Windpower Development Toolkit

Version 1.0

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<th>Description</th>
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<tbody>
<tr>
<td>AARI</td>
<td>Annual average rate of increase</td>
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<tr>
<td>AC</td>
<td>Alternating current</td>
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<td>AWEA</td>
<td>American Wind Energy Association</td>
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<td>ANEEL</td>
<td>Agencia Nacional de Energia Eletrica (Brazil)</td>
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<tr>
<td>BLM</td>
<td>Bureau of Land Management (U.S.)</td>
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<tr>
<td>CPI</td>
<td>Consumer price index</td>
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<tr>
<td>DB</td>
<td>Design build</td>
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<tr>
<td>DBC</td>
<td>Design, build, construct</td>
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<tr>
<td>DBO</td>
<td>Design, bid, operate</td>
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<tr>
<td>DKK</td>
<td>Danish Kroner</td>
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<tr>
<td>DM</td>
<td>Deutsche Mark</td>
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<tr>
<td>DOE</td>
<td>Department of Energy (U.S.)</td>
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<tr>
<td>DSCR</td>
<td>Debt service coverage ratio</td>
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<tr>
<td>DtA</td>
<td>Deutsche Ausgleichsbank</td>
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<tr>
<td>EEG</td>
<td>Erneuerbare-Energien-Gesetz</td>
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<tr>
<td>EIA</td>
<td>Environmental impact assessment</td>
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<tr>
<td>EPC</td>
<td>Engineer, procure, and construct</td>
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<tr>
<td>EPRI</td>
<td>Electric Power Research Institute</td>
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<tr>
<td>FT</td>
<td>Full-time</td>
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<tr>
<td>GCE</td>
<td>Energy crisis management council (Brazil)</td>
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<tr>
<td>GEF</td>
<td>Global Environment Facility</td>
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<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
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<tr>
<td>GWh</td>
<td>Gigawatt-hours (or million kilowatt-hours)</td>
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<tr>
<td>ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>Hz</td>
<td>Hertz</td>
</tr>
<tr>
<td>IA</td>
<td>Interconnection agreement</td>
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<tr>
<td>IPP</td>
<td>Independent power producer</td>
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<tr>
<td>IREDA</td>
<td>India Renewable Energy Development Agency</td>
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<tr>
<td>IRR</td>
<td>Internal rate of return</td>
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<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
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<tr>
<td>km</td>
<td>Kilometer</td>
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<tr>
<td>KtW</td>
<td>Kreditanstalt für Wiederaufbau</td>
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<tr>
<td>kW</td>
<td>Kilowatt</td>
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**Global Energy Concepts, LLC**  
**March 2004**
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>kWh</td>
<td>kilowatt-hours</td>
</tr>
<tr>
<td>m</td>
<td>Meter</td>
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<tr>
<td>MACRS</td>
<td>Modified Accelerated Cost Recovery System</td>
</tr>
<tr>
<td>MVA</td>
<td>Mega-volt-amperes</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatt (or 1000 kW, or million watts)</td>
</tr>
<tr>
<td>MWh</td>
<td>Megawatt-hours (or thousand kilowatt-hours)</td>
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<tr>
<td>NFFO</td>
<td>Non Fossil Fuel Obligation</td>
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<td>NSP</td>
<td>Northern States Power</td>
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<tr>
<td>O&amp;M</td>
<td>Operations and maintenance</td>
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<tr>
<td>PPA</td>
<td>Power purchase agreement</td>
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<tr>
<td>PROINFA</td>
<td>National Program of Incentives for Alternative Energy</td>
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<tr>
<td>PTC</td>
<td>Production tax credit</td>
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<tr>
<td>REFIT</td>
<td>Renewable Energy Feed-in Tariff</td>
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<tr>
<td>RFP</td>
<td>Request for proposals</td>
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<tr>
<td>RFQ</td>
<td>Request for qualifications</td>
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<tr>
<td>RPS</td>
<td>Renewable portfolio standard</td>
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<td>s</td>
<td>Second</td>
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<tr>
<td>SCADA</td>
<td>Supervisory control and data acquisition</td>
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<tr>
<td>SEED</td>
<td>Sustainable Energy and Economic Development Coalition</td>
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<tr>
<td>TVP</td>
<td>Turbine Verification Program</td>
</tr>
<tr>
<td>US$</td>
<td>United States dollars</td>
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<tr>
<td>VAR</td>
<td>Volt-ampere reactive</td>
</tr>
<tr>
<td>WPA</td>
<td>Wind Powering America</td>
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<tr>
<td>WPS</td>
<td>Wisconsin Public Service</td>
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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:
- 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 facilities, 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.
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
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)
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.
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.
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...
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, 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 (KfW). 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

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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. 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).
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
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 Capacity¹

<table>
<thead>
<tr>
<th>Year</th>
<th>Year End Installed Capacity, MW</th>
<th>Growth from Previous Year, MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>1,116</td>
<td>259</td>
</tr>
<tr>
<td>1998</td>
<td>1,420</td>
<td>304</td>
</tr>
<tr>
<td>1999</td>
<td>1,738</td>
<td>318</td>
</tr>
<tr>
<td>2000</td>
<td>2,341</td>
<td>603</td>
</tr>
<tr>
<td>2001</td>
<td>2,456</td>
<td>115</td>
</tr>
<tr>
<td>2002</td>
<td>2,880</td>
<td>424</td>
</tr>
<tr>
<td>2003 (estimated)</td>
<td></td>
<td>250</td>
</tr>
</tbody>
</table>

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;
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. 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)

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

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.
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 that could typically be claimed in the first one to two years.

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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.
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.

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

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

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

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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: \( 2.5 = 1.8 \times 1.40 \).
significant and continuing federal tax liability. 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.

**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.

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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.
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. 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 development.

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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.
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>
<thead>
<tr>
<th>State</th>
<th>% Renewable and Date</th>
<th>Applies to . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>1.1% by 2007</td>
<td>All</td>
</tr>
<tr>
<td>California</td>
<td>20% by 2017</td>
<td>3 largest utilities (which deliver about 75% of electricity in the state)</td>
</tr>
<tr>
<td>Connecticut</td>
<td>13% by 2009</td>
<td>Switched customers, muni/coops exempt</td>
</tr>
<tr>
<td>Iowa</td>
<td>2.6% by 1999</td>
<td>2 utilities</td>
</tr>
<tr>
<td>Maine</td>
<td>30% by 2000</td>
<td>All except muni/coops</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>4% by 2009</td>
<td>All except muni/coops</td>
</tr>
<tr>
<td>Minnesota</td>
<td>10.5% by 2006</td>
<td>1 utility (which delivers about 70% of electricity in the state)1</td>
</tr>
<tr>
<td>Nevada2</td>
<td>15% by 2013</td>
<td>All except muni/coops</td>
</tr>
<tr>
<td>New Jersey</td>
<td>6.5% by 2012</td>
<td>All except muni/coops</td>
</tr>
<tr>
<td>New Mexico</td>
<td>10% by 2011</td>
<td>All except muni/coops</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Varies by utility</td>
<td>All except muni/coops</td>
</tr>
<tr>
<td>Texas</td>
<td>3% by 2009</td>
<td>All except muni/coops</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>2.2% by 2011</td>
<td>All</td>
</tr>
</tbody>
</table>

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.
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
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
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.
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.
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.
- 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.

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\(^{15}\) 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.
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.
### Table 3-5. Summary of Policies Discussed

<table>
<thead>
<tr>
<th>Policy Type</th>
<th>Examples Where Used&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment tax credits, investment subsidies, and accelerated depreciation</td>
<td>Germany, Denmark, USA, California, India, Mexico</td>
<td>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.</td>
</tr>
<tr>
<td>Tax refunds, exemptions, and production tax credits</td>
<td>Denmark, USA, India, Brazil, Mexico</td>
<td>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</td>
</tr>
<tr>
<td>Feed-in tariffs (price setting)</td>
<td>Germany, Denmark, California, various Indian states, Brazil</td>
<td>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</td>
</tr>
<tr>
<td>Minimum capacity goals &amp; renewable portfolio standards</td>
<td>United Kingdom, various USA states, Brazil, China</td>
<td>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.</td>
</tr>
<tr>
<td>Government purchases</td>
<td>USA (federal and New York state)</td>
<td>May require transmission wheeling or retail product offering by serving utility (or tradable renewable energy certificate market) to be possible.</td>
</tr>
<tr>
<td>Government financing</td>
<td>Germany, India</td>
<td></td>
</tr>
<tr>
<td>Government guarantees of contracts</td>
<td>India</td>
<td>Government guarantee of power purchase agreement likely necessary to obtain financing if power buyer itself is not deemed credit-worthy.</td>
</tr>
<tr>
<td>Government land offered for wind development</td>
<td>USA, India</td>
<td>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.</td>
</tr>
<tr>
<td>Public goods charge</td>
<td>California, United Kingdom</td>
<td>In Denmark, required for eligibility for subsidies and, more recently, for grid connection. Helps ensure that technology receiving public funds is viable.</td>
</tr>
<tr>
<td>Wind turbine certification requirement</td>
<td>Germany, Denmark</td>
<td></td>
</tr>
<tr>
<td>Transmission access requirements</td>
<td>Denmark, India, Brazil, Mexico</td>
<td>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.</td>
</tr>
<tr>
<td>Turbine replacement incentives</td>
<td>Denmark</td>
<td>Higher price awarded to new projects that replace older equipment. Has increased redevelopment of old projects, and increased installed capacity.</td>
</tr>
</tbody>
</table>

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


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. 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

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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.
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 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

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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.
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. 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. 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.

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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.
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.
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. 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 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

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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.
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.
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
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 (kWh24) 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

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

<table>
<thead>
<tr>
<th>Arrangement</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Royalties                          | • General:                                                                   | • Landowner: Difficult to verify electricity and revenue generated by each turbine:*  
|                                    |   • Take into account varying productivity                                 |   • Individual turbine generation information is hard to get  
|                                    |   • 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  
| 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:                                                                   | • Landowner: Forgoes potentially higher, if fluctuating, level of income associated with royalty payments  
|                                    |   • 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: 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 |                                                                                                                                               |
| 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.
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.

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

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

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

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

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

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

* 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
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

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

<table>
<thead>
<tr>
<th>Development Step</th>
<th>PPA</th>
<th>Buy Project</th>
<th>Self Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Prospecting</td>
<td>Developer</td>
<td>Developer</td>
<td>Utility</td>
</tr>
<tr>
<td>Site Control</td>
<td>Developer</td>
<td>Developer</td>
<td>Utility</td>
</tr>
<tr>
<td>Wind Resource Assessment</td>
<td>Developer</td>
<td>Developer</td>
<td>Utility</td>
</tr>
<tr>
<td>Feasibility Study</td>
<td>Developer</td>
<td>Developer</td>
<td>Utility</td>
</tr>
<tr>
<td>Project Permitting</td>
<td>Developer</td>
<td>Developer or Utility(1)</td>
<td>Utility</td>
</tr>
<tr>
<td>Project Detailed Design</td>
<td>Developer</td>
<td>Developer or Utility(1)</td>
<td>Utility</td>
</tr>
<tr>
<td>Equipment Procurement</td>
<td>Developer</td>
<td>Developer or Utility(1)</td>
<td>Utility</td>
</tr>
<tr>
<td>Financing</td>
<td>Developer</td>
<td>Developer or Utility(1)</td>
<td>Utility</td>
</tr>
<tr>
<td>Construction</td>
<td>Developer</td>
<td>Developer or Utility(1)</td>
<td>Utility</td>
</tr>
<tr>
<td>Commissioning</td>
<td>Developer</td>
<td>Developer or Utility(1)</td>
<td>Utility</td>
</tr>
<tr>
<td>Operations &amp; Maintenance(2)</td>
<td>Developer</td>
<td>Utility</td>
<td>Utility</td>
</tr>
</tbody>
</table>

(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.
Table 5-2. Summary of Engineering and Construction Alternatives

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

**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. 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.

**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

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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.
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.
Project Location and Site Design: In some cases the general or specific project location will be identified in the RFP; 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. 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. 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

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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.
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.
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
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.
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 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 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.

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.
**Scheduling Maintenance:** In general, the plant operator must submit for approval a maintenance schedule for each calendar or contract year. 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

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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.
**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
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.
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 usable 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.

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\(^{37}\) 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.
**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
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.
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](image-url)
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>
<thead>
<tr>
<th>Approximate Voltage Level at Utility Interconnection</th>
<th>Size of Wind Power Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kV</td>
<td>Individual, ~ 200 kW</td>
</tr>
<tr>
<td>10 kV</td>
<td>Small, ~2 MW</td>
</tr>
<tr>
<td>50 kV</td>
<td>Medium, 2 - 40 MW</td>
</tr>
<tr>
<td>100 kV</td>
<td>Large, 20 - 100 MW</td>
</tr>
<tr>
<td>250 kV</td>
<td>Very large, 80 - 300 MW</td>
</tr>
</tbody>
</table>

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-
amperes (MVA), can be used to measure how robust the grid is at any given point.\textsuperscript{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.\textsuperscript{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.

\section*{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.

\textsuperscript{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.

\textsuperscript{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.).
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
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. 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

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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.
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.

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
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


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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.


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.
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)
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
(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.
8.4 Additional Sources of Information

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


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:

Economic fundamentals on the Internet:
- http://www.sbbc.co.uk/reports/laggan/economics1.htm

Wind power development process:
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
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.
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
- 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,
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.

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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
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.
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

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


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

\[10^3 \div 8^3 = 1.95, \text{ or almost a factor of two.}\]
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.
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-
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**

<table>
<thead>
<tr>
<th>Project Location</th>
<th>Land Use and Type</th>
<th>Turbine Layout</th>
<th>Turbine Spacing (rotor diameters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Davis, Texas</td>
<td>ridge tops/ranch land</td>
<td>2 offset, parallel, north-south</td>
<td>2.5 BETWEEN TURBINES WITHIN SAME ROW</td>
</tr>
<tr>
<td></td>
<td>land (hilly)</td>
<td>rows</td>
<td></td>
</tr>
<tr>
<td>Searsburg, Vermont</td>
<td>heavily forested ridgeline</td>
<td>1 northeast-southwest row on</td>
<td>variable (1.5 to 3.5) between</td>
</tr>
<tr>
<td></td>
<td>(hilly)</td>
<td>ridgeline</td>
<td>turbines</td>
</tr>
<tr>
<td>Kotzebue, Alaska</td>
<td>treeless coastal tundra</td>
<td>3 parallel north-south rows</td>
<td>5 between turbines within same</td>
</tr>
<tr>
<td></td>
<td>(flat)</td>
<td></td>
<td>row; 17 between rows</td>
</tr>
<tr>
<td>Glenmore, Wisconsin</td>
<td>agricultural plains (flat)</td>
<td>1 north-south row</td>
<td>3.6 between turbines in the row</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algona, Iowa</td>
<td>cropland (flat)</td>
<td>1 north-south row</td>
<td>5.7 between turbines in the row</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Springview, Nebraska</td>
<td>high plain/ranch land</td>
<td>1 northwest-southeast row</td>
<td>3.7 between turbines in the row</td>
</tr>
<tr>
<td></td>
<td>(flat)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Spring, Texas</td>
<td>ranch land/mesa tops</td>
<td>5 east-west rows on 3 mesa tops</td>
<td>2.5 to 3.0 between turbines</td>
</tr>
<tr>
<td></td>
<td>(flat)</td>
<td></td>
<td>within same row; 10 between rows</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Wind Direction/Terrain Type</th>
<th>Turbine Spacing (rotor diameters)</th>
<th>Row Spacing (rotor diameters)</th>
<th>Land Area</th>
<th>ha/MW</th>
<th>ha/Wind Turbine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m²</td>
<td>Hectares</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multidirectional/ Flat terrain</td>
<td>8</td>
<td>10</td>
<td>184,320</td>
<td>18.4</td>
<td>20.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multidirectional/ Rolling hills</td>
<td>10</td>
<td>15</td>
<td>345,600</td>
<td>34.6</td>
<td>38.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multidirectional/ Mountain ridges</td>
<td>15</td>
<td>20</td>
<td>691,200</td>
<td>69.1</td>
<td>76.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidirectional/ Flat terrain</td>
<td>3</td>
<td>10</td>
<td>69,120</td>
<td>6.9</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidirectional/ Rolling hills</td>
<td>4</td>
<td>15</td>
<td>138,240</td>
<td>13.8</td>
<td>15.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidirectional/ Mountain ridges</td>
<td>4</td>
<td>20</td>
<td>184,320</td>
<td>18.4</td>
<td>20.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Rotor Diameter (m)</th>
<th>72</th>
<th>60</th>
<th>54</th>
<th>48</th>
<th>52</th>
<th>50</th>
<th>47</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbine Rating (kW)</td>
<td>1500</td>
<td>1300</td>
<td>1000</td>
<td>900</td>
<td>850</td>
<td>800</td>
<td>660</td>
</tr>
<tr>
<td>Hectares per MW</td>
<td>10.4</td>
<td>8.3</td>
<td>8.7</td>
<td>7.7</td>
<td>9.5</td>
<td>9.4</td>
<td>10.0</td>
</tr>
<tr>
<td>Hectares per turbine</td>
<td>15.6</td>
<td>10.8</td>
<td>8.7</td>
<td>6.9</td>
<td>8.1</td>
<td>7.5</td>
<td>6.6</td>
</tr>
</tbody>
</table>

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.
WIND ENERGY LEASE AGREEMENT

This WIND ENERGY 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. 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: 

\[ \text{Damages} = \text{Price} \times \text{Yield} \times \text{Percentage of Damage} \times \text{Acreage} \]

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.
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
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
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 Mortgagor 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 entitled 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 owing 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: ________________________________
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.
Wind Power

Request for Proposals

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
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
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:
• 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:
  o Project wind resource assessment and energy projections
  o Project financing
  o Project design, engineering, procurement and construction specifications
  o Interconnection and substation design
  o Project environmental assessments
  o Project land use and zoning approval
  o Permits and related approvals
  o Regulatory compliance
  o Project construction and commissioning
  o Risk management and insurance
  o Project operations
  o 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 estimates 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
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.
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.
• 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
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
  - Reaonableness 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: [______________]
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
5. Mutual Confidentiality Agreement
6. Template for Financial Pro Forma
7. Template for Energy Delivery Schedule
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.
[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.”

W I T N E S S E T H:

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 may 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
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 “Alternate”) 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
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
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.
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:
(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
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.
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 policies 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.
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.
(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.
(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
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.
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
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.
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]
By: ______________________
Name: _____________________
Title: _____________________

[Buyer]
By: ______________________
Name: _____________________
Title: _____________________
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

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
EXHIBIT D TO MODEL PPA

BUYER PARENT GUARANTEE
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.
TRANSMISSION INTERCONNECTION AGREEMENT

BETWEEN

[IC Provider]

AND

[GENERATOR NAME]
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SCHEDULE A – POINT OF INTERCONNECTION
SCHEDULE B - PROJECT INTERCONNECTION REQUIREMENTS (“PIR”)
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.
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.
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.
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;
(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.
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
(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
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: _______________________
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**: 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**: 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.

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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.
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
### Table F-1. Discussion of Model Input Assumptions

<table>
<thead>
<tr>
<th>Row</th>
<th>Name</th>
<th>Starting Assumption</th>
<th>Typical Range</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Project capacity</td>
<td>80 MW</td>
<td>15 to 200</td>
<td>80 MW could consist of 40 wind turbines at 2 MW each, or 121 at 750 kW each</td>
</tr>
<tr>
<td>5</td>
<td>Average capacity factor</td>
<td>34%</td>
<td>25% to 40%</td>
<td>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.</td>
</tr>
<tr>
<td>6</td>
<td>Turnkey construction cost</td>
<td>US$1050 per kW of installed capacity</td>
<td>900 - 1250</td>
<td>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.</td>
</tr>
<tr>
<td>7</td>
<td>Operations, maintenance, management cost</td>
<td>US$40 per kW of capacity per year</td>
<td>Can vary widely</td>
<td>Includes labor, parts, insurance, property taxes, utilities, administration. Ideally, this entry should be built up from individual components, as shown in Table F-2.</td>
</tr>
<tr>
<td>8</td>
<td>Land lease cost</td>
<td>2% of gross revenues</td>
<td>1% to 4%</td>
<td>Sometimes based on a flat fee per year, or formulas more complex than a percentage of gross revenues.</td>
</tr>
<tr>
<td>9</td>
<td>Energy sales price</td>
<td>US$49 per MWh</td>
<td>35 – 60</td>
<td>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.</td>
</tr>
<tr>
<td>10</td>
<td>Annual increase in energy sales price</td>
<td>1.0% per year</td>
<td>0% - 3%</td>
<td>No inflation (0%) common. May also be tied to other indices, or have a stepped pricing structure.</td>
</tr>
<tr>
<td>11</td>
<td>Government incentive or other sales price</td>
<td>US$8 per MWh</td>
<td>0 – 25</td>
<td>Typical of subsidies provided by state or local government, or from the sale of environmental attributes.</td>
</tr>
<tr>
<td>12</td>
<td>Years of government incentive or other sales</td>
<td>10 years</td>
<td>0 – 10</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Income tax rate</td>
<td>35%</td>
<td>Varies</td>
<td>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.</td>
</tr>
<tr>
<td>14</td>
<td>Percent of project cost financed by loan</td>
<td>65%</td>
<td>33% - 67%</td>
<td>Remainder of project cost assumed funded by cash (equity).</td>
</tr>
<tr>
<td>15</td>
<td>Loan interest rate</td>
<td>8.0%</td>
<td>Varies</td>
<td>Can vary widely based on perceived risk, market conditions, inflation, term of loan, debt service coverage ratios, and other factors.</td>
</tr>
<tr>
<td>16</td>
<td>Loan term</td>
<td>15 years</td>
<td>15 – 20 years</td>
<td></td>
</tr>
<tr>
<td>Row</td>
<td>Name</td>
<td>Starting Assumption</td>
<td>Typical Range</td>
<td>Comments</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------</td>
<td>--------------------------</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>17</td>
<td>Assumed rate of cost inflation</td>
<td>2% per year</td>
<td>Varies</td>
<td>Project operations, maintenance, and management costs assumed to increase by this amount each year.</td>
</tr>
<tr>
<td>18</td>
<td>Asset depreciation term</td>
<td>20 years, straight line</td>
<td>Varies</td>
<td>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, &quot;straight line&quot; depreciation assumed. Accelerating depreciation generally increases the value of the project.</td>
</tr>
<tr>
<td>19</td>
<td>Wind energy tax credit</td>
<td>US$0 per MWh (i.e., no tax credit assumed)</td>
<td>Varies</td>
<td>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.</td>
</tr>
<tr>
<td>20</td>
<td>Annual increase in wind energy tax credit</td>
<td>1.5%</td>
<td>Varies</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Years of wind energy tax credit</td>
<td>10</td>
<td>Varies</td>
<td></td>
</tr>
</tbody>
</table>

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.
Table F-2. Cost Breakdown for Annual Operations, Maintenance and Management of an 80 MW Wind Project
(representative example)

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations, scheduled</td>
<td>$1,500,000</td>
<td>$1,600,000</td>
<td>$1,700,000</td>
</tr>
<tr>
<td>maintenance, warranty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replacement parts</td>
<td>300,000</td>
<td>320,000</td>
<td>350,000</td>
</tr>
<tr>
<td>Insurance</td>
<td>400,000</td>
<td>410,000</td>
<td>420,000</td>
</tr>
<tr>
<td>Property taxes</td>
<td>650,000</td>
<td>573,000</td>
<td>460,000</td>
</tr>
<tr>
<td>Interconnection fees</td>
<td>150,000</td>
<td>154,000</td>
<td>159,000</td>
</tr>
<tr>
<td>Utilities</td>
<td>120,000</td>
<td>125,000</td>
<td>130,000</td>
</tr>
<tr>
<td>Administration</td>
<td>80,000</td>
<td>82,000</td>
<td>85,000</td>
</tr>
<tr>
<td>Total</td>
<td>3,200,000</td>
<td>3,264,000</td>
<td>3,304,000</td>
</tr>
<tr>
<td>Total US$/kW</td>
<td>40.00</td>
<td>40.80</td>
<td>41.30</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Row</th>
<th>Name</th>
<th>Initial Calculated Value</th>
<th>Formula</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Project capital cost</td>
<td>$84,000,000</td>
<td>(Row 4) X (Row 6) X 1000</td>
<td>Project capacity X Turnkey construction cost X 1000</td>
</tr>
<tr>
<td>25</td>
<td>Amount of loan</td>
<td>$54,600,000</td>
<td>(Row 24) X (Row 14)</td>
<td>Project capital cost X Percent of project cost financed by loan</td>
</tr>
<tr>
<td>26</td>
<td>Amount of equity invested</td>
<td>$29,400,000</td>
<td>(Row 24) - (Row 25)</td>
<td>Project capital cost - Amount of loan</td>
</tr>
<tr>
<td>27</td>
<td>First year operations, maintenance, management</td>
<td>$3,200,000 per year</td>
<td>(Row 7) X (Row 4) X 1000</td>
<td>Operations, maintenance, management cost X Project capacity X 1000</td>
</tr>
<tr>
<td>28</td>
<td>Annual energy production</td>
<td>238,272 MWh per year</td>
<td>(Row 4) X (8760) X (Row 5)</td>
<td>Project capacity X 8760 hours per year X Average capacity factor</td>
</tr>
<tr>
<td>29</td>
<td>First year energy sales revenue</td>
<td>$11,675,000 per year</td>
<td>(Row 28) X (Row 9)</td>
<td>Annual energy production X Energy sales price</td>
</tr>
<tr>
<td>30</td>
<td>Minimum debt service coverage ratio</td>
<td>1.37</td>
<td>Minimum of (Row 57) in pro forma</td>
<td>Does not consider value or &quot;monetization&quot; of any tax credits. Typically must be at least 1.20 to 1.40.</td>
</tr>
<tr>
<td>31</td>
<td>Average debt service coverage ratio</td>
<td>1.54</td>
<td>Average of (Row 57) in pro forma</td>
<td>Does not consider value or &quot;monetization&quot; of any tax credits. Typically must be at least 1.30 to 1.50.</td>
</tr>
<tr>
<td>32</td>
<td>Before tax unleveraged return on investment</td>
<td>10%</td>
<td>Calculated based on the Internal rate of return (IRR) of (Row 50) in pro forma</td>
<td>Pre-tax rate of return assuming entire project is paid for with cash (does not consider the loan)</td>
</tr>
<tr>
<td>33</td>
<td>Before tax leveraged return on investment</td>
<td>13%</td>
<td>Calculated based on the Internal rate of return (IRR) of (Row 66) in pro forma</td>
<td>Pre-tax rate of return considering affect of loan</td>
</tr>
<tr>
<td>34</td>
<td>After tax leveraged return on investment</td>
<td>9%</td>
<td>Calculated based on the Internal rate of return (IRR) of (Row 85) in pro forma</td>
<td>After-tax rate of return considering affect of loan, tax liabilities, and tax credits.</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Row</th>
<th>Name</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Year</td>
<td>20-year project evaluation assumed. Year 0 is the year of construction, year 1 is the first year of operations.</td>
</tr>
<tr>
<td>38</td>
<td>Energy sales inflation factor</td>
<td>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.</td>
</tr>
<tr>
<td>39</td>
<td>Cost inflation factor</td>
<td>Applies the assumed cost inflation rate (Row 17) each year.</td>
</tr>
<tr>
<td>40</td>
<td>Tax credit inflation factor</td>
<td>Applies the assumed tax credit inflation rate (Row 20) each year.</td>
</tr>
<tr>
<td>42</td>
<td>Revenues and expenses</td>
<td>Revenues are denoted as positive numbers, expenses as (negative numbers).</td>
</tr>
<tr>
<td>43</td>
<td>Energy sales</td>
<td>Calculated as First year energy sales revenue (Row 29) X Energy sales inflation factor (Row 38).</td>
</tr>
<tr>
<td>44</td>
<td>Government incentive or other sales</td>
<td>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).</td>
</tr>
<tr>
<td>45</td>
<td>Operations, maintenance, management</td>
<td>Cost of operating and maintaining the facility. Calculated as First year operations, maintenance, management (Row 27) X Cost inflation factor (Row 39).</td>
</tr>
<tr>
<td>46</td>
<td>Land lease payment</td>
<td>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).</td>
</tr>
<tr>
<td>47</td>
<td>Net revenue before loan payments</td>
<td>Calculated as the sum of revenues less expenses.</td>
</tr>
<tr>
<td>49</td>
<td>Pre-tax unleveraged return on investment</td>
<td>Calculation of the internal rate of return (IRR) of the project, assuming no loan and no tax considerations.</td>
</tr>
<tr>
<td>50</td>
<td>Cashflow</td>
<td>The Project capital cost (Row 24) is incurred in year 0. Then, each year's Net revenue before loan payments (Row 47) is applied.</td>
</tr>
<tr>
<td>51</td>
<td>Rate of return</td>
<td>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.</td>
</tr>
<tr>
<td>53</td>
<td>Loan payments</td>
<td>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.</td>
</tr>
<tr>
<td>54</td>
<td>Principal amount, start of year</td>
<td>Amount of loan owed at the start of the year.</td>
</tr>
<tr>
<td>55</td>
<td>Interest paid</td>
<td>Interest payment due. Calculated as Principal amount, start of year (Row 54) X Loan interest rate (Row 15).</td>
</tr>
<tr>
<td>Row</td>
<td>Name</td>
<td>Comments</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>56</td>
<td>Principal paid</td>
<td>Amount that the outstanding principal owed on the loan is reduced. Calculated as Total loan payment (Row 57) – Interest paid (Row 55).</td>
</tr>
<tr>
<td>57</td>
<td>Total loan payment</td>
<td>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.</td>
</tr>
<tr>
<td>59</td>
<td>Principal amount, end of year</td>
<td>Amount of loan owed at the end of the year. Calculated as Principal amount, start of year (Row 54) - Principal paid (Row 56).</td>
</tr>
<tr>
<td>61</td>
<td>Debt service coverage ratio</td>
<td>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).</td>
</tr>
<tr>
<td>63</td>
<td>Net revenue after loan payment</td>
<td>Cash available after paying expenses and loan payments. Calculated as Net revenue before loan payment (Row 47) – Total loan payment (Row 57)</td>
</tr>
<tr>
<td>65</td>
<td>Pre-tax leveraged return on investment</td>
<td>The internal rate of return (IRR) of the project, considering the effects of the loan but not tax considerations.</td>
</tr>
<tr>
<td>66</td>
<td>Cashflow</td>
<td>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) applied.</td>
</tr>
<tr>
<td>67</td>
<td>Rate of return</td>
<td>The 20-year rate of return on the investment, considering the cost in year 0 and the revenues in years 1 to 20.</td>
</tr>
<tr>
<td>69</td>
<td>Tax considerations</td>
<td>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.)</td>
</tr>
<tr>
<td>70</td>
<td>Net revenue before loan payments</td>
<td>(Row 47).</td>
</tr>
<tr>
<td>71</td>
<td>Interest deduction</td>
<td>Interest paid (Row 55); assumed to be deductible from income taxes.</td>
</tr>
<tr>
<td>72</td>
<td>Depreciation deduction</td>
<td>Project capital cost (Row 24) divided by Asset depreciation term (Row 18). Becomes 0 after the assumed depreciation term (Row 18).</td>
</tr>
<tr>
<td>73</td>
<td>Income tax basis</td>
<td>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.</td>
</tr>
<tr>
<td>75</td>
<td>Income tax credit or (paid)</td>
<td>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.</td>
</tr>
<tr>
<td>Row</td>
<td>Name</td>
<td>Comments</td>
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<tr>
<td>-----</td>
<td>------------------------------------------</td>
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</tr>
<tr>
<td>76</td>
<td>Wind energy tax credit</td>
<td>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).</td>
</tr>
<tr>
<td>77</td>
<td>Net income tax credit or (paid)</td>
<td>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.</td>
</tr>
<tr>
<td>79</td>
<td>After-tax income calculation</td>
<td>This section combines the pre-tax income with the tax considerations, to determine the project owner’s net after-tax results.</td>
</tr>
<tr>
<td>80</td>
<td>Pre-tax income</td>
<td>(Row 66).</td>
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<tr>
<td>81</td>
<td>Income tax credit or (paid)</td>
<td>(Row 77).</td>
</tr>
<tr>
<td>82</td>
<td>After-tax income or (loss)</td>
<td>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.</td>
</tr>
<tr>
<td>84</td>
<td>After-tax leveraged return on investment</td>
<td>Calculation of the internal rate of return (IRR) of the project, considering the effects of the loan and taxes.</td>
</tr>
<tr>
<td>85</td>
<td>Cashflow</td>
<td>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.</td>
</tr>
<tr>
<td>86</td>
<td>Rate of return</td>
<td>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.</td>
</tr>
</tbody>
</table>

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...
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, 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.
• 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.
## Generic Wind Power Project Economic Analysis

### Input Assumptions (change any entry below to make "what-if" assumptions)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Value</th>
<th>Units</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Project capacity</td>
<td>60 MW</td>
<td></td>
<td>Typical utility-scale projects range from 25 to 280 MW</td>
</tr>
<tr>
<td>5</td>
<td>Average capacity factor</td>
<td>34%</td>
<td></td>
<td>Typical range 25% - 49%</td>
</tr>
<tr>
<td>6</td>
<td>Turnkey construction cost</td>
<td>1000 US$</td>
<td></td>
<td>Typical range 90% - 1250 US$/kW of installed capacity</td>
</tr>
<tr>
<td>7</td>
<td>Operations, maintenance, management cost</td>
<td>40 US$/kWyear</td>
<td></td>
<td>First year, then increases with inflation. Includes labor, parts, insurance, property taxes, utilities, administration.</td>
</tr>
<tr>
<td>8</td>
<td>Land lease cost</td>
<td>2%</td>
<td></td>
<td>Percent of gross revenues paid to landowner. Typical range 1% - 4%.</td>
</tr>
<tr>
<td>9</td>
<td>Energy sales price, first year of sales</td>
<td>49 US$/MWh</td>
<td></td>
<td>First year, assumed to increase with inflation. Assumed range 35 - 60 US$/MWh. Assumed continues for 10 years.</td>
</tr>
<tr>
<td>10</td>
<td>Annual increase in energy sales price</td>
<td>1.0% per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Government incentive on other sales</td>
<td>0 US$/MWh</td>
<td></td>
<td>Typical range 0 - 25 US$/MWh; assumed not to inflate over time.</td>
</tr>
<tr>
<td>12</td>
<td>Years of government incentive on other sales</td>
<td>5 years</td>
<td></td>
<td>Typical range 0 - 10 years</td>
</tr>
<tr>
<td>13</td>
<td>Income tax rate</td>
<td>35%</td>
<td></td>
<td>As percent of net earnings, after deducting interest and depreciation.</td>
</tr>
<tr>
<td>14</td>
<td>Percent of project cost financed by loan</td>
<td>65%</td>
<td></td>
<td>Typical range 32% - 67%</td>
</tr>
<tr>
<td>15</td>
<td>Loan interest rate</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Loan term</td>
<td>15 years</td>
<td></td>
<td>Typical range 15 - 28 years</td>
</tr>
<tr>
<td>17</td>
<td>Average rate of cost inflation</td>
<td>2.0% per year</td>
<td></td>
<td>Assumes &quot;straight line&quot; depreciation; more aggressive scenarios are often possible.</td>
</tr>
<tr>
<td>18</td>
<td>Asset depreciation</td>
<td>20 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Wind energy tax credit, first year of sales</td>
<td>0 US$/MWh</td>
<td></td>
<td>Typical range 0 - 25 US$/MWh; assumed not to inflate over time.</td>
</tr>
<tr>
<td>20</td>
<td>Annual increase in wind energy tax credit</td>
<td>1.5% per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Years of wind energy tax credit</td>
<td>10 years</td>
<td></td>
<td>Typical range 0 - 10 years</td>
</tr>
</tbody>
</table>

### Intermediate Calculations and Results

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Formula/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Project capital cost</td>
<td>Calculated as [project capacity] X [turnkey construction cost]</td>
</tr>
<tr>
<td>25</td>
<td>Amount of loan</td>
<td>Calculated as [project capital cost] X [percent of project cost financed by loan]</td>
</tr>
<tr>
<td>26</td>
<td>Amount of equity invested</td>
<td>Calculated as [project capital cost] - [amount of loan]</td>
</tr>
<tr>
<td>27</td>
<td>First year operations, maintenance, management</td>
<td>Calculated as [operations, maintenance, management cost] X [project capacity]</td>
</tr>
<tr>
<td>28</td>
<td>Annual energy production</td>
<td>Calculated as [project capacity] X [8760 hours per year] X [average capacity factor]</td>
</tr>
<tr>
<td>29</td>
<td>First year energy sales revenue</td>
<td>Calculated as [annual energy production] X [energy sales price]</td>
</tr>
<tr>
<td>30</td>
<td>Minimum debt service coverage ratio</td>
<td>1.37</td>
</tr>
<tr>
<td>31</td>
<td>Average debt service coverage ratio</td>
<td>1.54</td>
</tr>
<tr>
<td>32</td>
<td>Before tax unleveraged return on investment</td>
<td>Calculated in pro forma on next page. Does not consider value of &quot;moralization&quot; of any tax credits. Typically must be at least 1.20 to 1.40.</td>
</tr>
<tr>
<td>33</td>
<td>Before tax leveraged return on investment</td>
<td>Calculated in pro forma on next page. Does not consider value of &quot;moralization&quot; of any tax credits. Typically must be at least 1.20 to 1.40.</td>
</tr>
<tr>
<td>34</td>
<td>After tax leveraged return on investment</td>
<td>Calculated in pro forma on next page. Does not consider value of &quot;moralization&quot; of any tax credits. Typically must be at least 1.20 to 1.40.</td>
</tr>
</tbody>
</table>
## Pro Forma Operating Results

### US$1000 unless noted

<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
<tr>
<td>Sales</td>
<td>1.09</td>
<td>1.01</td>
<td>1.02</td>
<td>1.03</td>
<td>1.04</td>
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<td>1.20</td>
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<td>Sales growth factor</td>
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<td>1.01</td>
<td>1.02</td>
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<tr>
<td>Tax credit inflation factor</td>
<td>1.09</td>
<td>1.01</td>
<td>1.02</td>
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### Notes

- **Pro Forma Operating Results**: This section provides a detailed breakdown of expected operating results for the years specified, including sales, sales growth, and tax credit inflation factors. Each year's results are compared to the previous year, allowing for projections and financial planning.
- **Revenues and Expenses**: This includes specific elements such as operating expenses, interest expense, depreciation, and selling, general, and administrative expenses. The total cost of sales is subtracted from revenue to calculate net profit before taxes.
- **Income Tax**: The income tax is calculated based on the net profit before taxes.
- **Net Income**: This is the net profit after accounting for taxes.
- **Cash Flow**: The cash flow is the net income adjusted for non-cash items.
- **Ratios of Return**: Important financial ratios are calculated to assess the efficiency and profitability of the business.