Chapter 11

Interconnection and Transmission

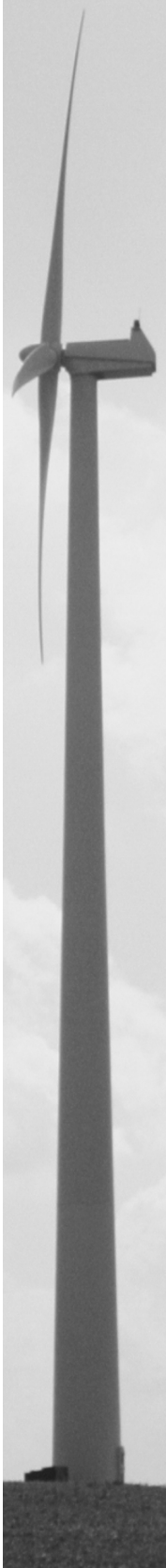
I. Using the Electric Grid for Wind-Generated Power

A farmer who wishes to sell wind-generated electricity must *interconnect* his or her wind energy project with the electric grid. To accomplish this interconnection, the wind energy project must satisfy a series of technical requirements designed to ensure engineering compatibility with the grid. This in turn requires detailed studies of the grid's capacity to move additional electricity from the location of the project.

In addition to satisfying the technical aspects of interconnection, the farmer must negotiate an *interconnection agreement* with the utility that owns the grid at the point of interconnection or, if applicable, another entity that manages the transfer of energy across the grid in the region. This interconnection agreement should cover issues such as who pays for necessary grid upgrades and who is responsible for installing the interconnecting equipment.

In practice, negotiating to interconnect a wind project with the electric grid is closely related in time and purpose to the process of seeking a willing purchaser for the electricity generated by the project. If the interconnecting utility is the same as the purchasing utility, the *power purchase agreement* (PPA) and the interconnection agreement may be negotiated at the same time; however, the two agreements are legally and conceptually distinct.

If the interconnecting utility is not the ultimate purchaser of the electricity, the farmer will also need to negotiate rights of *transmission* across the grid in order to move the wind-generated electricity from the point of interconnection to the ultimate purchaser. This process of transmitting electricity across long distances of the electric grid owned and managed by multiple utilities is called *wheeling power*. Like interconnection, transmission requires both compliance with various technical engineering requirements and a negotiated agreement to secure the necessary transmission rights across the grid.



The topics of interconnection and transmission are exceedingly complex, and the implications for a particular wind project vary greatly depending on the project size and location. Costs associated with both interconnection and transmission can greatly impact the project's financial feasibility. The negotiation process can be time-consuming, and in some instances the waiting list (also called the *queue*) for getting a study of the new project's impact on the grid can be months or even years long. And, in some cases, it may turn out that interconnection is simply not technically and financially feasible for the project location. Therefore, it is crucial to gather information and begin working on this process as early as possible in the planning stages of a wind project.

This chapter will first discuss the various federal and state regulations that govern utilities' interconnection processes and decisions. Next it will outline some standardized interconnection procedures and agreements as examples of what issues a farmer might encounter and what terms may need to be negotiated in an interconnection agreement. This chapter will close with a look at transmission of generated power from the wind project to a purchaser.

II. Interconnection

Interconnection has two components: (1) determining, from a technical and engineering standpoint, whether a generator can be safely and reliably interconnected with the electric grid, and (2) negotiating agreements that detail the terms and conditions of the interconnection.

Farmers seeking to sell wind-generated electricity through the electric grid will typically need to negotiate both of these aspects of interconnection directly with the utility that owns the power lines that will take the interconnection. However, in some cases, utilities have given the control over access to these power lines to a regional entity that manages and coordinates the entire electric grid on a regional basis. Although these regional entities were formed largely to coordinate the transmission of bulk power across multiple utilities' power lines, they have a major role in some farmers' interconnection requests, depending on the particularities of the power line at issue. If this is true for a given project, that farmer will need to negotiate some or all of his or her interconnection with these regional entities. Such an entity may be formally classified as an *Independent System Operator (ISO)* or a *Regional Transmission Organization (RTO)*, as discussed in more detail later in this chapter. However, they are referred to collectively here as *regional transmission providers.*

Historically, many utilities have resisted allowing small, independent energy generators, like wind projects, to interconnect with the grid. Many experts cite

the red tape and costs imposed on the interconnection process by these utilities as some of the biggest impediments to development of smaller independent energy generation projects.[1] For example, utilities can indirectly discourage interconnection projects by failing to respond to a request for interconnection in a timely manner, or by requiring excessive fees for the interconnection.

With increasing frequency, regulatory agencies at both the state and federal levels are beginning to respond to concerns about these utility-imposed obstacles to interconnection by requiring that utilities and regional transmission providers within their jurisdiction comply with certain interconnection standards. These standards are designed to reduce uncertainty and the transaction costs incurred by wind developers when attempting to independently negotiate interconnection with a utility. Thus, these standards typically require clear and reliable timelines for the interconnection process, the appointment of a utility representative who is responsible for interconnection issues, clearly defined technical engineering standards, and model terms and conditions for interconnection agreements, among other things.

These emerging state and federal interconnection rules typically lay out guidelines for the regulated utilities. Those utilities, in turn, are required to implement these regulatory guidelines in more detailed interconnection procedures and standard agreements that are incorporated into the utilities' filed tariffs, which must in turn be approved by the regulating agency.[2]

To be clear, then, it is the utilities and regional transmission providers, and not wind energy producers, who are directly subject to interconnection regulations. However, although wind energy producers are not likely to interact directly with the state and federal regulating agencies on these issues, they should become familiar with the governing rules in order to be best prepared for the interconnection process.

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[1] R. Brent Alderfer, M. Monika Eldridge, and Thomas J. Starrs, *Making Connections: Case Studies of Interconnection Requirements and Their Impacts on Distributed Power Projects* at i, 17 (Nat'l Renewable Energy Lab., Apr. 2000), *available at* http://www.nrel.gov/docs/fy00osti/28053.pdf (last visited June 6, 2007).

[2] *See, e.g.*, Minnesota Public Utilities Commission, *In the Matter of Establishing Generic Standards for Utility Tariffs for Interconnection and Operation of Distributed Generation Facilities under Minnesota Laws 2001, Chapter 212*, Docket No. E-999/CI-01-1023, at 29 (Sept. 28, 2004), *available at* http://www.puc.state.mn.us/docs/orders/04-0131.pdf (last visited June 5, 2007) [hereinafter "MN DG Standard"].

A. Government Regulation of Interconnection

As noted, both federal and state laws currently regulate utility interconnections. Whether state or federal rules apply to a given interconnection depends largely on: (1) what type of electric line the project is being connected to, and (2) which utility controls that line. These jurisdictional issues, however, are extraordinarily complex. There are few bright lines distinguishing between state and federal interconnection jurisdictions, and in many cases the issue of who is in charge is open to some debate.

Generally, federal interconnection rules, which are issued by the Federal Energy Regulatory Commission (FERC), apply to direct interconnections with high-voltage transmission lines that cross state lines and to interconnections with utilities that own, control, or operate these interstate transmission lines or sell wholesale energy across state lines.[3] FERC jurisdiction typically does not extend to rural electric cooperatives or municipal electric utilities.[4] However, federal jurisdiction does extend to these otherwise non-regulated utilities in some instances—for example, when a rural electric cooperative or municipal utility owns transmission facilities, access to those facilities will be subject to some federal requirements.[5]

State interconnection rules, on the other hand, generally cover the local distribution of energy not covered by FERC. This includes interconnections with in-state distribution lines that connect to the ultimate electric consumer.[6] It is also

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[3] 16 U.S.C. § 824 (2006); Federal Energy Regulatory Commission, *Preventing Undue Discrimination and Preference in Transmission Service*, 72 FERC ¶ 12,266, Order No. 890 (Feb. 16, 2007), *available at* http://www.ferc.gov/whats-new/comm-meet/2007/021507/E-1.pdf [hereinafter "FERC Order No. 890"]; FERC, *Standardization of Small Generator Interconnection Agreements and Procedures*, 70 FERC ¶ 34,190, Order No. 2006, at 4 (May 12, 2005), *available at* http://www.ferc.gov/EventCalendar/Files/20050512110357-order2006.pdf [hereinafter "FERC Order No. 2006"] (both sites last visited June 18, 2007). Note that FERC frequently grants rehearings of its orders. For this guide, citations refer to the original order unless a subsequent rehearing resulted in a substantive change necessary to the specific information being referenced at the time of this publication.

[4] 16 U.S.C. § 824(f) (2006).

[5] *See*, *e.g.*, 16 U.S.C. § 824j-1 (2006).

[6] *See generally*, Federal Energy Regulatory Commission, *Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public*

important to note that states choose whether their interconnection regulations will extend only to investor-owned utilities, or whether they will also regulate interconnections by rural electric cooperatives and municipal electric utilities.[7]

Even if a particular interconnection is not regulated by either state or federal rules, some utilities voluntarily set their own interconnection standards and make these self-imposed standards apply to all of, or some defined subset of, their interconnections.[8]

Finally, farmers should keep in mind that this is a constantly changing area of the law. Although not all states currently have interconnection standards in place, and some states have interconnection standards that do not apply to municipal utilities or rural electric cooperatives, this can change at any time. In fact, the Energy Policy Act of 2005 specifically requires states and unregulated utilities that do not yet have standardized interconnection procedures and agreements to consider adopting such standards, and to make a determination about implementation of such standards on or before August 8, 2007.[9]

Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 82 FERC ¶ 61, 046, Order No. 888, at 402 (Apr. 24, 1996), *available at* http://www.ferc.gov/legal/maj-ord-reg/land-docs/order888.asp (last visited June 20, 2007) [hereinafter "FERC Order No. 888"] (listing 7 indicators of local distribution).

[7] Minnesota, for example, extends its interconnection rules to rural electric cooperatives and municipal utilities, but Iowa does not. Minn. Stat. § 216B.164, subd. 2 (2006); Iowa Ann. Code § 199-15.2(1)(e) (2007).

[8] *See, e.g.,* National Rural Electric Cooperative Association, *Business and Contract Guide for Distributed Generations (DG) Interconnection* (March 18, 2002), *available at* http://www.nreca.org/Documents/PublicPolicy/nf3569draft06a.doc (last visited June 21, 2007).

[9] Energy Policy Act of 2005, 109 Pub. L. 58, Title XII, Subtitle E, § 1254(b), 119 Stat. 971 (Aug. 8, 2005) (amending 16 U.S.C. § 2622(b)). For a survey of what standards states have considered, adopted, and rejected, see the Interstate Renewable Energy Council's "States' Consideration of EPAct 2005 Standards" Table, *available at* http://www.irecusa.org/fileadmin/user_upload/ConnectDocs/EPAct.pdf (last visited June 15, 2007).

B. Mandatory Interconnection Under the Public Utility Regulatory Policies Act (PURPA)

There are some special interconnection rules that apply when a wind project is a *Qualifying Facility* (QF) under the Public Utility Regulatory Policies Act (PURPA). As discussed in detail in the chapter about selling power (Chapter 9), PURPA provides a guaranteed market for most electricity generated by QFs at the utility's *avoided cost rate*. FERC's regulations interpreting PURPA also require electric utilities to interconnect with QFs.[10]

In general, the state has regulatory authority over interconnection with QFs.[11] In some cases, however, the interconnecting utility might not purchase all of the QF's output, and may instead agree to transport some portion of the QF's electric output on interstate lines to another purchasing utility.[12] In such cases, FERC has authority to regulate the interconnection, including rates, terms, and conditions.[13] In other words, FERC has authority over a QF's interconnection if the QF sells any of its electricity to an entity other than the utility directly interconnected with it.

C. Important Interconnection Issues

This section will highlight issues in interconnection procedures and agreements that should be considered while navigating this process.

1. Interconnection Procedures

Standardized interconnection procedures are designed to ensure that the proposed interconnection will not endanger the safety and reliability of the electric grid. Generally, standardized procedures establish: (1) timelines that utilities must follow when acting on a generator's interconnection request,

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[10] 18 C.F.R. § 292.303(c) (2006); *see also* 16 U.S.C. § 2602(4) (2006) (defining "electric utility" for PURPA purposes); 18 C.F.R. § 292.306 (2006) (requiring QFs to pay interconnection costs). The Energy Policy Act of 2005 opened the door to new exceptions to this requirement, as described in the chapter of this guide discussing selling power (Chapter 9). 109 Pub. L. 58, Title XII, Subtitle E, § 1253, 119 Stat. 967 (Aug. 8, 2005).

[11] *See* 18 C.F.R. § 292.306 (2006).

[12] 18 C.F.R. § 292.303(d) (2006).

[13] See *W. Mass. Elec. Co. v. FERC*, 165 F.3d.992, 926 (D.C. Cir. 1999).

(2) technical procedures for studying and evaluating the proposed project's impact on the electric grid, (3) methods for estimating the cost of designing and constructing the interconnection, and (4) methods for resolving disputes between the electricity producer and the utility.

One important standardized interconnection procedure is FERC's Small Generator Interconnection Procedure (SGIP), which applies to FERC-regulated utilities and regional transmission providers.[14] The SGIP requires regulated utilities and transmission providers to offer interconnection on terms that are approved by FERC for interconnections within FERC's jurisdiction.[15]

The SGIP actually provides three separate procedures for processing an interconnection request, depending on the exact size and qualifications of the project. Separate streamlined processes are possible for projects with capacity under 10 kW and projects with capacity between 10 kW and 2 MW. For projects with capacity between 2 MW and 20 MW, and for smaller projects that do not meet certain technical requirements, a more in-depth "Study Process" will be used.

FERC Interconnection Standards for Larger Projects

The SGIP described in this section is used for projects with capacity up to 20 MW. FERC has adopted alternative standardized interconnection procedures for larger energy facilities, but these are beyond the scope of this discussion.

In addition to developing standard interconnection procedures and agreements for all large generators, FERC has established technical standards specifically for interconnection of large (over 20 MW) wind generation facilities to address those facilities' variable output, among other issues. These standards can be found in FERC Order No. 661, *Interconnection for Wind Energy*, 111 FERC ¶ 61, 353, which was issued on June 2, 2005, and is available on-line at http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10594521.

[14] FERC Order No. 2006, at 1. FERC's Small Generation Interconnection rule creates a Small Generator Interconnection Procedure (SGIP) and a Small Generator Interconnection Agreement (SGIA) for projects up to 20 MW.

[15] 18 C.F.R. § 35.28(f) (2007) (requiring federally regulated public utilities and non-public utilities seeking certain reciprocity benefits to implement this standardized interconnection procedure and agreement or a similar federally approved standard).

One example of a state's standardized interconnection procedure is Minnesota's Distributed Generation Interconnection Rule (DG Standard). The DG Standard applies to generation facilities with capacity up to 10 MW and requires utilities in the state to file a tariff detailing interconnection standards consistent with the DG Standard.[16] The procedure in Minnesota's DG Standard is aimed toward projects that are not anticipated to affect the interstate transmission system.[17]

The following paragraphs highlight issues important to all interconnection procedures and use the FERC SGIP and Minnesota DG Standard procedures to show how some issues might be addressed. To be clear, in the absence of an applicable standardized procedure and agreement, wind project owners will need to independently negotiate with the interconnecting utility or regional transmission provider. However, even in that scenario, the standardized procedures and agreements can provide guidance.

Interconnection Request. Utilities and regional transmission providers require a range of information from wind project owners who request interconnection. The application form is likely to ask for details about facility location, how the electricity generated will be used (that is, used on-site or sold), the energy source (for example, wind), the generator type and model, the nameplate capacity rating of the system (for example, 100 kW or 5 MW), a diagram of the facility, and other technical and equipment specifications.[18]

Engineering Studies. An engineering study or series of studies will be required to determine the feasibility of interconnecting a wind project at the proposed location, and to identify the kind of equipment that will be necessary to ensure grid safety and reliability in the event of an actual interconnection. The precise types of studies required will vary by utility and by project, but could include a feasibility study, a system impact study, and a facilities study.[19] A feasibility study identifies potentially adverse grid impacts that could result from interconnecting the wind project, as well as equipment and upgrades that might be needed. A system impact study examines electric system impacts in more detail and the potential effect of

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[16] Minn. Stat. § 216B.1611 (2006); MN DG Standard, at 29.

[17] MN DG Standard, Attachment 1, *Interconnection Process for Distributed Generation* 1.

[18] *See, e.g.*, FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure*, Attachment 2, *Small Generator Interconnection Request*.

[19] FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure* 8.

the project on the overall reliability of the electric system. A facilities study specifically identifies the equipment, engineering, procurement, and construction work needed and estimates the costs of these.

Usually a *scoping meeting*, with technical experts representing both the wind project and the utility, will be held early in the process in order to determine the studies needed and define their scope. Farmers should be aware that the utility and wind project owner may need to enter into an agreement, separate from the final interconnection agreement, for each engineering study that must be completed in order to define the scope of the study, assumptions to be used, and costs.[20]

Equipment and Upgrades. Various equipment purchases, modifications, and upgrades to the existing grid might be necessary to physically and electrically interconnect a wind project to the electric grid. There is a distinction between things needed for the actual interconnection of the wind generator to the distribution or transmission system, and things that need to be done to the distribution or transmission grid itself to allow it to accommodate the wind project.[21] Both types of improvements may be needed. Who ultimately owns the newly installed equipment and the wind project owner's cost obligations depend on whether the improvement is needed only to accomplish the physical interconnection or whether it is a system-wide upgrade. Engineering studies and subsequent negotiations with the utility or regional transmission provider will determine precisely what work needs to be done.

Timeline. The interconnection process formally begins with the submission of an interconnection request by a wind project owner to a utility or transmission provider. From that point, a farmer can generally expect the process to take at least several months for a multi-MW wind project.[22] Standardized interconnection procedures provide specific timelines for the

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[20] *See, e.g.*, FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure*, Attachments 6, 7, and 8.

[21] FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure*, Attachment 1, *Glossary*.

[22] *See, e.g.*, Midwest Independent Transmission System Operator, SGIP Timeline, *available at* http://www.midwestiso.org/page/Small%20Generator (click on "SGIP Timeline Chart" under "Interconnection Procedure Overview") (last visited June 11, 2007).

utility or regional transmission provider to review an application for completeness and meet with the project owner to define the study process. Interconnection requests submitted to transmission providers using FERC's procedures go into a *queue* system and are evaluated in the order in which they are received. To expedite the interconnection process for smaller generators, FERC's SGIP provides a "Fast Track Process" for projects between 10 kW and 2 MW. Projects in that size range that pass a screening for potential safety and reliability issues may avoid the longest delays.[23]

Costs. The costs of engineering studies and interconnection equipment are generally the responsibility of the wind project owner, unless the interconnecting utility agrees otherwise. The wind project owner might also have to pay for necessary electric grid upgrades beyond the point of interconnection.

A processing fee or a deposit will likely be required with the submission of an interconnection request. For example, under the FERC SGIP, a nonrefundable $500 processing fee is required for projects smaller than 2 MW, and a deposit up to $1,000 is required for projects between 2 MW and 20 MW.[24] Minnesota's DG Standard sets application fees on a sliding scale based on project size, with a maximum fee of $1,500 for projects of 10 MW and more.[25]

Additional deposits might be required for engineering studies. The total fees for those studies will be several thousands of dollars for a one- or two-turbine wind project.[26] The actual installation and construction of

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[23] FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure*, at 3-6. Some generators might be able to request to be connected "out of queue" order, but might face significant additional costs. *See* Bryan D. Morlock, *Clean Energy Resource Team* (Mar. 5, 2004), *available at* http://www.cleanenergyresourceteams.org/westcentral/Clean%20Energy%20Resource%20Team%20-Bryan%20Morlock.pdf (last visited June 20, 2007).

[24] FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure*; Attachment 2, *Small Generator Interconnection Request* 1.

[25] MN DG Standard, Attachment 1 (Process) at 5.

[26] Lisa M. Daniels, Sarah E. Johnson, and Wes Slaymaker, *Harvest the Wind: A Wind Energy Handbook for Illinois* 104 (IL Inst. for Rural Affairs 2004), *available at* http://www.iira.org/pubsnew/publications/IVARDC_Reports_614.pdf (last visited June 11, 2007).

interconnection equipment might cost from tens of thousands to more than two hundred thousand dollars for a one- or two-turbine wind project.[27] If a new substation or build-out of transmission lines is required, the costs could be significantly greater.

Dispute Resolution. Standardized interconnection procedures usually provide a method for resolving disputes that cannot be worked out between the parties.[28]

Combining Forces to Improve Project Economics

Many experts recommend that several small projects should seek to develop in a cluster near each other and then coordinate to save money on interconnection and other projects costs. For example, building a new substation or installing a new transmission line would be more economically feasible if several wind projects could share the benefits and the costs. In such a case, the projects could maintain separate ownership and financial structures, but collaborate in those situations, like interconnection grid upgrades, where economies of scale really matter. There might be substantial organizational and transactional barriers to such an arrangement, but the potential cost-savings might make this strategy, called *aggregation*, worth investigating.

2. Interconnection Agreements

Before the actual interconnection can take place, indeed before any interconnection construction begins, the utility or transmission provider and project owner must enter into an interconnection agreement. The interconnection agreement describes the legal relationship between the two

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[27] *See, e.g.*, Energy Trust of Oregon, *Community Wind: An Oregon Guidebook* 77, Table 7.1 (2005), *available at* http://www.energytrust.org/RR/wind/community/oregon_wind_guidebook.pdf (last visited June 15, 2007) (land zoned as exclusive Farm Use or Grazing/Farming is considered agricultural land); DanMar & Associates, Presentation at Community Wind Energy Conference (June 24, 2004), *available at* http://www.windustry.org/conferences/june2004/june2004_proceedings/juhl.pdf (last visited June 11, 2007).

[28] *See, e.g.*, FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure* 11-12; MN DG Standard, Attachment 1 (Process) at 3.

parties and their rights and responsibilities, including provisions for who must pay for necessary grid modifications and how the interconnection will be accomplished.

It is important to note that the interconnection agreement is not itself a contract for the purchase of electricity nor for transmission of electricity to portions of the electric grid owned by other utilities. A power purchase agreement, and possibly a transmission agreement, must be contracted for separately.

The remainder of this section will identify the major issues covered in interconnection agreements.[29] As noted, several utilities subject to state or federal regulation now have standardized interconnection agreements, and this section highlights how some of the issues are addressed in those standardized examples.

As has been emphasized throughout this guide, a farmer should have an experienced attorney review any contract related to a wind project before signing.

Point of Interconnection. Interconnection agreements should include detailed, technical descriptions of the generation facilities, the exact design and specifications for the agreed upon interconnection with the grid, and a detailed description of the chosen metering equipment. The description of the wind facility should specify the maximum installed capacity permitted to interconnect with the grid. The exact point at which the wind facility will be connected to the electric grid should be described precisely. This is also sometimes called the *point of common coupling*.[30]

Ownership. The interconnection agreement should make clear the ownership of every piece of the interconnection equipment. Typically, some of the interconnection facilities are owned by the wind project, and some are owned by the utility. Grid upgrades are typically owned by the utility that controls those particular lines.

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[29] *See, e.g.*, FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement*; MN DG Standard, Attachment 5 (Agreement).

[30] The point of interconnection is often the same as the *point of delivery* in a power purchase agreement—where ownership of the power changes hands—but it does not have to be.

Construction. The interconnection agreement should specify who is responsible for building the wind project and who is responsible for building, installing, and operating the interconnection facilities. Typically, the wind project owner is solely responsible for the construction, operation, and maintenance of the wind facility, while each party is responsible for its own interconnection facilities as identified in the agreement. The utility or regional transmission provider that administers the distribution and transmission lines carrying the generated energy is usually responsible for the design, construction, and installation of any distribution or network upgrades.

Categories of Equipment and Upgrades that May Be Required for Interconnection

Interconnection facilities include all equipment between the wind turbine and the point of interconnection, including any modifications, additions, or upgrades that must be made to interconnect the wind project to the grid. They are solely used by the wind project for its own interconnection.

Distribution upgrades include additions, modifications, and upgrades to the utility's electrical distribution lines beyond the point of interconnection that are necessary to allow the electricity generated by the interconnecting wind project to be transmitted on those lines.

Network upgrades include additions, modifications, and upgrades to the utility's transmission system that are necessary to move the wind project's electricity to market. These are different than distribution upgrades, which occur on the smaller distribution lines that move power to the end user.

For a more thorough explanation of terms related to interconnection, the glossary accompanying FERC's SGIA may be useful. It is available on-line at www.ferc.gov/industries/electric/indus-act/gi/small-gen/agreement.doc.

Allocating Costs. Who pays the costs of interconnection and how much those costs may be are major issues for wind project feasibility. [31]

[31] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶ 4.2.

Typically, the wind project owner is responsible for the costs of all interconnection facilities, including metering equipment, and all distribution upgrades that are necessary as a result of the project.[32] In addition to outright equipment expenses, these costs can include overhead, construction, operation, maintenance, repairs, and replacement of any newly installed facilities.

If any upgrades are required to the transmission grid, the SGIA requires the wind project owner to be initially responsible for the costs of those network upgrades; however, those costs will usually be repaid to the project owner over time.[33] Because all customers along the transmission line will benefit from the upgrades paid for by the newly interconnecting wind facility, the utility will be able to recover the cost of the upgrades in the long term through its transmission rates. Therefore, a utility following the SGIA should reimburse the interconnecting wind facility for the cost of network upgrades.[34]

Payment Schedule and Financial Security. Interconnection agreements should set out a payment schedule for the facilities and upgrades which are the wind project owner's responsibility. The utility might require reassurance in the form of some security or other guarantee of the owner's ability to pay the estimated costs of the work to be done.

Termination. The interconnection agreement should provide a process for termination of the agreement. Under the FERC SGIA, the wind project owner may terminate the interconnection agreement at any time by giving

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[32] See FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement*, Attachment 1, *Glossary of Terms: Interconnection Facilities*.

[33] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶¶ 5.2, 5.2.1.

[34] However, some regional transmission providers, including the Midwest ISO, have determined that some interconnecting projects are not entitled to full reimbursement. This issue continues to develop. *See, e.g.*, Federal Energy Regulatory Commission, *Midwest Independent Transmission System Operator, Inc., Order on Technical Conference, Rehearing, Clarification, and Compliance*, 117 FERC ¶ 61,241 (Nov. 29, 2006), *available at* http://elibrary-backup.ferc.gov/idmws/common/opennat.asp?fileID=11193091 (last visited June 30, 2007).

the utility 20 business days' written notice.[35] The utility does not typically have the same right to terminate the agreement at any time after giving notice, but either the utility or the wind project owner may terminate the interconnection agreement in case of default by the other party.[36]

Operational Issues. The interconnection agreement will cover a range of issues relating to the ongoing operation of the wind project, including technical standards that must be met and maintenance practices that must be followed.

Inspection, Testing, and Right of Access. Interconnection agreements will usually provide for testing and inspection of the wind facility before interconnection. Under FERC's SGIA, the wind project owner is responsible for testing and inspection, but the utility has the right to observe and inspect the site at its own expense.[37] Most interconnection agreements also give the utility an ongoing right of access to the wind facility under certain conditions. FERC's SGIA provides the utility with a right of access to the wind project premises for a reasonable purpose and at a reasonable time, if the wind project owner receives reasonable notice from the utility.[38] The utility will likely also seek a right to access the premises at any time in the event of an emergency or hazardous condition.

Disconnection. For a variety of reasons, a utility might need to disconnect a wind generator from its system. Such situations should be provided for in the interconnection agreement. Under FERC's SGIA, the utility has the right to temporarily disconnect the wind project if it is reasonably necessary due to emergency conditions, routine maintenance, construction and repair, forced outages to do immediate repairs, or adverse operating effects on the grid created by the operation of the wind facility.[39]

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[35] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶ 3.3.1.

[36] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶¶ 3.3.2, 7.6.2.

[37] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶ 2.1.

[38] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶ 2.3.2.

[39] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶ 3.4.4.

Modification of the Wind Project. The interconnection agreement should set out the process required when the wind project owner wishes to make changes to the wind facility that will have a material impact on the safety or reliability of the grid. Under FERC's SGIA, written authorization for the changes must be obtained from the utility.[40]

Insurance. The interconnection agreement will likely include a requirement that the wind project owner obtain sufficient liability insurance to cover the wind project and the interconnection. Standardized agreements may or may not include specific requirements for the type and amount of coverage.[41]

Confidentiality. The interconnection agreement will likely include a provision describing each party's obligation to protect the confidential information of the other party.[42] Information about the design, operating specifications, and metering data of the wind facility might be considered confidential information.

Duration of the Agreement. The interconnection agreement should state how long it will be in effect and might describe how it can be renewed. The initial term of an interconnection agreement might be long—possibly 10 to 20 years—with shorter renewal periods. An interconnection agreement might also remain effective until some specific event happens (for example, until the parties mutually agree to cancel the agreement) rather than for a specific time period.

Dispute Resolution. The interconnection agreement should provide a process for dispute resolution. This might include mediation, arbitration, or referral to a particular authority such as the state public utilities commission. For example, under Minnesota's DG Standard, the parties agree to participate in good faith in mediation of disputes; if mediation is unsuccessful, the parties may bring the dispute before the Minnesota Public

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[40] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶ 3.4.5.

[41] *See, e.g.*, FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶ 8.1; MN DG Standard, Attachment 5 (Agreement), at 8-9.

[42] *See, e.g.*, FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* 15; MN DG Standard, Attachment 5 (Agreement), at 11-12.

Utilities Commission for resolution.[43] FERC provides a Dispute Resolution Service to assist parties to an SGIA.[44]

Other Contract Issues. The interconnection agreement will likely cover other general contract issues such as assignment of rights under the agreement, liability, allocation of tax liabilities, and definitions of what constitutes default.[45]

III. Transmission

As mentioned earlier, an interconnection agreement alone does not give the wind project the right to transmit its generated electricity over portions of the electrical grid that are not owned by the interconnecting utility. Therefore, if the wind project has a power purchase agreement with an entity other than the interconnecting utility, the wind project owner must contract for access to transmission services across the grid in order to *wheel* the project's energy across the grid to the ultimate buyer. These transmission agreements may be made separately with each utility whose transmission lines will be used, or (more likely) the wind project will contract with a regional transmission provider for these services.

Acquiring transmission services is a complicated process that, like interconnection, requires sophisticated technical and legal assistance to navigate. This section will discuss only the basics of transmission service, who provides it, and some key transmission issues that regularly affect wind projects. As with interconnection, acquiring the necessary transmission rights also requires technical compliance with engineering standards that ensure safe and reliable functioning of the transmission grid.

A. Regulatory Control of Transmission System

Significant coordination of the electric grid is required to ensure the system does not become congested. If too much electricity is put on a particular line at a particular time, the system can become overloaded and shut down. If too little

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[43] MN DG Standard, Attachment 5 (Agreement), at 8.

[44] FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* 16.

[45] *See generally* FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement*; MN DG Standard, Attachment 5 (Agreement).

electricity is added to the grid at a given time, brownouts or even blackouts can result.

To best faciliate this coordination regionally, many of the utilities that own the actual transmission lines give operational control of their lines to an Independent System Operator (ISO) or Regional Transmission Organization (RTO). RTOs and ISOs are voluntarily organized within the electric industry and are operated independently from their industry members. These regional transmission providers then control who puts electricity on the transmission lines at any given time in order to ensure the safety and reliability of the system.

FERC now encourages the formation RTOs, and establishes the minimum characteristics and minimum functions[46] that an entity must satisfy in order to become an RTO.[47] In most parts of the country, a wind project that needs transmission services is likely to deal with one of these organizations. Alternatively, the utility that does the interconnection may deal directly with a regional transmission provider on the project's behalf.

For example, the Midwest Independent Transmission System Operator (Midwest ISO) covers most of the transmission territory in several Midwestern states. This organization was established as an ISO and then became the first FERC-approved RTO in 2001.[48]

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[46] *See generally* Federal Energy Regulatory Commission, *Regional Transmission Organizations*, 89 FERC ¶ 61,285, Order No. 2000, at 99-100 (Dec. 20, 1999), *available at* http://www.ferc.gov/legal/maj-ord-reg/land-docs/RM99-2A.pdf (last visited June 21, 2007).

[47] ISOs emerged as some of the first regional entities designed to fulfill federal requirements that access to transmission be open and administered on a non-discriminatory basis. Today, FERC encourages the formation of RTOs and has established 12 necessary RTO characteristics and functions—including that an RTO must be of "sufficient regional scope." The primary difference between RTOs and ISOs is that ISOs never had this required geographical component. FERC, *Frequently Asked Questions, What Is the Difference between an RTO and an ISO?*, http://www.ferc.gov/o12faqpro/default.asp?Action=Q&ID=261 (last visited June 8, 2007).

[48] *See* Midwest Independent Transmission System Operator, *About Us*, *available at* http://www.midwestiso.org/page/About%20Us (last visited June 19, 2007).

FERC regulations require utility and regional transmission providers to offer transmission service on an open, nondiscriminatory basis.[49] To create an open market in wholesale electricity, FERC requires each transmission provider, whether a regional organization or individual utility, to file an Open Access Transmission Tariff (OATT).[50] This OATT, once approved by FERC, sets the rates, terms, and conditions under which transmission and related services are provided.

FERC can also order a utility to make its transmission lines available to an electric generator for sale of electricity directly to a retail consumer.[51] Upon approving an application for such a transmission order, FERC sets a transmission rate to be paid by the electric generator that allows the utility "the recovery . . . of all the costs incurred in connection with the transmission services."[52] A wind project might benefit from this option if, for example, there was an opportunity to sell power directly to a large energy user, such as a manufacturing plant; however, this scenario is likely to be very rare.

B. Special Transmission Rules Under PURPA

In some instances, states may also assert authority over transmission issues. For example, Minnesota has a PURPA-related law that requires regulated utilities in the state to provide transmission service to QFs with capacity over 30 kW. This law requires utilities to either provide wheeling for the QF's output or agree with the QF to sell the QF's output to any other Minnesota utility anticipating or planning for generation expansion in the next 10 years.[53] QFs receive full payments for the electricity sold to these other utilities, less reasonable wheeling charges and line losses.

Similarly, under the federal rules, if a utility is required to buy a QF's output, the utility and QF can agree to instead sell the electricity to a different utility, with

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[49] FERC Order No. 890, at 1.

[50] FERC Order No. 890, Appendix C, *Pro Forma Open Access Transmission Tariff*. FERC now extends its open access requirements to otherwise non-regulated utilities, such as rural electric cooperatives. 109 Pub. L. 58, Title XII, Subtitle C, § 1231, 119 Stat. 955 (Aug. 8, 2005) (codified at 16 U.S.C. § 824j-1).

[51] 16 U.S.C. § 824j (2006).

[52] 16 U.S.C. § 824k (2006).

[53] Minn. Stat. § 216B.164, subd. 4(c) (2006).

the interconnecting utility being obligated to transmit the electricity.[54] The rate paid to the QF for the electricity will be adjusted to reflect line losses, but the QF cannot be charged for the transmission services.

C. Network Upgrades and Transmission Rates

As discussed above, when a wind project requesting interconnection will clearly impact the transmission grid, those impacts are studied as part of the initial interconnection process. [55] Any network upgrades determined to be needed for interconnection will prepare the project, to some degree, for ultimate transmission service; however, more upgrades might be required when the wind facility requests actual transmission service for a particular capacity to specific delivery points. In such a case, the transmission provider may do additional studies and require additional upgrades under the terms provided in the OATT.[56]

As discussed in the interconnection section of this chapter, any necessary network upgrades required as part of the interconnection process will be paid for by the wind facility, but those costs will usually be recovered through credits against transmission service charges.[57] The general rule for transmission upgrades is different. If the transmission provider determines—as part of the transmission request evaluation process—that more network upgrades are necessary, the OATT requires the transmission provider to make any necessary upgrades, with the wind facility bearing the full cost.[58] Rather than requiring a wind facility to simply pay for network upgrades upfront, FERC has traditionally allowed the transmission provider to recover the cost of network upgrades through the transmission rates charged to the wind facility.[59]

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[54] 18 C.F.R. § 292.303(d) (2007).

[55] Under FERC's SGIP, these impacts are considered as part of the System Impact Study. FERC Order No. 2006, Appendix E, *Small Generator Interconnection Procedure* 9-10.

[56] FERC Order No. 890, Appendix C, *Pro Forma Open Access Transmission Tariff* ¶¶ 19, 32.

[57] *See* FERC Order No. 2006, Appendix F, *Small Generator Interconnection Agreement* ¶¶ 5.2, 5.2.1.

[58] FERC Order No. 890, Appendix C, *Pro Forma Open Access Transmission Tariff* ¶ 13.5.

[59] *See* FERC Order No. 2006, at 118 n.127.

Given this rate scheme, it may be advantageous to maximize the amount of network upgrades that are contracted for as part of the initial interconnection process, as the costs of network upgrades in that process are credited back to the electricity generator while the cost of network upgrades in the transmission process must be borne directly by the new generator.

D. Unique Issues and Solutions for Transmitting Wind-Generated Electricity

The transmission rules were originally designed for conventional, "dispatchable" power generation that can be precisely scheduled, and these rules have not always transferred well to renewable energy sources, like wind, that are variable and inherently hard to predict. Wind generators also raise unique transmission issues due to their relatively low capacity and distance from population centers.[60] However, amendments to the OATT adopted early in 2007 make some significant headway toward addressing these issues.[61]

1. Duration of Transmission Service

Wind facilities are eligible for point-to-point service from the transmission provider. This means that they can contract for transmission service from the point of interconnection to the point of delivery to the buyer.[62] Until now, most wind generators have had to obtain contracts for *long-term firm point-to-point service*, which forces the wind project to reserve its maximum transmission capacity with the transmission provider ahead of time.[63] In this scenario, wind projects have had to pay transmission charges for all of their maximum reserved capacity, which is necessary for the windiest times. However, in reality, the intermittency and short-term unpredictability of the wind means that these projects actually use only a portion of that reserved,

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[60] Steven Stoft, Carrie Webber, and Ryan Wiser, *Transmission Pricing and Renewables: Issues, Options, and Recommendations* 13-18 (Lawrence Berkeley Nat'l Lab. May 1997), *available at* http://eetd.lbl.gov/EA/EMP/reports/39845.pdf (last visited June 20, 2007).

[61] *See* FERC Order No. 890, at 4-5.

[62] FERC Order No. 890, Appendix C, *Pro Forma Open Access Transmission Tariff* Pt. II.

[63] Steven Stoft, Carrie Webber, and Ryan Wiser, *Transmission Pricing and Renewables: Issues, Options, and Recommendations* 1-2 (Lawrence Berkeley Nat'l Lab. May 1997), *available at* http://eetd.lbl.gov/EA/EMP/reports/39845.pdf (last visited June 20, 2007).

purchased capacity.[64] Generators also might be denied long-term transmission service if line capacity is not available for their maximum output, even if the available line capacity would be exceeded for only a few hours per year.[65]

Nonetheless, a long-term contract for transmission services is important for project financing. Until 2007, wind energy generators' only other option was to select *non-firm transmission service*. Non-firm service means interruptible service that is scheduled by the transmission provider only on an "as available" basis. A wind project using non-firm transmission service would not have guaranteed access to the grid for its electricity output, which could jeopardize the project's ability to meet its obligations under a power purchase agreement and, therefore, would create problems for project financing.

FERC's 2007 OATT amendments create an alternative type of transmission service called *conditional firm*, which allows generators to take advantage of transmission capacity that is used only occasionally.[66] Under the newly authorized conditional firm transmission service, wind project owners can enter into long-term contracts for firm service and yet keep their costs down by releasing claims on transmission capacity during limited times of non-firm service designated in the contract.[67] For example, this might allow a wind project to release its claim on (and obligation to pay for) a certain amount of transmission capacity during months of seasonally lower wind speeds. Conditional firm service also allows more efficient use of the existing

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[64] Steven Stoft, Carrie Webber, and Ryan Wiser, *Transmission Pricing and Renewables: Issues, Options, and Recommendations* 1-2 (Lawrence Berkeley Nat'l Lab. May 1997), *available at* http://eetd.lbl.gov/EA/EMP/reports/39845.pdf (last visited June 20, 2007).

[65] Steven C. Hall and Marcus A. Wood, "Regulatory and Transmission-Related Issues" 10-6 from *The Law of Wind* (Stoel Rives, LLP, 3d ed. 2006), *available at* http://www.stoel.com/webfiles/LawOfWind_WEB_02_07.pdf (last visited June 19, 2007).

[66] FERC Order No. 890, Appendix C, *Pro Forma Open Access Transmission Tariff* ¶ 15.4(c); *see also* FERC Order No. 890, at 527 n.556 ("Conditional firm point-to-point service . . . and planning redispatch point-to-point service . . . are options available under long-term firm point-to-point service.").

[67] Stoel Rives, LLP, *EnergyLaw Alert: Order No. 890: FERC Creates New Transmission Service Rules for Wind Energy: Prying Open the Black Box* (Feb. 22, 2007), available at http://www.stoel.com/showalert.aspx?Show=2302 (last visited June 20, 2007).

power grid by making available line capacity that is only used occasionally but would be considered unavailable year-round under a long-term firm contract.[68]

2. Generation Imbalance

Wind projects are also subject to charges for additional, "ancillary" transmission services designed to help ensure the safety and reliability of the electric grid. One such service that has been particularly problematic for wind facilities is *generation imbalance service*, which a wind facility is required to pay for if it delivers an amount of energy that is different from the amount it had reserved on the system.[69] Because wind projects cannot control or predict the exact amount of electricity that will be generated by the project in a given time period, they have been historically disadvantaged by these charges.

FERC's new OATT order addresses this issue with new rules specifying that imbalance charges for wind should be based on actual costs to the transmission provider for dealing with the imbalance.[70] This ensures that wind facilities are not unduly penalized for the intermittent nature of their energy resource.

Some larger wind projects have also responded to challenges created by the intermittency of the wind by contracting with other electricity generators to provide "firming and shaping" products to the wind facility. This means that the other energy generator agrees to take or supply energy as needed to keep the wind facility's output in line with its scheduled reserved capacity in the transmission system. These arrangements may not be available in all

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[68] Steven C. Hall and Marcus A. Wood, "Regulatory and Transmission-Related Issues" 10-6 from *The Law of Wind* (Stoel Rives, LLP, 3d ed. 2006), *available at* http://www.stoel.com/webfiles/LawOfWind_WEB_02_07.pdf (last visited June 19, 2007).

[69] Steven C. Hall and Marcus A. Wood, "Regulatory and Transmission-Related Issues" 10-5 to 10-6 from *The Law of Wind* (Stoel Rives, LLP, 3d ed. 2006), *available at* http://www.stoel.com/webfiles/LawOfWind_WEB_02_07.pdf (last visited June 19, 2007).

[70] FERC Order No. 890, Appendix C, *Pro Forma Open Access Transmission Tariff*, Schedule 9.

areas, and may also be expensive.[71] Moreover, their continued need, given the 2007 OATT changes, is uncertain.

[71] Steven C. Hall and Marcus A. Wood, "Regulatory and Transmission-Related Issues" 10-5 to 10-6 from *The Law of Wind* (Stoel Rives, LLP, 3d ed. 2006), *available at* http://www.stoel.com/webfiles/LawOfWind_WEB_02_07.pdf; Steven Stoft, Carrie Webber, and Ryan Wiser, *Transmission Pricing and Renewables: Issues, Options, and Recommendations* 24 (Lawrence Berkeley Nat'l Lab. May 1997), *available at* http://eetd.lbl.gov/EA/EMP/reports/39845.pdf (both sites last visited June 19, 2007).