Process for Interconnection

Step 1 Application (By Applicant)

Once a decision has been made by the Applicant, that they would like to interconnect a Generation System with the Area EPS, the Applicant shall supply the Area EPS with the following information:

1) Completed Generation Interconnection Application (Appendix C), including;
   a) One-line diagram showing;
      i) Protective relaying.
      ii) Point of Common Coupling.
   b) Site plan of the proposed installation.
   c) Proposed schedule of the installation.
2) Payment of the application fee, according to the following sliding scale.

Generation Interconnection Application Fees

Interconnection Type	≤ 20kW	>20kW & ≤250kW	>250kW & ≤500kW	> 500 kW & ≤1000kW	>1000 kW
Open Transfer	$0	$0	$0	$100	$100
Quick Closed	$0	$100	$100	$250	$500
Soft Loading	$100	$250	$500	$500	$1000
Extended Parallel (Pre Certified System)	$0	$250	$1000	$1000	$1500
Other Extended Parallel Systems	$100	$500	$1500	$1500	$1500

This application fee is to contribute to the Area EPS Operator's labor costs for administration, review of the design concept and preliminary engineering screening for the proposed Generation System interconnection.

For the Application Fees chart, above;
The size (kW) of the Generation System is the total maximum Nameplate Capacity of the Generation System.

3. Types of Interconnections

A) The manner in which the Generation System is connected to and disconnected from the Area EPS can vary. Most transfer systems normally operate using one of the following five methods of transferring the load from the Area EPS to the Generation System.

B) If a transfer system is installed which has a user accessible selection of several transfer modes, the transfer mode that has the greatest protection requirements will establish the protection requirements for that transfer system.

i) Open Transition (Break-Before-Make) Transfer Switch – With this transfer switch, the load to be supplied from the Distributed Generation is first disconnected from the Area EPS and then connected to the Generation. This transfer can be relatively quick, but voltage and frequency excursions are to be expected during transfer. Computer equipment and other sensitive equipment will shut down and reset. The transfer switch typically consists of a standard UL approved transfer switch with mechanical interlocks between the two source contactors that drop the Area EPS source before the Distributed Generation is connected to supply the load.

(1) To qualify as an Open Transition switch and the limited protective requirements, mechanical interlocks are required between the two source contacts. This is required to ensure that one of the contacts is always open and the Generation System is never operated in parallel with the Area EPS. If the mechanical interlock is not present, the protection requirements are as if the switch is a closed transition switch.

(2) As a practical point of application, this type of transfer switch is typically used for loads less then 500kW. This is due to possible voltage flicker problems created on the Area EPS, when the load is removed from or returned to the Area EPS source. Depending up the Area EPS's stiffness this level may be larger or smaller then the 500kW level.

(3) Figure 1 at the end of this document provides a typical one-line of this type of installation.

ii) Quick Open Transition (Break-Before-Make) Transfer Switch – The load to be supplied from the Distributed Generation is first disconnected from the Area EPS and then connected to the Distributed Generation, similar to the open transition. However, this transition is typically much faster (under 500 ms) than the conventional open transition transfer operation. Voltage and frequency excursions will still occur, but some computer equipment and other sensitive equipment will typically not be affected with a properly designed system. The transfer switch consists of a standard UL approved transfer switch, with mechanical interlocks between the two source contacts that drop the Area EPS source before the Distributed Generation is connected to supply the load.

(1) Mechanical interlocks are required between the two source contacts to ensure that one of the contacts is always open. If the mechanical interlock is not present, the protection requirements are as if the switch is a closed transition switch

(2) As a practical point of application this type of transfer switch is typically used for loads less then 500kW. This is due to possible voltage flicker problems created on the Area EPS, when the load is removed from or returned to the Area EPS source. Depending up the Area EPS's stiffness this level may be larger or smaller than the 500kW level.

(3) Figure 2 at the end of this document provides a typical one-line of this type of installation and shows the required protective elements.

iii) Closed Transition (Make-Before-Break) Transfer Switch – The Distributed Generation is synchronized with the Area EPS prior to the transfer occurring. The transfer switch then parallels with the Area EPS for a short time (100 msec. or less) and then the Generation System and load is disconnect from the Area EPS. This transfer is less disruptive than the Quick Open Transition because it allows the Distributed Generation a brief time to pick up the load before the support of the Area EPS is lost. With this type of transfer, the load is always being supplied by the Area EPS or the Distributed Generation.

(1) As a practical point of application this type of transfer switch is typically used for loads less then 500kW. This is due to possible voltage flicker problems created on the Area EPS, when the load is removed from or returned to the Area EPS source. Depending up the Area EPS's stiffness this level may be larger or smaller then the 500kW level.

(2) Figure 2 at the end of this document provides a typical one-line of this type of installation and shows the required protective elements. The closed transition switch must include a separate parallel time limit relay, which is not part of the generation control PLC and trips the generation from the system for a failure of the transfer switch and/or the transfer switch controls.

iv) Soft Loading Transfer Switch

(1) With Limited Parallel Operation – The Distributed Generation is paralleled with the Area EPS for a limited amount of time (generally less then 1-2 minutes) to gradually transfer the load from the Area EPS to the Generation System. This minimizes the voltage and frequency problems, by softly loading and unloading the Generation System.

(a) The maximum parallel operation shall be controlled, via a parallel timing limit relay (62PL). This parallel time limit relay shall be a separate relay and not part of the generation control PLC.

(b) Protective Relaying is required as described in section 6.

(c) Figure 3 at the end of this document provide typical one-line diagrams of this type of installation and show the required protective elements.

(2) With Extended Parallel Operation – The Generation System is paralleled with the Area EPS in continuous operation. Special design, coordination and agreements are required before any extended parallel operation will be permitted. The Area EPS interconnection study will identify the issues involved.

(a) Any anticipated use in the extended parallel mode requires special agreements and special protection coordination.

(b) Protective Relaying is required as described in section 6.

(c) Figure 4 at the end of this document provides a typical one-line for this type of interconnection. It must be emphasized that this is a typical installations only and final installations may vary from the examples shown due to transformer connections, breaker configuration, etc.

v) Inverter Connection

This is a continuous parallel connection with the system. Small Generation Systems may utilize inverters to interface to the Area EPS. Solar, wind and fuel cells are some examples of Generation which typically use inverters to connect to the Area EPS. The design of such inverters shall either contain all necessary protection to prevent unintentional islanding, or the Interconnection Customer shall install conventional protection to affect the same protection. All required protective elements for a soft-loading transfer switch apply to an inverter

connection. Figure 5 at the end of this document, shows a typical inverter interconnection.

(1) Inverter Certification – Prior to installation, the inverter shall be Type-Certified for interconnection to the electrical power system. The certification will confirm its anti-islanding protection and power quality related levels at the Point of Common Coupling. Also, utility compatibility, electric shock hazard and fire safety are approved through UL listing of the model. Once this Type Certification is completed for that specific model, additional design review of the inverter should not be necessary by the Area EPS operator.

(2) For three-phase operation, the inverter control must also be able to detect and separate for the loss of one phase. Larger inverters will still require custom protection settings, which must be calculated and designed to be compatible with the specific Area EPS being interconnected with.

(3) A visible disconnect is required for safely isolating the Distributed Generation when connecting with an inverter. The inverter shall not be used as a safety isolation device.

(4) When banks of inverter systems are installed at one location, a design review by the Area EPS must be preformed to determine any additional protection systems, metering or other needs. The issues will be identified by the Area EPS during the interconnection study process

Generation Interconnection Application

WHO SHOULD FILE THIS APPLICATION: Anyone expressing interest to install generation which will interconnect with the Federated Rural Electric Association. This application should be completed and returned to the Federated Rural Electric Association Generation Interconnection Coordinator, in order to begin processing the request.

INFORMATION: This application is used by the Federated Rural Electric Association Operator to perform a preliminary interconnection review. The Applicant shall complete as much of the form as possible. The fields in BOLD are required to be completed to the best of the Applicant's ability. The Applicant will be contacted if additional information is required. The response may take up to 15 business days after receipt of all the required information.

COST: A payment to cover the application fee shall be included with this application. The application fee amount is outlined in the "State of Minnesota Interconnection Process for Distributed Generation Systems".

OWNER/APPLICANT		
Company / Applicant's Name:		
Representative:	**Phone Number:**	**FAX Number:**
Title:		
Mailing Address:		
Email Address:		
LOCATION OF GENERATION SYSTEM INTERCONNECTION		
Street Address, legal description or GPS coordinates:		
PROJECT DESIGN / ENGINEERING (if applicable)		
Company:		
Representative:	Phone:	FAX Number:
Mailing Address:		
Email Address:		
ELECTRICAL CONTRACTOR (if applicable)		
Company:		
Representative:	Phone:	FAX Number:
Mailing Address:		
Email Address:		
GENERATOR		
Manufacturer:		Model:
Type (Synchronous Induction, Inverter, etc):		**Phases: 1 or 3**
Rated Output (Prime kW):	**(Standby kW):**	**Frequency:**
Rated Power Factor (%):	**Rated Voltage (Volts):**	Rated Current (Amperes):
Energy Source (gas, steam, hydro, wind, etc.)		
TYPE OF INTERCONNECTED OPERATION		
Interconnection / Transfer method: □ **Open** □ **Quick Open** □ **Closed** □ **Soft Loading** □ **Inverter**		
Proposed use of generation: (Check all that may apply) □ **Peak Reduction** □ **Standby** □ **Energy Sales** □ **Cover Load**	**Duration Parallel:** □ **None** □ **Limited** □ **Continuous**	
Pre-Certified System: Yes / No (Circle one)	**Exporting Energy Yes / No (Circle one)**	

ESTIMATED LOAD INFORMATION		
The following information will be used to help properly design the interconnection. This information is not intended as a commitment or contract for billing purposes.		
Minimum anticipated load (generation not operating):	**kW:**	**kVA:**
Maximum anticipated load (generation not operating):	**kW:**	**kVA:**

ESTIMATED START/COMPLETION DATES	
Construction start date:	**Completion (operational) date:**

DESCRIPTION OF PROPOSED INSTALLATION AND OPERATION

Attach a single line diagram showing the switchgear, transformers, and generation facilities. Give a general description of the manner of operation of the generation (cogeneration, closed-transition peak shaving, open-transition peak shaving, emergency power, etc.). Also, does the Applicant intend to sell power and energy or ancillary services and/or wheel power over Federated Rural Electric Association facilities. If there is an intent to sell power and energy, also define the target market.

SIGN OFF AREA:

With this Application, we are requesting the Federated Rural Electric Association Operator to review the proposed Generation System Interconnection. We request that the Federated Rural Electric Association identifies the additional equipment and costs involved with the interconnection of this system and to provide a budgetary estimate of those costs. We understand that the estimated costs supplied by the Federated Rural Electric Association Operator, will be estimated using the information provided. We also agree that we will supply, as requested, additional information, to allow the Federated Rural Electric Association Operator to better review this proposed Generation System interconnection. We have read the "State of Minnesota Distributed Generation Interconnection Requirements" and will design the Generation System and interconnection to meet those requirements.

Applicant Name (print):

Applicant Signature: **Date:**

Windustry Web Site

The Windustry project is now online at www.windustry.org. The web site is designed to answer questions and provide information on topics ranging from the what to look at when considering large or small wind projects, knowing the power of your wind, and what's involved in large utility wind projects. Resources on economics of wind energy, turbine manufacturers, and other wind related information are available. We also have maps and stories of farmers and landowners who currently operate wind machines on their property provide personal insight into the decisions, benefits, and potential problems of wind development. So look us up.

www.windustry.org
Windustry Web Site

On The Windustry Trail

Don't sign on the dotted line until...

In March, Windustry conducted a series of ***Town Meetings on Wind Rights***. Landowners were presented with a outline of legal contract considerations to help them identify issues before signing wind easement contracts. Meetings were held in Pipestone, Lake Benton, Slayton, Moorhead and St. Charles.

More town meetings, ***Harvesting the Wind: A Landowners Perspective*** are being held in early April in Lake Wilson. These meetings are intended to provide even more opportunities for landowners to discuss issues and gather information on the wind development that is taking place in Southwest Minnesota. We have wind energy experts, banking and economic development professionals as speakers to talk about the benefits of the various payment options, tax implications, long term value of the land, and different ways of developing wind projects that include local ownership. All the meetings are free and open to the public.

Other Places to Visit on the Web

The internet contains a wealth of information regarding all aspects of wind energy, turbine design, and more. The following web sites are sources of information we have found valuable:

www.me3.org
Minnesotans for an Energy-Efficient Economy

www.mps.rrnet.com
Moorhead Public Service

www.igc.apc.org/awea/
The American Wind Energy Association

www.nationalwind.org
The National Wind Coordinating Committee

www.wpm.co.nz/
Monthly journal devoted to wind energy

www.ncsc.ncsu.edu/dsire.htm
Federal & State renewable incentives by state

www.homepower.com/hp/
Home Power magazine
Excellent summary of small wind machines and manufacturer information (article title: ***Apples and Oranges***)

IN APRIL, THE U.S. SENATE passed an Energy Bill that includes a Renewable Portfolio Standard (RPS), a provision requiring ten percent of electricity generation in the United States to come from renewable sources by 2020. A national RPS is the single most powerful way to vastly expand the market for wind energy. The House energy bill passed last year does not contain an RPS and the two bills have yet to be reconciled.

Production Tax Credit

IN OTHER GOOD NEWS for wind, congress renewed the Production Tax Credit (PTC) for wind energy in March as part of a long-delayed economic

info@northrock.org.

August 12-23, 2002, Carbondale, Colorado
Women's Wind Energy Workshop. A hands-on workshop for women to learn everything from how to measure the wind to designing a system to doing an actual installation.
Contact: Solar Energy International at www.solarenergy.org.

November 7-8, 2002, Minneapolis Minnesota
Minnesota Wind Conference. Save the date for Windustry's conference on reaching Minnesota's Renewable Energy Objective.

WINDUSTRY™

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SEED **Sustainable Energy for Economic Development**