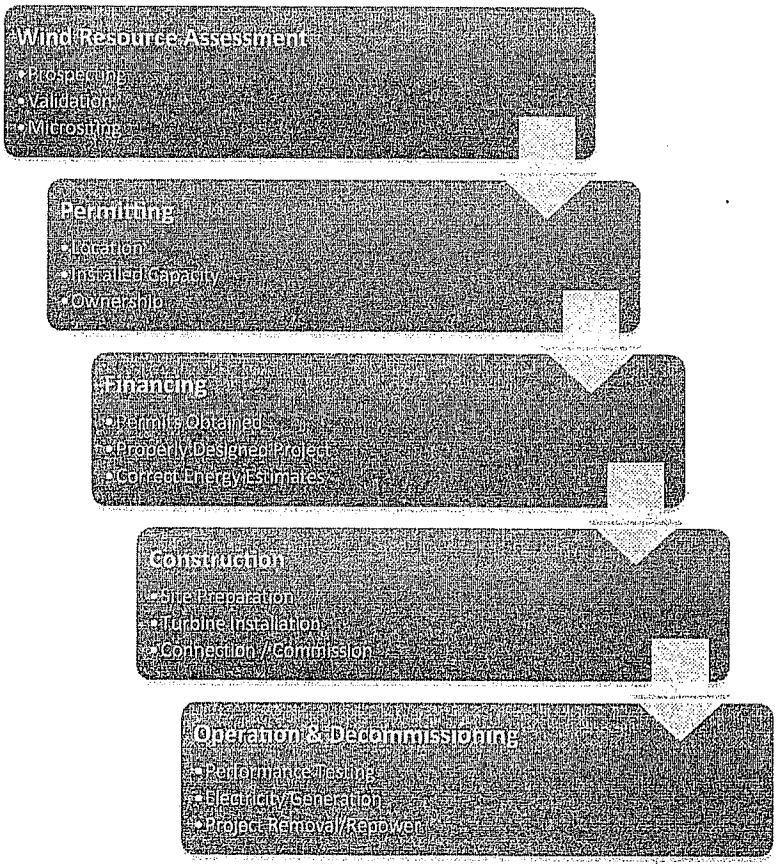

Figure 10 – Graphical summary of a utility scale wind energy project lifecycle.

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To date, wind energy development has occurred in areas with favorable wind resources, market conditions or incentives for wind energy. With implementation of the Renewable Portfolio Standard (RPS) in New York State, the potential for wind energy development has increased significantly. States that utilize an RPS have a necessary market, which can increase the likelihood of selling energy at competitive prices. Therefore, developers can benefit from identifying potential project sites within these states. A brief discussion of the activities and requirements for each step is provided in this document. For more information on New York State's RPS, please refer to Section 2.1: Market Drivers.

For a more in-depth walkthrough of the wind farm development process, consult AWEA's *Wind Energy Siting Handbook*; a link is provided in the additional resource section at the end of the chapter.

6.1. Wind Resource Assessment and Site Selection

Before a wind energy facility can be constructed, developers need to determine the wind resource of the site in question with a high degree of certainty. Developers (and others interested in wind energy) use three basic steps to identify and characterize the wind resource: prospecting, validation, and micrositing. The process of locating sites for wind energy development has many similarities to exploration for other resources such as minerals and petroleum.

Prospecting

Prospecting includes identifying potentially windy sites within a fairly large region—such as a state, county, or utility service area—and investigating the development potential and general suitability of these sites for wind energy projects.

Wind prospectors generally rely on multiple sources of information such as terrain maps, wind atlases, local wind speed data, and other climatologic information to identify good wind sites. Wind resource maps of New York are tools used by many developers to identify prospective project sites (see Section 2: Wind Energy in New York State). Wind maps provide site-specific estimates of wind speed and direction characteristics that can be used to predict the annual energy output of a proposed wind energy project. This information gives the developer more confidence when deciding whether or not to pursue more in-depth site evaluation and planning studies.

Developers conduct site visits to assess local conditions such as vegetation height and growth patterns (an indicator of high winds), location of residential buildings, quantity and existing uses of land, proximity to transmission lines, identification of potentially sensitive environmental areas, and other factors.

Validation

If the decision is positive and the studies proceed, an essential next step for large project is the measurement of on-site wind and other meteorological conditions such as air temperature. Validation of the wind resource involves a more detailed level of investigation and analysis to reduce the uncertainty in energy production estimates. This involves the process of installing monitoring stations to verify the magnitude and characteristics of the wind resource at a promising site. Site-specific wind speed data are critical because a small change in the annual average wind speed at a site can have a significant impact in determining whether or not a project is economically viable. A minimum of one year of data is typically recommended to accurately capture the seasonal variation in the wind resource.

Upon identifying parcels of land with apparent development potential, developers generally approach the landowners to obtain permission to install monitoring stations and negotiate land lease options (see Section 13: Land Acquisition). The installation of monitoring stations often represents the first point of interaction between a developer and a local authority, assuming that approval is required to erect the meteorological tower. If the met tower is located in an area that contains a height restriction on buildings or towers, the developer may be required to obtain a special use permit or an area variance.

For more information on wind resource assessment, please refer to Section 12: Developer Site Identification.

Micrositing

If the wind data confirm the viability of a project at a site, developers pursue land rights for the entire project and begin micrositing. Micrositing is the process of collecting additional wind data for the purposes of determining the most appropriate turbine for the site, identifying potential turbine locations, and optimizing the project layout. Wind can be highly variable, being influenced by terrain features, vegetation, and local atmospheric conditions. Experience has shown that limiting the number of met towers can result in erroneous energy production estimates. Therefore, once developers have determined that a specific area has the right mix of wind (based on initial met tower data), land, local support, and energy market; it is common to deploy additional met towers. The number of additional met towers is dependent on land characteristics, turbine size, potential turbine layouts, etc., but can vary from approximately one met tower for every 10 – 30 turbines.

6.2. Permitting

Most wind energy projects require some form of approval from government agencies. As part of the project planning activities, developer's will research town, county, state and, at times, federal rules and regulations. They must become familiar with local requirements and determine the jurisdiction of the various entities. The number of agencies and levels of government involved depend on a number of factors such as:

- The location of wind turbines, transmission lines, substation, O&M facilities, and access roads,
- The installed capacity of the facility,
- Ownership of the land, and
- Ownership of the project or funding sources.

Further discussion of the permitting that may be required in New York is discussed further in Section 14: Permitting and the Wind Energy Model Ordinance Options document in the Appendix.

6.3. Financing

Most wind energy projects require some form of financing to construct the project. To secure financing, a developer is required to demonstrate that multiple facets of the project have been secured:

- All necessary permits have been obtained
- The project is properly designed
- Energy projections are based on sound technical analysis
- A good market for the energy exists, or a power purchase agreement is in place

Local governments are not normally involved in the financing activities that projects perform since financing is typically received from large lending institutions or sources of equity. During the financing process, it is very common for the lenders or equity partners to have an independent engineer review all aspects of the project

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and report on the project's viability. In this process, the developer may be required to make changes to the project to resolve potential issues of concern raised by the engineer. If changes impact past local approvals and/or environmental assessments, then additional work with the local officials may be required. This is not a very common outcome of project financing, but it is an example of how local governments may be affected.

6.4. Construction

Construction of wind energy projects generally requires five to 12 months, depending on the size of the project, terrain, and weather conditions. Construction may be planned for low wind months for safety considerations and to minimize disruptions to crane related activities. The type of equipment used is similar to most construction sites with the exception of the large-capacity crane that is necessary to install the top tower sections, nacelle, and rotor. During construction, the project schedule is often focused on minimizing the time required for the large-capacity crane due to their high operating costs. Conventional earthmoving equipment such as excavators, bulldozers, graders, dump trucks, and cement trucks are the first pieces of equipment at the site and are used to construct the access roads, foundations, and install power cabling. While the infrastructure is being installed, turbine and tower components are delivered to the site and staged near the foundations. Upon completing assembly of the turbines, electrical and communication connections are made and turbine testing begins. Once the turbines are commissioned, energy production can begin.

Table 3 - Estimated Construction Schedule of a 30 MW Wind Power Plant

Task	Subtask	Duration
Site Preparation	Access Roads	2 - 6 Months
	Foundations	
	Power Collection System	
	Substation/Grid Interconnection	
	O&M Building	
Turbine Installation	Receive Tower and Turbine Components	1 - 1.5 Months
	Set Tower Base Sections	
	Complete Tower Assembly	
	Install Nacelle and Rotor	
Construction Completion	Complete Internal Turbine Assembly/Connections	1 - 2 Months
	Energize Project Site	
	Commission and Test Turbine Functions	
Post Construction	Performance Testing to Verify Proper Operation	1 - 3 Months
Note: Assuming twenty 1.5 MW wind turbines on 80 m towers		

It can take as many as seven trailers to transport the components for one turbine and as many as 60 trailers to transport the large-capacity crane. Turbine and crane components are transported in compliance with Federal and various State Department of Transportation (DOT) requirements for both size and weight. A common concern in rural communities is that the bearing capacity of local roads may be insufficient to accommodate multiple large loads. Turn radii and clearances are also critical factors for consideration. A delivery route analysis can determine which portions of the existing infrastructure are to be avoided or modified. Payment of infrastructure modifications required for construction is negotiable, and wind developers often accept paying the improvement costs. An increase in traffic during construction activities is noticeable in most rural communities.

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Project monitoring to ensure compliance with permit requirements is common during the construction phase. Monitoring may be performed to verify that site work is adequately protecting sensitive environmental areas (if any are present); that road conditions following construction have not degraded; and that the project is in compliance with structural, electrical, and other building codes. The NYS Department of Agriculture and Markets has issued guidelines for protection of agricultural lands during and after wind construction.

6.5. Operation and Decommissioning

The turbines are designed to operate automatically and independently. The control system manages all necessary adjustments in operation, monitors turbine performance, and initiates alarms when conditions warrant. Much of the site operation is handled remotely from the O&M office via the use of computers and a high-speed communication network between the turbines.

In general, projects are staffed with one operator for every 10 to 20 turbines, depending on the project and turbine size. Operators are specially trained and apply both electrical and mechanical skills to address turbine faults, troubleshoot operation problems, and perform repairs. Much of the work is performed inside the turbines, which involves a significant amount of climbing.

Repowering wind energy projects refers to the replacement of old, more costly and typically smaller wind turbines with new equipment. As the turbines approach the end of their design life (usually 20 years) or if a significant improvement in technology occurs, a project owner may assess the costs associated with repowering a site. An advantage of repowering is that the site conditions and wind resource are well known. In addition, surrounding communities are familiar with the project's presence. To date, repowering has only occurred in California where wind turbines have been installed since the 1980s. These early wind turbines are significantly smaller in size than the current generation of machines. As a result, project owners can frequently replace numerous small turbines with one large model.

The new wind energy projects in New York are expected to operate for 20 years or more but some lease agreements between landowners and the project owners may extend well beyond this period. As a result, wind turbines may be present on the land at these sites for many more years if a reevaluation or repowering of the project is acceptable to the landowner and local approval is obtained.

Decommissioning involves the removal of all evidence of a wind power project after it has reached the end of its design life. Depending on permit requirements and terms of the land lease agreements, the project owner may be required to restore the land to original site conditions. Often at the outset of a project, a reserve fund is set aside to ensure that sufficient resources exist for the eventual decommissioning of the project. Decommissioning includes removal of all turbines and towers, concrete foundations to some reasonable depth below grade, underground cabling, power poles, met towers, substation equipment, and O&M buildings. Site restoration includes re-grading and replanting areas where foundations, roads, and buildings were located (see Section 10: Environmental Impacts). While all turbines may not be repowered, every turbine should be decommissioned at the end of its lifetime.

6.6. Additional Resources

- American Wind Energy Association – Wind Energy Siting Handbook (2008). This handbook provides a comprehensive walkthrough of the development process for utility-scale wind projects. (http://www.awea.org/sitinghandbook)

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- NYS Department of Agriculture and Markets – Guidelines for Agricultural Mitigation for Windpower Projects. Guidelines for protection of agricultural lands during and after wind construction. (http://www.agmkt.state.ny.us/AP/agservices/constructWind.html)
- The NYS Department of Agriculture and Markets has issued guidelines for protection of agricultural lands during and after wind construction. Readers can find these resources at: http://www.agmkt.state.ny.us/AP/agservices/constructWind.html.

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7. Economic Impacts

Any business development will have both direct and indirect economic impacts on the local and regional economies, and wind energy projects are no different. A new wind project directly affects an area through the purchase of goods and services, generation of land use revenue, taxes or payments in lieu of taxes, and employment. Secondary or indirect economic effects may include increased spending power, economic diversification, changes in property values and the use of indigenous resources.

In New York State, rural communities with good wind resources are being confronted with the question of whether to welcome or reject wind energy development. Since wind development is new and not well understood in many communities, concerns about the potential economic impacts can contribute to apprehension about wind projects.

In financially depressed areas, the prospect of wind development may be appealing, particularly to farmers who can use the revenue from land leases to augment their farming income. In some cases, this may save their farms, and save the area from other development. Neighbors, too, might prefer wind turbines, which guarantee that the majority of the surrounding land will never be developed, over the alternatives (such as a housing development, the fate of many no-longer-profitable family farms).

Typically, a proposed wind project will affect its host community in a number of ways, some positive, some negative. Whether any single impact is viewed as a benefit or a drawback depends a good deal on the perspective of the viewer. In considering whether to permit the development of a wind farm, it is up to the community to weigh all the impacts, and decide whether the positives outweigh the negatives. This section is designed to help communities understand the components of this process.

7.1. Direct Economic Impacts

Direct economic effects from the development of a wind project include land owner revenue, revenues to local governments from property or other taxes, the creation of jobs, and the use of local services.

Land Owner Revenue

The development of a wind project can increase the productivity of the land and provide an additional source of income to rural land owners from leasing and royalty agreements. Wind turbines occupy 4% or less of the land area required for a wind power project. Since only a fraction of this land is utilized by physical plant structures and roads, the previous use of the land (e.g., ranching or farming) typically continues alongside the wind power facility.

Depending on the placement of the turbines on one or more properties, the project may directly benefit one or more landowners through lease payments and production royalties. In addition to these direct benefits, the broader community may benefit. This is due to multiplier effects associated with the increased income of the host landowners, and to the increased long-term stability of those landowners, who have diversified their sources of income.

For more information on land leasing, please refer to Section 13.2: Lease Agreements.

Property Taxes

Property taxes or annual payments in lieu of taxes (PILOT) from a wind power project significantly impact the community. In many locations, wind projects can be among the highest paying property tax entities. Based on information from Madison County, New York, voluntary payments from the Madison Wind Power Project amount to approximately $30,000 per year each for both the town of Madison and the Madison Central School District, or approximately $5,200 per MW. The Fenner Wind Power Project is providing the town of Fenner with approximately $150,000 per year for 15 years, or approximately $5,000 per MW. The Maple Ridge Wind Project in Lewis County is expected to result in a substantial increase in annual tax revenue for the county. Annual payments are anticipated to be over $8 million from the project. This large amount is due in part to the location of the project in an Empire Zone.[10] Even without the Empire Zone benefits, the project would still pay more than $1million annually in PILOT payments. The largest beneficiaries of the added revenue will be the towns and schools.

Job Creation

As with most business ventures, wind energy projects create jobs. In general, the employment opportunities associated with a wind power plant are in construction, operations and maintenance (O&M), and manufacturing. Various studies have shown that, compared to conventional generation options, wind development creates more jobs per dollar invested and per kWh generated. It should be noted that most wind energy jobs are in the manufacturing, construction and installation fields, with relatively few jobs in ongoing operations and maintenance.

Construction Employment

Construction-related employment for a wind power project usually involves short-term assignments during the construction of the project. Construction time for a large wind project depends on the size and location of the project, but averages between seven to ten months in duration. In the United States, a 50 MW wind project will create the equivalent of 40 full-time jobs during the construction period. Typically, an arrangement will be made for the developer to hire or turbine manufacturer to serve as a general contractor, which is beneficial as this ensures the contractors familiarity with building wind projects. As they are responsible for the overall project construction activities, the general contractor will hire subcontractors that are experienced in civil work (grading, excavation, and concrete), electrical work, and mechanical assembly. Typical personnel requirements include construction managers, electricians, heavy equipment operators, security personnel, and general laborers for assembly and civil work. The number of positions that might be filled by local personnel depends upon the skill base of the local population and the policies and location of the construction or contracting company.

O&M Employment

The number of people employed by a wind power project during commercial operation depends primarily on the project size and administrative structure. Small projects, usually less than 10 turbines, are generally remotely operated and only bring in maintenance personnel when required. Larger projects will have a full-time O&M staff, the size of which depends on the project size, turbine type, and local labor practices. Although some maintenance activities on the larger turbines may require more time or different equipment, many maintenance activities require approximately the same level of effort regardless of the turbine size, so a few large turbines

[10] Under a New York State initiative, sales tax exemption, real property and business tax credits are available for qualified businesses locating and expanding in designated Empire Zones.

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are cheaper to maintain than many small ones. A 50 MW wind project would be expected to require two full-time technicians to carry out O&M activities.

Wind turbines typically have regular maintenance scheduled every six months. In the U.S., each scheduled service of a 500 kW to 1,500 kW (1.5 MW) turbine typically requires two people for one 8-hour period. For six large projects in the U. S. (between 25 and 100 MW) with turbines of 750 kW or greater, approximately 1 full-time maintenance job was created for every 5 to 8 MW of installed capacity.

Wind projects are usually staffed with primarily local personnel, with an experienced supervisor or facility manager supporting the locally hired employees. The number of local employees hired will depend on available skills and training. Skills that project managers and operators must have include computer literacy, inventory management, job and equipment scheduling, performance record-keeping, statistical trend analysis, and data processing. Maintenance personnel generally need to be proficient mechanics or electrical/electronic technicians. With these skills they can readily be trained in wind power mechanical and electrical systems and maintenance equipment. Specialized turbine training is often provided by the turbine manufacturer.

Skills in each of the following areas need to be available to successfully maintain a wind power project.

- Hydraulics
- Rotating machinery
- Cranes and other heavy lifting equipment
- Composites repair (e.g., fiberglass)
- Electronic controls
- Power electronics
- Medium- and high-voltage electrical equipment
- Safe climbing and maintenance procedures

Once the project begins operation, the majority of the maintenance activities require climbing the tower and working within the confines of the nacelle and hub. This type of physical activity requires agility and strength, similar to the skills of an electric utility lineman. This is physically demanding work, and finding and retaining the proper combination of people who can both tolerate the physical demands and have the skills required to maintain modern turbines can be challenging.

Manufacturing Employment

The majority of commercial wind turbines sold in the U.S. are manufactured in Europe and the U.S. Although some turbine manufacturers build many of their own components, others are better described as assemblers because the major components of their turbines are produced by other companies and then assembled into their wind turbine model. The American Wind Energy Association (AWEA) estimates that wind turbine and component manufacturers directly contribute to the economies of 46 states. These companies manufacture and market towers, gearboxes, blades, monitoring equipment, and other wind energy-related equipment.

Manufacturers sometimes source individual components locally, depending on the local skills and resources. Towers, for example, are difficult and expensive to transport. As a result, towers are frequently the first turbine component to be manufactured locally in a developing wind power market. Tower fabrication requires capabilities similar to that required for manufacturing large steel storage tanks and towers for other purposes, which increases the probability that local businesses can grow into tower manufacturing with minimal new investment in the plant, equipment, and training. Cabling, transformers, concrete, and other project components may be easily sourced locally.

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The employment resulting from component manufacturing can be significant, although the total number of manufacturing jobs created will depend on the manufacturing capabilities of the area, the incentives provided, and the size of the market, among other factors. For example, a wind turbine blade manufacturing facility located in Quebec has a capacity of 240 MW, or approximately 400-500 blades annually, is estimated to create employment for 100-120 factory workers. Gamesa, a wind energy company based in Spain, has located its U.S. headquarters and east coast development offices in Philadelphia and a blade manufacturing plant in Ebensburg, PA, creating approximately 235 manufacturing jobs.

Development of Regional Cooperatives

Under the right circumstances, cooperatives can provide a way for local communities to gain additional economic benefits from wind energy development by retaining the return on investment and energy sales profits that might otherwise go to a private developer located outside of the region. Locally-owned wind cooperatives develop wind power projects and sell the electricity to a utility. The cooperative development and ownership of wind power plants has proven successful in countries such as Denmark, where approximately two-thirds of the turbines are owned by individuals or cooperatives, but has not been practiced widely in the U. S.

7.2. Property Tax: Exemptions and PILOT

Payments to local governments can take the form of property tax, sales tax on miscellaneous materials and supplies purchased locally, or alternative payment agreements negotiated between a local taxing jurisdiction and the project owner to compensate for the additional burden the project may place on local services. These payments either incent or deter developers' interests in an area. Whatever approach or mechanism is used for establishing payments to governments, the magnitude of the payments should be comparable to the costs associated with additional services required by the project while providing a reasonable benefit to the larger community. For many small towns, payments from wind energy projects result in a significant increase in revenue in comparison to other local revenue sources.

Some areas have limited or exempted wind energy projects from paying certain or all local taxes to induce development and increase the economic diversity of small rural towns. Other forms of stimulus include business or corporate incentives for establishing manufacturing or company headquarters in a region or state.

Exemption

Property values increase via appreciation, improvements to the property, and additions to the property. If a property owner either installs a home-sized wind turbine or leases a portion of the property to a developer for installation of a utility-scale turbine, the assessed value of the property may increase. If the property owner owns the wind turbine, the owner is responsible for any increase in property taxes or for filing for an exemption. If the turbine is owned by an entity other than the property owner, the turbine owner is responsible for any increase in property taxes due to the wind turbine, known as leasehold improvements, as negotiated in the land lease agreement.

Payment of additional property taxes on improvements associated with wind turbines is exempt for a period of 15 years under the New York State Real Property Tax Law (RPTL Section 487) unless disallowed by the local taxing jurisdiction. This exemption applies to county, city, town, village, and school taxing jurisdictions but does not apply to special-use districts such as fire districts. As of June, 2009, projects must be installed by January 1, 2011, to be eligible.

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Any county, city, town, village, or school district may actively retract this exemption by adopting a local law or school district resolution to disallow it. However, the city school districts of New York, Buffalo, Rochester, Syracuse, and Yonkers cannot retract the exemption. This tax exemption has become a significant negotiation issue between project developers and local taxing jurisdictions. Taxing jurisdictions that have not disallowed the exemption can do so at any time prior to the turbines being constructed, thereby making the project pay its full tax burden. Local governments can use this provision as leverage to negotiate a voluntary payment with the developers.

Payments-in-lieu-of-Taxes

For county, city, town, village, and school district taxing jurisdictions that do not retract the exemption, they may enter into a contract for payments-in-lieu-of-taxes (PILOTs) with the property owner; in this case, the owner of the wind turbine equipment would be included in the PILOT agreement. PILOT agreements may be written by the county's or local taxing jurisdiction's tax counsel. Several taxing jurisdictions can be parties to the same agreement; each taxing jurisdiction does not have to enter into its own PILOT with the project owner. If multiple jurisdictions are parties to the agreement, the PILOT agreement defines the amount the property owner pays each taxing jurisdiction. This amount is paid in lieu of property taxes due on the equipment and improvements to the land. PILOT amounts cannot exceed the amount that would be due if property taxes due to the improvement were not exempt, and the agreement cannot continue for more than 15 years. PILOT agreements only cover the amount to be paid and how it is distributed among the different parties to the agreement. PILOT agreements do not include language on how these funds will be used (see Sections 9 and 10).

Common PILOT Payment Structure

Specific guidelines for determining the magnitude of PILOTs do not exist except for the provision that payments may not exceed what would have been owed had the equipment been assessed under the ordinary tax provisions. A common structure is a $/installed capacity amount. One agency indicated that they are considering a payment of approximately $5,000 per MW per year with a contract term of 15 years. Information from Madison County, New York, shows that voluntary payments from the Madison Wind Power Project amounts to revenue for both the town of Madison and the Madison Central School District of approximately $30,000 per year each, or approximately $5,200 per installed MW. The Fenner Wind Power Project is providing the town of Fenner with approximately $150,000 per year for 15 years, or approximately $5,000 per installed MW.

Alternative PILOT Payment Structures

Although basing payments to local taxing jurisdictions on the value of the project or the installed capacity is the most common method for structuring such payments, several alternatives have been explored. For example, the use of actual turbine energy production (kWh) may be a more objective measurement for basing payments. Similar to the royalties or royalties with guaranteed minimum payment options in a land lease agreement, the project could pay the taxing district a percentage of gross revenue (see Section 13: Land Acquisition). When basing payments from wind energy projects on capacity, a 30 MW wind farm on a moderately windy site provides the same local revenue as a 30 MW wind farm on land with a high wind resource. If payments were based on actual energy production, more revenue may be available from the project with a higher wind resource. One downside to this approach is that tax revenues will vary from year to year due to variations in the wind resource, which may make budgeting difficult.

As an example of how PILOT payments can be structured, the state of Minnesota uses a production-based PILOT model to calculate payments to local taxing jurisdictions based on energy production from wind turbines. The payments are based on project size:

- Large-Scale Wind Energy Conversion Systems: Projects with installed capacities of 12 MW or greater will make payments of 0.12 cents per kWh.
- Medium-Scale Wind Energy Conversion Systems: Projects with installed capacities between 2 and 12 MW will make payments of 0.036 cents per kWh.
- Small-Scale Wind Energy Conversion Systems: Projects with installed capacities between 250 kW and 2 MW will make payments of 0.012 cents per kWh.
- Systems with installed capacities less than 250 kW are exempt from the production tax.

Wind Farm Impact on Property Owner Tax Assessment

Typically, utility-scale turbines, as part of a large wind energy project, are placed on the project owner's tax assessment and treated as a leasehold improvement. The landowner should receive a separate notification and assessment for the land only. In New York, the tax-exempt status for wind turbines and associated equipment expires after 15 years. As the wind turbines become fully taxable, the concern is to protect the landowner from the tax liability associated with wind turbines.

Recently, a unique situation occurred at the Madison and Fenner wind power projects when the wind turbines were listed as improvements on the tax parcel owned by the landowner. Even though the wind turbines are currently exempt from real property tax, the presence of the turbines on the landowner's tax assessment caused considerable concern for the landowner. Listing the turbines on the landowner's parcel means that, theoretically, the landowner has the tax liability of the wind farm improvements in the event that the project owner defaults or files bankruptcy pursuant to any clauses in the land lease agreement.

An alternative to placing the turbines on the landowner's parcel is for the turbines to be placed on a separate suffix or leasehold parcel that is associated with the wind project owner. This would ensure that all tax liabilities for this leasehold would reside with the project owner and not the landowner. This appears to be a relatively simple method for addressing an issue that is extremely important to landowners. At the Maple Ridge wind project in the Tug Hill area, Lewis County has taken this approach to protect the underlying landowner. A new tax ID is created for each tower location and the wind project owner of the tower and associated equipment is exclusively responsible for the taxes associated with the equipment. However, assessors cannot be obligated to separately assess the turbines to their owners instead of assessing them to the landowner.

Wind Farm Impact on Local School Taxing District

New York State law exempting eligible wind energy systems from property taxes will have an impact on the financial resources available to local taxing districts, including school districts, within which the project resides. To help quantify this impact, NYSERDA contracted the Pace Energy Project to evaluate the fiscal impact of property tax exemptions for wind energy development on state school aid.[11] While there are competing tendencies, it is expected that, under most circumstances, the wind energy exemption will have a favorable fiscal impact. This conclusion is supported by the following considerations:

- Over half of all financial resources available to school districts derive from revenues raised locally. The exemption of wind energy system equipment from the calculation of "assessed value" means that the school district will collect a lesser amount of property tax than if the equipment had been fully taxable.
- The tax loss associated with the wind energy exemption will be partially offset by any Payments in Lieu of Taxes the school district negotiates with wind developers. It is anticipated that PILOTS will be more germane to large, utility-scale systems than to smaller customer-sited wind projects.

[11] Fiscal Implications of Property Tax Exemption for Wind Projects, (2005) NYSERDA and Pace Energy Project

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- A further compensating factor is the positive influence of the wind energy exemption on the formula for calculating state school aid. While there are many state aid formulas, as a general rule, the lower the assessed value of District property per pupil, the greater the state aid; conversely, the greater the assessed value, the lower the state aid. However, because wind energy systems are not considered in the quantification of assessed value, the statutory exemption increases economic activity within the district while maintaining the status quo with respect to the school district's expected state aid.
- As a prominent example, nearly half of all state aid consists of Operating Aid, which is based on weighted attendance and wealth of school districts. The statutory exemption for wind energy systems means that the school district's wealth remains constant for purpose of the formula, and will receive the same level of school aid.
- At the time the wind-related property becomes part of the taxable property base, an increase in the assessed value of District property per pupil, results in lower state aid. Therefore, the impact of property tax incentives for wind development occurs, if at all, after the 15-year period.[12]
- When the statutory exemption expires, the wind farm will come on the rolls based on its depreciated value as a 15-year old asset. Thus, the financial impacts of the expiration of the tax exemption – both positive and negative – will attenuate over time.

Disclaimer

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[12] If the wind equipment remains in the hands of the original developer, the wind equipment should be fully depreciated by Year 6 under the Modified Accelerated Cost Recovery System (MACRS). Under MACRS, wind property is currently provided a depreciation life of 5 years, substantially shorter than the 15 to 20 year depreciation lives of non-renewable power supply investments. Faster depreciation results in tax benefits early in a project's life, and is preferred by investors because an after-tax dollar is worth more today than in later years. <www.dsireusa.org>
If at the end of the depreciation period, the project were sold to another developer, the purchaser's basis for depreciation would be his cost to buy those used turbines. Under the mid-year convention, federal tax depreciation deduction for the first year would be 20%, the second year 32%, the third year 19.2%, the fourth year 11.52%, the fifth year 11.52%, and the sixth year 5.76%. E-mail correspondence from Edwin Ing, American Wind Energy Association, to Fred Zalcman, dated Sep, 1, 2004.

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- Fiscal Implications of Property Tax Exemption for Wind Project, NYSERDA and Pace Energy Project

7.3. Indirect Economic Impacts

The construction and operation of a wind project results in the purchase of local goods and services such as construction materials and equipment, maintenance tools, supplies, and equipment and manpower essentials such as food, clothing, safety equipment, and other articles. As previously mentioned, support services such as accounting, banking, and legal assistance are required. The rental of local equipment for maintenance is common. The Kern County Wind Energy Association, based in California, estimates that approximately $11 million is paid annually to local businesses for goods and services as a result of wind power projects in Tehachapi, California.[13] This equates to $22,000 per MW or $3,667 per wind turbine.

While a wind power plant can have a substantial regional economic impact, it has a minimal impact on the local and state infrastructure because of the high capital-to-labor ratio of the plant's operation. Additional employment and property taxes add value to the local economy without creating a substantial burden on the existing water and sewer system, transportation network, or on emergency, education, and other public services.

Because businesses within a local economy are closely linked by business and personal purchasing patterns, direct benefits have an indirect effect on the economy. The direct effects spur rounds of spending in the local and state economy, increasing the overall benefit to the area. Increased taxes from a wind power project may result in additional government spending on local, state, and federal services, or in decreased tax burdens on other property owners. Another secondary impact, referred to as the induced effect, comes from additional household earnings from employment growth that results in increased household spending on goods and services.

Additional value to local economies results from increased diversification of the county and state economic bases. Economic diversification ensures greater stability to the economy by minimizing financial high and low cycles associated with a specific industry. This effect is particularly important in rural areas that tend to have a one-dimensional economy. Single dimension economies result in limited local business interaction; therefore, more goods and services are imported and more dollars leave the region.

Individuals can gain indirect benefits through a municipal government that owns a wind power project. For example, a municipally-owned project located on a harbor in northern Europe uses the project revenues for harbor improvements. A number of wind projects are owned by public utilities in the U.S. and most of these enjoy strong public support.

Certain indirect economic impacts may be viewed negatively. For example, those in local recreation and eco-tourism industries may fear that siting wind turbines on a highly-visible ridgeline could negatively impact their business. Adjacent property owners may be concerned about possible devaluation of their properties due to the

[13] Tehachapi, CA, is one of the three main wind development areas in the state of California. The first wind turbines in the area were installed in the mid-1980s; however, new wind projects and "re-powered" projects continue to be installed today. (Re-powering refers to the replacement of older, smaller wind turbines with newer, larger models). Wind development in Tehachapi includes approximately 500 MW of wind capacity and more than 3,000 wind turbines, ranging in size from approximately 100 kW to more than 1 MW. Tehachapi is also the location of the company headquarters and/or the central O&M facilities for several developers.

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proximity of turbines. Although some studies have associated wind farms with enhanced tourism and increased property values, more studies will be required before these concerns can be definitively addressed.

7.4. Economic Case Study

The original economic study that has been summarized in this section can be found in the Major Economic Impacts section of the Appendix. The Maple Ridge project sponsors provided NYSERDA with the construction costs and expenditures of phase I and phase IA of the project (231 MW) along with Payment in Lieu of Taxes (PILOT) figures, generalized landowner lease payment structures, and project-specific labor composition statistics. The Maple Ridge project was a two-phase project; phase I included 120 turbines (198 MW) that were installed in 2005 and 20 turbines (32 MW) installed in 2006, while phase II included 55 turbines (90 MW) installed in 2006. The second phase of the project brought the total number of turbines to 195. The initial 140 turbines involved leases with 61 landowners.

Since the economic details were only given for the phase I and IA, the total impact that likely accrues for New York State and the affected locales were extrapolated to the full project size (330 MW) and categorized to each major economic impact. A summary of the major categories can be found below:

- Wind data acquisition & analysis, project permitting and engineering
- Land acquisition activities
- Community outreach and marketing
- Local spending on food, services, fuel, lodging, etc. by non-NY workers
- Regional/In-state construction wages
- Regional/In-state spending on construction materials
- Increased commerce activity
- Operations and Maintenance employment (O&M)
- Property tax-related payments to municipalities
- Landowner revenue

A wind project will create and sustain many positive economic impacts, commencing during the development phase and continuing throughout the viable economic life of the project. In New York State, the major economic impacts of such projects are likely to be in the range of $9.71 to $10.66 per MWh (nominal dollars)[14]. The resulting local and state benefits from a NY based wind farm appear higher when compared to wind farms in western parts of the country for several reasons:

- Higher land values in NYS result in higher land lease payments,
- Smaller parcel size means greater number of landowner negotiations,
- Higher property taxes,
- More complex permitting requirements,
- More dense population often results in land-use conflicts and project opposition,
- Stricter labor requirements for construction activity in NYS, and
- Engineering and construction considerations that are unique to building a wind farm in the Northeast topographical environment.

[14] This range does not include energy price suppression or economic activity associated with increased personal spending power of those affected by a project (multiplier effect). Preliminary figures indicate that the multiplier for direct spending in rural New York counties can approach 1.3

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The potential for New York State to capitalize on the economic effects associated with wind generation is considerable. As of May, 2009, the NYISO generation interconnection queue has more than 70 wind projects vying for interconnection rights; these projects represent more than 8000 MW of potential generation capacity, which results in about 70,700,000 MWh/yr.[15] Assuming 30% of those projects are successful; NYS could stand to be the recipient of more than $1.24 billion in economic benefits.[16]

The above estimates were updated from a previous economic study with more recent data. The original study is included in the Appendix.

[15] Data calculated from the NYISO queue as of October 12, 2005 adjusted for an annual capacity rating of 30%
[16] Assumes the minimum economic life of a project (20 years) and $9.71 per MWh in impacts

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8. Socioeconomic Impacts

Development of a local wind power industry or construction of a wind power project can have socioeconomic impacts on a region or community. These impacts are more difficult to quantify, but may include impacts to local culture and customs, land use, scenic, recreational and ecological resources, infrastructure (e.g., water, sewage, waste removal, roads, housing), emergency personnel and systems, and education. The extent of the potential impacts depends on the scope of the industry and the project(s).

Wind energy projects tend to be located in rural areas, which may be more significantly impacted than urban areas. Rural areas tend to be more culturally homogenous than urban areas. For projects or industry in rural areas, the addition of skilled labor from outside the area may put pressure on the local community due to cultural differences. Non-local workers relocating to the project area potentially bring different social attitudes, norms, and practices. In areas where the size of the development is small and limited to wind power projects, these cultural stressors are usually minimized since wind power project construction only lasts an average of six months and ongoing O&M jobs can frequently be filled by local personnel.

The amount of non-local labor will also impact short-term housing availability. For projects located in remote areas, the project developer may need to provide temporary or permanent housing. Typically, long-term housing for permanent employees is not a problem. Usually the facility manager and possibly one other staff member would be hired from outside the local community because of their expertise in operating wind power projects. All other staff positions would be filled, if possible, with skilled local labor.

As is the case for any significant construction activity, a wind power project has the potential to increase the work load for police, fire, medical, and other similar services. Although major events such as fires are rare in the construction and operation of a wind project, industrial accidents do happen and must be planned for. Typically, the construction general contractor and O&M manager will work with the local and surrounding communities to determine the ability of local services to handle potential events, and to put mitigation measures in place as necessary.

The need for construction vehicles and equipment can create impacts on local communities, with a greater effect in rural areas than in urban areas. Any road development or widening and paving would result in permanent infrastructure changes to the local community, which are generally, but not always, viewed as positive. Paving a dirt road would allow for future development and widening a road may make general travel along the road safer. Some people living along an access road may not want the road paved and widened, fearing a general increase in traffic and traffic speed. These concerns regarding traffic are usually addressed in a traffic study, completed as a part of the project development process, with the developer offering mitigation measures if necessary.

Wind power projects, particularly in rural areas, can also change the visual character of an area by introducing large-scale structures and machinery into previously undeveloped areas. This includes the wind turbines themselves, as well as electrical transmission equipment and construction vehicles such as cranes and service trucks.

8.1. Property Value

Limited documentation exists regarding the impact of wind turbines on property values because it is difficult to properly relate changes in property values to the presence of wind turbines. Since property values fluctuate due to a variety of factors, principally the subjective opinions of the buyers and sellers, it is difficult to isolate

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changes related to the presence of wind turbines. Furthermore, a multitude of additional local, regional, and national economic factors influence property values.

Concern over decreased property values is most often expressed by neighboring property owners that are not participating in a wind power project. More specifically, these neighbors are not receiving annual payments for land leases or easements and feel that the close proximity of a commercial wind energy project to their property will reduce the number of potentially interested buyers, resulting in lower selling prices. While this belief should not be discounted, some potential buyers may enjoy the presence of a renewable energy source and the 'high tech' appearance of the turbines. Property owners that are participants in the project have the revenue generated from the turbines as an additional factor that can increase the value of their land.

On a larger scale, tax revenue from commercial wind energy projects is greater than the financial burdens the projects place on local services. Experience has shown that the net increase in funds available to local governments and schools has had beneficial impacts. More income from wind energy projects can allow increased local services or decreased the local tax burdens; either of which has a positive influence on the local economy. Over time, improved services or reduced residential tax burdens may have the effect of making the community or region more desirable and possibly increasing property values.

The Renewable Energy Policy Project (REPP) published a study of property values in 2003[17]. REPP evaluated residential property values at 10 wind power projects (10 MW and larger) throughout the U.S. built between 1998 and 2001. While many more projects were initially evaluated, these 10 projects had a statistically significant number of data points for the analysis. The Madison and Fenner, New York, projects are both included in this list of projects.

Property values in a viewshed radius of five miles were compared with property values in nearby communities. In 87 percent of the 30 individual analyses conducted, sale prices increased within the viewshed faster than in the comparable areas. In general, property values rose, but when the property values decreased, the values decreased slower in the viewshed than in the comparable community. The results of each case should be understood within the context of the correlation between the presence of the wind energy project and property values. In some cases, the correlation was weak, which indicates that any impact the wind turbines may have had on the property values was overshadowed by other factors not investigated in the REPP report.

Another study, conducted in 2006 by the Bard Center for Environmental Policy, examined the impacts on local property values of the Fenner wind farm[18]. The researcher visited each home within five miles of a turbine to ascertain to what degree the wind farm was visible. When the transaction values were examine from home sales pre- and post-construction, the study found that property values were unaffected by the 20 turbine wind farm installation.

8.2. Public Health and Safety

Public health and safety issues associated with wind energy projects are different from other forms of energy generation since a combustible fuel source, fuel storage, and generation of toxic or hazardous materials are not present. Wind energy projects do share similar electrical infrastructure requirements with conventional power generation facilities such as medium to high-voltage power lines and substation equipment. Unique concerns for wind turbines relate to the configuration of the equipment: blade throws, ice shedding, fire, tower collapses, and vandalism. While most of these are extremely unusual events, public agencies generally address these

[17] *The Effect of Wind Development on Local Property Values* (2003). Renewable Energy Policy Project
[18] Hoen, B. (2006). Impact of Windmill Visibility on Property Values in Madison County, New York

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potential occurrences by establishing reasonable setbacks from residences and public corridors based on the size of the turbine and blades.

Noise/Infrasound

The sound emissions from wind turbines are an often cited concern about wind projects. When in operation, wind turbines can emit mechanical (from gearbox or yaw drive) and aerodynamic (blade movement) sound. Since the perception of noise is a subjective matter, it is difficult to define objectionable noise. One person may regard a wind turbine as noisy and disruptive while another person may not under the same conditions.

The term infrasound is used to describe low frequency sounds (below 20Hz). In some cases, people have attributed health problems to infrasound generated by wind turbines. While wind turbines do produce infrasound, it is below the audible threshold and is not believed to have adverse affect on a person's health[19].

Sound emission studies can be conducted by determining how the sound from the wind farm will propagate to surrounding receptors, thereby providing a sound emission constraint in the project design process. The noise emitted from wind turbines is discussed in greater detail in Section 10.2: Sound Emissions.

Shadow Flicker

Shadow flicker can occur when the blades of the wind turbine cast a rapidly moving shadow on a residence or other structure. The pulsating light effect caused by the frequent movement of the shadows across a window can be unpleasant for the occupants. Shadow flicker is most likely to occur at sunrise or sunset, when shadows are cast over the longest distance.

The occurrence of shadow flicker is easily calculated; computer models can be utilized to determine the appropriate setbacks necessary to minimize shadow flicker. When proper planning and migration strategies are implemented during the project design process, the occurrence of shadow flicker can be greatly minimized if not avoided entirely. Shadow flicker mitigation strategies are discussed in Section 10.1: Aesthetics and Viewshed Analysis.

Blade Throw

A turbine blade can break due to improper design, improper manufacturing, improper installation, wind gusts that exceed the maximum design load of the turbine structure, impact with cranes or towers, or lightning. The distance a blade piece can be thrown from a turbine depends on its mass, shape, speed at the time it breaks from the machine, the orientation of the blade at the time of the throw, and the prevailing wind speed.

Although a few instances of blade throws were reported during the early years of the wind industry, these occurrences are now rare, due in large part to better testing, design, and engineering of commercial wind turbines. In October 2008, a Suzlon wind turbine located near Wyanet, IL suffered a blade failure. The cracked blade fell approximately 100 to 150 ft from the base of the turbine in an adjacent cornfield. To address the blade crack problem, the manufacturer has announced a retrofit program to fix all affected blades.

Fire

Wind turbines have rarely caught fire. Typically, a turbine fire is allowed to burn itself out while staff personnel and fire personnel maintain a safety area around the turbine and protect against the potential for spot ground fires that might start due to sparks or falling material. Power to the section of the project with the turbine fire is

[19] Leventhall, G. (2006). Infrasound from wind turbines – Fact, fiction or deception. Canadian Acoustics

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disconnected to protect the remaining array turbines, the substation, and the power grid itself. An effective method for extinguishing a turbine fire from the ground does not yet exist, and the events do not last long enough to warrant aerial attempts to extinguish the fire. However, since the public typically does not have access to the private land on which the turbines are positioned, the public's well-being should not be at risk.

Tower Collapse

Although turbine tower collapses are rare, a few instances of tower collapse have been reported due to various circumstances. The reasons for collapses vary depending on conditions and tower type, but have included blade strikes, rotor overspeeding, mechanical brake failure, cyclonic winds, and poor or improper maintenance (torque bolts). In cases where information is available, the majority of the major components (rotor, tower, and nacelle) have fallen to within 1 to 2 hub-height distances from the base. As with turbine fires, members of the public do not typically have access to the private lands on which wind farms are located. In March of 2009, a wind turbine collapsed at a wind farm in Northern New York State; no one was injured in this incident. The manufacturer attributed the collapse to improper wiring during installation which allowed the turbine to over-speed during high wind speed conditions. As of May 2009, no known member of the public has been killed or injured by a failure of a wind turbine.

Ice Shedding

Ice can accumulate on the blades, nacelle, and tower during certain extreme cold-weather conditions. Many times turbines will shut down in icing conditions because the ice accumulation on the blades causes the rotor to become unbalanced, resulting in an increase in vibration that prompts the control system to trigger a shutdown. Ice formation can also reduce power production, which is sensed by the control system that subsequently halts turbine operation. As the ice melts it will fall to the ground in the vicinity of the turbine.

During operable wind speeds and when the turbine has not yet been shut down automatically or manually, ice can break off the blades and be thrown from the turbine, instead of dropping straight down. The distance traveled by a piece of ice depends on the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational rate of the blade when the ice breaks from the blade, the mass of the ice, the shape of the ice (e.g., spherical, flat, smooth), and the prevailing wind speed.

Manufacturers and blade designers continue to research materials and methods that could be employed to reduce the possibility of ice accumulation and subsequent throws. Design features such as the use of black blades and the applications of special coatings have been used at some cold-weather sites. The best practices to reduce the possibility of ice throws include establishment of setback safety zones around the turbines and modifications to the turbine operation during periods of icing, as listed below:

- Turbine Controls – In addition to accumulating on the blades, icing affects the wind speed and direction sensors on the nacelle that provide information to the control system of the turbine. If the sensors become iced up, the control computer may detect no wind speed and/or no change in the wind direction and can stop turbine operation automatically. When ice melts from the sensor, the control computer automatically returns the turbine to operation. Icing on the blades results in reduced performance, unusual loads, or vibrations that are detected by the control system and trigger an automatic stop. In these cases, the turbine remains off-line until an operator inspects and manually restarts the turbine. If the turbine is not operating, ice from the blades, nacelle, and tower falls to the ground in the immediate vicinity of the machine.
- Operator Intervention – Project operators can halt operation of certain turbines or the entire project during icing events to prevent ice throws and equipment damage. Provided some wind is available, site

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operators can manually 'bump' the rotor for a few slow rotations to make the blades flex and relieve some of the ice build-up. Under these conditions, the slow rotor speed will again result in ice falling to the ground in the immediate vicinity of the machine.

- Safety Zones – Establishing adequate setback areas from inhabited buildings, roads, and power lines significantly reduces the risk of injury or damage in the event of ice throws. Research into quantifying ice throws is limited, which is relative to the limited reporting. The most complete study to date has been performed in the UK by C. Morgan, et al. The study quantified the risk of possible strikes from ice throws, in terms of distance from the turbine. The study does not propose specific setback distances but provides information to help establish setbacks that are comparable to other levels of risk.

Another factor to consider when assessing the risk of ice throws from wind turbines is that the power grid is impacted by ice formation and power to the project may be interrupted by the utility due to repair work or actual outages. Turbine operations stop immediately when grid power is lost, thereby reducing ice throw risks.

The people most at risk from falling ice are the site personnel, as most ice falls from the blades, nacelle, and rotor near the base of the tower. Most project developers have strict rules established for personnel and operations during icing events to prevent worker injury and to protect the public.

Vandalism

Though not unique to wind turbine installations, the potential for vandalism or trespassing can cause safety concerns. Wind turbines may attract more attention than other structures. Project developers report incidences of unauthorized access on their sites ranging from curiosity seekers to bullet holes in blades. Permits may require fencing and postings at project entrances to prevent unauthorized access. Other requirements intended to reduce personal injury and public hazards include locked access to towers and electrical equipment, warning signs with postings of 24-hour emergency numbers, and fenced storage yards for equipment and spare parts. Fencing requirements will depend on existing land uses such as grazing. Some communities have established information kiosks along roadsides to channel curious sightseers out of road traffic and into an area that is a safe distance from the turbines.

Working with Local Emergency Response Teams

Project developers commonly work with local emergency response teams to provide information or training on tower rescues and other wind-specific concerns. Falls, injuries from heavy or rotating equipment, and injuries from electricity represent examples of the types of events that can occur at a wind energy facility. The height of the nacelle as well as the confined working space can provide additional challenges for medical responders. The national Occupational Safety and Health Administration (OSHA) regulations, in addition to state worker safety regulations, cover all of the worker safety issues associated with electricity, structural climbing, and other hazards present in a wind farm.

Mitigation through Setbacks

Many concerns associated with safety, noise, and aesthetics can be addressed by placing distance between the wind turbines and people, property lines, roads, and scenic areas. Although no consensus on appropriate distances or types of setbacks exists, several common themes appear in a number of wind energy regulations put into place prior to May 2005.

Most local government requirements include setback specifications for the distance between the wind turbine and structures (residences and other buildings), property lines, and roads. A few agencies have defined setbacks from railroads and overhead transmission lines. The most common way to define a setback distance is in terms

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of a multiple of the turbine structure height (i.e. 1.5 times the turbine structure height). Other options are to specify a fixed distance or a combination of a fixed distance and a multiple of the turbine height. When specifying the structure height, it is important to define whether the height is the top of the nacelle or the highest point reached by the rotor blade (maximum tip height, or MTH).

With regard to setbacks from structures and residences, some permitting agencies differentiate between houses and buildings on the property leased for the project, and houses and buildings on adjacent parcels. The implication is that a greater distance is appropriate from structures on adjacent parcels since those properties have less control over the development than the landowner. A waiver of such requirements is typically granted if written permission is provided from the neighboring landowner.

Examples
Wind turbine setbacks from residences
- Fenner/Stockbridge, NY – 1.5 x MTH
- Martinsburg, NY – 1500 ft
- Contra Costa County, CA – 2 x MTH
- Palm Springs, CA – 1200 ft

Setbacks from property lines may vary for side and rear lot lines but are generally specified in the same way as setbacks from residences. Setbacks from property lines can pose a challenge for small wind turbines since these installations tend to occur on smaller land parcels. To address this issue, some agencies define setbacks for commercial wind turbines only. Small turbines are either exempt or evaluated on a case-by-case basis. The community may wish to exempt turbines from property line setbacks if the adjacent property contains a wind turbine from the same plant, or the adjacent property is a participant in the project through a land lease and/or wind easement. This is an important consideration particularly in New York, since turbine layouts and plant infrastructure can result in many parcels of land being utilized for one project.

Examples
Wind turbine setbacks from property lines
- Fenner/Stockbridge, NY – 1.5 x MTH
- Martinsburg, NY – 300 ft (rear and side lot lines)
- Contra Costa County, CA – 3 x MTH or 500 ft, whichever is greater (from all boundaries)
- Cook County, MN – tower height
- Wasco County, OR – at least 5 rotor diameters

Setbacks from roads are typically greater for major highways than for local roads. In some cases, scenic setbacks have been required from particular state highways, local roadways, and trails in close proximity to designated wind development areas.

When establishing setbacks, the intended effect must be balanced with economic considerations for the project and overall permitting objectives. For example, a setback decision made by a Town Board in Addison, Wisconsin, had the effect of reducing the number of proposed turbines by more than two-thirds for a wind project in their jurisdiction. The project developer proposed a setback of 650 ft around each turbine (approximately 2.5 x MTH) to address concerns raised about noise, safety and visual impacts. The Town Board decided to expand the setback to a minimum of 1000 ft from any residences, road rights-of-way, or property boundaries. The developer had a limited ability to re-position the turbines on the remaining leased property while still maintaining an acceptable energy output from the project. As a result, the number of proposed turbine sites was reduced from 28 to approximately 8. Ultimately, the developer elected to suspend the project because they were unable to satisfy the setbacks and maintain the project's economic viability. This example demonstrates the importance of establishing setback policies that are consistent with the community's sentiment, even if this could potentially preclude wind development.

Safety in Design, Construction, and Operation

Wind turbines and wind power projects often use qualified third-party inspectors to verify grid and system safety prior to being energized and during operation. In the design phase, state and local laws require that

licensed professional engineers review and stamp the drawings for structural elements (tower, foundation, roads, building, etc.) and the electrical collection and interconnection facilities. Depending on the local requirements and permits, building inspectors can inspect the project. Finally, OSHA has the authority to inspect working conditions.

Wind turbines and wind energy project installations are designed to meet numerous applicable standards. Many of these standards are common to a wide range of industrial equipment and electrical and structural installations. All engineered structures and power generating equipment in the United States must meet a number of codes and standards as dictated, typically, by the local municipalities and the interconnecting utilities. At the top level of these are the National Building Code and the National Electrical Code. All, or part, of these codes are typically included in municipal permitting regulations. These codes include standards for earthquakes, structural integrity, electrical specifications, and power quality. Local municipalities may have noise, environmental, and safety codes as well. The interconnecting utility may have its own set of design requirements that pertain to power factor (leading and lagging), voltage, frequency, dynamic reactive power support, etc. The requirements are often based on applicable Institute of Electrical and Electronic Engineers (IEEE) standards.

Others pertain to wind-turbine-specific design standards, including the International Electrotechnical Commission (IEC) standards for design and safety. These IEC standards are contained in Sections 61400 and can be found at http://www.awea.org/standards/iec_stds.html. Some of the areas addressed in the wind-turbine-specific design standards include, but are not limited to, wind regime definitions, load cases, and safety factors. The overall certification requirements are codified in individual standards, as are the detailed methodologies for testing power performance, acoustic noise emissions, power quality, and blade structure.

For example, the IEC 61400 group of wind turbine standards includes blade testing guidelines. Testing to these standards is conducted by both independent agents and by the blade and turbine vendors themselves. The test standards include procedures for both fatigue and maximum-strength tests. The fatigue testing typically includes long-duration testing (one to three months) by continuously cycling the load on the blade. The maximum strength test is designed to mimic an extreme load event. In each case the blade is either proof tested to a predetermined load or tested to failure, depending on the goals of the test. Blade tests are carried out at the NREL/NWTC facility in Boulder, Colorado, in the U.S., at the Risø National Laboratory in Denmark, the Technical University at Delft in the Netherlands, and CRES in Greece or other similar facility. In addition, LM Glasfiber in Denmark, a blade manufacturer, maintains its own blade test facilities, as do turbine manufacturers such as Vestas. As of May 2009, the United States Federal Government has allocated $25 Million for the establishment of a Wind Technology Testing Center in Massachusetts. The facility is scheduled to be operational in 2010.

Three certifying bodies have established procedures for reviewing manufacturer's designs and confirming compliance with the IEC standards: Underwriters Laboratory, Germanischer Lloyd, and Det Norske Veritas. All wind turbines must meet the design and safety requirements in order to be certified by one of these bodies. Certification to these standards is a nearly universal requirement for a wind power project to be built or financed.

8.3. Additional Resources

- *The Effect of Wind Development on Local Property Values* (2003). Renewable Energy Policy Project. (http://www.repp.org/articles/static/1/binaries/wind_online_final.pdf)
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- *Community Wind Financing, A Handbook by the Environmental Law & Policy Center*, Charles Kubert, Howard Learner, Jill Geiger, Rebecca Stamey-White. (www.elpc.org)
- The Germanischer Lloyd, Det Norske Veritas, and Underwriter's Laboratory standards are available from these entities. For information about these certifying bodies, see the following web sites:
    - http://www.gl-group.com/start.htm
    - http://www.dnv.com
    - http://www.ul.com

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New York State
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Development Authority

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9. Bird and Bats: Impacts and Surveys

This section reviews the potential impacts from utility-scale wind energy development on birds and bats, how impacts can be studied, and how impacts may be mitigated. The potential impacts from wind energy development were placed in context with potential impacts of other power generating technologies with which the reader may be more familiar.

Heavy construction work, common to development of all power generating facilities, will affect the ecological resources in the vicinity of the project both during the construction activities and operation of the project. Some of the major concerns include loss or change of habitat for foraging and nesting birds, change in vegetative cover types, and death of birds and bats due to collisions with the wind turbine/tower structures. Since the potential for bird and bat mortality is a topic that receives significant attention for wind energy projects, this section focuses on birds and bats. Potential impacts to other biotic resources would be evaluated within an environmental impact review, as appropriate.

Town officials and others involved in the permitting process may receive materials from a wide range of organizations. As much of the material will be biased pro or con, it is important to review the material for facts rather than opinion. Many of the studies will give insight into what has occurred at operational facilities. Keep in mind that while knowing general trends gathered from wind energy projects across the U.S. and the impacts from wind energy projects located in similar terrain and ecological areas may be helpful, this knowledge is typically not a substitute for knowledge gained from conducting a site-specific environmental assessment.

9.1. Historical Bird Impacts

Bird deaths associated with wind turbines have received attention primarily due to the loss of raptors at wind farms in the Altamont Pass area in California. From 1983-1986, a large number of turbines with approximately 1,000 MW of installed capacity were constructed in California, approximately one-third of which were installed in Altamont Pass. The turbines ranged in size from 25 kW to 100 kW and utilized lattice towers that attracted roosting birds. In response to the high number of avian strikes, the wind farms implemented seasonal shutdowns, removal/relocation of high risk turbines, as well as other mitigation measures. Since the 1990s, utility-scale projects have been constructed utilizing turbines ranging in size from 500 kW to 3,000 kW, which have incorporated design changes, such as the use of tubular towers, to reduce the potential for avian perching and collisions. In addition, the newer turbines are much larger in capacity requiring fewer turbines at a project to achieve a desired overall capacity.

For comparison, Figure 11 presents historic bird mortality rates at several projects across the U.S.[20]. The estimates are based on year long studies and include extrapolation for scavenger and searcher efficiency. At California projects, bird mortality was estimated to be approximately 9 birds per MW per year for all species; whereas the average estimated mortality at projects located outside California (and using newer turbine technology) was 3.1 birds per MW per year.

[20] Based on information from Erickson, W. (2005) Wildlife Impact and Risk Assessment Methods for Wind Energy Projects. Presented at AWEA Wind Power Conference: Denver.

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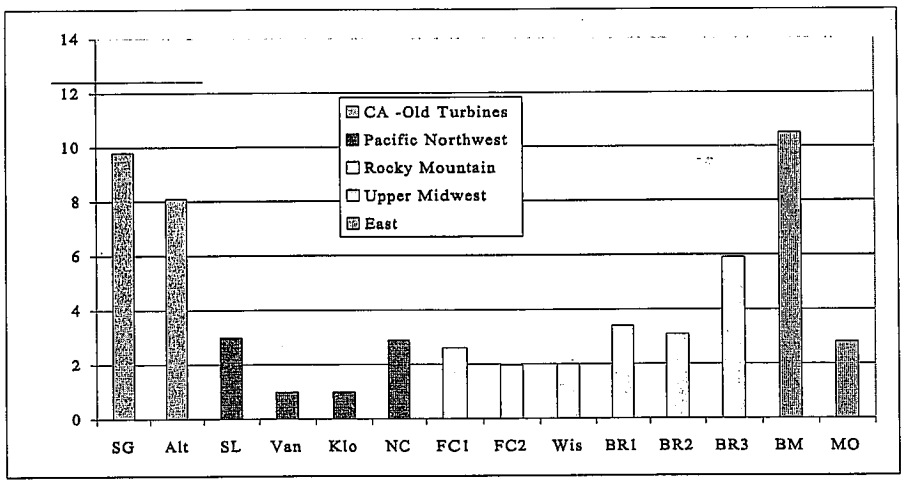

Figure 11 - Estimated Bird Fatalities

Figure 12 presents raptor specific fatalities at wind energy projects across the U.S.[21] Raptor fatalities have dropped significantly since the experiences at Altamont Pass, in part due to better siting, pre-construction bird studies, and deployment of improved turbine technology. In addition, the projects with very low-to-no raptor mortality have been located in areas with lower raptor populations than at Altamont Pass.

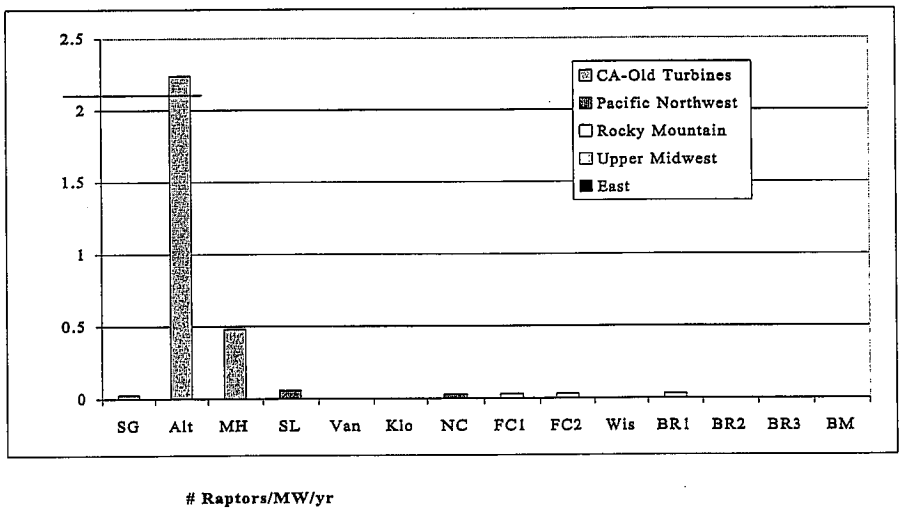

Figure 12 – Estimated Raptor Fatalities

Since the Altamont Pass experience, the wind industry, scientists and state and federal agencies have been working together to understand the relationship of birds with wind turbines and how to better site turbines while still receiving an adequate wind resource. Lessons learned from that time are being applied to today's proposed projects.

[21] Based on information from Erickson, W. (2005) *Wildlife Impact and Risk Assessment Methods for Wind Energy Projects.* Presented at AWEA Wind Power Conference: Denver.

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Bird mortality is not limited to wind turbines. Studies show that wind turbines, on average, are less harmful than more common human structures, as shown in Figure 13. It is not the intent of this graphic to diminish the impact wind turbines have on local bird populations; however, it does put the impact in perspective with the impact other human activities have on birds.

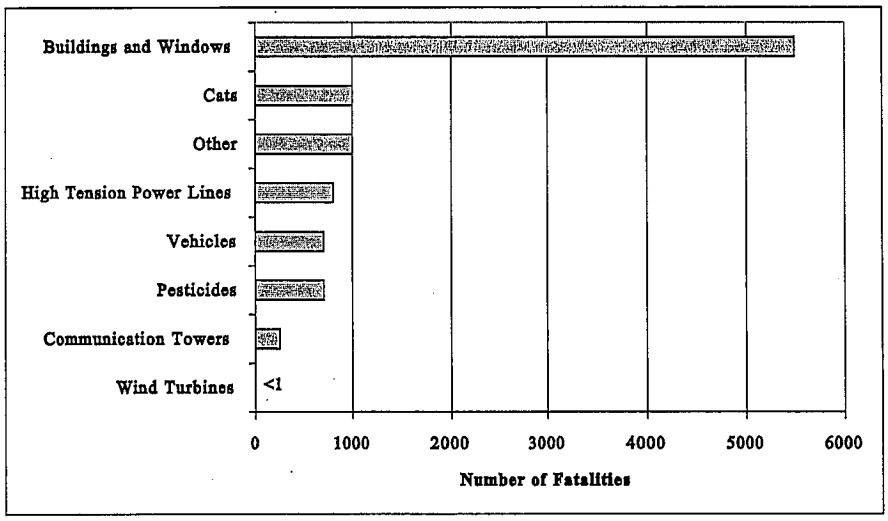

Figure 13 - Source of Bird Fatalities per 10,000 Fatalities[22]

Pre- and Historical Bat Impacts

As wind turbine installations expanded to the eastern states, a new issue developed – the potential for bat fatalities associated with wind turbines. Bat deaths are usually assumed to be from collisions; however, new evidence suggests that rapid changes in air pressure, known as barotraumas, near the rotating blades may be responsible for most bat deaths. Birds have a more robust respiratory system and are not susceptible to this problem. Bats have collided with other man-made structures such as lighthouses, television towers, communication towers, large windows, tall buildings, power lines, and barbed-wire fences. The numbers of bats killed from specific incidents at these types of structures appear to be small. Similar mortality rates were experienced with wind turbine projects in the Western and mid-Western States. However, higher mortality rates are being experienced at wind power projects built in the east/mid-Atlantic regions. Although these documented kills were at wind power projects associated with long treed ridgelines, the higher rate of bat mortality in the east may in part be attributed to other factors.

The bat mortality information provided in

Table 4 is a compilation of data from 21 post-construction studies at 19 wind energy facilities in the U.S. and Canada. 23 The values are estimated based on the count of carcasses found and corrected for estimated scavenger uptake rates and estimated searcher efficiency. Since this is a collection of several independent studies, the researcher noted that the bat fatality estimates are conditioned by factors such as study length and search interval, and the estimates can potentially be biased by different methodologies used to account for search efficiency, scavenger removal, and differences in habitat.

[22] Erickson, W. et al. (2005) A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collision

[23] Arnett, E. (2008) Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management

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Table 4 – Results of Bat Mortality Studies in the US and Canada from 1996-2006

Study Area	Estimated Fatalities		Wind Turbines		Reference
	/Turbine	/MW	Number	Capacity	
Canada					
Castle River, AB	0.5	0.8	60	0.66-MW	Brown and Hamilton 2002
McBride Lake, AB	0.5	0.7	144	0.66-MW	Brown and Hamilton 2006a
Summerview, AB	18.5	10.6	39	1.8-MW	Brown and Hamilton 2006b
Eastern United States					
Buffalo Mountain, TN (phase 1)	20.8	31.5	3	0.66-MW	Nicholson 2003, Fiedler 2004
Buffalo Mountain, TN (phase 2)	35.2	53.3	3	0.66-MW	Fiedler et al. 2007
	69.6	38.7	15	1.8-MW	Fiedler et al. 2007
Maple Ridge, NY (phase 1)	24.5	14.9	120	1.65-MW	Jain et al. 2007
Meyersdale, PA	23	15.3	20	1.5-MW	Kerns et al. 2005
Mountaineer, WV (2003)	48	32	44	1.5-MW	Kerns and Kerlinger 2004
Mountaineer, WV (2004)	38	25.3	44	1.5-MW	Kerns et al. 2005
Rocky Mountains, USA					
Foote Creek Rim, WY	1.3	2	69	0.66-MW	Young et al. 2003
Pacific Northwest, USA					
High Winds, CA	3.4	1.9	90	1.8-MW	Kerlinger et al. 2006
Klondike, OR	1.2	0.8	16	1.5-MW	Johnson et al. 2003b
Nine Canyon, WA	3.2	2.5	454	0.66-MW	Erickson et al. 2003a
Stateline, OR/WA	1.1	1.7	38	0.66-MW	Erickson et al. 2003b
Vansycle, OR	0.7	1.1	37	1.3-MW	Erickson et al. 2000
Midwestern United States					
Buffalo Ridge, MN (phase 1)	0.1	0.2	73	0.33-MW	Johnson et al. 2003a
Buffalo Ridge, MN (phase 2)	2	2.7	143	0.75-MW	Johnson et al. 2003a, 2004
Buffalo Ridge, MN (phase 3)	2.1	2.7	138	0.75-MW	Johnson et al. 2003a, 2004
Lincoln, WI	4.3	6.5	31	0.66-MW	Howe et al. 2002
Top of Iowa, IA	7.8	8.7	89	0.9-MW	Jain 2005
South-central United States					
Woodward, OK	1.2	0.8	68	1.5-MW	Piorkowski 2006
Adapted from Arnett et al. 2008					

The findings of these studies have identified several patterns associated with the bat fatalities, but researchers have not yet been able to definitively attribute the collisions to any one factor. The fatalities were found to be skewed towards migratory bats and consistently peak in midsummer through fall. The studies found that the fatalities were not concentrated at any one turbine location (they were distributed across the facility), and FAA lighting (red strobe lights) did not seem to have any influence on the collisions. Higher fatality frequencies were related to the passage of weather fronts and low wind speed conditions (<6.0m/s).

The amount of bat fatalities at wind facilities the eastern US are noticeably higher than in the rest of the country. The eastern farms are primarily located in deciduous forested ridges. Researchers have speculated that the bats may be more attracted to ridge top sites due to the availability of insect prey.[24]

[24] Horn, J. (2008) Behavioral Responses of Bats to Operating Wind Turbines. Journal of Wildlife Management

Studies have been performed in New York to study the effects that wind turbines have on bat populations. In 2006, a post-construction avian and bat study was conducted at the Maple Ridge Wind Power Project located in Lewis County, New York[25]. The study consisted of 120 turbines and found a total of 125 avian and 326 bat fatalities during the study period, representing 30 and 5 species respectively. The conclusions from the study estimated 5.81 incidents/MW/season for avian fatalities and 14.87 incidents/MW/season for bat fatalities.

The information in Table 4 indicates the potential variability of bat mortality in different regions and among projects in the east. Therefore, it is important to understand the potential impacts at each specific proposed wind energy project location.

9.2. Pre- and Post-Construction Monitoring

Environmental assessments of wind energy projects now commonly require pre-construction and post-construction monitoring of the project area to determine the project's impact. Surveys include researching the biological resources within the project area, migration patterns of birds/bats passing through the project area, and the protective status of migratory and nesting/resident species in an area where turbines are being considered. Bird and bat surveys are often conducted during the spring and fall seasons to identify the migratory patterns of birds and/or bats as they pass through the project area. Important bird areas across the State have been identified by Audubon New York and digital mapping of these areas has been provided to many counties.

In early 2009, the New York State Department of Environmental Conservation released the Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects in New York State, which was sponsored by NYSERDA. The guidelines outline the recommendations proposed by the DEC for commercial wind developers, which include characterizing bird and bat populations at site locations, documenting bird and bat mortality rates, and identifying other indirect effects. This document will help standardize the processes and methodologies used during pre- and post-construction monitoring throughout New York State. Additionally, it will create meaningful data that can be compared across wind farm locations and from differing time periods.

The following is directly quoted from the guidelines discussed above. The full text of the guidelines can be found at the NYS Department of Environmental Conservation website. [26]

> *The overall goal of the recommended studies is to determine the potential for a specific wind energy project to have an adverse impact on bird and bat resources by characterizing the use of the site and surrounding area by bird and bat species under a variety of environmental conditions throughout the year, and by estimating the mortality rate of birds and bats due to collisions and other effects associated with turbines. The effects of construction and operation on habitat and changes in wildlife use of the site will also be studied to determine any displacement or loss of species related to project operation. Data collected prior to construction can be compared to information collected in a similar manner after construction to determine what impact, if any, the project has on migrating and resident breeding and wintering birds and bats... Ultimately, information gained from pre- and post-construction studies will be used to identify*

[25] Jain, A. Annual Report for the Maple Ridge Wind Power Project Post-construction Bird and Bat Fatality Study. 2006. Curry and Kerlinger, LLC

[26] *Guideline for Conducting Bird and Bat Studies at Commercial Wind Energy Projects*. January 2009. New York State Department of Environmental Conservation.

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mitigative measures that may be used to minimize direct and indirect impacts from project operation.

- *Pre-Construction Studies*
  - *The objectives of the pre-construction studies are to determine:*
    - *To what extent the area of the proposed project is used by migrating, breeding, and wintering birds and bats and how the physical and biological features of the proposed site may influence such use; and,*
    - *The expected and potential impact to birds and bats as a result of using the site during operation of the project.*
- *Post-Construction Studies*
  - *The objectives of the post-construction studies are:*
    - *To estimate direct impacts of the operating project in terms of mortality rates of birds and bats caused by collisions or other effects of the turbines; and,*
    - *To document any indirect impacts of construction and operation in the form of habituation/avoidance behavior of birds and bats in the area.*
- *Bird Studies*
  - *Migrating birds, particularly neo-tropical migrants, are sensitive to changes occurring across the landscape that alter the amount and quality of habitat available to them during migration. Many aspects of the biology, population structure, and ecology of these birds are poorly understood. In a general sense, the following is known:*
    - *Most songbirds and many shorebirds and waterfowl migrate at night, while raptors move during the day;*
    - *The exact spatial and temporal distribution of this migration is affected by weather patterns, food availability, and geographic features;*
    - *Concentrations of species and individual birds vary with the habitat, season, and year;*
    - *Birds are much more physiologically vulnerable during migration than at other times of the year; and,*
    - *The effects of human-caused habitat and landscape alterations are persistent over time.*
  - *Study methods for bird surveys include reconnaissance surveys, habitat surveys for sensitive/listed species, and radar. The radar surveys provide information on target passage rate, flight altitude, and flight direction. Acoustical monitoring of migratory birds can also be used to identify some species that vocalize in flight, and provide an estimate of flight height for these species. DEC will recommend a combination of some or all of these methods based on the specifics of the site, as each provides a different type and scope of information about the bird species utilizing the area.*
- *Bat Studies*
  - *At this time, the greatest concern is for the Indiana bat (Myotis sodalis), and the species that typically migrate--eastern red (Lasiurus borealis), hoary (Lasiurus cinereus), and silverhaired bats (Lasionycteris noctivagans). These species are likely to be exposed to multiple wind projects across much of their migration routes, and thus face the largest potential mortality. Studies in eastern North America and in Canada have shown that these three migratory species comprise the majority of turbine-related bat mortalities. There is some evidence to suggest that pipistrelles are migratory as well. Migratory bats*

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potentially occupy the landscape from April until the end of October, with the peak of movements occurring from mid-April until June, and from mid-July until early October.

- *It is not currently known if these bats migrate across a broad front, if they use migratory corridors, what the typical flight height is, or if their migration is affected by geographic features. If bats are reluctant to cross large bodies of water, then the shores of the Great Lakes are more likely to have concentrations of migrating bats at lower altitudes than other regions of the state. Methods used to determine passage rates of bats and to estimate the likelihood of collisions with turbines include mist netting, radar, thermal and/or light amplification imaging and acoustical monitoring. None of these methods provides definitive information and all have some drawbacks, although acoustical monitoring is the most widely used because of the relatively low cost, low commitment of staff time, the ability to distinguish between birds and bats, and the ability to identify most individual calls to species or species guild. A limitation of this method, however, is that it records only the number of calls detected, and does not give an estimated number of individuals of any bat species in the project area. Nevertheless, DEC recommendations include acoustical sampling, in conjunction with mist-netting and radio tracking where appropriate to gather information on bat presence and movements at a wind energy project.*

9.3. Bird and Bat Survey Techniques

Since most birds and bats in North America migrate at night, nocturnal surveys are conducted to estimate the number and kinds of birds and bats migrating. Survey techniques for nocturnal wildlife studies include radar, visual, acoustic/ultrasonic, and mist netting. Each approach has pros and cons, as outlined in Table 5. Though several techniques are available, the X-band radar appears to be the best method since it allows the numbers of bats and/or birds, their flight altitude and direction, and passage rates to be determined. The significant drawback is the inability to identify the target as a bat or bird; therefore, it may be necessary to use this method in conjunction with either visual or acoustic methods for species identification.

When working with wind developers, the NYS DEC has supported the use of raptor and diurnal migration surveys, marine radar surveys, breeding bird/resident bird surveys, and acoustical/ultrasonic bird and bat surveys.

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Table 5 – Survey techniques for birds and bats

Technique/Tool	Purpose	Pros	Cons
Radar			
X-band Radar / Marine Radar	Document and quantify nocturnal bird/bat migration – surveillance (horizontal) and vertical modes	Portable; detect individual birds or bats within ~1 mile radius; flight directions and altitudes; passage rates; effective in fog; data can be displayed in topographic terrain models	Cannot differentiate between birds and bats; insects can confound data; ineffective in rain
NEXRAD	Once weather data is filtered out, can quantify broad, regional migrations of bio-targets (birds, bats & insects)	Landscape view of migration; predict major migration nights; potentially can identify major stopover habitats	Low resolution; limited low altitude coverage; insects confound data
Visual			
Spotlights (Ceilometers)	Count targets observed, estimate overall passage rates, direction of flight	Inexpensive; can differentiate between birds and bats	Small sampling area and range; attraction/ repulsion bias
Moon watching	Same as spotlights	Excellent during full moon	Limited good sampling nights
Night vision optics	Same as spotlight	Goggles effective with spotlights; spotlights need red or infrared lens to reduce or eliminate attraction bias	Effective to only 100-150 m; costly (~$2,500); not effective in fog or rain
Thermal imaging devices	Count the number of bats flying in the project site	No attraction/repulsion bias	Similar detectability as night vision optics; poor in heavy fog; very costly (~$60,000-$100,000)
Mist Nets	Species identification	Species ID; determine resident species	Limited to low (~10m) altitudes; probably not suitable for migratory species
Recorders			
Acoustic recorders (birds)	Species identification	Single microphone: species ID and call rates; Microphone array = species ID, call rates, and altitudes; Detects warbles to ~1000ft, thrushes to ~2000ft	Background noise (e.g. insects) can be problematic; unknown and variable proportion of birds calling; not all bird species calls are known.
Ultrasonic recorders / echolocation detectors (bats)	Species identification	Flexible (e.g. locate at ground or altitude); collect data in remote locations	Limited species identification (only some of those vocalizing); detection limit ~<25m
Sources: Mabee, Todd. (2004) *Nocturnal Wildlife Study Techniques at Wind Power Sites.* AWEA Wind Power Project Siting Workshop. Woodlot Alternatives, Inc. (2004) *Birds Don't Have to be Wind Park 'Show Stoppers.'* North American Windpower			

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The bird and bat studies at these sites not only serve to estimate abundance and fatalities but also seek to answer questions on what specific characteristics seem to promote or deter bird and/or bat fatalities. With this data, better impact avoidance, minimization, and mitigation can occur.[27]

For example, some hypothesized that certain lights may attract nocturnal migrants. After researchers reviewed mortality data gathered from several studies conducted at multiple wind projects, the results show no difference in bat and nocturnal migrant mortality at lit and unlit turbines. With this information, researchers can focus on other questions and potential issues. As another example, scientists are trying to discover the mechanisms bats use to navigate. Initial hypotheses believed bats used echolocation, like they use to hunt food, but some recent research indicates that, at least for one bat species, echolocation may not be used for navigation. While mortality count surveys are regularly conducted, additional research is on-going to determine navigation mechanisms, along with migration patterns, and breeding habits of various species. Researchers hope that as studies continue at existing projects and studies start at projects being developed and constructed, the larger pool of data will provide the necessary information to answer the on-going questions. Once these types of mechanisms are understood, scientists can study how those mechanisms interact with wind turbines, and ultimately, propose appropriate mitigation measures.

If proposed projects are located in similar type terrain with similar species and/or usage patterns, the data collected at wind power projects in New York may be useful for extrapolation to other proposed sites, which will give a preliminary understanding of any potential impacts. However, site specific studies will still be needed for each proposed project.

9.4. Species Listings

United States Fish and Wildlife Service (USF&WS) maintains a list of all threatened species, endangered species, and critical habitats by state in which they occur. As of January 2009, 23 animals and 10 plants found in New York are listed as either threatened or endangered by the USF&WS. New York State maintains its own list of endangered and threatened species that may contain different species than the USF&WS. An environmental consultant can determine if any of the species listed on either list exist at a proposed development site and the extent of the habitat supporting the species.

The New York State Natural Heritage Program maintains a database on the locations of rare plants, rare animals, and significant natural communities found within New York State. Proposed development sites should be screened against the database. The screening focuses on identifying rare species and significant natural communities at or in the vicinity of the proposed project site, and on identifying rare species of birds and bats within a larger area around the proposed project site. The DEC staff can also provide useful insight as to the occurrence of listed species or species of concern in a proposed development area. Local birding groups may also provide information on migrant and resident bird species in a local area.

9.5. Habitat

Loss of habitat and vegetation can occur during the construction process as a result of increased human presence, noise, motion, and alteration of the terrain for roads, buildings, foundations or other site infrastructure elements. Although developers generally try to select sites with minimal tree cover, tree removal

[27] The review hierarchy for environmental assessments is first to avoid potential impacts if possible, then minimize potential impacts, then mitigate potential impacts.

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does occur at some projects for construction needs and access roads. Selective tree removal to improve exposure to the wind can also result in a loss of forested habitat.

Site topography and project layout have the largest impact on loss of habitat issues. Construction in steep areas can produce more disturbances due to the need for more cut and fill excavation work. Loss of habitat can be mitigated through re-vegetation actions or through setting aside other sections of land from development. Plans for site work should be reviewed to ensure sufficient soil and water quality control measures, similar to those required for other construction projects, are in place. For more information on these types of potential impacts, see Section 10: Other Environmental Impacts.

Surveys of habitat and vegetation often focus on the condition of the habitat, if any vegetation listed as threatened or endangered exists in the proposed development area, if the area is already fragmented[28], and what species are thought or known to require that habitat or vegetation for survival (critical habitat).

9.6. Mitigation Strategies

Depending on the level and type of impact estimated during the pre-construction monitoring, appropriate avoidance, minimization, or mitigation strategies can be developed. Some strategies include the following:

- Turbine relocation (depending on topography, wind resource, and access to land) or removal from the proposed project layout if suitable alternative locations cannot be found.
- Electrical lines: several methods have been developed at power projects for minimizing the impact to birds from electrical wires. Methods include burying cable when practical and installing bird diverters on overhead lines.
- Minimal lighting at operation and maintenance buildings, substation, and interconnection facilities.
- Bird diverters: bird diverters are devices used on guy-wires that prevent birds from flying into guy wires, which may be present if the project uses a guyed meteorological tower (these are not applicable for turbine towers.)
- Operational alterations during bird and/or bat migration season in an effort to reduce turbine strikes.

9.7. Additional Resources

- Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects. (http://www.dec.ny.gov/docs/wildlife_pdf/windguidelines.pdf)
- Bat and Wind Energy Cooperative. The Bat Conservation International has teamed up with government agencies, industry organizations, and academic organizations study the interaction of bats with wind turbines and help develop siting practices that will minimize bat deaths resulting from collision with wind turbines. (http://www.batsandwind.org)
- The California Energy Commission report Effects of Wind Energy Development: An Annotated Bibliography contains a good listing of sources for further review.

[28] Wind turbines, access roads, transmission lines, and operation and maintenance building(s) occupy a fraction of the land that's leased for the project due to spacing requirements between the turbines for wind exposure purposes. By contrast, much more contiguous land is occupied by golf courses, housing developments, business centers, or shopping malls. If an area is already fragmented, a wind energy project may help preserve the remaining sensitive areas by including them within the project area, but not building on or near those areas.

- Erickson, Wallace P. et. al. (2001) Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States. National Wind Coordinating Committee resource document.
- Johnson, G. A Review of Bat Collision Mortality at Wind Farms. Presentation at the 2005 AWEA Wind Power Conference. Denver, CO. May 2005.
- Mabee, Todd. (2004) Nocturnal Wildlife Study Techniques at Wind Power Sites. AWEA Wind Power Project Siting Workshop, Oregon.
- National Wind Coordinating Council's National Avian-Wind Power Planning Meetings. This site lists several presentations on survey techniques, research questions, and monitoring survey results. (http://www.nationalwind.org/publications/default.htm)
- New York Department of Environmental Conservation. (http://www.dec.ny.gov)
- New York Natural Heritage Program. To request a screening, submit a letter with a brief description of the project and the location, along with a map of the location to New York Heritage Program, Information Services, 625 Broadway Albany, NY 12233-4757. (http://www.dec.ny.gov/animals/29338.html)
- United States Fish and Wildlife Service.
    - Main website: http://www.fws.gov
    - Threatened and Endangered Species: http://www.fws.gov/endangered/wildlife.html#Species
- New York Field Office's List: http://nyfo.fws.gov/es/list.htm.
- Interim Guidelines on Avoiding and Minimizing Wildlife Impacts from Wind Turbines. These voluntary, interim guidelines provide guidance to regional field offices when they participate in evaluating a wind energy project. Projects are evaluated on a case-by-case basis. Each field office has wide flexibility in following the suggestions in the guidelines based on the specific merits of each case. (http://www.fws.gov/habitatconservation/Service%20Interim%20Guidelines.pdf)
- Woodlot Alternatives, Inc. (2004) Birds Don't Have to be Wind Park 'Show Stoppers.' Published in North American Windpower, August 2004 (http://www.woodlotalt.com/publications/NorthAmericanWindpowerArticle2004.pdf)

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10. Other Environmental Impacts

The installation and continued presence of any structure (building, mall, bridge, or power plant) will impact the environment, and wind turbines are no different. Typically, those impacts are evaluated and quantified, mitigated when possible, and weighed against the public good when mitigation is not possible. Wind turbines are relatively low-impact compared with coal, natural gas, and nuclear power plants—they do not generally cause air, water or ground pollution, produce toxic chemicals or radioactive waste, or require mining or drilling for fuel—but some potential environmental impacts need to be considered when wind energy projects are sited. Generally, developers and lead agencies[29] will investigate any areas of concern as part of the State Environmental Quality Review (SEQR) process, which requires the lead agency to take a hard look at potential environmental impacts.

This section discusses environmental impacts in the following areas:

- Aesthetics of the viewshed
- Sound emissions
- Cultural and archeological
- Telecommunications
- Site Conditions and Construction

10.1. Aesthetics and Viewshed Analysis

For many wind energy projects, visual impact is the most significant issue that local communities must address. Concerns surrounding wind development should not be underestimated nor dismissed as insignificant. Many people choose to live in rural areas because they enjoy the openness, remoteness and tranquility. Introducing wind turbines to these areas, which frequently enjoy scenic resources, presents a change to the environment that people may not enjoy.

Therefore, it is particularly important that the visual impact assessment conducted for each project accurately predict the visual impacts. This impact can be significant because of the height of the turbines, the large area occupied by the projects, the location of projects in exposed (hilltop) areas, and the movement of the rotor. This impact is subjective, and the degree to which it is an issue is a function of the value placed on the landscape and viewshed by the local community.

Some of the controversy can be mitigated by: good communication and planning ahead (see Section 11: Comprehensive Plan); community outreach to educate and involve the community early in the process; continued outreach keeping the public involved and informed in every step of the process; and cooperating with the wind developer to obtain the most beneficial arrangement for the community, both in terms of financial compensation and in details such as turbine location, spacing, and setbacks.

Typically, developers perform the following steps to quantify the potential visual impact of a project:

- Determine turbine locations and heights
- Determine the viewshed
- Identify key viewpoints

[29] A lead agency is the government agency responsible for reviewing the potential environmental impacts on a project. The lead agency may use resources from other agencies to help conduct the review and evaluation.

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- Assess existing conditions
- Document project changes
- Analyze changes
- Develop mitigation where needed

The zone of visual influence, or viewshed, is determined based on the existing environment and land uses. Key points within this viewshed are then determined by field inspection and discussions with local officials or stakeholders. These points may include historic monuments or markers, high traffic routes, dwellings in or adjacent to the project, schools, sports fields, or business districts. As a part of the mitigation process, the potential changes to the viewshed at these key points are documented through visualization modeling and then analyzed. During the analysis the following types of questions are asked and answered:

- To what extent is the project or specific turbines visible?
- When is the project or turbine visible (season or time of day)?
- Who sees the project or turbines and under what circumstances (season, light conditions, or during what activities)?
- To what extent does the visibility of the project alter the character and quality of the viewshed?
- What is the relationship of visual impacts to the policies and values in that location?

Questions like these attempt to quantify what often is a qualitative problem. For example, the project may be visible along a stretch of road, but the impact of that visibility depends on the surrounding environment and land uses (e.g., is the road a scenic byway or is the view already dotted with homes, business, or other structures). It also depends on the length of time the project is visible (e.g., as the person travels in the car), and at what time is the project visible (e.g., only visible on sunny to partly cloudy days but not at night, or the turbines are visible all day and the FAA lights at night). Understanding impacts at this level helps quantify the impact on the community and helps developers create a project layout that is both sensitive to these issues and optimizes energy production.

Influences on Visual Impact

Visual impacts vary from different viewpoints surrounding a project site. In areas with hilly terrain, the surrounding topography can hide turbine views from many locations. Turbines may also be more visible during different types of lighting conditions and during winter seasons when many surrounding trees are bare.

Turbine spacing can also have an impact on the aesthetics of a wind project. Spacing between turbines is primarily determined to optimize the energy output, but topography can dictate turbine spacing. Sufficient space between turbines is necessary for the turbines to experience the best winds and to reduce turbine-to-turbine turbulence (which could affect long-term turbine life). The use of larger turbines has improved the visual impact of projects because fewer turbines are used and the space between them is greater (for more information on land requirements, see Section 13: Land Acquisition).

The color of the turbines can influence the magnitude of visual impacts. Most local agencies require that non-reflective, unobtrusive colors be used to paint the tower and blades. Most wind turbines are painted either a light gray or off-white to blend in with the sky when viewed from the ground, yet remain visible to pilots when viewed from the air.

It is important to consider the lighting of wind turbines when evaluating the visual impact. FAA requirements could include strobe, red flashing, or steady red lights (for more information of FAA lighting requirements, see Section 14: Permitting). Depending on the lighting requirements, the nighttime visual impact may be greater than the daytime impact.

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Uniformity of color, structure types, and surface finishes can also improve the visual impact. Local authorities sometimes specify uniformity requirements in their permits.

Visualization Modeling

Modern visual simulation software can digitally simulate the view of a wind energy project from a variety of locations and in different light conditions. This tool helps communities understand the visual impact and helps developers identify areas that might need a mitigation plan. In New York, it could be valuable to obtain proposed turbine location area photos during summer and winter since the vegetation and lighting during these two seasons are very different. In addition, topographic maps can be incorporated into the software to develop a map overlay that estimates the number of turbines visible from any location within a region. Local communities can request submittal of visualization maps and simulated project views to help assess the impacts.

Visualization modeling is a tool for understanding how a turbine or turbines would look to the unaided eye in a landscape. Programs use a digital elevation model to create a contour map and wire frame of the topography of the area. Aerial photos and/or topological maps provide the background map. Photos taken from various locations around the viewshed are overlaid on the map to produce the visualization. To most closely mimic the human eye, photos are taken with a 50mm focal length on a 35mm camera or a 50mm equivalent focal length with a digital camera. The location of the camera, height of the camera off the ground, as well as the location of identifiable objects in the pictures are taken using a GPS system to ensure a correct fit to the digital (or digitized) pictures onto the modeling wire frame.

Photos are taken from populated spots, such as a shop, residence or school. Additional photos may be taken from locations that have been identified by concerned citizens or project opponents. To model the maximum impact, pictures are taken on a clear day. The time is recorded so the shading of the turbines and surrounding landscapes can be modeled accurately.

Pictures may also be taken at night, but these light conditions remove our perception of light intensity. Therefore, it is very difficult to accurately model FAA beacon lights on the turbine(s) compared to any lights in the surrounding viewshed.

Once the pictures are overlaid onto the wire frame, the turbines can be placed into the model. The visualization programs contain digital pictures of most major manufacturer's turbines, and the user inputs tower dimensions, blade dimensions, nacelle shape, and blade shape, among other parameters to accurately picture the turbine(s) planned for the particular site. An example wind farm visual simulation is provided in Figure 14 below.

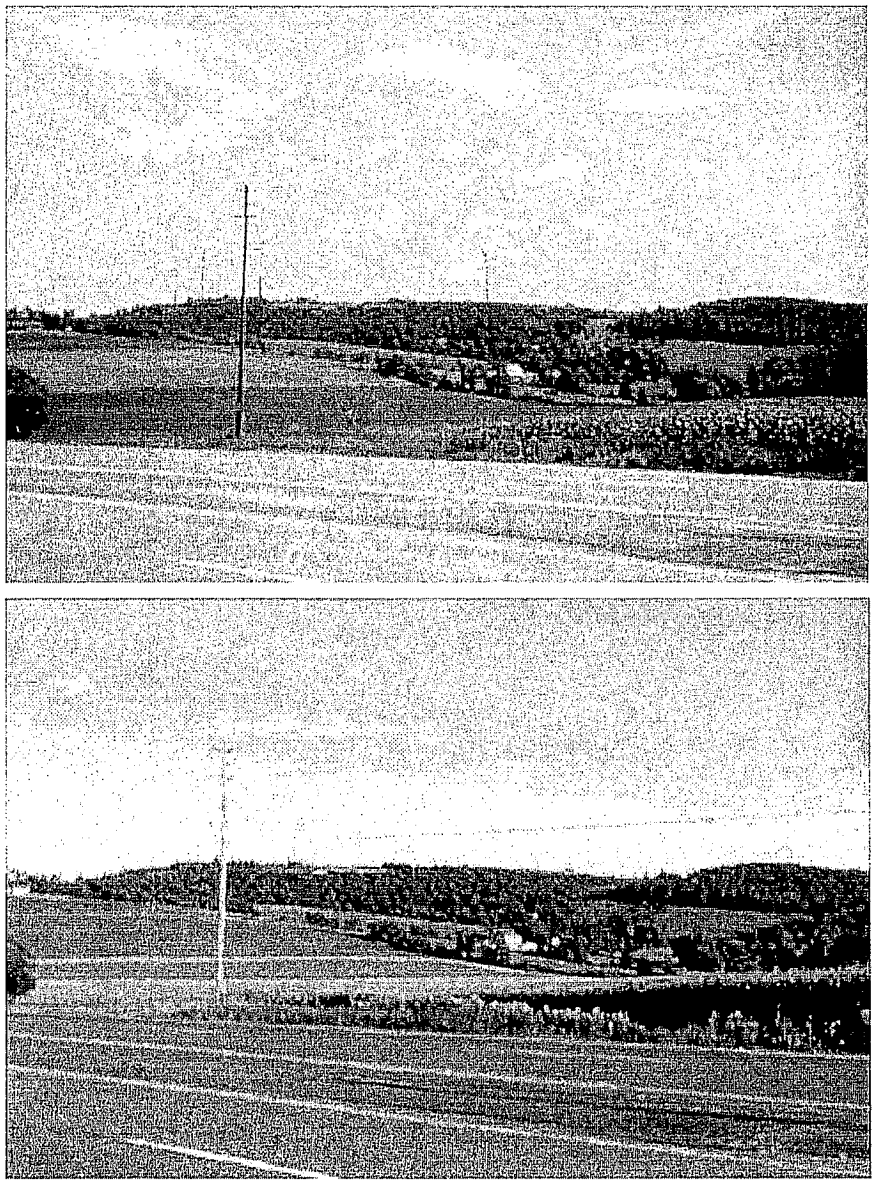

Figure 14 – Wind farm simulation (upper) and photograph (lower). (Source: EDR)

Several other methods of evaluating the visual impact of a project can be used. For example, a developer may float a weather balloon to help assess visibility at the proposed tower height and location. Once the visual impact has been quantified, numerous mitigation techniques are available.

Shadow Flicker

Visualization models can also calculate the shadow zones or flicker zones around wind turbines during different times of the day and during different seasons to calculate the affected areas. The location of the receptor (such as windows in a structure, or a public park) is input and the chance of a shadow being cast or shadow flicker occurring from moving blades can be determined. These calculations provide a worst case analysis since the models do not account for the blocking effects of trees and structures, only the topography. The distances

calculated in the models, along with an understanding of any potential blocking effects, can be used in determining appropriate setbacks or other mitigation measures.

10.2. Sound Emission

Formerly, noise from operating turbines was a very serious problem for the wind energy industry. Some early types of turbines, built in the early 1980s, were loud enough to be audible from as much as a mile away. The industry quickly realized that this problem needed to be addressed, and manufacturers began to work on making their machines quieter through improved engineering. Today, an operating wind energy project at a distance of 750 to 1,000 feet emits sounds at a level comparable to a kitchen refrigerator or a moderately quiet room. With appropriate setbacks, wind turbine sound emissions should not affect neighboring residents.

Measurement

Sound is typically quantified using the decibel (dBA) scale. This scale is logarithmic and quantifies sound from the entire range of audible frequencies, taking human sensitivities to certain frequencies into account. **Error! eference source not found.** presents a list of common sources of sound, and their relative decibel levels:

Table 6 - Relative Decibel Levels of Common Sounds

Source or Activity	Indicative Noise Level (dBA)
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind energy project at 1,150 ft (350 m)	35-45
Car at 40 mph at 328 ft (100 m)	55
Busy general office	60
Truck at 30 mph at 328 ft (100m)	65
Pneumatic drill at 23 ft (7 m)	95
Jet aircraft at 820 ft (250 m)	105
Threshold of pain	140
Source: The Scottish Office, Environment Department, Planning Advice Note, PAN 45, Annex A: Wind Power, A.27. Renewable Energy Technologies, August 1994. Cited in "Noise from Wind Turbines," British Wind Energy Association, http://www.bwea.com/ref/noise.html	

The perceived loudness of a sound decreases by the inverse square law; if the distance between a sound source and an observer is doubled, the perceived sound is decreased by a factor of four. Furthermore, if two identical sources are located at equal distances from an observer (i.e. wind turbines), the noise level (dB) will double. However, since humans perceive sound in terms of the logarithm of the sound pressure, the number of sources would need to increase by a factor of ten to double the perceived sound level.[30]

Source

The sources of the sounds are either mechanical or aerodynamic. Mechanical sounds are produced by components in the nacelle, while aerodynamic sounds are produced by the flow of air over the blades. Sound emission levels vary by turbine size. For example, smaller turbines (<30 kW) rotate at much faster speeds than large, utility-scale turbines, and thus, tend to emit more sound. The component housing for a small turbine may

[30] Sound from Turbines, Danish Wind Industry Association

not be insulated as well as a nacelle on a larger turbine. Therefore, sound/noise regulations need to separately address small, residential-scale turbines and large, utility-scale turbines.

Depending on the size and configuration, both upwind and downwind turbines can emit up to four types of sounds during operation: tonal, broadband, low frequency, and impulsive.

- Tonal sounds emanate at discrete frequencies (e.g., meshing gears)[31]
- Broadband sounds are characterized by a continuous distribution of sound pressure with frequencies over 100 Hz (e.g., whooshing sound)
- Low frequency sounds range from 20 to 100 Hz
- Impulsive sounds are short acoustic impulses[32]

A fifth type of sound generated by wind turbines is infrasound. The term infrasound is used to describe low frequency sounds (below 20Hz). In some cases, people have attributed health problems to infrasound generated by wind turbines. While wind turbines do produce infrasound, it is below the audible threshold and is not believed to have an adverse affect on a person's health[33]. There have been several other studies investigating wind turbine infrasound generation and possibly associated health risks. HGC Engineering concluded that infrasonic levels created by wind turbines are comparable to the ambient levels created in the natural environment by the wind.[34] They further conclude that there is no evidence of adverse health effects caused by this infrasound.

Measuring

Sound is measured as a sound *power* level or sound *pressure* level. Sound power refers to the acoustic power emitted by the source while sound pressure is measured by the observer at a location. A sound level meter senses the pressure emulating from the source, and converts this to a decibel reading. There is a difference, however, between the sound level and the perceived noise from a wind turbine. The term noise, in this case, refers to sound that is perceived as annoying by the observer. So while sound pressure levels can be measured, the perception of that sound pressure level cannot. Thus, determination of the sounds as noise becomes a subjective matter that can make control and mitigation of concerns difficult. Most sound/noise studies that test the sound pressure levels produced by turbines are not publicly available, which leaves anecdotal evidence or qualitative studies. Since sound can be described in many different, but equally valid ways, comparing anecdotal evidence can be difficult.

Additionally, many environmental conditions can have a significant effect on the type of sounds emitted from a turbine as well as the distance sounds travel from the turbine. Wind direction, atmospheric conditions, wind speed, vegetation cover, topography, and local background sounds all affect the reception of sounds from turbines. Sounds from turbines are typically more perceptible in low to moderate wind conditions since the natural background sound of the wind masks turbine sounds in high wind speed conditions. Therefore, most public authorities rely on sound calculations instead of sound measurements to assess a project's potential impact. Calculating potential sound emission from a future wind farm is an important step in assessing the project's environmental impact and acquiring required permits and permissions.

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[31] Large-scale wind turbines are designed with the rotor (blades and hub) upwind of the tower (upwind). The majority of small-scale turbines also utilize an upwind design.

[32] Rogers, Anthony A. et. al. Wind Turbine Noise Issues. Renewable Energy Research Laboratory, Center for Energy Efficiency and Renewable Energy, Department of Mechanical and Industrial Engineering, University of Massachusetts at Amherst. June 2002, amended March 2004.

[33] Leventhall, G. (2006). Infrasound from wind turbines – Fact, fiction or deception. Canadian Acoustics

[34] HGC Engineering (2006), Wind Turbines and Infrasound. Prepared for CanWEA.

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Most turbine manufacturers provide turbine sound data, determined in accordance with IEC international standards. These standards are referenced to an 8 m/s wind speed at 10 meters above the ground. The measurements are usually taken at ground level using a microphone and then normalized to IEC standards. The levels given by wind turbine manufacturers allow a direct comparison between turbines and facilitate sound studies.

Assessing and Mitigating

Aerodynamic sound from turbines has been reduced in recent years by changing the thickness of the blades' trailing edges and by making the blades face upwind rather than downwind. On downwind designs, when the wind hits the tower before the blades, the tower's shadow can cause a thumping sound each time a blade passes behind the tower; on upwind designs, the wind hits the blades first, then the tower, minimizing noise. Improved insulation has reduced the sound emitted by mechanical components, such as the gearbox.

Strategies for assessing or mitigating sound from wind farms usually consider the different tonal frequency of the sounds emanating from wind turbines, not just overall decibel level. Therefore, background sounds must be considered. Most local requirements use some form of exceedance over measured background levels as a threshold. The exceedance level can vary from 5 to 8 decibels.

Distance is the most effective mitigating measure for addressing sound from wind turbines; thus, utilizing setbacks that specify a certain sound level at a certain distance from the turbine is an effective mitigation option.

Examples of Sound Regulations:

Town of Fenner, Madison County

- Sound from individual turbines shall not exceed 50 dBA as measured at the boundaries of all the closest parcels that are owned by non-site owners and abut the site parcels (includes background sounds)

Ontario, Canada

- Setbacks are instituted to prevent sound from exceeding 40 dBA at the receptor
- The applicable setback increases with the number of turbines and the turbine's sound level rating

Riverside County, California

- 50 to 55 dBA depending on the size of the project and the location
- Certain conditions may trigger an acoustic study
- Low frequency noise (between 5 to 100 Hz) is limited to 67 to 75 dBA

Sound emission modeling software programs may be utilized to simulate the built wind farm and potential sound emissions. These models may take the type of turbine, turbine layout, and site characteristics into account to help estimate the project's potential impact. These models may also be useful in determining the impact a project will have on multiple towns and communities in the vicinity of the project.

As part of a State Environmental Quality Review, all relevant environmental issues must be assessed, including the potential sound emission impacts. During an environmental review, site characteristics that may be analyzed include, but are not limited to, the following[35]:

- Evaluation of sound characteristics
  - Ambient noise level
  - Future noise level
  - Increase in sound pressure level
  - Sharp and startling noise

[35] Assessing and Mitigating Noise Impacts, New York State Department of Environmental Conservation (2001)

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  - Frequency and tone
  - Percentile of sound levels
- Receptor locations
  - Property lines
  - Homes and businesses
- Thresholds for significant sound pressure level increase
  - 0-3 dBA increase should have no effect on receptors
  - 3-6 dBA has potential for adverse impacts when sensitive receptors are present
  - 6-10 dBA may require a closer analysis, including land use and receptors
  - >10 dBA deserves consideration of avoidance or mitigation

10.3. Cultural and Archeological

Historic, cultural, and archeological surveys are typically conducted as part of the environmental assessment for a proposed project. Because wind projects include vegetation clearance, disturbance of ground surface, excavation below the ground surface, and aesthetic impacts, they have the potential to affect archaeological and historic resources that may be present in the area. Negatively impacting a historic site does not necessarily automatically halt a project; instead mitigation or offset measures may be created and reviewed before determining whether a project goes forward.

Federal and New York State preservation legislation includes the following:

- National Historic Preservation Act 1966, Section 106. If a project uses federal funds or requires federal approval or permitting, then the involved federal agencies consult with the State Historic Preservation Office (SHPO), which is housed within the state Office of Parks, Recreation and Historic Preservation, regarding efforts to identify and manage historic and cultural resources within the area of potential impact. Sometimes the recipient of federal funds will be required to consult with the SHPO on behalf of the federal agency, although this does not remove the federal agency from ultimate Section 106 compliance responsibility.
- New York State Historic Preservation Act of 1980, Section 14.09. State agencies are required to consult with the state Office of Parks, Recreation and Historic Preservation for undertakings that could impact historical and archeological resources that are listed or eligible for listing on the state Register of Historic Places. Undertakings by a state agency include funding, approval, and/or physical activity conducted by the state agency.
- State Environmental Quality Review Act (SEQR), Article 8. This establishes a set of uniform procedures by which all state, county, and local governmental agencies incorporate consideration of environmental impacts into their planning, review, and decision-making processes. Historic and archeological resources are components of the environment and must be assessed during the SEQR process.

Cultural and Archeological Surveys

Archeological surveys, which contain cultural surveys, are often needed when a project involves ground disturbance in areas that are known to contain archeological sites or have conditions favorable to finding such sites. Many wind energy project developers conduct cultural, historic, and archeological resource surveys as part of their environmental assessment. Surveys in New York are conducted in accordance with the federal and state legislation listed above. If historic or archeological resources are found in the survey area, mitigation plans will be developed to preserve those areas.

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The New York State Museum hosts a Cultural Resource Survey Program, which assists state agencies with cultural and archeological surveys. Their website contains a link to the New York Archeological Council's Cultural Resource Standards Handbook: Guidance for Understanding and Applying the New York State Standards for Cultural Resource Investigations (2000). The handbook assists non-archeologists in understanding the professional standards for cultural resource investigations.

The SHPO does not maintain a list of archeological consultants, but has developed guidelines to help select a consultant to do the survey.

10.4. Telecommunications

Several companies have studied how construction of wind turbines and other structures impact various modes of telecommunication. The modes include the following:

- Microwave communications, point-to-point
- Off-air television reception
- RADAR
- Land Mobile Radio (LMR)
- Cellular and PCS telephones
- AM radio coverage
- Amateur radio operations

The potential impacts on these devices can be studied during development of a project and mitigated, when necessary.

Microwave

Interference of microwaves can be predicted by using a database of microwave licensing and calculating Fresnel zone blockage. Microwaves are transmitted via line-of-sight; if a structure is placed in the line-of-sight, interference occurs. Therefore, it is relatively straightforward to calculate potential interference by turbines at a project based on the Fresnel zones of microwave paths in the area, the turbine dimensions, and the turbine locations. Conducting this analysis in the development stage allows for mitigation measures such as turbine relocation or relocation/re-engineering of the microwave facility.

Over-the-Air Television

The probable interference of over-the-air television signals can be determined using a database of TV stations within a 100 mile radius of the project, the position of the TV station antennas relative to the wind energy project and communities or clusters of homes near the project, and the signal attenuation and multipath. If reception could be a problem, a developer may offer to provide alternative service preemptively or may conduct a pre-construction baseline study and post-construction follow-up study to determine if any of the structures are causing interference, and to what level. Depending on the level of interference, if any, the developer may offer alternative services such as cable or wireless service.

One pre- and post-construction study determined that signal noise could be generated at low VHF channels within 0.5 miles of the turbines studied. The flicker seen correlated to propeller motion and was more noticeable in older TV sets, and ghosting could be produced due to multipath reflection off of the turbines.

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Potential Impacts on Other Technologies

RADAR signal blockage could occur in the sector of the wind turbines. A reduction in target detection capability and degradation of range and target tracking can occur, as well as potential false positives.

Wind facilities have minor effects on LMR, cellular, and PCS systems. Since effects are so minor, turbines and utility towers can serve dual purposes by hosting repeater antennas for LMR and base station antennas for cellular and PCS.

Wind turbine towers will alter AM radio coverage by affecting the emitting AM antenna pattern. The recommended separation is >1 km for omni-directional antennas and >3 km for directional antennas. Wind turbines only affect amateur radio operations when the turbines are in close proximity to the antenna, <1,000 ft.

10.5. Site Condition and Construction Impacts

When one thinks of a wind farm project, one immediately thinks of the environmental benefits of a green energy project. However, like any other major construction effort, building a wind farm moves a lot of dirt, which in and of itself could have a negative environmental impact when not managed properly. Construction of a wind farm involves a lot more than erecting turbines. Such a project will include a number of components:

- Construction trailer, lay-down yard, and equipment staging;
- Access roads to the turbines (temporary access may be wider than the permanent road that remains after construction);
- Public road improvements (allowing local roads to accommodate heavy construction equipment);
- Wind turbines (foundations, towers, and turbines, plus a temporary construction staging area);
- Interconnection between turbines (temporary clearing prior to the installation of, typically buried, electrical collection system lines);
- Disposal areas for cleared vegetation, rock, and excess subsoil;
- Substation;
- Transmission line and associated access;
- Permanent operations and maintenance facilities. In order to ensure that construction is undertaken responsibly, project proponents have created very successful environmental construction compliance programs that meet federal, state and local environmental permit requirements.

Some of the most common construction related concerns are listed below. An environmental construction compliance program should address all of these concerns.

- Are all construction activities properly approved by the appropriate agencies prior to the start of construction?
- Are construction activities and access occurring only in approved areas and along approved routes?
- Has the work area been properly defined, staked, and/or fenced prior to construction?
- Is regular notice of road closures or other traffic inconveniences being adequately communicated to police and emergency services, local residents, and others?
- Have all underground utilities been identified prior to ground disturbing activities?
- Are agricultural protection measures being appropriately implemented?
- Have wetland resources been properly staked prior to construction? Do construction crews know to avoid access through or disposal of debris in wetlands?
- Have sediment and erosion control measures been installed? Are they properly maintained, especially after storm events?

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- If there is to be blasting on site, have all appropriate landowner notifications been made?
- Is dust being properly controlled?

An environmental construction compliance program typically consists of several components, which have successfully enabled projects to be built in compliance with environmental and land use permits:

- Planning -- Prior to the start of construction, the project proponent should thoroughly read its environmental permits and extract all environmental requirements that would apply during construction. These requirements should be compiled into a construction environmental management implementation tool. This tool often includes: Roles and Responsibilities, Project Contact List, Preconstruction Coordination, Construction Operations, Post Construction Activities, Safety, Human and Industrial Sanitation, Environmental Compliance Program (including monitoring criteria, compliance approach, compliance levels, training, communication, reporting, corrective action, variance process), and Appendices including copies of documents that must be at the project site (e.g. permits, authorizations, plans, and any other documents that create or describe environmental requirements for construction and restoration).
- Training -- Before construction begins, project proponents typically require that all contractors and subcontractors attend an environmental training program during which the environmental construction compliance program is explained in detail. In addition, throughout construction, before new crews work at a project site, they must receive Environmental Training. If compliance issues arise during construction, retraining in certain aspects of the plan occurs.
- Preconstruction Coordination -- Project proponents often hire Environmental Inspectors to assist the construction team with environmental compliance. Prior to the start of construction at any given site the Environmental Inspector, Contractor and any Subcontractors conduct a site walkover of areas to be affected by construction activities. During the walkover, this group identifies landowner restrictions, sensitive resources (biological, geological, and cultural), limits of clearing, proposed stream crossings, location of drainage features, and layout of sediment and erosion control features. Specific construction procedures are determined. Landowners and agencies are consulted or included, as needed. A pre-construction checklist is typically completed during the walkover so that nothing is missed. In addition, wetland and any other sensitive resource features are flagged in the field prior to construction. The limits of work areas, especially in agricultural areas, are defined prior to construction.
- Inspection During Construction Operations -- If an Environmental Inspector is retained, the Environmental Inspector typically visits each construction work site at least once per day and is present during construction at environmentally sensitive areas. Environmental Inspectors have a significant role to play in suggesting methods to bring construction activity into compliance and can temporarily halt certain activities that may cause damage to sensitive environmental resources. Environmental Inspectors keep a log of all of the project sites they visit and record whether the construction activities they observed were in compliance. Environmental Inspectors meet with construction management every morning in order to be kept abreast of all construction issues. Environmental Inspectors conduct training on various aspects of the environmental compliance program as new crews come to the project site or as refresher training becomes necessary. Regulatory agencies sometimes employ Environmental Monitors to keep an eye on compliance activities, too.
- Weekly Reporting and Agency Audits/Inspections -- Depending upon reporting requirements associated with the permits, the Environmental Inspectors' daily logs are converted into weekly, monthly, or quarterly reports for the federal, state, and local agencies that monitor compliance on this project. Some regulatory agencies conduct a regular weekly, monthly, or quarterly compliance audit at project sites. In addition, compliance tours can be periodically arranged for local, state, and federal officials.

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- Restoration -- The Environmental Inspectors or other project proponent designees will create an environmental punch list based upon the restoration requirements in the permits. As construction activities wind down, the Environmental Inspectors will conduct a restoration walk over with the construction contractors to ensure that restoration activities occur as required. Permits and bond-release provisions often require project proponents to conduct a multi-year post construction monitoring program of restoration efforts.

Agricultural Impacts

Generally, wind energy projects are compatible with agricultural land uses and may help farmers who lease land to wind developers preserve their farms by providing them a supplemental income. Because wind turbines physically occupy only a small fraction of the land, most of the leased land remains available for planting and grazing. However, impacts to the agricultural resources can occur as the result of wind projects.

Two types of agricultural impacts can result from the construction of wind energy projects on agricultural land. One is the permanent loss of productive land as a result of the installation of the access roads and turbine towers, as well as the facilities needed for the interconnection between the wind energy project and an existing electric transmission line. The other is the damage to soil resources and a loss of crops in areas disturbed during construction. Both of these impacts can be minimized with proper planning and communication.

The proper siting of access roads and towers can significantly reduce the amount of land permanently lost from production as a result of this type of project. Constructing a permanent access road through the center of the field can reduce the efficiency of the farm tillage and harvest operations by significantly altering cropping patterns. Disruption to center-pivoting irrigation systems should be avoided whenever possible. Generally, locating the roads and tower sites along the edge of fields results in the least amount of productive land being lost.

Loss of productive farmland can occur at the point of connection between the wind energy project and the electric transmission line. Good communication is needed between the state Department of Agriculture and Markets (DAM), the project sponsor, the landowner, and the utility company concerning the transmission line interconnection. All parties need to fully understand the type and location of all facilities required for the interconnection. It should be noted that, although rare, it is possible to increase productive farmland in some areas, such as western New York, where access roads for turbines can allow access to fields that were previously inaccessible by farming equipment.

Another concern is the potential for permanent damage to the soil in areas disturbed during construction. Since the depth of the topsoil layer is generally quite shallow in New York, it is critical to protect this layer in order to achieve maximum crop production. Topsoil should be stripped from any areas disturbed by construction, including along access roads, around tower sites, and any other areas where excavation is necessary, and stockpiled. Following construction, the topsoil must be graded to the original depth. It is important for the project sponsor to negotiate adequate work space with the landowner in order to allow for proper protection of the topsoil resource. When properly coordinated, farmers can successfully plant crops in close proximity to access roads and towers.

Projects of this nature may cause compaction to the topsoil and subsoil layers. If not properly mitigated, the compaction can reduce crop production for a number of years. Deep soil tillage in agricultural areas is recommended during restoration. On average, approximately 1 acre/MW is disturbed during construction. Of that amount, about half is used permanently by the project during operation and less than a tenth is compacted and leveled for the crane pad. The remaining amount is used for staging, temporary placement of the rotor and

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tower sections, and the assembly work area. These are light duty areas that may require some leveling, but no compaction.

Many of the soils in the areas where wind energy projects have been constructed or are proposed are shallow to bedrock and/or have a high concentration of rock in the subsoil. Extensive excavation in these types of soils can result in a higher than normal concentration of rock in the upper subsoil and topsoil layer. If not properly removed or used as appropriate for other project needs (e.g. foundation backfill, access road cover), this rock concentration can create difficulties for the farm operator.

Changes in the natural surface and subsurface drainage patterns have been observed at existing wind energy projects. These changes can occur as a result of the construction of the access roads, as well as from other excavation. Drainage impacts need to be considered during the planning and construction phases and need to be properly mitigated during the restoration phase.

Proper implementation of the *DAM's Guidelines for Agricultural Mitigation for Windpower Projects* will help to minimize the impacts to the agricultural resources.

Traffic and Road Conditions

The construction phase of a wind project results in a short-term increase in the number and size of tractor trailers present on rural roadways. For example, during construction each turbine may require 10 to 20 concrete trucks to provide sufficient material for the foundation, depending on the type of foundation. Transportation of the tower sections, nacelles, and blades will require multiple deliveries using specialized transport vehicles. Large-capacity conventional crawler cranes required for turbine assembly are transported to the site in pieces by as many as 60 tractor-trailers. Other tractor-trailers are required to deliver supplies, tools, and materials for construction.

The increased truck traffic combined with the increased loading on the roads is a concern for transportation departments responsible for road maintenance and repair. Wind energy project developers recognize that the increased traffic may cause damage to roadways and usually include provisions for the turbine supplier and associated contractors to be responsible for any road repairs that may be necessary upon construction completion.

Town governments, in conjunction with the project developer, should document local road conditions in the vicinity of the project prior to construction. Project approval should stipulate that the developer restore any road damage to the documented pre-construction conditions.

Sometimes roads must be reinforced or widened to accommodate the trailers and trucks that deliver components. These changes are permanent. While some residents welcome the upgrades, others may object, fearing an increase in traffic or traffic speeds after construction is completed.

During and after construction, local roads may experience increased traffic due to local residents or tourists observing project progress and turbine operation. Residents on small rural roads may object to the unexpected increase in people visiting their area. Others may seize the opportunity to create small businesses selling tours or souvenirs. As the novelty of the project decreases over time, traffic concerns will decrease. Installation of roadside information kiosks can help channel tourist traffic to an area or areas acceptable to local residents.

Soil Erosion

Road, building, and foundation construction are the principal wind-project construction activities that can cause erosion concerns. The potential for soil erosion at a wind project is examined during the SEQR process. For almost all types of project development, local agencies have established sediment and soil erosion requirements

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that take into account local conditions. Selection of erosion and sediment control measures is guided by the local soil conditions, weather environment, project needs, and local or state regulations.

Most local agencies require developers to submit grading, erosion, and/or sedimentation plans prior to issuance of building permits. Approaches to minimize or prevent soil erosion for wind energy projects are very similar to requirements for other forms of construction. The following lists the types of prevention and mitigation measures typically employed during construction of a wind energy project.

- Use natural terrain features as much as possible to minimize the amount of grading required.
- Limit the amount of time that disturbed soil is exposed.
- Keep existing vegetation in place and undisturbed to the extent possible.
- If local conditions warrant, minimize soil transport by employing sediment ponds, hay bales, silt fences, or other measures.
- Prohibit vehicle travel off of access roads.

Stormwater Runoff

Stormwater runoff during construction can be a potentially significant issue, and both the State government and local governments have codes for addressing this issue. During heavy construction, as soils are disturbed, stormwater runoff may carry away sediment and pollutants from any spills or drips. Stormwater runoff from concrete work areas is a concern due to elevated acidic content. Stormwater pollution prevention plans are filed with the DEC for approval.

Wetlands and Stream Crossings

During the SEQR process, it will be determined if a part of the project (e.g., access road, transmission line, or turbine) is located in a wetland or crosses a stream. Projects that fall in this category require the developer to apply for wetland and stream crossing permits. Depending on the type of wetland, the agency issuing the permit varies. The DEC issues permits related to tidal wetlands. These areas, according to the DEC, occur along the salt water shoreline, bays, inlets, canals, and estuaries of Long Island, New York City, and Westchester County, as well as along the Hudson River in Westchester and Rockland Counties upstream of the salt line. The DEC maintains a Tidal Wetlands Permit Program on their website. The DEC maintains a Freshwater Wetlands Permit Program on their website. According to this site the following agencies are involved in protecting freshwater wetland resources and one or more can be involved in issuing freshwater wetland permits:

- US Army Corps of Engineers
- NYS Department of State
- NYS Office of General Services
- Adirondack Park Agency
- Local governments

These permits will define the allowed work in a particular location, as well as any required mitigation measures. Wetlands are typically identified early in the project development process and developers make significant efforts to avoid disturbing these areas. Wetland concerns are most likely to arise during the construction process when activity at the project site is greatest. Long term operations are not likely to encounter wetland concerns since permanent project features would not be placed in wetland areas.

Solid and Hazardous Waste

As a part of the SEQR, any solid or hazardous waste from construction or operation of the wind energy project must be addressed. Waste from wind energy projects primarily consists of general solid waste associated with

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the shop office, packaging material from equipment and supply shipments, spent lubricants, and small components that have failed, but also includes hazardous wastes such as solvents used for cleaning turbine parts. Project operations and maintenance (O&M) buildings have conditions typically found within automobile or boat repair facilities. Leaks of hydraulic fluids or lubrication oils from components within the nacelles or shop handling of lubricants represent the most common places for accidental releases of hazardous material into the environment. All projects are required to handle and store lubricants in accordance with local, state, and federal requirements. When minor equipment leaks are identified, project operators investigate the reason for the condition and implement corrective actions with the turbine manufacturer. Releases are almost always contained within the nacelle and/or tower. Failures in the hydraulic blade pitch systems located in the hub can result in the release of oil along the outside of the tower, which poses an environmental risk and results in immediate attention. Manufacturers are more frequently using electric motors for blade control, which is eliminating this potential release pathway. Depending on the fluid types used, the DEC may require a project to have a hazardous material handling plan.

The use of hazardous materials is typically minimal during the operation of a wind energy facility, which makes complying with solid and hazardous waste permit requirements relatively straightforward. Solid waste is typically managed through a solid waste removal service contract. Lubricant suppliers have established programs for collecting waste lubricants and oils generated during routine maintenance activities, such as gearbox or hydraulic station oil changes, and large components that are replaced can be returned to the manufacturer for refurbishment. These programs allow developers to comply with requirements and maintain the health of the environment.

Repowering

Repowering wind energy projects refers to the replacement of old and typically smaller wind turbines with new equipment. As the turbines approach the end of their design life (typically 20 years) or if a significant improvement in technology occurs, a project owner may assess the costs associated with repowering a site. Although this type of activity is not expected to occur in New York in the near term, government authorities should recognize the potential for repowering and address any concerns in their permits.

Decommissioning

Decommissioning involves the removal of all evidence of a wind energy project after it has reached the end of its design life. Depending on permit requirements and terms of the land lease agreements, the project owner may be required to restore the land to original site conditions. While the State of New York does not have decommissioning requirements for wind energy projects, local governments can include such requirements in their zoning or site plan laws.

Figure 15 presents examples of the types of requirements others have developed or proposed regarding decommissioning. This information may be useful in determining how best to handle decommissioning in the town or village.

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State of Minnesota Siting Permit Application Requirement

Decommissioning and Restoration.

The applicant shall include the following information regarding decommissioning of the project and restoring the site:

- The anticipated life of the project;
- The estimated decommissioning costs in current dollars;
- The method and schedule for updating the costs of decommissioning and restoration;
- The method of ensuring that funds will be available for decommissioning and restoration; and
- The anticipated manner in which the project will be decommissioned and the site restored.

One Developer's Proposed Approach for a 53 MW Wind Plant

Developer proposed to remove all project items to a depth of 36 inches

- 20-year project life
- $1 million is budgeted for decommissioning
- Decommissioning funds will be set aside in an independent management account
- Independent account management will report status of available funds to the project annually

Figure 15 - Sample Decommissioning Requirements

Local agencies have attempted to address decommissioning concerns in several ways. Some agencies have required that turbines be removed from the site if they are not operational for a specified period of time (i.e., multiple years). Others require the permittee to maintain a fund for removal or post a bond. The most common approach is to require the submission of a decommissioning plan. In the worst-case scenario, salvage value for the scrap metal may be sufficient to cover the dismantling costs. According to the NYS DOS Counsel's office, municipalities may not require a removal bond as part of a land use approval. They suggest including a removal clause for non-operation for a specified time in a local zoning law. Non-removal would then become a zoning enforcement matter.

A key consideration in decommissioning requirements is determining the need for complete removal of the turbine foundations. While typically extending 3-5 feet below ground surface for slab type foundations, they can, depending upon the design and soil conditions, extend as much as 30 feet below ground surface. A common decommissioning standard is removal of all below-ground project elements to a depth of 36 inches. This is considered to be adequate for agriculture or future construction. Disconnected cables buried 36 inches or deeper can sometimes remain in place if their presence does not adversely impact land use and they do not pose a safety hazard.

Site restoration is generally a component handled within the land lease agreement between the developer and landowner. Local governments may want to establish some minimum requirements that provide a consistent standard for landowners within a common topographical area that is compatible with other land uses in that area.

10.6. Construction Impact Examples

The construction of a wind farm can have an adverse impact on the agricultural resources of the surrounding area. The Department of Agriculture and Markets has observed the construction of wind farms in New York and has identified several impacts to agricultural resources that can occur as the result of such projects. They have

provided information regarding the agricultural impacts during and after construction to landowners who are considering participating in future wind farm projects.

The amount of land disturbed during construction depends on the size and number of turbines, existing infrastructure (e.g., roads and transmission), and topography. Temporary construction disturbance averages 1 acre/MW to accommodate a construction lay-down area at each turbine location, access roads, underground transmission line, substation, and construction vehicle parking. Permanent disturbance averages 0.5 acres/MW. It is recommended that the landowner be involved in the siting process to minimize interference with farming operations.

The following is a summary of general guidelines that should be considered during wind farm siting and construction to minimize agricultural impacts:

- Access roads should be built along fence lines or other natural boundaries to minimize the disturbance to fields and cropping patterns.
- The agricultural topsoil should be stripped from the area adjacent to access roads to prevent damage from vehicle traffic and parking, and replaced after construction.
- When the soil is disturbed, the topsoil should be carefully separated from the subsoil below. This will help to facilitate a successful restoration of the project area.

Examples of impacts that wind farm construction can have on agricultural land are provided below, as well as a discussion of the appropriate actions to help mitigate the impact.

Note: All photographs in this section were provided by Matthew Brower of the NYS Department of Agriculture and Markets

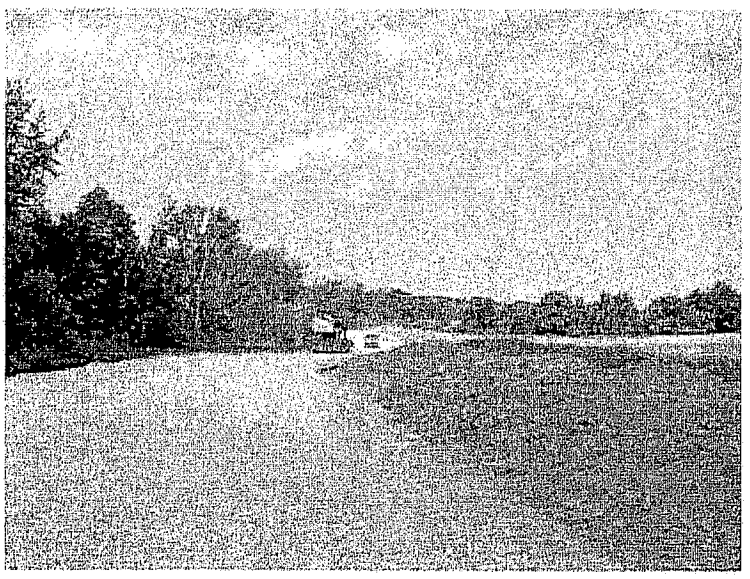

Figure 16 - Photograph of an access road to a wind farm

Figure 16 offers an example of an access road that was installed along a tree line at the edge of a farm field. The practice of constructing access roads along fence lines or natural boundaries helps to minimize the disturbance to the field and the farmer's cropping pattern.

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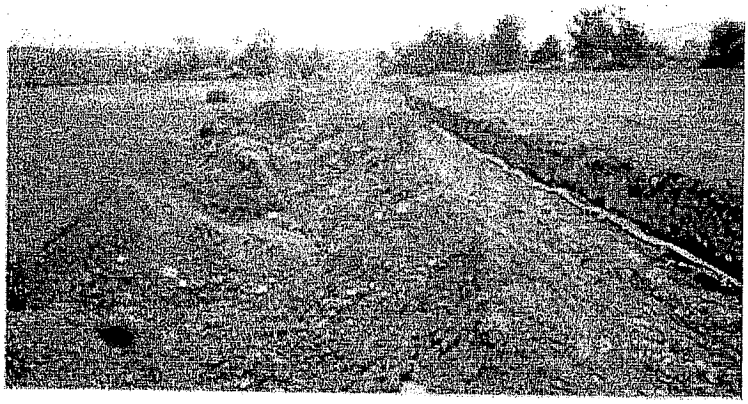

Figure 17 - Photograph of a trench dug for a collection system

Trenches similar to the one shown in Figure 17 are dug out for the wind farm's underground electrical collection and communication systems. To protect the integrity of the agricultural topsoil and to ensure the success of the restoration process, the topsoil needs to be carefully separated from the subsoil when the trenches are dug. On agriculturally developed lands, the collection and communication systems are positioned below plow depth so that the land can be fully utilized once it is restored following construction.

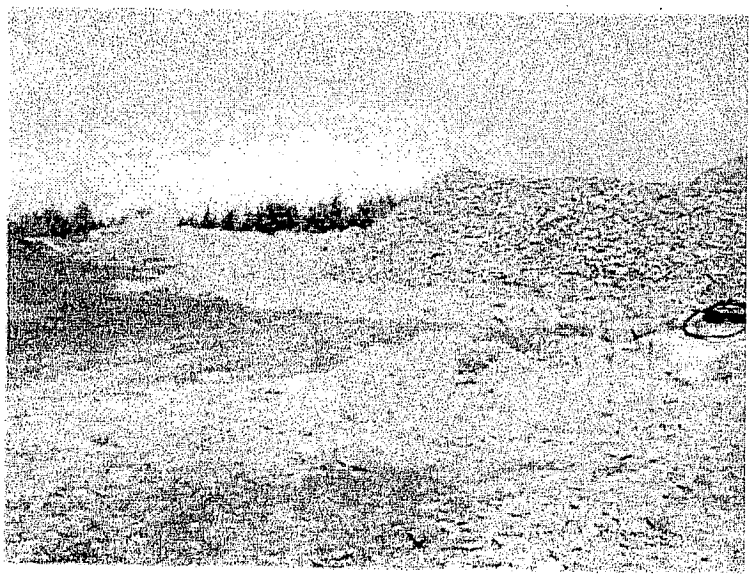

Figure 18 - The topsoil is separated from the rocky subsoil removed for the foundation

Figure 18 shows a significant volume of rock that was excavated from the hole for the turbine foundation. In this instance, the topsoil (mounded on the left) was properly separated from the rocky subsoil. This will help to ensure that the restoration of the project area is successful.

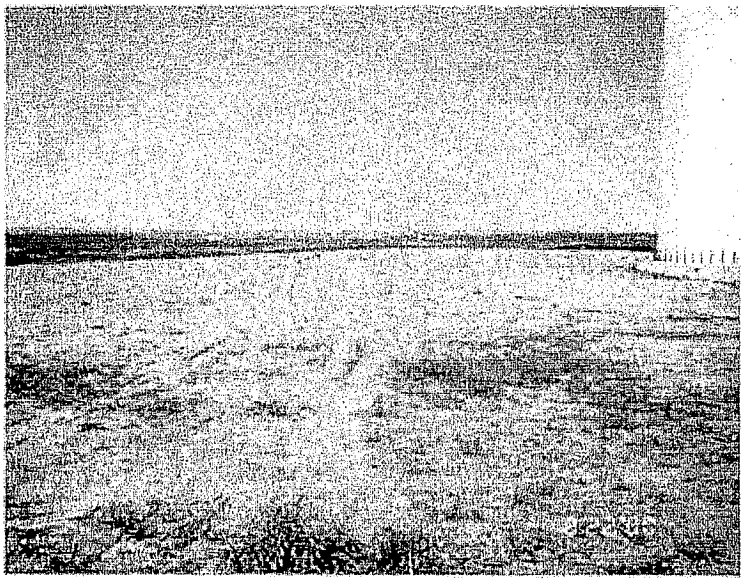

Figure 19 - Seeding failed due to inadequate restoration

In Figure 19 above, attempts to seed the area around the tower failed due to a lack of topsoil material on the surface; this photo was taken one year after the site had been restored and seeded. Imported topsoil was required to establish seeding.

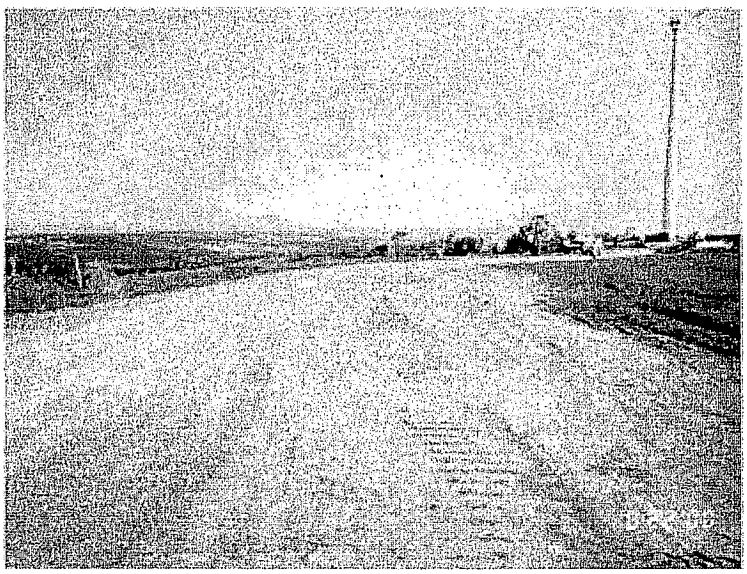

Figure 20 - Topsoil along access road which was damaged due to compaction



Figure 21 - Seeding failed along access road due to a lack of topsoil

In Figure 20, the topsoil had been damaged due to compaction from vehicle traffic and parking; subsoil decompaction and imported topsoil are required during restoration. As shown in Figure 21, a lack of good-quality topsoil makes it challenging to seed the land. The proper technique to mitigate the effects of soil compaction is illustrated in Figure 22; the topsoil bordering the access road has been stripped to allow room for vehicles and equipment. After construction is completed, the restoration process involves simply placing the topsoil back over the exposed subsoil.

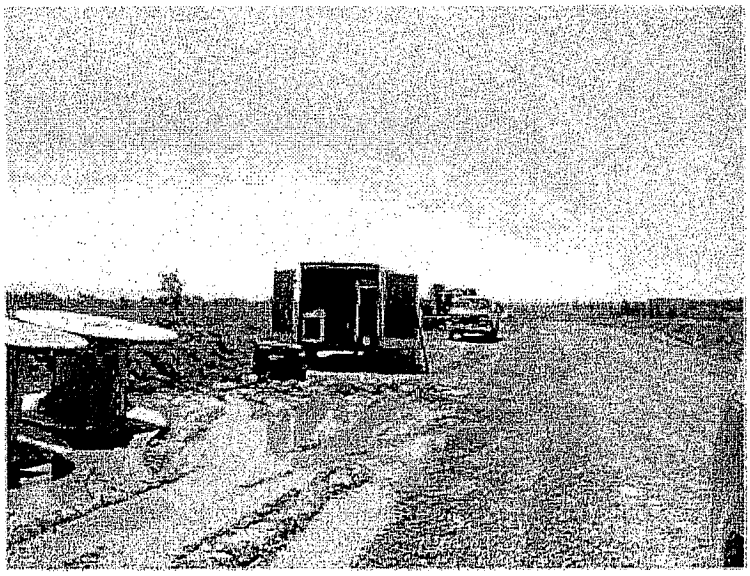

Figure 22 - Topsoil was stripped along access road to prevent damaged from traffic

The connection from the substation to the transmission line can result in a loss of productive farmland. The supporting cables of a guyed tower extend out from the tower and anchor into the ground, occupying a sizable amount of land area, as shown in Figure 23.

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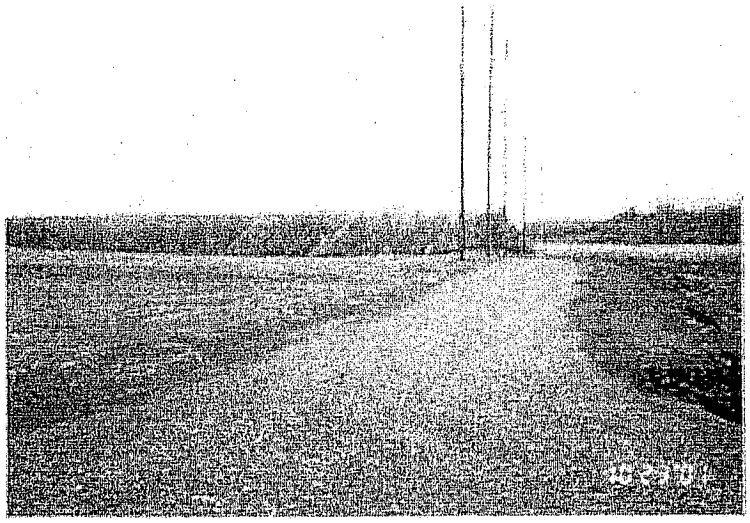

Figure 23 - Overhead electrical lines supported by guyed towers

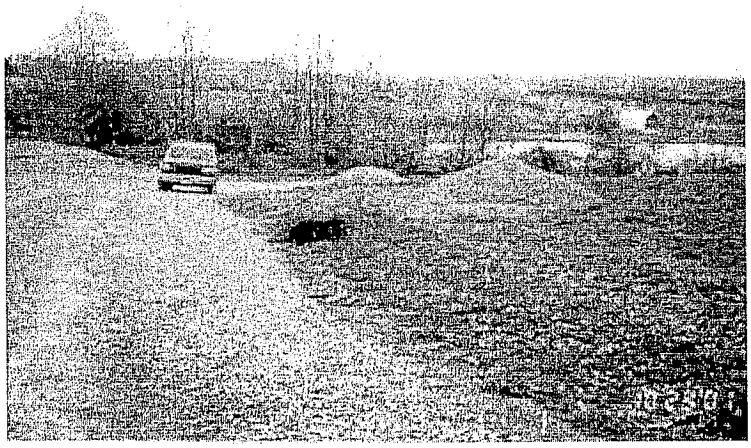

Figure 24 - Crushed stone mistakenly placed in an agricultural field

Crushed stone is used in the construction of access roads; the pile shown in Figure 24 should not have been left in an agricultural field after restoration. An example of a soil saturation problem can be seen on the left hand side of the access road in Figure 25. This type of drainage problem needs to be addressed to prevent damage to the field.



Figure 25 - Drainage problem found near an access road

10.7. Additional Resources

To learn more about how these issues tie into the SEQR process, step-by-step instructions on the SEQR process may be obtained from the state Department of Environmental Conservation (DEC), or online at http://www.dec.ny.gov/permits/357.html.

Visual Impact

- The state Department of Environmental Conservation has published a program policy titled *Assessing and Mitigating Visual Impacts*. This document offers a full range of assessment and mitigation procedures, discussed within the context of SEQR. It is available online at http://www.dec.ny.gov/docs/permits_ej_operations_pdf/visual2000.pdf.
- Pasqualetti, M. et. al. (2002) *Wind Power in View: Energy Landscapes in a Crowded World*. Academic Press: California (234 p.).
- Thayer, Robert and Carla Freeman. (1987) *Altamont: Public Perception of a Wind Energy Landscape*. Center for Design Research, Department of Environmental Design, University of California-Davis.
- USDA and USFS (1995) *Landscape Aesthetics: A Handbook for Scenery Management*. Agricultural Handbook Number 701.

Sound Emission

- For test results on small wind turbines, see Migliore, P. et. al. (2003) Acoustic Tests of Small Wind Turbines. National Renewable Energy Laboratory, NREL/CP-500-34662. Preprints of the paper were presented at the 2004 Wind Energy Symposium. This document reports the results of acoustic tests (based on international standards) conducted on eight turbines ranging in size from 400 W to 100 kW. Turbines in this size range would be used in residential or commercial applications.
- For more detail on sound power and sound pressure as well as measuring sound, see Rogers, Anthony A. et. al. Wind Turbine Noise Issues. Renewable Energy Research Laboratory, Center for Energy Efficiency and Renewable Energy, Department of Mechanical and Industrial Engineering, University of

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Massachusetts at Amherst, June 2002, amended March 2004. This white paper provides a solid overview of the basics of sound emissions and reception, sound versus noise, and sound power level versus sound pressure level. It also includes more complete discussions on the types of sound emitted by wind turbines and the ability to hear the wind turbine sounds given background sounds. The paper also includes a separate, but brief, discussion on sounds from small wind turbines.

- The state DEC has published a policy paper titled *Assessing and Mitigating Noise Impacts*. It is available online at www.dec.state.ny.us/website/dcs/policy/noise2000.pdf.

Cultural and Archeological

- SPHINX (State Preservation Historical Information Network Exchange) is a database maintained by the state Office of Parks, Recreation and Historic Preservation. It contains information on national and state register properties (standing historic and archeological sites). A password is required to access the exchange and can be requested through the SHPO.
- Geographic Information System (GIS) for Archeological and National Register is an interactive, state-wide map that shows boundaries of registered properties and an overlay of general archeological areas. The user can zoom in to the location of a listed property. The map is located at http://www.oprhp.state.ny.us/nr/main.asp. An explanation of the data is located on the SHPO website at http://nysparks.state.ny.us/shpo/resources/index.htm.

The Preservation League of New York State is compiling 18 GIS layers of environmental, scenic, and historic data. These GIS layers will be valuable for local communities in understanding the resources within their area. Audubon New York, the state program of the National Audubon Society, has an Important Bird Areas GIS layer that communities may request for use in planning.

Additional information can be found through the following agencies and organizations:

- New York State Department of Environmental Conservation (www.dec.state.ny.us)
- Society for American Archeology (www.saa.org)
- National Trust for Historic Preservation (www.nationaltrust.org)
- Advisory Council on Historic Preservation (www.achp.gov)
- New York Archeological Council (www.nyarchaeology.org)
- New York State Museum (www.nysm.nysed.gov/crsp)

Telecommunications

- Oliver, Kurt. Telecommunications Issues for Wind Turbine Facilities. Presentation at AWEA Conference, Oregon, 2004.
- BBC et. al. The Impact of Large Buildings and Structures (including Wind Farms) on Terrestrial Television Reception. United Kingdom. No date.

Construction

Proper implementation of the *DAM's Guidelines for Agricultural Mitigation for Windpower Projects* will help to minimize the impacts to the agricultural resources. This document is available online at www.agmkt.state.ny.us/AP/agservices/constructWind.html.

- Stormwater management guidelines for new development are available at http://www.dec.state.ny.us/website/dow/appndixd.htm
- Stormwater Management and Erosion Control Plan (Structure and Content) is available at http://www.dec.state.ny.us/website/dow/appndixf.htm

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- The NYS Department of State (DOS) maintains the Stormwater Management Guidance Manual for Local Officials. This 75-page document is intended to help regulated communities and local officials in New York manage stormwater. The manual is available at http://www.dos.state.ny.us/lgss/stormwaterpub/pdfs/stormwater11.pdf

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www.nyserda.org

Prepared by:
AWS Truewind, LLC

NYSERDA
New York State
Energy Research and
Development Authority

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11. Comprehensive Planning

Comprehensive planning is essential to ensure that regional wind development is consistent with a community's values and objectives. Ultimately, the community may or may not decide to pursue wind development, nevertheless, either approach will benefit from implementing a comprehensive plan.

A considerable number of New York municipalities have adopted comprehensive plans to guide their communities' future growth and development. Comprehensive plans allow municipalities to envision the kind of future they want and put together a strategy to achieve it. That strategy is then carried out through a community's zoning ordinance and other implementing measures. New York communities that use zoning must base that zoning on an adopted comprehensive plan. When local zoning is challenged, courts will look to a community's comprehensive plan for guidance on the rationale for and intent behind local regulations. All of this lends real weight to the critical role of the comprehensive plan in outlining wind energy development policy.

Community planning is a proactive tool because it anticipates and prepares for, rather than reacts to, potential future opportunities. It works in any community's favor because it can be used to manage development in growing areas, attract development to slow-growth areas, and preserve open spaces. One of the important roles of the comprehensive plan is to identify natural resources that can be managed in ways that will benefit the community as a whole. Communities that lack comprehensive plans are less prepared to address potential wind development in their area, and may miss critical opportunities to direct decisions according to a larger community vision.

A comprehensive plan should have four parts: 1) inventory, 2) analysis, 3) goals and objectives and 4) an action strategy. The comprehensive plan may include a generic environmental impact statement (GEIS).

11.1. Inventory

The inventory is the primary building block of the plan because it can identify unique natural resource capabilities and constraints that are helpful in guiding local development, management and protection efforts. Most rural comprehensive plans identify farm land, forest land, wildlife habitats and water resources as key natural resources. These resources usually represent a mix of working landscapes with economic utility and natural landscapes that provide environmental, cultural or scenic benefits to the community. Communities with high wind energy potential may want to identify such sites in their comprehensive plans because they represent an important natural resource and opportunity to create a new kind of working landscape. These sites should be inventoried and mapped and a text provided that describes the resource and its level of wind energy potential. GIS mapping and information on wind energy potential for particular sites can be obtained from NYSERDA.

11.2. Analysis

The next step should involve looking at the potential wind development sites in the context of other natural and cultural resources, existing and adjacent land uses and other relevant factors. Because planning involves balancing a variety of needs and priorities, proposed future land uses and activities must be analyzed and evaluated for their respective advantages and drawbacks. That way, decisions that benefit the community as a whole can be reached.

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In comparison to other forms of power generation facilities, wind energy projects are land intensive. Wind projects require large tracks of land to obtain good wind exposure while minimizing inefficiencies. Acreage for a wind energy facility can vary from 30 to 80 acres per MW of installed capacity, depending on many factors such as topography, existing land use and vegetation cover. However, the specific footprint of the turbines is very small – only approximately 3% to 5% of the total acreage is used by the facility.

Wind energy facilities are compatible with agricultural and livestock grazing land uses, usually with little significant impact. In fact, wind projects can provide an important supplemental form of income to farmers that can encourage them to continue farming rather than convert their land to residential uses.

Already-developed or highly-parcelized areas that are likely to be developed for residential uses are less compatible scenarios for wind energy development because of potential conflicts. Some communities will find windy sites close to developing areas that they would like to protect for future wind energy uses. Other communities will decide that protecting scenic vistas is a higher priority. These decisions may require local officials to rethink underlying zoning, permitted uses and plans for extending infrastructure to minimize the potential for future conflicts.

Keep in mind that the windiest spots aren't always the only ones of interest to wind developers. Buildings or large structures placed upwind of wind farms may adversely impact energy production from the turbines. Wind developers often obtain land lease options on crucial upwind land parcels. If a community has decided to encourage wind development in their area, they may wish to include a provision in their comprehensive plan that designates upwind lands for low-density uses only.

Wind projects can sometimes have impacts on nearby recreational land use, historic and scenic landscapes and avian and bat populations. The location of any inventoried wetland or water areas that are home to birds or any rare or endangered species within or adjacent to identified wind sites should be a factor for consideration in evaluating the potential for these sites, as there can in some cases be conflicts between these uses. Audubon New York has identified Important Bird Areas across the State and provided digital mapping of these areas to many counties (For more information on bird and bat impacts, see Section 9: Birds and Bats).

Similarly, the location of any inventoried scenic viewshed or historic district within or adjacent to identified wind sites should also be a factor for consideration. The Preservation League of New York State is producing a series of 18 GIS layers that show the locations of state- and federally-identified significant natural, scenic and historic resources as overlaid with high-priority wind sites across the State. These maps will likely be available to communities for a small fee and could be useful to local officials in the comprehensive planning process.

The location of prime bird habitat, scenic vistas or historic sites within identified wind resource areas may persuade local officials to designate only part of the identified wind area for the development of this use.

11.3. Goals and Objectives

Goals and objectives set forth the broad values and specific intentions of the community. They are often drawn from public input as part of a citizen participation process, from community surveys and from the input of a local planning advisory group. Wind energy goals and objectives should meld public opinion with the factual information derived from data and analysis to guide the plan's final recommendations for action.

A sample goal might be "To protect high-priority wind energy sites for wind energy development." A sample objective intended to follow through with this goal might be "Revise the zoning ordinance to permit wind energy facilities." Alternatively, if a community wishes to prevent wind development in their area, their goal might be "To preserve the natural habitat by preventing the development of energy projects that are inconsistent with

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community's values." An example objective associated with this goal could be to "Create a wind ordinance, or revising an existing one, to preclude the development of future wind projects." The adoption of a wind ordinance that reflects the community's sentiment towards wind development will help to avoid future conflicts.

11.4. An Action Strategy

An action strategy identifies the comprehensive plan's specific recommendations. This should include a Future Land Use Map. If the community wishes to promote wind energy development, the map would identify those areas local officials believe have the greatest potential for wind energy development with the lowest potential for adverse environmental or other impacts. This might consist of one large area or a few smaller areas, but should not consist of many very small areas, as this limits the ability for development. The map should be the basis for applying consistent zoning standards that will facilitate and promote the use of these sites for wind energy. The action strategy should include a series of specific recommendations for implementing the objectives of the plan with respect to developing wind energy resources.

New York State's Environmental Quality Review Act (SEQRA) provides municipalities the opportunity to anticipate potential adverse environmental impacts of proposed development and land use actions and avoid these through mitigating measures. Towns with significant wind energy resources, which are in favor of future development, could consider preparing a generic environmental impact statement (GEIS) for wind energy development as part of a comprehensive plan. A GEIS would include the identification of mitigating measures that would then be implemented through zoning standards, such as setbacks or noise controls. This would eliminate the need for SEQRA review of individual proposed wind projects if local officials choose, thereby streamlining the review process for all parties down the road.

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12. Developer Site Identification

In order to help landowners and community leaders better understand the development process, this section discusses how project developers identify potential project sites. This section provides detail on the type and amount of land required for wind power projects, as well as information on how wind power developers identify land they may want to utilize through option or leasing agreements. The land requirements to be addressed encompass all components of a conventional wind power project, including the wind turbines, service roads, crane pads, and the electrical interconnection to the grid.

In general, land requirements for wind power projects vary considerably and mostly depend on two sets of factors. The first set pertains to the developer's goals in terms of preferred windy locales and desired project size or power capacity (i.e., number of turbines). Although larger projects require more land area, they tend to yield lower costs of energy due to economies of scale. Therefore, most developers desire generally contiguous land areas that can accept enough wind turbines to achieve a project capacity of at least 30 megawatts, and preferably more.

The second set of factors pertains to local landform characteristics and existing patterns of land use and land ownership. Various New York landforms—coastal plains, valley floors, hills, ridges, plateaus, and mountains—have differing exposures to prevailing wind conditions. The areas offer differing wind power project siting opportunities. Accordingly, land requirements for a wind power project will vary depending on the landform type. Even after a given landform is identified, other factors such as land ownership patterns and land use/land cover patterns will influence how a wind project is designed and how much land is required.

The following sections provide further insight into the leading factors that influence the location of projects, as well as determine the land requirements of various sized wind power projects for different landform settings.

Before entering into agreements to acquire the use of lands, developers first need to determine where to focus their siting efforts, with an aim on finding areas possessing at least five qualities:

- Attractive wind conditions,
- Reasonable access to electrical transmission,
- Terrain favorable to construction,
- Land use and environmental compatibility, and
- Sufficient land area with the foregoing qualities to achieve an economical project size.

The process of comparing proposed project sites based upon a balance of these five parameters is referred to as site screening. The process of screening for potential project sites can be automated by summarizing costs associated with road creation, proximity to transmission, etc., to arrive at an estimated cost of energy for each proposed site. Site selection based upon a preliminary cost of energy assessment usually involves a site visit to confirm the validity of assumptions that were made in the screening process, as well as a fatal flaw analysis to identify any potential problems.

12.1. Wind Resource Assessment

A wind project's energy production and life-cycle economics depend more on the strength of the wind resource than any other factor. Therefore, developers must seek windy locations when prospecting for potential development sites. A rule-of-thumb is that a site's annual average wind speed should be 14.5 mph (6.5 m/s) or stronger at the wind turbines' hub height to be considered at least marginally attractive for project

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development. Other project cost variables may require stronger average winds in order to realize economic viability.

The most common tools used by developers to find windy sites are topographic maps, wind maps, and the expertise of meteorological consultants. In addition to terrain contours, topographic maps provide detailed information on the location of political boundaries, populated areas, roads, parks, transmission lines, and other relevant siting features. Wind maps are similar in nature but show predicted wind speeds and prevailing directions based on sophisticated numerical weather model predictions that also take into account local terrain and land cover influences.

Online Tools

Several wind resource assessment companies offer online tools to estimate the wind resource at a specific project site, including AWS Truewind and 3TIER. AWS Truewind's ***WindNavigator***[36] provides wind resource information for the entire continental United States at a resolution of 1.6 miles (2.5 km). Additionally, NYSERDA has supported the development of a statewide wind map tailored specifically for the use of small-scale wind turbines, Small windExplorer.[37] This wind map application provides wind resource information at small wind turbine hub heights, as well as other land use information at a spatial resolution of 200 m. Screenshots of these programs are presented in Figure 26 and Figure 27.

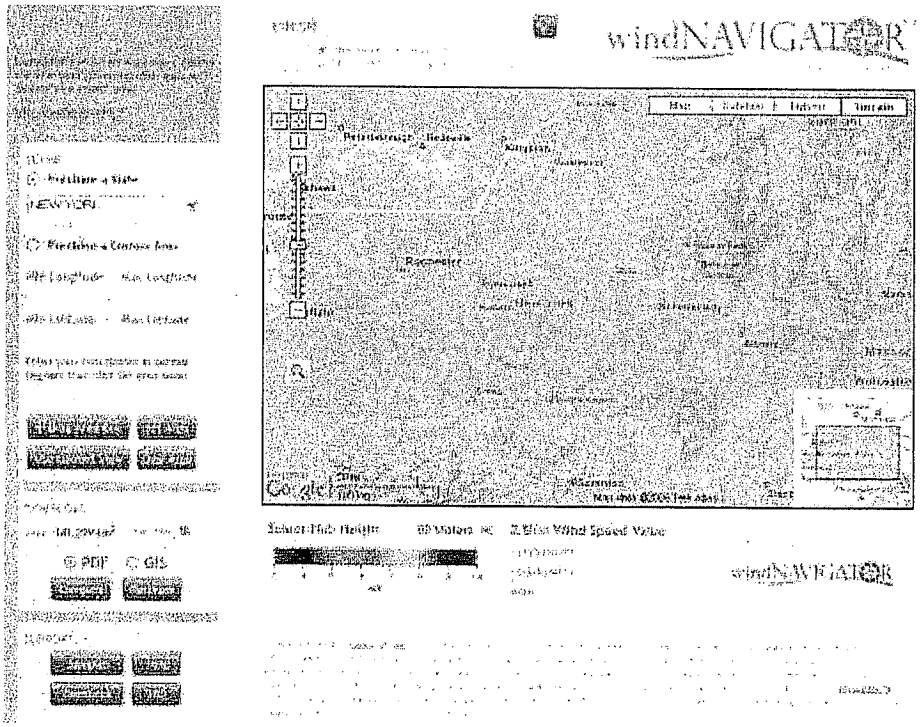

Figure 26 – Screenshot of a New York State wind map generated by windNavigator

[36] http://navigator.awstruewind.com
[37] http://windexplorer.awstruewind.com

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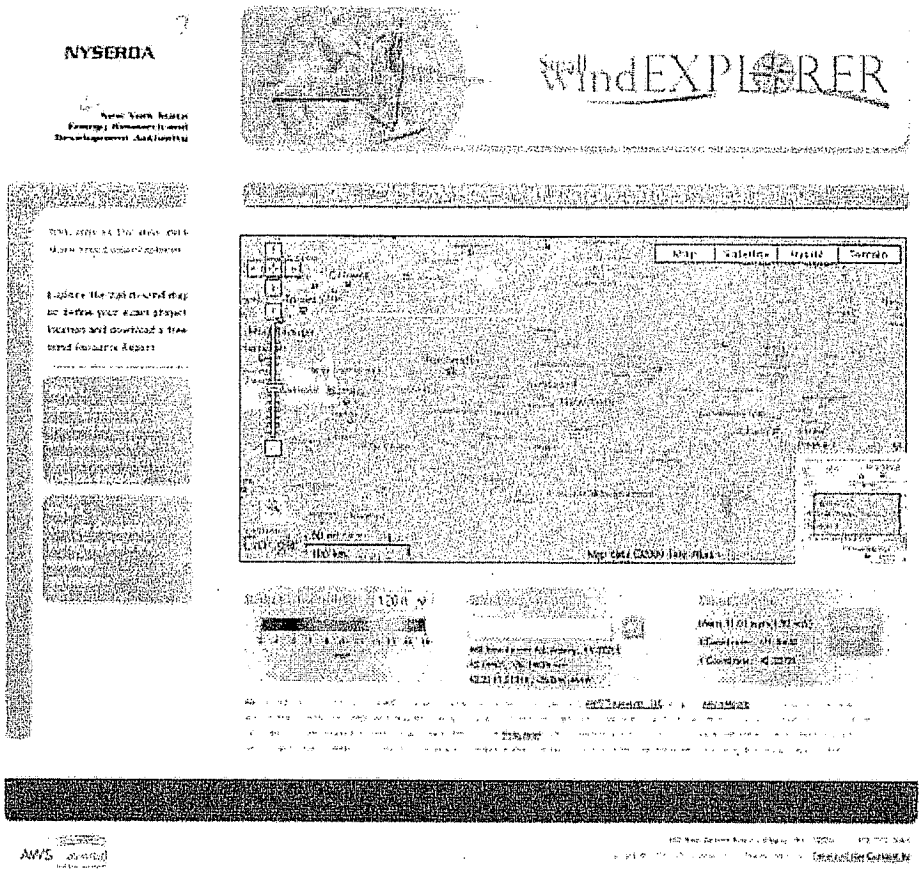

Figure 27 – Screenshot of the New York State Small windExplorer

Meteorological expertise can supplement map information with local knowledge of wind conditions and recommendations for an on-site wind measurement program. While wind maps are useful in providing wind resource information for large areas, onsite measurements of the wind resource, using tall meteorological towers, are required to confirm the wind conditions, including the diurnal and seasonal variability, within the area of interest.

Installing meteorological towers and remote sensing equipment allows the developer to record weather information (e.g., wind speed, wind direction, gusts, temperature) that can be used, together with regional climatic reference station data, to characterize the long-term wind resource at the site. Onsite measurements are necessary to greatly reduce the uncertainty in predicting a project's eventual energy production. Developers are interested in reducing a project's energy uncertainty because most wind projects are financed by third-party investors. By reducing the uncertainty in the energy estimates they are reducing the risk perceived by the investor, thereby increasing the likelihood for investment or simply providing for more favorable investment terms.

Meteorological Towers

Developers have several choices in the type of structure they use for pre-development monitoring of the wind resource. The structures most generally used are guyed masts and guyed-lattice towers, as shown in Figure 28

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and Figure 29, respectively. The faint lines extending down and out from the mast and lattice tower are the guy wires.

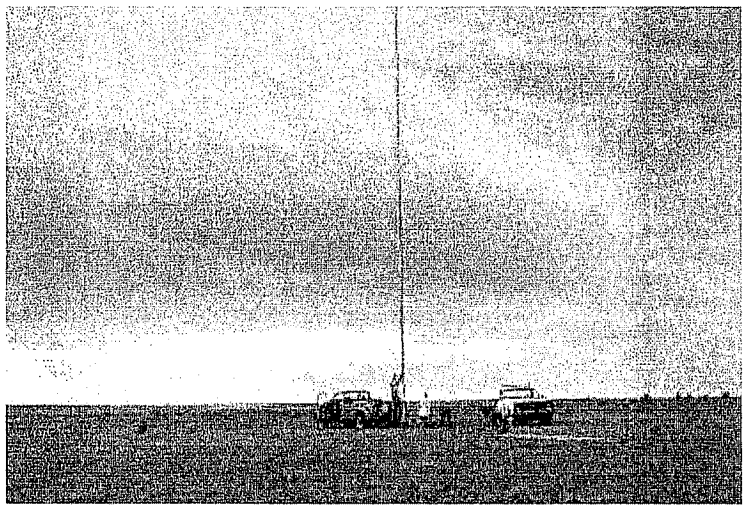

Figure 28 – Guyed tubular meteorological tower

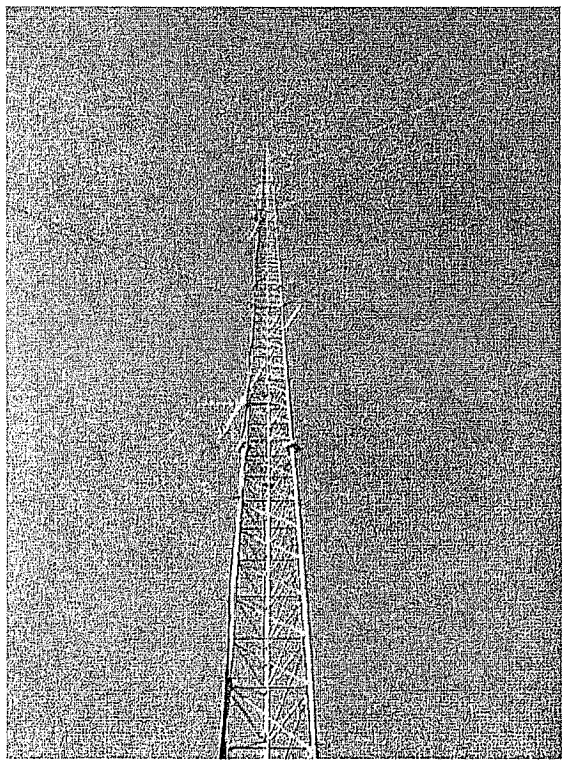

Figure 29 – Guyed lattice meteorological tower

Meteorological (met) towers are typically 60 or 80 meters and have monitoring equipment on multiple heights. These towers use anemometers, wind vanes, and temperature sensors to measure the wind speed, wind direction, and temperature, respectively. The data is collected at the base of tower and either stored or

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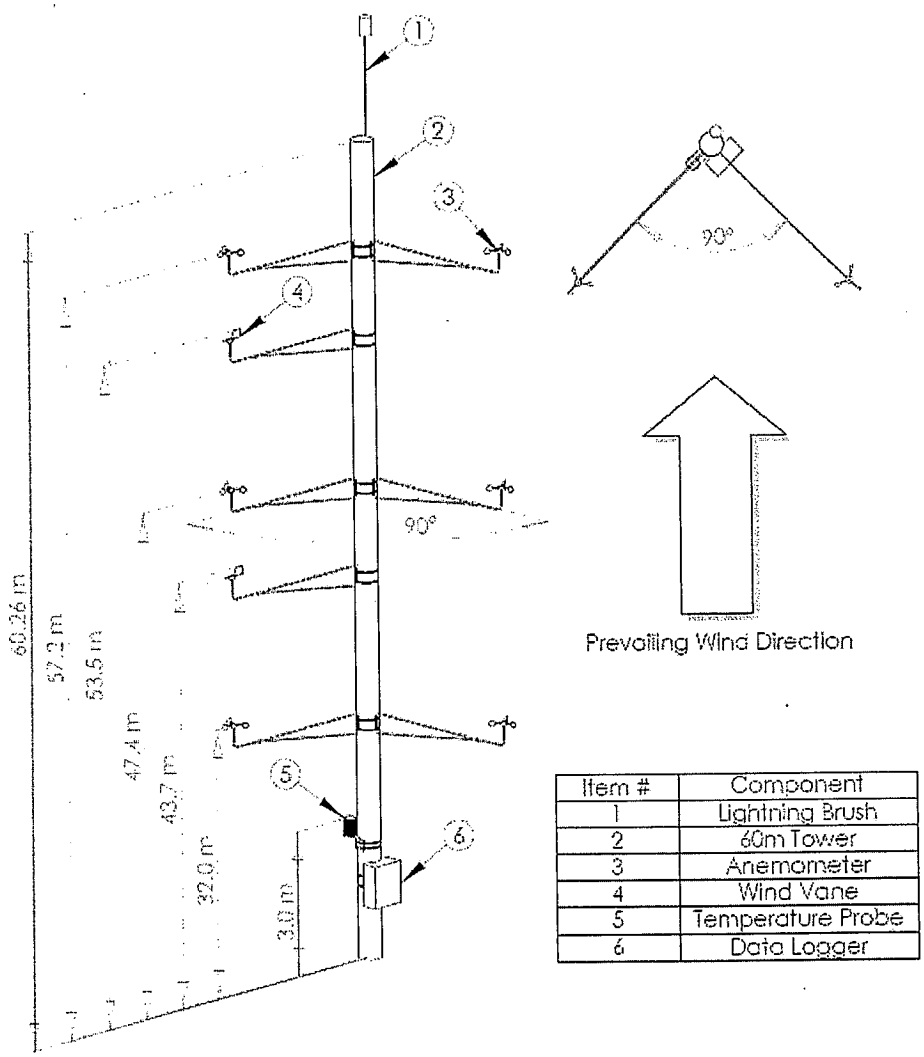
transmitted for analysis. Figure 30 shows a collapsed view of the measurement equipment used on a met tower.

As shown in Figure 30, each monitoring level should have at least two anemometers for data quality and redundancy purposes. Each level will have a wind vane below the anemometer level. The top of the tower features a lightning brush and the base has a temperature probe and data acquisition system.



Item #	Component
1	Lightning Brush
2	60m Tower
3	Anemometer
4	Wind Vane
5	Temperature Probe
6	Data Logger

Figure 30 – Example of measurement equipment on a meteorological tower

Remote Sensing

The wind resource can be quantified using remote sensing equipment, which can be used as a complement or as a replacement to met towers. Both SODAR (sonic detection and ranging) and LIDAR (light detection and ranging) remote sensing equipment are used during the wind resource assessment process. SODAR and LIDAR are similar to RADAR technology, except they use sound and light instead of radio waves.

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SODAR monitoring stations will typically be placed at ground level and will emit sound pulses, or chirps, vertically into the atmosphere. The equipment analyzes the sound waves reflected from different levels of the atmosphere to calculate a vertical profile of the wind speed and direction.

LIDAR monitoring stations are very similar to the SODAR stations and use lasers instead of sound pulses to measure the wind resource. LIDARs will either emit a continuous beam or laser pulse that scans a cone of the atmosphere above the equipment. The reflected light from the atmosphere is then analyzed to determine the wind speed and direction at multiple heights above the ground. Since LIDAR uses light instead of sound, the stations are silent to nearby observers.

While there are ongoing efforts to increase the acceptance of remote sensing as a stand-alone source for financing, the technology has not yet matured to this point. As such, the use of remote sensing alone in a wind assessment resource campaign would serve to increase the uncertainty in the resulting energy production estimates. Until remote sensing gains further acceptance within the industry, it is recommended that it be utilized in a complimentary capacity within a wind resource assessment program.

12.2. Site Requirements

Proximity to Transmission

To minimize land use impacts and control costs, developers desire project sites that are in close proximity to the existing electric transmission grid. The power from a wind project needs to be delivered to the grid at an approved interconnection point, which is typically a new or existing substation. Acquiring a route for the interconnection circuits will involve the negotiation of rights-of-way from one or more landowners, plus permitting and construction costs. New interconnection circuits are expensive, with costs depending on the voltage level, the types of terrain and associated land uses along the interconnection route, and whether or not a portion of the installation is underground. Consequently, relatively small wind projects are normally built near existing transmission facilities, while larger wind projects can justify the costs of interconnection at greater distances from existing transmission system.

Terrain Favorable for Construction

The delivery and construction of wind power project equipment requires that the terrain be accessible by heavy-duty vehicles (e.g., tractor trailers, cement trucks) and cranes. Areas with excessively steep slopes or deep gullies can be difficult to access and may impose unacceptable safety risks. Existing roads may need to be widened or redesigned to provide larger turning radii so that vehicles carrying oversized components (blades, tower sections) can negotiate them. Soil conditions must be favorable for road construction and for installing underground facilities such as wind turbine foundations, fiber-optic communication lines, and electrical conductors. All of these factors have cost and land use implications and are therefore an important consideration when evaluating prospective project sites.

Land Use and Environmental Compatibility

When initially evaluating prospective land areas, developers make a preliminary assessment of known land uses and local environmental sensitivities in terms of their likely compatibility with wind development. Considerations are given to the availability of open spaces and cultivated or inactive lands, the number of residences and the spacing between them, the number of landowners, the proximity to parks and recognized wildlife habitats, and other factors. All factors are then weighed together to determine if a wind project has a

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reasonable chance of receiving approvals of all permits. These factors will influence how a wind project can be physically arranged on the landscape to minimize land use conflicts. Land requirements of a wind power project will be a function of local land use patterns. For example, a given wind project in an agriculturally active area with scattered homes, may require more land area than a remote, uninhabited ridge top.

12.3. Land Area Required

Once a site is selected to develop a wind project, land area requirements are determined in greater detail. The primary objective of a wind project design is to site the wind turbines such that the cost of energy is minimized, therefore maximizing profit or increasing the viability of the project in case of a price-based Request for Proposals. The developer uses tailored design tools and software to optimally place wind turbines at eligible sites.

Wind turbines are typically arranged in single or multiple rows, depending on the size and shape of the landform. A single row is most often found on ridgelines and hilltops where the amount of well-exposed land is very limited. Broader and flatter land features can accommodate multiple rows of turbines. In both cases, rows are laid out to be roughly perpendicular to the prevailing wind direction(s).

The distance between wind turbine rows and between turbines within each row is commonly described in terms of rotor diameters. For example, if a project design is described as having a 3 by 10 spacing, it means that the turbines are generally spaced 3 rotor diameters apart within rows, and the rows are spaced 10 rotor diameters apart (see Figure 31). For a project using wind turbines with a 230 ft (70 m) rotor diameter, this would mean spacing the turbines 690 ft (210 m) apart within a row, and 2,300 ft (700 m) apart between rows. Figure 31 provides an illustration of this particular turbine layout.

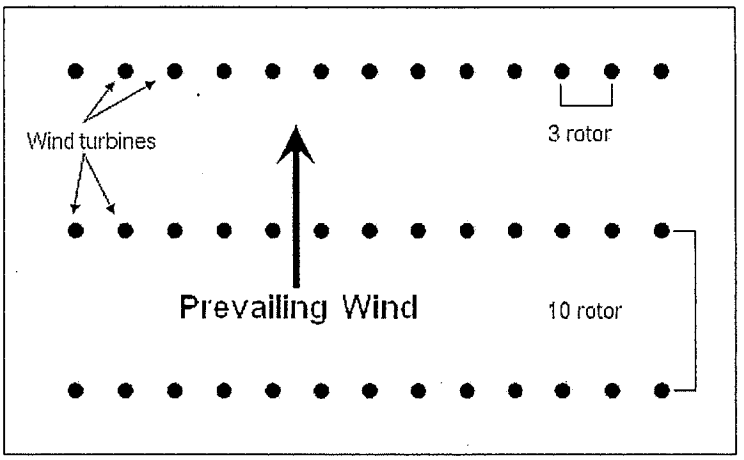

Figure 31 - Illustration of Turbine Spacing (example: 3 x 10 spacing)

The interference of one wind turbine on the airflow experienced by a downwind turbine is called the wake effect. The wake generated by a wind turbine reduces the velocity of the downwind airflow, and causes it to be much more turbulent. Turbines that are closely spaced will experience higher wake-induced energy losses, and will be subjected to increased loading due to the turbulent air flow, which can reduce a turbine's operational life. Wide spacing between wind turbines generally maximizes energy production but increases land and infrastructure requirements (e.g., cabling, roads). Cost considerations must be analyzed before finalizing turbine locations.

The distance between rows in complex terrain is typically dictated by the terrain characteristics (i.e., turbines will be placed on ridgelines in hilly terrain to take advantage of the better wind exposure, and the layout will be dictated by the orientation of the ridgelines). On relatively flat terrain, turbine rows are ideally spaced depending on the in-row spacing between turbines. The objective is to optimize the balance between the higher wake effects and lower costs associated with tighter spacing.

The spacing within the array is dictated by wind direction. In unidirectional environments, where most of the energy-producing winds come from the same direction, turbines can be placed closer together within rows, typically 3 to 4 rotor diameters apart. The rows need to be spaced at least 8 rotor diameters apart to avoid adversely impacting energy production of the turbines located deeper in the array due to wake-induced losses.

Depending on the project site, the wind rose may be uni- or omni-direction, as shown in Figure 32. Omni-directional wind resources, where the prevailing directions are from multiple directions, necessitate greater spacing. Due to the variability in wind direction, a site with this type of wind resource would typical have a spacing of 5 to 7 rotor diameters between turbines and 7 to 8 rotor diameters between rows. The acceptance of the final layout, as well as warranty coverage, is typically contingent upon the results of a suitability analysis performed by the turbine manufacturer. This analysis takes into consideration the fatigue loading and extreme condition loading the turbine is expected to experience during its operational life. A turbine manufacturer may require or allow tighter or looser spacing depending on the characteristics of their turbine and the wind characteristics at the site.

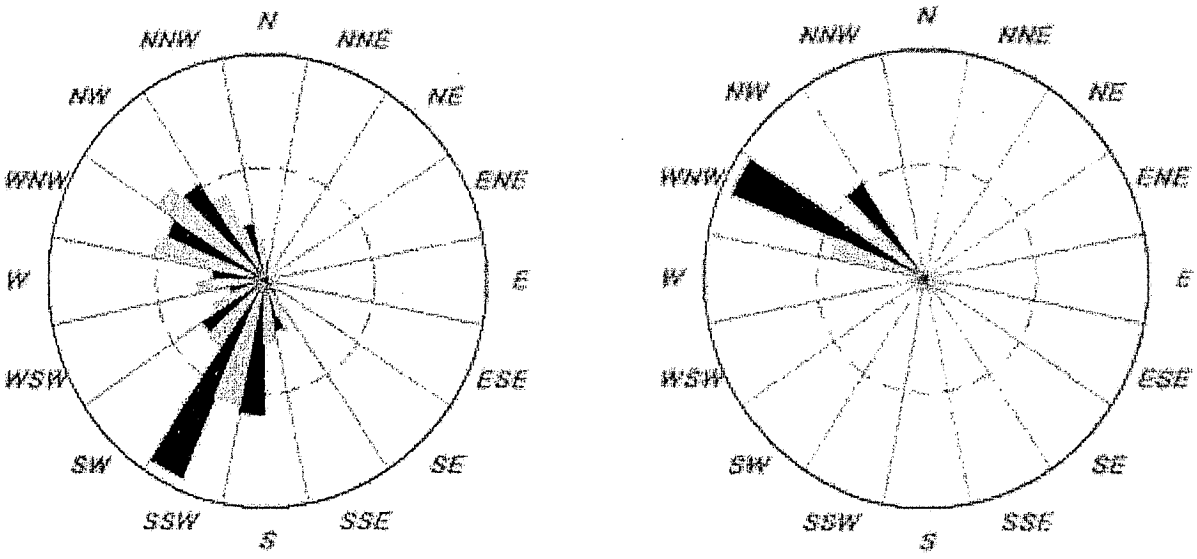

Figure 32 - Example wind roses for an omni-directional (left) and uni-directional (right) wind resource.

Table 7 illustrates the actual turbine spacing for five of the wind power projects in the northeastern United States. New York projects show a range of turbine spacing and related spacing factors such as landform type. As more projects are built in New York in the future, there will be more examples of turbine spacing to illustrate the host of variables that influence project design and land requirements. In addition to those already described, the variables also include: setback distances of turbines from residences, property lines, and roads;

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preferential placement of turbines near the edges of cultivated fields and wooded lots; and consideration of landowner preferences for turbine number and placement.

Table 7 - Example Turbine Spacing

Project Location	Land Use and Type	Turbine Layout	Turbine Spacing (rotor diameters)
Madison, NY	farmed hilltop	circular row of 7 turbines along hill rim	4 diameters between turbines
Wethersfield, NY	open farmland, north-south ridgeline	single north-south row of 10 turbines perpendicular to prevailing wind direction	3 diameters between turbines
Fenner, NY	mixed farmland and woodlots on broad hill	variable layout of 20 turbines	generally 5 to 7 diameters between turbines
Meyersdale, PA	Ridge top, farmland	single northeast-southwest row of 20 turbines	3 diameters between turbines
Searsburg, VT	forested ridgeline	single northeast-southwest row of 11 turbines on ridge	variable (1.5 to 3.5 diameters) between turbines
Sources: Turbine Verification Program by the U.S. Department of Energy and the Electric Power Research Institute; AWS Truewind, LLC.			

The acreage required for a wind power project can be defined two ways. The first is the overall area containing the entire project, including the open spaces between turbines. In Figure 31, for example, 39 wind turbines are arranged in three rows of 13 turbines each. The turbines are spaced three rotor diameters apart within rows, and 10 diameters apart between rows. Assuming a rotor diameter of 230 ft (70 m), the total area occupied by the turbines including a small setback perimeter surrounding the rectangular project area is approximately 1,040 acres. In other words, an average of 26.7 acres is required for every turbine. If each turbine has a generating capacity of 1.5 megawatts (for a project total of 58.5 MW), which would be consistent with the 230 ft (70 m) rotor diameter, the land requirement would be 17.8 acres per megawatt of generating capacity.

The above example layout illustrates a relatively flat site experiencing a single prevailing wind direction with no other constraints. If a site were to have two prevailing wind directions 90° apart, wider turbine spacing within rows would require a larger per turbine project area. Assuming a 50-turbine array consisting of 5 rows of turbines with 10 turbines per row, with 7-rotor diameter spacing both between rows and between turbines within rows, the total project acreage would be approximately 2,956 acres. This translates to 59 acres per turbine or 39 acres per megawatt, which is more than twice the area than the previous example. In reality, even more acreage per unit turbine or capacity may be required by a project when accounting for terrain undulations, setbacks from local homes, and other site-specific considerations, including substations, roads, and an O&M facility.

Another way to describe the land requirements of a project is to define only the area actually occupied by the project's facilities. A project's facility consists of the turbines and their foundations, service roads, crane pads, electrical equipment, and any associated buildings. Figure 33 is an aerial view of a small wind project in Madison, NY, with these facilities labeled. In general, a project's facilities occupy only about 5 percent of the

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total project area. This means that the large majority of the space within a project area can be used for traditional purposes, such as agriculture.

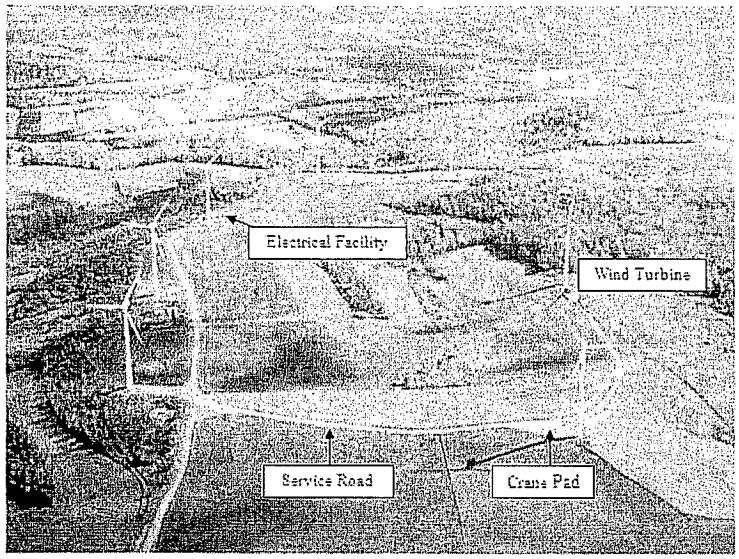

Figure 33 - Aerial View of a Wind Power Project in Madison, NY[5](photo by Chris Milian)

12.4. Visual Impact Analysis

Frequently, visual impacts are among the most contentious issues raised about proposed wind farms. Because wind resources in the Northeast tend to be best at high elevations and near large bodies of water, turbines can be visible for long distances and may significantly alter scenic vistas. Although some people enjoy the sight of wind turbines, others consider them unsightly. Unfortunately, it is usually not possible to locate wind turbines with no visible impact. Therefore, it is important that consideration and mitigation or offsetting of adverse visual impacts be included in the pre-construction permitting process.

The process of assessing and mitigating visual impacts for wind turbines is the same as for other highly visible structures, such as cell phone, radio and television transmission towers. The following list outlines the responsibilities of the applicant and permitting parties as defined by the DEC, as well as the tools available when considering visual impacts. A more complete discussion may be found in the New York State Department of Environmental Conservation Program Policy *Assessing and Mitigating Visual Impacts* (DEP-00-2 July 31, 2000). Numbers in parenthesis indicate referenced pages in the DEC document.

Responsibilities of the Developer

It is the responsibility of the developer to provide all the information necessary for the town to understand what is being proposed, where it is being proposed and what is being done to avoid and or mitigate project impacts:

- Inventory (reveal, describe and fully characterize), using clear language and with understandable graphics, all the State and Nationally designated scenic and aesthetic resources within the project-affected area. These include such places as State parks and forestlands (3).

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- Inventory (reveal, describe and fully characterize), using clear language and with understandable graphics, all significant locally designated scenic and aesthetic resources within the project-affected area. These include such places as county and town parks and other designated places considered important to the host community.
- Graphically show boundary lines of all inventoried aesthetic resources on a viewshed map.
- Describe visitor usage and aesthetic values and attributes of all inventoried resources.
- Reveal and characterize visual and aesthetic impacts of all project components.
- Using the mitigation strategies of the NYSDEC Visual Assessment Policy employ all strategies that minimize adverse visual and aesthetic impacts as much as practicable (5).

Responsibilities of the Town

It is the responsibility of the town to review the information provided by the Project Sponsor and certify that project impacts have been minimized to the maximum extent possible consistent with social, economic and other essential considerations (for more information about jurisdictions and lead agencies, see Section 14: Permitting):

- Verify that the project sponsor has inventoried all significant aesthetic resources, even those within other jurisdictions having a view of the wind farm (3).
- Certify that all impacts have been minimized to the maximum extent practicable consistent with social, economic and other essential considerations (3).
- Require that project sponsors will employ all applicable and practicable mitigation strategies (6).

Tools to describe and characterize visual impacts

A viewshed map shows all of the places from which the project can be seen (5,14). The viewshed map should depict the boundaries of all local, state and nationally significant aesthetic resources.

Visual simulations illustrate what the project will look like from particular places of aesthetic significance or places of concern or of interest to the community (5).

A line-of-sight profile provides a simplified and measurable way to show how much of a particular tower will be seen from selected places of concern. (5,15). An example of a line-of-site profile is provided in Figure 34.

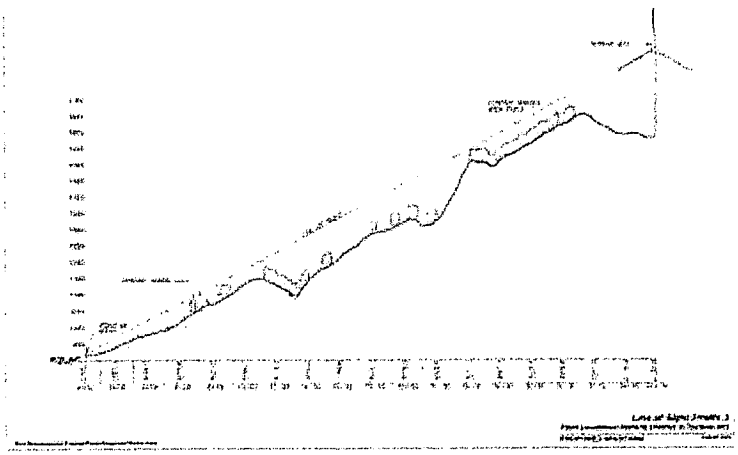

Figure 34 – Example of a line-of-site profile for turbine visualization

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Mitigation Strategies

The following list of mitigation strategies is generally applicable to wind energy facilities:

Downsizing. Downsizing or eliminating certain turbines may significantly reduce visual impacts (7). During the course of project review, it may become apparent to the town that one or two of the proposed turbine site locations may cause most of the perceived adverse visual impact. A project sponsor may then be encouraged to eliminate these offending turbines. However, the town should be aware that, at times, these offending tower sites may be the most economically productive and therefore project sponsors may be most reluctant to eliminate these turbines. Thus, downsizing mitigation strategies should only be used in key circumstances where benefits are substantial and far outweigh the costs (reduced income) to project sponsors.

Relocation. Instead of eliminating a few of the most impacting towers a project sponsor may be encouraged to relocate these project components to other locations of less impact (e.g., locations where the screening effects of topography and vegetation may be taken advantage of) (7). However, like downsizing, project sponsors may be reluctant to relocate turbines from economically superior generating sites to considerably inferior ones.

Lighting. Minimize off-site lighting, glare, and light pollution (7). FAA lighting criteria that may include strobe lighting, red flashing, or steady red lights must be met.

Non-specular materials. For overhead electric transmission facilities project sponsors should commit to using cables that do not shine (7).

Screening. Visual barriers, for example trees, and/or earthen grassy berms (with or without trees and or shrubs), or at times even fences may serve a useful purpose, but only in suitable locations (6).

Camouflage. Usually utility substations are screened using landscape architectural treatments such as coniferous shrubs and trees, but at times disguise is used when appropriate (7).

Decommissioning. Removing all or part of the project after its useful life reduces the duration of the project's impacts. Project sponsors should commit to a detailed decommissioning plan, which includes a clearly defined way to pay for it. (7,9)

Offsets. If negative impacts cannot be acceptably minimized, then offsets can be employed (for example removing a chronic eyesore within the project viewshed). (8,9)

12.5. Additional Resources

For more information on wind resource assessment and remote sensing technology, please refer to the Wind Resource Assessment Handbook located at the following link: http://www.nrel.gov/wind/pdfs/22223.pdf.

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13. Land Acquisition

In order to tap a wind resource, a developer must enter into a legal arrangement with the landowner, unless the developer already owns the land, which is usually the case with industrial or municipality projects. In New York, this arrangement is usually a lease, although the developer may also employ easements to secure certain rights. Additionally, the lease/easement may include, or be preceded by, an Option Agreement, by which the developer obtains the exclusive right to conduct further site characterization, and ultimately, to develop the site if tests and expected market conditions validate the project.

Broadly speaking, developers have two alternatives for acquiring the right to install wind turbines on land: leasing or purchasing. Sometimes developers purchase land outright for wind projects, but this is not very common. Most land purchases occur for electric utility project ownership or for a research project (i.e., not in a competitive, commercial environment). Land purchase is uncommon because it results in an expense that must be added to an already capital-intensive project. Furthermore, because the wind turbines occupy a small portion of the land, and are compatible with most existing land uses on the property, the developer does not need to acquire all of the land for the wind power project.

Land ownership does have the advantage of providing a wind power developer with long-term control of the project site, which would allow for new projects to be constructed after the useful life of the original project without the need to negotiate a new lease. Though not common, in the United States, electric utilities and municipalities that own their wind power projects are the most likely to own the underlying land. Land ownership gives the utility the benefits of long-term control of the power-generating asset, and the land purchase can often be included in the utility's rate base (investments and expenses the utility is allowed to recover from customers).

Leasing the land or obtaining easements from the landowner is the most common type of arrangement made by wind power project developers for three key reasons. First, for non-utility independent power producers (IPPs), a leasing agreement is more beneficial to the cash flow of the project because land lease payments are usually spread out over the life of the project and therefore do not have a disproportionate impact on the project's financial returns at the beginning of the project. For wind projects that are only marginally profitable, the land payment arrangement can make a meaningful difference in the project cash flow and economic viability.

Second, wind turbines occupy only a small portion of the overall land used for a project and wind developers have no use for the remaining land. Leasing the land for wind energy development provides the landowner with additional revenue without significantly interrupting existing operations. Wind project developers—whether utilities or IPPs—generally are not interested in expanding their business to take over agricultural pursuits; and, therefore, a leasing agreement may make more economic sense.

Third, land purchase is uncommon because many farmers or ranchers are reluctant to sell land that may have been in their families for generations. Supplementing their income with lease payments from wind developers allows them to retain their property, continue with their long-established activities, and maintain a lifestyle with which they are comfortable.

As described below, leases and easements are legally distinct instruments, and are usually used to secure different kinds of rights. Depending upon local custom, the terms lease and easement may be used interchangeably or in combination. In fact, they are sometimes confused, and a document that's labeled as a lease may actually be an easement. Because leases and easements can have very different legal and tax implications, landowners should have their attorney carefully review the agreement to ensure that the document and implications are properly defined and understood. With that caution in mind, this guide uses the

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term lease to describe the agreements developers use to secure access to wind resources, unless the context requires otherwise.

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13.1. Easements

There are several other important aspects of the wind project that the developer can usually secure from the landowners by means other than taking full physical possession of the land. These include:

- The right to lay cables connecting the wind turbines to substations and ultimately to the power grid
- The right to cross non-leased land for construction, operation, and maintenance of the turbines and related equipment
- The right to prevent obstacles (buildings, trees) which might interfere with the free flow of wind across the turbines
- The right to produce noise, shadows or other minor nuisances

Easements are commonly used for these purposes. An easement is non-possessory property interest that gives the holder—in this case, the developer—a right of use over the property or that of the landowner's neighbor; or that prevents landowners from doing something that is otherwise lawful, but that would be detrimental to the wind project. For instance, an easement might prohibit landowners from putting up a grain silo directly upwind of a turbine. Because easements convey property rights, they must be in writing and they must be filed with the proper municipality or county recorder. The easement will run in perpetuity (forever) unless the instrument granting the easement provides for a term of years. Developers usually offer a one-time, lump-sum payment for the easement.

13.2. Lease Agreements

Under a lease arrangement, the developer rents a portion of the property for a term of years. The lease will take the form of a written contract between the landowner and the developer. It will spell out the landowner's rights and obligations, and similarly, the rights and duties of the developer. This document will govern the relationship between the landowner and developer over the life of the wind project. From the standpoint of the developer, the most important aspect of the lease is that it secures the exclusive right to use defined sections of the property for development, installation, operation and maintenance of wind turbines and related equipment. From the standpoint of most landowners, the critical elements of the lease include provisions dealing with payments (how much, when and under what conditions) and their ability to continue to use the property for farming, hunting or other purposes.

A well-crafted lease will deal with all other facets of the wind operation from its inception to its decommissioning. It will address matters such as the duration of the agreement; the total acreage affected; ownership of the wind farm equipment; responsibility for taxes and utilities; liability insurance; the developer's

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right to install signs and give tours of the facility; and every other aspect of the relationship between the landowner and developer. Several of these issues are covered in more detail below.

When developing, constructing, and operating a wind power plant, the developer needs access to land with a viable wind resource. Potential project areas usually extend over many properties, requiring the developer to secure lease agreements with multiple land owners. Wind power developers typically obtain long-term leases on land for use by the project. Often, this is done in two steps: an option phase and a long-term lease phase. To determine whether a parcel of land has a strong wind resource, the developer must first gain access to the land to install wind monitoring equipment. This short-term access is gained through a mutual agreement, usually referred to an Options Agreement. If testing reveals a good wind resource and other factors indicate the project is feasible, the developer would normally exercise the option, and the long-term lease would be completed. If not, the option can expire. It is possible for the short-term option phase and longer-term lease agreement to be included in a single agreement.

When preparing a wind power project land lease or Option Agreement, a number of elements should be considered. These include payment structures, pricing, terms, and land use issues. The perspectives and interest of landowners and project developers are discussed in this section as well as the typical ways in which the needs of the participants are met by the agreements.

Reasons for a Landowner to Participate

Often, land suitable for wind power projects is owned by rural landowners or by communal or government (federal, state, or county) entities. Landowners may be interested in leasing their land to wind power projects for one or more of the following:

- Increased Income – Leasing the wind rights to a wind power developer can provide valuable additional income. At the same time, most of the leased land remains available for farming or ranching around the turbines and facilities, which as discussed earlier, occupies less than 5% of the land on which the project is located.
- Income Diversification – Whether a farmer's fields lay fallow or are in production, a farmer can receive payments from a wind power lease.
- Economic Development for the Local Community – Wind energy development can bring a boost to the local economy through the creation of skilled jobs, including manufacturing turbines or building and operating wind power projects, and through increased taxes to the local government.

Option Agreements

Once potential sites are identified, the developer will enter into an Option Agreement with the landowners to gain access to the land for testing and to secure the rights to the land if the project goes forward. The developer normally needs to obtain at least six months to two years worth of hourly wind data at a specific location to evaluate the wind resource. For more information on wind resource assessment, please refer to Section 12.1: Wind Resource Assessment.

The option period typically lasts three to five years to allow sufficient time to procure testing equipment and test the resource. The term may be extendable. Before the term is over, the developer can either exercise the option to lease the land, request an extension, or let the option expire. This way, both the landowner and developer are protected during that option period if it is decided that the wind project development will not be carried out. If the project does not go forward, the expiration of the option means the developer is not tied to unwanted property and payments, and the landowner can put the land to other use.

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During the option period, the developer often pays modest fees to landowners for the right to place the wind resource measurement equipment (i.e., meteorological towers with anemometers to measure wind speed and other instruments to measure wind direction and temperature) on the site, and sometimes pays fees to compensate for construction-related disruptions. In the United States, these compensation packages can vary widely, and can depend upon the wind resource and the desirability of the land.

Major Issues to be addressed in a Lease

Leases should be carefully developed so they clearly address issues important to the project developer and landowner at the time the lease starts, as well as years later during project operations. In many cases, the people who originally negotiate a lease will not be involved later in the operating period of the project, so it is important that any understanding between the parties be properly addressed in the written lease to prevent future misunderstandings.

A well-executed lease is an important part of the project development process. Before allowing wind turbines to be purchased and installed, investors will want to be sure the lease provides clear, unimpeded rights to access and use of the land over the long term.

The most important portions of the land lease are generally the length of the agreement (term), what other uses are acceptable on the land surrounding the wind turbines, the payment structure, and decommissioning. These and other major land lease provisions are described below.

Term

Wind power leases generally have terms of 20 to 50 years, often with an option for extending the lease. A typical wind power project has a useful life of 15 to 25 years. A term of 20 years allows one project to be developed and operate for its useful life, while a term of 40 or 50 years would likely cover two project cycles (one project, and then a second project on the same site at the end of the useful life of the first project). Some contracts include clauses specifying the conditions under which either party has the right to terminate the contract. These termination clauses need to be reasonable so that the risk of installing the wind turbine equipment and having the lease terminated is low and manageable.

Area Leased

The lease should clearly state where wind turbines, roads, construction storage areas, and operations and maintenance areas can be located. Any desired setbacks from residences and property lines should be stated. Because construction and major repairs require more activity on the land than routine operations, the lease should include a provision for temporary land use during such periods for equipment storage, cranes, and other construction, operations, and maintenance activities.

The developer will want the right to install wind turbines and infrastructure anywhere on the property (taking into account required and desired setbacks) and may find it difficult when the lease is written to be specific about where turbines will be located, and what size they will be. The location and size of individual turbines will depend upon detailed wind studies throughout the project site, which typically includes many landowners for one project.

A typical lease would state that the developer shall determine the size, type, manufacturer and exact location of wind turbines at its sole discretion, but developer will not locate, position, or place any wind turbines within a given distance of an occupied residence that exists on the effective date of the lease without the landowner's prior written consent. The landowner often provides input regarding the placement of the wind turbines on their property.

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Approved Uses

The lease should clarify what land uses the landowner reserves for the land around the turbines. The landowner typically reserves the right to continue to grow crops, raise cattle, or otherwise use the land. Most rural land uses are compatible with wind power projects; however, there can be some restrictions. For example, a developer may ask that hunting be restricted in the area around the turbines, for fear that bullets would damage expensive equipment. In these cases, it is possible that the income a landowner can earn from leasing his or her land for wind power project development can more than offset any income that might be lost by switching to another land use. Developers also will be concerned with any uses that could affect the wind in the area of the turbines. For example, tree crops or large structures could be restricted.

Access

The wind power facility needs to be accessible both by road and via electrical cabling. As discussed in the previous section, easements are frequently used for this purpose

Upwind Blockage

Developers have an interest in protecting the project site from any future upwind development that could adversely impact the wind resource on the project site. If the same landowner owns the upwind land, the lease may include provisions addressing this issue. The developer may want an easement that prohibits any development within the upwind property that might impact the wind at the turbine sites. The extent of this potential problem depends on the topography of the land and the wind characteristics. The extent to which upwind development affects a project depends on the distance to the project. While properties more than 2 km away usually are not of concern, the appropriate distance of concern depends on the size of the upwind project and atmospheric conditions.

Noise and Other Disturbances

Landowners may want to include sound standards for construction activities, including reasonable construction hours, or sound standards for the wind turbines measured at the turbines themselves or at nearby homes. Noise and other disturbances can be difficult and expensive to measure. If such provisions are included, care must be taken in writing them so that they can be interpreted unambiguously and not used unfairly by one party against the other.

Access Control

Wind power projects often involve the construction and use of new roads to access the wind turbines. Provisions for signs, gates, locks, and security patrols should be included in leases as appropriate.

Crop Protection

Normally wind turbines can operate in productive fields with minimal interference. However, crop damage may occur in some situations, and the lease should address how this will be handled. Typical lease provisions require developers to use best efforts to minimize damage, but allow for the possibility that damage may occur, and subject the party causing the damage to paying appropriate compensation. For example, if a wind turbine suffers damage to a blade from lightning, it may be necessary to bring a crane in to remove the blade, place it on the ground, and install a new blade. During the growing season this activity might require some crop areas near the turbine to be flattened so the blades could be placed on the ground. Typically a landowner would receive payment from the wind power project for such crop damage calculated as the lost amount of product multiplied by the market price for such crops in the season in which the crop was damaged or destroyed. If this example incident occurred when the field was fallow or not producing, no crop damage payments would be made. The

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exact formula and conditions must be spelled out in the lease to protect the property owner. Some leases might require that the access roads be removed or minimized and the farm land restored to its original state after construction. Subsoil decompaction and the addition of imported topsoil may be required during restoration.

Road Maintenance

The lease should identify responsibilities for maintenance of existing and new access roads. Generally the wind power developer is responsible for such maintenance. The provisions should provide protection to the property owner by allowing for penalties if maintenance is not performed after a reasonable request and time passage.

Decommissioning

Leases should include provisions for decommissioning the project at the end of its useful life. This includes removing wind turbines, transformers, wiring which penetrates above-ground, and the top part of foundations, and returning the land as nearly as is practical to its original condition. The lease should also address the timely removal or disposal of damaged equipment.

In practice, this typically means that:

- Turbines, blades, towers, transformers, and transformer foundations are removed from the site.
- Turbine foundation hardware and protrusions such as anchor bolts and tower levelers will be removed, but foundations will remain completely in place, or be removed to a specified depth (for example, 1 meter) below ground level.
- The project substation generally becomes the property of the utility purchasing the power and, therefore, is not removed by the developer.
- Underground electrical wiring remains in place because removing it after the project's life will create more disturbance than leaving it in place.
- Access roads may be left in place if the terms of the lease do not require their removal.

Taxes

Responsibility for payment of property taxes should be clearly specified in the lease. The wind power project developer generally assumes responsibility for any increases in property taxes associated with the wind power project.[38]

Compensation

A key reason for allowing wind power development on one's land is the payment received. Leases should clearly identify how payments are calculated, and when payment needs to be made. Payment structures and typical payment amounts are described later in this paper.

Other Common Terms

In addition to the issues described above, there are standard terms that are needed for the lease to be binding. These terms include, but are not limited to:

- Liens and Tenants – in which the lessor warrants that there are no liens, encumbrances, leases, mortgages, deeds of trust, fractured interests, mineral or oil and gas rights, or other exceptions to the title of ownership except as disclosed in a title report or other writing delivered to the project developer

[38] Some landowners are concerned about the impact of wind turbines on property values. This issue is not commonly addressed in lease agreements. For more information please see Section 8.1: Property Values.

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- Encumbrances: Required Notices to Mortgagees – including the right to encumber and covenants for the project lender's benefit
- Assignment – granting the developer the right to sell, assign, encumber, transfer, or grant easements under the lease without the landowner's consent
- Termination – granting either party the right to terminate the lease for non-performance and defining the events of non-performance which constitute default
- Force Majeure – excusing either party from fault to perform under the agreement due to acts of God or other uncontrollable circumstances
- Ownership of Installed Property – defining the installed property as owned by the project developer
- Memorandum – assuring that the lease will be legally executed and recorded.

Typical Payment Structures and Rates

It is important to understand that a property's location within a proposed project area doesn't necessarily guarantee that a turbine will be placed on the property. There are many factors that contribute to the design of a project layout and the distribution of turbines across the project area is not determined until the later phases of project development. However, some developers do compensate landowners who are adjacent to turbine installations; this amount is usually less than a full lease, but generally more than an Option Agreement.

Royalties

The most common compensation structure is the royalty payment. In royalty arrangements, the developer pays the landowner a percentage of the revenue received from the electricity produced by the turbines. This percentage is negotiated between the landowner and the developer. Royalties ensure an ongoing economic relationship between the developer and the landowner and guarantee benefits for the landowner, provided the turbines generate the expected power. Royalties fluctuate with production, which varies with the seasonal and yearly wind resource, and can fluctuate if the price at which the electricity is sold by the wind power project is variable. Revenue can be measured by gross receipts or metered production multiplied by the price of power paid to the project. One well-accepted option is for the developer and wind power project operator to provide a summary of gross receipts along with each payment (quarterly, annually, or other payment period agreed to in the contract), with developers allowing owners access to the data upon request. The landowner does not have a say in the price of the electricity that is sold.

Today in the United States, wind power project land leasing royalties tend to be within the range of 1% to 4% of gross revenue, with the majority being between 2% and 3% of gross revenue[39]. This royalty payment can be expressed in terms of a percent of production (MWh). In most cases, the percentage is a fixed number throughout the term of the lease.

In some cases, the royalty percentage escalates over time. In California, for example, an escalating payment was common in early wind projects because some of the contracts had escalating prices for power, allowing the inclusion of escalating clauses in the lease contracts. For most leases with escalating payments, the percentage tends to be fixed at a lower rate in the initial years of operation, escalating to a higher fixed rate in later years as the loan on the equipment is repaid.

Royalties are paid on a per turbine production basis or based on the average turbine production across the project (overall project generation divided by the number of turbines in the project). The latter is easier for the developer to determine and account for, and is more advantageous to the landowner because it reduces risk and it is easier to verify. The advantage of this arrangement versus payment on output of a specific turbine is

[39] See Windustry study in Table 9

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that the pooling arrangement takes into account the production of the entire project and reduces the effects of variability of individual turbine production or the possibility that one turbine could suffer from operations problems.

In addition to land on which the wind turbines are physically located, land typically is needed for other project facilities such as meteorological towers, wiring, and the electrical substation, and landowners must be compensated for those uses as well. Sometimes separate leases are created for the other project facilities, and sometimes they are included in the same leases used for the wind turbines.

Royalty and Guaranteed Minimum Payment Combination

Often, lease payments based on a percentage of gross revenue are supplemented by a guaranteed minimum payment. Minimum payments essentially serve as a floor price and guarantee that landowners receive some revenue, even if the wind turbines experience more than typical maintenance outages or if winds are lower than expected in any given year, producing less energy and generating less revenue than expected.

Flat- or Fixed-Fee

In a flat- or fixed-fee arrangement, the developer and landowner(s) agree on a fixed fee—per turbine or per unit of land or per MW of installed capacity—to be paid by the developer on a monthly or yearly basis, reflecting the total amount of land made available by the landowner(s) for meteorological towers, turbines, turbine spacing requirements, access roads, and control and maintenance buildings. This type of payment arrangement ensures transparency and clarity of understanding, and provides both the landowner and project developer with certainty regarding future income or payment streams.

Based on a survey of compensation packages from published sources, Windustry has summarized the payment structures and prices paid for several projects[40]. The average of the fixed payment lease agreements reviewed by Windustry was $2,820 per MW, with values ranging from $1,515 to $5,387per MW. The average rate equates to a fixed payment of approximately $4,230 for a 1.5 MW wind turbine per year.

One-Time, Lump-Sum Payment

This type of contract is the least common arrangement, but may be satisfactory to both parties if the landowner is in need of immediate cash and is willing to forego the prospect of a steady income stream, and the developer has the ability to release a large amount of cash up front. This arrangement removes the ongoing economic agreement between the landowner/developer and could result in potential problems if ownership of the land is transferred without economic benefits flowing to the new landowner.

The principal advantages and disadvantages of each lease payment structure are summarized in Table 8 and the summary from the Windustry study is provided in Table 9.

[40] Wind Energy Easements and Leases: Compensation Packages, Windustry, June 2009

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Table 8 - Advantages and Disadvantages of Different Payment Structures

Arrangement	Advantages	Disadvantages
Royalties	***General:*** Take into account varying productivity Give landowner incentive to work with developer to place the turbines on the most productive locations Give landowners and developers incentives to ensure continuous power generation Easy to verify if based on gross revenue	***Landowner:*** Difficult to verify electricity and revenue generated by each turbine:* Individual turbine generation information is hard to obtain Individual monitors on turbines do not reflect the energy sold because they do not account for energy losses in the electrical system Developers generally do not like to share turbine productivity data
Royalty/Minimum Guarantee Combination	Same as above, with additional benefits from an up-front fee or a minimum guarantee	Same as above
Flat or Fixed Fee (per turbine or per acre or per MW installed)	***Landowner:*** Provides steady, predictable income stream Protected in years of low power generation and/or revenue ***Developer:*** Does well in high-production/revenue years ***General:*** Can be used to compensate a landowner for use of land for an access road crossing the property, even if turbine is not installed on the land Clarity and transparency: Easy to verify	***Landowner:*** Forgoes potentially higher, if fluctuating, level of income associated with royalty payments ***Developer:*** Expenses are harder to bear in years of low power generation and/or revenue ***General:*** Payments do not mirror actual revenue generated Eliminates the economic incentive for the landowner to cooperate with the developer to ensure maximum power generation
Lump Sum	***Landowner:*** Source of immediate cash ***Developer:*** Does not have to provide payments in subsequent years	***Landowner:*** Does not provide steady income stream Value of the project does not stay tied to the land ***Developer:*** Must provide lump sum up front Landowner has no stake in the long-term success of the project Both: Bad fit to have financial transaction complete but physical use ongoing over many years
* In the United States, information about the amount of power generated by a facility is often publicly available from grid operating managers or the utility purchasing the power. Even so, such information does not indicate how much is generated by individual wind turbines within a project.		

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Table 9 – Wind Energy Lease/Easement Compensation

Project Information					Landowner Payment Information		
Project	State	Date	Project Size (MW)	Turbine Size (MW)	Per Turbine Per Year	Per MW Per Year	Notes
Iowa Distributed Wind Energy Project	IA	1998	2.25	0.75	$1,800	$2,400	Plus a $2,500 up front payment
Lake Benton I	MN	1998	107.25	0.75	$1,500	$2,000	Estimated payments for 15 of 143 turbines
Deleware Mountain Wind Farm	TX	1999	30	0.75	$1,500	$2,000	
Lake Benton II	MN	1999	103.5	0.75	-	-	$450/acre for wind rights; $1,200/acre for easement on land needed for roads and towers; $5,000 for each tower constructed
Storm Lake I and II	IA	1999	192.75	0.75	$2,000	$2,667	$750/turbine + 2% revenue = $2,000 per turbine
Vancyle Ridge	OR	1999	25	0.66	$1,500-$2000	$2,272-$2,667	
Waverly II	IA	1999	1.5	0.75	$1,740	$2,320	Plus a $2,500 up front payment
Madison Windpower	NY	2000	11.55	1.65	$2,000-$4000	$1,212-$2,424	
Farmer Project	MN	2001	1.5	0.75	$2,000	$2,667	Landowner owns the project, has additional revenue streams
Indian Mesa	TX	2001	82.5	0.66	-	-	Royalty rate of 4% yrs 1-10, 6% yrs 11-20, 8% yrs 21-30. Signing bonus of $2,000/MW.
Woodward Mountain	TX	2001	159.7	0.66	-	-	Royalty rate of 4% yrs 1-10, 6% yrs 11-20. Signing bonus of $2,000/MW.
Nine Canyon Wind Farm	WA	2002	48	1.30	-	-	Annual "rent" of the greater of $1,000/turbine or 3.5% of gross revenues. Compensation for increase in property taxes.
Top of Iowa	IA	2002	80.1	0.90	$2,400	$2,667	
Colorado Green	CO	2003	162	1.50	$3,000-$6000	$2,000-$4,000	98 of 108 turbines hosted by one landowner
High Winds Energy Center	CA	2003	162	1.80	$9,500	$5,185	Estimated $21.5 million in lease payments over 25 years. Average payment of $9,555/turbine/year.
Mendota Hills Wind Farm	IL	2003	50.4	0.80	$1,800-$2,000	$2,250-$2,500	
New Mexico Wind Energy Center	NM	2003	204	1.50	$4,000	$2,700	Estimated based on $550,000 in total lease payments
Woodward	OK	2003	102	1.50	$4,000	$2,667	"Up to $4,000" /turbine/year
Ainsworth Wind Energy Facility	NE	2005	59.4	1.65	$2,500	$1,515	
Crescent Ridge Wind Farm	IL	2005	54.5	1.65	$5,000	$3,030	Greater of either flat rate of $5,000/turbine/year or a percentage of revenue estimated at $6,200/turbine/year
Trimont Area Wind Farm	MN	2005	100.5	1.50	$3,500-$4500	$2,500-$3,000	Based on estimates of $250,000-$300,000 total payments.
Weatherford Wind Energy Center	OK	2005	147	1.50	$3,061	$2,040	
Big Horn Wind Power Project	WA	2006	200	1.50	$3,450	$2,300	
Maple Ridge	NY	2006	321.75	1.65	$5,128-$6600	$3,108	

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Oliver Wind Energy Center (I & II)	ND	2006-2007	98.6	2.30 & 1.50	$5,555	$3,061	
Peetz Table Wind Energy Center	CO	2007	400.5	1.50	$5,617-$7,490	$3,750-$4,993	
Langdon Wind Energy Center	ND	2007-2008	159	1.50	$4,717	$3,144	
Forward Wind Energy Center	WI	2008	129	1.50	-	-	$4,200 annual landowner easement payments (and $500 annual payments to landowners within 1 mile of turbine)
Ashtabula Wing Energy Center	ND	2008	148.5	1.50	8,080	$5,387	
Crystal Lake	IA	2008	150	1.50	$6,000	$4,000	
Smokey Hills Wind Farm	KS	2008	100.8	1.80	$3,000	$1,667	
Source: Wind Energy Easements and Leases: Compensation Packages, Windustry, June 2009							

Other sources of data support the figures presented above. For example, the Wind Powering America (WPA) program of the United States Department of Energy (DOE) provides materials on rural economic development of wind, citing annual revenue to farmers of $1,500 per turbine. Although a turbine size is not mentioned in the WPA documents, the most commonly deployed turbine size in the Midwest region of the United States during the preparation of the WPA documents is in the 600-750 kW range. Normalizing the WPA's data to a per-MW price suggests that payments range from $2,000 to $2,500, which is consistent with Windustry's findings above. However, more recent projects that feature turbines over 1.50 MW may pay more, as shown in the results of the Windustry study.

Another source of comparable data for the numbers cited above is the Turbine Verification Program (TVP), a U.S. DOE and Electric Power Research Institute (EPRI) program, in which cost-share or risk-share funds were provided to several utilities to develop and operate wind projects. While the data generated by the TVP program are not directly comparable to that of wind power projects developed without government aid, they help corroborate the data presented above.

Table 10 summarizes data for several TVP wind power projects comprising a wide range of effective payment per MW values. Three projects (Fort Davis, Glenmore, and Algona) are within or near the above-mentioned range. However, some of the projects are outside the norm. The Kotzebue project, for example, has an unusually high per MW payment because it is based on a per-turbine amount and small turbines are used in the project (10 turbines at 50 kW each). The Springview project's payment per MW is exceptionally low because the project was promoted as a small-scale demonstration project. In addition, the land was not being used for any other purpose and a significant amount of similar land in the region with comparable wind resources was available. Finally, several of these projects required no spacing between rows because they required only a single row of turbines.

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Table 10 - Land Requirements and Payments for TVP Projects

Project Location	Land Use/ Type	Total Land Area Leased (acre)	Acres Leased per Turbine (per MW)*	Leased Land Occupied by the Turbines	Annual Land Cost/ Acre Leased	Approximate Payment per MW ($/year)
Fort Davis, Texas	Ridge tops/ ranch land	75.1	6.4 (11.4)	5.0%	$266	$3,022
Searsburg, Vermont	Heavily forested ridgeline	35.1	6.4 (5.7)	9.8%	$114	$648
Kotzebue, Alaska	Treeless coastal tundra	148.3	14.8 (296.5)	0.3%	$27	$8,000
Glenmore, Wisconsin	Agricultural plains	2.5	1.2 (2.0)	34.2%	$1,058	$2,090
Algona, Iowa	Cropland	52.1	17.3 (23.2)	2.8%	$96	$2,228
Springview, Nebraska	High plain/ ranch land	33.1	16.6 (49.4)	2.9%	$15	$740
Big Spring, Texas	Ranch land/ mesa tops	7,131	154.9 (209)	0.3%	Unknown	Unknown
* In some cases, the acre/MW figure appears low. This is likely because land for turbine spacing between rows was not needed and leased because several of these small projects had only one row of turbines.						

Other Pricing Considerations

In addition to the base lease amounts, an up-front or initial payment is fairly common but not universal. Up-front payments generally are in the range of $1,000 to $3,000 per turbine. A lump-sum payment may be made during the construction period, particularly in cases where the landowner is inconvenienced or loses other short-term revenues due to the construction activities. For example, during construction, additional land may need to be removed from crop cultivation and used for equipment storage areas.

In cases where land is leased from multiple landowners for one project, developers typically take one of two approaches: 1) they make payments based on the electricity output of the specific turbines located on each individual land parcel; or 2) they make payment based on the average output of all turbines in the project multiplied by the number of turbines located on each individual land parcel. The second approach is easier to document and verify, and poses less risk to landowners, who will receive payment as long as the project generates electricity, regardless of whether the turbines produce electricity on their individual parcels.

Lease payment terms also depend on alternative uses for the land, the local market for wind energy, and the availability of similar land with comparable development potential, as shown by these two U.S. examples. In the Altamont Pass area of California, leases were negotiated to escalate to fairly high rates because the land was being sought for residential development in a rapidly growing area near San Francisco. In the Midwest, lease rates generally are fixed at lower rates over the lease period because of the remoteness and/or the low land values of the areas being considered for wind development. In addition, many locations possess an abundance of equally good wind areas, and the ability of a developer to move on to another landowner can drive down the lease price.

Alternatively, a number of examples exist where lease rates were escalated because of an action that established a short-term market for wind. For example, the Bonneville Power Administration, a federal power agency in the northwest United States, announced an intention to buy a significant amount of wind energy and issued a request for proposals (RFP) in 2001. Developers attempting to sign leases with landowners and prepare proposals in response to the RFP created a land rush. In such cases, property owners with known wind

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resources and documented wind resource information are in a position to negotiate with multiple developers and shop for the highest rate.

There are many examples of landowners who have signed leases with developers or companies that do not submit competitive bids. As a result, the landowner does not receive any revenue because the project is not developed. To avoid this situation, it is advisable for landowners to insist that the Option Agreement include a provision that permits them to withdraw from the agreement if the developers do not begin constructing a project within a certain number of years.

When considering royalty payment amounts, it is important to consider what they are based on, and the extent to which project owners financially benefit by means which are not included in the calculation of the royalty payment. For example, the gross revenues used as the basis for the royalty payment typically are based on the power sales revenues, but they may or may not include revenues from other sources, such as green premium revenues or government incentives. In particular, tax credits (such as the federal performance tax credit (PTC) in the United States) generally are not included in any calculation of royalties. Because the PTC effectively allows project developers to offer lower power purchase prices, which the royalty is typically based upon, they can offer landowners a higher percentage of revenue since energy sales prices represent only a portion of their financial benefit from the project.

Consider these two examples of 20 MW projects generating 60,000 MWh per year. One project sells power at $35/MWh, for gross power sales revenues of $2.1 million per year. A 2% royalty on this amount would provide the landowners with $42,000 per year, or $2,100 per MW installed per year. For a different 20 MW project that sells power at $70/MWh, a 1% royalty would result in about the same annual project royalty payment and payment per MW installed. A per MW installed payment of around $2,000-$2,500 is approximately the current industry standard. This is lower than for projects that were built ten years ago, as a result of increased competition, industry consolidation, and technological advances which have lowered the cost of energy production.

Regardless of industry norms or market conditions, actual land lease payment amounts will have to be negotiated between the developer and landowner, and many unique possibilities exist as to both the methods of calculating payments, and the payment amounts.

13.3. Additional Resources

- Land, N. and Grant, W. Landowner's Guide to Wind Energy in the Upper Midwest. Izaak Walton League, 2001.
- National Wind Coordinating Committee. Permitting of Wind Energy Facilities, A Handbook. 2001. Available at www.nationalwind.org.
- Guidelines for Agricultural Mitigation for Wind Power Projects - New York State Department of Agriculture and Markets (http://www.agmkt.state.ny.us/AP/agservices/constructWind.html)
- New York Energy Research and Development Authority – NYSERDA administers the New York Energy $mart(SM) program, which is designed to support certain public benefit programs during the transition to a more competitive electricity market. NYSERDA's Wind Power Naturally website offers a variety of useful information on New York's wind resource, siting and permitting information, case studies and available incentives. (http://www.powernaturally.org)

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- American Wind Energy Association (AWEA) – National trade organization. Includes contact information for developers, consultants, equipment suppliers, and other members. Provides details on large and small wind technology, policy initiatives, locations of installed wind projects, and links to other information.
  (http://www.awea.org)
- National Wind Coordinating Committee – Consensus-based group made up of wind developers, utility personal, government representatives, environmental groups, economic development organizations, and others. Investigates and discusses issues associated with wind energy, in particular avian issues, siting, transmission, and economic development. Includes numerous web links to other wind energy sites.
  (http://www.nationalwind.org)
- National Renewable Energy Laboratory/National Wind Technology Center – US DOE. Laboratory focused on wind energy research and development. Includes extensive information on the technology and associated research activities, publications, photos, and links.
  (http://www.nrel.gov/wind)
- U.S. Department of Energy Wind Program – Includes information on DOE's wind program, the technology, publications, and links.
  (http://www.eere.energy.gov/windandhydro/)
- Windpowering America – US DOE program with specific focus on the use of wind power generation as a source of income for American farmers, Native Americans, and rural landowners.
  (http://www.windpoweringamerica.gov)
- Windustry – Non-profit organization that promotes wind energy through outreach, educational materials, and technical assistance to rural landowners, local communities and utilities, and state, regional, and nonprofit collaborations.
  (http://www.windustry.org)
- Wind Energy Easements and Leases: Compensation Packages, Windustry, June 2009
  (http://www.windustry.org/sites/windustry.org/files/Compensation-2009-07-06.pdf)

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14. Permitting

Planning ahead for the siting of wind energy facilities will help municipalities anticipate and effectively evaluate applications for these uses. By determining, in advance, where and under what conditions municipalities would prefer wind projects to be located, and then amending or adopting land use regulations and maps to reflect these preferences, a time-consuming and potentially controversial review process may be avoided.

As New York State continues to expand the use of renewable energy, wind energy project developers will continue to approach municipalities across the state with proposed wind projects that warrant local review.

At the same time, in some communities, residents are organizing and hiring legal representation to oppose new wind projects. Local officials are increasingly finding themselves caught in the middle, and without access to dependable, accurate information that will help them make informed decisions that are consistent with the community's values. This section is intended to describe project review options and local land use evaluation methods, and provide local officials with the information and tools needed to create a meaningful review process for wind energy facilities.

14.1. Local Ordinance Options and Examples

Effective wind ordinance standards should address several objectives, including: ensuring public safety, expressing local preferences, identifying and minimizing on- and off-site impacts, promoting good land use practice, informing and involving the public and providing legal defensibility. Predictable and clear standards and a reasonable timeframe for review provide fairness for towns, wind developers and the public, and help to streamline the review process. Some flexibility is also needed in ordinance language to enable municipalities to respond to unique situations.

Local Review Options

A town does not have to employ zoning to develop and adopt a wind energy ordinance, although it is preferable as it better assures that the town will get the type of development it wants. If a municipality wishes to allow wind development, there are a variety of ways in which towns can review and allow for wind energy facilities:

- As an outright permitted use
- With a special use permit
- Subject to site plan review
- As an accessory use
- Based on a use variance

In most cases, towns will probably want to use a combination of the special use permit and/or site plan review, especially for large, commercial wind energy facilities.

Zoning for Wind

A town that uses zoning and has an up-to-date comprehensive plan that addresses the wind energy resource is in an excellent position to proactively identify key wind energy areas that could be developed. The existing zoning for these areas could then be amended to allow wind energy facilities, subject to the town's chosen review process. The areas suitable for wind energy facilities are sometimes located within parts of multiple zones rather than primarily in one or two zones. In these cases, it might make sense to create a wind energy

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overlay zone for application to these areas. An overlay would apply special wind energy review standards to proposed wind energy uses in addition to the standards that apply to the underlying zone. Careful attention to potential visual, avian, and heritage/visual impacts in defining the overlay area can greatly mitigate or even eliminate these issues when wind energy facilities are proposed. The overlay zone should be shown on the town's zoning map and could be an incentive to attract wind developers to the town. Zoning can play a critical role in keeping wind development in areas with compatible uses.

For more information on comprehensive plans, please refer to Section 11: Comprehensive Planning.

Setbacks and Other Zoning Considerations

Many concerns associated with safety, noise and aesthetics can be addressed by placing distance between wind turbines and people, property lines, roads and certain environmental areas or scenic or historic landscapes. Although there is no consensus on appropriate distances or types of setbacks, there are several common themes that appear in a number of wind energy regulations that various communities have adopted.

Most local government requirements include setbacks for the distance between the wind turbine and residences/other buildings, property lines and roads. Property lines should always be part of the setback formula in order to provide consistency and not endanger future uses on adjacent parcels. A few communities have also defined setbacks from railroads, above-ground transmission lines and other specific uses. The most common way to define a setback distance is in terms of a multiple of the turbine height. Other options are to specify a fixed distance or a combination of a fixed distance and a multiple of the turbine height. Setbacks should be at least as great as the height of the turbine. When specifying the structure height, it is important to define whether the height is considered the top of the tower or the highest point reached by the rotor blade. More information regarding setbacks, including example setbacks used in operational projects, is provided in Section 8.2: Public Health and Safety.

Some communities provide that setbacks may be reduced when doing so would enhance aesthetic, noise or safety considerations. Turbines are often exempt from property line setbacks if the adjacent property contains a wind turbine from the same plant or the adjacent property is a participant in the project through a land lease and/or wind access agreement. This is an important consideration since turbine layouts and plant infrastructure can result in many parcels of land being utilized for one project.

Communities may adopt noise regulations that apply to wind facilities. These can also involve the use of setbacks. Noise impacts may be measured at the property line or at the location of the affected uses – residences and certain other public uses. Use of property lines in determining setbacks assures that future uses of unbuilt adjacent parcels will not be exposed to unreasonable noise impacts.

When establishing setbacks, the intended protective effect must be balanced with economic considerations for wind projects. For instance, sizeable setbacks could be viewed as providing maximum mitigation of adverse noise, visual and environmental impacts. However, sizeable setbacks could render a large portion of a proposed site unusable for wind turbines, thereby reducing the overall number of turbines that could be accommodated, thus sacrificing the feasibility of the project.

Height restrictions are a part of most zoning ordinances and can also have an adverse, though unintended, impact on wind turbine installations. Many local height restrictions do make exceptions for church spires, silos, cell towers and similar uses. Since the wind resource generally improves with height, in areas where wind energy facilities are to be permitted, height exceptions should similarly include wind turbines.

Some communities specify a minimum height for the blade tips above ground level. Minimum limits are driven by safety concerns and typically range from 15 to 30 feet. Because today's commercial wind turbines are

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typically installed on towers of at least 200 feet, minimum levels above ground are unlikely to be an issue. Although small turbines are installed on lower towers, their rotors are smaller and these limits should also not be an issue.

For a discussion of appropriate review standards for environmental and cultural impacts, see Section 10: Other Environmental Impacts.

14.2. Role of Government Agencies

Most wind energy projects in New York are subject to permitting by municipal authorities, who may review project proposals under various regulatory frameworks, including local zoning ordinances and the SEQR. Yet those involved in land use decisions at the local level sometimes feel unprepared to conduct such a review. Many municipalities lack planning staff and most municipal planning and zoning boards have had relatively little exposure to wind energy technology. This discussion is intended to help fill this information gap and assist local governments in their decision-making. Finally, this section summarizes the areas where interaction with other state and federal agencies may occur.

Local Review Options

In general, land use regulations are intended to guide future growth and development by ensuring that sufficient land is available for a variety of uses, adjacent uses are compatible, and a reasonable transition area exists between areas of different usage. As such, they can be an important element in addressing what, if any, wind energy development will be allowed in a municipality.

Municipalities wishing to allow or promote wind development must carefully consider what land areas would be best suited for wind energy development and make sure that this use is allowed in those areas. Municipalities must try to strike a balance between developing a responsible review process and imposing undue burdens on the developer. While it is important to be thorough and comprehensive, it is equally important to conduct a process within a reasonable time frame.

Local government review standards and timelines have an impact on the economic viability of a wind project in today's competitive markets.

Local regulations that may apply to proposed wind energy facilities include building permits, special use permits, site plan review, and zoning. The use of any one or more of these regulations varies widely across the state. About 78% of New York municipalities use zoning. Many of the more remote, rural parts of the state, where good wind energy potential may exist, do not use zoning. Wind energy projects located on land that is not subject to zoning may only require a building permit and, possibly, site plan review. This simplified approach, while perhaps adequate for small wind projects, may not be adequate to ensure compatibility with surrounding uses, especially for larger projects. The action also will trigger review under the State Environmental Quality Review Act (SEQRA).

Where zoning is in use, one of the biggest impediment to the siting of wind energy facilities is the ordinance that fails to identify wind energy facilities as allowed uses. Because wind projects are so new, many municipalities have not yet added this use to their ordinances. In most zoning ordinances, non-listed uses are considered prohibited uses and may only be permitted through utilizing the use variance process. Because the statutory use variance criteria are difficult to meet and the process is cumbersome, this is a less-than-ideal approach to evaluating and allowing wind energy facilities.

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Updating Land Use Regulations

Land use regulations, including zoning, should be periodically updated to allow municipalities to address new uses, such as wind energy facilities. Local land use regulations must be in accordance with an adopted comprehensive plan. For this reason, many communities update their comprehensive plan and zoning ordinance in a parallel process.

As municipalities evaluate and update their land use regulations with respect to wind projects, they should consider what type of review should be used. There are a variety of review options, as follows:

- Permitted use
- Special use permit
- Site plan review
- Accessory use
- Use variance
- Overlay Zone

Depending on the process that municipalities use, the reviewing body may be the local enforcement officer, the planning board, the zoning board of appeals, the local legislative body, or some combination of these. It is useful here to review the purpose of each of these options.

Permitted Use

Permitted uses in a zoning ordinance law are those that the municipality feels should be allowed in a particular zone under all circumstances, though they may be made subject to specific conditions that would be reviewed as part of a ministerial decision by the municipality's enforcement officer. Municipalities may, for instance, choose to make small wind energy facilities permitted uses in remote, rural areas where there is little potential of adverse impacts to nearby properties.

Special Use Permit

Special use permits are employed when the use is believed to be generally appropriate for a particular zone, though perhaps not in all circumstances or as proposed, and are subject to either general or specific conditions to ensure compatibility with and/or minimal impacts on nearby uses. Special use permits are normally issued by the planning board or zoning board of appeals as part of a discretionary review process involving a public hearing. Special use permits can be issued only where zoning is used. Special use permits are an effective tool for municipalities evaluating large, commercial wind projects with potential adverse impacts for nearby properties.

Site Plan Review

Site plan review is a process that is used to ensure that the permitted use is designed, constructed, and laid out in an appropriate way. Site plan review can be used with or without zoning because the proposed use of the property is not an issue. This is a good supplementary tool to use in the evaluation of wind projects. Site plan review is normally performed by the planning board or zoning board of appeals. Where site plan review and special use permits are both used, it is preferable for wind projects to be evaluated by a single reviewing body.

Accessory Use

Accessory uses are secondary to a principal use on the same property. A single wind turbine that is primarily used to supply electricity to a residence or a farm, for instance, might be considered an accessory use. Municipalities can amend the definition of accessory use in their zoning to include small wind projects.

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Use Variance

Use variances can permit uses that are not listed as allowed in a particular zone. Use variances may be issued by the zoning board of appeals as part of a quasi-judicial review process involving a public hearing. This process exists to handle the unanticipated exception to the rule. Use variance may only be issued if the applicant meets strict statutory tests. The burden of proof of the appropriateness of the use rests on the applicant. It is preferable to allow the use in appropriate zones and to establish a meaningful but not overly cumbersome review process than to rely on the use variance process to allow wind energy facilities.

Overlay Zone

Part of any update of land use regulations should include an update of the zoning map. Such an update presents municipalities with the opportunity to create a wind energy overlay zone that can be used as a way to attract wind energy developers to the community, if desired. Wind energy facilities can also simply be added as an allowed use in various existing zones in the municipality. The different options in this area are discussed further in the *Wind Energy Model Ordinance Options* section of the Appendix.

Meaningful and Fair Review

Once municipalities choose an approach to reviewing and permitting wind energy facilities, they should consider what the substance of that review will be. A different set of review standards may be appropriate for large commercial wind energy facilities as opposed to a single small turbine. Nevertheless, permitting considerations will likely include most or all of the following issues:

- Public health and safety
- Siting and installation
- Setbacks from residences, roads, and property lines
- Nuisance impacts: sound, electromagnetic/microwave interference
- Environmental impacts: avian, soil erosion
- Visual impacts

The level of detail required to address these issues in a permitting strategy will vary depending on project location, existing land uses, community concerns, local environmental issues, and other factors.

Municipalities should encourage wind developers to schedule a pre-application conference to meet with municipality staff to discuss the proposed project in general terms and to clarify the application requirements. The conference should be informal. However, the applicant should be encouraged to bring preliminary materials to the conference to inform staff (and/or a review board member) of siting information. The general purpose of the pre-application conference is:

- To find out, on an informal basis, what the applicant has in mind
- To explain the municipality's standards and procedures
- To provide the applicant with the application form and list of items to be submitted.

Straight-forward discussion early on can help reduce the time and expense involved in the approval process.

Coordinating the Review with Others

Any proposed special use permit or site plan for a proposed wind project (or any other use) that is within 500 feet of a municipal boundary, a county or state park, road, stream, public building, or a farm operation located in an agricultural district, may need to be referred to the county planning agency (or regional planning agency if

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there is no county agency) for its input (Section 239-m of the General Municipal Law). County referral is also usually required of any comprehensive plan or zoning ordinance amendments to accommodate wind projects.

Building Codes

Recent experience from New York wind projects has identified some concerns that local building inspectors may lack sufficient knowledge and understanding of wind projects and technology. Local inspectors in rural areas tend to be more familiar with residential, agricultural, and commercial construction as opposed to civil works or power plant construction. Although wind energy projects utilize turbines that are unique in comparison to other forms of energy-generating equipment, the issues associated with building and electrical code compliance are the same as any other power-generating plant. Road construction and operations and maintenance building construction are no different from other construction projects. The local utility receiving energy from the wind plant is responsible for inspection and acceptance of the turbine equipment, collection system, substation, and interconnection.

Local governments can also have their own building code, which may address issues not addressed by the state building code.

A link to the Administration and Enforcement of the Uniform Fire Prevention and Building Code and the Energy Conservation Construction Code (Uniform Code) is provided in the additional resources section. Local governments may also have their own building code.

Interactions with State and Federal Agencies

Local jurisdictions may also interact with state and federal agencies when conducting the environmental review for a wind energy project. Some of the state and federal agencies that may become involved in the review of a wind energy project include those listed in Table 11. This sample information is provided from the large-scale, commercial wind energy project located near Prattsburgh, New York.

An involved agency typically has some form of discretionary authority relating to a specific aspect of a proposed action (e.g., the granting of a required permit). An interested agency lacks this discretionary authority but still chooses to participate in the review process because of specific expertise and/or concerns.

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Table 11 - Agency Involvement in the Prattsburgh Wind Farm

Agency	Involvement in WindFarm Prattsburgh environmental review process
NYS Department of Environmental Conservation	Interested agency; may be Involved agency if NYSDEC permits are required (e.g., state regulated wetlands or stream permits); has broad responsibilities to consider impact of projects on natural resources, including birds, bats and their habitats.
NYS Department of Agriculture and Markets	Interested agency; focus on ensuring that soils and farming operations are not adversely affected by construction activities
NYS Public Service Commission	Interested agency; oversees issues relating to energy interconnection and transmission
NYS Office of Parks, Recreation and Historic Preservation	Interested agency; state administrators of National Historic Preservation Act
U.S. Fish and Wildlife Service	Interested agency; focus on ensuring that no adverse impacts occur to sensitive wildlife habitat or species; has responsibilities under Migratory Bird Act and Threatened and Endangered Species Act.
USDA Animal Plant Health Inspection Service	Interested agency; responsible for plant protection and quarantine program
U.S. Army Corps of Engineers	Interested agency; likely to issue permits in compliance with Section 404 of the Federal Clean Water Act
Federal Aviation Administration	Interested agency; provides obstruction lighting recommendations to minimize aviation risks
Source: http://www.prattsburghwind.com	

NYS Department of Environmental Conservation (DEC)

The NYSDEC may become involved in project approval if land that will be affected by the project falls into its jurisdiction under the federal Clean Air and Clean Water Acts. Issues related to streams or wetlands represent one of the most common ways in which the NYSDEC could become involved.

The DEC does not issue a specific permit for wind projects. Rather, permits may be required for specific actions taken in the construction of the wind project.

For example, a permit would be required if the project involved filling of a section of a state regulated wetland or disturbance to the bed or banks of a state regulated stream. For a typical wind project, the following permits may be required:

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Freshwater Wetlands Permit (Part 663)[41]

This permit program was created in light of the legislature's intent to preserve, protect, and conserve freshwater wetlands and to regulate development so as to preserve their beneficial qualities. A permit would be required for regulated activities involving freshwater wetlands that appear on the New York State wetlands maps. Generally, the permits are limited to wetlands 12.4 acres or greater in size, though smaller wetlands of unusual significance may be included. Regulated activities include the following:

- filling, draining or excavating, grading, and dredging;
- constructing buildings, roadways, septic systems, bulkheads, dikes, dams, and docks;
- clear–cutting timber and other vegetation in a wetland or its 100 foot adjacent area.

While it is not likely that a turbine itself would be located in a wetland, it is possible that an access road or electrical interconnections between turbines, the substation, and the electrical grid may involve disturbances to a wetland.

The applicant's plans are required to show the freshwater wetlands boundary (if any) and the source of information providing that boundary.

In determining whether to issue a permit, the following factors must be considered:

- wetland class
- effect of the project on wetland functions and benefits
- possible alternatives outside of the wetland or adjacent area and,
- loss or degradation to the wetland cannot be more than insubstantial

Use and Protection of Waters Permit (Part 608)[42]

This permit program was created in view of the legislature's intent to minimize the disturbance of streams and water bodies and so prevent unreasonable erosion of soil, increased turbidity, loss of fish and aquatic wildlife or habitat destruction. This permit may be required if construction of access roads or electrical interconnections (turbine construction more rarely) involve disturbance to a stream (classified c(t) or above) or if excavation or placement of fill occurs in any of the "navigable waters of the state or in wetlands that are adjacent to and contiguous at any point to any of the navigable waters of the state, and that are inundated at mean high water level or tide."

The applicant must show that the proposal: 1) is reasonable and necessary 2) will not endanger the health, safety and welfare of the people of the State of New York 3) will not cause unreasonable, uncontrolled, or unnecessary damage to the natural resources of the state including soil, forests, water, fish, and aquatic and related environment.

Federal Clean Water Act (Section 401) Certificate[43]

This certificate program was created consistent with the legislative intent to ensure that federal agencies issue permits without violating the state's water quality standards or impairing designated uses.

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[41] Statutory Authority provided by NYS Environmental Conservation Law (ECL), Article 24. Applicable regulations found in 6NYCRR Parts 663.

[42] Statutory Authority provided by NYS Environmental Conservation Law (ECL), Article 15, Title 5. Applicable regulations are found in 6NYCRR Part 608.

[43] Statutory Authority provided by NYS Federal Clean Water Act, Section 401. Applicable regulations are found in 6NYCRR Part 608.

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The Section 404 federal permit process, and corresponding state certification under Section 401, regulates the discharge of dredged or fill materials to the waters of the United States (to include wetlands). The State must issue a Section 401 water quality certificate before a Federal agency can approve a Section 404 permit.

The certificate verifies that the federally approved action is in compliance with State water quality standards or designated use of the water body.

The burden of proof is on the applicant.

Unlike the Freshwater Wetland permit, this permit and corresponding certificate are necessary for the discharge of dredged or fill material to wetlands smaller than 12.4 acres in size.

Stormwater Discharge Permit

For a wind energy project, the amount of land disturbed during construction depends on the size and number of turbines, existing infrastructure (e.g., roads and transmission), and topography.

Temporary disturbances caused by construction are approximately one acre per megawatt (MW); this estimate accommodates a construction lay-down area at each turbine location, access roads, underground transmission line, substation, and construction vehicle parking. Permanent disturbances caused by construction activities average 0.5 acres/MW.

Under Phase II of EPA's stormwater rules, construction activities that commenced on or after March 10, 2003 and that disturb one or more acres of land must be authorized by a stormwater discharge permit.

On January 8, 2003, the NYSDEC issued one of the most progressive discharge permits in the nation for such authorizations.

The permit NYSDEC issued is the SPDES General Permit For Stormwater Discharges from Construction Activity (GP-02-01).To obtain coverage under the general permit, the operator of a construction activity must file a completed Notice of Intent (NOI) with the DEC. Submitting an NOI is an affirmation that a stormwater pollution prevention plan (SWPPP) has been prepared for the site and will be implemented prior to the commencement of construction commences. Coverage under the general permit can begin either five (5) or sixty (60) business days after receipt of the NOI to by the DEC.

All stormwater pollution prevention plans include provisions for erosion and sediment controls. For construction activities that meet either Condition A, B or C described below, the operator shall develop a full SWPPP which includes water quantity and water quality controls (post-construction stormwater control practices), in addition to the erosion and sediment controls.

Condition A - Construction site or post construction runoff discharging a pollutant of concern to either impaired water identified on NYSDEC's 303(d) list or a TMDL watershed for which pollutants in stormwater have been identified as a source of the impairment.

Condition B - Construction site runoff from Phase 1 construction activities (construction activities disturbing five (5) or more acres).

Condition C - Construction site runoff from construction activity disturbing between one (1) and five (5) acres of land during the course of the project, exclusive of the construction of single family residences and construction activities at agricultural properties.

The detailed components of a stormwater pollution prevention plan are set forth in the New York State Stormwater Management Design Manual. Please note that many SWPPPS have unnecessarily included model runs that increase the volume but not the value of the SWPPP.

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Possible Roles of the DEC in the SEQR Process

An agency can participate in a SEQR review as either an Involved Agency or as an Interested Agency. An Involved Agency is an agency that has or will have a discretionary decision to make regarding some aspect of the action. A discretionary decision would include reviewing a permit application or a certification request. An Interested Agency lacks a discretionary authority but still wishes to participate in the review process because of its specific expertise or concerns about the activity. Being an Involved Agency, particularly if designated the Lead Agency (the agency principally responsible for carrying out, funding or approving an action), gives an agency greater legal leverage in directing the conduct of the SEQR process than if it is an Interested Agency.

Even if the DEC is not an Involved Agency, it will fully participate in the environmental review of the proposal to ensure that resource issues of statewide concern are identified and assessed in the environmental review process conducted under SEQR. The DEC's interests would include assessing the projects possible impact to state wildlife such as bats, raptors (hawks and eagles, for example), migratory waterfowl, and migratory songbirds and their habitats. If impacts were disclosed, the DEC would also identify ways that the impacts could be avoided or reduced.

NYS Department of Agriculture and Markets (Ag & Markets)

Villages, municipalities, and cities in New York State have broad ability to enact land use rules and regulations; however, these powers must be in accordance with the policy and goals of *Article AA-25 of the Agricultural and Markets Law*. This law prevents unreasonable restrictions by local government rules on land use within agricultural districts unless it can be demonstrated that public health or safety is threatened. The purpose of the law is to encourage development and improvement of agricultural land for production of food and other agricultural products. DAM has created a document specifically focused on wind energy to facilitate the review process. A link to the *Guidelines for Agricultural Mitigation for Windpower Projects* is available in Additional Resources.

NYS Public Service Commission

The Public Service Commission is responsible for overseeing issues related to energy interconnection and transmission, including the siting of facilities under Article VII of the Public Service Law (PSL). It must also approve the construction of wind energy facilities with generating capacity over 80 megawatts, pursuant to PSL Section 68.

New York State Office of Parks, Recreation, and Historic Preservation may require consultation if there are visual impacts involving historic structures or locations. For more information on this Office and the tools it has available to developers and municipality decision-makers please see the *Other Potential Environmental Impacts* section of this Toolkit.

US Fish & Wildlife Service

If a proposed project site includes or is adjacent to sensitive plant or wildlife habitat, the USF&WS can perform a threatened and endangered species review. The review identifies any threatened or endangered species located in or near the proposed project area and determines the likely level of impact. A positive species finding would trigger the National Environmental Policy Act's requirement for an assessment of the need for an Environmental Impact Statement; this process could be coordinated with the SEQR process.

Adirondack Park Agency (APA)

If a proposed project site is within the Adirondack Park, the project may need to meet additional APA requirements. The APA administers the Adirondack Park Agency Act (Executive Law, article 27), the Freshwater

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Wetlands Act (Environmental Conservation Law, article 24) on state lands within the park and the Wind Scenic and Recreational Rivers System Act (Environmental Conservation Lax, article 15, title 27) for private lands within the park borders.

USDA – Animal Plant Health Inspection Service

The Animal Plant Health Inspection Service of the USDA may be called upon to help assess the vulnerability of the project area's ecosystem to invasive pests and pathogens.

Army Corps of Engineers

The Army Corps of Engineers (COE) may become involved in a project, if any portion of the project (e.g., access road, distribution line) crosses a water body subject to COE jurisdiction such as streams flowing into navigable waters. The COE may also become involved in offshore wind energy projects in the Great Lakes and the Atlantic Ocean. Its level of involvement could range from expert review to mitigation plan suggestions to permit issuance.

Minerals Management Service

The Minerals Management Service (MMS) of the Department of the Interior manages the natural gas, oil, and other mineral resources in Federal waters on the Outer Continental Shelf. The MMS will grant leases, easements, and rights-of-way for offshore wind farms located in this region.

Federal Aviation Administration (FAA)

Given the height of today's commercial wind turbines, the majority of wind energy facilities are subject to the FAA's review for safety lighting. The FAA requires lighting on any structure taller than 200 feet. Projects located near airports or military facilities or in aviation corridors may require additional review, even if they fall below the 200 foot threshold.

FAA lighting varies significantly from project to project because the FAA only recently adopted a national standard for lighting utility-scale wind turbines. Some lighting scenarios include lighting every other turbine or bracketing the project (i.e., lighting the turbines at just the corners of the project, the outermost ring of turbines, or the turbines at the end of rows).

To create a national standard, the FAA along with the national Department of Energy (DOE), the American Wind Energy Association (AWEA), and participating projects, started a study in 1999 to determine the most effective and efficient technique for lighting wind turbine projects. This study combined airborne evaluations of select project sites as well as model simulation to test the recommended guidelines. Some of the proposed recommendations tested at the Blue Canyon Wind project in Oklahoma included the following:

- Half mile separation unless bracketing used,
- Red strobe (L864) required,
- White strobe (L865) depending on location,
- Synchronize all lights,
- Omit daylight illumination,
- Light must extend above highest point of the nacelle, and
- White/off-white towers preferred.

The final report was issued in February of 2007. The final standards issued by the FAA include, but are not limited to, the following guidelines:

- Not all wind turbine units need to be lighted. Definition of the periphery of the installation is essential

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- Obstruction lights within a group of wind turbines should have unlighted separations or gaps of no more than ½ mile
- All flashing lighting should be synchronized
- Nighttime wind turbine obstruction lighting should consist of the preferred FAA L-864 aviation flashing red lights
- Daytime lighting of wind turbine farms is not required, as long as the turbine structures are painted in a bright white color or light off-white color most often found on wind turbines.

Table 12 lists the types of aviation lighting installed for some of New York's existing wind projects.

Table 12 - Examples of Aviation Lighting at New York Wind Power Projects

	Madison	Fenner	Wethersfield	Maple Ridge
Flash Pattern *FPM – Flashes per Minute*	40 FPM - Day 20-40 FPM - Night	40 FPM - Day 20-40 FPM - Night	40 FPM - Day 20-40 FPM - Night	20-40 FPM Day and Night
Turbines Lit	7 of 7 (100%)	20 of 20 (100%)	10 of 10 (100%)	55 of 195 (28%)
Brightness	Medium intensity (white) Obstruction light (red)	Medium intensity (white) Obstruction light (red)	Medium intensity (white) Obstruction light (red)	Obstruction light (red,flashing)
Lights per Turbine	1 white (all turbines, day) 2 red (all turbines, night)	1 white (7 turbines, day) 2 red (all turbines, night)	1 white (3 turbines, day) 2 red (all turbines, night)	1 red (55 turbines, day & night)
FAA Light Type	L-865 (day) L-864 (night)	L-865\L-864 (7 turbines) L-864 (13 turbines)	L-865\L-864 (3 turbines) L-864 (7 turbines)	L-864 (55 turbines)
Source: AWS Truewind, LLC				

Although the FAA's determination of how to light a wind power project is not an open process like an environmental review, municipalities might be able to offer their lighting preference for a wind project in their local area. However, aviation safety will be a priority.

14.3. Overview of the SEQR Process

New York's State Environmental Quality Review Act (SEQR) requires the consideration of environmental factors early in the planning stages of any actions that are directly undertaken, funded or approved by local, regional, and state agencies. SEQR is both a procedural and substantive law. The law requires certain procedures or steps to be followed in the environmental review. It also requires that agencies base decisions or conclusions on substantive information developed in the environmental review of a project. The review process may result in an agency requiring project modifications or even project denial if the potential adverse impacts cannot be mitigated or avoided. Another component of SEQR is the requirement to consider alternatives in the review process.

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Classify the Action: Type I, Type II, Unlisted

Actions under SEQR are listed as Type I, Type II, or Unlisted. The classification of an action is important in determining the procedures to be followed. Type I actions are those projects that are more likely to require the preparation of an Environmental Impact Statement (EIS) than unlisted actions. The criteria for classifying actions as Type I can be found in DEC's regulations at Title 6 of the Compilation of Codes, Rules and Regulations of the state of New York (6 NYCRR) § 617.4. Type II actions are those actions that have been determined not to have a significant impact or are otherwise precluded from environmental review under the Environmental Conservation Law (ECL) Article 8. Type II actions are not subject to review under SEQR, and a list of these actions can be found in 6 NYCRR 617.5. All actions that are not Type I or Type II are considered Unlisted actions. However, an involved agency has the discretion to treat an Unlisted action as a Type I action.

Examples of Type I actions include any project over 100 feet above ground level in a locality without zoning regulations pertaining to height, as well as any project that involves the physical alteration of 10 acres. This would include not only alteration from turbine construction but also lay down areas, access roads, transmission lines, and any electrical substation improvements. If a project is in an agricultural district, the threshold for physical alteration is only 2.5 acres. To date, most of the commercial wind projects have exceeded these thresholds and have been classified as Type I actions. As described below, Type I actions require certain procedures to be followed, but do not always require the preparation of an Environmental Impact Statement.

For Type I actions, SEQR requires that a project sponsor complete the Full Environmental Assessment Form (Full EAF). The Full EAF requires the project sponsor to provide more information regarding a project than the Short Environmental Assessment Form. If a wind developer submits an application to a local municipality for a commercial wind project and a state or local agency determines that a project is a Type I action, then the Full EAF should be included with the application or a request should be made to have one submitted. The project sponsor may also choose to supplement the Full EAF with any studies or analyses related to the particular project. SEQR also requires that a coordinated environmental review be conducted. This means that all involved agencies (agencies with discretion to approve, fund, or undertake an action) cooperate to produce one integrated environmental review. It also allows interested agencies (agencies with concerns but without jurisdiction) to participate in the review.

Lead Agency

SEQR requires that one of the involved agencies lead the environmental review. This agency is referred to as the Lead Agency and has numerous responsibilities in the coordinated environmental review. Typically, the lead agency is selected based on whether the anticipated impacts are primarily of statewide, regional or local significance. If impacts are generally local in nature, then either an agency at the town or county level should assume the role of lead agency. For this reason, the local municipalities have assumed the role of lead agency. In some cases, municipalities have assumed lead agency by default because no other agency had jurisdiction. The Commissioner of the New York State Department of Environmental Conservation (DEC) resolves any disputes regarding who serves as lead agency.

Determination of Significance

Once a lead agency has been established, a determination of significance must be made. For Type I actions, the determination of significance is a declaration made by the lead agency regarding the potential for a project to have significant impacts on the environment. A negative declaration indicates the project will have minimal impacts, while a positive declaration indicates the potential for significant adverse environmental impacts. A negative declaration ends the SEQR process. A positive declaration requires the preparation of an EIS.

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A lead agency needs to understand the term "significance." Although a subjective term, significance is measured by the magnitude (severity) and importance (relation to its setting) of the impacts. The bigger or more severe the impact, the more a detailed analysis is required. The importance of the impact will depend on the setting and the local community values. A lead agency should consider whether the impacts are short or long term. A lead agency should note that a determination of significance is not the point at which to weigh the social and economic impacts of a project. A threshold determination should only be based on whether the project is likely to have significant impacts.

For commercial wind projects the potential environmental impacts can include, but may not be limited to, visual, sound, avian (birds and bats), water quality (wetlands, stream, stormwater runoff), historic preservation, agricultural, and community character. Some of these may be related to construction and will be short term impacts. Others will be related to the operation of the wind energy project and can be long term impacts. In either case, these potential impacts need to be carefully considered.

The threshold for requiring an EIS is not based on the number of turbines but on the potential for significant adverse impacts. Therefore, projects utilizing a small number of turbines are not exempt from performing an EIS unless a negative declaration is made.

If a lead agency decides to complete a negative declaration, it must consider all relevant impacts, not just those impacts within its jurisdiction. The lead agency's decision must document, in writing, the reasons for the decision. The negative declaration must contain a reasoned elaboration of why the project will not have significant impacts on the environment. The negative declaration must also be based on information obtained before the lead agency at the time of the decision. It may not be based on future studies or conditions to be imposed by the lead agency.

Even for wind projects involving a small number of turbines, the potential impacts make it difficult to write a negative declaration based on the information provided in the Full EAF and application alone. In most cases where a lead agency has issued a negative declaration for a wind project the project sponsor has supplemented the Full EAF with studies and analyses. This additional information is what allows the lead agency to make a reasoned elaboration regarding the project impacts and why they are not significant.

EIS Process

If the lead agency believes significant potential impacts may occur due to the proposed project, SEQR requires the lead agency to issue a positive declaration and require the preparation of an EIS. Procedurally, the EIS process adds additional steps to the process, but the results are a more thorough environmental analysis.

The EIS process also provides formal opportunities for public participation throughout the process. They include scoping of the Draft EIS and a 30 day public comment period on the Draft EIS. These provide opportunities for the public and other agencies to provide input into the review process, resulting in a review with a broader perspective. It also increases the likelihood that the project will be consistent with community values. Although not required, a SEQR hearing also provides another opportunity for public participation in the process.

Another important component of the EIS process is the requirement to look at alternatives. For the wind projects that have been the subject of an EIS thus far, the range of alternatives that were reviewed include different turbine locations, a reduction in the number of turbines, and the no action alternative. (SEQR requires the review of the no action alternative in an EIS.)

It must be noted that an EIS does not have to address every possible impact. The process is set up for the lead agency to identify those potentially significant adverse impacts. The EIS should focus on those impacts. Through the scoping process the lead agency can limit the issues to be addressed in the EIS.

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The preparation of a findings statement concludes the EIS process. A findings statement indicates that all requirements of SEQR have been met. Similar to the negative declaration, SEQR requires that the findings statement provide a reasoned elaboration why a project should be approved or denied. The findings statement is the time for an involved agency to weigh the potential adverse environmental impacts against the needs and benefits of the project. All involved agencies must issue their own findings statement.

SEQR Fees

Local communities that consider becoming a lead agency should be aware of the option of SEQR fees. In short, the SEQR fee provision allows a lead agency to require the project sponsor to provide money to assist in the SEQR review of the project. Many lead agencies have been reluctant to explore this option due to possible resistance they might receive from project sponsors. In fact, some project sponsors are willing to explore the option because it will, in most cases, expedite the review process. The other misconception is that the project sponsor provides for the consulting services; therefore, biasing the review. To avoid this scenario, the project sponsors have the option to establish a fund to allow the lead agency to hire their own consultants. The consultant would then report directly to the lead agency and not the project sponsor.

14.4. Additional Resources

- NYS Department of Environmental Conservation - Stormwater (www.dec.state.ny.us/water/stormwater)
- Environmental Protection Agency – Stormwater (www.epa.gov/npdes/stormwater)
- Administration and Enforcement of the Uniform Fire Prevention and Building Code and the Energy Conservation Construction Code (Uniform Code). (http://www.dos.state.ny.us/CODE/LS-CODES.HTML)
- New York Department of Environmental Conservation – Freshwater Wetlands Permits (http://www.dec.ny.gov/permits/6058.html)
- New York Department of Environmental Conservation – Use of Protected Waters Permits (http://www.dec.ny.gov/permits/6042.html)
- New York State Stormwater Management Design Manual (http://www.dec.ny.gov/chemical/29072.html)
- New York Standards and Specifications for Erosion and Sediment Control (Blue Book) (http://www.dec.state.ny.us/website/dow/toolbox/bluebook/bluebook.html)
- New York Department of Environmental Conservation – SEQR Permits (http://www.dec.ny.gov/permits/357.html)
- NYS DAM - Guidelines for Agricultural Mitigation for Windpower Projects (http://www.agmkt.state.ny.us/AP/agservices/constructWind.html)
- FAA Advisory Circular – Obstruction Marking and Lighting (http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/b993dcdfc37fcdc486257251005c4e21)

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15. Interconnection

15.1. New York Interconnection Procedure

The New York Independent System Operator (NYISO) requires that the wind farm developer follows several steps and requirements in order to connect to the grid. In order to give stakeholders an increased knowledge of the interconnection process, the following bullets detail the procedure.

- For each Point of Interconnection (POI) to be studied, the developer of a wind farm will be required to submit to NYISO: a request for interconnection, a $10,000 deposit, a demonstration of site control or another $10,000 deposit in lieu of site control, and at least a minimum set of technical data. Each POI is considered a separate request, even if the POI is the same site but at a different voltage level, and is required to submit a separate set of deposit(s) and data.
- Upon receipt of a valid interconnection request, NYISO staff will assign the project a queue position and initiate the Interconnection Study process. Initially, a Scoping Meeting will be set between NYISO, the developer and the connecting Transmission Owner(s) (TO) to determine alternative interconnection options and to exchange information. After the Scoping Meeting has occurred the developer will make an informed and definitive selection of which POIs will be studied by NYISO.
- NYISO will tender a Feasibility Study Agreement, which must be executed and returned to NYISO with a $10,000 study deposit. Upon the receipt of executed agreement, NYISO will begin the feasibility study. The study will consist of a power flow and short-circuit analysis of the base case with the addition of any facilities that have become in-service, have a signed Interconnection Agreement, or hold a higher pending queue position. Should a modification occur, such as a higher queued project dropping out of the queue, a re-study may be needed. After the completion of the Feasibility Study, NYISO will provide the customer with a report including a good faith estimate of (i) system upgrades required to effect full transfer of the new generation (ii) cost responsibility for necessary system upgrades, and (iii) time to construct.
- Along with the Feasibility Study Report, the developer will receive a System Reliability Impact Study (SRIS) Agreement, to be executed and delivered to NYISO, including demonstration of site control and a $50,000 deposit. The SRIS will study the effects of the proposed project to the reliability of the New York Transmission system. This study will consist of a short-circuit analysis, power flow, and stability analysis of the base case with the addition of any facilities that have become in-service, have a signed Interconnection Agreement, or hold a higher pending queue position, as well as all transmission upgrades for the queue projects added. Should a modification occur, such as a higher queued project dropping out of the queue, a re-study may be needed. After the completion of the SRIS, NYISO will provide the customer with a report including a (i) good faith estimate of non-binding upgrade costs, (ii) good faith estimate of a non-binding upgrade timeline, and (iii) a list of required upgrade facilities.
- Along with the SRIS Report, the developer will receive an Interconnection Facilities Study Agreement. For this study, the project will be placed into a cluster called a class year for the study. The developer will execute and deliver the Facilities Study Agreement to NYISO, including demonstration of site control and a deposit equaling the greater of $100,000 or the facilities portion of the estimated monthly study cost. The clustered approach to the Interconnection Facilities Study will include all class year projects in one combined study. The study will specify and estimate the cost of the equipment, engineering and design work, permitting, site acquisition, procurement and construction work and commissioning needed for the class year at each substation or feeder. Along with the estimated cost, a good faith

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schedule for upgrades will be established, which will contain major milestones to facilitate the tracking of the progress of each Large Facility interconnection project.

- After the Facilities Study has been completed, the developer will have the option to enter into an Optional Interconnection Study, which will utilize further data to support the previous studies. Upon the completion of the Optional Interconnection Study and/or the Facilities Study, a Large Generator Interconnection Application (LGIA) will be tendered by NYISO. The LGIA will be signed by the developer and filed with FERC along with a non-refundable $250,000 security to the Transmission Owner to begin construction of the necessary facility upgrades. The facility will have no more than 3 years to become commissioned after the signing of the LGIA.

The information is subject to the current large generator interconnection procedure (LGIP) for the NYISO, which became effective on 4 August 2008. However, NYISO is currently in a transitional phase with respect to the Federal Energy Regulatory Commission (FERC) issued (December 2007) interconnection queue reform. NYISO and its stakeholders have begun to undertake a comprehensive review of the interconnection procedure and queue process. No public status reports have been issued as of May, 2009.

15.2. Additional Resources

- NYISO Interconnection Study Process (http://www.nyiso.com/public/services/planning/interconnection_studies_process.jsp)

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16. Frequently Asked Questions

16.1. Technology

How large are today's wind turbines?

Most wind turbines in New York today are about 300 ft (91 m) to 400 ft (122 m) to the maximum tip height of the blade. Tower heights range from 213 ft (65 m) to 262 ft (80 m). As a size comparison, the above maximum tip heights of the blade are approximately equivalent to a 25 to 33 story building. For more information on wind turbine technology, please refer to Section 4: Utility-Scale Wind.

How much electricity does a wind turbine produce?

Most wind turbines in New York are rated at about 1.5 megawatts (MW). Each turbine of 1.5 MW produces enough electricity to serve about 740 homes. Commercially available turbines range from 1 to 3 MW. For more information on wind turbine performance specifications, please refer to Section 4: Utility-Scale Wind.

Given the current wind energy technology, how reliable is their operation?

Reliability of wind turbines is typically defined as the quantity of time they are on-line and ready to produce electricity divided by the total time in the year. Whether or not they produce electricity is a function of the wind. Ignoring external influences on turbine availability such as grid outages or forced curtailments by the utilities, wind turbines have demonstrated very high reliability, meaning they are available to produce energy approximately 97% of the time. However, due to intermittency of the wind resource, the turbines do not always produce the maximum power output possible. When averaged over a year, wind projects typically operate at levels equivalent to 30 to 40% of their full capacity (capacity factor). For more information on wind energy reliability, please refer to Section 5.1: Intermittency.

Can energy production by the wind project be reasonably predicted in advance?

While the wind doesn't blow all the time, reliable patterns exist on a daily and seasonal basis. These patterns are used to project long-term energy production from wind projects, as well as to forecast short-term energy production.

As part of project development, long-term wind measurements are compiled from nearby monitoring stations (such as airports and government environmental monitoring stations). These long-term data are correlated to the on-site wind measurements, which are then adjusted up or down depending on the correlation to reflect the long-term resource. Although it is expected that the wind resource will vary from this estimate in any given year, the intention is to predict the long-term average output from a wind project over its estimated design life.

While wind is variable, it is generally predictable. Forecasting mitigates some of the impact of its intermittency. Utilities use short-term forecasts (i.e., up to 48 hours in advance) to plan the dispatch of their generation resources. In the past few years, sophisticated wind prediction computer models have been developed to predict the hourly output from a wind project for several days into the future. Continued improvement in these models is expected to result in increasingly accurate forecasts. The New York Independent System Operator currently uses these forecasting techniques for the wind farms installed in the State.

For more information on wind energy reliability, please refer to Section 5.1: Intermittency.

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16.2. Socioeconomic Impacts

How does the local town, county, or municipality benefit from wind energy development?

Wind energy development benefits the local community in several ways. First, wind projects help to increase the tax base or revenue in cases where payments-in-lieu of taxes are used. Wind power projects place very low demands on the existing town and county public services (such as water, sewer, fire, and road maintenance) in comparison to other forms of residential and commercial development activities. This low demand on services means that money from the wind projects are applied directly to existing community needs. For example, the 30 MW wind energy project in Fenner, New York, is providing the town of Fenner approximately $150,000 per year from payments-in-lieu-of-taxes and the 11.6 MW Madison wind energy project is providing approximately $30,000 per year for both the Town of Madison and the Madison Central School District.

Other direct economic impacts include the creation of new jobs for construction and ongoing operation and maintenance. Multiplier effects include new, or increased, business to support the operation of the wind project or to support the general growth of the wind industry in that area. For example, a part supplier may expand operations to that locale, keeping dollars in the local community as well as bringing in non-local dollars for projects outside the locale. Hotels, restaurants, and other service industries can also see increases in business primarily during the construction phase. This can extend into the operation phase at reduced levels. Tourism is another area that can experience increases in activity.

For more information on wind energy's impact on local communities, please refer to Section 7: Economic Impacts and Section 8: Socioeconomic Impacts.

How many jobs are typically created by a new wind power project during construction and during operation? What types of jobs are created? Can local labor be used?

During Construction: Employment during construction varies by project size and by specific construction activities. Generally wind energy project construction work is performed over a 6- to 9-month period. All forms of conventional construction labor are employed to build wind energy projects. The wind turbine supplier is typically responsible for transport, delivery and installation of the tower sections, nacelle and rotor. Existing teams of personnel trained by the manufacturers and local labor are utilized for these tasks. Local or regional construction companies are commonly retained for balance-of-plant construction work (roads, foundations, electrical collection system, O&M building, etc). As an example, about 78 jobs were created during the construction of the Fenner, NY wind plant (30 MW in size with 20 turbines.)

During Operation: Project staffing levels can vary depending on the project size, location, equipment type, and O&M approach. Maintenance personnel generally need to be proficient mechanics or electrical/electronic technicians. With these skills, they can be readily trained in wind power mechanical and electrical systems and maintenance equipment. Approximately one O&M job is created for every 10 to 20 turbines.

For more information on wind energy's economic impact, please refer to Section 7: Economic Impacts.

How does the landowner benefit?

The landowners benefit directly from annual lease payments throughout the project's operating life while being able to maintain existing land uses over approximately 95% of the land. For land that is already in production (e.g., farming or ranching), the landowner receives two revenue streams – one from the existing use and one from the wind project.

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For more information on land owner benefits, please refer to Section 7: Economic Impacts and Section 8: Socioeconomic Impacts.

How does a wind power project affect property values?

A study was recently completed to evaluate the impact of wind projects of at least 10 MW on nearby property values. The study evaluated approximately 25,000 land transactions within 5 miles (the view shed) of 10 wind projects. Of all the wind projects built in the U.S. between 1998 and 2001, 27 projects fit the criteria of having 3 years of land transaction data before and after the wind project. Of those 27, only 10 had statistically good data. The report concludes "statistical evidence does not support the contention that property values within the viewshed of wind developments suffer or perform poorer than in a comparable region." The report is available on-line at http://www.crest.org/articles/static/1/binaries/wind_online_final.pdf.

For more information on property values, please refer to Section 8.1: Property Value.

Do wind power projects affect TV, radio, or cell phone reception?

Utility-scale wind power projects do not affect cell phone reception. In fact cell phones are often the main means of communication used on wind energy projects. Turbines could potentially interfere with radio or TV signals if the turbine is in the line of sight between a receiver and the signal source. This problem can usually be handled by improving the receiver's antenna, installing relays to transmit the signal around the wind energy project, or making slight adjustments to particular turbine locations. Use of satellite or cable television is also an option as wind projects will not affect these systems.

For more information on wind energy's effect on telecommunications, please refer to Section 10.4: Telecommunications

For communities and people in close proximity to a wind power project, what were the reactions before the wind power project was built? How did reactions change after construction?

Based on polling conducted in several states (Texas, Vermont) and countries (Canada, the United Kingdom), support for wind projects generally increases after installation. Many people are still relatively unfamiliar with wind energy and its actual visual and sound impacts before a project, and discover after the project is built that the impacts are not as significant as first believed. In areas where pre-construction support was high, it remained high after construction. In areas where pre-construction support was low or medium, it increased following project completion. Some examples demonstrating the magnitude of opinion changes and additional references are included in an article prepared by the American Wind Energy Association (http://www.awea.org/faq/survpub.html).

Given the current wind energy technology, how much sound, measured in decibels (dBA) can be heard at various distances from the base of a turbine? At what frequency(s) do wind turbines emit sound?

Sound from wind power projects varies by specific site depending on wind direction, speed, and atmospheric conditions. Wind projects typically emit two types of sounds: a swooshing sound from the blades and a mechanical sound from the gearbox and generator. During periods of high winds, the natural sound of the wind itself often drowns out any sound from the wind turbines. Sounds from wind turbines are most noticeable under low wind conditions.

Wind turbine manufacturers have implemented a number of modifications to reduce turbine sounds to their current low levels. Modifications include limiting rotor tip speeds, modifying the airfoil shape, and utilizing helical mesh gears within the gearbox. Sound levels from turbines are approximately 43-45 decibels as measured at 820-1,150 ft (250-350 m) from the turbine. Putting this sound level in perspective, the threshold of

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hearing is 0-10 decibels, a soft whisper is 30 decibels, ambient sounds in a quiet suburban residential area are 48-52 decibels; ambient sounds in an urban residential area are 58-62 decibels. Additional information on sound from wind turbines can be found in the following documents:

- Wind Energy and Noise, http://www.awea.org/pubs/factsheets/WE_Noise.pdf
- Noise from Wind Turbines: The Facts, http://www.bwea.com/ref/noise.html

For more information on wind energy sound emissions, please refer to Section 10.2: Sound Emission.

Can setbacks be effective in insulating the public from turbine/project sounds and visual impacts?

Distance is a very effective tool for sound attenuation. For this reason, wind turbines are generally located approximately 1,000 ft (305 m) or more away from residences.

Although wind turbines can be visible from great distances, the local topography and vegetation can block them from view. Visual aesthetics is a subjective topic; some people like the turbines, others feel they ruin the natural scenery. Most wind developers try to be sensitive to these issues while ensuring that projects are developed in a manner that is economically viable in the long term.

For more information on sound and visual impacts and mitigation strategies, please refer to Section 10: Other Environmental Impacts.

Are setbacks sufficient to minimize the chance that turbines will cast shadows on nearby dwellings?

Yes. As part of project layout analysis, computer models can calculate the shadow zones around wind turbines during different times of the day and during different seasons to calculate the affected areas. The position and direction of windows in a structure are input and the chance of a cast shadow or shadow flicker from moving blades can be determined. These calculations provide a worst case analysis since the models do not account for the blocking effects of trees and structures. The distances calculated in the models, along with an understanding of any potential blocking effects, can be used in determining appropriate setbacks.

For more information on shadow flicker, please refer to Section 8.2: Public Health and Safety.

Are turbines required to have lights?

Yes. The Federal Aviation Administration (FAA) requires any structure over 200 ft (61 m) to have aviation warning beacons. Rules for structures near airports are more stringent. The local or regional FAA office decides the light color, number of lights per project, flash pattern, etc. For wind turbines, the beacon is typically placed on top of the nacelle. The blades are not lit.

For more information on turbine lighting, please refer to Section 10.1: Aesthetics and Viewshed Analysis.

16.3. Environmental Impacts

Have birds been killed by wind turbine blades? How are flight paths of migratory birds affected?

Birds have been killed by flying into wind turbine blades and the support structure. The most publicized examples are in Altamont Pass, California. Since that time, equipment designs have changed (horizontal-bar lattice towers have been replaced by tubular towers or angled-bar lattice towers which reduces perching and nesting space), blade speeds have been reduced, and environmental considerations during the siting process have become much more rigorous. The wind industry is working with environmental groups, federal regulators, and other interested parties to develop methods of measuring and mitigating wind energy's effect on birds. Migratory birds are less of a concern than raptors, but flight paths of migratory birds should also be considered

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in a site assessment. The wind energy industry has taken significant steps toward quantifying and supporting research on avian mortality.

For more information on possible bird and bat impacts, please refer to Section 9: Bird and Bats: Impacts and Surveys.

How does mortality of birds at wind power projects compare to mortality associated with other commonly accepted human activities?

Even at Altamont Pass, only 1-2 birds per turbine are killed each year in the U.S. With approximately 26,600 turbine towers (both large- and small-scale), the total avian mortality equates to approximately 26,600-53,200 deaths per year. Tall communication towers kill approximately 4 million birds a year. Approximately 60 million die in collisions with vehicles, another 98 million with buildings and windows, and another 100+ million due to housecats and feral cats.

Additional information is available in the following reports:

- Comparative Impacts of Wind and Other Energy Sources on Wildlife, http://www.awea.org/pubs/factsheets/wildlife.pdf
- Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States, http://www.nationalwind.org/pubs/default.htm

For more information on possible bird and bat impacts, please refer to Section 9: Bird and Bats: Impacts and Surveys.

How do wind power projects affect the habitat of ground animals?

Increased traffic and noise, particularly during construction, can temporarily disrupt wildlife use of the immediate area. During operation, the increased presence of human activity may alter animal behavior; however, these effects would be minor compared to other forms of development. A detailed study at a wind project in Vermont indicated that the installation of a wind project did not affect the bear populations in the area. Another study of elk conducted at a project in Wyoming did not discover displacement effects and noted that use of the area had not declined.

For more information on environmental impacts, please refer to Section 9 and Section 10.

Do the turbines produce hazardous wastes?

Turbines require lubricating oils, grease, and hydraulic and insulating fluids (within electrical transformers). When spent, these materials are handled and managed in accordance with state and federal hazardous materials and solid waste regulations.

Lubrication oils are returned to the suppliers for recycling. Otherwise, properly maintained wind projects do not produce hazardous waste nor emit radiation, particulate matter, or greenhouse gases.

How much pollution is displaced by the operation of a 1,000 kW (1 MW) wind turbine over a typical turbine life span of 20 years?

Assuming that a 1 MW turbine operates at a 30% capacity factor over its 20-year life span, the turbine would produce 3,066 MWh/year or a total of 61,320,000 kWh in 20 years. Using the average fuel mix in New York State for coal, natural gas, and oil for the year ending 2002 to quantify emissions, 0.892 pounds of CO2, 0.003 pounds of SO2, and 0.0012 pounds of NOx were produced for 1 kWh of electricity.

Therefore, in one year a 1 MW turbine displaces:

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- 2,344,176 pounds of CO2,
- 7,884 pounds of SO2, and
- 3,154 pounds of NOx

Over the 20-year life of the turbine, the amount of pollution displaced is:

- 46.9 million pounds of CO2,
- 157,680 pounds of SO2, and
- 63,072 pounds of NOx.

16.4. Health and Safety

Are there industry standards for setbacks from housing, roads, property lines, and power lines?

In general, setbacks used in wind power projects vary from 500 to 1,350 ft from homes, structures, sensitive environmental areas, etc. Setbacks from roads and non-participating property lines differ, depending on the ordinance or conditional use permit, but are often equal to the maximum tip height, maximum tip height plus some extra distance such as 100 ft, or a multiple of maximum tip height.

For more information on wind farm design, please refer to Section 8.2: Public Health and Safety.

Are such setback distances sufficient to minimize the chance of public injury and loss of private and public property value?

Yes, long-term operation experience in California has demonstrated that properly sited projects that employ adequate setbacks have a low risk of public injury and loss of private and public property. No member of the public has been injured or killed from an operating wind energy project. Other forms of energy generation pose higher levels of risk, particularly when factoring in exposure to air pollution.

For more information on wind farm design, please refer to Section 8.2: Public Health and Safety.

Can turbine blades become coated with ice? If the potential for icing and ice throws exists, are there ways to protect the public or reduce the risk of injury to the public from ice being thrown from turbine blades?

Icing conditions can occur in areas of New York and these conditions are typically evaluated as part of the project development process. The distance ice may travel from a blade is difficult to document since icing events are rare (in comparison to the total time in a year), it is difficult to document/witness a true ice throw, and the size of the ice will influence the distance. Project operators note that large pieces of ice (that are considered potentially hazardous) tend to fall within the 1-2 rotor diameters of the turbines (approximately 250 to 500 feet). Risk of injury from potential ice throws is managed in several ways including the following practices:

- Blade Design – Manufacturers and blade designers continue to research materials and methods that could be employed to reduce the possibility of ice accumulation and subsequent throws. Design features such as the use of black blades and the applications of special coatings have been used at some cold weather sites. Some turbine designs feature a vibration sensor to detect rotor imbalance caused by unsymmetrical ice accumulation.
- Turbine Controls – If ice accumulates on turbine blades, it also affects the wind speed and direction sensors. If the sensors become iced up, the control computer stops turbine operation automatically. Icing on the blades results in reduced performance, unusual loads, or vibrations that are detected by the

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control system and trigger an automatic stop. If the turbine is not operating, ice from the blades, nacelle, and tower falls to the ground in the immediate vicinity of the machine.

- Operator Intervention – Project operators can halt operation of certain turbines (or the entire project) during icing events. Provided there is some wind available, site operators can manually 'bump' the rotor for a few slow rotations to make the blades flex and relieve some of the ice build-up.
- Safety Zones – Establishing adequate setback areas from inhabited buildings, roads, and power lines significantly reduces the risk of injury or damage in the event of ice throws. There is a limited body of research into quantifying ice throws probably due to the fact that there have been no reported injuries associated with these events.

The people most at risk from falling ice are the site personnel, as most ice falls from the blades, nacelle, and rotor near the base of the tower. Most project developers have strict rules established for personnel and operations during an icing event to prevent worker injury and to protect the public.

For more information on health and safety, please refer to Section 8.2: Public Health and Safety.

Have blades or other components ever broken off?

Although there are a few reported instances of blade throws during the early years of the wind industry with old technology, these occurrences are now rare, due in large part to better testing, design, and engineering of commercial wind turbines. In October 2008, a Suzlon wind turbine located near Wyanet, IL suffered a blade failure. The cracked blade fell approximately 100 to 150 ft from the base of the turbine in an adjacent cornfield. To address the blade crack problem, the manufacturer has announced a retrofit program to fix all affected blades.

For more information on health and safety, please refer to Section 8.2: Public Health and Safety.

Have turbine towers ever collapsed and if so, how have they failed and how far have they fallen?

Although turbine tower collapses are rare, there are reported instances of tower collapse due to a number of unique circumstances. The reasons for collapses vary depending on conditions and tower type, but have included blade strikes, rotor overspeed, manufacturer defects, cyclonic winds, and poor or improper installation or maintenance (torque bolts). In cases where information is available, the majority of the rotor, tower and nacelle have fallen to within 1 to 2 hub height distances from the base. In March 2009, a GE wind turbine at the Noble Altona Wind Park in upstate New York collapsed. A subsequent investigation revealed the collapse was caused by faulty wiring that prevented the turbine from shutting down. Other turbines on the farm were not affected by the same wiring anomaly.

For more information on health and safety, please refer to Section 8.2: Public Health and Safety.

What safety provisions are used to keep the public safe?

Wind turbines have locked doors at the tower base and on all transformers precluding the ability of a non-authorized person to access the operating equipment. Substations and interconnection points are always fenced. A fence may be used around the O&M building, depending on its location.

Some communities have established information kiosks along roadsides to channel curious sightseers out of road traffic and into an area that is a safe distance from the turbines.

For more information on health and safety, please refer to Section 8.2: Public Health and Safety.

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Have any wind turbines ever caught fire? If so, what is the typical response protocol? How is public safety maintained?

In extremely rare circumstances, wind turbines have caught fire. Since the public typically does not have access to the private land on which the turbines are positioned, the safety of the general public is not compromised. If a wind turbine catches fire, staff personnel and fire personnel maintain a safety area around the turbine and protect against the potential for spot ground fires until the fire is out. Power to the section of the project with the turbine fire is also disconnected.

For more information on health and safety, please refer to Section 8.2: Public Health and Safety.

16.5. Site Exploration

What criteria are used in determining the location of a wind power project?

The key criteria include an adequate wind resource, sufficient quantity of land, appropriate terrain features and orientation to prevailing winds, close proximity to transmission lines (with capacity to receive the power), limited or manageable environmental issues (e.g., sensitive habitats or species), manageable historic and cultural issues (e.g., preservation areas or artifacts), the presence of an energy purchaser, conducive state or federal policies to encourage development, and a supportive community and landowners.

For more information on site identifcation, please refer to Section 12: Developer Site Identification.

What is the first task the developer performs when scouting out or exploring a location for a wind energy project?

There are a number of first tasks that developers and prospectors conduct when considering new areas for a wind energy project. The key activities include a review of existing wind resource information (existing measurements, wind atlases, meteorological knowledge, etc.); an evaluation of land, elevation and topographic features on maps; and an assessment of energy market conditions, rules, and policies. Site surveys are then performed to identify properties of interest, determine the proximity to transmission lines, inspect existing wind measurement equipment, evaluate area vegetation and land forms for signs of wind-influenced growth patterns or erosion, and assess compatibility with existing land uses.

If the information indicates the site is promising for wind development, developers, then begin talking to landowners about their interest in hosting wind turbines and pursue installing wind monitoring equipment. Other tasks include discussions with the local utilities and/or transmission line owners to determine if there is capacity on the transmission lines in the vicinity and to identify where wind generation could be added to the system.

For more information on site identifcation, please refer to Section 12: Developer Site Identification.

Can wind power projects be built in stands of trees?

Yes; however, tree removal will be required for the access roads, turbine assembly areas and final locations, the power collection system, and the substation. Wind projects in wooded areas exist in Vermont, West Virginia, Pennsylvania, and Tennessee. The wind resource will be impacted by the trees. Project developers might use taller towers to reduce the impact of the trees on the wind speeds experienced by the turbines. Tree removal for the express purpose of improving the wind resource is not a common practice.

For more information on site identifcation, please refer to Section 12: Developer Site Identification.

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16.6. Land Control and Landowner Information

It is often said that wind project development can coexist with pre-project land uses, thereby preserving the multiple uses of the land by the landowner (i.e., farming and ranching). How much space does a typical wind energy project utilize during construction and during operation? If a project were sited on forested land, how much land would be cleared for construction work areas? How much could be reclaimed?

In open, flat terrain, utility-scale plants require approximately 30-80 acres/MW for spacing, setbacks, etc., but only about 5% of the land is used for construction and 2-3% of the land is used for the turbine structures, facilities, and access roads during operation. A wind project located on a ridgeline in hilly terrain may require less space, approximately 20 to 40 acres/MW depending on the terrain features. Upon project decommissioning, the entire area can be reclaimed.

Other than loss of land for construction work areas and long-term operation and maintenance, does a wind power project have any other affect on crop yield?

No. Any land not directly used for turbine structures, facilities, and access roads is available for other uses, as long as it does not significantly decrease the wind resource at the project.

For more information on wind energy construction impact, please refer to Section 10.5: Site Condition and Construction Impacts.

What information resources are available for landowners considering leasing their land to a wind power project?

On-line resources include the following:

- U.S. DOE's Wind Powering America web site contains a detailed compilation of reference materials for landowners to become better educated about the development process. http://www.eere.energy.gov/windandhydro/windpoweringamerica/.
- Green Energy Ohio has assembled a "Tool Kit for Wind Energy" document on wind energy development. Specifically Section 10: Wind Power for Farms contains a collection of FAQs and links to other information about land leases written specifically for the landowner either wanting to bring wind to their property or facing negotiations with a wind developer. http://www.greenenergyohio.org/page.cfm?pageId=100
- Windustry, a non-profit organization, provides landowner testimonials discussing all aspects of wind energy project impacts at www.windustry.com. A specific section under easements includes a bullet list of questions for landowners to ask developers and an explanation of easement agreement clauses. Another document, Harvest the Wind: A Wind Energy Handbook for Illinois, produced by Windustry is available at http://www.iira.org/pubsnew/publications/IVARDC_Reports_614.pdf. This document contains both generic and Illinois-specific information on wind energy development. Chapter 3 focuses on the land acquisition process.

How does the landowner ensure that the land can be returned to farming or other uses?

Decommissioning clauses in lease agreements typically require all visible traces to be removed, and concrete removed to a depth of 3 ft or covered with like soil material to a height of 3 ft. Provisions for returning the land to its original state may also be included and defined in the land lease agreement. Complete foundation removal

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is not viable since some foundations can extend 30 ft into the ground. As long at the top working layer of soil is returned, farming or other uses can be restored.

For more information on wind energy construction impact, please refer to Section 10.5: Site Condition and Construction Impacts.

How do landowners protect themselves from a wind project that becomes abandoned by the developer or owner/operator?

Due to sizable investments, outstanding loans, contractual energy delivery requirements, and public policy, wind energy projects are not facilities that can easily become abandoned. The value of the known wind resource, equipment, a power sale contract, and an interconnect agreement would attract new owners. At a minimum, the lending banks would be highly motivated to see the project continue operation if for no other reason than to receive repayment of their loan.

A landowner's main form of protection against an abandoned project is the decommissioning clauses and requirements in the land lease agreement. In areas where local permitting authorities establish decommissioning requirements, landowners are additionally protected since the government has a legal obligation to intervene.

Additionally, local governments or lending banks often require projects to establish decommissioning escrow accounts or post a letter of credit or bond to pay for decommissioning. At a minimum the equipment will have scrap value that (depending on the cost paid for scrap steel) could be sufficient to pay for the entire decommissioning process.

For more information on turbine decommissioning, please refer to Section 6.5: Operation and Decommissioning.

What obligations does a wind power project developer have in advising landowners to seek their own counsel?

The developer has no specific obligation to advise landowners to seek their own counsel. As with any contract negotiation, it makes good sense to have a lawyer knowledgeable in the particular field review the contract. Legal costs may seem prohibitive and some project developers may be willing to help offset some of the legal costs; however, the landowner should select counsel that can provide independent, objective advice.

What is the relationship between the wind power project developer, project owner, and landowner?

The relationship between the developer/owner and landowner is contractually defined through legal agreements including documents such as a met tower agreement, Option Agreement, or Land Lease Agreement. The wind resource above a property is treated similarly to minerals or gas resources in the ground and lease agreements define the legal rules, rights and compensation associated with the resource and land to which both parties agree. Local governments are not a party in these agreements and have no oversight jurisdiction on the agreement per se. The first two agreements noted above define the relationship during the initial wind testing/assessment phase and may have a shorter duration (in the range of 2 to 5 years). These are typically exclusive agreements (i.e., preventing the landowner from leasing land to more than one developer) and can place limits on the type of information the landowner is allowed to transfer to others. The Land Lease defines the relationship during construction, operation, and decommissioning of the actual project and typically has a term of 20 years with options for extensions. The Met Tower and Option agreements are usually between the developer and the landowner while the lease may be between the project owner and landowner.

Land leases may also be necessary for other project components such as access roads, power lines, met towers, and operations and maintenance (O&M) facilities. The costs developers/owners are willing different than for the

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wind turbines. Finally, project developers/owners may be interested in leasing neighboring land to help control the types of tall structures that can be built on land surrounding the wind project. This type of wind easement lease helps ensure that the project is adequately exposed to a good wind resource for the project's operating life.

16.7. Lease Agreements

Clean and renewable, utility-scale wind power is more than just the fastest growing sector of the energy industry. For many farmers with windy land, it's also the latest cash crop. Thanks to the strong, steady winds that blow across large portions of New York, many residents may have a valuable wind resource associated with their property.

Although residents can try to develop this resource independently, building a utility-scale wind farm is a complex, expensive undertaking. Many landowners have found it preferable instead to enter into agreements with wind developers who have the experience and financial backing necessary to install and operate a wind farm. Wind developers have land liaisons that may approach landowners for the purpose of initiating leasing or Option Agreements. Typically, a number of questions arise about how such an agreement would affect the property.

This section answers the most common questions landowners have about wind development and gives guidance as to how the issues that concern them should be addressed in an agreement between the landowner and a developer. These are only general guidelines. A wind agreement is a legally binding contract that may impact the landowner's property for years to come. As such, an attorney should review any proposed legal document. For additional information regarding leasing, please refer to Section 13: Land Acquisition.

How long will the agreement last?

There are four primary stages in the life of a utility-scale wind farm: pre-development, construction, operation and maintenance, and de-commissioning. The developer will need access to the property throughout the life-cycle of the project, but the kind of access—the nature of the rights required—will be different at each stage. Thus the type of agreement and its terms—from duration of the contract to payment structure—will depend on which stage of development the wind farm is in. **Error! Reference source not found.** provides a visual epresentation of these stages and the required agreements.

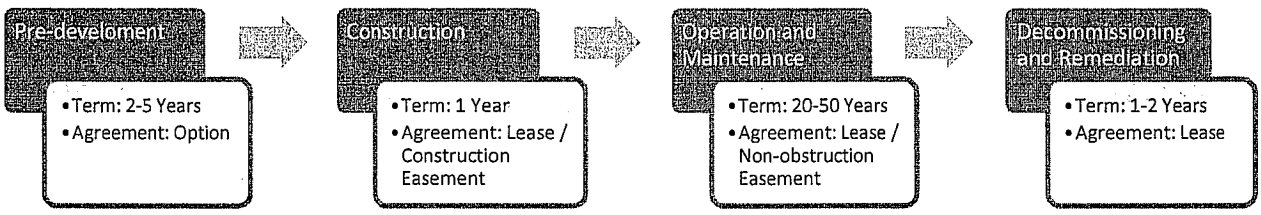

Figure 35 –Four primary stages of wind project development and required agreements.

Pre-Development Phase

During this phase the developer lays the groundwork for the proposed wind farm and begins to approach landowners about leasing property for the wind farm. In the short-term, the developer will need to exercise site

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control in order to establish the technical and economic viability of the project. Overall, this phase can last from two to three years or longer. Key aspects of the pre-development process include:

Gathering wind data. The developer will need permission to erect a met tower with anemometers and wind vanes to test the strength and direction of wind that blows across the potential project land. At least one years' worth of wind data will generally be needed. The developer will be unable to get financial backing for the project unless it is able to show that it has access to good, windy land.

Negotiate power purchase agreements. Once a good wind resource is established, the developer attempts to negotiate a long-term contract, called a power purchase agreement or PPA, with a buyer (usually a utility or power marketer) for the power the proposed wind farm will produce. Although the PPA is between the developer and the power purchaser, it will also have an impact on landowners, as it can help determine whether the project will be constructed. While the PPA is important to financers, some projects enter the system as merchant projects. These projects bid power into the day-ahead power market and are secured with hedge funds.

Environmental permitting. The developer may need to obtain permits from various local, state and federal agencies before construction begins on the project. The developer will need access to the site to conduct necessary environmental reviews and monitoring programs, and may seek certain assurances that the landowner will assist in this effort.

In order to assure that these pre-development steps can be carried out, the developer will enter into a signed options agreement. Under this contract, the landowner agrees to give the developer the exclusive right to enter into a long-term lease agreement for the property if the wind farm moves forward. A copy of this future long-term agreement is typically included in the options agreement as an exhibit. Landowners should compare it with any other offers they might receive; once they sign an options agreement with one developer, the landowner won't be able to lease the wind rights to another developer until and unless the first one decides not to exercise its option or the options period expires.

The options agreement should remain in effect long enough to give the developer reasonable time to conduct the necessary studies to determine the project's feasibility, but shouldn't tie up the land for more than a few years. Terms of two to five years are typical, and landowners should negotiate a provision that will allow for withdraw from the agreement if the developer does not begin construction within a certain number of years. If the options period is extendable, landowners should make sure that the extension isn't automatic.

> *Contract tip:* Landowners should consider negotiating for a copy of the wind and meteorological data the developer will be collecting from the land during the options period and/or short-term lease agreement. If the developer doesn't exercise its option, this information can be shown to future developers as a demonstration of the property's wind resource potential.

Development and Construction Phase

If the wind farm moves forward, the developer will exercise its option and the long-term lease agreement will come into effect. Most wind leases are for terms of 20 to 50 years, with a 20- to 25-year term allowing for the lifecycle of one project, and a 50-year term allowing for two, successive projects. If the lease is extendable, the landowner should make sure that the extension isn't automatic; they may want to negotiate new financial terms after the first term expires.

Many wind agreements contain a clause that specifies that the developer will pay the landowner a fixed fee during the construction phase. The contract should specify what constitutes the beginning of construction. Additionally, because there may be a lag between when the developer commits to the project and the start of

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construction—and thus, the start of rental payments—some developers pay landowners a commitment bonus of a few hundred to a few thousand dollars.

Depending on the size of the project, construction itself may take from six to nine months and possibly longer. This will probably be the most active and visible phase of the project: Construction crews will be on the property on a daily basis, excavating roads and turbine foundations, digging trenches to lay cable, and operating the heavy equipment to install the large turbine components. The payment terms for this period should be sufficient to compensate for any loss of income the landowner may incur as the result of an inability to farm portions of the property. The lease agreement should also provide for compensation in the event any crops are damaged or destroyed as a result of the construction process.

> *Contract tip: The large cables that will carry the power generated by the turbines should be buried at least three feet below the ground's surface to accommodate farming needs. Be sure the agreement specifies the depth to which the cables should be buried on the property.*

The New York State Department of Agriculture and Markets has developed a comprehensive set of *Guidelines for Agricultural Mitigation for Wind Power Projects*. These guidelines set forth best practices in the siting, construction and remediation of wind farms in County adopted, State certified agricultural districts. Although these guidelines do not have the force of law, the landowner may wish to refer to them before entering into negotiations with the wind developer. A link to agricultural mitigation guidelines are provided in the additional resources section at the end of this Chapter.

Operations and Maintenance Phase

After the wind turbines and other wind farm infrastructure are installed, the project begins its useful life, generating energy. Most wind turbines have an operational life of 15 to 25 years. During this period, the farm operation and the wind power project will co-exist; this will typically be the least disruptive phase of the project from the landowner's perspective. The developer will, periodically need to access the land to maintain the project's equipment and to make any necessary repairs.

Depending on the payment structure in each particular contract, the way in which landowner payments are calculated in this period may differ from how they were calculated during the construction phase. If so, the landowner should make sure that the agreement specifies what constitutes the commencement of operations.

Decommissioning and/or Contract Renewal

At the end of the wind farm's life the developer should remove and dispose of all the project's structures. The lease should contain a provision specifying the developer's duties during this decommissioning period. These duties are discussed in more detail below.

If the developer has an option to renew its lease, it may choose to do so at this time and build a new project on the property using the latest technology. The landowner should be sure that the original agreement gives the right to renegotiate the financial terms for the new project.

How much land will the developer need? Will I still be able to farm my land?

Large wind projects require 30-80 acres of land per MW to ensure adequate exposure to the wind and proper setbacks from homes and roadways. Thus, a single wind farm may extend over hundreds—even thousands—of acres. However, the wind turbines and other structures that comprise the wind farm will actually occupy only a small portion of that area, usually 5% or less. A typical rule of thumb is that a 750 kW turbine will take up about a quarter acre and a 1.5 MW turbine about a half acre.

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Dirt or gravel access roads account for most of the area needed for a wind farm. These roads should be built at the same level as the surrounding farm land to allow easy cross-access for farm equipment. During construction, the roads may need to be as wide as 50 feet to accommodate the turbine and tower components and the large cranes necessary for installation. After construction, the roads will need to remain wide enough for the developer's service vehicles, usually pickup trucks or vans.

> *Contract tip: The agreement should specify that the developer is responsible for maintaining these roads. It should also give landowners the right to use them.*

In addition to the land occupied by the access roads, space will be needed around each turbine for a 10x12-foot concrete pad for an electrical transformer and a 30–60-foot-diameter excavation for the turbine's foundation. Additionally, a substation will be needed to collect the power and step up voltage levels for export to the transmission grid. For a more detailed discussion of land use requirements, please refer Section 12.3: Land Area Requirements.

The property that's not actually occupied by the wind farm's equipment should be as suitable for agriculture as always. In fact, many landowners are able to farm and graze livestock right up to the turbine pads and other physical structures of the wind farm. Agreement should specify which uses the landowner intends to reserve for their property.

> *Contract tip: The lease agreement should explicitly provide for all interests reserved by the landowner. Common reservations include: farming, grazing, mineral extraction, and hunting. Note, however, that hunting may be an issue for the wind developer concerned about damage to turbine blades or other system components.*

Although only a small portion of the leased property will actually be used for the wind farm, the developer will probably want the right to develop all of it. This is because at the time the agreement is being crafted, the developer will not yet know specifically where the best winds are, and thus the optimal location for each wind turbine. Wind speeds can vary dramatically, even over just a few acres. And because the power a wind turbine produces is a cubic function of wind speed, even a slight increase in wind speed will result in a large increase in power—and revenue. Thus developers want to tie up as much land as possible at the outset to make sure they'll have access to the best wind sites on it.

Nevertheless, care should be taken to limit the land subject to the agreement to just the area that is reasonably necessary for the wind farm. The agreement should define the plot(s) that will be needed for the wind farm with as much precision as possible. It should specify any special site features, such as farm structures or certain fields that are off limits; and it should take into account buffer zones that may be necessary to prevent noise and visual impacts from the wind farm from interfering with the landowner's enjoyment of their property and that of their neighbors. Additionally, if the land is used for agricultural purposes, the landowner may want roads and structures to be constructed to minimize crop disruption. Then, within these general constraints, the developer will have discretion in placing the turbines to maximize the wind farm's production.

> *Contract tip: Request permission to review and approve the final project plan. Some developers will grant landowners this right, on the condition that approval will not be unreasonably withheld.*

How much money can I expect to receive?

The amount of money a landowner can expect for leasing wind rights will depend on the location of the property, the wind resource, the value of the electricity, the value of the land for alternative uses, and the availability of other windy sites in the area. Similarly, the amount and structure of payments offered to the

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landowner will vary widely from developer to developer. The following discussion highlights the terms landowners are likely to encounter, along with advantages and disadvantages. *It is important to bear in mind that all of these terms are negotiable; as with any negotiation, the landowner should not feel bound by the terms being offered.*

Option Payments

Under an Option Agreement landowners can typically expect a modest one-time payment, which may be calculated as a base amount, and/or a fee of several dollars per each acre subject to the option.

As previously discussed, during the option period the developer will need to take detailed measurements of the wind on the property. Whether this right is granted in the option agreement or in a separate short-term licensing or lease agreement, the landowner can expect an additional fee per year.

Payments Under the Lease

If the wind farm moves forward and the developer decides to exercise the option on the land, the long-term lease or easement agreement will come into effect. Depending on factors ranging from the phase the project is in to the number and capacity of the wind turbines or other structures on the property, annual payments could range from $300 to $3,000 per megawatt. The payment and rate structure in the particular agreement will determine precisely how much the payments will be and when they will occur.

A number of possible structures can be utilized, each with advantages and drawbacks.

Royalty Payments: Royalty payments are the most common payment arrangement. The developer pays landowners a percentage (usually 1–4%) of the revenue received from the electricity generated by the turbines on the land. Thus, the payments will vary depending on, among other factors, seasonal fluctuations in the wind, the turbines' operating availability, and how much the developer is being paid for the energy produced. This variability can work to as either an advantage or disadvantage, depending on how much power the turbines actually produce in a given period and how much the developer is paid for that power.

> *Contract tip: The lease agreement should specify how often payments will be made and how revenue is to be measured: Negotiate for the right to periodically review the data on which the revenue calculations are based and to have the payments due certified by an auditor.*

Royalties Plus a Guaranteed Minimum Payment: Here, in addition to a percentage of the revenues, landowners will also receive a guaranteed minimum payment. Thus, even if the turbines experience operating difficulties or if the winds are lower than expected, there is a guarantee of some revenue. This arrangement allows landowners to share in the wind farm's prosperity, while offering some protection against possible problems in its operations.

The text box below illustrates the royalties that might be generated from a 5 megawatt wind farm:

How much can I expect in royalty payments from leasing my land?

Capacity = 5 MW
Capacity Factor = 25%
Market price = 5 cents/kWh
Gross revenues = $547,000
Royalty = 2% of gross
Total annual royalties = $10,950 or $2,190/MW installed

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Note: The example above is provided to demonstrate the calculations involved in estimating royalty payments, the actual compensation amount will be dependent upon the specific terms of the lease agreement.

Fixed Fee: In this type of agreement, the developer pays a flat, fixed fee on a monthly or yearly basis. The fee can be per turbine, per unit of land, or per MW of installed capacity. Although potentially less lucrative than royalty-based arrangements, fixed-fee payments have the advantage of simplicity (no complicated review of receipts or auditing is required), and payment stability, as a certain amount of money will be received each period. From a national perspective, typical annual fixed-fee payments have ranged from $1,200–$3,800 per MW.

One-Time, Lump-Sum Payment: In this arrangement, the developer would give one large payment up front as compensation for use of the property over the lifetime of the wind project. This has the advantage of putting a substantial sum of money in landowner hands immediately. However, this arrangement generally results in a smaller lifetime payment than would be the case under an annual royalty associated with a successful wind farm because it shifts additional risk to the developer, and because of discounting for the time value of money. Additionally, if the property is sold later, the new owner would acquire the burden of hosting a wind farm without the on-going economic benefits of royalty or fixed-fee payments, making the property less valuable to future buyers.

> *Contract tip: Carefully review the terms of the royalty payment amount to make sure that the percentage is calculated on a base amount of revenues that includes any revenue derived from the sale of the non-energy related output of the wind farm. Renewable energy certificates (also called renewable energy credits or renewable attributes) represent the environmental attributes of electricity produced from renewable energy sources, and are often sold separately from commodity electricity.*

Regardless of the type of agreement and payment structure, the amount received should represent a fair price for the property rights being granting. One way to ensure that a fair deal is being granted is by negotiating a clause within the lease that requires the developer to grant treat each landowner executing a similar agreement with the same favorability. Also, the landowner can request that an inflationary factor be built into the payment agreement.

Are there legal liabilities from construction or operation of the wind farm?

Disclaimer: These guidelines are provided in an effort to assist landowners in understanding the provisions that would be expected in a typical lease agreement. It is strongly recommended that landowners seek legal counsel when negotiation the terms of their lease agreement.

Just as on traditional farms, accidents can happen on wind farms, too. The agreement should contain provisions to protect landowners from any legal liability arising out such accidents.

First, the agreement should explicitly place responsibility on the developer for any damages it might cause to the landowner, the property, or a third party. For instance, if one of the developer's service vehicles were to crash into a section of the fencing, the developer would be required to pay the reasonable cost of replacing the fence.

Next, both landowner and the wind developer will want to be protected from any liability arising from the other's actions. To accomplish this, the agreement should include a mutual indemnification clause. Under this clause, the landowner and the developer agree to absolve one another from any responsibility for damage or other liability resulting from the separate operations on the property.

Finally, the agreement should shield the landowner from liability for any damage or harm the developer's activities may cause to a third party. For instance, the developer might give people, such as potential investors,

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tours of its operations on the property. If one of these people were to trip over a cable or other piece of wind farm equipment and break a wrist, he or she might try to sue not only the developer, but the landowner as well. The agreement should indemnify the landowner against such a suit.

To give effect to all of these provisions, the agreement should require the developer to carry a general liability insurance policy of at least $5 million, on which the landowner is named as an additional insured. As an additional insured, landowners will be covered by the developer's insurance policy. As an additional insured, the landowner will want to check the insurer's rating, a grade which assesses the company's financial strength and ability to meet ongoing obligations to policyholders. The insurance company ratings can be found through resources such as A.M. Best Ratings and Analysis (www.ambest.com). While a rating of A- or higher is preferable, only a few insurance companies provide coverage for wind developers; thus, a developer's choices in insurers are somewhat limited.

> *Contract Tip: The agreement should provide that the developer's insurance policy cannot be cancelled by the developer without prior written notice to the landowner.*

Even if the landowner is named as an additional insured on the developer's policy, landowners will need to maintain their own comprehensive farm liability policy just as held prior to leasing the wind rights. An insurance agent should review the existing policy and the wind rights agreements to determine whether additional coverage is needed. Landowners should consider requesting the developer to assume responsibility for any increase in the insurance premiums as a result of the wind farm operations.

What about damages to my crops?

In general, wind farms are unobtrusive tenants, causing little interference with agricultural uses of the underlying land. There are situations where damage to the crops may occur, particularly during construction or repairs. If a turbine needs to have a blade replaced, for instance, the old blade may have to be removed and set down in one of the fields, flattening crops. The agreement should require the developer to use best efforts to minimize any such harm and to compensate landowners for any damage that does occur.

The agreement should include a crop-damage formulation for determining what would constitute sufficient compensation. For instance, a typical provision would require the developer to pay damages as calculated by multiplying the amount of lost product by the market price for the particular crop in the season in which the crop was damaged or destroyed.

What obligations and duties might the developer have and what happens if the developer fails to live up to them?

The developer's primary duties to the landowner will be to make payments according to the agreement and to avoid interfering unduly with the use of the property. Additional developer obligations may include the following:

- Duty to keep the land free from liens, and to indemnify landowners against any costs, expenses or damages that might incur as the result of a lien.
- Duty to comply with all state, federal, and local laws.
- Duty to obtain and comply with all necessary permits, at no cost to the landowner.
- Duty not to use, store, dispose or release hazardous substances on the land.

If the developer fails to live up to one of its obligations under the contract, it may be in breach of the agreement. The agreement should give landowners the right to sue the developer or pursue any other legal means available to enforce the obligation. Even if the developer breaches one of its obligations, however, the contract will

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remain in effect and landowners will be required to continue to live up to the duties under it (see below), unless the developer is in material breach.

A material breach is one that excuses the non-breaching party from performing its contract obligations. The agreement should specify what events would constitute a material breach. For instance, the developer's failure to make a payment to the landowner when it's due might be a material breach, if such failure continues for a specified period of time after written notice of the infraction has been given by the landowner. Most agreements give the party that's in breach a chance to cure any defects before a breach is considered material.

What duties and obligations might I have as a landowner?

The primary duty will be to allow the developer to construct, operate and maintain a wind energy facility under the agreement without unduly interfering with those rights. Additionally, the duties and obligations will probably also include the following:

- Duty not to engage in activities that would impede the wind, cause wind turbulence, or otherwise interfere with the wind turbines' energy production. For instance, the agreement may limit the ability to construct buildings above a certain height, within a certain distance of any turbine.
- Duty to assist and cooperate with the developer in obtaining any permits necessary for the construction or financing of the wind project. This duty should be at no cost to the landowner.
- Duty to cooperate with the developer in obtaining any necessary subordination agreements or approvals from existing lien holders.

What rights and duties might others have in the lease?

Wind farms require considerable up-front capital. Oftentimes a bank or other third-party lender will finance these projects under a mortgage with the developer. The bank will want to take certain steps to protect its investment, including ensuring that it has the right:

- to cure any default of the developer's obligations;
- to foreclose on its lien; or
- to sell and assign the lease to another wind energy operator.

These and other provisions, such as a requirement that the bank be given adequate notice of any default, will be included in the lease to enable the bank to take prompt action and to provide reasonable assurance that the wind farm will continue to operate.

How do I protect my interests when the wind farm ceases operation?

Even at the end of the project's life, much of the wind farm's equipment will still be valuable, and for this reason, the project developer or its successor is unlikely to leave it sitting idle on the land. Nevertheless, the lease should stipulate what duties developers will have when the agreement comes to an end. Usually, these duties will include removing the turbines, towers, transformers, and all other structures that protrude above ground. The developer should also be responsible for removing the tops of the turbine foundations to a certain depth below the surface; the bulk of the foundations, however, will remain in place, as will all the underground cable. Removing these underground structures would be more disruptive than leaving them in place. Unless otherwise stipulated, the roads, too, will remain.

> *Contract Tip: Some developers may provide a bond or letter of credit or otherwise place money in escrow at the beginning of the project to ensure that funds will be available to pay for decommissioning. If the agreement presented to the landowner does not already require the developer to take similar steps, negotiation of such a requirement should be considered.*

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Will leasing my wind rights affect my participation in government farm subsidy or conservation programs?

Allowing wind development on the property may void or otherwise impact landowner's participation in government farm subsidy or conservation programs. Landowners who participate in such a program can contact the program's local administrator to determine the impact before entering into an agreement with a wind developer. If the wind agreement would violate any restrictions under the program, the landowner should consider negotiating a clause that would require the developer to add compensation for any lost government payments or the imposition of any penalties.

What about property taxes?

Under existing New York State law[44], the assessment of additional property taxes resulting from an increase in the value of the property as a result of the wind energy development may be exempt for a period of 15 years. There are three important limitations that should be considered during negotiation of the lease agreement.

- The exemption is at the discretion of the local taxing jurisdiction; although local taxing districts have generally granted the exemption this has not always been the case.
- The current exemption is set to expire on December 31, 2010. Landowners negotiating lease agreements should carefully evaluate the risk of this tax exemption not being renewed.
- The operating life of the wind turbine may exceed the tax exemption period.

The agreement should specify who would be responsible for any such increase. Generally, the wind developer takes responsibility; however, developers in New York have been hesitant to do this. If property taxes associated with the value of the wind farm remain with the landowner, this should be considered in negotiating the terms of payment.

Similarly, the New York State agricultural district law[45] allows owners of eligible land to file for Agricultural Value Assessment on their property. This designation may be advantageous from a tax perspective, because the value of the land is based on its soil quality and agricultural value rather than on its market value or other local criteria. A penalty of 5 times the tax savings for the last year of participation (plus an interest charge) is imposed when the land is converted to non-agricultural use. Placement of wind turbines on the subject property will probably constitute a conversion from agricultural to commercial use and trigger the penalty provision. Landowners are urged to consider the potential impact of this rollback on the economic value of leasing their wind rights.

Landowners may currently be taking advantage of one of the many other tax credits, exemptions and reduced assessments that could be affected by wind development. These include:

- Reduced assessment for Woodlots over 50 acres (Form 480-a)
- Farm Property School Tax Credit (Form IT-217)
- New York State Investment Tax Credit (NYIC Form IT-212)
- Real Property Tax Credit (Form IT-214)

Again, before entering into a lease agreement, landowners should consult with an attorney and possibly an accountant. Other good sources of information on these tax benefits and actions which may negate them

[44] New York State Real Property Tax Law, ¶487. For a summary of the property tax exemption afforded by this law and its fiscal impact on state school aid please refer to Pace Energy Project, "Fiscal Implications of Property Tax Exemption for Wind Projects on State School Aid Formula" (June 2004), available at < www.powernaturally.org >.
[45] New York State Agriculture and Markets Law, ¶300.

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include the county Department of Real Property Services or the local Cornell Cooperative Extension. Several helpful publications are also available on the New York State Office of Real Property Services website at http://www.orps.state.ny.us/.

16.8. Permitting

What types of studies are typically required by permitting authorities during their review of wind power project development?

The types of studies required by permitting authorities vary depending on the local land use regulations, state regulations, type of land impacted (state, federal, etc.), and sources of project funding. Depending on the specific conditions, permitting approval and study requirements can range from a building permit to a detailed Environmental Impact Statement. Typically, project developers prepare project documentation or assessments that examine the potential impacts on air, water, visual resources, wildlife, land use, sound levels, and health. Other studies may be required as indicated by the regulating authority and specific site conditions. Based on the content and completeness of the project documentation, local authorities may decide that they have sufficient information to make a ruling on the project.

For more information on wind energy permitting, please refer to Section 14: Permitting.

16.9. Construction

Vehicles from heavy construction operations, such as a wind power project, could potentially damage local and county roads. Have wind power projects ever helped the locality maintain roads during construction?

If road damage is a potential problem, the owner/developer works with the locality to address those concerns and mitigate impacts. Wind power projects have been required to make road upgrades where the existing infrastructure has not been adequate for the truck transport requirements. Payment of the costs is negotiated with the local governments.

For more information on wind energy project construction impacts, please refer to Section 10.5: Site Condition and Construction Impacts.

Once construction is complete, will the construction areas, including construction roads, be restored to their original condition?

Those portions of lay down areas not needed for plant operation are usually restored to the original condition. Roads built for construction are typically left in place and used as access roads to the project site and turbine locations. The balance-of-plant construction contractor is responsible for this work. Typically this activity is included in the scope of work in the construction contract, and is incorporated as a part of the construction loan. Some locations require removal of temporary roads and soil decompaction and restoration.

For more information on wind energy project construction impacts, please refer to Section 10.5: Site Condition and Construction Impacts.

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16.10. Electricity

If I purchase wind power, do the electrons actually flow to me? If not, where do they flow to and how can I claim that I am getting the environmental benefits that I paid for?

Electrons flow along the path of least resistance, which means they will flow to the closest load. Electrons created by wind power that are delivered onto a local transmission line will be drawn to high loads such as cities and large manufacturing facilities. But a portion of the electrons are also drawn into the local distribution system to serve smaller loads like street lights, homes, and shopping centers. There is no physical way to force electrons generated by a certain energy source to be delivered to specific locations via the power grid. The only way to guarantee that consumers receive electrons from a renewable energy source is to have a system installed on their side of the utility meter.

Accounting of wind power generation is based on meter readings at the project and at the customer's location. Certification programs such as Green-e (www.green-e.org) and the Green Pricing Accreditation Initiative (www.resourcesolutions.org/greenpricing.htm) have been created to audit and verify that accounting practices of green product suppliers truly deliver the green energy purchased by customers.

What are the real markets for electricity generated from wind energy?

Markets for wind energy are driven by a number of different factors including the following:

- Natural increases in electricity consumption – Electricity consumption increases continually as population increases and the use of electrical consumer goods expands. In general, the rate of electricity demand slows when economic activity slows and increases when economic conditions improve. The retirement of older generation plants also results in an increased need for new electricity sources. Utilities must meet this growing demand by adding new generation or by energy conservation. Wind energy competes for these additions with conventional generating technologies such as coal, hydroelectric, and natural gas. Adding wind and other renewables to the generation mix has value because it diversifies the generating technology utilized (thereby reducing risk), reduces the impact of fuel price volatility, does not add to air pollution or have waste disposal concerns, helps improve public perceptions, and can be installed relatively quickly to meet unexpected needs.
- Response to public policy – Policy initiatives in over 20 states across the country and within the Federal government have created new markets for wind energy by requiring utilities, and other electricity suppliers, to include renewable energy in their generation portfolios. These changes have primarily occurred as part of the utility deregulation process as policy makers have recognized that renewable energy sources have system benefits and that existing market rules are biased toward conventional generating options. New market rules are helping to expand the existing market for wind power. Additional information on state renewable energy incentives can be found at www.dsireusa.org.
- Customer demand for green power – Customer polls repeatedly show a preference for green power. As a result, many utilities are offering green energy products to build customer loyalty, increase their expertise with new generation sources, and expand their business lines. Wind power provides one response to a growing market for green energy products. Green pricing is an optional utility service that allows customers to support a utility company's investment in renewable energy technologies. Customers typically pay a premium on their electric bill to cover the extra cost of the renewable energy. More than 300 utilities are now offering a green pricing option. Green power can also be purchased from organizations other than utilities.

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A number of large companies have chosen to purchase green power in the U.S. for reasons such as expanding an existing policy of environmental stewardship and obtaining power at long-term, fixed prices. Some of the large corporations that have started to purchase energy from wind farms include Alcoa, Toyota, Lowe's, Kinko's, Pitney Bowes, Lockheed Martin, and Staples. Additional information can be found at http://www.eere.energy.gov/greenpower.

16.11. Economics

Aside from the benefits of reduced pollution, does wind power have other benefits (economic or otherwise)?

Wind power projects reduce pollution through the reduction of fuel consumption necessary for electricity production from other generating options. Expansion of wind energy will reduce our dependence on foreign sources of fuel, as well as reduce the consumption of native, finite sources of fuel such as coal and natural gas. In hydroelectric dominated utility systems, wind energy helps conserve water or can make up for water deliberately released to improve water quality for fish and other water dependent species.

Other benefits include:

- Adding wind energy to the generation mix reduces the impact of rising fuel prices, which in turn lessens the potential for increases to consumer's electric bills.
- Wind projects, through land lease agreements, increase the financial security of local landowners through lease and royalty payments. In many cases, wind turbines on working farms and ranches have helped to provide a stable source of income allowing maintenance of existing operations or expansion into new areas.
- Wind projects expand the local tax base and keep dollars in the community. Payments to local governments (in lieu of taxes) can be hundreds of thousands of dollars or more per year depending on the project size, wind resource, and other factors. For small communities and towns, this can represent a significant increase to funds available for schools, civil works, maintenance of existing services, or addition of new services.

For more information on wind energy project economics, please refer to Section 7: Economic Impacts.

How much capital do current wind projects typically require and what are the sources?

Capital investment varies based on turbine size and project size. Large turbines (like those used in utility-scale projects) can cost between $1,700/kW and $2,300/kW installed, while small-scale turbines cost approximately $6,000/kW installed. A 100 MW project using 67 1.5 MW turbines could cost from $170 to $230 million. Sources of funding include bank loans, bonds, and equity investors. The split between debt and equity can range from 70% debt/30% equity to 50% debt/50% equity.

For more information on wind energy project economics, please refer to Section 7: Economic Impacts.

Can we help to pay for the development and maintenance of wind generated electricity in ways other than through government funding and tax incentives?

Alternative methods for the public to support and pay for wind energy include:

- Purchasing green energy from local utilities or other suppliers.
- Investment into stock of wind industry companies that are publicly traded.

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- Formation of cooperatives that are whole or part owners in a wind energy project (a common economic model in Germany and Denmark).
- Support of companies that purchase sizeable quantities of renewable energy.

For more information on wind energy project economics, please refer to Section 7: Economic Impacts.

16.12. Incentives

Are utility-scale wind power projects eligible for tax incentives?

At the federal level, wind projects may be eligible for a Federal production tax credit (PTC). This credit has expired and been reinstated several times over the past decade. The availability of the PTC is expected to remain critical to the development of wind power. The owners of utility-scale wind projects are eligible to receive the federal PTC, assuming that they have a large enough tax base to be able to utilize the credit.

The American Recovery and Reinvestment Act passed in February, 2009 provides an additional 3 year extension of the Production Tax Credit (PTC) through December 31, 2012 and introduced additional incentive options including an Investment Tax Credit (ITC) and grant program.

Where can I find information on state and federal incentives for wind-generated power?

The Database of State Incentives for Renewable Energy (DSIRE) maintains a comprehensive website, www.dsireusa.org, which contains detailed information on renewable energy incentives. Other information is available through the U.S. Department of Energy, state energy offices, and local government agencies. NYSERDA maintains information on incentives available in New York.

How do these types of incentives affect the cost of energy?

Most economic incentives are designed to impact either the capital investment (dollars or financing terms) or tax basis. These incentives can lower the principal and interest payment or lower taxes paid by the project, which directly lowers the cost of energy. Most legislative incentives do not directly impact the cost of energy. Their goal is to help establish and/or strengthen the market for renewable energy.

How do the tax incentives for wind energy compare to incentives for other forms of energy generation?

All energy technologies receive some form of support from the federal and/or state government but the type of incentive and its impact on the cost of energy from generation technologies varies widely. Subsidies come in various forms, including payment for production, tax deductions, guarantees, and leasing of public lands at below-market prices. Incentives can also be provided indirectly, for example, through federal research and development programs, or provisions in federal legislation and regulations. The Renewable Energy Policy Project has written several papers on federal energy policy, including a paper that compares incentives for wind, solar, and nuclear power. Links to these documents can be found at www.repp.org.

16.13. Additional Resources

- American Wind Energy Association – Frequently Asked Questions
  http://www.awea.org/faq/index.html
- Grassroots Campaign for Wind power – Wind Energy FAQ
  http://www.cogreenpower.org/landowner.htm

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- Green-e – Renewable Electricity Certification Program
  http://www.green-e.org
- Green Energy Ohio – "Section 10: Wind Power for Farms" – Tool Kit for Wind Energy
  http://www.greenenergyohio.org/page.cfm?pageId=100
- International Electrotechnical Commission – IEC Wind Turbine Standards
  http://www.awea.org/standards/iec_stds.html
- Windustry
  http://www.windustry.com
- National Wind Coordinating Committee
  www.nationalwind.org
- New York State Public Service Commission
  http://www.dps.state.ny.us/articlex.htm
- NYSERDA
  www.powernaturally.org
- Renewable Energy Policy Project
  http://www.crest.org/articles/static/1/binaries/wind_online_final.pdf
- The British Wind Energy Association – Wind Energy FAQs
  http://www.bwea.com/ref/faq.html
- U.S. Department of Energy – Energy Efficiency and Renewable Energy Website
  http://www.eere.energy.gov/greenpower
- U.S. Department of Energy – Wind Powering America web site
  www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/wpa/34600_landowners_faq.pdf

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Power ...Naturally



NEW YORK STATE

WIND ENERGY TOOLKIT

Community Wind Energy

Available at:
www.powernaturally.org
May 2009
NYS Energy Research and
Development Authority
17 Columbia Circle
Albany, NY 12203-6399
www.nyserda.org

Prepared by:
AWS Truewind, LLC

NYSERDA
New York State
Energy Research and
Development Authority

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17. Community Wind Energy Development

While the majority of large wind energy projects in the U.S. are owned by strategic investors who have developed or acquired wind farms as part of an investment portfolio, the concept of community-owned wind energy is growing in popularity. The term community wind refers to locally-owned, utility-scale wind projects that are connected to the grid. This approach to wind energy development allows one or more members of the local community to have a significant financial investment in the project other than through land leases, tax revenue, or other payments in lieu of taxes. The community-owned wind strategy has been used for many years throughout Europe and is the foundation of the Danish wind industry. This cooperative approach to wind development, fostered by incentives offered by the Danish government, is responsible for an immense amount of wind energy development within Denmark. Common examples include installing one large turbine to offset electric purchases at a school, or a municipality or electric cooperative may wish to install a few large wind turbines to offset electric needs at municipal buildings or to supplement the bulk energy purchases of a cooperative on behalf of its customer-owners.

17.1. Development Steps

Developing a community wind project can be a very complex process with various steps and parallel paths. In order to understand the many development steps, www.Windustry.org has compiled a Community Wind Toolbox that details the important steps and critical paths. Windustry states that the time required to complete development of a community wind project depends on several critical path milestones:

- *Securing land with a demonstrated bankable wind resource;*
- *Securing permits and development financing;*
- *Completing negotiation of a power purchase agreement (PPA) with a utility or other off-taker;*
- *Completing interconnection and transmission agreements;*
- *Arranging capital financing;*
- *Procuring wind turbines, transformers, and other components, and contracting for construction; and*
- *Building and commissioning the project.*

The community wind development steps presented above are not in sequential order; certain steps will take longer than others and need to be started at different times to ensure continuous progress and success. For more detailed information on the project development steps, please refer to the Windustry Community Wind Toolbox (http://windustry.com/CommunityWindToolbox).

Traditionally, large utility-scale wind energy projects are connected to the grid and sell electricity on the wholesale market through a Power Purchase Agreement (PPA). Aside from entering into a PPA with a utility, community wind projects in New York State have the opportunity to take advantage of the state's net metering program. The net metering program allows utility customers to build a wind energy project that can meet up to 100% of their electricity needs and receive credit, on an annual basis, for any excess power produced.

New York State's current net metering policy limits the size of non-residential wind energy systems to 2 MW or the peak load. If the property's consumption is large enough, this would allow at least one utility-scale turbine to be operated under the net metering program. Keeping a project under the 2 MW limit will allow increased benefit from the net metering program, but the project would not benefit from the economies of scale of a project with multiple turbines.

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17.2. Wind Project Development Checklist

The following wind project development checklist was developed by Windustry and is presented in the Windustry Community Wind Toolbox.

The checklist below is intended to give you an idea of the steps involved in developing wholesale community wind energy projects and to help you organize your development process. It is important to understand that many of the steps in the list below will happen simultaneously or may be dependent upon the completion of other steps and that the path to development is not linear. This checklist is meant to provide a framework, not a hard-and-fast rulebook for the exact steps you must take or a set order for the process. Each community wind project is unique and distinct from others, and your project may require additional steps or it may be less involved.

Development Phase

Project Management & Planning

- *Identify your project goals and areas where you will need to hire an expert*
- *Make preliminary contacts with consultants*
- *Select your business structure, project manager and CEO*
- *Raise seed capital to hire experts and perform feasibility studies*
- *Identify risk factors and how to mitigate them*
- *Develop your project plan and timeline*

Wind Resource Assessment

- *Preliminary wind assessment*
  - *Review your site on state/county wind maps*
  - *Collect information from nearby monitoring sites*
  - *Estimate annual electricity production*
  - *Estimate economic feasibility*
- *Detailed site characterization*
  - *Research feasibility study grants and anemometer loan programs*
  - *Set up anemometers and other instruments*
  - *Consult with a wind modeling company (optional)*
  - *Collect, validate, and analyze data*
  - *Develop detailed production estimates and cash flow projections*

Siting

- *Site Assessment*
  - *Inspect site: How much open space is available? Are there substantial wind obstacles? What is the topography like?*
  - *How close are distribution and transmission lines?*
  - *Gain control of site for installation of anemometer through easement or land purchase*
  - *Investigate interconnection opportunities*
  - *Investigate site access*
  - *Design and initiate wildlife surveys*
  - *Discuss project with your neighbors*
- *Qualify your land's potential for wind energy*
  - *Create a wind rose*

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- *Calculate wind shear*
- *Review setback and spacing requirements*
- *Determine turbine layout*

Permitting and Zoning

- *Investigate which Federal, State, and Local permits are required for your project*
- *Meet with permitting authorities to process pre-applications*
- *Conduct community informational meetings*
- *Prepare and submit permit applications*
- *Permit review and determination*

Land Control

- *Determine existing right-of-way easements*
- *Negotiate easements and royalties for landowner(s)*
- *Establish control of land and secure easements*

Financing

- *Research loan and grant options*
- *Identify tax incentives and eligibility requirements*
- *Develop cash flow, balance sheet, and income statements*
- *Complete applications for loans and grants*
- *Conduct equity drive*
- *Negotiate and execute agreements with equity investors*
- *Negotiate and execute Power Purchase Agreement*
- *Negotiate and execute contract to sell renewable energy credits*

Business Model

- *Establish legal entity*
- *Determine ownership rights, capital contributions, distributions and allocations*
- *Execute contracts*

Cost Estimates

- *Define insurance requirements and solicit estimates*
- *Execute insurance and other agreements*

Interconnection

- *Meet with utility and agree on interconnection studies*
- *Perform interconnection studies*
- *Complete interconnection application*
- *Negotiate and execute transmission agreement (if needed)*

Turbine Selection and Purchase

- *Review turbine spec sheets and determine which turbine is best for your project based on capacity rating, size, price, and availability*
- *Negotiate and execute turbine purchase agreement and warranty*
- *Place turbine order with deposit*

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Next Steps

Construction Preparation

- *Investigate potential construction companies and solicit estimates*
- *Execute construction contract*

Construction Phase

Site Preparation

- *Grading and road improvements/construction*
- *Trenching, cable-laying, and transformer installation*
- *Foundation and crane pad construction*
- *Fencing and erosion projects*
- *Substation construction/improvements and testing*

Turbine Installation

- *Turbine and tower transportation*
- *Turbine and tower installation*
- *Interconnection*
- *Testing and Commissioning*

Site Restoration

Inspections Completion

Operations and Maintenance Phase

Establish maintenance contract

Perform routine maintenance checks and repairs

Decommissioning and site restoration

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17.3. Community Wind Case Studies

There are a number of community wind projects in operation throughout the nation; the following project summaries provide a brief overview of existing community-owned wind energy projects:

Hull Wind, MA

A utility-scale wind turbine project in the town of Hull, Massachusetts, referred to as Hull Wind One, was brought online in December of 2001. The project consisted of one 660kW turbine, with a rotor diameter of 47m and a hub height of 50m. The turbine is owned and operated by the Hull Municipal Light Plant; all electricity generated by the project is delivered onto the municipally owned grid. The municipality was able to offset their entire usage for the town's street lighting, and the excess energy was sold to the community.

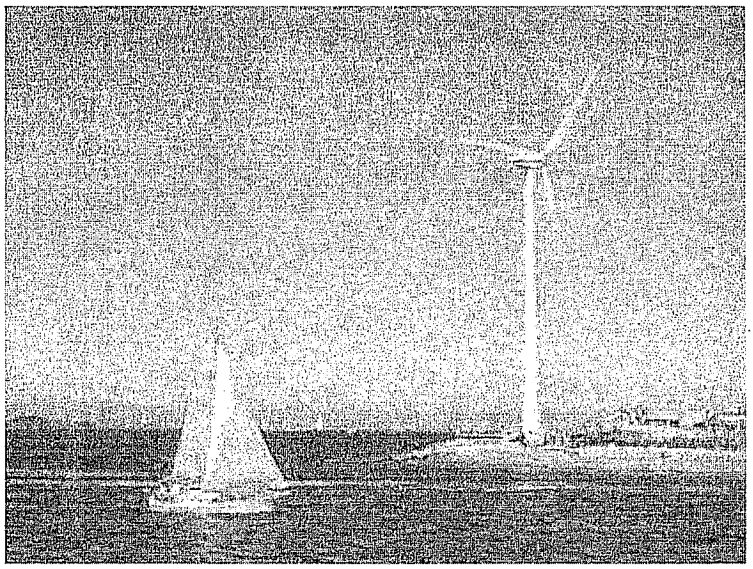

Figure 36 - Hull Wind One project site. (Source: www.ceere.org/rerl)

Supported by the success of the Hull Wind One project, a second turbine was commissioned in Hull in May of 2006. The Hull Wind Two project consisted of a much larger 1800kW turbine, which was installed on top of a capped landfill. Together, the two turbines are able to supply more than 10% of the community's energy needs.

MinWind, MN

A group of farmers in Minnesota developed a community wind project with the goal of diversifying and developing the local economy, and maximizing the return on their investment. In the fall of 2002, two community-owned wind energy projects, MinWind I & II were brought online in Luverne, Minnesota. Each project site consists of two 950kW wind turbines. The projects are owned under a cooperative structure, having sixty-six shareholders who are comprised of farmers and residents of the local community. The farmers formed two limited liability companies (LLC) to maximize their use of tax credit and Minnesota's renewable production incentive, $0.015/kWh. The farmers were able to negotiate a power purchase agreement with a local utility, whereby the utility agrees to buy the electricity produced by the wind farm at a wholesale rate.

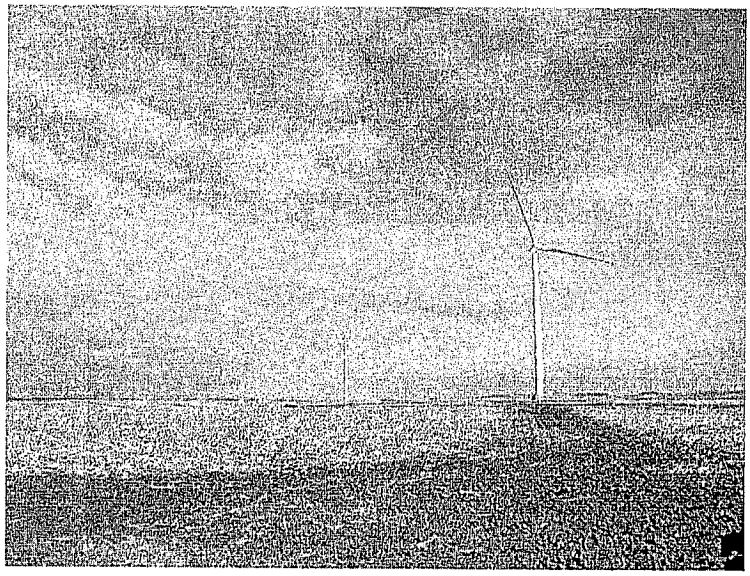

Figure 37 - MinWind project site. (Source: www.windfarmersnetwork.org)

Spurred by the success of the first two MinWind projects, local interest in wind energy grew rapidly; the community started planning for additional wind projects began shortly after the completion of MinWind I & II. Using the same cooperative ownership structure as for MinWind I & II, seven more community wind projects were developed. MinWind III-IX consists of seven 1.65 MW wind turbines, owned by approximately 200 local investors.

Spirit Lake Elementary School, IA

An elementary school in the Spirit Lake School District, located in central Iowa, was a community wind pioneer in U.S. In 1993, with the assistance of a low-interest loan from the Energy Council of the Iowa Department of Natural Resources and a grant from the Department of Energy, the school district was able to install a 250kW wind turbine, with a rotor diameter of 26.5 m and a hub height of 43 m. The school installed a 750kW turbine in 2001, with rotor diameter of 48 m and a hub height of 50 m. The school expects that the combined capacity of the two turbines will be able to completely satisfy the electrical needs of the middle school and high school, as well as a number of ancillary facilities.

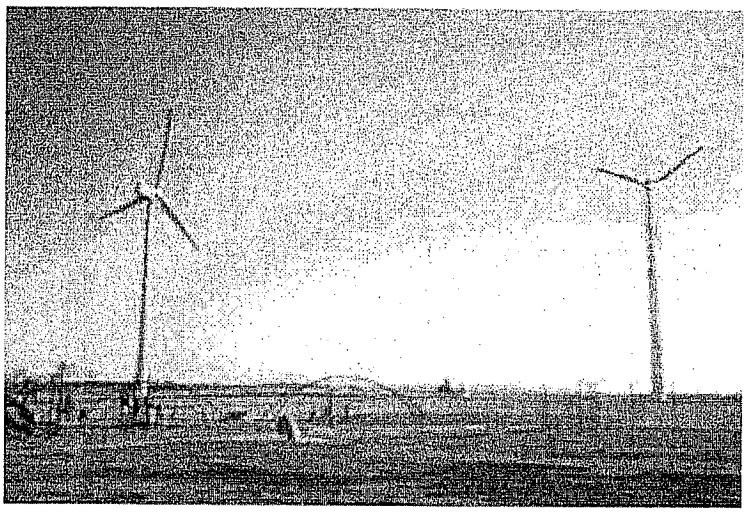

Figure 38 - Spirit Lake Elementary School project site. (source: www.spirit-lake.k12.ia.us)

The turbines are operated under a net metering arrangement with the local utility. The district purchases electricity from the local utility for $.08/kWh in times of peak demand or low-wind, and sells electricity back to the utility at a rate of $.06/kWh when the power generated by the turbines exceeds the school's demand. This system allows the school to build up a surplus of energy credit during periods of low-usage, such as overnight or during the summer, which can be used to offset the increased load that the school experiences when in session.

17.4. Additional Resources

- *Windustry (www.windustry.org)*
  - *Windustry is an excellent resource for information about community wind projects. Their Community Wind Toolbox provides a great deal of useful information for those looking to develop a community-owned wind energy project.*
- *Wind-Works (www.wind-works.org)*
  - *Wind-works is a website that features a collection of informative articles related to co-op and community wind projects.*
- *Community Wind: An Oregon Guidebook (http://www.energytrust.org/wind/community/guidebook/CommWindGuidebook.pdf)*
  - *The guidebook is a well-developed guide to community wind written by Northwest Sustainable Energy for Economic Development.*
- More information about the Hull Wind project can be found at their website (www.hullwind.org).

Power ...Naturally



NEW YORK STATE

WIND ENERGY TOOLKIT

Appendix

Available at:
www.powernaturally.org
May 2009
NYS Energy Research and
Development Authority
17 Columbia Circle
Albany, NY 12203-6399
www.nyserda.org

Prepared by:
AWS Truewind, LLC

NYSERDA

New York State
Energy Research and
Development Authority

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Appendix A

INSERT PDF OF ORIGINAL TOOLKIT FILE: Major Economic Impacts of Utility Scale Wind Projects in New York State

http://www.powernaturally.org/programs/wind/MajorEcoImpactsUtilityScaleWind.pdf

Appendix B

INSERT PDF OF ORIGINAL TOOLKIT FILE: Wind Energy Model Ordinance Options

http://www.powernaturally.org/programs/wind/toolkit/2_windenergymodel.pdf

00002277

Subject: County Commission meeting testimony-wind energy siting regulations
From: Casey McClellan <mcclellancasey@yahoo.com>
Date: Tue, 3 May 2011 08:28:23 -0700 (PDT)
To: heather@co.umatilla.or.us

I would like to offer the following comments regarding the offset distance or buffer zone between wind turbine installations and Urban Growth Boundaries and other human dwellings.

I assert that it would be very destructive to quality of life and the future of cities in Umatilla County to have anything less than a 2 mile setback. Wind energy installations so obviously degrade the visual and auditory environment that a 2 mile setback really reflects the bare minmum to preserve existing and future landowners rights to peaceful enjoyment of their property.

There are appropriate places to for wind energy installations: Those that don't degrade current economic, social and scenic value of existing homes and lands. There's a lot of real estate that would be great for wind energy. The foothills of the Blue's and encroachment on current urban areas are not among those appropriate sites.

The Commission should respect the City of Milton Freewater's stand for a minimum 2 mile setback from th UGA, and keep these installations in areas where they will have minimal impact on current agri-tourism in the Walla Walla Valley.

Casey McClellan
Umapine, Oregon
509 520 8928

May 2, 2011

Dear Umatilla County Commissioners,

Please consider the following in regard to your decision on setbacks :

- There are increasing complaints and peer-reviewed research to substantiate concerns of anxiety, stress, and health effects from exposure to infra and low frequency sound. (First International Symposium on Adverse Health Effects and Industrial Wind Turbines (October 29-31, 2010) There needs to be more research on sleep disturbance, stress and psychological distress related to the unique noise from the turbines. Rushing forward with these "wind farms" is irresponsible without carrying out the optimal studies to dispel evidence of negative health effects.
- Wind industry rhetoric and its proponents seemingly dispel these negative impacts on community health and in my opinion, could care less about environmental or public benefits. This is all about money; tax credits, renewable energy certificates, subsidies, you name it. Well-meaning persons succumb to the promise of green energy and tax revenues in the short term, but will eventually find they have ruined their own environment.
- These industrial wind "farms" need to be placed far away from where people work and live. (over the objections of a few landowners hoping for easy lease money) "According to expert organizations such as professional Certified Real Estate Appraisers, industrial wind development adversely impacts land values within the immediate wind-zone and a peripheral area of approximately two miles" http://www.chronicle-express.com/news/x806169421/A-new-slant-on-wind-farms
- These industrial wind factories do not belong in the mountains and rolling foothills of our "Blues" where scanning the expanse of the horizon will reveal massive towers with red, flashing lights for miles and miles dominating the landscape. Peaceful beauty permanently destroyed when we already have an abundance of hydro-electric power is insane.

Sincerely,

Ron Edwards
85124 Hwy 339
Milton-Freewater, OR 97862

PS Any of the commissioners who have family members that would benefit financially from these industrial wind factories should excuse themselves from this decision making process.

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Subject: testimony text work session
From: Christa Maiuri <Maiurirc@charter.net>
Date: Mon, 02 May 2011 18:58:39 -0700
To: heather@co.umatilla.or.us

I am writing to voice my opposition to wind farms in general and especially the ruling to allow them within a 1/2 mile of any residence or other occupied building. I think that the commissioners should take another look at the effectiveness of the wind farms and the long term damage they can actually do to the wildlife and landscape. Would you want a wind machine within a 1/2 mile of your personal residence. I think when all of these wind farms go up and people no longer comment on what a beautiful valley we live in there will be regrets. It makes me so sad to see such beautiful areas now dotted with hundreds of wind machines. They could have been located in areas set back from beautiful vistas. I was willing to give them a chance until the only thing driving the installation of them was money. It really isn't about going "green". It's about the bottom line for a very few select individuals.

Christa Maiuri
Walla Walla, WA 99362

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Subject: Fw: testimony text work session
From: "Dana Dibble" <appleseed@bmi.net>
Date: Mon, 2 May 2011 17:38:40 -0700
To: <heather@co.umatilla.or.us>

----- Original Message -----
From: Dana Dibble
To: heather
Sent: Monday, May 02, 2011 5:36 PM
Subject: testimony text work session

I would like to offer my opinion to a minimum 2 mile set back of any wind tower to any residence, after all the testimony from other homeowners whose lives have now been affected and wind farm companies just assuming they are just going to buy out every problem, it is time to act, especially when several cities being encroached upon is now becoming reality, instead of a single home , they will possibly looking at a class action by thousands of residents and a city is involved . After everything coming to light on the disruption , displacement and lethal death of numerous mammals and species of birds from past wind farm projects it is time to do something sensible. 2 mile set back is the very least that should be done. and then a hard look at everything else should come next thank-you Dana Dibble

Subject: testimony text work session
From: "TOM SUSAN DAVIS" <tomsusan95@msn.com>
Date: Mon, 2 May 2011 17:47:35 -0700
To: <heather@co.umatilla.or.us>

Dear Sirs,

I am in favor of the two-mile setback from residences.

Susan Turbyne Davis
54211 Turbyne Rd.
Milton-Freewater, OR 97862
541-938-5565

00002282

Subject: Testimony Work Session
From: TDKENN@aol.com
Date: Mon, 2 May 2011 20:55:27 -0400 (EDT)
To: heather@co.umatilla.or.us

Heather,

With regard to the work session testimony for wind generator's, I support the two (02) mile set back.

Thank you,

Tim Kennedy
247 N 4th
Athena, OR 97813

00002283

Subject: testimony work session
From: Lori Kennedy <mrstims@yahoo.com>
Date: Mon, 2 May 2011 18:01:57 -0700 (PDT)
To: "heather@co.umatilla.or.us" <heather@co.umatilla.or.us>

Heather, with regard to tomorrows work session I support a 2 mile setback.

thanks,
Lori Kennedy
Athena, Oregon

00002284

Subject: testamony text work session
From: "Gerry Reese" <gerry167@charter.net>
Date: Mon, 2 May 2011 19:57:03 -0700
To: <heather@co.umatilla.or.us>

regarding the placement of wind turbines, I am in favor of a two mile minimum set back from all residences.

Gerry Reese
53862 Hwy 332
Milton-Freewater, Oregon 97862

00002285

Subject: Testimony Text Work Session
From: Leslie Brown <winesapred@msn.com>
Date: Mon, 2 May 2011 20:50:46 -0700
To: <heather@co.umatilla.or.us>

To Involved Parties:

This email is in regard to your work session planned to begin tomorrow. We have sent correspondence in the past to involved parties urging studies to occur that fully the permanent impact of the wind machines placement. Much research has been provided. To our dismay, the excessive research provided and public input has been ignored.

Now with the work session scheduled tomorrow, we urge you to at least restrict the placement to a minimum of a two mile residential setback. The county needs to understand fully the future impact it brings to our local environment. Please consider this and make this restriction.

Thank you.

Leonard and Leslie Brown

Subject: wind turbines
From: Irene Walters <irene.walters@gmail.com>
Date: Mon, 2 May 2011 22:44:55 -0700
To: heather@co.umatilla.or.us

Testimonies text work station; May 1, 2011

I am not good at my computer but I want to make a request regarding the wind turbines...Please Im pleading that the wind turbines cannot be put nearer than 2 miles of any resident in umatilla county. I live in milton freewater and

they will be between my house and the view of the Blues .. So the least I can ask that they b e at least 2 miles away. Thank you for listening.

Sincerely, Irene Walters

PS I own my farm, which myt father bought in 1946

00002287

Umatilla County

Department of Land Use Planning

Director
Tamra Mabbott

Land Use
Planning
Division:
541-278-6252

CODE
ENFORCEMENT
541-278-6300

***
Emergency
Management
Division:

EMERGENCY
MANAGEMENT
541-966-3700

CHEMICAL
STOCKPILE
EMERGENCY
PREPAREDNESS
PROGRAM
(CSEPP)
541-966-3700
1-877-367-2737

April 20, 2011

MEMO
TO: Board of Commissioners
FROM: Tamra Mabbott
RE: Code Update, Section 152.616 (HHH)
Maps to show effect of one mile and two mile wind turbine setback

As a follow up to your March 17, 2011 hearing, Planning Staff developed maps to illustrate a one mile and a two-mile buffer area. There was quite a bit of discussion and speculation about what impact the different setbacks would have.

The three maps are based on locations of actual (permitted) existing meteorological towers, likely locations for future commercial wind energy development applications.

Our cartographer, Julie Alford, developed the maps. Each set of maps show a one-mile radius and a two-mile radius around existing dwellings within a township and range.

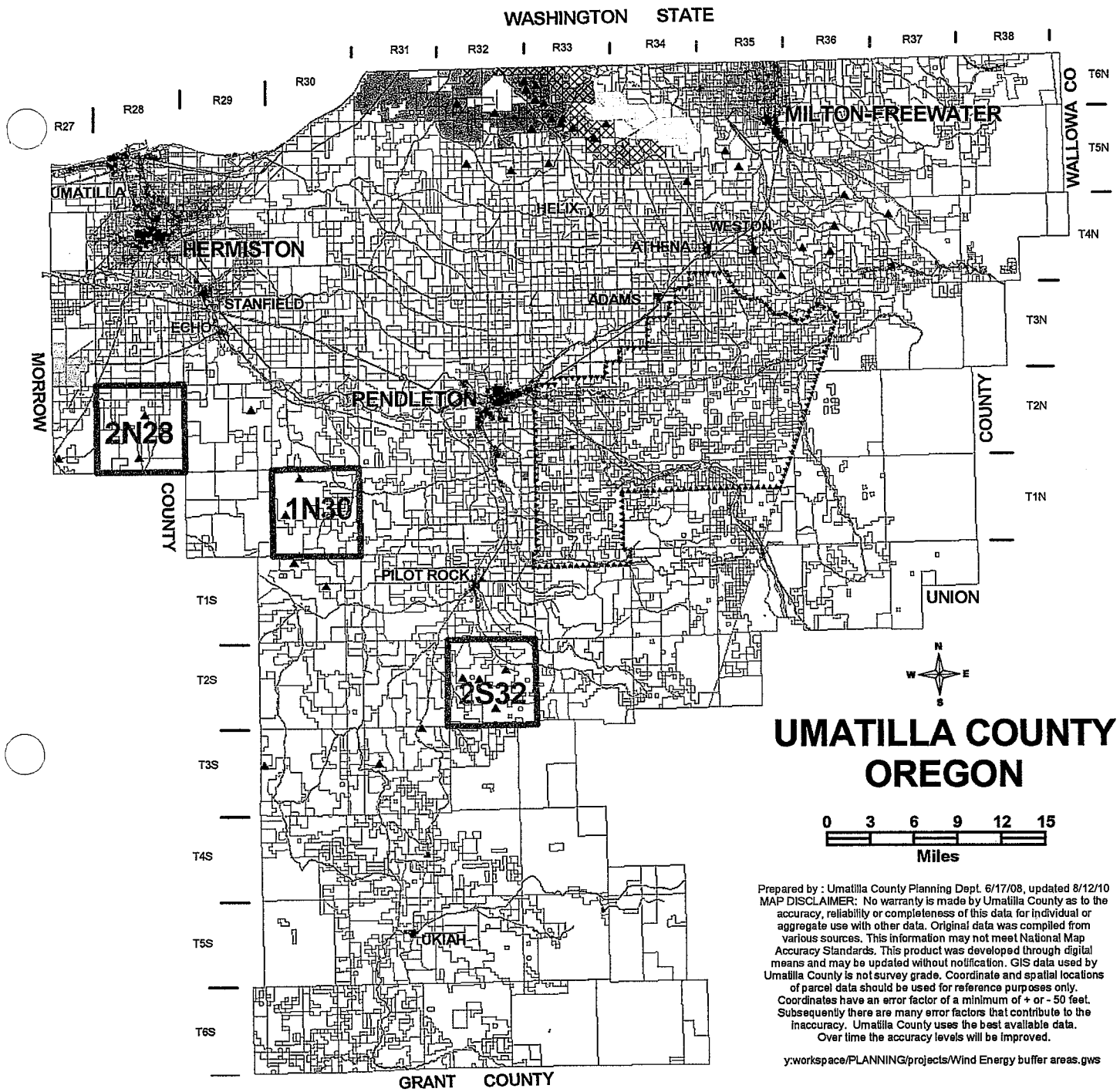
The three areas correspond to the base map entitled "Buffer Area Reference Map."
The three areas include:

Township 2 North Range 28 EWM

Township 1 North Range 30 EWM

Township 2 South Range 32 EWM

00002288



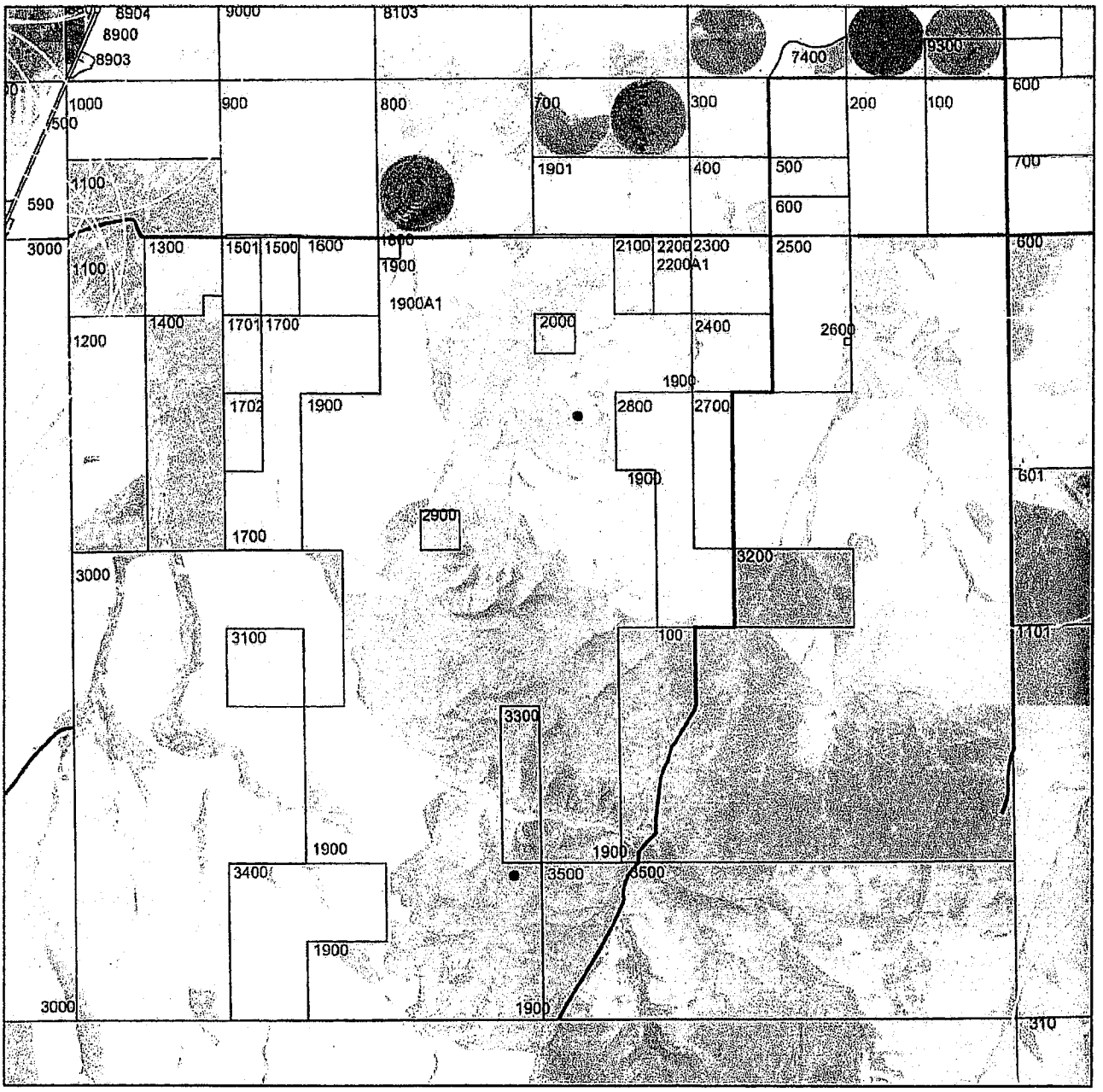
Prepared by : Umatilla County Planning Dept. 6/17/08, updated 8/12/10
MAP DISCLAIMER: No warranty is made by Umatilla County as to the accuracy, reliability or completeness of this data for individual or aggregate use with other data. Original data was compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification. GIS data used by Umatilla County is not survey grade. Coordinate and spatial locations of parcel data should be used for reference purposes only. Coordinates have an error factor of a minimum of + or - 50 feet. Subsequently there are many error factors that contribute to the inaccuracy. Umatilla County uses the best available data. Over time the accuracy levels will be improved.

y:workspace/PLANNING/projects/Wind Energy buffer areas.gws

Buffer Area Reference Map

- See Attached Buffer Area Maps
- ESI Vansycle
- FPL Stateline 1
- FPL Stateline 2
- FPL Stateline 3
- Eurus Combine Hills
- Iberdrola Helix Wind Power
- Oregon Windfarms LLC
- Met towers (issued since 2006)
- Bonneville Power Admin. Easement
- Reservation Boundary

00002289 Printed: 4/18/11



2009 AERIAL PHOTO, T2N R28E, UMATILLA COUNTY
1 MILE BUFFER AREA FROM HOME SITE

0.0 0.3 0.6 0.9 1.2 1.5
Miles

N
W E
S

Legend

Home_site

1 mi Buffer around Home_site

Met_towers

Parcel_Boundary

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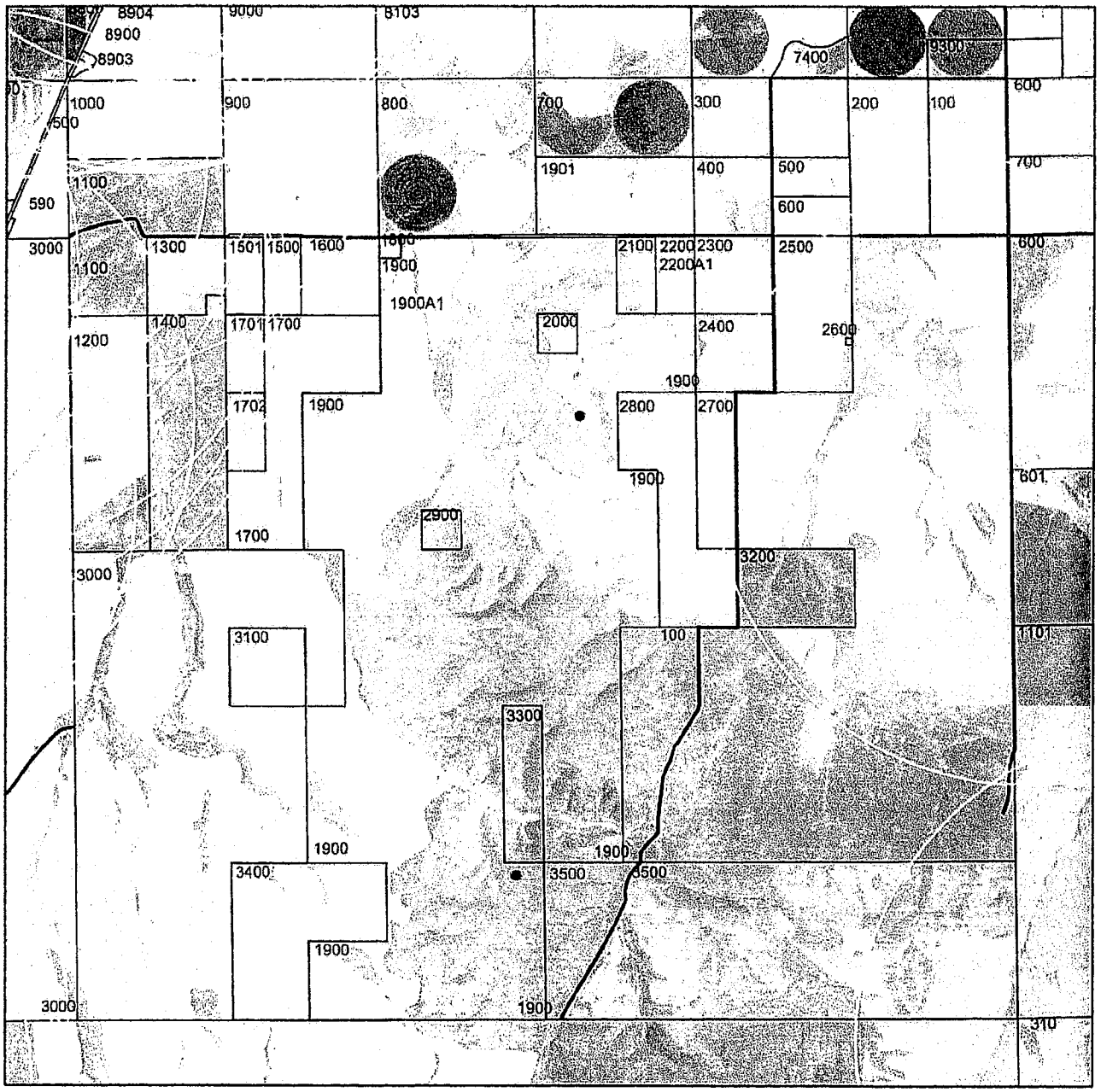
00002290



2009 AERIAL PHOTO, T2N R28E, UMATILLA COUNTY
2 MILE BUFFER AREA FROM HOME SITE

0.0 0.3 0.6 0.9 1.2 1.5
Miles

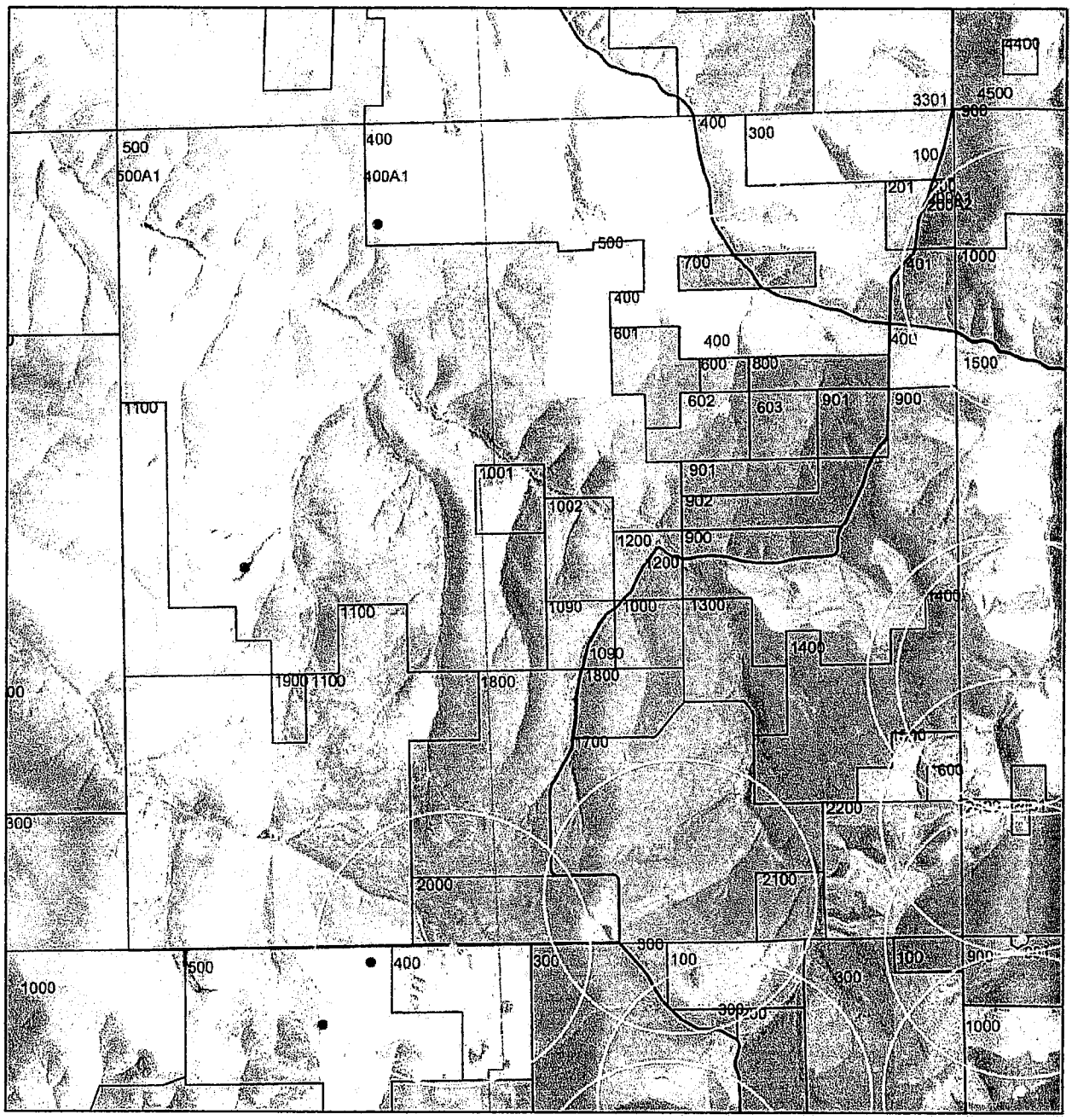
N
W E
S

Legend

- Home_site
- 2 mi Buffer around Home_site
- Met_towers
- Parcel_Boundary

MAP DISCLAIMER: No warranty is made by Umatilla County as to the accuracy, reliability or completeness of this data. Parcel data should be used for reference purposes only. Not for legal use. Created by J. Alford, Umatilla County Planning Department, 4/4/2011

00002231



2009 AERIAL PHOTO, T1N R30E, UMATILLA COUNTY
1 MILE BUFFER AREA FROM HOME SITES

0.0 0.3 0.6 0.9 1.2 1.5
Miles

Legend

- Home_site
- 1 mi Buffer around Home_site
- Met_towers
- Parcel_Boundary

N
W E
S

MAP DISCLAIMER: No warranty is made by Umatilla County as to the accuracy, reliability or completeness of this data. Parcel data should be used for reference purposes only. Not for legal use. Created by J. Alford, Umatilla County Planning Department, 4/6/2011

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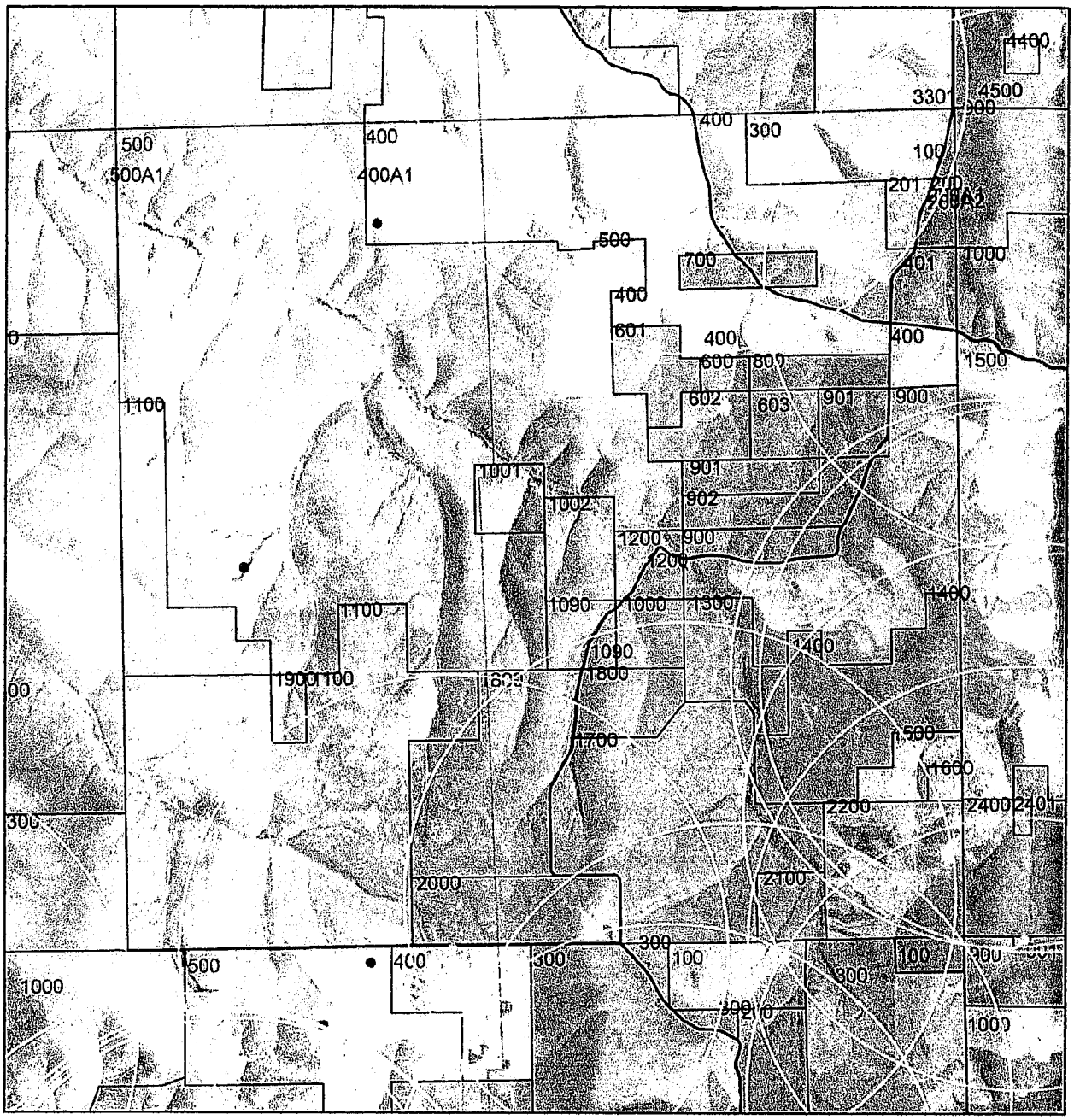

2009 AERIAL PHOTO, T1N R30E, UMATILLA COUNTY
2 MILE BUFFER AREA FROM HOME SITES

0.0 0.3 0.6 0.9 1.2 1.5
Miles

N
W E
S

Legend

- Home_site
- 2 mi Buffer around Home_site
- Met_towers
- Parcel_Boundary

MAP DISCLAIMER. No warranty is made by Umatilla County as to the accuracy, reliability or completeness of this data. Parcel data should be used for reference purposes only. Not for legal use. Created by J. Alford, Umatilla County Planning Department, 4/4/2011

00002293



2009 AERIAL PHOTO, T2S R31E, UMATILLA COUNTY
1 MILE BUFFER AREA FROM HOME SITE

0.00 0.25 0.50 0.75 1.00 1.25
Miles

N
W E
S

Legend

- Home_site
- 1 mi Buffer around Home_site
- Met_towers
- Parcel_Boundary

MAP DISCLAIMER: No warranty is made by Umatilla County as to the accuracy, reliability or completeness of this data. Parcel data should be used for reference purposes only. Not for legal use. Created by J. Alford, Umatilla County Planning Department, 4/4/2011

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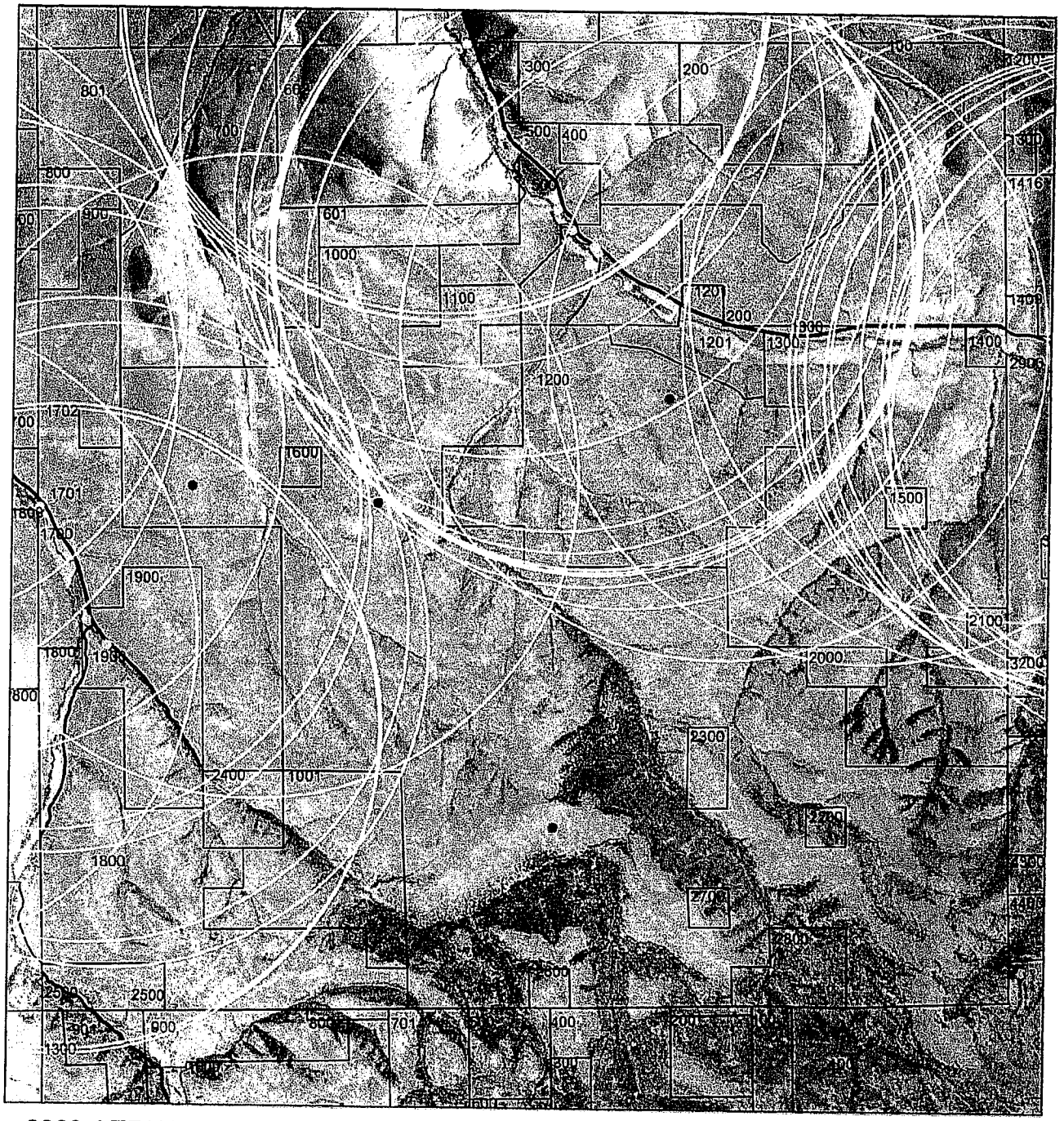

2009 AERIAL PHOTO, T2S R31E, UMATILLA COUNTY
2 MILE BUFFER AREA FROM HOME SITE

0.00 0.25 0.50 0.75 1.00 1.25
Miles

Legend

- Home_site
- 2 mi Buffer around Home_site
- Met_towers
- Parcel_Boundary

N
W E
S

MAP DISCLAIMER. No warranty is made by Umatilla County as to the accuracy, reliability or completeness of this data. Parcel data should be used for reference purposes only. Not for legal use. Created by J. Alford, Umatilla County Planning Department. 4/4/2011

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APR 18 2011

UMATILLA COUNTY
PLANNING DEPARTMENT

RECEIVED
Apr 18 2011
BCC

elementpower

Element Power
421 SW Sixth Avenue, Suite 1000
Portland, OR 97204
503.416.0800 – Main
503.416.0801 – Fax
www.elpower.com

Umatilla County Board of Commissioners
Umatilla County Courthouse
216 SE Fourth Street
Pendleton, OR 97801

4/15/2011

RE: UCDC 152.615 & 616 (HHH) Ordinance amendments

Honorable Commissioners,

Element Power is pleased to submit the enclosed comments on the Umatilla County Zoning Ordinance amendments (UCDC 152.615 & 616(HHH)). Element is pleased to see that the County has decided to hold another work session on the issues under consideration and will make a concerted effort to participate in future meetings. Element would like to commend the County for taking their time and examining the issues from several perspectives before making any final decisions. We understand your concerns for making sure future wind energy development is managed in a way that is respectful of the environment and County residents. However, we want to encourage the County to pass an ordinance that is not overly restrictive to the degree that even the most well planned out and fully mitigated projects are at risk of appeals (which in turn affect a project's success and will be costly for the county and its residents). I have provided specific examples within this letter of areas I believe the County is being unnecessarily overly restrictive. Many of the impacts that are addressed through proposed ordinance revisions are more appropriately addressed through the conditional use permit process, where project impacts can be assessed on a case-by-case basis.

In order of their appearance in the revised ordinance, we provide the following comments:

(5) Application Requirements.

(C) (1) Nonproprietary evidence of wind monitoring data qualifying the wind resources within the project boundary, such as a description of procedures and process for wind study.

Though we are pleased to see that the County has considered the sensitive nature of proprietary data, we are concerned as to the level of information required under this provision. Due to the

competitive nature of wind energy development, developers will not share the result of their wind energy studies with any parties other than those involved in financing and negotiation of power purchase agreements. We understand that the County wants to ensure a project is valid before spending time and resources evaluating the CUP application, however we feel that the County neither has the expertise nor the need to evaluate wind energy data in order to process a land use application.

(C) (2) Evidence of active utility transmission interconnect requests and/or process and description of same.

This requirement is unreasonable as developers often, for very good reason, have not submitted a transmission interconnection request at the time they commence permitting activities. Many factors go into the timing of an interconnection request and most often the requests change over time as new information about the project and new marketing strategies become available to the developer. It should not be a requirement that the developer provide evidence of this process as it is irrelevant to the land use decision the county is responsible for. This is akin to requiring a farmer to prove a business relationship with a feedlot prior to allowing him to raise cattle. The County's role is to evaluate the land use decision, not the business relationship between a developer and the transmission provider.

(F) A revegetation and erosion control plan, developed in consultation with the Umatilla County Public Works Department., Soil and Water Conservation District, Watershed Council, the Oregon Agricultural Water Quality Management Program (administered by the Oregon Department of Agriculture), the Department of Environmental Quality and the Confederated Tribes of the Umatilla Indian Reservation.

Element Power encourages the County to require that plans such as this one are developed in consultation only with agencies that have jurisdiction over the issue of concern. All other parties should be able to participate in the CUP process as an interested party. Additionally, if a developer finds a need to reach out to a stakeholder for input, they should be encouraged to do so in an informal relationship; however, the County should not be forcing consultation with parties that are non-jurisdictional agencies. The risk is that you are forcing a developer to consult with parties that may be adverse to the proposed project. Since many of the parties listed in this ordinance requirements have no authority over any other development projects in the County, it is inappropriate that wind energy developers be forced into a relationship with them.

(A) Setbacks.
The minimum setback shall be a buffer distance of no less than the following:
(1) From tower to the City Limit boundary 2 miles or 20 times the overall tower-to-blade tip height, whichever is greater.
(2) From tower to land zoned Unincorporated Community (UC) 10 times the overall tower-to-blade tip height.
(3) From tower to a rural home 3520 feet or 10 times the overall tower-to blade tip height, whichever is greater, unless a written waiver is obtained from the

landowner and recorded in the County Deed Records.
(4) From tower to the boundary right-of-way of county roads (gravel or paved) 2 times the overall tower-to-blade tip height.

Element Power believes the County's proposed set-back requirements are overly restrictive and are not appropriate for mitigating impacts, which otherwise could be dealt with on a case-by-case basis. Set-backs related to health and safety and noise can be calculated on a project by project basis after analysis of the potential impacts is conducted by a professional. By establishing such large set-backs in the UCDC, the County and its residents will be limiting the economic benefits received from the projects. Additionally, the County has not adequately assessed the impacts that are being addressed by the set-backs and has not adequately demonstrated that set-backs are necessary for mitigating the impacts.

By requiring a set-back of 2 times the overall tower to blade tip height from wind turbines to county roads, the County may be forcing the unnecessary development of additional project roads, which causes greater impact to the land than using existing county roads where possible. Often county roads are used for access to wind projects in efforts to reduce the number of new roads constructed. Typical set-backs in other rural counties are the height of the tower, which is more than adequate to address safety concerns. Developers usually enter into agreements with a county to ensure the county roads are maintained at a level equivalent to their existing use or better. We do not think a set-back of 2 times the overall tower height from county roads is necessary and feel the County has not adequately justified the need for or the impact mitigated by such a set-back requirement. Moreover, it is unclear why there is any safety basis to require an additional setback from a state highway, as the current draft proposes.

(6) From tower to Archeological or Cultural Sites 2 times the overall tower-to blade tip height.

Requiring a wind turbine set-back from archaeological or cultural resources sites is an inappropriate way to manage potential impacts to these sensitive resources. As an archaeologist by training with 10 years of experience in cultural resources management, I can unequivocally say that there is no other ordinance in the region which singles out wind turbines as having a pre-determined impact on cultural resources and requires mitigation through a previously-established set-back requirement. Impacts and subsequent protection measures for cultural resources are most often determined on a case by case basis, where a professional archaeologist in consultation with state officials and tribes determines appropriate mitigation. If the County is going to consider a turbine set-back for archaeological sites, it must consider a similar set-back for other structures, which will have similar impacts on cultural resources, such as dwellings, accessory farm buildings, and other common structures sited in the County.

By definition under federal and state laws, anything over 50 years of age has the potential to be classified as a cultural resource. Under the County's currently proposed ordinance, a wind turbine might need to be set back 800 feet from a 50-year old piece of abandoned farm machinery, a 50-year old garbage dump, or a 50-year old abandoned rail road. If it is the County's intention to protect these types of resources from an undetermined impact, then it must

protect these types of resources from all other undetermined impacts and require setbacks of other structures and construction activities which will have similar impacts to wind turbines.

It is unreasonable to assume that all cultural resources will be impacted by proximity to a wind turbine. Cultural resources are often protected by set-backs during construction and operations to minimize potential ground disturbance, but these are impacts and mitigation measures that are determined on a case by case basis, where the type of resource and its sensitivity to the proposed action are considered.

A more appropriate condition for protection of cultural resources is as follows: "The applicant will evaluate potential impacts to cultural resources and archaeological sites. If cultural resources are identified within the area of potential effect, the applicant will consult with the State Historic Preservation Officer on appropriate avoidance, minimization or mitigation measures."

(C) The Development and Operation of the Facility will protect and preserve existing trees, vegetation, water resources, wildlife, wildlife habitat, fish, avian, archaeological sites and objects, sites of historic or religious significance to Native American Tribes and other natural resources. Compliance with this standard may require mitigation and/or submission of an annual monitoring report.

This proposed requirement includes language which is unnecessarily strong for protection of the listed resources. We agree with the County that these resources should be protected, but from experience in other regions, we have seen how a county is setting themselves up for a lawsuit if they approve projects which have any impacts on the listed resources. Using language such as "take reasonable efforts to..." or "protect and preserve to the greatest extent possible" you are obtaining the same level of expected protection, however you are allowing for some impact, which can be mitigated. If your ordinance plainly states that the applicant will "protect and preserve" you will not be able to approve any applications, for all development projects will have some impacts on the environment.

As an example, under the proposed language, the County is at risk for approving any project which potentially impacts trees, vegetation, wildlife habitat, etc. It is impossible to construct a wind energy project (or any development for that matter) without some impacts to some of these resources. Another example: If a cultural resources site (e.e., a lithic scatter) is identified within the area of potential effect, and through consultation with the State Historic Preservation Officer and the Tribes, it is determined that impacts to the site can be mitigated through site testing and artifact collection, an applicant still cannot meet the requirement of the County's proposed "protect and preserve" standard because impacts will occur during testing and collection.

It is suggested that the language be rewritten to allow some impacts to occur, and to rely on reasonable mitigation to off-set the impacts. A more reasonable requirement is " The development and operations of the Facility will take measures to protect and preserve sensitive habitat and species of concern such as threatened or endangered species, and cultural resources eligible to the National Register of Historic Places."

In closing, Element Power encourages the County to consider adoption of an ordinance which provides a reasonable number of restrictions on wind energy development, while allowing developers some flexibility to evaluate and mitigate impacts on a case by case basis. Element also urges the County to rely on peer reviewed literature (such as the material provided in the Renewable Northwest Project submission) to research potential impacts and avoid relying on fictional information obtained from the internet. As with all major decisions that will have an effect on the County's economy and the rights of private landowners, we are hopeful that the County will rely on the most rigorous scientific information when finalizing the wind ordinance.

Thank you for consideration of our comments. If you have any questions, please feel free to call me at 503-416-0815.

Nicole Hughes

Senior Project Manager
Element Power

Horizon Wind Energy
An EDP Renewables Company

3701 Hayward Road
Cle Elum, WA 98922

509.962.1122 phone
509.857.2138 fax

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UMATILLA COUNTY
PLANNING DEPARTMENT

April 15, 2011

Umatilla Board of Commissioners
Umatilla County Courthouse
216 SE Fourth Street
Pendleton, OR 97801

RE: UCDC 152.615 & 616 (HHH) Proposed amendments

Honorable Chairman and Commissioners:

I would like to thank the Board of Commissioners for the opportunity to provide additional written comments regarding the proposed Planning Commission Amendments to UCDC 152.615 & 5616 (HHH). As I stated during the March 17, 2011 public hearing, the proposed revisions have severe impacts on future wind development activities in your County.

Planning Commissioner Reeder's comments and presentations have been posted to the County Land Use Planning web site. I urge the Board of County Commissioners to review factual and scientific data, this information will substantiate the setback recommendations and other code changes that industry has recommended to the Planning Commission on November 16, 2010 and February 15, 2011. The recommended revisions to the proposed county code are attached; please note Horizon supports the comments identified in green, which have not been incorporated into the final draft revisions presented to the County Commissioners.

Many sections of the proposed code revisions are critical for future development within Umatilla County. There are also revisions that are appropriate for both wind power development and County concerns. The most concerning revision would be that of setbacks. The proposed revisions will literally stop many projects from future development. Not only will the County loose potential tax revenue and job resources, the private landowners will lose their right to develop their land for their benefit. The proposed setbacks of 2 miles or 20 times tip height have no scientific justification and basis other than stopping wind energy. After considerable review, Washington State Supreme Court unanimously approved Case No. 81332-9 (consolidated with No. 81427-9) approving a Site Certification Agreement with a four times tip height setback from structures. This setback was previously recommended by the Washington Energy Facility Site Evaluation Council and approved by Governor Christine Gregoire on September 18, 2007 (documents attached).

The code revisions include a number a plans that are to be submitted prior to permit approval. While I agree the majority of these plans are appropriate, the timing of the plan submittal may not be. Fire Control Plan, Erosion Control Plans and other approvals typically cannot be accurately completed until the project has an off-taker and the siting is in advanced stages. It may be more appropriate to have these plans required prior to construction rather than prior to permit approval. This is also true with the transmission code revisions, it may be unknown what the transmission route is until the off-taker has been identified. It is most common for an off-taker to be identified following the approval of the development permit.

Developers expect a County Ordinance for wind development to be consistent with requirements to other development activities within the County. For example, it does not appear that other permitted activities within the rural zonings are required to obtain approval from neighbors within two miles before a permit is issued, and that the code revisions unfairly penalize one industry. Developers need to have surety in the permit process, flexibility in processing the applications as suggested by the Planning Director during the March 17, 2011 hearing, does not provide for a dependable or defendable process.

The Board of Commissioners has an extremely difficult and important policy decision to make in the near future. I trust the Board will review all of the documents that are being submitted in an unbiased and factual manner. I look forward to the Board's workshop at which time I anticipate the Board to discuss the submitted documentation. I plan to be present to answer any questions you may have.

Sincerely,

Joy Potter
Project Manager

Attachments: Recommended Code Revisions
Site Certification Agreement
Supreme Court Ruling

CONDITIONAL USES

Sub-Sections

152.610	Definition
152.611	New or altered conditional uses; conformance with requirements; performance bonds
152.612	Procedure for taking action on a conditional use application
152.613	Time limit on a conditional use permit
152.614	Limit on reapplication
152.615	Additional restrictions
152.616	Standards for review of conditional uses and land use decisions
152.617	Standards for review of conditional uses and land use decisions on EFU zoned land

§ 152.610 DEFINITION.

For the purpose of this subchapter, the following definition shall apply unless the context clearly indicates or requires a different meaning.

CONDITIONAL USES. Activities that are similar to other activities permitted within a zone, but are not entirely compatible with the permitted uses or purpose and intent of the zone, or compatible with surrounding land uses on adjacent lands in another zoning district.

LAND USE DECISION. Includes a final decision by a local government concerning the adoption, amendment or application of the statewide planning goals, a comprehensive plan provision, a land use regulation or a new land use regulation. (A Land Use Decision does not include: (1) a decision of a local government which is made under land use standards which do not require interpretation or the exercise of policy or legal judgment; (2) a decision of a local government which approved or denies a building permit issued under clear and objective land use standards.) (Pursuant to ORS 197.015 (10))

(Ord. 83-4, passed 5-9-83; Ord. 2005-02, passed 1-5-2005)

§ 152.611 NEW OR ALTERED CONDITIONAL USES; CONFORMANCE WITH REQUIREMENTS; PERFORMANCE BONDS.

(A) Conditional uses listed in this chapter may be permitted, enlarged or altered contingent upon appropriate authorization, in accordance with the standards and procedures set forth in this subchapter.

(B) In permitting a new conditional use or the alteration of an existing conditional use, the appropriate planning authority may impose conditions, which are considered necessary to protect the best interests of the surrounding area or the county as a whole.

(C) In the case of a use existing prior to the effective date of this chapter and classified in this chapter as a conditional use, any change in use or in lot area or an alteration of structure shall conform with the requirements for a conditional use.

(D) The county may require an applicant to furnish the county with a performance bond or such other form of assurance that the county deems necessary to guarantee development in accordance

with the standards established and conditions attached in granting a conditional use.

(Ord. 83-4, passed 5-9-83; Ord. 2005-02, passed 1-5-2005)

§ 152.612 PROCEDURE FOR TAKING ACTION ON A CONDITIONAL USE APPLICATION.

The procedure for taking action on a conditional use or land use decision application shall be as follows:

(A) A property owner or the Planning Commission may initiate a request for a conditional use by filing an application ~~with the secretary of the Planning Commission,~~ using forms prescribed pursuant to § 152.767;

(B) A conditional use and land use decision application shall be processed via administrative review per § 152.769;

(C) A conditional use permit or land use decision will not be approved unless the proposed use of the land will be in conformance with the County Comprehensive Plan;

(D) An applicant granted a conditional use permit or land use decision must obtain a county zoning permit ~~for each tax lot~~ before commencing construction. [*NOTE: zoning permits should be treated the same as conditional use permits and land use decisions, and should be based on the project site boundary, not on the basis of tax lots*].

(E) A conditional use or land use decision may be referred to the Umatilla County Planning Commission if the Planning Director deems circumstances warrant such additional review and consideration, except for a conditional use or land use decision issued under ORS 469.401(3). [*NOTE: ORS 469.401(3) requires a county, after EFSC issues a site certificate, to issue the relevant conditional use permit or land use decision without hearings or other proceedings upon proper application and payment of fees.*]

(Ord. 83-4, passed 5-9-83; Ord. 2005-02, passed 1-5-2005)

§ 152.613 TIME LIMIT ON A CONDITIONAL USE PERMIT.

(A) A conditional use permit shall be void after one year or such lesser time as the permit may specify unless 20% of the total estimated project cost has occurred or the proposed use has occurred. However, the Planning Director or the proper planning authority may extend authorization for an additional period not to exceed one year, on request from the applicant. The total time allowed shall not exceed two years from the original approval date.

(B) If delay in establishing the use is demonstrably due to a delay by a state of federal agency in issuing a required permit, at no fault of the applicant, the Planning Director or a Designee of the Planning Director may extend the time limit imposed by division (A) of this section for a period not to exceed one year following issuance of the state or federal agency permit. The applicant shall establish that state or federal permits have not yet been issued, and that the delay has not been caused by the applicant.

(C) Time Limitation on Transportation-Related Conditional Use Permits. Authorization of a conditional use shall be void after a period specified by the

applicant as reasonable and necessary based on season, right-of-way acquisition, and other pertinent factors. This period shall not exceed three years.

(Ord. 83-4, passed 5-9-83; Ord. 2005-02, passed 1-5-2005)

§ 152.614 LIMIT ONE APPLICATION.

No application for a conditional use permit shall be considered within one year of the denial of such a request, unless in the opinion of the Hearings Officer, Planning Director or the appropriate planning authority new evidence or a change of circumstances warrant it.

(Ord. 83-4, passed 5-9-83; Ord. 2005-02, passed 1-5-2005)

§ 152.615 ADDITIONAL CONDITIONAL USE PERMIT RESTRICTIONS.

In addition to the requirements and criteria listed in this subchapter, the Hearings Officer, Planning Director or the appropriate planning authority may impose the following conditions upon a finding that circumstances warrant such additional restrictions:

(A) Limiting the manner in which the use is conducted, including restricting hours of operation and restraints to minimize such ~~a~~ environmental effects as noise, vibration, air pollution, **water pollution,** glare or odor;

(B) Establishing a special yard, other open space or lot area or dimension;

(C) Limiting the height, size or location of a building or other structure;

(D) Designating the size, number, location and nature of vehicle access points;

(E) Increasing the required street dedication, roadway width or improvements within the street right of way;

(F) Designating the size, location, screening, drainage, surfacing or other improvement of a parking or loading area;

(G) Limiting or otherwise designating the number, size, location, height and lighting of signs;

(H) Limiting the location and intensity of outdoor lighting and requiring its shielding;

(I) Requiring diking, screening, landscaping or other methods to protect adjacent or nearby property and designating standards for installation and maintenance.

(J) Designating the size, height, location and materials for a fence;

(K) Protecting and preserving existing trees, vegetation, water resources, air quality~~resources,~~ wildlife habitat, or other significant natural resources [*NOTE: the term "quality" is consistent with the DEQ regulatory scheme*];

(L) Parking area requirements as listed in §§ 152.560 through 152.562 of this chapter.

(Ord. 83-4, passed 5-9-83; Ord. 2005-02, passed 1-5-2005)

§ 152.616 STANDARDS FOR REVIEW OF CONDITIONAL USES AND LAND USE DECISIONS.

The following standards shall apply for review by the Hearings Officer, the Planning Director or appropriate planning authority of the specific conditional uses and land use decisions listed in this chapter:

(HHH) *Commercial Wind Power Generation Facility.*

(1) The procedure for taking action on the siting of a facility is a request for a conditional use. A public hearing pursuant to Sections ~~152.750–755 and~~ 152.771 shall be held to determine if the applicant meets the siting requirements for a Wind Power Generation Facility. The requirement for a hearing and any other procedure, including pre-application conference and application requirements, will not apply to proposed facilities for which the Oregon Energy Facility Siting Council (EFSC) is making the land use decision. [*NOTE: clarifying that EFSC jurisdictional projects are subject only to the County's applicable substantive, and not procedural, requirements*].

[Former # (2) moved to # (5)]

New→# (2) A pre-application meeting~~(s)~~ is required. The applicant will be expected to bring preliminary information about the application components described in Application Requirement (5) below. County staff will arrange the meeting and will invite local, state, federal and other agency representatives ~~and individuals with pertinent expertise in natural resources,~~ to participate. The purpose of the pre-application meeting will be to identify potential impacts and opportunities and to advise on the level of detail required in each of the application components described in (5) below, and establish technical oversight requirements for monitoring plans. This pre-application requirement does not apply to projects being sited through EFSC.

(3) Umatilla County may impose clear and objective conditions in accordance with the County Comprehensive Plan, County Development Code and state law, which Umatilla County considers necessary to protect the best interests of the surrounding area, or Umatilla County as a whole.

(4) Prior to commencement of any construction, all other necessary pre-construction permits shall be obtained, including but not limited to a conditional use permit, ~~e.g. Umatilla County~~ ~~Z~~zoning p~~P~~ermit~~,~~ and road access ~~and other~~ permit~~,s~~ from ~~the~~ Umatilla County ~~Public Works Department,~~ and ~~from the Oregon Department of Transportation.~~ other ~~permits from~~ state agencies with the requisite jurisdiction.

~~(2)~~ (5) *Application Requirements.* The following information shall be provided as part of the local land use application. For projects sited through EFSC, these application requirements do not apply as applicable substantive criteria and the applicant must provide as a part of the application for site certificate information consistent with the requirements in OAR chapter 345, division 21.~~:~~

(A) (1) A general description of the proposed Wind Power Generation Facility~~;~~:

(2) A~~a~~ tentative construction schedule~~;~~:

(3) Tthe legal description of the property on which the facility will be located~~,~~; and

(4) Iidentification of the general area for all components of the proposed Wind Power Generation Facility~~,~~.

(B) A ~~including a~~ map showing the location of components.

(C) ~~(1) Evidence of wind monitoring data qualifying the wind resources within the project boundary.~~ [*NOTE: this would require the applicant to provide proprietary business information. It is a business decision for an applicant to decide whether wind resources are adequate to support a commercially viable project.*]

~~(2) Evidence of active utility transmission interconnect requests and/or process and description of same, and~~ [*NOTE: this would require the applicant to provide proprietary business information. It is a business decision for an applicant to move forward with a land use application independent from an interconnection request*]

~~(13)~~ Route and plan for transmission facilities connecting the project to the grid.

~~(B)~~(D) Identification of potential conflicts, if any, with: (1) Accepted forest practices and farming or ranching practices as defined in ORS 215.203(2) ~~(c)~~ on adjacent lands devoted to farm and/or forest uses; (2) Other resource operations and practices on adjacent lands except for ~~except for including~~ wind power generation facilities on such adjacent lands. [*NOTE: no standard requires applicant to evaluate potential impacts to existing operating wind facilities so it is unclear why this analysis would be provided. Treatment of wake impacts should be addressed by the developers and agreed-upon setbacks should be negotiated outside of the permit process.*] ~~;. and (3) Accepted farm or forest practices on surrounding EFU/GF or NR land, including the nature and the extent of the impact of the proposed facility on the cost of such practices.~~

~~(C)~~(E) A Transportation Plan, with proposed recommendations, if any, reflecting the guidelines provided in the Umatilla County Transportation System Plan (TSP) and the transportation impacts of the proposed Wind Power Generation Facility upon the local and regional road system during and after construction, after consultation with Umatilla County Public Works Director. The plan will designate the size, number, location and nature of vehicle access points.

~~(D)~~(F) A~~n~~ fish, wildlife and avian impact monitoring plan. The ~~avian~~ monitoring plan shall be designed and administered by the applicant's wildlife professionals. [See HHH (2), above] ~~For projects being sited by EFSC, compliance with EFSC's avian monitoring requirements will be deemed to meet this requirement.~~ The plan shall include the formation of a technical oversight committee to review the plan, and consist of the following persons:

(1) The landowners/farm tenants.

(2) Facility owner/operator representative. (Chair)

(3) Oregon Department of Fish and Wildlife representative, if the agency chooses to participate.

(4) Two Umatilla County residents with no direct economic interest in the project and recommended by the applicants for appointment by the Umatilla County Board of Commissioners.

(5) U.S. Fish and Wildlife representative, if the agency chooses to participate.

(6) Umatilla County Planning Commission member. ~~At the request of applicant, this committee requirement may be waived or discontinued by the County.~~

[Former (2) (E) moved to (6) (I)]

~~(F)~~(G) An ~~fire prevention and~~ emergency management and operations ~~response~~ plan for all phases of the life of the facility. The plan shall address the following: ~~address the major concerns associated with the terrain, dry conditions, and fire hazards, limited access,, and water quality as needed, addressing both normal and extraordinary conditions.~~

(1) The plan shall identify the fire district or fire department and verify that the district/department has the appropriate equipment, training and personnel to respond to fires, spills and high rise rescue. If the local fire district or department does not have adequate high rise rescue capability, the applicant shall provide a plan for providing such response in case of an emergency

~~(2) A spill prevention control and counter measure plan(SPCC) shall be provided.~~ [*NOTE: this is something that is not developed until closer to operations and would not be available at the time of the application. Plus, any need for a SPCC would be satisfied through applicable state permitting.*]

(~~2~~3) The plan shall identify the ~~An Operations and Maintenance Plan detailing~~ expected work force, local response capability, (contract or otherwise), controlled access, and in the case of transmission lines, proof of emergency response capability in accordance with OPUC rules governing operation and maintenance of such lines.

(34) The plan shall identify measures ~~An Emergency Response Plan~~ for responding to natural and/or man made emergencies or disasters.

~~(G)~~(H) ~~An~~ revegetation and erosion control plan, developed in consultation with the Umatilla County Public Works Department~~,, Soil and Water Conservation District, Watershed Council, the Oregon Agricultural Water Quality Management Program (administered by the Oregon Department of Agriculture), the Department of Environmental Quality and the Confederated Tribes of the Umatilla Indian Reservation~~. [*NOTE: is there an issue in the county that requires involving all these parties? This seems like a very intensive requirement that could take a significant amount of time to achieve. Such parties will have an opportunity to comment during the local land use proceeding, during which time any concern over the revegetation plan could be raised and addressed*.] At a minimum, ~~T~~the plan should include the seeding of all road cuts or related bare road areas as a result of all

construction, demolition and rehabilitation with an appropriate mix of native vegetation or vegetation suited to the area. ~~This requirement will be satisfied if the applicant has an NPDES (National Pollution Discharge Elimination System) permit.~~ The plan should also address monitoring during and post construction. This requirement will be satisfied if the applicant is seeking an NPDES (National Pollution Discharge Elimination System) permit

~~(H)~~(I) A weed control plan addressing prevention and control of all Umatilla County identified noxious weeds and other weeds such as thistles which distribute weed seed while blowing across nearby lands following maturity, directly resulting from the Wind Power Generation Facility during preparation, construction, operation and demolition/rehabilitation.

~~(I) A socioeconomic impact assessment of the Wind Power Generation Facility, evaluating such factors as, but not limited to, the project's effects upon the social, economic, public service, cultural, visual, and recreational aspects of affected communities and/or individuals. These effects can be viewed as either positive or negative. In order to maximize potential benefits and to mitigate outcomes that are viewed as problematic, decision makers need information about the socioeconomic impacts that are likely to occur.~~

[New (6) (J) below moved from (2) (K)]

~~(K)~~(J) Information pertaining to the impacts of the Wind Power Generation Facility on:

(1) Wetlands and Streams;

(2) Fish, Avian and Wildlife (all potential species of reasonable concern~~)~~, including but not limited to federally listed threatened and endangered species);

(3) Fish, Avian and Wildlife Habitat;

(4) Criminal Activity (vandalism, theft, trespass, etc). Include a plan and proposed actions~~, if any,~~ to avoid, minimize or mitigate negative impacts.

[New (5) (K) below moved from (2) (L)]

~~(L)~~(K) A dismantling and decommissioning plan of all components of the Wind Power Generation Facility, as provided in §152.616 (HHH) (7).

~~(5)~~ (6) *Standards/Criteria of Approval.* The following requirements and restrictions apply to the siting of a facility:

(A) Setbacks.

(1) ~~The Wind Power Generation Facility shall be on property zoned EFU/GF or NR, and n~~No portion of the facility turbines/towers shall be within 3,520 feet of properties zoned residential use or designated on the Comprehensive Plan as residential. (For clarification purposes of this section, EFU/GF/NR zones are not considered zoned for residential use.)

(2) Turbines/towers must ~~shall not~~ be set back at least ~~constructed closer than~~ 1,320 feet ~~one half mile of~~ from an existing residence~~.~~, measured from the centerline of the turbine tower to the center of the nearest residence existing at the time of tower

construction, unless a written waiver is obtained from the landowner and ~~that shall be~~ recorded with the County deed records. [*NOTE: the suggested setback is consistent with EFSC's conditions of approval for wind facilities. See Helix Site Certificate Condition 43(c).*]

(3) New above-ground electrical transmission lines associated with the facility ~~project~~ shall not be constructed closer than 2~~5~~00 feet to an existing residence, measured from the line to the center of the nearest residence existing at the time of line construction, unless a ~~without prior~~ written waiver is obtained from the landowner ~~approval of the homeowner, said written approval to~~ and ~~be~~ recorded with the County deed records, or unless the~~.~~ ~~Exceptions to the 500 feet setback include~~ transmission lines are placed in public right of way. ~~*Note: Transmission and distribution lines constructed and owned by the applicant what are not within the project boundary are subject to a separate land use permit.*~~ [*NOTE: the suggested language mirrors the language for the residential setback the facility for consistency and is consistent with EFSC's conditions of approval. Additionally, the facility and all related or supporting facilities are located within the facility site boundary and therefore should be subject to only one land use decision.*]

(4) Public Safety. Turbines/towers must be setback from any public road right-of-way ~~way~~ a minimum distance of 110-percent of maximum ~~two times the overall total tower to~~ blade tip height, measured from the centerline of the turbine tower to the nearest edge of any public right-of-way. [*NOTE: this suggested language is consistent with EFSC's conditions of approval for wind facilities. See Helix Site Certificate Condition 43(b)*]

~~E)~~(5) The turbines/towers shall be of a size and design to help minimize ~~reduce~~ noise or other detrimental effects. ~~At a minimum,~~ ~~t~~The facility shall be designed and operated within the limits of the noise standards established by DEQ rule~~the State of Oregon~~. A noise study may be required to confirm that the facility will be ~~verify downwind noise impacts in all wind directions are in~~ compliance with DEQ~~the~~ noise standards.

(B)

Reasonable efforts shall be made to design ~~blend~~ the wind ~~facility~~ turbines/towers to minimize adverse visual features~~with the natural surrounding area in order to minimize impacts upon open space and the natural landscape~~. [*NOTE: this suggested language is consistent with the EFSC standard in OAR 345-024-0015.*]

(C)

~~The Development and Operation of the Facility will reasonably~~ Reasonable efforts shall be taken to ~~Reasonable efforts shall be taken to~~ protect and ~~to~~ preserve existing trees, vegetation, water resources, wildlife, wildlife habitat, fish, avian ~~or~~ and other significant natural resources. ~~Compliance with this standard may require mitigation and/or submission of an annual monitoring report.~~ [*NOTE: suggest keeping the original code language, or otherwise require an analysis of significant adverse impacts to provide more certainty of what the code criterion requires.*]

(D)

The turbine towers shall be designed and constructed to discourage bird nesting and wildlife attraction.

[Former (5) (E) was moved to (6) (A) (5)]

~~(F)~~(E)

Private access roads constructed as a part of the facility ~~established and controlled by the Wind Power Facility shall~~ may be gated to protect the facility and property owners from illegal or unwarranted trespass, and illegal dumping and hunting.

~~(G)~~(F)

Where practicable the electrical cable collector system shall be installed underground, at a minimum depth of 3 feet; elsewhere the cable collector system shall be installed to prevent adverse impacts on agriculture operations.

~~(H)~~(G)

Required permanent maintenance/operations buildings shall be located off-site in one of Umatilla County's appropriately zoned areas, except that such a building may be constructed on-site if:

1) Tthe building is designed and constructed generally consistent with the character of similar buildings used by commercial farmers or ranchers, and

2) Tthe building will be removed or converted to farm use upon decommissioning of the Wind Power Generation Facility consistent with the provisions of § 152.616 (HHH) (7).

~~(I)~~(H)

A Wind Power Generation Facility shall comply with the Specific Safety Standards for Wind Facilities delineated in OAR 345-024-0010 (as adopted at time of application).

[New (6) (I) below, moved from (2) (E)]

~~(E)~~(I)

A Covenant Not to Sue with regard to generally accepted farming practices shall be recorded with the County. Generally accepted farming practices shall be consistent with the definition of Farming Practices under ORS 30.930. The applicant shall covenant not to sue owners, operators, contractors, employees, or invitees of property zoned for farm use for generally accepted farming practices.

(J)

Roads.

(1) A Road Use Agreement with Umatilla County regarding the impacts ~~and mitigation~~ on county roads and mitigation for the impacts shall be required as a condition of approval.

(2) Design specifications ~~Layout and design~~ of the facility ~~project~~ roads shall comply with county standards and be reviewed and approved by the county road department prior to construction. [*NOTE: the county will have the opportunity to review and approve the specific road design specifications when issuing building permits.*]

[New (6) (K) below, moved from (2) (J)]

~~(J)~~(K)

Demonstrate ~~All Wind Power Generation Facilities must show~~ compliance with the standards found in OAR 660-033-0130 (37).

~~6) To the extent feasible, the county will accept information presented by an~~

~~application for an EFSC proceeding in the form and on the schedule required by EFSC.~~

~~(7)(L)~~ ~~Submit a plan for~~ ~~The applicants dismantling of uncompleted construction and/or decommissioning plan for and/or re-powering of the Wind Power Generation Facility shall include the following information: as described in §152.616 (HHH) (7).~~ [*NOTE: this standard is duplicative of what is required under new subsection (5)(K) above as a part of the application. For projects sited through EFSC, this information is included in Exhibit W. If included as a standard or criterion of approval, it is unclear what is required to demonstrate compliance.*]

[New (6) (M) below, moved from # (8)]

(LM)~~(8)~~ A surety bond, letter of credit, or other financial assurance mechanisms acceptable to the County ~~or letter of credit~~ shall be established to cover ~~for~~ the cost of dismantling ~~of~~ uncompleted construction and/or decommissioning of the facility~~.~~, and site restoration ~~rehabilitation~~ pursuant to ~~(See~~ § 152.616 (HHH) (7) &(8)). For projects being sited through EFSC, the financial assurance required by EFSC will be deemed to meet this requirement. [*NOTE: the code should provide sufficient flexibility to allow for various forms of financial assurances depending on what is available in the future. Additionally, financial assurance satisfying EFSC's standards should satisfy the substantive requirement of this code provision*] ~~For projects being sited by the State of Oregon's Energy Facility Siting Council (EFSC), the bond or letter of credit required by EFSC will be deemed to meet this requirement.~~

[New (6) (N) below, moved from # (9)]

~~(9)~~(M~~N~~) The actual latitude and longitude location or Stateplane NAD 83(91) coordinates of each turbine tower, connecting lines, operations and maintenance~~O & M~~ building, substation and transmission lines, shall be provided to Umatilla County within 90 days of starting ~~once commercial~~ electrical production ~~begins~~.

~~(O)~~ ~~An Operating and Facility Maintenance Plan shall be submitted and subject to county review and approval.~~ [*NOTE: this already seems to be a requirement imposed under the emergency operation plan under subsection (5) above. If included as a standard or criterion of approval, it is unclear what is required to demonstrate compliance*]

[New (6) (P) below, moved from (10)]

~~(10)(P)~~ ~~A summary of as built construction~~changes in the facility from the ~~original plan, if any, shall be provided by the owner/operator. within 90 days of starting electrical production.~~ [*NOTE: as revised, how is this requirement different than what is required as a part of subsection (N) above? Also, this seems to be a matter that would be addressed through the building permit process, not the land use process and is therefore unnecessary to include as a standard.*]

[New (7) below was formerly (7) (A)]

(7)~~(A)~~ A plan for dismantling and/or decommissioning that provides for completion of dismantling or decommissioning of the facility without significant delay and protects public health,

safety and the environment in compliance with the restoration requirements of this section. For projects sited through EFSC, compliance with EFSC's financial assurance and decommissioning standards shall be deemed to be in compliance with the dismantling and decommissioning requirements of ~~this~~ § 152.616 (HHH)(7) & (8). [*NOTE: this suggested language from subsection (8)(D) and was moved here for clarity*]

~~(B)~~(A) A description of actions the facility owner proposes to take to restore the site to a useful, non-hazardous condition, including options for post-dismantle or decommission land use, information on how impacts on fish, wildlife, avian populations and the environment would be minimized during the dismantling or decommissioning process, and measures to protect the public against risk or danger resulting from post-decommissioning site conditions in compliance with the requirements of this section.

~~(C)~~(B) A current detailed cost estimate, a comparison of that estimate with present funds ~~the bond set aside~~ for dismantling or decommissioning, and a plan for assuring the availability of adequate funds for completion of dismantling or decommissioning. The cost estimate will be reviewed and ~~be~~ updated by the facility owner/operator on a 3 ~~5~~-year basis~~.~~, unless material changes have been made in the overall facility that would materially increase or decrease these costs. If so, the report must be revised within 120 days of completion of such changes.

~~(D)~~(C) Restoration of the site shall consist of the following:

1) Dismantle turbines, towers, pad-mounted transformers, meteorological towers and related aboveground equipment. All concrete turbine pads shall be removed to a depth of at least three feet below the surface grade.

2) The underground collection and communication cables need not be removed if at a depth of three feet or greater. These cables at a depth of three feet or greater can be abandoned in place if they are deemed not a hazard or interfering with agricultural use or other ~~consistent~~ resource uses of the land.

3) Gravel shall be removed from areas surrounding turbine pads.

4) Private ~~A~~ access roads shall be removed by removing gravel and restoring the surface grade and soil, unless the landowner elects to maintain the private access roads. [*NOTE: often-times landowners want to keep the private access roads for better access to fields*]

5) After removal of the structures and roads, the area shall be graded as close as is reasonably possible to its original contours and the soils shall be restored to a condition compatible with farm uses or consistent with other resource uses. Re-vegetation shall include planting by applicant of native plant seed mixes, planting by applicant of plant species suited to the area, or planting by landowner of agricultural crops, as appropriate, and shall be consistent with the weed control plan approved by Umatilla County.

6) Roads, cleared pads, fences, gates, and improvements may be left in place if a letter from the land owner is submitted to Umatilla County indicating said land owner will be responsible for, and will maintain said roads and/or facilities for farm or other purposes as permitted under applicable zoning.

[New # (8) below was formerly (7) (E)]

~~(E)~~(8) The applicant (facility owner/operator) shall submit to Umatilla County proof of financial assurance ~~a bond or letter of credit~~ acceptable to the County, in the amount of the decommissioning fund naming Umatilla County ~~and the landowner as~~ beneficiary or payee. For projects sited through EFSC, compliance with EFSC's financial assurance and decommissioning standards shall be deemed to be in compliance with the dismantling and decommissioning requirements of ~~this~~ § 152.616 (HHH)(7) & (8). [*NOTE: this suggested language is from subsection (8)(D) and was moved here for clarity. Also, using the term "financial assurance" provides flexibility for the type of mechanisms that may be used*]

~~(1)~~(A) The calculation of present year dollars shall be made using the U.S. Gross Domestic Product Implicit Price Deflator as published by the U.S. Department of commerce, Bureau of Economic Analysis, or any successor agency (the Aindex.@). The amount of the financial assurance ~~bond or letter of credit account~~ shall be changed up or down if the change in the Index moves by more than ~~change if the Index changes be increased at such time when the cumulative percentage increase in the Index exceeds~~ 10 percent from the last change, and then the amount shall be increased or decreased by the cumulative percentage increase. If at any time the Index is no longer published, Umatilla County and the applicant shall select a comparable calculation of present year dollars. The amount of the financial assurance ~~bond or letter of credit account~~ shall be pro-rated within the year to the date of decommissioning. [*NOTE: using the term "financial assurance" provides flexibility for the type of mechanisms that may be used*]

~~(2)~~(B) The decommissioning financial assurance ~~bond fund~~ shall not be subject to revocation or reduction before decommissioning of the Wind Power Generation Facility~~.~~ and restoration ~~rehabilitation~~ of the project site~~s~~. [*NOTE: using the term "financial assurance" provides flexibility for the type of mechanisms that may be used*]

~~(3)~~(C) The facility owner/operator shall describe the status of the decommissioning financial assurance ~~bond fund~~ in the annual report submitted to the Umatilla County.

~~(F) If any disputes arise between Umatilla County and the landowner on the expenditure of any proceeds from the bond or the letter of credit, either party may request non-binding arbitration. Each party shall appoint an arbitrator, with the two arbitrators choosing a third. The arbitration shall proceed according to the Oregon statutes governing arbitration. The cost of the arbitration (excluding attorney fees) shall be shared equally by the parties.~~

~~(G) For projects sited by EFSC, compliance with EFSC's financial assurance and decommissioning standards shall be~~

~~deemed to be in compliance with the dismantling and decommissioning requirements of this § 152.616 (HHH)(7) & (8).~~ [*NOTE: suggest moving to subsection (7) and (8) introductions for clarity*]

[Former # (8) moved to (6) (M)]

[Former # (9) moved to (6) (N)]

[Former # (10) moved to (6) (P)]

[New # (9) below, moved from # (12)]

~~(9)(12)~~ Within 120 days after the end of each calendar year the facility owner/operator shall provide Umatilla County an annual report including the following information:

(A)

Energy production by month and year.

(B)

Non-proprietary information about wind conditions, (e.~~-~~g., monthly averages, high wind events, bursts).

(C)

A summary of changes to the facility that do not require facility requirement amendments.

(D)

A summary of the **fish, wildlife and** avian monitoring program – bird injuries, casualties, positive impacts on area wildlife and any recommendations for changes in the monitoring program.

(E)

Employment impacts to the community and Umatilla County during and after construction.

(F)

Success or failures of weed control practices.

(G)

Status of the decommissioning financial assurance ~~bond fund~~.

(H)

Summary comments –

1) ~~any~~ P~~p~~roblems with the projects, any adjustments needed, or any suggestions.

2) The annual report requirement may be modified ~~discontinued or required at a less frequent schedule~~ by the County~~.~~ as warranted by project conditions, circumstances and compliance. The reporting requirement and/or reporting schedule shall be reviewed, and possibly altered, at the request of the facility owner/operator. For facilities under EFSC jurisdiction and for which an annual report is required, the annual report to EFSC satisfies this requirement.

[New # (10) below, moved from # (11)]

(10) ~~(11)~~ (A)

The Wind Power Generation Facility requirements shall be facility specific, but can be amended as long as the facility does not exceed the boundaries of the Umatilla County conditional use permit where the original facility was constructed.

(B)

An amendment to the conditional use permit shall be **subject to the standards and procedures found in § 152.611. For projects sited through EFSC, a conditional use permit amendment is triggered under ORS 469.401(3) only if EFSC approves a site certificate amendment. Otherwise,**

~~Additionally,~~ an amendment shall be required if the proposed facility changes would:

1) ~~Increase the land area taken out of agricultural production by an additional 20 acres or more; (2) Increase the land area taken out of agricultural production sufficiently to trigger taking a Goal 3 exception; (3) Require an Expansion~~ Expand ~~of~~ the established facility boundaries; (2) ~~(4)~~ Increase the number of towers; (3) ~~(5)~~ Increase generator output by more than 25 percent relative to the generation capacity authorized by the initial permit due to the repowering or upgrading of power generation capacity~~.~~; ~~(4) Changes to project private roads or access points to be established at or inside the project boundaries.~~ [*NOTE: as long as a facility layout, such as a road route, is changed within the approved site boundary, no amendment should be required*]

Notification by the facility owner/operator to the Umatilla County Planning Department of changes not requiring an amendment such as a change in the project owner/operator of record, a change in the emergency plan or change in the maintenance contact are encouraged but are not ~~encouraged, but not~~ required ~~to be reported immediately~~. An amendment to a Site Certificate issued by EFSC will be governed by the rules for amendments established by EFSC. [*NOTE: requiring immediate notification is subjective. The current code language seems sufficient.*]

[# (12) moved to # (9)]

(Ord. 83-4, passed 5-9-83; Ord. 2002-02, passed 5-20-2003; Ord. 2005-02, passed 1-5-2005; Ord. 2009-09, passed 12-8-09)

SITE CERTIFICATION AGREEMENT
BETWEEN

THE STATE OF WASHINGTON

AND

SAGEBRUSH POWER PARTNERS, LLC

For the

KITTITAS VALLEY WIND POWER PROJECT

KITTITAS COUNTY, WASHINGTON

ENERGY FACILITY SITE EVALUATION COUNCIL

OLYMPIA, WASHINGTON

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SITE CERTIFICATION AGREEMENT

FOR THE KITTITAS VALLEY WIND POWER PROJECT

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Attachments

1. Project Legal Description

2. Council Order No. 826, Findings of Fact, Conclusions of Law, and Order Recommending Approval of Site Certification on Condition dated March 27, 2007.

3. Final Project Configuration

4. RES America, Inc. - Underground Cable Trenching Protocol

5. Department of the Army, Corps of Engineers - Nationwide Permit

6. Washington Department of Fish and Wildlife - Hydraulic Project Approval

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SITE CERTIFICATION AGREEMENT

FOR THE KITTITAS VALLEY WIND POWER PROJECT

between

THE STATE OF WASHINGTON

and

SAGEBRUSH POWER PARTNERS, LLC.

This Site Certification Agreement (Agreement) is made pursuant to Chapter 80.50 of the Revised Code of Washington (RCW) by and between the State of Washington, acting by and through the Governor of the State, and Sagebrush Power Partners, LLC, (Sagebrush or the Certificate Holder), 53 Yamhill Street, Portland, Oregon, 97204.

Sagebrush filed, as permitted by law, an application with the Energy Facility Site Evaluation Council (EFSEC or Council) for site certification for the construction and operation of a wind powered generation facility to be located in Kittitas County, Washington. The Council reviewed Application 2003-01, conducted public and adjudicative hearings, and by order, recommended approval of the application by the Governor. On_____, the Governor approved the Site Certification Agreement authorizing Sagebrush to construct and operate the Kittitas Valley Wind Power Project (Project).

The parties hereby now desire to set forth all terms, conditions, and covenants in relation to such site certification in this Agreement pursuant to RCW 80.50.100(1).

The effective date of this Agreement shall be _____.

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ARTICLE I: SITE CERTIFICATION

A. Site Description

1. Project Site. The site on which the Kittitas Valley Wind Power Project (Project) is to be constructed and operated is located in unincorporated Kittitas County, and is described more particularly in Attachment 2 to this Agreement.

2. Mitigation Parcel. The legal description of the Mitigation Parcel to be used for mitigation of habitat, vegetation and wildlife impacts is set out in Attachment 3 of this Agreement. No later than sixty (60) days prior to the beginning of Site Preparation, the Certificate Holder shall provide to EFSEC the final metes and bounds of the Mitigation Parcel and a copy of fully executed and recorded deed restrictions for the Mitigation Parcel, providing legal protection for the Mitigation Parcel for the life of the Project.

B. Site Certification

The State of Washington hereby authorizes Sagebrush Power Partners, LLC (Sagebrush or Certificate Holder), and any and all parent companies to construct and operate the Project, as described in Article I.C. of this Agreement, subject to the terms and conditions set forth in Council Order No. 826, Findings of Fact, Conclusions of Law, and Order Recommending Site Certification on Condition, and this Site Certification Agreement. Attachment 2 to this agreement.

Such construction and operation shall be located within the areas designated herein and in the Application for Site Certification submitted by Sagebrush Power Partners LLC on January 13, 2003, and in accordance with any modifications to those areas as set out in the Final Environmental Impact Statement (FEIS). Construction of any Project facilities or structures on lands leased from the Washington State Department of Natural Resources (DNR) is permitted when lease agreements are secured from DNR.

This Site Certification Agreement authorizes the Certificate Holder to construct the Project such that Substantial Completion is achieved no later than five (5) years from the date that all final state and federal permits necessary to construct and operate the Project are obtained and associated appeals have been exhausted; provided, however, that such construction is not delayed by a *force majeure* event, and that the construction schedule that the Certificate Holder submits pursuant to Article IV.J of this Agreement demonstrates its intention and good faith basis to believe that construction shall be completed within eighteen (18) months of beginning Construction.

Nothing in this Agreement will be construed to restrict the ability of the Certificate Holder to Begin Commercial Operation of some wind turbine generators prior to completing construction of all wind turbine generator strings and other Project components.

C. Project Description

The Kittitas Valley Wind Power Project will consist of: wind turbine generators (WTGs) and their construction corridors; permanent meteorological towers; access roadways; electrical collection/interconnection and communication systems and their respective corridors and rights of way; electrical step-up and interconnection substations; an operations and maintenance (O&M) facility; an informational kiosk; temporary construction-related facilities; other related Project facilities as described in the Application; and an approximately 539-acre Mitigation Parcel.

1. Wind Turbine Generators and Corridors. The Project shall consist of a maximum of sixty-five (65), 3-bladed wind turbines on tubular steel towers, not to exceed a maximum height (hub height plus blade tip height) of 410 feet. The WTGs will be equipped with turbine control, safety and braking systems, and will be interconnected to a central Supervisory Control and Data Acquisition (SCADA) system. The Certificate Holder shall select a Project configuration within the range of turbine scenarios that follow:

Turbine Size Scenario	330-foot Turbine	410-foot Turbine
Approximate Generator Nameplate Rating	1.5 MW	3.0 MW
Maximum "Tip" Height (Hub height plus blade length)	330 feet	410 feet
Approximate Total Nameplate Capacity	97.5 MW	195 MW

The general location of components of the Project including, but not limited to, the turbine corridors, roadways, electrical collection and distribution system, operations and visitors center; maintenance facility, electrical substations, electrical feeder line(s) and other related Project facilities as described in the ASC, and as updated in the Final Environmental Impact Statement (EIS). The WTGs shall be located only in the turbine corridors identified in the Final EIS, as illustrated in Attachment 3, and in accordance with the final construction plans approved by EFSEC pursuant to Article IV. K.

2. Meteorological Towers. The Project will include up to five (5) free-standing (non-guyed) permanent meteorological towers. The height of the towers shall not exceed the Hub Height of the WTGs selected.

3. Access Roadways. The Project will include up to twenty-one (21) miles (approximately) of roadways for access to the WTGs and other Project facilities.

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4. Electrical Collection/Interconnection and Communication Systems.

a) Collector System. The electrical output of the WTGs will be collected and transmitted to the Project Substation(s) via a system of underground and overhead electric cables. Fiber optic or copper communication wires will also link the individual WTGs to a central computer monitoring system.

b) Project Step-Up Substation(s). Power from the Project will be collected and fed to the Puget Sound Energy (PSE) and/or the Bonneville Power Administration (BPA) high voltage transmission lines through a Project step-up substation(s). The step-up substation(s) would connect to the respective PSE and/or BPA interconnect.

c) Interconnecting Transmission Systems. The Project will interconnect with the BPA and/or PSE transmission systems on or adjacent to the Project site.

5. Operations and O&M Facility and Informational Kiosk.

a) The O&M facility will include a main building with offices, restrooms, visitor reception area, outdoor parking facilities, turn-around area, laydown area, outdoor lighting and gated access. The O&M facility building will have a foundation footprint of approximately 5,000 sq. ft. and will be placed on a site of approximately five (5) acres. It will be constructed near the northwest corner of the intersection of US 97 and Bettas Road.

b) The O&M facility will include a water well exempt pursuant to RCW 90.44.050 (withdrawing less than 5,000 gallons per day) for water supply. Sanitary wastewater from the maintenance facility will be discharged to an on-site septic system.

c) An informational kiosk will be constructed near the O&M facility off Bettas Road.

6. Mitigation Parcel. An approximately 539-acre Mitigation Parcel has been designated for mitigation of all permanent and temporary impacts to habitat caused by construction and operation of the Project. The area designated for mitigation is located in Sections 22 and 27, T 79 N, R 17 E in Kittitas County.

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7. Turbine Setbacks.

Turbines shall be set back from existing built elements as follows:

- Distance from residences, existing as of January 13, 2003, of adjacent landowners without signed agreements with the Certificate Holder: four times the maximum turbine tip height (i.e. 330-foot turbine = 1,320-foot setback; 440 = 1,640-foot setback). For each turbine located within 2,500 feet of a non-participating landowner's existing residence, micro-siting determinations shall give highest priority to increasing the distance of the turbine from that non-participating landowner's residence, even beyond the minimum four times height setback described above, so as to further mitigate and minimize any visual impacts on that non-participating landowner. Prior to commencement of construction, the Applicant shall provide EFSEC with documentation demonstrating its engineering efforts to site the applicable turbine locations in this manner, indicating the various factors reviewed for each micro-siting recommendation.
- Distance from residences of landowners with signed agreements with the Certificate Holder: maximum turbine height (also called "blade tip height").

For purposes of this article, "existing built element" is defined as those built elements constructed as of January 13, 2003, or properties with vested rights to build as of January 13, 2003. For purposes of this article, "residence" means the primary physical structure on a residential lot utilized as a single family home; as used herein, "residence" includes the entire structure within the main walls and the eaves of the roof, but does not include uncovered decks, uncovered patios, or outbuildings.

Distance shall be measured horizontally from the centerline of the turbine tower to the outermost envelope of the built element considered.

Turbines shall be set back from property lines, roads, and other features as follows:

- Distance from property lines of adjacent landowners without signed agreements with the Certificate Holder: 541 feet.
- Distance from property lines of landowners with signed agreements with the Certificate Holder: N/A.
- Distance from Bonneville/PSE transmission lines: maximum turbine height or as dictated by the respective transmission line owners.
- Distance from county and state roads: maximum turbine height.

As noted above, distance shall be measured horizontally from the centerline of the turbine tower to the property line or the outermost edge of the road or other feature considered.

ARTICLE II: DEFINITIONS

Where used in this Site Certification Agreement, the following terms shall have the meaning set forth below:

1. "Application" means the *Application for Site Certification: Kittitas Valley Wind Power Project*, designated No. 2003-01, submitted January 13, 2003 and incorporated by reference herein.

2. "Approval" (by EFSEC) means an affirmative action by EFSEC or its authorized agents regarding documents, plans, designs, programs, or other similar requirements submitted pursuant to this Agreement.

3. "Begin Commercial Operation" or "Beginning of Commercial Operation" means the time when the Project begins generating and delivering electricity to the electric power grid, other than electricity which may delivered as a part of testing and startup of the Project.

4. "BMPs" means Best Management Practices.

5. "Bonneville" or "BPA" means Bonneville Power Administration.

6. "Certificate Holder" means Sagebrush Power Partners, LLC, or its successor.

7. "Construction" means any of the following activities: any foundation construction including hole excavation, form work, rebar, excavation and pouring of concrete for the WTGs, the operations and maintenance facility building, or the substations and erection of any permanent, above-ground structures including any transmission line poles, substation poles, meteorological towers, or turbine towers.

8. "County" means Kittitas County, Washington.

9. "DAHP" means the Washington State Department of Archeology and Historic Preservation.

10. "DNR" means the Washington State Department of Natural Resources.

11. "Ecology" means the Washington State Department of Ecology.

12. "EFSEC" or "Council" means the State of Washington Energy Facility Site Evaluation Council, or such other agency or agencies of the State of

Washington as may hereafter succeed to the powers of EFSEC for the purposes of this Agreement.

13. "EFSEC Costs" means any and all reasonable costs, both direct and indirect, associated with EFSEC activities with respect to this Site Certification Agreement (SCA), including but not limited to monitoring, staffing and SCA maintenance.

14. "EIS" or "Final EIS" means the EFSEC Kittitas Valley Wind Power Project Final Environmental Impact Statement (February 2007) issued pursuant to the requirements of the State Environmental Policy Act.

15. "End of Construction" means the time when all Project facilities have been substantially constructed and are in operation.

16. "FAA" means the Federal Aviation Administration.

17. "Force Majeure Event" has the following meaning: Any event that directly prevents or delays the performance by the Party affected of any obligation arising under this Agreement, including an event that is within one or more of the following categories: condemnation; expropriation; invasion; plague; drought; landslide; tornado; hurricane; tsunami; flood; lightning; earthquake; fire; explosion; epidemic; quarantine; war (declared or undeclared), terrorism or other armed conflict; material physical damage to the Project caused by third parties; riot or similar civil disturbance or commotion; other acts of God; acts of the public enemy; blockade; insurrection, riot or revolution; sabotage or vandalism; embargoes; and, actions of a governmental authority other than EFSEC.

18. "Kittitas Valley Wind Power Project" or "Project" means: wind turbine generators (WTGs) and their construction corridors; permanent meteorological towers; access roadways; electrical collection/interconnection and communication systems and their respective corridors and rights-of-way; electrical step-up and interconnection substations; an operations and maintenance facility; informational kiosk; temporary construction-related facilities; other related Project facilities as described in the Application, and an approximately 539 acre Mitigation Parcel. The specific components of the Project are identified in Article I.C.

19. "IBC" means the International Building Code.

20. "Micro-siting" means the final technical and engineering process by which the Certificate Holder shall recommend the precise placement of the final location of each wind turbine generator. The plans produced by this process shall be

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included in the Site Certification Agreement's Construction Management Plan as required by Article IV, Section I.

21. "NPDES permit" means National Pollutant Discharge Elimination System permit.

22. "PSE" means Puget Sound Energy.

23. "RCW" means the Revised Code of Washington.

24. "Site", "Project Site" or "Project Area" means the property identified in Attachments 2 and 3, located in Kittitas County, on which the Project is to be constructed and operated, including the Mitigation Parcel, underground and overhead electrical collection and interconnect substations.

25. "Site Certification Agreement", "SCA" or "Agreement" means this formal written agreement between the Certificate Holder and the State of Washington, including all attachments hereto and exhibits, modifications, amendments, and documents incorporated herein.

26. "Site Preparation" means any of the following activities: Project Site clearing, grading, earth moving, cutting or filling, excavation, and preparation of roads and/or laydown areas.

27. "State" or "state" means the state of Washington.

28. "Substantial Completion" means: the Project is generating and delivering energy to the electric power grid.

29. "UBC" means the Uniform Building Code of 1997.

30. "WAC" means the Washington Administrative Code.

31. "WDFW" means the Washington Department of Fish and Wildlife.

32. "WTG" means wind turbine generator.

33. "WSDOT" means the Washington State Department of Transportation.

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ARTICLE III: GENERAL CONDITIONS

A. Legal Relationship

1. This Agreement shall bind the Certificate Holder, and its successors in interest, and the State and any of its departments, agencies, divisions, bureaus, commissions, boards, and its political subdivisions, subject to all the terms and conditions set forth herein, as to the approval of, and all activities undertaken with respect to, the Project or the Site. The Certificate Holder shall ensure that any activities undertaken with respect to the Project or the Site by its agents (including affiliates), contractors, and subcontractors comply with this Agreement. The term "affiliates" includes any other person or entity controlling, controlled by, or under common control of or with the Certificate Holder.

2. This Agreement, which includes those commitments made by the Certificate Holder in the Application (the Application is hereby incorporated by reference), constitutes the whole and complete agreement between the State of Washington and the Certificate Holder, and supersedes any other negotiations, representations, or agreements, either written or oral.

B. Enforcement

1. This Agreement may be enforced by resort to all remedies available at law or in equity.

2. This Agreement may be suspended or revoked by EFSEC pursuant to Chapter 34.05 RCW and Chapter 80.50 RCW, for failure by the Certificate Holder to comply with the terms and conditions of this Agreement, for violations of Chapter 80.50 RCW and the rules promulgated thereunder or for violation of any applicable resolutions or orders of EFSEC.

3. When any action of the Council is required by or authorized in this Site Certification Agreement, the Council may, but shall not be required to, conduct a hearing pursuant to Chapter 34.05 RCW.

C. Notices and Filings

Filing of any documents or notices required by this Agreement with EFSEC shall be deemed to have been duly made when delivery is made to EFSEC's offices in Thurston County.

Notices to be served by EFSEC on the Certificate Holder shall be deemed to have been duly made when deposited in first class mail, postage prepaid, addressed to the Certificate Holder at 53 SW Yamhill Street, Portland, Oregon 97204, with a copy to 808 Travis, Suite 700, Houston, TX, 77002.

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D. Rights of Inspection

Throughout the duration of this Agreement, the Certificate Holder shall provide access to the Site, the Project structures, buildings and facilities, underground and overhead electrical collector lines, the Mitigation Parcel, and all records relating to the construction and operation of the Project to designated representatives of EFSEC in the performance of their official duties. Such duties include, but are not limited to, monitoring and inspections to verify the Certificate Holder's compliance with this Agreement. EFSEC personnel or any designated representatives of EFSEC shall follow all worker safety requirements observed and enforced on the Project site by the Site Certificate Holder and its contractors.

E. Retention of Records

The Certificate Holder shall retain such records as are necessary to demonstrate the Certificate Holder's compliance with this Agreement.

F. Consolidation of Plans and Submittal to EFSEC

Any plans required by this Agreement may be consolidated with other such plans, if such consolidation is approved in advance by EFSEC. This Site Certification Agreement includes time periods for the Certificate Holder to provide certain plans and other information to EFSEC or its designees. The intent of these time periods is to provide sufficient time for EFSEC or its designees to review submittals without delay to the Project construction schedule, *provided* submittals made to EFSEC and/or its designees are complete.

G. Site Certification Agreement Compliance Monitoring and Costs

The Certificate Holder shall pay to the Council such reasonable monitoring costs as are actually and necessarily incurred during the construction and operation of the Project to assure compliance with the conditions of this Agreement as required by Chapter 80.50 RCW. The amount and manner of payment shall be prescribed by EFSEC pursuant to applicable rules and procedures.

The Certificate Holder shall to EFSEC's satisfaction deposit or otherwise guarantee payment of all EFSEC Costs as defined in Article II.12, for the period commensurate with the activities of this Agreement. EFSEC shall provide the Certificate Holder an annual estimate of such costs. The instrument guaranteeing payment of EFSEC's costs shall be structured in such a manner as to allow EFSEC to collect from a third party and without approval of the Certificate Holder any such costs which the Certificate Holder fails to pay to EFSEC during any preceding billing period.

H. Site Restoration

The Certificate Holder is responsible for site restoration pursuant to the Council's rules, Chapter 463-42 WAC, in effect at the time of submittal of the Application.

The Certificate Holder shall submit an Initial Site Restoration Plan in accordance with the requirements set out in Article IV.D of this Agreement. The Certificate Holder may not begin Site Preparation or Construction until the Council has approved the Initial Site Restoration Plan, including the posting of all necessary securities or funds associated therewith.

The Certificate Holder shall submit a detailed site restoration plan to EFSEC for approval in accordance with the requirements of Article VIII.A. of this Agreement.

I. EFSEC Liaison

No later than thirty (30) days from the effective date of this Agreement, the Certificate Holder shall designate a person to act as a liaison between EFSEC and the Certificate Holder.

J. Changes in Project Management

The Certificate Holder shall notify EFSEC of any change in the primary management personnel, or scope of responsibilities of such personnel, for the Project.

K. Amendment of Site Certification Agreement

1. This Agreement may be amended pursuant to EFSEC rules and procedures applicable at the time of the request for amendment. Any requests by the Certificate Holder for amendments to this Agreement shall be made in writing.

2. A change in ownership of the Project shall be pursuant to EFSEC rules and procedures.

3. Unless otherwise required by EFSEC any change in the terms or conditions of the following Sections or Attachments to this Agreement shall not require amendment of this Site Certification Agreement in the manner prescribed in Section K.1 above: Attachment 1, Project legal description; Attachment 4, RES America - Underground Cable Trenching Protocol; Attachment 5, Department of Army Corps of Engineers Nationwide Permit; and Attachment 6, WDFW - Hydraulic Project Approval.

4. Repair, maintenance and replacement of Project Facilities

   a) The Certificate Holder is permitted, without any further amendment to this agreement, to repair and maintain Project Facilities described in Article I.C, including the WTGs, consistent with the terms of this Agreement.

   b) The Certificate Holder is permitted to replace the WTGs without amendment to this Agreement provided the replacement meets the following conditions:

      (i) the WTG is being replaced with the same make and model WTG originally used in the Project ("Replacement Turbine"); or the WTG is

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being replaced with a wind turbine that is within the size limits and general configuration defined in Article I.C, Project Description ("Comparable Turbine");

(ii) the Replacement Turbine or Comparable Turbine is located in the same location as the WTG being replaced; and

(iii) the Replacement Turbine or Comparable Turbine meets all other conditions set out in this Agreement.

c) The Certificate Holder shall notify EFSEC of the replacement of a WTG no later than thirty (30) days prior to the replacement occurring.

5. In circumstances where the Project causes a significant adverse impact on the environment not previously analyzed or anticipated by this Agreement, including wildlife impacts that significantly exceed projections anticipated in the Application and Final EIS, or where such impacts are imminent, EFSEC shall take all steps it deems reasonably necessary, including imposition of specific conditions or requirements on the Certificate Holder as a consequence of such a situation in addition to the terms and conditions of this Agreement. Such additional conditions or requirements initially shall be effective for not more than ninety (90) days, and may be extended once for an additional ninety (90) day period if deemed necessary by EFSEC; provided, however, EFSEC may impose conditions on a longer-term basis pursuant to WAC 463-36-090.

L. Order of Precedence

In the event of an inconsistency in this Agreement, the inconsistency shall be resolved by giving precedence in the following order:

1. Applicable federal and State of Washington statutes and regulations;

2. The body of this Site Certification Agreement;

3. Attachment 2, Council Order No.826, Findings of Fact, Conclusions of Law, and Order Recommending Approval of Site Certification on Condition;

4. Any other provision, term or material incorporated herein by reference or otherwise attached to, or incorporated in, this Site Certification Agreement.

ARTICLE IV: PLANS, APPROVALS AND ACTIONS REQUIRED PRIOR TO CONSTRUCTION

A. Notice of Federal Permit Approvals

No later than thirty (30) days after the effective date of this Agreement, the Certificate Holder shall notify the Council of all Federal permits, not delegated to EFSEC, that are required for construction and operation of the Project, if any, and the anticipated date of permit issuance to the Certificate Holder. The Certificate Holder shall notify the Council when all required federal permits have been obtained, no later than ten (10) business days after the last permit has been issued.

B. Mitigation Measures

During construction, operation, decommissioning, and site restoration of this Project, the Certificate Holder shall implement the mitigation measures set forth in this Agreement, including those presented in the Application, as modified or amended in the Final EIS.

No later than sixty (60) days prior to the beginning of Site Preparation, the Certificate Holder shall file with EFSEC a comprehensive list of mitigation measures required by the Final EIS and this Agreement. For each of these mitigation measures, including the micro-siting of turbines required by Article I(C)(7), the Certificate Holder shall further identify the construction plan and/or operation plan addressing the methodology for its achievement.

The specific plans and submittals listed in the remainder of this Article IV, and Articles V, VI, VII and VIII, shall incorporate these mitigation measures as applicable.

C. Construction Stormwater Plans

1. Notice of Intent. No later than sixty (60) days prior to the beginning of Site Preparation the Certificate Holder shall file with EFSEC a Notice of Intent to be covered by a General National Pollutant Discharge Elimination System (NPDES) Permit for Stormwater Discharges Associated with Construction Activities.

2. Construction Stormwater Pollution Prevention Plan. No later than sixty (60) days prior to the beginning of Site Preparation the Certificate Holder shall develop and submit for EFSEC approval a Construction Stormwater Pollution Prevention Plan (Construction SWPPP). The Construction SWPPP shall meet the requirements of the Ecology stormwater pollution prevention program (chapter 173-230 WAC), and the objectives and requirements in Special Condition S.9. of the *National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Stormwater Discharges Associated with Construction Activities* issued by the Department of Ecology on November 16, 2005 or as revised. The Certificate Holder shall not begin Site Preparation prior to obtaining Council approval of the Construction SWPPP.

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The Construction SWPPP shall include measures for temporary erosion and sedimentation control. The Construction SWPPP shall identify a regular inspection and maintenance schedule for all erosion control structures. The schedule shall include inspections after significant rainfall events. Any damaged structures shall be addressed immediately. Inspections, and subsequent erosion control structure corrections, shall be documented in writing and available for EFSEC's review on request.

3. Construction Spill Prevention, Control and Countermeasures Plan. The Certificate Holder shall submit to the Council for review and approval a Construction Spill Prevention, Control, and Countermeasures Plan (Construction SPCCP), consistent with the requirements of Chapter 40 CFR Part 112. The Construction SPCCP shall include the Site, feeder line corridors, and all access roads. The Certificate Holder shall require all contractors working on the facility to have a spill prevention and countermeasure program consistent with 40 CFR Part 112. The Certificate Holder shall not begin Site Preparation prior to obtaining Council approval of the Construction SPCCP. All applicable elements of the Construction SPCCP shall be implemented prior to the beginning of Site Preparation.

D. Initial Site Restoration Plan

The Certificate Holder is responsible for Project decommissioning and site restoration pursuant to Council rules. The Certificate Holder shall develop an Initial Site Restoration Plan, pursuant to the requirements of WAC 463-42-655 in effect on the date of Application, and shall submit the Decommissioning Plan to the Council for review at least sixty (60) days prior to the beginning of Site Preparation. The Certificate Holder shall not begin Site Preparation prior to obtaining approval of the Initial Site Restoration Plan from the Council.

The Initial Site Restoration Plan shall be prepared in sufficient detail to identify, evaluate, and resolve all major environmental and public health and safety issues reasonably anticipated by the Certificate Holder on the date the Plan is submitted to EFSEC. The Initial Site Restoration Plan shall describe the process used to evaluate the options and select the measures that will be taken to restore or preserve the Project site or otherwise protect the public against risks or danger resulting from the Project. The Initial Site Restoration Plan shall include a discussion of economic factors regarding the costs and benefits of various restoration options versus the relative public risk, and shall address provisions for funding or bonding arrangements to meet the Project site restoration or management costs. The Initial Site Restoration Plan shall be prepared in detail commensurate with the time until site restoration is to begin. The scope of proposed monitoring shall be addressed in the Initial Site Restoration Plan.

The Plan shall include the following elements:

1. Decommissioning Timing and Scope, as required by Article VIII.C. of this Agreement.

2. Decommissioning Funding and Surety, as required by Article VIII.D of this Agreement.

3. Mitigation measures contained in the Final EIS that would be implemented for decommissioning of the Project.

4. The Initial Site Restoration Plan shall address both the possibility that site restoration will occur prior to, or at the end of, the useful life of the Project and also the possibility of the Project being suspended or terminated during construction.

5. A description of the assumptions underlying the plan. For example, the plan should explain the anticipated useful life of the Project, the anticipated time frame of site restoration, and the anticipated future use of the site.

6. An initial plan for demolishing facilities, salvaging equipment, and disposing of waste materials.

7. Performing an on-site audit, and preparing an initial plan for disposing of hazardous materials (if any) present on the site and remediation of hazardous contamination (if any) at the site.

8. An initial plan for restoring the site, including the removal of structures and foundations and the regrading of the site, if appropriate.

9. Provisions for preservation or removal of Project facilities if the Project is suspended or terminated during construction.

E. Habitat, Vegetation, and Fish and Wildlife Mitigation

1. Construction Timing. The Certificate Holder shall avoid, to the greatest extent possible, construction activities outside areas that will be permanently disturbed except during the months of May through October when soil moisture is low. Trenching of underground electric collection cables may be performed outside this time window, as the soil cover in those areas will be disturbed regardless of the season and will need to be restored and reseeded. Trenching activities will conducted in accordance with the Underground Cable Trenching Protocol in Attachment 4.

2. Construction Best Management Practices. In addition to the mitigation measures identified in the Application, the Final EIS, and this Agreement, the Certificate Holder shall use construction techniques and Best Management Practices (BMPs) to minimize potential impacts to habitat and wildlife. These include the following:

    a) Use of BMPs to minimize construction-related surface water runoff and soil erosion;

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b) Use of certified "weed free" straw bales during construction to avoid introduction of noxious or invasive weeds;

c) Flagging of any sensitive habitat areas (e.g. springs, raptor nests, wetlands, etc.) near proposed areas of construction activity and designation of such areas as "off limits" to all construction personnel;

d) Proper storage and management of all wastes generated during construction;

e) Requiring construction personnel to avoid driving over or otherwise disturbing areas outside the designated construction areas.

f) Covering temporarily disturbed areas in accordance with erosion control measures set forth in the Application, the Final EIS, and the Construction Storm Water Plans, Article IV.C of this SCA.

3. Technical Advisory Committee. The purpose of the Technical Advisory Committee (TAC) is to ensure that monitoring data collected pursuant to the required Post-Construction Avian Monitoring Plan (see Article VI.C) or other related monitoring data is considered in a forum in which independent and informed parties can collaborate with the Certificate Holder. The TAC will make recommendations to EFSEC if it deems additional studies or mitigation are warranted to address impacts that were either not foreseen in the Application or the Final EIS, or exceed impacts that were projected. In order to make advisory recommendations to EFSEC, the TAC will review and consider: results of Project monitoring studies, including post-construction avian and bat mortality surveys, to evaluate impacts to habitat and wildlife, including avian and bat species; new scientific findings made at wind generation facilities with respect to the impacts on habitat and wildlife, as they may relate to the Kittitas Valley Wind Power Project. The TAC will assess whether the post-construction restoration and mitigation and monitoring programs for wildlife that have been identified and implemented merit further studies or additional mitigation, taking into consideration factors such as the species involved, the nature of the impact, monitoring trends, and new scientific findings.

The TAC will coordinate with the Certificate Holder to review the draft of the Post-Construction Avian Monitoring Plan (Article VI.C). The TAC will also review the Applicant's implementation of the Post-Construction Habitat Restoration Plan (Article IV.E.6).

The TAC may include, but need not be limited to, representatives from WDFW, U.S. Fish and Wildlife Service, EFSEC, Kittitas County, DNR, the Audubon Society, and the Certificate Holder. EFSEC, at its discretion, may add additional representatives to the TAC from local interest groups as well as state, local, federal and tribal governments.

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No individual representative to the TAC may be party to a turbine lease agreement, or any other contractual obligation with the Certificate Holder. All TAC members shall be approved by EFSEC.

No later than sixty (60) days prior to the beginning of Site Preparation the Certificate Holder shall contact the agencies and organizations listed above requesting that they designate a representative to the TAC, and that the agencies or organizations notify EFSEC in writing of their TAC representative and of their member's term of representation. No later than sixty (60) days prior to the beginning of Commercial Operation, the Certificate Holder shall convene the first meeting of the TAC.

No later than sixty (60) days after the beginning of Construction, the Certificate Holder shall submit to EFSEC proposed Rules of Procedure describing how the TAC shall operate, including but not limited to a schedule for meetings, a meeting procedure, a process for recording meeting discussions, a process for making and presenting timely TAC recommendations to the Council, and other procedures that will assist the TAC to function properly and efficiently. The Certificate Holder will provide a copy of the proposed Rules of Procedure to the TAC at their first meeting for their review and comment. The TAC may suggest modifications of the plan; any such modifications must be approved by EFSEC.

The TAC will be convened for the life of the Project, except that EFSEC may terminate the TAC if: the TAC has ceased to meet due to member attrition; or, the TAC determines that all of the pre-permitting, operational and post-operational monitoring has been completed and further monitoring is not necessary; or the TAC members recommend that it be terminated. The failure of the TAC to meet and/or members to participate at any meeting shall not be deemed a violation of this Agreement, any condition of approval, or any mitigation measure. If the TAC is terminated or dissolved, EFSEC may reconvene and reconstitute the TAC at its discretion.

The ultimate authority to implement additional mitigation measures, including any recommended by the TAC, shall reside with EFSEC.

4. Meteorological Towers. The Certificate Holder shall install and operate up to five (5) non-guyed permanent meteorological towers.

5. Wetlands, Streams and Riparian Areas. The Certificate Holder shall implement the following mitigation measures for all work conducted in wetlands, streams and riparian areas:

    a) Mitigation measures required by the Department of the Army, Corps of Engineers, Nationwide Permit report as issued March 15, 2004, and

revised and extended April 3, 2006 (included as Attachment 5 to this agreement);

b) Mitigation measures set out in WDFW Hydraulic Project Approval dated June 25, 2004 (included as Attachment 6 to this Agreement);

c) Mitigation measures set out in the Application for Site Certification No. 2003-01 and the Kittitas Valley Wind Power Project Final EIS.

At least sixty (60) days prior to the beginning of site preparation the Certificate Holder shall submit to EFSEC for review and approval construction drawings for all work in wetlands, streams and riparian areas. The drawings shall specify the exact locations of work to be conducted, buffers that are required, and best management practices and mitigation measures that will be implemented as required by this article.

6. Restoration of Habitat in Temporarily Disturbed Areas. The Certificate Holder shall develop a Habitat Restoration Plan for temporarily disturbed areas, and shall conduct habitat-reseeding programs when optimal germination and establishment conditions are present, as determined in consultation with WDFW, and not necessarily immediately following the disruption. No later than forty-five (45) days prior to the beginning of Construction, the Post-Construction Restoration Plan shall be submitted to the Council for review and approval. The Post-Construction Restoration Plan shall include a restoration schedule that shall identify timing windows during which restoration should take place, and an overall timeline for when all restoration activities shall be completed. The Certificate Holder shall not begin construction until EFSEC approval of the Post-Construction Restoration Plan.

7. Reference Site. The Certificate Holder shall work with WDFW and the TAC to monitor and evaluate the success of restoration efforts using an agreed-upon "reference site" in order to gain insights, which might inform future restoration efforts at other projects. No later than 60 days before Site Preparation, the Certificate Holder shall inform EFSEC of the "reference site" selected in agreement with WDFW. The Certificate Holder shall ensure effective erosion and weed control and shall provide a good-faith effort to restore habitat on the Project site. The Certificate Holder shall not be responsible for additional mitigation measures beyond what has been proposed in the Application and Final EIS, and required by this Agreement, should restored habitat on the Project site differ in quality from the standard established by the "reference site;" however, WDFW and the TAC may suggest modifications to the initial plan as new information becomes available.

8. Habitat Mitigation Parcel. The Certificate Holder shall protect an approximately 539-acre Mitigation Parcel to mitigate for all permanent and temporary impacts to habitat caused by the Project. The Mitigation Parcel meets the requirements for ratios outlined in the WDFW Wind Power Guidelines (2003). The Certificate Holder shall

ensure that no development takes place on the parcel by protecting and retaining the Mitigation Parcel for the life of the Project. The Parcel shall be fenced to exclude livestock grazing.

9. Speed Limit. The Certificate Holder shall post and enforce driving speed limits of 25 miles per hour within the Project Area to minimize potential collisions with wildlife during construction.

10. Hunting. Hunting shall not be permitted in the Project Area during Construction of the Project. Hunting in the Project Area after Construction shall only be permitted in accordance with the Hunting Plan described below (see Section VI.D.6).

F. Construction Traffic Development Standards

Development Standards: The Certificate Holder shall incorporate the mitigation measures presented in Section 1.4 of the Application, additional mitigation measures noted in the Final EIS and the following development standards into the design and construction of the Project.

1. Project Access Roads. Access to the various rows of turbines will be achieved via graveled roads branching from state Highways 10 and 97 and the County's Bettas and Hayward Roads.

   Access roads from state Highways 10 and 97 shall be constructed with slope and culverts designed according to WSDOT and Washington state access management standards under Title 468 WAC and Chapter 47.50 RCW. Access from County roads shall be constructed with the appropriate slopes and culverts in accordance with Kittitas County standards. Project site roads shall be designed in accordance with Table 12-1 of the Kittitas County Road Standards for Private Roads with Low Density Traffic. In areas where Project roads exceed a 12% grade, the roads shall be designed to ensure that fire vehicles can gain access to the site as necessary to provide emergency services.

2. Video Monitoring. County roads, including shoulder pavement, shall be video monitored before and after construction of the Project to identify road degradation.

3. Bettas Road. That portion of Bettas Road that will be used for Project construction and operations (approximately 1.4 miles from state Highway 97 to Hayward Hill Road) will be improved, following construction, to the current Kittitas County road standards applicable to this section of road.

4. Hayward Hill Road. That portion of Hayward Hill Road that will be used for Project construction and operations (approximately 1.4 miles from Bettas Road to the access road to turbine string row B) will be improved, to a 22-foot gravel road. If construction of the Project results in the degradation of the existing pavement and/or shoulders on the County's roads other than Bettas and Hayward Hill Roads, the Certificate Holder shall reinstate these roads to their condition prior to construction.

5. Visitors' Kiosk. The Certificate Holder will construct a visitors' kiosk and public viewing area near the proposed O&M facility off Bettas Road with adequate signage directing the public to a safe parking lot to view and learn about the Project.

6. County-State Right-of-Way. The Certificate Holder shall seek Approval of a franchise for location of facilities within County owned right-of-way (including overhead electric power lines).

7. Project Site Access. Project access roads run across both private and public (WDNR) lands. In order to coordinate access to public lands in accordance with DNR land management practices the Certificate Holder will implement an adaptive management approach in coordination with DNR. Adaptive management allows for changes over time to the level of control and types of activities on the Project site, as needed. In general, the Certificate Holder will permit controlled access to and through the site to public lands, as long as it does not interfere with or introduce adverse impacts on Project operations or personnel. At a minimum, Project site access during operation shall be allowed as follows:

   - Officials of the Washington State Department of Natural Resources are currently allowed to access the Project site and will continue to be allowed access by key.
   - The Certificate Holder will allow others to access the Project site on a case-by-case basis as permitted by leases entered into with private and public landowners.

8. Construction Traffic Management Plan. At least sixty (60) days prior to the beginning of Site Preparation, the Certificate Holder shall submit to EFSEC for review a Construction Traffic Management Plan. The Certificate Holder shall not begin Site Preparation prior to obtaining Council approval of the Construction Traffic Management Plan. This plan will incorporate those items outlined in Article IV.F.1 through 7, above.

9. Off-Site Disposal Plan. The Certificate Holder shall notify EFSEC, at the earliest time possible, of any permits or approvals required to conduct oversize or overweight hauls.

10. FAA Review. No later than thirty (30) days prior to the beginning of Construction, the Certificate Holder shall provide to EFSEC copies of the Determination of Non-Hazard certificates issued by the Federal Aviation Administration (FAA) and related information, which demonstrates that the Project will not impact approved flight approaches, flight communications, or operations at the Kittitas County Airport (Bowers Field).

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G. Cultural and Archeological Resources Plan

With the assistance of an experienced archeologist, and in consultation with the Department of Archeology and Historic Preservation (DAHP), the Certificate Holder shall develop a Cultural Resources Monitoring Plan for monitoring construction activities and responding to the discovery of archeological artifacts or buried human remains. The Certificate Holder shall provide copies of the Plan for comment to potentially affected tribes. The Certificate Holder shall submit the Plan to EFSEC for review and approval no later than forty-five (45) days prior to the start of Site Preparation. The Certificate Holder shall not begin Site Preparation prior to obtaining approval of the Plan from the Council. All applicable elements of the Plan shall be implemented prior to the start of Site Preparation. The Plan shall include, but not be limited to, the following:

1. The Certificate Holder shall maintain 100-foot design and construction buffers as measured from any ground-disturbing construction activities and the archaeological and historical sites identified during the cultural resource survey performed for the Application, even though these sites do not meet the standard qualifications for National Register of Historic Places (NRHP) listing. The Project archaeologist shall flag off or otherwise delineate the archaeological sites with a 100-foot buffer. Ground disturbing actions within a specified radius of any archaeological sites, either recorded during the initial survey or previously documented, will be monitored by a professional archaeologist to prevent damage or destruction to both known and unanticipated but later discovered archaeological resources.

2. If any archaeological artifacts, including but not limited to human remains, are observed, disturbance and/or excavation in that area will cease, and the Certificate Holder shall notify the DAHP, EFSEC, and the affected tribes. At that time, appropriate treatment and mitigation measures shall be developed in coordination with the agencies and tribes cited above, and implemented following approval by EFSEC. If the Project cannot be moved or re-routed to avoid the resources, the Certificate Holder shall test the resources for eligibility for listing on the NRHP. Depending on the outcome of the testing for eligibility, the Certificate Holder shall prepare a mitigation plan in consultation with DAHP and any affected tribes.

3. Prior to any excavation of, or disturbance to, the archaeological sites, the Certificate Holder shall obtain an excavation permit from DAHP pursuant to the requirements of RCW 27.53.060. The Project archaeologist will remove any flagging tape or pin flags at the end of the construction-monitoring phase of the Project.

4. If a tribe requests to have its representatives present during earth-disturbing construction activities, the Certificate Holder shall comply with its wishes. In all cases the Certificate Holder shall note all concerns raised through tribal requests, and shall inform EFSEC of such tribal requests.

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H. Construction Emergency Plan

1. Construction Emergency Plan. The Certificate Holder shall retain qualified contractors familiar with the general construction techniques and practices to be used for the Project and its related support facilities. The construction specifications shall require contractors to implement a safety program that includes an emergency plan. The Certificate Holder shall prepare and submit a Construction Emergency Plan to EFSEC for review at least sixty (60) days prior to the beginning of Site Preparation. The Certificate Holder shall coordinate development and implementation of the Plan with applicable local and state emergency services providers. The Certificate Holder shall not begin Site Preparation or Construction prior to obtaining EFSEC approval of the Construction Emergency Plan. The Construction Emergency Plan shall include consideration of:

    a) Medical emergencies;
    b) Construction emergencies;
    c) Project Area evacuation;
    d) Fire protection and prevention;
    e) Flooding;
    f) Extreme weather abnormalities;
    g) Earthquake;
    h) Volcanic Eruption;
    i) Facility blackout;
    j) Hazardous materials spills;
    k) Blade or tower failure;
    l) Aircraft impact;
    m) Terrorism, sabotage, or vandalism;
    n) Bomb threat.

2. Fire Protection Services. The fire protection services agreement that the Certificate Holder has executed with Kittitas County Fire District #1 for the Project assures that suitable fire protection services are in place during the construction and ongoing operations of the Project. A fire protection services agreement shall be maintained for the life of the Project, or until the Project site is annexed into a Fire District or other municipal entity that provides fire protection services.

3. Fire Control Plan. The Certificate Holder shall develop and implement a Fire Control Plan in coordination with state and local agencies to minimize risk of accidental fire during construction and to ensure effective response to any fire that does occur on the Project Site. The Certificate Holder shall submit the Fire Control Plan to for review and approval at least sixty (60) days prior to Site Preparation. The Certificate Holder shall not begin Site Preparation prior to obtaining Council approval of the Fire Control Plan.

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I. Construction Management Plan

At least sixty (60) days prior to the start of Site Preparation, the Certificate Holder shall submit for the Council's review and approval a detailed Construction Management Plan addressing the primary Site Preparation and Construction phases for the Project. The Construction Management Plan shall be generally based on the mitigation measures contained in this Agreement and those identified in the Final EIS. The Certificate Holder shall not begin Site Preparation prior to obtaining Council approval of the Construction Management Plan.

J. Construction Schedule

No later than thirty (30) days prior to the beginning of Site Preparation, the Certificate Holder shall submit to EFSEC an overall construction schedule. Notices of significant changes in the construction schedule shall be filed with EFSEC no later than fifteen (15) days before the schedule change.

K. Construction Plans and Specifications

1. At least sixty (60) days prior to the beginning of Construction, the Certificate Holder shall submit to EFSEC or its designated representative for approval those construction plans, specifications, drawings and design documents that demonstrate the Project design will be in compliance with the conditions of this Agreement. The plans shall include overall Project site plans, foundation drawings, equipment and material specifications, and vendor guarantees for equipment performance as appropriate. The Certificate Holder shall not Begin Construction prior to obtaining Council approval of the construction plans and specifications.

2. The Certificate Holder shall provide a final project layout plan to demonstrate that project structures comply with the setback conditions of Article I.C.7., to include the micro-siting determinations required to minimize visual impacts to non-participating landowners' existing residences. The Council shall approve each individual turbine location, to include micro-siting decisions, in accordance with the mitigation priorities identified in Article I.C.7.

3. Project buildings, structures, and associated systems shall be designed and constructed consistent with requirements, including the seismic standards, of the Uniform Building Code (UBC) or the International Building Code (IBC), but no less stringent than those found in the UBC of 1997.

4. Project facilities shall be located consistent with the mitigation measures proposed for facility protection from unstable land or landslides.

5. The Certificate Holder shall design, install, operate and maintain the domestic on-site sewage system in accordance with Kittitas County requirements.

6. The Certificate Holder shall purchase water only from sources that have been certificated or otherwise authorized by the Department of Ecology. At least thirty (30) days prior to the beginning of Site Preparation, the Certificate Holder shall provide to EFSEC proof of contract for the water supply source it intends to use during Site Preparation, Construction and Operation. The Certificate Holder shall notify EFSEC of any changes in the source of supply no later than fifteen (15) days before the change.

7. Prior to the beginning of Site Preparation, the Certificate Holder shall present to EFSEC copies of the signed and executed leases with DNR.

L. Noise and Shadow Flicker Modeling

Thirty (30) days prior to the beginning of site preparation the Certificate Holder shall submit to EFSEC for review the modeling of noise and shadow flicker impacts from the project in its final layout and accounting for the specific WTG components selected.

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ARTICLE V: PROJECT CONSTRUCTION

A. Environmental Monitoring During Construction

1. Environmental Monitor (EM). EFSEC will provide Environmental Monitoring for the construction phase of the Project, at the Certificate Holder's cost. The Environmental Monitor shall be an independent, qualified engineering firm (or a person associated with such firm) selected by EFSEC and shall report directly to EFSEC.

2. Environmental Compliance Program for Construction Activities. The Certificate Holder shall identify and develop environmental monitoring and "stop-work" criteria in consultation with the EM and other EFSEC designees prior to beginning Site Preparation. EFSEC will review and approve the final stop-work criteria to be implemented for the Project. The Environmental Compliance Program will cover avoidance of sensitive areas during construction, waste handling and storage, stormwater management, spill prevention and control, habitat restoration efforts begun during the construction phase of the project and other mitigation measures required by this Agreement. The Certificate Holder shall implement the program to ensure that construction activities meet the conditions, limits and specifications set out in the Site Certification Agreement, all Attachments thereto, and all other applicable state and federal environmental regulations.

3. Copies of Plans and Permits Kept On Site. A copy of the Site Certification Agreement, Plans approved by the Council or its designees, and all applicable construction permits will be kept on site. The lead Project construction personnel and construction project managers will be required to read, follow, and be responsible for all required compliance activities. The EM will be responsible for monitoring that all construction permit requirements are adhered to, and that any deficiencies are promptly reported and that corrective measures are initiated.

4. Environmental Monitor Weekly Reports. The EM will provide weekly reports to EFSEC on environmental problems reported or discovered as well as corrective actions taken by the Certificate Holder to resolve these problems. Upon identification of an environmental noncompliance issue, the EM will work with the responsible subcontractor or direct-hire workers to correct the violation; if non-compliance is not corrected in a reasonable period of time the EM shall issue a "stop work" order for that portion of the work not in compliance with Project environmental requirements.

5. Environmental Monitor Availability. No excavation, filling or regrading work shall be performed at any time unless the EM is available for full, concurrent and independent environmental monitoring on-site.

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6. Environmental Monitor Report Copies. The EM will provide copies to the Certificate Holder of reports submitted to EFSEC. The Environmental Monitor will promptly notify EFSEC of any "stop work" orders that have been issued.

B. Quarterly Construction Reports

The Certificate Holder shall submit quarterly construction progress reports to EFSEC no later than thirty (30) days after the end of each calendar quarter. Such reports shall describe the status of construction and identify any changes in the construction schedule.

C. Construction Inspection

EFSEC shall provide plan review and inspection of construction for all Project buildings, structures, underground and overhead electrical lines, sanitary waste water discharge systems, and other Project facilities to ensure compliance with this Agreement. Construction shall be in accordance with the approved design and construction plans, the IBC and UBC and other relevant regulations. EFSEC may contract with Kittitas County to provide these services. If Kittitas County is unable to provide timely review and inspection services, EFSEC shall coordinate with the County the selection of other appropriate agency or firms to provide such services.

D. As-Built Drawings

The Certificate Holder shall maintain a complete set of as-built drawings on file for the life of the Project, and shall allow the Council or its designated representative access to the drawings on request following reasonable notice.

E. Construction Noise

The Certificate Holder and its contractors and subcontractors shall use industry standard noise attenuation controls during construction to mitigate noise impacts and shall comply with applicable state and local noise emission regulations. The Certificate Holder shall limit blasting and loud construction activities to daytime hours (7 a.m. to 10 p.m.), and shall comply with the applicable requirements of WAC 173-60-040 during the hours of 10:00 p.m. and 7:00 a.m.

F. Construction Safety and Security

1. Federal and State Safety Regulations. The Certificate Holder shall comply with applicable federal and state safety regulations (including regulations promulgated under the Federal Occupational Safety and Health Act and the Washington Industrial Safety and Health Act), as well as local and state industrial codes and standards (such as the Uniform Fire Code). The Certificate Holder, its general contractor, and all subcontractors shall make every reasonable effort to maximize safety for individuals working at the Project.

2. Construction Phase Health and Safety Plan. The Certificate Holder shall develop a Construction Phase Health and Safety Plan. The Plan shall be implemented prior to the beginning of Site Preparation. The Certificate Holder shall consult with local and state organizations providing emergency response services during the development of the plan to ensure timely response in the event of an emergency. The Certificate Holder shall submit the plan to EFSEC for review and approval no later than sixty (60) days prior to Site Preparation.

3. Construction Phase Site Security Plan. The Certificate Holder shall develop and implement a construction phase site security plan to effectively monitor the Project Site. The Certificate Holder shall consult with local and state organizations providing emergency response services during the development of the plan to ensure timely response in the event of an emergency. The Certificate Holder shall submit the plan to EFSEC for review and approval no later than sixty (60) days prior to Site Preparation.

   Site access will be controlled and all on-site construction staff and visitors will be required to carry an identification pass. Temporary fencing with a locked gate may be installed at laydown areas for storage of equipment and materials.

4. Visitors Safety. Visitors shall be provided with safety equipment where and when appropriate.

G. Fugitive Dust

The Certificate Holder shall implement appropriate mitigation measures to control fugitive dust from roads and construction activities.

H. Contaminated Soils

In the event that contaminated soils are encountered during construction, the Certificate Holder shall notify EFSEC and Ecology as soon as possible. The Certificate Holder shall manage, handle and dispose of contaminated soils in accordance with applicable local, state and federal requirements.

I. Light and Glare

The Certificate Holder shall implement mitigation measures to minimize light and glare impacts. Project structures shall be painted with neutral/low reflectivity finishes to the extent feasible. The O&M facility buildings shall be painted with a low reflectivity earth tone colored finish. The only lighting on the turbines will be the aviation lighting required by FAA. Outdoor lighting at the operations and maintenance facility and substation(s) will be minimized to safety and security requirements, sensors will be used to keep lighting turned off when not required, and lighting will be equipped with hoods and directed to minimize backscatter and offsite light trespass.

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J. Unique Features

In the event that unique physical or geological features (such as petrified wood deposits) are discovered at the Project site during construction, the Certificate Holder shall stop work at that location, and shall notify EFSEC and DAHP to coordinate an appropriate response.

K. Construction Wastes and Clean-Up

The Certificate Holder shall dispose of sanitary and other wastes generated during construction at facilities authorized to accept such wastes.

The Certificate Holder shall properly dispose of all temporary structures not intended for future use upon completion of construction. The Certificate Holder also shall dispose of used timber, brush, refuse or flammable materials resulting from the clearing of lands or from construction of the Project in a manner and schedule approved by EFSEC.

ARTICLE VI: SUBMITTALS REQUIRED PRIOR TO THE BEGINNING OF COMMERCIAL OPERATION

A. Operations Stormwater Pollution Prevention Plan

1. Operations Stormwater Pollution Prevention Plan. The Certificate Holder shall prepare an operations stormwater pollution prevention plan (Operations SWPPP) and submit it to EFSEC for approval at least thirty (30) days prior to the beginning of Commercial Operation. The Operations SWPPP shall include an operations manual for permanent BMPs. The Operations SWPPP shall be prepared in accordance with the guidance provided in the Ecology *Stormwater Management Manual for Eastern Washington, September 2004*. The Certificate Holder shall periodically review the Operations SWPPP against the guidance provided in the applicable Ecology Stormwater Management Manual, and make modifications as necessary to the Operations SWPPP to comply with current requirements for BMPs.

2. Operations Spill Prevention, Control and Countermeasure Plan. No later than thirty (30) days prior to the beginning of Commercial Operation the Certificate Holder shall submit to EFSEC an Operations Spill Prevention, Control and Countermeasures Plan (Operations SPCCP) for review and approval. The Operations SPCCP shall be prepared pursuant to the requirements of 40 CFR Part 112, Sections 311 and 402 of the Clean Water Act and Section 402 (a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080. The Operations SPCCP shall include the Site, all Project structures and facilities on the site, substations(s), feeder line corridors, and all access roads. The Operations SPCCP shall be implemented within three (3) months of the beginning of Commercial Operation. The Operations SPCCP must be updated and submitted to the Council every two (2) years.

B. Emergency Plans

1. Operations Emergency Plan. No later than sixty (60) days prior to the beginning of Commercial Operation, the Certificate Holder shall submit for the Council's approval an Emergency Response Plan for the Project to provide for employee safety in the event of emergencies, such as those listed below. The Certificate Holder shall coordinate development of the plan with local and state agencies that provide emergency response services in the Project Area. Periodically, the Certificate Holder shall provide the Council with updated lists of emergency personnel, communication channels and procedures. The Emergency Response Plan shall address in detail the procedures to be followed in the event of emergencies listed in Article IV.H.1.

2. Fire Protection Services. The Certificate Holder shall maintain a fire protection services agreement for the life of the Project or until the Project site is annexed into a Fire District or other municipal entity which provides fire protection services.

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3. Operations Fire Control Plan. The Certificate Holder shall develop and implement an operations phase Fire Control Plan in coordination with state and local agencies to minimize risk of accidental fire during operation and ensure effective response to any fire that does occur. No later than sixty (60) days prior to the beginning of Commercial Operation the Certificate Holder shall submit the Plan to EFSEC for review and approval.

C. Post-Construction Avian Monitoring Plan

No later than one hundred twenty (120) days after the beginning of Construction and prior to beginning Commercial Operation the Certificate Holder shall submit to EFSEC for review and approval a Post-Construction Avian Monitoring Plan. The Post-Construction Avian Monitoring Plan shall be developed in coordination with the WDFW and the TAC. The purpose of the plan shall be to quantify impacts to avian species and to assess the adequacy of mitigation measures implemented. The monitoring plan shall include the following components:

1. The Certificate Holder shall implement a wildlife casualty/fatality reporting and handling system by Project personnel (operations and maintenance staff) for the life of the Project following a detailed written protocol developed for the Project and similar to that used by other wind projects in the region, the Wild Horse, Vansycle and the Stateline wind projects, for example.

   Fatality monitoring shall include standardized carcass searches, scavenger removal trials, searcher efficacy trials, and reporting of incidental fatalities by maintenance personnel and others.

2. The Certificate Holder shall perform a minimum of one breeding season's raptor nest survey of the project area including a 1 mile buffer to locate and monitor active raptor nests potentially affected by construction and operation of the Project.

3. The Certificate Holder shall conduct a two-year monitoring study to evaluate impacts to avian species, with incidental monitoring during the life of the Project. This study will include, at a minimum, standardized casualty searches on a 28-day interval throughout each year combined with searcher efficacy trials and carcass removal trials to estimate the direct impacts to avian species from the Project.

4. The Post-Construction Avian Monitoring Plan for the Project will follow a detailed written protocol which will document the monitoring measures being conducted.

5. EFSEC shall reconvene the TAC if unanticipated circumstances arise during incidental monitoring.

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ARTICLE VII: PROJECT OPERATION

A. Water Discharge

The Certificate Holder shall ensure that all stormwater control measures and discharges are consistent with the Operations SWPPP, required by Article VI.A and the Ecology *Stormwater Management Manual for Eastern Washington, September 2004*.

Domestic sewage generated at the O&M facility shall be discharged to on-site septic system.

B. Noise Emissions

The Certificate Holder shall operate the Project in compliance with applicable Washington State Environmental Noise Levels, Chapter 173-60 WAC.

C. Fugitive Dust Emissions

The Certificate Holder shall continue to implement construction dust abatement measures as necessary.

D. Habitat, Vegetation and Wildlife BMPs

During Project operations, the Certificate Holder shall implement appropriate operational BMPs to minimize impacts to plants and animals. In addition to those mitigation measures presented in the Application and the Final EIS, these include the following:

1. Implementation of the Operations Fire Control Plan developed pursuant to Article VI.B.3, in coordination with local fire districts, to avoid accidental wildfires and respond effectively to any fire that might occur.

2. Implementation of the Certificate Holder's agreement with Kittitas County Rural Fire District #1 to provide fire protection services during the construction and operation of the Project.

3. Operational BMPs to minimize storm water runoff and soil erosion.

4. Implementation of an effective noxious weed control program, in coordination with the Kittitas County Noxious Weed Control Board, to control the spread and prevent the introduction of noxious weeds.

5. Identification and removal of all carcasses of livestock, big game, etc. from the Project Area that may attract foraging raptors.

6. Hunting shall not be permitted in the Project Area. Should control of large game be required, the Certificate Holder shall prepare a hunting plan in consultation with

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WDFW and, as necessary, with DNR, and shall submit the plan to EFSEC for review and approval. Hunting will be permitted only after the Hunting plan is approved.

E. Traffic Monitoring

The Certificate Holder shall monitor traffic levels following construction of the Project for a period of three years. Monitoring shall start at the beginning of Commercial Operation. Monitoring results shall be reported to EFSEC no later than thirty (30) days after the end of each calendar quarter. Should tourist- and operations-related traffic to and from the Project site exceed WSDOT warrants, as contained in Chapter 910 of the WSDOT Design Manual, the Certificate Holder shall construct right and/or left turn lanes on state Highway 97. Said improvements shall be designed and constructed in accordance with WSDOT guidelines. Construction of new turn lanes may constitute a modification of this Agreement pursuant to EFSEC rules and procedures, and may require prior EFSEC approval.

F. Safety and Security

1. Personnel Safety. The safety of operating personnel is required by regulations promulgated under the Federal Occupational Safety and Health Act and the Washington Industrial Safety and Health Act. The Certificate Holder shall comply with applicable federal and state safety laws and regulations (including regulations promulgated under the Federal Occupational Safety and Health Act and the Washington Industrial Safety and Health Act) as well as local and industrial codes and standards (such as the Uniform Fire Code).

2. Operations Phase Health and Safety Plan. No later than sixty (60) days after the beginning of Commercial Operation, the Certificate Holder shall develop, and after EFSEC approval, implement an Operations Phase Health and Safety Plan. The Certificate Holder shall consult with local and state organizations providing emergency response services during the development of the plan to ensure timely response in the event of an emergency.

3. Operations Phase Site Security Plan. No later than sixty (60) days after the beginning of Commercial Operation, the Certificate Holder shall develop and implement an Operations Phase Site Security Plan. The Certificate Holder shall submit the Plan to EFSEC for review and approval. The Plan shall include, but not be limited to, the following elements: controlling access to the site by any visitors, contractors, vendors, or suppliers; security lighting of the operation and visitors center and the maintenance facility buildings; fencing of the substation(s); and securing access to wind turbines, pad transformers, pad-mounted switch panels and other outdoor facilities. A copy of the final Security Plan shall be provided to EFSEC and any other agencies involved in emergency response.

4. Visitors Safety. The Certificate Holder shall require visitors to observe the safety plans and shall provide then with safety equipment where and when appropriate.

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G. Dangerous or Hazardous Materials

The Certificate Holder shall handle, treat, store, and dispose of all dangerous or hazardous materials in accordance with Washington state standards for hazardous and dangerous wastes, Chapter 463-40 WAC and Chapter 173-303 WAC. Following any abnormal seismic activity, volcanic eruption, severe weather activity, flooding, vandalism or terrorist attacks the Certificate Holder shall inspect areas where hazardous materials are stored to verify that containment systems are operating as designed.

H. Decommissioning of Individual Wind Turbine Generators

During the lifetime of the project, the Certificate Holder may choose, or be otherwise required to, decommission individual WTGs without the entire project being terminated pursuant to Article VIII of this agreement.

In accordance with Article III, Section K, paragraph 5, of this agreement, individual WTGs found to cause unanticipated significant adverse impact(s) on the environment may have further operating conditions imposed by EFSEC, including permanent shutdown, decommissioning, and removal from the Project Area. In addition, EFSEC retains the authority to order removal of any individual WTG that remains inoperable or is not used for more than six months.

The Certificate Holder will disassemble and remove from the Project Area the WTG being decommissioned within one year of the last date the WTG produced power for sale. Decommissioning of the WTG does not require removal of the WTG foundation.

The Certificate Holder shall notify EFSEC of its intent to decommission the turbine, and shall provide a schedule for decommissioning activities.

I. Shadow Flicker Mitigation Measures

To mitigate for shadow flicker effects, the Certificate Holder shall shut down the operation of a WTG, for the duration of such inpact, upon the written request of a non-participating landowners whose residence:

- was constructed as of January 13, 2003, or was located on a property with vested rights to build as of January 13, 2003; and
- is located within 2,500 feet of the offending turbines; and
- has a line of sight view of the turbine.

Within five (5) business days of receipt of any such request, the Certificate Holder shall notify EFSEC of the request received to mitigate shadow flicker effects. In addition, within two (2) weeks of original receipt of any such request, the Certificate Holder shall notify EFSEC of the actions taken in response. EFSEC shall retain authority to review and override the Certificate Holder's denial(s) of any non-participating landowner's request(s) in this regard.

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ARTICLE VIII: PROJECT TERMINATION, DECOMMISSIONING AND SITE RESTORATION

A. Detailed Site Restoration Plan

The Certificate Holder shall submit a Detailed Site Restoration Plan to EFSEC for approval within ninety (90) days from the time the Council is notified of the termination of the Project. The Detailed Site Restoration Plan will provide for restoration of the Site within the timeframe specified in Article VIII.C., taking into account the Initial Site Restoration Plan and the anticipated future use of the Site. The Detailed Site Restoration Plan shall address the elements required to be addressed in WAC 463-42-665 (in effect at the date of submittal of the Application), and the requirements of the Council-approved Initial Site Restoration Plan pursuant to Article IV.D. of this Agreement. The Certificate Holder shall not begin Site Restoration activities without prior approval from the Council.

B. Project Termination

1. Termination of this Site Certification Agreement, except pursuant to its own terms, is an amendment of this Agreement.

2. The Certificate Holder shall notify EFSEC of its intent to terminate the Project.

3. The Certificate Holder shall terminate the Project if, at the written request of the Council, the Certificate Holder demonstrates that the energy generated by the Project for the past twelve (12) month period is less than 10% of the Historical Energy Production (as defined below) and the following exemptions do not apply: the twelve (12) month reduced energy output period described above is the result of (i) a repair, restoration or improvement to an integral part of the Project that affects the generation of electricity that is being diligently pursued by the Certificate Holder, or (ii) a force majeure event, including, but not limited to, an extended low wind period. Historical Energy Production means the sum of all energy generated by the Project divided by the number of months since the beginning of Commercial Operation multiplied by twelve, starting twelve months after Commercial Operation commences.

4. The Council may initiate proceedings leading to SCA amendment pursuant to WAC 463-36-090.

C. Decommissioning Timing and Scope

1. Timing. The Certificate Holder shall commence decommissioning of the Project within twelve (12) months following the termination described in Article VIII.B. above.

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The period to perform the decommissioning may be extended if there is a delay caused by conditions beyond the control of the Certificate Holder including, but not limited to, inclement weather conditions, equipment failure, wildlife considerations or the availability of cranes or equipment to support decommissioning.

2. Scope. Decommissioning the Project shall involve removal of the Turbines; removal of foundations to a depth of 3 feet below grade; regrading the areas around the Project Facilities; removal of Project access roads and overhead cables (except for any roads and/or power cables that Project Area landowners wish to retain); and final reseeding of disturbed lands (all of which shall comprise "Decommissioning"). Decommissioning shall occur in the order of removing the Turbines as the first priority and performing the remaining elements immediately thereafter.

3. Monthly Reports. If requested by EFSEC, the Certificate Holder will provide monthly status reports until this decommissioning work is completed.

D. Decommissioning Funding and Surety

1. Except as provided in Art. VIII, D, 3 below, the Certificate Holder or any Transferee, as the case may be, shall provide financial assurance sufficient for Decommissioning costs in the form of a performance bond, guaranty or a letter of credit to ensure the availability of funds for such costs (the "Decommissioning Security") to EFSEC. The Certificate Holder shall include a detailed engineering estimate of the cost of decommissioning in its Initial Site Restoration Plan submitted to EFSEC.

   The Initial Site Restoration Plan shall provide that the Decommissioning costs shall be reevaluated annually during construction of the Project and once every five (5) years thereafter from the date of Substantial Completion to ensure sufficient funds for Decommissioning. If deemed appropriate at that time, the amount of decommissioning funds may be adjusted by EFSEC accordingly.

2. The duty to provide such security shall commence thirty (30) days prior to the beginning of Construction of the Project, and shall be renewed on an annual basis. On or before the date on which financial security must be established, the Certificate Holder shall provide EFSEC with one of the following security devices that is reasonably acceptable to EFSEC:

   Performance Bond. The Certificate Holder or any Transferee, as the case may be, shall provide financial security for the performance of its decommissioning obligations through a Performance Bond issued by a surety registered with the Washington State Insurance Commissioner and which is, at the time of delivery of the bond, on the authorized insurance provider list published by the Insurance Commissioner. The Performance Bond shall be in an amount equal to the Decommissioning costs. The Performance Bond shall be for a term of one (1) year, shall be continuously renewed, extended, or

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replaced so that it remains in effect for the remaining term of this Agreement or until the secured decommissioning obligations are satisfied, whichever occurs sooner. In order to ensure continuous renewal of the Performance Bond with no lapse, each Performance Bond shall be required to be extended or replaced at least one month in advance of its expiration date. Failure to secure such renewal or extension shall constitute a default of the Applicant under this Agreement and under the Bond provisions; or

Letter of Credit. The Certificate Holder or any Transferee, as the case may be, shall provide financial security for the performance of its decommissioning obligations through a letter of credit issued by a bank whose long-term debt is rated "A" or better by a Rating Service. The letter of credit shall be in an amount equal to the Decommissioning costs. The letter of credit shall be for a term of 1 year and shall be continuously renewed, extended, or replaced so that it remains in effect for the remaining term of this Development Agreement or until the secured decommissioning obligations are satisfied, whichever occurs sooner. The State of Washington, by and through EFSEC or its successor or designees, shall be authorized under the letter of credit to make one or more sight drawings thereon upon certification to the issuing bank of the Applicant's or Transferee's (as the case may be) failure to perform its decommissioning obligations when due; or

Guaranty. Applicant or any Transferee, as the case may be, shall provide financial security for the performance of its decommissioning obligations by delivering a payment guaranty guaranteeing its Decommissioning obligations hereunder from an entity (i) having, at the time of delivery of such guaranty, a senior unsecured long term debt rating ("Credit Rating") of (1) if such entity has a Credit Rating from Standard and Poor's but not from Moody's, BBB- or better from Standard and Poor's or (2) if such entity has a Credit Rating from Moody's but not from Standard and Poor's, Baa3 or better from Moody's or (3) if such entity has a Credit Rating from both Standard and Poor's and Moody's, BBB- or better from Standard and Poor's and Baa3 or better from Moody's; or (ii) having audited financial statements, prepared by a nationally-recognized firm of independent auditors and indicating a financial net worth of at least $75,000,000.

3. If Project ownership is transferred after the effective date of this Agreement pursuant to applicable EFSEC laws and regulations, EFSEC may consider and approve other financial instruments and/or assurances that would provide for the Certificate Holder's performance of its Decommissioning obligations pursuant to Article VIII.C. and VIII.D.

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KITTITAS VALLEY WIND POWER PROJECT

ARTICLE IX: SITE CERTIFICATION AGREEMENT SIGNATURES

Dated and effective this 18th day of September, 2007.

FOR THE STATE OF WASHINGTON

Christine Gregoire

Christine Gregoire, Governor

FOR SAGEBRUSH POWER PARTNERS, LLC.

Christopher M. Taylor

Christopher Taylor, Director of Development

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IN THE SUPREME COURT OF THE STATE OF WASHINGTON

RESIDENTS OPPOSED TO KITTITAS TURBINES and F. STEVEN LATHROP, Petitioners, v. STATE ENERGY FACILITY SITE EVALUATION COUNCIL (EFSEC) and CHRISTINE O. GREGOIRE, Governor of the State of Washington, Respondents. KITTITAS COUNTY, a subdivision of the State of Washington, Petitioner, v. THE HONORABLE CHRISTINE O. GREGOIRE, Washington State Governor; ENERGY FACILITY SITE EVALUATION COUNCIL; SAGEBRUSH POWER PARTNERS L.L.C.; HORIZON WIND ENERGY; WASHINGTON STATE DEPARTMENT OF COMMUNITY, TRADE AND ECONOMIC DEVELOPMENT; COUNSEL FOR THE ENVIRONMENT; DEPARTMENT OF	)	No. 81332-9 (consolidated with No. 81427-9) En Banc

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ECOLOGY; DEPARTMENT OF FISH AND WILDLIFE; UTILITIES AND TRANSPORTATION COMMISSION; DEPARTMENT OF NATURAL RESOURCES; DEPARTMENT OF TRANSPORTATION; RENEWABLE NORTHWEST PROJECT; PHOENIX ECONOMIC DEVELOPMENT GROUP; SIERRA CLUB CASCADE CHAPTER; RESIDENTS OPPOSED TO KITTITAS TURBINES (ROKT); and STEVEN LATHROP,	)	
Respondents.	)	Filed November 20, 2008

OWENS, J. --

Nature of the Case

This case involves the State's authority to permit the construction and operation of wind turbines for energy production in the state without authorization from the county in which the turbines will be placed. Specifically, we consider both jurisdictional and substantive challenges arising from the governor's authority to site an energy facility that exclusively uses wind power under the energy facilities site locations act (EFSLA), chapter 80.50 RCW.

Initially, we must determine whether this court has jurisdiction to review a petition certified from superior court. Under EFSLA, a party may file a petition in Thurston County Superior Court for review of the governor's decision to approve an

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energy facility site. Upon receiving the petition, but before taking its own review, that court will certify the petition to this court if it determines that the petition meets certain criteria. The main question regarding jurisdiction is whether this procedure violates article IV of our state constitution by vesting direct review in this court without requiring initial review by the superior court.

We hold that the certification procedure under EFSLA confers appellate jurisdiction on this court and therefore does not violate the constitution. We accept review of the certified petitions from the superior court.

Having determined that this court has jurisdiction, we must address the various substantive challenges to EFSLA raised by Residents Opposed to Kittitas Turbines (ROKT), Kittitas County (County), and F. Steven Lathrop (collectively Petitioners). Petitioners argue that EFSLA does not authorize the governor to preempt county land use laws when siting a facility that exclusively uses wind power. Petitioners further argue that the State abused its authority in deciding whether to preempt county land use laws, that it violated the appearance of fairness doctrine, and that it failed to adequately consider an environmental impact statement. In addition, Petitioners urge this court to remand the case to the superior court for further fact finding on alleged procedural irregularities in the State's siting process. We reject all of Petitioners' claims and hold that the governor properly exercised her authority under EFSLA to

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approve the site certification for the wind energy project in this case.

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Facts

I. *Statutory Procedures*

EFSLA governs the location, construction, and operation conditions of energy facilities in Washington. It creates a process for determining energy facility locations in the state. An application to construct an energy facility requires site certification, a binding agreement between the applicant and the State that conditions approval of an energy facility location on the applicant's assured compliance with certain regulations related to the construction and operation of the facility. RCW 80.50.020(5). Site certification authorizes the applicant to construct and operate an energy facility in lieu of any other permit or document required by any other agency or subdivision. RCW 80.50.120(2), (3).

The legislature created the Energy Facility Site Evaluation Council (EFSEC) to administer the site certification process. RCW 80.50.030. EFSEC is a multiagency body comprised of representatives from various state agencies. RCW 80.50.030(3). A county in which an application has proposed an energy facility site also shall appoint a representative to EFSEC for consideration of that application. RCW 80.50.030(4). EFSEC receives and processes applications for site certification pursuant to its own adopted guidelines. RCW 80.50.040(2), (5), .071.

EFSLA expressly preempts energy facility certification decisions by other

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governmental entities. RCW 80.50.110(2). However, EFSEC must first hold a public hearing to determine whether a site certification application is consistent with the county land use plans and zoning laws. RCW 80.50.090(2). Furthermore, EFSEC must include conditions in a site certification to protect the interests of the local government or community affected by the proposed facility. RCW 80.50.100(1).

At the time it processed the application in this case, EFSEC had promulgated regulations governing how it would implement its preemption authority over local jurisdictions. Under these regulations, if EFSEC determined that an energy facility site was not consistent with local land use or zoning laws, then the applicant had to make all reasonable efforts to resolve noncompliance with the local jurisdiction. Former WAC 463-28-030(1) (2004), *repealed by* Wash. St. Reg. 07-21-035 (Nov. 9, 2007). EFSEC would stay its own proceedings during the period that the applicant sought compliance with the local jurisdiction. Former WAC 463-28-030(2). The applicant could request preemption by EFSEC after attempting to resolve noncompliance issues with the local jurisdiction. Former WAC 463-28-040 (1978), *repealed by* Wash. St. Reg. 07-21-035 (Nov. 9, 2007).

After processing an application, EFSEC must prepare a report for the governor recommending the disposition of the application within one year of receiving it. RCW 80.50.100(1). If EFSEC recommends that the governor approve the application, then

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it will provide a draft certification agreement to the governor. *Id.* The governor must either determine whether to approve or reject the draft certification or direct EFSEC to reconsider certain aspects of the draft certification. RCW 80.50.100(2)(a)-(c). If the governor directs reconsideration, EFSEC will revise the draft certification and resubmit the application to the governor. RCW 80.50.100(2)(c). The governor then must approve or reject the application. *Id.*

A party may file a petition for review of the governor's final decision in Thurston County Superior Court. RCW 80.50.140(1). That court will certify the petition to this court if it determines that the administrative record is complete and review can be made on the record, that the petition involves fundamental and urgent public interests, and that review by this court would likely be sought regardless of the decision in superior court. RCW 80.50.140(1)(a)-(d).

II. *History of the Kittitas Valley Wind Power Project Application*

In January 2003, Horizon Wind Energy, LLC (Horizon),[1] through its subsidiary Sagebrush Power Partners, LLC, filed an application with EFSEC for site certification of the Kittitas Valley Wind Power Project (KVWPP or Project). The original Project proposed the construction of up to 121 wind turbine generators located along Highway 97, roughly halfway between Cle Elum and Ellensburg in Kittitas County. Horizon

[1] Horizon originally filed its application under its former name, Zilkha Renewable Energy, LLC, but changed to Horizon after being acquired by Goldman Sachs.

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allegedly chose this site because of the reliable wind resource and its proximity to several electrical transmission lines to which the turbines could connect.

The KVWPP consists of several turbine "strings" running along ridge tops over private and state owned land. Administrative Record (AR) at 52, 322 (map). Horizon obtained wind option agreements with all private landowners on whose property it would install turbines. It also negotiated a lease with the Department of Natural Resources (DNR) for use of state lands that consist of approximately one-fourth of the project site.

The Kittitas Board of County Commissioners (BOCC) appointed a representative to EFSEC for consideration of the Project. *See* RCW 80.50.030(4). The County also moved to intervene as an interested party in the adjudicative proceedings. EFSEC granted intervention status to the County, the Department of Community, Trade and Economic Development (CTED), ROKT, county resident Lathrop, and other parties before it held an adjudicative proceeding regarding the KVWPP application.

Lathrop filed a motion to disqualify DNR and CTED from participating as members of EFSEC based on the apparent interest that each department had in the KVWPP. Specifically, Lathrop alleged that CTED had conflicting interests in seeking party intervention to support the KVWPP application while holding a seat as a

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member of EFSEC. The County joined in Lathrop's motion to disqualify DNR from participating because DNR "owned" some of the project lands. AR at 2438, 2389 (acknowledging lease between DNR and Horizon). The representative of each department denied the motion to disqualify their respective departments from EFSEC. *See* RCW 34.05.425(3); AR at 2518-19 (Lathrop's petition for review of EFSEC order denying motion to disqualify).

EFSEC held a hearing in May 2003, at which the parties agreed that Horizon's application was not consistent with the Kittitas County Code (KCC). The County had recently enacted a Wind Farm Resource Overlay Zone ordinance to require county approval of any "wind farm" location through a permitting process. AR at 461-62 (KCC 17.61A). The ordinance did not zone for wind farms but instead required applicants to apply for both a site-specific rezone as well as a site-specific amendment to the comprehensive plan in order to obtain a development permit.

EFSEC's regulations required Horizon to request preemption of the County's laws within 90 days of its decision. Former WAC 463-28-040. However, Horizon sought several extensions of that deadline in an attempt to seek compliance with the County's laws. In June 2003, Horizon submitted an application with the County seeking land use permits for the KVWPP. Over the next seven months, Horizon and the County attempted to site the Project in accordance with the KCC and reported on

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their progress to EFSEC. Ultimately, the parties could not reach agreement on compliance with the KCC.

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In February 2004, Horizon filed a request for preemption. EFSEC scheduled an adjudicatory hearing for August 2004. After extensive briefing, Horizon and the County filed a joint motion to stay the hearing while the parties focused on another wind energy project application Horizon had filed with the County.[2] In March 2005, Horizon suspended its request for preemption in order to continue to pursue land use consistency with the County. Later, Horizon withdrew its request for preemption altogether and refiled an application for land use permits with the County in its continuing efforts to obtain land use consistency with the KCC.

The County received Horizon's new permit application in October 2005.[3] The application substantially reduced the KVWPP from 121 turbines to a maximum of 80 turbines in order to comply with the KCC. In addition, the application proposed a 1,000-foot setback of turbines from any property owner not participating in the Project.

The County began review of the application on January 10, 2006, at a joint hearing of the County Planning Commission (Commission) and the BOCC. The

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[2] The County eventually approved Horizon's Wild Horse Wind Power Project, thereby obviating the need for preemption for that project.

[3] The application again required Horizon to apply for a development permit, which required a development agreement and a site-specific rezone of the County's existing zoning from Forest and Range and Agriculture to a Wind Farm Resource Overlay Zone. AR at 461-62, 6163-65. KCC 17.61A also required Horizon to apply for an amendment to the county comprehensive plan from a Rural designation to a Wind Resource Overlay District. AR at 461-62, 6163-65.

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Commission and the BOCC decided to bifurcate the proceedings whereby the Commission would hold public hearings and make its recommendation. Next, the BOCC would hold its own hearings on the same application.

Horizon made an opening presentation at the initial joint hearing, including extensive testimony and documentation on various issues involving the effect of the Project, including the visual effects, property values, noise impact, insurance coverage, and "shadow flicker"[4] effect. AR 7230-80. The commissioners had the opportunity to question each of Horizon's experts. Horizon noted that through negotiation it had reduced the original project proposal from 120 turbines to 64.

The Commission held three additional hearings on the application, during which it received public comment and additional testimony from Horizon. After the fourth public hearing on January 30, 2006, the Commission recommended to deny the application.

Next, the BOCC held a series of its own hearings on March 29 and 30, April 27, and May 3 and 31. During the course of these proceedings it became apparent that the main point of contention between the parties involved the setback requirements of the turbines from the nonparticipating properties. The commissioners asked Horizon why it would not consider a 2,000-foot setback that it understood would eliminate any

[4] Horizon's expert explained "shadow flicker" as "the alternating changes in light intensity caused by wind turbine blade as it passes through the sun's line of sight, causing a passing shadow." AR at 7271 (presentation by Andrew Young).

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shadow flicker effect, or a 2,640-5,280-foot setback that would further decrease the visual impact. They also asked if Horizon would consider reorganizing the proposed locations for the 64 turbines within the Project in order to increase setbacks from properties.

Regarding shadow flicker, Horizon explained that the effect diminishes over distance and disappears at 2,000 feet. Horizon stated that the 1,000-foot setback would adequately mitigate the shadow flicker. Horizon also indicated that the 1,000-foot setback represented a "self-imposed" international standard that related to the mitigation of noise impact. AR at 7837-38, 8135, 8275. Horizon pointed out that requiring a 2,000-foot setback would require it to eliminate rather than mitigate the effect.

Horizon further explained that it reduced the number of turbines almost by one-half of the original proposal in order to mitigate the visual impact. It pointed out that most of the turbines it proposed to eliminate were located around the periphery of the Project in order to enhance viewpoints. Based on the commissioners' requests, Horizon sent a letter to the BOCC on April 25, 2006, proposing to increase the setback distance from nonparticipating property owners to 1,320 feet. Horizon suggested any further setback requirement would render the Project "economically [un]viable." AR at 8275-76.

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The BOCC again addressed the setback issue at a hearing on May 3, 2006. Based on his own personal observations of an existing wind turbine project, one commissioner suggested that the appropriate setback distance should be between 2,000 feet and 3,300 feet. Another commissioner proposed a 2,500-foot setback requirement based on his own observations at the same site. The third commissioner proposed a setback distance of 3,000 feet, based on his observations of noise and "looming" impact of the existing site. AR at 8151.

In response to the BOCC's suggestions, Horizon reiterated that the proposed setback of 2,500 feet would render the Project unviable. Horizon sent a letter to the BOCC on May 15, 2006, indicating that a setback requirement between 2,000 feet and 3,000 feet would require it to eliminate an additional 43 percent of the already reduced Project.

On May 19, Horizon sent a letter to the County requesting clear direction as to which commissioner's setback standard to apply when attempting to reconfigure the Project. At a hearing on May 31, the County stated that it was not prepared to provide a specific setback requirement for the Project. Horizon claimed that the Project would not be economically viable if it were reduced in accordance with the BOCC's proposals. Horizon indicated that a 2,000-foot setback from nonparticipating property lines would require Horizon to remove all but 15-20 turbines, which it concluded was

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not viable. Horizon also asserted that a 2,500-foot setback from nonparticipating residence structures similarly would reduce the project in half. The BOCC scheduled yet another meeting for June 6, 2006, at which time it formally denied the application.

After the BOCC denied its application, Horizon filed a second request for preemption with EFSEC. EFSEC conducted a series of adjudicative and public hearings in Kittitas County regarding Horizon's application and the preemption of the KCC. After the hearings, EFSEC voted six to one, with the county representative dissenting, to preempt the KCC and to recommend approval of the site certification. EFSEC issued a proposed site certification agreement and sent the recommendation to the governor. The proposed agreement provided for a setback requirement at a distance of four times the height of a turbine.[5]

The governor directed EFSEC to reconsider the proposed site certification agreement. The governor based her decision "solely . . . on the need to determine on this particular Project whether additional setbacks beyond the four times height (4xh) requirement for non-participating landowners are achievable while allowing the Project to remain economically viable." AR at 11390.

[5] For example, a 330-foot turbine (measured from the tip of the blade at its highest point) would require a 1,320-foot setback and a 440-foot turbine would require a 1,640-foot setback. AR at 11306.

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EFSEC held another public hearing on the issues of setbacks and viability. It purposefully avoided inquiry into economic viability because such a matter was beyond its statutory authority to provide environmental and ecological guidelines. Furthermore, EFSEC determined that additional setback requirements could not resolve the objections of the 16 nonparticipating residents affected by the proposed locations. It concluded that the residents' objections could be satisfied only by cancellation of the Project, which presumably would be economically unviable. However, it did offer that Horizon could "micro-sit[e]" the location of the turbines with the "highest possible consideration" for the nonparticipating residents. AR at 14339-40. EFSEC sent its determination back to the governor with a proposed amendment to include the "'micro-siting'" process. AR at 11862-63. The governor accepted EFSEC's response and approved the site certification agreement.

III. *Procedural History*

Petitioners filed petitions for review of the governor's final determination in Thurston County Superior Court.[6] Petitioners alleged that EFSEC could not preempt county laws regarding the siting of a wind powered energy facility, that EFSEC's members violated the appearance of fairness doctrine, and that EFSEC's decision to preempt the County was not supported by substantial evidence.

EFSEC filed a motion to certify the petitions to this court pursuant to RCW

[6] The court consolidated the petitions.

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80.50.140. ROKT opposed the motion and claimed certain procedural irregularities in the administrative proceedings that were discovered after those proceedings. The County also alleged that EFSEC Chairman Jim Luce exhibited bias in favor of Horizon's application. The superior court allowed the parties to submit declarations and allowed Petitioners to take the depositions of Chairman Luce and EFSEC member Chris Towne. The court found the declarations and depositions to be consistent and denied any further discovery or testimony. The court then determined that certification was warranted under RCW 80.50.140. The court supplemented the record with the additional testimony and certified the petitions to this court.

Petitioners have challenged this court's jurisdiction to review the petitions directly. The court clerk requested additional briefing on the issue of jurisdiction and scheduled this case for oral argument on the merits as well as the jurisdictional issue.

Analysis

I. Jurisdictional Issues

A. *The Certification Procedures Established in RCW 80.50.140 Do Not Violate Article IV of the State Constitution*

Petitioners challenge our jurisdiction to accept the superior court's certification of the petitions for review. Specifically, Petitioners contend that certification procedures under EFSLA violate article IV of the state constitution by conferring unauthorized original jurisdiction upon this court.

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EFSLA authorizes judicial review of the governor's final decision on an application for a site certification. A petition for review must be filed in Thurston County Superior Court. RCW 80.50.140(1). That court shall certify the petition directly to this court if the court determines that certain conditions are met:

> (a) Review can be made on the administrative record;
>
> (b) Fundamental and urgent interests affecting the public interest and development of energy facilities are involved which require a prompt determination;
>
> (c) Review by the supreme court would likely be sought regardless of the determination of the Thurston county superior court; and
>
> (d) The record is complete for review.

Id. These conditions facially limit certification to cases that do not require fact-finding or discovery. If the superior court determines that review cannot be limited to the administrative record because of procedural irregularities in the record, the court must take testimony and determine such factual issues in question before certifying the petition to this court. *Id.* EFSLA instructs that review of the final administrative decision is made in accord with the procedures of the Washington Administrative Procedure Act (APA), chapter 34.05 RCW. RCW 80.50.140(1).[7]

[7] While such authorization may seem redundant as the APA provides the exclusive means of judicial review of agency action, the governor is not an "'[a]gency'" under the APA. RCW 34.05.010(2). Therefore, the power to review the governor's decision derives from EFSLA, not the APA.

Petitioners claim that RCW 80.50.140 violates article IV of the state constitution by attempting to expand this court's original jurisdiction. Article IV, section 4 provides, "[t]he supreme court shall have original jurisdiction in habeas corpus, and quo warranto and mandamus as to all state officers, and appellate jurisdiction in all actions and proceedings" where the amount in controversy does not exceed $200. Const. art. IV, § 4. Petitioners assert that the plain language of section 4 does not provide this court with original jurisdiction over the type of action in this case, but rather vests original jurisdiction in the superior courts under article IV, section 6. Br. of Pet'rs ROKT & Lathrop at 21.[8]

The review under EFSLA, however, invokes the superior court's appellate, not original, jurisdiction. This court has consistently held that a right of direct review in superior court of an administrative decision invokes the limited appellate jurisdiction of the court. *Union Bay Pres. Coal. v. Cosmos Dev. & Admin. Corp.*, 127 Wn.2d 614, 617, 902 P.2d 1247 (1995); *Mader v. Health Care Auth.*, 149 Wn.2d 458, 468, 70 P.3d 931 (2003); *Fay v. Nw. Airlines, Inc.*, 115 Wn.2d 194, 197, 796 P.2d 412 (1990). While the constitution does not expressly provide for appellate jurisdiction of agency action in superior court, this court has recognized that the superior courts have

[8] EFSEC argues that article II, section 26 authorizes the legislature to determine in what courts suits against the State may be brought. Br. of Resp'ts EFSEC & Gregoire at 8-9. However, this provision relates to state immunity and does not directly address appellate and original jurisdiction. That section has traditionally been interpreted to determine in which county the state may be sued.

inherent authority to review administrative decisions for arbitrary and capricious action under the discretionary writ of certiorari. *Saldin Sec., Inc. v. Snohomish County*, 134 Wn.2d 288, 292, 949 P.2d 370 (1998); *Pierce County Sheriff v. Civil Serv. Comm'n*, 98 Wn.2d 690, 694, 658 P.2d 648 (1983); *Bridle Trails Cmty. Club v. City of Bellevue*, 45 Wn. App. 248, 251-52, 724 P.2d 1110 (1986) ("This review by 'constitutional' or 'common law' certiorari is not full appellate review on the merits." (footnote omitted)); Const. art. IV, § 6 (recognizing power of superior courts to issue writs). Allowing only limited appellate review over administrative decisions, rather than original or appellate jurisdiction as a matter of right, "serves an important policy purpose in protecting the integrity of administrative decisionmaking." *King County v. Wash. State Boundary Review Bd.*, 122 Wn.2d 648, 668, 860 P.2d 1024 (1993).

The legislature may confer such limited appellate review by statute. *Union Bay*, 127 Wn.2d at 617; *City of Seattle v. Pub. Employment Relations Comm'n*, 116 Wn.2d 923, 926, 809 P.2d 1377 (1991); *Deschenes v. King County*, 83 Wn.2d 714, 716, 521 P.2d 1181 (1974). For example, we have recognized that the review procedures established under the APA create appellate jurisdiction in the superior court, which requires compliance with all statutory procedural requirements before such jurisdiction is properly invoked. *Union Bay*, 127 Wn.2d at 617-18.

As the superior court asserts appellate jurisdiction to review administrative

decisions, the certification of a petition for review of an administrative decision likewise invokes this court's appellate jurisdiction. Indeed, this court sits in the same place as the superior court when reviewing a superior court's direct review of an administrative decision. *Heinmiller v. Dep't of Health*, 127 Wn.2d 595, 601, 903 P.2d 433, 909 P.2d 1294 (1995) (citing *Tapper v. Employment Sec. Dep't*, 122 Wn.2d 397, 402, 858 P.2d 494 (1993)). We apply the same review to administrative decisions as the superior courts. *Farm Supply Distribs., Inc. v. Utils. & Transp. Comm'n*, 83 Wn.2d 446, 448, 518 P.2d 1237 (1974) ("Each level of the judiciary actually reviews administrative decisions in an appellate capacity."). EFSLA's certification procedures do not change the nature of the jurisdiction used to review the administrative decision. In fact, the certification procedures further limit this court's review by requiring that the superior court determine all factual issues related to alleged procedural irregularities before certifying the petition to this court. RCW 80.50.140(1).

Article IV vests general appellate jurisdiction in this court. The plain language of the constitution provides appellate jurisdiction in this court over "all actions and proceedings." Const. art. IV, § 4. As this provision is not self-executing, the legislature may properly confer appellate jurisdiction on this court. *See Robison v. LaForge*, 170 Wash. 678, 679, 17 P.2d 843 (1932) ("The provision of our constitution, Art. IV, § 4, conferring the right of appeal, is not self-executing, but receives its

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vitality from legislative enactment."); *Kreidler v. Eikenberry*, 111 Wn.2d 828, 836, 766 P.2d 438 (1989). Therefore, our review of the administrative decision in this case is properly within our appellate jurisdiction.

Petitioners rely on *North Bend Stage Line, Inc. v. Department of Public Works*, 170 Wash. 217, 16 P.2d 206 (1932), in which this court struck down a statute that attempted to authorize direct review in this court of an order of the Department of Public Works. The court held that review of the department's order constituted original rather than appellate jurisdiction. *Id.* at 222. The court opined that "'all actions and proceedings'" in article IV, section 4 means jurisdiction over decisions "of a purely judicial nature, which have been determined in some judicial court established by the constitution or in pursuance thereof." *Id.* Such jurisdiction did not include review of the department's order.

The court went on to explain that the constitution vested superior courts with original jurisdiction over """such special cases and proceedings as are not otherwise provided for."""" *Id.* at 225 (quoting *Winsor v. Bridges*, 24 Wash. 540, 547, 64 P. 780 (1901) (quoting Const. art. IV, § 6)). Therefore, the legislature could not create jurisdiction over such matters in the supreme court as a matter of right to the extent

that it would deprive the superior court of its exclusive jurisdiction.[9] The court concluded that the statute in question violated article IV because it created a right to seek direct review of the department's order in this court, which necessarily deprived the superior court of its original jurisdiction.[10] *Id.* at 227-28.

North Bend is distinguishable from the present case. Unlike the statute at issue in *North Bend*, EFSLA creates a right of direct review in superior court, not this court. As discussed above, such review invokes the superior court's appellate jurisdiction. Therefore, EFSLA does not invoke this court's original jurisdiction.

Furthermore, the *North Bend* court did not address the certification procedure at issue here. While the certified petition does not present this court with review of a

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[9] The parties do not raise and therefore we take no position on the issue of whether article IV actually prohibits the legislature from expanding the jurisdiction of this court where such expansion does not infringe on the exclusive jurisdiction of another court. *See In re Elliott*, 74 Wn.2d 600, 604, 446 P.2d 347 (1968) ("[T]he state constitution is a limitation upon the actions and powers of the legislature, instead of a grant of power. So far as the power of the legislature is not limited by the constitution, it is unrestrained.").

[10] Petitioners also rely on *Department of Highways v. King County Chapter*, 82 Wn.2d 280, 510 P.2d 216 (1973), but mainly for its citations to *North Bend* in dicta. The holding in *Department of Highways* involved only an issue of statutory construction. The court held that the APA's procedures regarding direct review of agency actions controlled over another statute that permitted direct review to the Court of Appeals. After determining that the review procedure created by statute did not permit direct review of an administrative decision in the Court of Appeals, the court expressly declined not to reach the question of whether the legislature may provide for direct review of an administrative decision to the Court of Appeals. *Id.* at 287 ("Nor are we faced with the question whether the legislature may provide for an appeal direct to the Court of Appeals from an administrative decision and thus oust the superior court of original jurisdiction to review decisions of inferior tribunals.").

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"purely judicial" decision, the certification procedure under RCW 80.50.140 merely provides a vehicle through which the superior court transfers cases of limited appellate jurisdiction to this court. We already have a rule that permits the Court of Appeals to take direct review of a final decision by an administrative agency. RAP 2.1(c). This rule permits direct review of an agency decision by the Court of Appeals under the procedures of the APA. RCW 34.05.518(2). The criteria for certification to the Court of Appeals closely resemble the procedures established under EFSLA.[11]

Similarly, we have long asserted our own authority to review cases transferred from the Court of Appeals. RAP 4.4; *see* RCW 2.06.030 (authorizing the transfer of a case from the Court of Appeals in order to promote the "orderly administration of justice"). We also have upheld the statutorily created procedure for this court to accept certified questions from federal courts. *In re Elliott*, 74 Wn.2d 600, 604-05, 446 P.2d 347 (1968); *see* Federal Court Local Law Certificate Procedure Act, ch. 2.60

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[11] Pursuant to RCW 34.05.518(2):

> The superior court may certify a case for direct review only if the judicial review is limited to the record of the agency proceeding and the court finds that:
>
> (a) Fundamental and urgent issues affecting the future administrative process or the public interest are involved which require a prompt determination;
>
> (b) Delay in obtaining a final and prompt determination of such issues would be detrimental to any party or the public interest;
>
> (c) An appeal to the court of appeals would be likely regardless of the determination in superior court; and
>
> (d) The appellate court's determination in the proceeding would have significant precedential value.

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RCW. Because the superior court can certify direct review to the Court of Appeals under RAP 2.1(c) and this court can transfer a case from the Court of Appeals, RAP 4.4, this court already possesses the authority to apply direct review of final decisions of administrative agencies.

On the other hand, the certification process under RCW 80.50.140 differs from the other certification procedures described above by suggesting that this court must review a petition certified from the superior court. That section provides that "[u]pon certification, the supreme court *shall* assign the petition for hearing at the earliest possible date, and it *shall* expedite its review and decision in every way possible." RCW 80.50.140(1) (emphasis added). This language is problematic because the constitution prohibits the legislature from depriving this court of its power to review a decision of the superior court. *Saldin Sec.*, 134 Wn.2d at 295-96 ("statutory limitation of judicial review cannot interfere with the court's constitutionally inherent power of review."). Under RCW 80.50.140(1), the superior court decides whether a petition meets certain criteria before certifying the case to this court. RCW 80.50.140(1)(a)-(d). The legislature cannot deprive this court of its authority to review the superior court's decision to certify the case.

In order to avoid this apparent constitutional infirmity, we construe the mandatory "shall" under RCW 80.50.140 as permissive, in accord with this court's

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constitutional power to review a decision of the superior court. We may interpret the mandatory "shall" as permissive if it otherwise would render a statute unconstitutional. *Elliott*, 74 Wn.2d at 607 ("'The word "shall" must also be construed as permissive when the statute can thereby be upheld, if a construction to the contrary could render it unconstitutional.'" (quoting 82 C.J.S. *Statutes* § 380, at 882 (1953))). In *Elliott*, this court recognized that "even if the statute is intended to be imperative it will be construed as discretionary because the statute is subject to the implied limitations of the constitution as a matter of construction." *Id.* at 608. Under this permissible construction, RCW 80.50.140 does not require us to accept certification from the superior court, and we may determine whether or not to accept certification. This simply recognizes the constitutional limitations on the legislature's power and does not otherwise limit the legislative intent under EFSLA.

We hold that the certification procedures under RCW 80.50.140 properly invoke this court's appellate jurisdiction. Furthermore, we hold that the procedures do not require us to accept certification from the superior court, and we retain the discretion to accept or decline certification from that court.

B. *The Superior Court Properly Certified this Case for Review*

Having determined that we have jurisdiction to review the certified petitions, we must decide whether to accept certification from the superior court. The superior

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court decided that the petitions met the four conditions under RCW 80.50.140(1) and certified the petitions to this court. As the trial court's decision to certify invokes this court's own discretion to accept jurisdiction, we review the superior court's decision de novo. *See Crosby v. Spokane County*, 137 Wn.2d 296, 301, 971 P.2d 32 (1999) ("The issue whether a court has jurisdiction is a question of law subject to de novo review.").

The superior court initially determined that review could be made on the administrative record, RCW 80.50.140(1)(a), because Petitioners had alleged procedural irregularities in the application process. Under RCW 80.50.140(1), if the court determines that review cannot be limited to the administrative record because of alleged irregularities in the administrative procedures, then it shall "take testimony and determine such factual issues raised by the alleged irregularities" before certifying the petition for review. Petitioners allege that the superior court erred in certifying the petitions because the superior court "failed to take the requisite testimony and make factual determinations" regarding their allegations of procedural irregularities. Br. of Pet'rs ROKT & Lathrop at 24. We review the trial court's decision to limit testimony under a relevance standard as that court received and evaluated the evidence in question. *Roberts v. Atl. Richfield Co.*, 88 Wn.2d 887, 893, 568 P.2d 764 (1977). While appellate review of administrative decisions is generally limited to the

administrative record, we will look to the superior court record where that court has taken additional evidence necessary for review or has examined an issue not raised in the administrative record. *See Waste Mgmt. of Seattle, Inc. v. Utils. & Transp. Comm'n*, 123 Wn.2d 621, 633-34, 869 P.2d 1034 (1994).

The substance of the alleged irregularities relate to Petitioners' claims that Chairman Luce engaged in a conflict of interest and improper ex parte communications and exhibited bias in favor of EFSEC's preemption authority. The court granted Petitioners the ability to supplement the record with the declarations and depositions obtained through discovery in order to support their allegations of irregularity. The court reviewed the evidence produced and found no material disputed issue of fact that would require further evidentiary hearings. The court did not make a specific finding of procedural irregularity but determined that the record was complete for this court's substantive review of Petitioners' allegations. The court entered an order to supplement with the testimony for certification.

A court may limit the amount of testimony that it will accept. The court's decision to receive testimony has practical limits. *Roberts,* 88 Wn.2d at 893 ("The elements by which relevancy is measured include whether the testimony would have a tendency to mislead, distract, waste time, confuse or impede the trial, or be too remote either as to issues or in point of time."). Given the court's authority to limit testimony

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on relevance grounds, we do not believe the court acted outside its discretion.

The court permitted Petitioners to supplement the record with declarations and deposition transcripts from the key people involved in the allegations. Declarations and depositions constitute testimony. Black's Law Dictionary 1514 (8th ed. 2004) ("[T]estimony" means "[e]vidence that a competent witness under oath or affirmation gives at trial or in an affidavit or deposition."); *Hohnsbehn v. Bd. of Trustees of Police Pension Fund*, 304 Ill. App. 3d 564, 568, 711 N.E.2d 323, 238 Ill. Dec. 220 (1999) ("The word 'testimony' means much more than mere in-person testimony at the hearing." (citing Black's Law Dictionary 1476 (6th ed. 1990))). Therefore, RCW 80.50.140(1) did not require the superior court to conduct an evidentiary hearing or to allow Petitioners' to conduct in-court interrogation of witnesses.

The testimony permitted by the court provided Petitioners with a sufficient record to make their allegations of impropriety against the EFSEC council members. Petitioners argue that they were entitled to take more testimony, but do not assert that they need to present additional facts in order to support their claims. The factual issues giving rise to their claim are documented in the supplemental record. The supplemental record establishes the acts taken by the EFSEC council members. The only question remaining is whether such conduct amounts to a violation of law as alleged by Petitioners. This is a purely legal question that can be determined from the

existing record. Taking additional testimony is not required for such a decision and would only waste time. Therefore, the court did not err in limiting the testimony to the declarations and depositions.

Upon supplementing the record, the court determined that the record was complete for review in satisfaction of RCW 80.50.140(1)(d). The court went on to determine the remaining criteria under RCW 80.50.140(1). The court found that the petition involved fundamental and urgent interests under RCW 80.50.140(1)(b). We agree. The legislature has recognized public interests in providing energy at a reasonable cost, RCW 80.50.010(3), and avoiding costly duplication in the siting process and ensuring that decisions are made timely and without unnecessary delay, RCW 80.50.010(5). Such public interests are present in this case, requiring prompt review. Petitioners question the State's authority to site energy facilities under EFSLA, which has been in effect for over 30 years. A delay in finally determining such authority will result in uncertainty for all existing and pending siting projects. Such uncertainty could lead to delay in the construction and operation of energy facilities and ultimately restrict the availability of energy at reasonable costs in the state.

The superior court also determined that the parties would likely seek review in this court regardless of its determination. RCW 80.50.140(c). Again, we agree. The

stakes in this case are high, pitting the jurisdiction of a multidepartment state council against county jurisdiction over siting energy facilities. The winner gets control over the siting of energy facilities. Whoever lost in superior court would have great motivation to seek review in this court in order to preserve its jurisdiction.

We hold that the testimony taken in superior court sufficiently supplemented the record for effective review by this court and does not require us to remand for further fact-finding on alleged procedural irregularities. We further hold that the petitions for review meet the conditions under RCW 80.50.140(1), and therefore we accept certification from the superior court. We will review Petitioners' substantive claims on the record certified by the superior court.

III. Substantive Issues

A. *Scope of Review under the APA*

Petitioners raise several challenges regarding the authority and propriety of the State's decision to preempt the County's land use laws in order to site an energy facility. Before reaching Petitioners' substantive claims, we must determine the scope of our review of that decision. EFSLA creates a right of judicial review of the "final decision" made on an application for site certification, pursuant to the procedures of the APA. RCW 80.50.140(1). However, that section does not define whether the final decision relates only to the governor's actual decision itself or also includes review of

the administrative process followed by EFSEC in making its recommendation to the governor.

The governor makes the very last decision on an application for certification, which simply requires her to approve or reject the application in her discretion. RCW 80.50.100(2). However, EFSLA provides no guidelines or procedures for how the governor may exercise her discretion to finally approve or reject the application. Therefore, if review were limited to the actual last decision made, there would essentially be nothing to review.

As EFSLA does not determine the scope of review, we look to the APA for guidance. Under the APA, the approval of a site certification falls within the definition of a "'[l]icense.'" RCW 34.05.010(9)(a). "'Licensing' includes the agency process respecting the issuance . . . of a license." RCW 34.05.010(9)(b). Licensing focuses on the process or procedures used by the issuing agency. In addition, an "'[a]djudicative proceeding'" includes "all cases of licensing . . . in which the granting of an application [for a license] is contested by a person having standing to contest under the law." RCW 34.05.010(1). Therefore, we consider the governor's approval of the certification as an "'[a]djudicative proceeding'" under the APA. As such, this court's review should include the process used in approving the certification.

The APA provides standards for reviewing orders issued in adjudicative

proceedings. RCW 34.05.570(3). While EFSEC did not technically issue an order after holding its public hearing, EFSLA required EFSEC to conduct the hearing as an adjudicative proceeding. RCW 80.50.090(3). Under the APA, review of adjudicative proceedings is limited to the following concerns:

> (a) The order, or the statute or rule on which the order is based, is in violation of constitutional provisions on its face or as applied;
>
> (b) The order is outside the statutory authority or jurisdiction of the agency conferred by any provision of law;
>
> (c) The agency has engaged in unlawful procedure or decision-making process, or has failed to follow a prescribed procedure;
>
> (d) The agency has erroneously interpreted or applied the law;
>
> (e) The order is not supported by evidence that is substantial when viewed in light of the whole record before the court, which includes the agency record for judicial review, supplemented by any additional evidence received by the court under this chapter;
>
> (f) The agency has not decided all issues requiring resolution by the agency;
>
> . . . .
>
> (h) The order is inconsistent with a rule of the agency unless the agency explains the inconsistency by stating facts and reasons to demonstrate a rational basis for inconsistency; or
>
> (i) The order is arbitrary or capricious.

RCW 34.05.570(3). This list governs the scope of our review of Petitioners' substantive claims. We address each claim individually.

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B. *EFSLA Governs the Siting of an Energy Facility that Exclusively Uses Wind Power*

Petitioners claim that EFSLA does not confer jurisdiction on EFSEC to preempt the County's land use and zoning laws regarding the siting of wind energy facilities. This issue falls within RCW 34.05.570(3)(b), regarding the statutory authority or jurisdiction of an agency.

By its very terms, EFSLA applies to an energy facility that exclusively uses wind power, regardless of generating capacity. EFSLA defines the scope of energy facilities covered by the statute. It expressly applies "to the construction, reconstruction, or enlargement of a new or existing energy facility that *exclusively uses alternative energy resources* and chooses to receive certification under this chapter, regardless of the generating capacity of the project." RCW 80.50.060(2) (emphasis added). The "alternative energy resources" language was added in 2001. Laws of 2001, ch. 214, § 2. The same year, the legislature defined "'[a]lternative energy resource'" as "(a) Wind; (b) solar energy; (c) geothermal energy; (d) landfill gas; (e) wave or tidal action; or (f) biomass energy based on solid organic fuels from wood, forest, or field residues, or dedicated energy crops." RCW 80.50.020(18). The KVWPP proposes to use wind energy to generate electricity and therefore falls within the plain meaning of RCW 80.50.060(2). *See Dep't of Ecology v. Campbell & Gwinn, LLC*, 146 Wn.2d 1, 9-10, 43 P.3d 4 (2002) ("[I]f the statute's meaning is plain on its

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face, then the court must give effect to that plain meaning as an expression of legislative intent.").

Petitioners take a different view. Their interpretation would have us look to the definition of an "energy facility" as defining the scope of projects covered under EFSLA because RCW 80.50.060(2) applies to an "*energy facility* that exclusively uses alternative energy resources." (Emphasis added.) In their view, any facility that uses an alternative energy resource still must fit within the meaning of an energy facility, as defined under EFSLA.

EFSLA defines an "'[e]nergy facility'" as "an energy plant or transmission facilities." RCW 80.50.020(11). The definition for a "'[t]ransmission facility'" is totally inapplicable here. RCW 80.50.020(7). EFSLA defines an "'[e]nergy plant'" as one of five kinds of facilities distinguished by the kind of energy used and the output generated. RCW 80.50.020(15)(a)-(e). Subsection (a) refers to a thermal power plant, subsections (b) and (d) refer to facilities that use natural gas, and subsections (c) and (e) refer to facilities that use petroleum. The definition makes no reference to any of the "'[a]lternative energy resource[s]'" defined in RCW 80.50.020(18).

Petitioners' reading of RCW 80.50.060(2) would exclude at least wind and wave action projects from coverage under EFSLA. Under Petitioners' reading, RCW 80.50.060(2) would limit an energy facility that exclusively uses alternative resources

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to a facility that uses thermal, petroleum, or natural gas. While several of the alternative energy resources enumerated in RCW 80.50.020(18) arguably could fit into the meaning of thermal power, resources such as wind and wave action would not.

We cannot accept Petitioners' interpretation as it would render meaningless the legislature's explicit inclusion of wind as an alternative energy resource, as well as any other alternative energy that was not a thermal, gas, or petroleum based energy resource. The definition of an energy facility that uses alternative energy resources must apply to those alternative energy resources expressly defined in EFSLA in order to give the statute meaning. *State v. J.P.*, 149 Wn.2d 444, 450, 69 P.3d 318 (2003). EFSLA instructs that the definitions section applies throughout the statute "unless the context clearly requires otherwise." RCW 80.50.020. The context of RCW 80.50.060(2) clearly requires that an "energy facility that exclusively uses alternative energy resources" applies to a wind energy facility.[12]

Petitioners argue that the phrase "alternative energy resources" must relate to the existing definition of an energy facility because RCW 80.50.060(2) exempts such resources from the output requirements for energy facilities under RCW 80.50.020(11), (15). However, our interpretation does not render meaningless the last

[12] Furthermore, the legislature amended the definition section in 2007 to indicate that alternative energy resources apply beyond the strict definitional limits of an energy facility. EFSLA now defines a "'[s]ite'" as "any proposed or approved location of an energy facility, alternative energy resource, or electrical transmission facility." RCW 80.50.020(4); Laws of 2007, ch. 325, § 1.

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phrase of RCW 80.50.060(2). The exemption from any output requirement simply makes clear the legislature's intent to apply EFSLA's siting procedures to all alternative energy projects. The language expressly defines the scope of coverage rather than implying the scope of coverage by silence. In other words, the legislature intended to be as clear as possible that no alternative energy project would be too small for EFSLA's siting process.

We hold that EFSLA applies to energy facilities that exclusively use wind power. As such, EFSLA governs the KVWPP application.

C. *The Growth Management Act Did Not Supersede EFSEC's Preemption Authority under EFSLA*

Petitioners argue that EFSEC could not exercise its preemption authority over the County because the Growth Management Act (GMA), chapter 36.70A RCW, required EFSEC to comply with the County's comprehensive land use plan and regulations. Respondents EFSEC and Sagebrush contend that the GMA did not repeal EFSLA, and therefore the specific preemption authority under EFSLA governs over the GMA. Review of this issue also falls within RCW 34.05.570(3)(b).

EFSLA provides that "[t]he state hereby preempts the regulation and certification of the location, construction, and operational conditions of certification of the energy facilities included under RCW 80.50.060 as now or hereafter amended." RCW 80.50.110(2). As discussed above, RCW 80.50.060(2) includes energy facilities

that use alternative energy resources, including wind power. EFSEC relied on this authority to preempt the County's land use laws in this case.

Twenty years after enacting EFSLA, the legislature enacted the GMA in order to coordinate and plan economic growth and development among communities, local governments, and corporations. RCW 36.70A.010. The legislature amended the GMA in 2002 to recognize the importance of protecting rural lands and economies. RCW 36.70A.011. The GMA requires that "[s]tate agencies shall comply with the local comprehensive plans and development regulations and amendments thereto adopted pursuant to this chapter except as otherwise provided in [provisions under chapter 71.09 RCW]." RCW 36.70A.103. Petitioners contend that this language supersedes and therefore governs over the preemption language in EFSLA.

We attempt to read statutes governing the same subject matter in pari materia. *Hallauer v. Spectrum Props., Inc.*, 143 Wn.2d 126, 146, 18 P.3d 540 (2001) ("Such statutes 'must be construed together.'" (internal quotation marks omitted) (quoting *In re Pers. Restraint of Yim*, 139 Wn.2d 581, 592, 989 P.2d 512 (1999)). However, these two statutes present an apparent contradiction. A state agency cannot both preempt local laws and comply with such laws at the same time.

Fortunately, the rules of statutory construction provide a way to resolve this tension. Under the general-specific rule, a specific statute will prevail over a general

statute. *Wark v. Wash. Nat'l Guard*, 87 Wn.2d 864, 867, 557 P.2d 844 (1976) ("It is the law in this jurisdiction, as elsewhere, that where concurrent general and special acts are in pari materia and cannot be harmonized, the latter will prevail, unless it appears that the legislature intended to make the general act controlling."). As this court recognized in *Wark*, "It is a fundamental rule that where the general statute, if standing alone, would include the same matter as the special act and thus conflict with it, the special act will be considered as an exception to, or qualification of, the general statute, whether it was passed before or after such general enactment." *Id.*; *see State v. Conte*, 159 Wn.2d 797, 803, 154 P.3d 194, *cert. denied*, 128 S. Ct. 512 (2007). Furthermore, if the general statute was enacted after the specific statute, this court will construe the original specific statute as an exception to the general statute, unless expressly repealed. *Wark*, 87 Wn.2d at 867 ("If it was passed before the general statute, the special statute will be construed as remaining an exception to its terms, unless it is repealed by express words or by necessary implication."); *State ex rel. Dep't. of Pub. Serv. v. N. Pac. Ry. Co.*, 200 Wash. 663, 668, 94 P.2d 502 (1939) ("'It is elementary that a general statute or rule, though subsequently enacted or promulgated, does not affect a special statute or rule.'" (quoting *In re W. Barton St. Sewer*, 163 Wash. 645, 647, 1 P.2d 858 (1931))).

Applying the general-specific rule to statutes at issue, EFSLA represents the

specific statute and the GMA represents the general one. EFSLA governs a discrete and specific function of certifying sites for the construction and operation of energy facilities. On the other hand, the GMA applies to the comprehensive planning and management of land within counties and cities. RCW 36.70A.040. Therefore, EFSLA can be properly read as a specific exception to the general goals and procedures of the GMA.

The GMA does not expressly repeal EFSEC's preemption power under RCW 80.50.110(2). The GMA provides that the State maintains "authority to site any other essential public facility under RCW 36.70A.200 in conformance with local comprehensive plans and development regulations adopted pursuant to chapter 36.70A RCW." RCW 36.70A.103. RCW 36.70A.200(1) requires a county's comprehensive plan to include a process for siting "essential public facilities," which it refers to as airports, schools, transportation, correctional, waste, inpatient, substance abuse, mental health, group home, and transitional facilities. The GMA makes no mention of an energy facility nor gives any express indication that the legislature intended to repeal EFSEC's preemption power to site energy facilities.

The regulations adopted by CTED pursuant to the GMA further support this conclusion. The legislature designated CTED with the authority to promulgate regulations implementing the GMA. RCW 36.70A.190(4)(b). The legislature also

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assigned CTED to provide administrative and staff support for EFSEC. RCW 80.50.030(2)(b). CTED's duties under both statutes give it a unique and authoritative perspective of the relationship between EFSLA and the GMA. We afford deference to such an agency's rules. *Green River Cmty. Coll. Dist. No. 10 v. Higher Educ. Personnel Bd.*, 107 Wn.2d 427, 438, 730 P.2d 653 (1986) ("[A] heightened degree of deference is appropriate where the agency's construction of a statute is within the agency's field of expertise.").

Within its authority to promulgate the regulations for the GMA, CTED recognized that its regulations "should accommodate situations where the state has explicitly preempted all local land use regulations, as for example, in the siting of major energy facilities under RCW 80.50.110." WAC 365-195-745(1). Therefore, CTED expressly recognizes that the GMA must be read in conformity with EFSLA.[13] This recognition confirms our interpretation that the GMA does not supersede or repeal EFSEC's preemption powers under EFSLA.

D. *The Final Environmental Impact Statement Adequately Considered the Mitigation of Visual Impact Caused by the KVWPP*

[13] In 2006, the legislature amended EFSLA in conformity with CTED's interpretation. EFSLA now expressly requires EFSEC to determine whether a project is consistent with laws adopted under the GMA as the initial step in the preemption analysis. Under RCW 80.50.090(2), EFSEC must hold "a public hearing to determine whether or not the proposed [project] is consistent and in compliance with city, county, or regional land use plans or zoning ordinances" before making its decision to preempt such laws. The 2006 amendment specifically added the GMA to the definitions for "'[l]and use plan'" and "'[z]oning ordinance.'" RCW 80.50.020(16), (17).

The County argues that EFSEC violated the State Environmental Policy Act (SEPA), chapter 43.21C RCW, by producing an inadequate final environmental impact statement (FEIS) for consideration of the KVWPP application. Review of this issue falls within RCW 34.05.570(3)(c), (f). This court evaluates the adequacy of a FEIS under the "rule of reason" standard. *Klickitat County Citizens Against Imported Waste v. Klickitat County*, 122 Wn.2d 619, 633, 860 P.2d 390, 866 P.2d 1256 (1993). Under this standard, a FEIS "must present decisionmakers with a 'reasonably thorough discussion of the significant aspects of the probable environmental consequences' of the agency's decision.'" *Id.* (citing *Cheney v. City of Mountlake Terrace*, 87 Wn.2d 338, 344-45, 552 P.2d 184 (1976) (quoting *Trout Unlimited v. Morton*, 509 F.2d 1276, 1283 (9th Cir. 1974))).

The County alleges that the FEIS is deficient because it does not analyze specific turbine setback distances as a mitigation measure for the visual impact of the turbines. The County notes that WAC 197-11-440(6) mandates that the "[a]ffected environment, significant impacts, and mitigation measures" section of a FEIS discuss reasonable measures that would significantly mitigate significant environmental impacts of the project and indicate the intended environmental benefits of those mitigation measures. However, a FEIS does not require inclusion of specific remedies of each environmental impact. The basic purpose for requiring a FEIS is "'to require

local governments to consider total environmental and ecological factors to the fullest extent when taking "major actions significantly affecting the quality of the environment."'" *Wash. State Boundary Review Bd.*, 122 Wn.2d at 659 (quoting *Lassila v. City of Wenatchee*, 89 Wn.2d 804, 813, 576 P.2d 54 (1978) (quoting RCW 43.21C.030(c))).

The FEIS establishes the elementary fact that greater distances mitigate the visual impact of turbines. The FEIS submitted for the KVWPP carefully discusses the turbines' potential visual impacts in a 43-page section. AR at 10065-107. That section clearly indicates that locating turbines at greater distances from viewers reduces visual impact of those turbines. It determines that the turbines have a greater impact on viewers the closer they are located to the viewer. AR at 10066 (designating 0.5 miles or fewer "[h]igh" viewer sensitivity, 0.5 to 5 miles "[m]oderate," and greater than 5 miles "[l]ow."); AR at 10096-97 (noting that certain turbines would be "highly visible" because viewers would see them at "relatively close range"). The FEIS specifically evaluated more than a dozen viewpoints, which accounted for the distance of the viewers from the turbines. *See* AR at 10073-99.

The FEIS does not violate the "rule of reason" merely because it does not list "moving turbines away from every possible viewpoint" as a potential mitigation measure. The FEIS served its function of presenting "decisionmakers with a

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'reasonably thorough discussion'" of the visual impact of the project. *Klickitat County*, 122 Wn.2d at 633 (quoting *Cheney*, 87 Wn.2d at 344-45). Therefore, we hold that the FEIS did not fail to address the mitigation of visual impact of the KVWPP.

EFSEC's use of evidence outside the FEIS in its final certification decision does not render the FEIS inadequate. The County points out that EFSEC eventually approved a setback of four times turbine height, relying on testimony from the applicant's expert. County's Opening Br. at 40-41. The County takes issue with the fact that such a setback distance was not specifically discussed in the FEIS. FEIS's are critical evaluative tools for decision makers, but nothing in SEPA requires decision makers to rely solely on the information contained in the FEIS's when making decisions. The FEIS here was adequate, and EFSEC used it properly.

E. *EFSEC Members DNR, CTED, and Chairman Luce Did Not Violate the Appearance of Fairness Doctrine*

Petitioners allege that participation by DNR and CTED on EFSEC violated the appearance of fairness doctrine. Petitioners also allege that Chairman Luce violated the doctrine by engaging in ex parte communications and making biased statements in favor of EFSEC's preemption authority. Review of this issue falls within RCW 34.05.570(3)(c) for engaging in unlawful decision making or failing to follow prescribed procedures.

The appearance of fairness doctrine provides that "[m]embers of commissions

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with the role of conducting fair and impartial fact-finding hearings must, as far as practical, be open-minded, objective, impartial, free of entangling influences, capable of hearing the weak voices as well as the strong and must also give the appearance of impartiality." *Narrowsview Pres. Ass'n v. City of Tacoma*, 84 Wn.2d 416, 420, 526 P.2d 897 (1974). The doctrine applies only "as far as practical" to ensure fair and objective decision making by administrative bodies. *Id.* The practicality of the appearance of fairness will largely be determined by the procedures being applied.

Petitioners claim that DNR violated the doctrine by participating on EFSEC when it had a financial interest in the KVWPP. This claim relates to the fact that DNR leased state land to Horizon as part of the Project. Petitioners further claim that CTED violated the doctrine by participating on EFSEC while participating as a party intervenor in the site certification application process. Before reaching the substance of these allegations, we must first determine if the doctrine applies to the participation of the departmental seats created by EFSLA.

The appearance of fairness does not protect constitutional rights.[14] *City of Bellevue v. King County Boundary Review Bd.*, 90 Wn.2d 856, 863, 586 P.2d 470 (1978) ("Our appearance of fairness doctrine, though related to concerns dealing with

[14] The heading of the ROKT brief on this issue claims "EFSEC Violated Established Appearance of Fairness and Due Process Requirements of Fair and Impartial Hearing." Br. of Pet'rs ROKT & Lathrop at 25. However, its entire argument is premised on the appearance of fairness doctrine, without any mention of the constitution or due process.

due process considerations, is not constitutionally based."). Therefore, the fairness of a decision-making body is measured by how the legislature chose to structure the administrative body.

DNR and CTED participated on EFSEC by statutory mandate. RCW 80.50.030(3)(a) provides that "[t]he council *shall* consist of . . . (iii) Department of community, trade, and economic development; . . . (v) Department of natural resources." (Emphasis added.) Therefore, the legislature intended for DNR and CTED to participate on the council and EFSEC does not have the authority to determine its own membership. The appearance of fairness doctrine does not override the legislature's decision to include these agencies on EFSEC.

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The legislature did not intend to exclude interested parties from sitting on EFSEC. The legislature provided a right for a county to appoint a representative to EFSEC when it considered an application located in that county. RCW 80.50.030(4). Without question, any county in which an energy facility is proposed would have a great interest in the decision whether to preempt the county's authority to site such a facility. Indeed, in this case, the County appointed a representative to EFSEC and later intervened as an interested party. The presence of the County on EFSEC demonstrates that the legislature envisioned EFSEC to include a variety of perspectives and interested parties in the decision-making process. We will not disturb the legislature's decision.

Of course, the appearance of fairness doctrine certainly can be used to challenge an individual's participation as an administrative decision maker. EFSLA does not mandate the appointment of a particular *person* by DNR or CTED. However, Petitioners do not challenge the individual representatives of DNR or CTED that sat on the council.[15]

[15] During EFSEC's proceedings, Petitioners moved for disqualification of DNR and CTED. EFSEC followed the procedures of the APA and determined not to disqualify either member. RCW 34.05.425(3). Petitioners do not seek review of that determination.

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Petitioners allege that Luce himself violated the appearance of fairness on several grounds related to correspondence that they discovered after the application process had been completed. Petitioners point to an e-mail sent from Luce on February 24, 2004, which they claim indicated his bias and prejudice in this case. Ex. 14 to Dep. of Luce (Jan. 18, 2008). However, Petitioners merely parse out words from this document without explaining their meaning in context. For example, the County refers to Luce's comments that the KCC "'circumvented'" and "'subverted'" EFSEC, "and so warranted preemption." County's Opening Br. at 15; Ex. 14 to Dep. of Luce. Petitioners fail to explain how these comments allegedly show bias or prejudice.

The record indicates that the KCC Wind Farm Resource Overlay Zone ordinance clearly conflicted with EFSEC's jurisdiction, which is the very reason why EFSEC required Horizon to seek compliance with the County before requesting preemption. Furthermore, the County simply refers to a comment made by Luce characterizing the County's position as "'very unpersuasive,'" but the County fails to explain anything about the context in which that comment was made. County's Opening Br. at 15. The superior court provided Petitioners the opportunity to depose Luce regarding these comments to allow Petitioners to follow up on their claims of bias and partiality. This court need not indulge Petitioners in searching for any bias or prejudice in these comments.

Petitioners cite to another e-mail sent by Luce in which he wrote, "if we don't preempt we are effectively out of business as a 'State siting Council.'" Ex. 8 to Dep. of Luce. In his deposition, Luce explained that the facts of this case so clearly required preemption as authorized under EFSLA that if it did not preempt the County, then EFSEC would not be following its legislative mandate and should close down. Dep. of Luce at 36-37. Such comments accurately reflect the law under which EFSEC was created. RCW 80.50.010(5) specifically instructs EFSEC to avoid costly duplication in the siting process, presumably through its preemption power. Petitioners' other examples of bias are similarly unpersuasive. *See, e.g.*, County's Opening Br. at 15-16 (indicating Luce's belief that the County's Wind Farm Resource Overlay Zone ordinance "'improperly usurps and unnecessarily duplicates EFSEC's statutory role in the siting of energy facilities and . . . must therefore be preempted'" (alteration in original) (quoting Ex. 1 to Dep. of Luce at 69)). This does not show any bias against the County.

Petitioners also claim that Luce violated the doctrine by engaging in ex parte communications with the governor, counsel for Horizon (Darrell Peeples), and a representative for party Renewable Northwest Project (RNP). The allegations relate to comments made by the governor at the dedication of a previously sited wind project in Kittitas County. Dep. of Luce at 17-20. Those comments were interpreted in a

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newspaper editorial as reflecting the governor's general policy about preemption in the siting process. Luce expressed concern to the governor's office that her remarks at the dedication needed clarification based on the editorial. *Id.* at 20. Luce admitted that he sent a proposed draft letter to the governor. *Id.* at 115. Peeples and a representative of RNP asked Luce for a copy of any written clarification from the governor if she made it. *Id.* at 17-18. When the governor wrote a letter to Luce explaining her position on preemption, Luce distributed it at EFSEC's regular public meeting. He also sent a copy to Peeples and RNP as requested. *Id.* Luce denied that Peeples ever asked him to contact the governor or that Peeples requested that the governor clarify her position. *Id.* at 20.

This unremarkable exchange suggests no bias or prejudice. A simple request for a document that was made public does not indicate any impermissible ex parte communication. The communication did not relate to any proceeding regarding Horizon's application.

We hold that the participation by DNR and CTED, as statutorily mandated members of EFSEC, did not violate the appearance of fairness doctrine. Furthermore, we hold that Petitioners have presented no evidence in the administrative record and evidence produced in the superior court to show that Luce violated the appearance of fairness doctrine. Furthermore, Petitioners do not argue that further discovery or

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evidentiary hearings in the superior court would make an adequate showing of bias or prejudice.

F. *Substantial Evidence Supports EFSEC's Decision To Grant Horizon's Request for Preemption*

ROKT argues that EFSEC's decision to preempt the KCC is unsupportable under EFSLA and EFSEC's own regulations. This court may review the decision to determine if it is "supported by evidence that is substantial when viewed in light of the whole record before the court." RCW 34.05.570(3)(e). "[S]ubstantial evidence is 'a sufficient quantity of evidence to persuade a fair-minded person of the truth or correctness of the order.'" *City of Redmond v. Cent. Puget Sound Growth Mgmt. Hearings Bd.*, 136 Wn.2d 38, 46, 959 P.2d 1091 (1998) (quoting *Callecod v. Wash. State Patrol*, 84 Wn. App. 663, 673, 929 P.2d 510 (1997)).

EFSLA requires EFSEC to determine if an application complies with a local government's land use laws. RCW 80.50.090. If not, EFSEC's rules (at the time of the KVWPP application) required the applicant to make all reasonable efforts to resolve the noncompliance. Former WAC 463-28-030(1). EFSEC would stay its own proceedings while the applicant sought compliance with the local government. Former WAC 463-28-030(2). The applicant had to submit regular reports to EFSEC regarding the status of negotiations with the local government. Former WAC 463-28-030(3). ROKT does not allege that Horizon did not meet these requirements.

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If the applicant reported that efforts to resolve the noncompliance were not successful, then it could file a request for preemption. Former WAC 463-28-040. The request had to address the following issues:

> (1) That the applicant has demonstrated a good faith effort to resolve the noncompliance issues.
>
> (2) That the applicant and the local authorities are unable to reach an agreement which will resolve the issues.
>
> (3) That alternate locations which are within the same county and city have been reviewed and have been found unacceptable.
>
> (4) Interests of the state as delineated in RCW 80.50.010.

Id. In this case, Horizon requested preemption with EFSEC, addressing all four issues. After conducting a series of hearings, EFSEC entered an order recommending that the governor approve Horizon's application. The order included findings of fact and conclusions of law on Horizon's request for preemption.

ROKT contends that Horizon did not demonstrate good faith in its four-year negotiations with the County. Specifically, ROKT asserts that Horizon "had absolutely no interest in finding any level of compromise with Kittitas County." Br. of Pet'rs ROKT & Lathrop at 46.

In its order recommending approval, EFSEC recognized that its rule contained no definition of good faith. It went on to determine that good faith includes a showing that (1) the applicant worked as extensively as possible to resolve inconsistencies, up

to the point where further negotiations would be futile, and (2) reasonable compromises have been explored by both sides. In addition, it determined that good faith did not require resolution of all disputes. Applying this standard, EFSEC determined that Horizon demonstrated good faith.

We believe that EFSEC properly applied its standard in finding that Horizon acted in good faith in trying to resolve its noncompliance with the KCC. The KCC Wind Farm Resource Overlay Zone ordinance required Horizon to apply for site-specific exceptions to both the County zoning ordinance and comprehensive plan and to seek approval from two county boards. Horizon actively participated in numerous hearings over a five-month period in an attempt to comply with the ordinance requirements. Horizon submitted reports and presented expert testimony on the various impacts of the Project. Such extensive participation facially demonstrates good faith negotiation.

The record does not support ROKT's claim that Horizon had no interest in finding compromise with the County. The parties engaged in extensive negotiations with both County boards, through which Horizon made many substantial amendments to its original application in order to comply with the KCC. Indeed, even ROKT asserts that "[f]rom the time it first filed its Application, the Applicant had been constantly modifying the scope of the project, the location and number of turbines, and

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the terms and conditions to which it agrees to be bound." Br. of Pet'rs ROKT & Lathrop at 62. This does not indicate a failure to seek a compromise. Instead, it supports EFSEC's finding that Horizon made continuous attempts to accommodate the County's concerns. The "modifications" referred to by ROKT directly relate to Horizon's proposals to reduce the size of the Project in order to mitigate the noise and visual effects of the Project.

In the end, the only issue that remained in contention was the setback distance of the turbines from nonparticipating resident properties. *See id.* at 48 (referring to setbacks as "the central issue at the County level").[16] At a height of over 400 feet, the BOCC and County residents expressed concern over the visual and noise impact the KVWPP would have on the affected properties.[17]

Horizon made several substantial concessions on this issue. As mentioned, Horizon offered a sizable reduction of the Project from 120 turbines to 45-60 turbines

[16] As EFSEC's order recommending preemption states, "[a]lthough the BOCC does not explicitly state as much in Resolution 2006-90, it would appear to the Council that the BOCC concluded that the proposed Project complied with the County's Wind Farm [Resource] Overlay [Zone] Ordinance in nearly all respects, excepting concerns for height, visual impacts and shadow flicker effects." AR at 1472 (Council Order No. 826, at 16 n.33).

[17] Indeed, the very thought of such imposing structures across the landscape conjures up one of the most enduring literary scenes. "'It is very evident,' answered Don Quixote, 'that thou art not versed in the business of adventures: they are giants: and, if thou art afraid, get thee aside and pray, whilst I engage with them in fierce and unequal combat.'" Miguel De Cervantes Saavedra, *Don Quixote De La Mancha* 59 (Motteux, Jarvis, & Smollett rev. trans., New York: D. Appleton & Co. 1863) (1605).

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in order to accommodate the County's concerns. In addition, Horizon offered to

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increase its proposed setback distance from 1,000 feet to 1,320 feet from nonparticipating residents in order to alleviate the County's concerns over noise and visual effects of the turbines. The BOCC proposed various alternative distances from 2,000 feet to 3,000 feet based largely on each commissioner's personal observations at an existing wind project site. The record reflects that Horizon attempted to address each proposal that was made and followed up with responses in correspondence with the County and at later meetings with the BOCC.

Ultimately, Horizon testified that an increase in setbacks to a distance of 2,500 feet would force Horizon to reduce the Project in half. Horizon claimed that such a drastic reduction would make the Project economically unviable. The BOCC requested that Horizon offer some economic data to show at what size the Project would lose viability. Horizon responded by explaining that it could not reduce the Project within the BOCC's proposals because such a reduction would decrease Horizon's chances to sell the energy in a highly competitive utilities market. When Horizon did not provide the BOCC with its financial information, the BOCC denied the application.

ROKT argues that Horizon did not seek a compromise as to the setback distance because it refused to provide any economic data to support its assertion that further setbacks from 1,320 feet would render the Project economically unviable.

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However, EFSEC determined that it would not require Horizon to disclose such information because economic analysis was beyond its expertise. EFSLA requires EFSEC to develop environmental and ecological guidelines regarding energy facility siting. RCW 80.50.040(2). As economic analysis does not relate to environmental or ecological concerns, we believe EFSEC was within its authority to refuse to review the economic viability of the KVWPP. Furthermore, we believe that Horizon presented a sufficient explanation that reducing the Project to over one-half of its original size would substantially decrease its chances to sell electricity.

ROKT also argues that EFSEC did not properly evaluate alternative locations under its third criterion for preemption. EFSEC determined that no alternative site would satisfy the requirements for the KVWPP. ROKT argues that EFSEC applied the wrong standard for review of this issue by focusing on alternatives available to Horizon, rather than focusing on the State's energy needs. Br. of Pet'rs ROKT & Lathrop at 65. However, the criteria under former WAC 463-28-040 referred to issues that the applicant must address. It would be unreasonable to require Horizon to address any alternatives that were not available to it in making a request for preemption.

Lastly, ROKT claims that EFSEC did not properly evaluate the fourth criterion relating to the State's interest in siting energy facilities. The record indicates that

EFSEC adequately addressed the fourth criterion regarding the State's interests. We consider the evaluation of the State's interest in providing abundant and affordable energy largely a matter of public interest, and we afford great deference to EFSEC's expertise in this field. *Hillis v. Dep't of Ecology*, 131 Wn.2d 373, 396, 932 P.2d 139 (1997); *Schuh v. Dep't of Ecology*, 100 Wn.2d 180, 187, 667 P.2d 64 (1983).

Based on our review of this record, including the numerous public hearings and correspondence between Horizon and the County, we hold that substantial evidence supports EFSEC's conclusion to recommend preemption based on the criteria under former WAC 463-28-040.

Conclusion

We have appellate jurisdiction to review administrative decisions and we accept review of this case pursuant to the certification procedures established under RCW 80.50.140. Applying the review standards under the APA, we hold that EFSLA governs the siting of wind energy facilities and that EFSEC's preemption power does not violate the GMA. Furthermore, we hold that the FEIS produced in this case adequately considered the mitigation of visual impacts for the Project. We also hold that EFSEC members did not violate the appearance of fairness doctrine. And finally, we hold that substantial evidence supports EFSEC's decision to preempt the County's

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land use and zoning laws. For these reasons, we affirm the governor's final decision to approve the KVWPP site certification application.

AUTHOR:

Justice Susan Owens

WE CONCUR:

Justice Charles W. Johnson	Justice Mary E. Fairhurst
Justice Barbara A. Madsen	Justice James M. Johnson
Justice Richard B. Sanders	Justice Debra L. Stephens
Justice Tom Chambers	Stephen M. Brown, Justice Pro Tem.

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Subject: Re: UCDC 152.615 & 616 Letter for County Commissioners
From: Tamra Mabbott <Tamra.Mabbott@ucem.us>
Date: Fri, 15 Apr 2011 13:58:48 -0700
To: "Potter, Joy" <Joy.Potter@horizonwind.com>, Carol Johnson <carol@co.umatilla.or.us>

Joy - yes, this will be forwarded to the Board along with the rest of the new submittals.
Thank you for your comments.
Cordially, Tamra

RECEIVED

APR 15 2011

UMATILLA COUNTY
PLANNING DEPARTMENT

On 4/15/2011 10:30 AM, Potter, Joy wrote:

Tamara:

Attached please find a letter addressed to the Board of Commissioners regarding the proposed revisions to the above mentioned county code. I have also included 3 attachments. Please forward to the Board as I do not have a direct email address.

Hard copies will be sent as well, please confirm that these documents will be delivered to the commissioners to be considered during their workshop session they discussed at the last public hearing.

Thank you

Joy

Joy Potter | Project Manager
joy.potter@horizonwind.com
Direct 509.962.1122 | Mobile 509.899.4472
Horizon Wind Energy | www.horizonwind.com
3701 Hayward Road, Cle Elum, WA 98922

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RENEWABLES

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APR 15 2011

UMATILLA COUNTY
PLANNING DEPARTMENT

April 15, 2011

VIA E-MAIL

Board of County Commissioners
c/o Tamra Mabbott
Umatilla County
216 SE Fourth Street
Pendleton, OR 97801

Re: Proposed Code Amendments to UCDC 152.616(HHH)

Dear Commissioners:

I would like to thank the Board of Commissioners for the opportunity to provide additional written comments on the Planning Commission's proposed amendments to UCDC 152.616(HHH). As currently proposed, the amendments would result in significant ramifications for wind energy development in Umatilla County, and Iberdrola Renewables, Inc. ("IRI") has ongoing concerns that the proposed amendments are based on fear and speculation rather than sound science.

IRI has commented throughout this code amendment process and requests that the Board carefully review IRI's prior submittal materials, as well as the suggestions and comments provided by other wind developer comments. In particular, we encourage the Board to reconsider the Planning Commission's recommendations with respect to changes to UCDC 152.616(HHH)(8)(C). The proposed change would create a standard that makes it virtually impossible to demonstrate compliance. IRI encourages the Board to adopt standards-based criteria that require "reasonable efforts" to protect resources like the language that is already contained in the UCDC.

Additionally, IRI strongly encourages the Board to seriously consider the materials Renewable Northwest Project ("RNP") provided the Board in the form of an "informational binder." The materials provided offer professional, scientific information on economics, property values, health, setbacks, and sound. This evidence supports those setbacks and language modifications IRI has advocated for throughout this code amendment process. Additionally, as an enclosure to this letter, IRI provides the Board with its response to Planning Commissioners Reeder's comments and questions concerning the proposed amendment to IRI's Helix Wind Power Project. This information supplements the RNP materials and further describes why reliance on the Oregon noise regulations are adequate to protect human health, safety, and welfare of Oregon's citizens (see OAR 340-035-0005).

Thank you for your consideration.

Very truly yours,

Chase Whitney

Chase Whitney
Project Developer

Enclosure

IBERDROLA RENEWABLES, Inc.
1125 NW Couch St., Suite 700
Portland, OR 97209
Telephone (503) 796-7000
www.iberdrolarenewables.us

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Whitney, Chase

From: Whitney, Chase
Sent: Friday, April 15, 2011 3:33 PM
To: Clinton B. Reeder; Tamra Mabbott; Carol Johnson
Cc: Parsons, Sara McMahon; Albrich, Elaine; Filippi, David; Mark.Bastasch@CH2M.com; Pauline.Sullivan@CH2M.com; Carrie.Konkol@ch2m.com
Subject: RE: Helix Wind Project Setbacks
Attachments: Terjeson041411.pdf

RECEIVED
APR 15 2011
UMATILLA COUNTY
PLANNING DEPARTMENT

Tamra and Carol,

Please accept this response to Mr. Reeder's email of April 4, 2011. I would also like to request that this response and the attached document be entered into the record for the amendment to Conditional Use Section 152.616 (HHH) of the Umatilla County Development Code.

There are several important factors that should be considered regarding the modeling methods required on projects permitted through the EFSC process. The Oregon noise modeling considers the maximum rated sound level – regardless of wind direction – and assumes that the prevailing wind is always blowing from the turbine to the house; thus, there is no reason to make further adjustments to account for prevailing wind direction. The modeling method is based on the international standard for outdoor sound propagation, ISO 9613, and is used throughout the world to predict wind turbine sound levels. This standard assumes downwind propagation from the source to the receiver. For a series of sources that are set out in linear arrays, such as wind turbines, this means the wind is blowing from each source to each modeling point simultaneously. While physically impossible, this means that all modeling points or contours are developed assuming they are simultaneously downwind from all turbines. The reductions in noise levels resulting from upwind or cross wind propagation are not taken into account in the model results. It is also important to note that the reductions in noise levels afforded by topographic shielding (where the line of sight to the turbine is blocked by intervening terrain) are also not taken into account in the model results.

The acoustical model is developed based on all turbines simultaneously exceeding their maximum rated sound level by 2 dBA. This is unlikely to occur for several reasons. First, there is some reduction in wind speed as the energy is extracted from turbines. Second, the wind regime throughout the project area is not uniform. While wind speeds corresponding to maximum sound power levels may be realized in one area of the project, lower wind speeds and sound levels are likely in another. In addition, while one turbine may exceed the mean level periodically, it is statistically unlikely that all would do so simultaneously.

The Oregon approach was established to consider the maximum rated sound level – regardless of wind speed; thus, there is no reason to make further adjustment to account for differences between wind speeds in valleys or ridges. While other countries historically referenced a 10 meter wind speed and are now revising their approach, Oregon recognized the challenges a 10 meter reference would create. It also should be noted that the noise rules established in Oregon remain among the most restrictive in the world. The Netherlands recently completed a comprehensive review of wind turbine sound effects. Their previous standard referenced a 10 meter wind speed and was found to be unreliable. Their revised rules establish an annual average limit of 47 dBA (which is expressed in the preferred European Union metric, Lden, a day, evening and night average) and a specific nighttime limit of 41 dBA which is 5 dBA greater than Oregon's 36 dBA requirement based on their comprehensive review of potential reactions to wind turbine sound. It is also important to note that the Oregon noise limits are established based on site specific analysis of each project's layout and turbine selection, rather than on arbitrarily established distance setbacks.

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With regard to the structure of noise easement payments, IRI negotiates with each landowner as we do with wind energy leases, transmission easements, and all other real estate agreements; we propose payments based on market conditions and negotiate the amounts and structures with each land owner. Without releasing private information about our financial agreements with landowners, we will say that IRI has structured the Helix noise easements to continue through the life of the planned facility and we do consider our participating landowners to be financial partners in the project. IRI views these agreements as an effective way to broaden the project to benefit adjacent landowners who may not have facilities directly placed on their property.

Mr. Reeder also discussed noise monitoring at residences. The existing noise standard as enforced by EFSC requires that a certificate holder maintain a complaint response system to address noise complaints (as described in Helix Condition 102 sent previously). The certificate holder is required to promptly notify the Department of any complaints received regarding facility noise and of any actions taken by the certificate holder to address those complaints. In addition, an owner of a noise sensitive property can file a complaint directly with EFSC. In response to a complaint from the owner of a noise sensitive property regarding noise levels during operation of the facility, EFSC may require the certificate holder to monitor and record the statistical noise levels to verify that the certificate holder is operating the facility in compliance with the noise control regulations. We would support the County adopting similar language for projects permitted through the County.

IRI is encouraged by Mr. Reeder's growing confidence in the state noise standard as an effective means of providing effective and appropriate setbacks for non-participating residences. The existing noise standard also provides an opportunity for consultation and engagement with property owners near a proposed project. Through this consultation and possible negotiation, property owners are able to learn about the proposed project and interact directly with the developer. The decision to enter into a noise agreement is completely up to each individual property owner. IRI understands several members of the Helix community have expressed concerns and do not wish to participate in the project. IRI respects those comments and will design the final layout as required by the site certificate based on the location of participating landowners and in compliance with the noise rules. The final layout does allow "land owners and residents, who so choose, to permit wind towers on their land and near their homes while offering reasonable protection to those who wish to have a buffer between their homes and the towers." Such an approach allows for the construction of the wind facility in the area and generation of renewable energy.

With regard to Mr. Reeder's concerns over short and long-term community support, IRI agrees that community engagement is key. The development process is incremental and information is gained and shared throughout the process. IRI agrees that the sharing of information and facts is an important part to any successful project, and IRI strives to be as open and forthright as possible. A wind project is a 30-year commitment to the community and we hope to repower our facility, so our involvement with a community could potentially last for generations. We work hard to earn the trust and respect of the communities in which we do business. Our goal is to benefit the local economy and be a productive member of the local community from the very start of the project planning process. We acknowledge that some people may feel that we did not notify them soon enough about the project, and are working hard to regain their trust. IRI feels strongly that the current noise regulations and EFSC process provide substantial opportunity for public notification and comment as part of the development and planning effort. Specific opportunities are summarized below:

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- On March 10, 2009, ODOE issued public notice of the filing of the Application for Site Certificate. ODOE mailed the notice to the property owners listed in Exhibit F of the application and to those on the Council's general mailing list and the special mailing list set up for the proposed Facility, as described in OAR 345-015-0190. The notice included information about locations where copies of the complete application would be available for public review.
- ODOE published the notice of the application by publishing the notice in the *East Oregonian*, a newspaper of general circulation available in the vicinity of the proposed facility.
- ODOE posted notice of the filing on its website. In the public notices, the Department invited public comment by a deadline of April 6, 2009.

- ODOE issued the Draft Proposed Order on May 5, 2009, and provided notice of a public hearing at least 20 days before the hearing date, as required under OAR 345-015-0220. ODOE published the notice in the *East Oregonian*, a newspaper of general circulation available in the vicinity of the proposed facility. In addition, ODOE posted notice of the public hearing on its website.
- ODOE held a public hearing on on May 27, 2009, in Helix, Oregon. Hearing Officer John Burgess presided and explained that any person intending to raise an issue that may be the basis for a contested case must raise the issue in person or in writing on the record of the public hearing."
- ODOE issued a Proposed Order on June 17, 2009, and provided the contested case notice required under OAR 345-015-0230(3).The contested case notice specified a deadline of July 2, 2009, for interested persons to request party status. No requests for party status were received by the deadline.
- On July 7, 2009, the Hearing Officer issued an Order concluding the contested case proceeding. The Council considered the Department's Proposed Order at a public meeting in The Dalles, Oregon, on July 31, 2009, and issued this Final Order.
- On August 26, 2010, ODOE sent notice of the amendment request to all those on the Council's mailing list and to an updated list of property owners supplied by IRI, requesting public comments by September 24, 2010.
- On Monday, November 8, 2010, IRI voluntarily hosted an open house at the Helix School in Helix, Oregon to provide an opportunity for interested parties to learn more about the proposed project and identify any mistakes or omissions in RfA #1.
- On December 17, 2010, the Council held an informational hearing on the site certificate transfer request, as required under OAR 345-027-0100(7). There were no public comments on the proposed transfer.
- On February 9, 2011, ODOE issued the Proposed Order and circulated a public notice requesting comments on the Proposed Order. The public comment period was extended until April 27, 2011 to allow for additional public involvement.
- On April 27, 2011, the Council will hold another public meeting at the Helix School for oral public comments on the Proposed Order.

In addition, the following actions were taken in accordance with the cited OARs:

- In the Application for Site Certificate, IRI assembled the relevant sections of the current Umatilla County tax maps and reviewed the tax maps to identify tax lots wholly or partially within the areas required by OAR 345-021-0010(1)(f). Tables F-1, F-2, and F-3 identify property owners within 500 feet of the main site boundary, preferred transmission line, and alternative transmission line,
- In the Application for Site Certificate, IRI provided information about the predicted noise levels during the Facility's construction and operation in accordance with OAR 345-021-0010(1)(x)(A), and included an analysis of the Facility's compliance with applicable DEQ noise regulations per OAR 345-021-0010(1)(x)(B). In addition, pursuant to OAR 345-021-0010(1)(x)(C) and (D), IRI provided information demonstrating that it would secure noise waivers were necessary and would implement the proposed conditions to address noise. The three missing homes identified above were not within the 36 dBA contour of the original application.

IRI strongly disagrees with Mr. Reeder's view that wind development creates "Wind Turbine Victims" or "Refugees." Rather, IRI believes that the wider community benefits made possible by wind development are often overlooked or completely disregarded. A letter recently submitted to Umatilla County in support of the Helix project succinctly summarized these benefits to the town of Helix and Umatilla County as a whole. The letter goes on to state the following:

Just a few of the positive benefits are:

-Clean Energy

-New Jobs: 100 megawatt project: 6-10 permanent employees

- 200 megawatt project: 6-17 permanent employees

- SIP to area communities.

- Additional tax revenues for the county.

- Financial benefits to the landowners involved.

-Increased land values.

-Improved roads for farmers.

-Benefit to local businesses

-Supplemental income for Farmers

-Benefits for the Helix School District

-HELP

To help understand the financial contributions to the county and state, we asked Paul Chalmers of the Umatilla County Tax Assessors Office to provide us with some numbers. For the time period of May 5, 2002 through March 17, 2011, Florida Power & light, Nextera, & Combine Hill II have made available $718,633.51 in "Community Service Fees", ("HELP" to the Helix Community). (See attachment 2 to the letter)

From 2002 through 2010, Umatilla County has received tax revenues totaling $11,388,551.00 from area wind projects. (See attachment 3 to the letter)

Mr. Chalmers said for the 201D-2011 tax year, that without wind, there would an assessed value increase of 1%. With wind, there would be an assessed value increase of 3.4%. (See attachment 3) These are substantial amounts of much needed revenues for our local schools and tax districts.

IRI appreciates Mr. Reeder's acknowledgement that all energy resources have their drawbacks and impacts. While wind is not completely benign, it is a significant home-grown resource that can play an important role in our country's overall energy portfolio. It is clean and inexhaustible, and Oregon is uniquely situated to take advantage of it.

Regards,

Chase Whitney

Chase Whitney
Business Developer
Wind Development
1125 NW Couch St. Suite 700, Portland, OR 97209
Phone: 503-796-7220 Mobile: 503-869-7427 Fax: 503-796-6907
chase.whitney@iberdrolaREN.com

In the interests of the environment, please print only if necessary and recycle

00002424

From: Clinton B. Reeder [mailto:clinton_reeder@westforkco.com]
Sent: Saturday, April 09, 2011 9:50 AM
To: Tamra Mabbott; Carol Johnson
Cc: Whitney, Chase
Subject: FW: Helix Wind Project Setbacks

Tamra and Carol.
If I understand this communication correctly, it states the point I made in the Board of Commissioners' hearing: that at least in the Helix Project situation the state noise standard requires the kind of setbacks stated in this email from Chase Whitney. That is, in order to comply with the state noise standard, the noise boundary around this proposed project would demand the sort of setbacks described in this email.

One problems I see is how to use this information in the Helix Project situation: would the noise boundary map need to be re-run assuming winds from the North (not too uncommon in the winter months, and might pose an increased noise concern for the city of Helix) or winds FROM the SE (also not uncommon during certain parts of the year)? It would be very interesting to see maps with these different wind directions. Setbacks cannot just be set based on the prevailing winds, but must (at least in my opinion) consider the most common frequent wind directions. Otherwise, we will likely see too much resistance build later after operations start.

In this respect, I think the county and developers MUST give very significant consideration to both longer and shorter-term community support. For example, I would not (generally) recommend signing any mitigation agreements that did not run the full operating cycle of a development. What is happening now, with the mitigation payments made over maybe half or less of the productive life of the project means that the local community will continue to experience significant impacts from the developments well after the mitigation payments end. I think that is a mistake, for both the developer and the local community. I think since they will be "intimate neighbors" for the operating life of the project/s, they should also be "mitigation financial partners" for the life of the projects. Otherwise, the older the project gets, the more likely there will be unmitigated effects arise that further complicate the long term relationship between the community and the developers (who ever they might be at the time, due to changes in ownership of the projects). [I understand there are also financial planning considerations that serve as incentives to keep the payment periods shorter.]

Several weeks ago, while I was discussing the wind turbine noise issue with my son, Jeff, who can be rather creative at times, he asked me why we did not consider setting up recording stations at homes near the noise boundary, and then making noise easement payments based on a per hour fee, tied to the average level of the noise reading, paying a higher fee as the actual recorded noise exceeded the state standard. Maybe even a graduated scale of payments, with the percent increase in the per hour fee rising more than proportional to the actual increase in noise level – in order to provide an incentive to the wind developer to do whatever was necessary to keep the noise impact within more tolerable levels... but letting the local residents know that whenever the noise impact exceeded standards, there would be a cash mitigation payment made. While it appears to me this could be made to happen effectively, one major drawback would (could, might) be to initiate a less than accurately predictable cash flow situation for the wind developer. If so, the unstable cash flow demand might jeopardize the discounted current cash value of the project enough to undermine the overall capital value of the project. On the other hand, such an effect could be moderated by the wind developer electing to site the turbine towers further away from homes in order to lessen the risk that the wind turbine noise would be great enough to run up the noise easement payments. While the idea of metering the adverse effects of noise that exceeds the state noise standards might seem a bit bizarre, it might reduce the potential legal and other costs (testing, monitoring, etc.) associated with resolving circumstances when actual noise exceeds the noise predicted by pre-project modeling.

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I am curious to see what two more maps might suggest: one with a north wind, and another with the SE wind --- to compare to the NW prevailing winds in this area. I do not think we can make a rational final setback decision until we have better information concerning the effects generated by the non-prevailing winds. It appears to me that a north / northwest wind might drop a home or two to the east but add maybe 2-6 homes to the west of the Helix Project. If we could see such maps in the near future, it might help make a more rational setback decision at the upcoming continuation of the Board of Commissioners' hearing. One developer-consultant has suggested that current studies such as this, concerning identified problems and/or solutions might be very helpful at this stage of wind power development in this county. Another study suggested involves investigating the cumulative effect of wind power development on bird and other wildlife species.

I am also intrigued by the possibility that the county might be able to just rely upon the state noise standard, and let the noise map boundary establish a credible setback distance for the various projects, on a case-by-case basis, maybe with a stated minimum protective setback distance in the county ordinance. There is already considerable questioning going on concerning just what variables are included in the current computer model being used to generate the noise maps. Does the model include terrain elevations? Does it consider the day-night changes in natural convection currents up-canyon and down-canyon as day-night temperatures change, maybe a factor that to some degree is rather independent of the prevailing wind direction. My recent Internet search for setback information suggests rather strongly that setback distances should carefully consider terrain, with the more rolling terrain areas having larger setback distances; and that mountainous areas have even further setback distances, apparently due to the "canyon effects" as well as higher wind velocity at higher elevations.

My fondest dream for these projects is to simply increase the exchange of pertinent information between the wind developers and the local community. Far too much harm is being done by all the secrecy! It leaves local people far too uncertain; without any meaningful way to get answers to questions; excludes people who have not, will not, maybe might with the right information, sign noise easements. Trust is a major problem with these developments, and trust is closely related to the level of secrecy. It is far too arrogant of the wind developers to come into a community and expect to act in secrecy and accomplish their development goals without resistance to the lack of information and the great uncertainty. This causes local people to not trust, to have less confidence in the developers – and by extension to not trust the neighbors who might sign away the peace and quiet of the neighborhood without even talking to other neighbors with whom they must interact at least occasionally relative to other issues and concerns in the community.

I do not wish to sound too critical, but it appears to me the wind developers are either over-sensitive to the potential social upheaval their projects are causing, or maybe far too insensitive to the social-community cohesion aspects of their projects. I am increasingly convinced it is possible to manage the socio-economic impact of these projects in far more productive fashion, and maybe save money and time for everyone involved.

The current process is simply far too intimidating and coercive to end up with the community reasonably intact after operations start... and more developers want to come into the area. Tower Density, Tower Size (over-powering impact on the landscape, including noise and the night-time horizon via blinking lights, – unless future technology reduces noise) and Cumulate Effects of noise, blinking night-lights and general visual effects will continue to be an increasing problem, unless we somehow develop a more productive way to manage wind power project siting and operational decisions. I have been a self-employed business person for about 45 years, both as a consultant and as a commercial farmer (both owner and operator), plus a professional research and teaching economist (and state-wide Extension Economist, for 13 years), and behavioralist (observer-student of organizational, industry, legislative, community conduct) as well. This broad range of training and experience convinces me that simply relying on the explanation that current operating patterns are "necessary for competitive reasons" is far too inadequate for a public utility development like wind power – and is exactly why societies around the world have invested for years in developing Public Utility Economic Theory and associated regulatory mechanisms. Wind power development, due to its rather random scattering of the industrial wind turbines and distribution lines across the rural landscape simply does not, in certain ways, "fit' the prevailing public utility development model,

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and needs attention to how best to adapt so that the local socio-economic issues are more appropriately managed. Otherwise, as the need for and actual development increase, all diversely located alternative "industrial" energy development projects will face similar unresolved socio-economic limitations and conflict.

In this respect, I think it is a very positive step being taken by EFSC, to hold a (maybe, hopefully a precedent setting) public meeting to hear oral testimony, as well as receive written material, from local citizens in the Helix area on April 27, 2011 (6:00 -8:30 PM, at the Helix school). It appears to me that the EFSC siting process does not adequately address the Oregon Land Use Planning Goal of "Public Participation" – they wait until far too late in the process to seek public comment, which results in far too many affected people not being aware of the imminent impact/s, and limits hearing the voices of concern and the local suggestions for adaptation of project proposals until far too late in the process. It does not satisfy very well the state land use planning program concept in Oregon to only accept input from the developers in the early stages of new state sited wind energy projects. Far too much is already invested in the project development process before the public has any opportunity make a meaningful input and/or even hear about at least the general scope, location and concept of a proposed new development. Secrecy is NOT the appropriate means to elicit public acceptance in any reasonably democratic decision process that embodies highly significant local impacts, like wind power development projects.

I encourage the wind developers to step back a bit, and think about the local community WITHOUT FIRST FOCUSING ON THE MONEY SIDE OF THE CIRCUMSTANCES. Yes, the money provided by the developments is very important – but there are other issues that may at times take precedence, or at least severely disrupt the money focused negotiations. The money side of the development projects all too easily reduces to "What is the financial cost of the community's support?"; "How many years minimum can we negotiate for the payments?" Etc. rather than at least a reasonable focus on "How many Wind Turbine Refugees will this project likely create, and how can that number be reasonably reduced, to minimize longer term costs and legal complications?" Minimal attention to the harsh socio-economic reality that these projects are creating Wind Power Development Victims is an increasingly costly mistake, with the secrecy of the noise easement negotiations creating considerable disparity among recipients of future economic "victim benefits" from the developments.

I have suggested that the victims consider employing the services of one competent legal firm, and negotiate collectively, patiently rather than one at a time. This would at least provide a common information base from which they might make such a decision (the need for such a strategy might be altered if the flow of credible information were increased from the developers). Regardless, if they negotiated collectively, the process would likely benefit from whatever creativity might be generated in the process -- most rural communities have considerable hidden talent in this respect.

Finally, it is increasingly clear that this matter is not unique to just wind power development. As the search for natural gas and other energy sources increases, whether renewable or new deposits of non-renewals, the community-wide impacts will (must) be more productively confronted if the longer term socio-economic realities are to be more productively managed in the future. Gas recovery from shale deposits, for example, is causing a similar discussion, with a similar but much more intense reference to water quality concerns (water is forced into shale deposits to force loose the gas held within the shale deposits, causing both surface accumulations and groundwater movement of contaminated water, which in turn contaminates soils, livestock watering sources and human drinking and commercial-industrial water supplies.

Just some thoughts – maybe justification for more productive discussions in the near future between the county, the wind developers and "concerned citizens". Maybe it would be productive to invite the local Community College to support a series of Alternative Energy Development Debates, plus debate training for students, to enhance the problem-solving and information search and sharing skills of our youth, and community members as well.

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Just in case anyone wonders, I remain: Committed to identifying the issues and concerns, searching for information and ideas, and solving the problems – not stopping wind power development, or development of any other alternative energy sources. Maybe we need a motto, something like: "Community and Resource Friendly Alternative Energy Development Projects".

Best Wishes, and High Hopes for our collective tomorrows!

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FAX (available - please call)
Clinton_Reeder@westforkco.com

From: Whitney, Chase [mailto:Chase.Whitney@iberdrolaren.com]
Sent: Tuesday, April 05, 2011 1:10 PM
To: Carol Johnson
Cc: Tamra Mabbott; Clinton B. Reeder; Parsons, Sara McMahon; Mark.Bastasch@CH2M.com; ERALBRICH@stoel.com; DEFILIPPI@stoel.com
Subject: RE: Helix Wind Project Setbacks

Carol,

The Helix project will comply with EFSC conditions 100-102 copied below, which will result in a much larger setback from non-participating rural residences than the 1,320 ft required by EFSC condition 43. Because the project must demonstrate compliance with the DEQ noise rules, distances from turbine strings to non-participating homes would range from approximately 3800 to 8500 feet (0.7 to 1.6 miles) based on a turbine with maximum sound power level of 106 dBA. This number depends on a variety of factors, such as turbine maximum sound power level as well as the number and location of turbines in proximity to the residence. It is for these reasons that EFSC requires a detailed site specific analysis prior to construction to demonstrate compliance with the DEQ noise rules, as a standard setback distance is not sufficiently robust to ensure compliance with the restrictive DEQ noise rules at rural residences. While the resulting setback from a rural home to a string of towers is likely greater than the setback to a single tower, there is no hard and fast setback distance for rural homes from strings as compared to single towers, EFSC and DEQ rules recognize that a more rigorous process is required based on the various factors described above.

43	Setbacks	The certificate holder shall construct all facility components in compliance with the following setback requirements: (a) All facility components must be at least 3,520 feet from the property line of properties zoned residential use or designated in the Umatilla County Comprehensive Plan as residential. (b) Where (a) does not apply, the certificate holder shall maintain a minimum distance of 110-percent of maximum blade tip height, measured from the centerline of the turbine tower to the nearest edge of any public road right-of-way. The certificate holder shall assume a minimum right-of-way width of 60 feet.

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		(c) Where (a) does not apply, the certificate holder shall maintain a minimum distance of 1,320 feet, measured from the centerline of the turbine tower to the center of the nearest residence existing at the time of tower construction. (d) Where (a) does not apply, the certificate holder shall maintain a minimum distance of 110-percent of maximum blade tip height, measured from the centerline of the turbine tower to the nearest boundary of the certificate holder's lease area.
86	Transmission Lines	The certificate holder shall take reasonable steps to reduce or manage human exposure to electromagnetic fields, including but not limited to:
		(a) Constructing all aboveground transmission lines at least 200 feet from any residence or other occupied structure, measured from the centerline of the transmission line.
		etc
100	Noise Abatement	To reduce construction noise impacts at nearby residences, the certificate holder shall:
		(a) Confine the noisiest operation of heavy construction equipment to the daylight hours.
		(b) Require contractors to install and maintain exhaust mufflers on all combustion engine-powered equipment; and
		(c) Establish a complaint response system at the construction manager's office to address noise complaints.
101	Turbine Noise	Before beginning construction, the certificate holder shall provide to the Department:
		(a) Information that identifies the final design locations of all turbines to be built at the facility.
		(b) The maximum sound power level for the substation transformers and the maximum sound power level and octave band data for the turbines selected for the facility based on manufacturers' warranties or confirmed by other means acceptable to the Department.
		(c) The results of noise analysis of the facility to be built according to the final design performed in a manner consistent with the requirements of OAR 340-035-0035(1)(b)(B)(iii) (IV) and (VI) demonstrating to the satisfaction of the Department that the total noise generated by the facility (including the noise from turbines and substation transformers) would meet the ambient degradation test and maximum allowable test at the appropriate measurement point for all potentially-affected noise sensitive properties.

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		(d) For each noise-sensitive property where the certificate holder relies on a noise waiver to demonstrate compliance in accordance with OAR 340-035-0035(1)(b)(B)(iii)(III), a copy of the a legally effective easement or real covenant pursuant to which the owner of the property authorizes the certificate holder's operation of the facility to increase ambient statistical noise levels L10 and L50 by more than 10 dBA at the appropriate measurement point. The legally-effective easement or real covenant must: include a legal description of the burdened property (the noise sensitive property); be recorded in the real property records of the county; expressly benefit the certificate holder; expressly run with the land and bind all future owners, lessees or holders of any interest in the burdened property; and not be subject to revocation without the certificate holder's written approval.
102	Turbine Noise	During operation, the certificate holder shall maintain a complaint response system to address noise complaints. The certificate holder shall promptly notify the Department of any complaints received regarding facility noise and of any actions taken by the certificate holder to address those complaints. In response to a complaint from the owner of a noise sensitive property regarding noise levels during operation of the facility, the Council may require the certificate holder to monitor and record the statistical noise levels to verify that the certificate holder is operating the facility in compliance with the noise control regulations.

Regards,

Chase

Chase Whitney
Business Developer
Wind Development
1125 NW Couch St. Suite 700, Portland, OR 97209
Phone: 503-796-7220 Mobile: 503-869-7427 Fax: 503-796-6907
chase.whitney@iberdrolaREN.com

In the interests of the environment, please print only if necessary and recycle

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From: Carol Johnson [mailto:carol@co.umatilla.or.us]
Sent: Monday, April 04, 2011 4:13 PM
To: Whitney, Chase
Cc: Tamra Mabbott; Clinton B. Reeder
Subject: Helix Wind Project Setbacks

April 4, 2011

Hello Chase,
There has been some discussion on what setbacks the Helix project is proposing from a tower to a local rural home site. Could you please clarify what distance is proposed by the Helix Wind Project from towers to rural home sites and whether there is a greater setback from a rural home to a string of towers?

00002430

Thank you,
Carol
--
Carol Johnson, *Senior Planner*
Umatilla County Department of Land Use Planning
216 SE 4th ST | Pendleton, OR 97801
Phone: 541-278-6301 | Fax: 541-278-5480
http://www.umatillacounty.net/planning - Visit our website for copies of planning documents, permit applications and other helpful information.

Please Be Aware - Documents such as emails, letters, maps, reports, etc. sent from or received by the Umatilla County Department of Land Use Planning are subject to Oregon Public Records law and are NOT CONFIDENTIAL. All such documents are available to the public upon request; costs for copies may be collected. This includes materials that may contain sensitive data or other information, and Umatilla County will not be held liable for its distribution.

Please be advised that email addresses for Iberdrola Renewables personnel have changed to *first.last@iberdrolaREN.com* effective Aug. 16, 2010. Please make a note. Thank you.

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RECEIVED
APR 15 2011
UMATILLA COUNTY
PLANNING DEPARTMENT

Attention: John White
Terjeson Comments on Helix Wind Power Amendment
9 pages (including cover page)

Gunder Terjeson and Kirk Terjeson (Helix, Oregon) April 7, 2011

To: EFSC, Umatilla County Commissioners, Umatilla County Planning Commission:

We are writing this letter in support of the Helix Wind Power Facility Amendment. Some of our ground is enrolled in the original siting of the Helix Wind Power Facility. Although we have chosen not to enroll additional ground into the amended site, we would like to voice our support for this amendment and also to retain the current noise easement setback regulations.

Kirk and I did not know of the Feb. 24th Umatilla Co. Planning Commission meeting or the Mar. 17th Umatilla Co. Board of Commissioners meeting. We became aware of comments and concerns made by a few people describing the negative aspects of wind energy projects. Kirk and I farm and both have houses close to the Vancycle Ridge Wind project and have not experienced any of the problems stated in the Feb. or March meetings.

To become better informed, Kirk traveled to the EFSC meeting on March 25th in The Dalles. In attendance was Larry Givens, Umatilla County Commissioner. He addressed the EFSC panel that day saying he was speaking as a private citizen, not a County Commissioner. The substance of his talk painted a negative picture of wind energy. He even went so far as to propose a moratorium on the building of wind projects in Oregon. Kirk traveled back to Pendleton to talk to one of the County Commissioners. He was told none of the Commissioners were in and was informed Mr. Givens was not in because he was attending the meeting in The Dalles... representing the County Commissioners .(The appearance of attending the meeting stating his views as a private citizen while on the clock as a County Commissioner may have been confusing to some of the people attending the meeting.)

Kirk then talked with Givens' fellow Umatilla County Commissioners in the following week. Commissioners' Hansell and Doherty listened to concerns that Kirk had relating to the moratorium Commissioner Givens had proposed. Neither one of them had heard anything about this up to then.

We sincerely hope Commissioner Givens who stated at the EFSC meeting , as a private citizen, the reasons he is hesitant about the development of wind energy, that he can fairly represent those of us who favor wind energy, as a Commissioner of Umatilla County. We also ask all involved participants not to lump opposition to other wind projects into the Helix Wind Power Facility Amendment. Each project should be judged on their own.

Kirk also met with Clinton Reeder, a member of the Umatilla County Planning Commission. Mr. Reeder has provided considerable research to the Commissioners and the public concerning the Helix Wind Power Facility Amendment. Unfortunately, for being in a position of influence, Mr. Reeder has misrepresented some key facts and important issues.

1) Setback Regulations: Mr. Reeder keeps claiming that the current setback for a rural home is ¼ of a mile and that the landowner is stuck with this distance. This is not true. The Helix Wind Power Facility Amendment will comply with EFSC conditions 100-102 which is a much larger

setback from non participating rural residences than the 1320 ft. required by EFSC condition 43. (See attachment 1 from Chase Whitney of Iberdrola Rewables.) Because the project must demonstrate compliance with DEQ noise rules, distances from turbine strings to non-participating homes would range from approximately 3800 to 8500 feet (0.7 to 1.6 miles) based on a turbine with maximum sound power level of 106 dBA.

2) The Oregon Department of Environmental Quality has designated 36 decibels as the noise limit that wind projects can generate at nearby homes. A two mile setback does not address larger turbines in the future, while the current EFSC conditions do. What research was done to come up with the proposed arbitrary 2 mile setback? We farm within 1/8 mile of a string of turbines, have one household and our place of business approximately 1 mile from a string of turbines and have not noticed any ill effects or distractions . They have become a part of the landscape. The Umatilla Co. Planning Commission, with Mr. Reeder's input, is proposing a 2 mile setback. A two mile setback may virtually end wind projects in Eastern Oregon as not many places have an area that does not have a dwelling on it in that distance. We feel the current regulations are more than sufficient. They protect land owners with the distance conditions that are approved by EFSC and decibel levels approved by the Oregon Department of Environmental Quality while allowing wind developers stretches of land to build longer strings of turbines.
3) Flashing Red Lights: Mr. Reeder claims there are flashing red lights on every turbine. This is not so. The FAA regulates how many lights are needed. I can see 10 turbines from my house and never have had any issues with the lights at night. (There are 3 red lights out of the 10 turbines that I can see from my residence).
4) Wildlife: The elk and upland bird population have increased since the installation of turbines on the Stateline wind projects in our area. The Oregon Department of Fish and Wildlife have now issued general season elk tags to the public. The elk herd has increased in size to the point where ODFW has started to issue crop damage elk tags to local area landowners. The mule deer population has remained constant.
5) Property and Land Values: We have been reading in the Planning Commissions' minutes and the East Oregonian, how wind developments are hurting property values. Mr. Reeder says this is a very important issue and needs to be addressed by putting in a two mile setback. With current EFSC setbacks, we are aware of only one house sale since the Helix Wind Project began and its value had increased. What research has been done to guarantee that values will increase any more with a two mile setback?

   The only wheat ground that we are aware of that has been sold in the last three years, in the Helix Wind Project area, was sold before the Helix Wind Power Facility started. Even then, this ground was advertised with a sales stipulation, that the wind rights or portion of the wind rights were not for sale with the land. WIND has become a valuable commodity!
6) Community Discord: Mr. Reeder and Mr. Givens are painting a picture of a community divided. There are different points of view concerning the Helix Wind Project. Whatever the outcome, not everyone is going to be pleased with the results. It is not unlike other community hot topics, whether it is the school district, city issues, bond issues...change causes controversy, but eventually these issues are resolved and life goes on.

7) Clinton Reeder is a knowledgeable man. However, we feel he has not represented both sides of the wind issue fairly. Just a few of the positive benefits are:

-Clean Energy

-New Jobs: 100 megawatt project: 6-10 permanent employees
200 megawatt project: 6-17 permanent employees
-SIP to area communities.
-Additional tax revenues for the county.
- Financial benefits to the landowners involved.
-Increased land values.
-Improved roads for farmers.
-Benefit to local businesses
-Supplemental income for Farmers
-Benefits for the Helix School District
-HELP

To help understand the financial contributions to the county and state, we asked Paul Chalmers of the Umatilla County Tax Assessors Office to provide us with some numbers. For the time period of May 5, 2002 through March 17, 2011, Florida Power & Light, Nextera, & Combine Hill II have made available $718,633.51 in "Community Service Fees", ("HELP" to the Helix Community). (See attachment 2)

From 2002 through 2010, Umatilla County has received tax revenues totaling $11,388,551.00 from area wind projects. (See attachment 3)

Mr. Chalmers said for the 2010-2011 tax year, that without wind, there would an assessed value increase of 1%. With wind, there would be an assessed value increase of 3.4%. (See attachment 3)

These are substantial amounts of much needed revenues for our local schools and tax districts.

Around 1999 the first Vansycle Ridge Wind Farm turbines went up. There were 38 of the .66 MW towers. They have since amended the project with larger 2.3MW turbines. While we may not have been wild about them at first being installed, (it's that change thing again), we had no objection to our neighbors having them installed on their ground. Now 12 years later, we feel it has been a positive industry for our community. We farm and live close to these turbines and noise has never been an issue. Even during our harvest lunch break, where we eat outside next to our combines, we are not far from some of the turbines and our harvest crews have never voiced a concern about the sound of the turbines. Kirk asked his kids, now 19 and 17 years old, if they had heard the turbine noise while growing up at their house about 1 mile away from the turbines, and both responded "no".

While we would have turbines on some of our ground for the initial phase of this project, Kirk and I decided not to enroll in the Helix Wind Facility Amendment. We have not signed noise easements for our personal residences, but feel the current FSEC guidelines are more than adequate to protect our quality of life where we live. Also, by not enrolling our 1300 acres, we have buffered six additional

families that would have had turbines closer to their homes had we signed. Two of these families who are not in favor of the current noise easements, will gain setback as a result of this.

Another point that gets buried in this discussion of the Helix Wind Power Facility is that PPM, now Iberdrola Renewables, has followed the guidelines and regulations put forth by the state and local governments to get to this stage. They have spent a considerable amount of money in state and county planning, historical , cultural, avian, and wildlife studies to name a few. Iberdrola has invested a substantial amount of time and capital in this project and it is unfair to change the rules halfway through with the body of evidence that has been provided by the opposition.

Kirk and I have lived in the Helix area all our lives. Our Grandfather and relatives homesteaded this ground in 1888. Our fathers, aunts and uncles have helped to maintain this farm for almost 125 years. There have been many changes in farming and the landscape in those years. Some have been welcomed while others took some getting used to. The number of farms in our small area of Helix have dwindled since Kirk and I took over our farm 30 years ago. There are a small number of opportunities for communities our size to increase the revenues for dry land farmers, while also gaining revenues for the tax districts and school in Helix. We hope to be able to pass on the tradition of farming to our family and the opportunity that will be provided by the Helix Wind Power Facility Amendment can help in reaching that goal.

To conclude, we feel there are sufficient regulations in place provided by EFSC and Umatilla County to vote on the Helix Wind Power Facility Amendment without any further delay. Even with renewable energy being mandated by Federal and State government agencies, we would not be in favor of the Helix Wind Project if we felt our rights were not being protected. Though we are not participating in the Helix Amendment, we feel strongly that we, along with the Helix Community and Umatilla County will benefit from it being passed. Wind energy has been a part of the Helix landscape for 12 years. It has provided jobs and revenues for Umatilla County. The Helix Wind Power Facility Amendment is an opportunity to continue this. We understand that the progress made in the wind energy industry has not been welcomed by everyone. We believe that in the Helix area you will find a majority of people have accepted this change as a positive one. If Commissioner Givens feels a moratorium to stop wind turbines is needed (especially with the pressure he is getting from opponents of turbines in the Blue Mountains), we ask that he not lump us into that conversation. We hope Mr. Reeder will take into consideration all the positive aspects of past wind projects. There are also specific facts concerning the Helix Wind Facility Project that, if he was not aware of, need to be taken into account.

Thank You.

Gunder Terjeson and Kirk Terjeson

Attachment 1

From: Whitney, Chase
Sent: Tuesday, April 05, 2011 1:10 PM
To: Carol Johnson
Cc: Tamra Mabbott; Clinton B. Reeder; Parsons, Sara McMahon; Mark.Bastasch@CH2M.com; [illegible]
Subject: RE: Helix Wind Project Setbacks

Carol,

The Helix project will comply with EFSC conditions 100-102 copied below, which will result in a much larger setback from non-participating rural residences than the 1,320 ft required by EFSC condition 43. Because the project must demonstrate compliance with the DEQ noise rules, distances from turbine strings to non-participating homes would range from approximately 3800 to 9500 feet (0.7 to 1.6 miles) based on a turbine with maximum sound power level of 106 dBA. This number depends on a variety of factors, such as turbine maximum sound power level as well as the number and location of turbines in proximity to the residence. It is for these reasons that EFSC requires a detailed site specific analysis prior to construction to demonstrate compliance with the DEQ noise rules, as a standard setback distance is not sufficiently robust to ensure compliance with the restrictive DEQ noise rules at rural residences. While the resulting setback from a rural home to a string of towers is likely greater than the setback to a single tower, there is no hard and fast setback distance for rural homes from strings as compared to single towers. EFSC and DEQ rules recognize that a more rigorous process is required based on the various factors described above.

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		etc
100	Noise Abatement	To reduce construction noise impacts at nearby residences, the certificate holder shall:
		(a) Confine the noisiest operation of heavy construction equipment to the daylight hours.
		(b) Require contractors to install and maintain exhaust mufflers on all combustion engine-powered equipment; and
		(c) Establish a complaint response system at the construction manager's office to address noise complaints.
101	Turbine Noise	Before beginning construction, the certificate holder shall provide to the Department:
		(a) Information that identifies the final design locations of all turbines to be built at the facility.
		(b) The maximum sound power level for the substation transformers and the maximum sound power level and octave band data for the turbines selected for the facility based on manufacturers' warranties or confirmed by other means acceptable to the Department.
		(c) The results of noise analysis of the facility to be built according to the final design performed in a manner consistent with the requirements of OAR 340-035-0035(1)(b)(B)(ii) (IV) and (VI) demonstrating to the satisfaction of the Department that the total noise generated by the facility (including the noise from turbines and substation transformers) would meet the ambient degradation test and maximum allowable test at the appropriate measurement point for all potentially-affected noise sensitive properties.
		(d) For each noise-sensitive property where the certificate holder relies on a noise waiver to demonstrate compliance in accordance with OAR 340-035-0035(1)(b)(B)(ii)(III), a copy of the a legally effective easement or real covenant pursuant to which the owner of the property authorizes the certificate holder's operation of the facility to increase ambient statistical noise levels L10 and L50 by more than 10 dBA at the appropriate measurement point. The legally-effective easement or real covenant must: include a legal description of the burdened property (the noise sensitive property); be recorded in the real property records of the county; expressly benefit the certificate holder; expressly run with the land and bind all future owners, lessees or holders of any interest in the burdened property; and not be subject to revocation without the certificate holder's written approval.
102	Turbine Noise	During operation, the certificate holder shall maintain a complaint response system to address noise complaints. The certificate holder shall promptly notify the Department of any complaints received regarding facility noise and of any actions taken by the certificate holder to address those complaints. In response to a complaint from the owner of a noise sensitive property regarding noise levels during operation of the facility, the Council may require the certificate holder to monitor and record the statistical noise levels to verify that the certificate holder is operating the facility in compliance with the noise control regulations.

"Community Service Fee"

attachment 2 (page 1) "Included"

1603 - 1003 - HELP

Date	Description	Amount In	Amount Out	Balance
05/21/02	Contribution #1	$ 50,000.00		$ 50,000.00
06/30/02	Interest Earned	$ 42.90		$ 50,042.90
11/08/02	Helix School - Doors/Hot Water		$ 25,000.00	$ 25,042.90
12/12/02	Helix - Roof		$ 25,000.00	$ 42.90
01/30/03	Contribution #2	$ 50,000.00		$ 50,042.90
05/22/03	Helix - Roof		$ 6,375.75	$ 43,667.15
06/30/03	Interest Earned	$ 700.85		$ 44,368.00
08/12/03	Helix School		$ 25,000.00	$ 19,368.00
12/18/03	Helix		$ 13,212.00	$ 6,156.00
12/31/03	Contribution #3	$ 50,000.00		$ 56,156.00
01/08/04	Helix		$ 906.14	$ 55,249.86
06/30/04	Interest Earned	$ 488.62		$ 55,738.48
08/31/04	Helix Return Funds	$ 8,900.00		$ 64,638.48
12/29/04	Contribution #4	$ 50,000.00		$ 114,638.48
01/27/05	Helix		$ 1,405.11	$ 113,233.37
03/03/05	Helix School		$ 25,000.00	$ 88,233.37
03/03/05	Helix School		$ 8,900.00	$ 79,333.37
06/30/05	Interest Earned	$ 1,783.17		$ 81,116.54
09/01/05	Helix - Sidewalk		$ 23,211.00	$ 57,905.54
11/10/05	Helix - Sidewalk		$ 27,076.00	$ 30,829.54
12/30/05	Contribution #5	$ 50,000.00		$ 80,829.54
05/31/06	HELP Correction	$ 999.90		$ 81,829.44
05/31/06	HELP Correction		$ 999.90	$ 80,829.54
06/30/06	Interest Earned	$ 2,968.95		$ 83,798.49
12/28/06	Helix		$ 9,252.23	$ 74,546.26
12/29/06	Contribution #6	$ 50,000.00		$ 124,546.26
02/22/07	Helix - Flood		$ 8,391.75	$ 116,154.51
03/08/07	Helix School		$ 22,450.11	$ 93,704.40
06/21/07	Helix School		$ 21,870.00	$ 71,834.40
06/30/07	Interest Earned	$ 5,389.46		$ 77,223.86
08/24/07	Helix - FWDP		$ 2,072.45	$ 75,151.41
10/11/07	Helix		$ 3,292.36	$ 71,859.05
10/18/07	Helix - Park		$ 25,731.44	$ 46,127.61
10/25/07	Hermiston Chamber - Farm Fair		$ 150.00	$ 45,977.61
12/26/07	Contribution #7	$ 50,000.00		$ 95,977.61
06/12/08	Helix School		$ 5,679.89	$ 90,297.72
06/12/08	Helix School		$ 24,881.17	$ 65,416.55
06/30/08	Interest Earned	$ 3,917.84		$ 69,334.39
12/30/08	Contribution #8	$ 50,000.00		$ 119,334.39
12/31/08	Interest Earned	$ 2,319.68		$ 121,654.07
02/12/09	Correction AWERE		$ 999.90	$ 120,654.17
02/12/09	Correction BCC - Farm fair	$ 150.00		$ 120,804.17
04/01/09	Helix School Dist Project		$ 23,945.49	$ 96,858.68
12/16/09	Contribution #9	$ 50,000.00	$ -	$ 146,858.68
04/22/10	Helix School 2008 carry over		$ 832.00	$ 146,026.68
04/22/10	Helix School 2009		$ 23,891.94	$ 122,134.74
06/08/10	Interest Earned	$ 1,512.30		$ 123,647.04

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attachment 2 (page 2)

06/29/10	City of HELIX 2010		$ 21,362.73	$	102,284.31
08/26/10	Helix Comm Church		$ 13,325.00	$	88,959.31
12/02/10	Helix 08-09		$ 10,149.35	$	78,809.96
12/22/10	Contribution #10	$ 50,000.00		$	128,809.96
12/30/10	NEXTERA 2010	$ 190,360.50		$	319,170.46
12/30/10	COMBINE HILLS	$ 8,363.30		$	327,533.76
02/17/11	Helix School - Facility 2010		$ 4,490.00	$	323,043.76
02/17/11	Helix School - Kitchen 2010		$ 4,255.74	$	318,788.02
02/17/11	Helix School - Playground 2010		$ 1,500.00	$	317,288.02
02/17/11	Helix School - Technology		$ 14,500.00	$	302,788.02
02/17/11	Helix School - Trees 2010		$ 1,100.00	$	301,688.02
03/17/11	Interest Earned	$ 785.94		$	302,473.96
				$	302,473.96
				$	302,473.96
				$	302,473.96

FPL 10@50,000 $ 500,000.00

COMBINE HILLS II 2010 8363 30

NEXTERA 2010 190360.50

INTEREST 19909.71

718,633.51

attachment 3

FOR 2010-11 TAX YEAR
WITHOUT WIND = 1% INCREASE
WITH WIND = 3.4% INCREASE

A/V

WIND POWER COMPARISON

ACCOUNT	YEAR	% of New	VALUE	VALUE PER TOWER	PERCENT CHANGE	TOTAL TAX	COUNTY TAX
158187	2002		68,063,000	540,183		$688,157.78	$193,691.07
FPL VANSYCLE	2003		89,315,000	493,453	91.35%	$907,395.76	$254,431.64
(STATELINE)	2004		88,640,000	469,724	99.24%	$882,179.34	$252,508.77
126 TOWERS @ 660 KW EA FOR 2002 VALUE	2005		83,000,000	458,564	93.64%	$836,731.30	$236,442.10
55 ADDED FOR THE 2003 VALUE	2006		62,580,000	345,746	75.40%	$631,200.67	$178,271.65
CODE AREA 01-02	2007		56,893,000	314,326	90.91%	$572,770.28	$162,071.09
	2008		58,097,000	320,978	102.12%	$584,891.55	$165,500.92
	2009		47,563,000	262,779	81.87%	$478,840.50	$135,492.72
	2010	57.27%	38,979,000	215,354	81.95%	$392,421.08	$111,039.48
						$5,984,588.26	$1,689,849.43
159512	2004		39,996,000	975,512		$392,800.72	$113,936.61
EURUS COMBINE	2005		39,000,000	951,220	97.51%	$381,392.70	$111,099.30
41 TOWERS@ 1 MW ea	2006		32,623,000	795,683	83.65%	$312,759.96	$92,933.14
CODE AREA 07-12	2007		29,176,000	711,610	89.43%	$275,981.62	$83,113.67
	2008		25,896,000	631,610	88.76%	$244,955.44	$73,769.94
	2009		27,020,000	659,024	104.34%	$255,587.58	$76,971.87
	2010	65.46%	26,182,000	638,585	96.90%	$247,660.77	$74,584.66
						$2,111,138.80	$626,409.19
155672	1999		24,700,000	650,000		$251,112.55	$70,382.89
ESI VANSYCLE	2000		24,800,000	652,632	100.40%	$249,056.48	$70,647.76
38 TOWERS @ 660KW ea	2001		23,800,000	626,316	95.97%	$239,013.88	$67,799.06
CODE AREA 01-02	2002		23,000,000	605,263	96.64%	$228,824.01	$65,520.10
	2003		21,811,000	573,974	94.83%	$216,984.80	$62,133.00
	2004		21,620,000	568,947	99.12%	$215,094.57	$61,588.89
	2005		21,000,000	552,632	97.13%	$208,926.27	$59,822.70
	2006		14,104,000	371,158	67.16%	$140,318.66	$40,178.06
	2007		15,127,000	398,079	107.25%	$150,496.56	$43,092.28
	2008		16,560,000	435,789	109.47%	$164,753.29	$47,174.47
	2009		16,972,000	446,632	102.49%	$168,852.22	$48,348.14
	2010	64.78%	16,000,000	421,053	94.27%	$159,181.92	$45,579.20
						$2,392,625.41	$682,246.56
2008 totals			100,553,000			$994,600.28	$286,445.33
2009 totals			91,555,000			$903,280.31	$260,812.73
2010 totals			159,143,000			$1,699,462.61	$453,350.66
TOTAL TAX YTD						**$11,388,551.31**	**$3,220,452.50**

P 9/9
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Please excuse the hiccups in this letter, I tried several times to fix them. Hope you can make sense of it.
JoLynn Bull

65

RECEIVED
APR 15 2011
UMATILLA COUNTY
PLANNING DEPARTMENT

RECEIVED
APR 15 2011
BCC

Dear Sirs:

My husband and I own 600 acres on Weston Mt and have signed a contract with Horizon Wind Energy Co

Several years ago we attended meetings and workshops to get wind energy in Umatilla County and the state of Oregon.

So we were excited when Horizon Wind Energy contacted us about leasing part of our land.

We have attended all but one of the planning meetings since Oct 2008. I again signed up to be on the planning committee. As I signed my name I was asked if I was for or against the wind. I told the lady for, and she put a check by my name. I have since learned that lady was Tamera Marbott. I was never called or notified of any planning meetings.

We sat through way to many meetings that tried to show negetive effects of wind power and was bombbarded with missinformation. When a question was asked or a response made in favor of wind power came up we were told the question would be addressed later but it never was.

Wind power is clean and quiet. The "whoosh" sound made by the blades is not any louder than the waves hitting the beach along our beautiful ocean coast. Nor louder than a mountian stream that everyone says is so relaxing. Wind power noise is not near as loud as the many night noises in and around our towns and cities. Dogs barking, car horns, engine noises neighbors radio, TV ect.

The set backs in the last recommendation are equally inapproiate. We have no problem with 1/4 mile setbacks. The local terrain should determine setbacks and not some committee making "rules"miles away from the site.

I feel this whole matter is more about some people getting towers while other people are not. Greed is a terrible thing and very short sited. Wind monies can and do help local communities not just land owners. Schools, Ambulance Service, Other emergency services. Merchandise purchased in shops and businesses, Road repairs and so on. Please do not let the biased opinions of the currant "planning" committee interfer with sound judgment.

Sincerely,
Tom & JoLynn Bull

NOTE* Ms Marbott is a very knowledegable, and has very strong opinons on this subject. She surrounded herself with those of like opinions. As a professional she should have excused herself as biased and not able to be objective. This should be noted on her next work performance review.