



Area Engineering

Interconnection of Distributed Generation

DATE: December 4, 2014

Enclosed is a copy of Xcel Energy's "Distributed Generation Standard Interconnection and Power Purchase Tariff."

This document contains the requirements for interconnection to the Xcel Energy Electric Distribution System. The attached Tariff applies to the Interconnection of Distributed Generation Systems up to 10 MW.

Customers seeking interconnection to operate any DG facility must complete required documents listed in the table on tariff Sheet 91. Refer to original Sheet 92 of the tariff document for an overview of the interconnection process and associated application fees and study costs. The application is found in Appendix B, Sheets 102-104. Technical requirements for interconnection are found in the "Distributed Generation Interconnection Requirements" section beginning on sheet 135.

Return the application form and fee to:

Bode Falade
5309 West 70th St
Edina, MN 55439
Olabode.B.Falade@xcelenergy.com

Xcel Energy will review your Application and provide comments back to you within 15 business days regarding the feasibility, issues, and potential costs of your Interconnection request.

In order to aid with the time required to review your application, please include the following information with your application.

- Application Form signed by customer
- A **One-Line** diagram, or circuit diagram, showing the installation of your system is required. The following information is required on the 1-line:
 - Customer name, installation address (valid, permanent 911 or USPS address, not GPS coordinates), and installer name and contact info.
 - Main service meter and main service panel
 - Production meter, if applicable. Note ownership.

- Visible, lockable AC disconnect for Utility use.
- All Switches, Breakers, fuses, Junction boxes, Combiner boxes, protective devices, etc. in the electrical circuit from the main service meter to the generation system.
- Generator system (PV Panels)
- Clearly provide electrical ratings of the equipment. Volts, Amps, # phases, kW, etc.
- Clearly note if the Inverter(s) are UL1741 certified.
- Grounding Transformers and/or ground referencing equipment.
- Indicate all distributed generation systems, both new and existing .
- **Site Plan** identifying location of equipment noted on the 1-line.
 - Customer name, installation address, and installer name and contact info.
 - Building and Streets identified and Nautical direction
 - A detail view or plan view may be required to clearly show location of meters, main service and AC disconnect, i.e. interior or exterior wall, etc.
 - Note distance between equipment. The AC Disconnect should be readily accessible and typically located within 10' of the main service meter.
 - Include location of new and existing systems
- **Label Details**
 - Labels to be weatherproof, durable and permanently mounted
 - Demonstrate compliance with NEC
 - Include label on Main Service Meter, "Generation System Connected", or similar.
 - Include Label "Utility AC Disconnect"

If you have additional questions, please contact Bode Falade.

**DISTRIBUTED RESOURCES
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1st Revised Sheet No. TOC-1

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF**

Section No. 10
1st Revised Sheet No. 73

AVAILABILITY

Available to retail electric customers at distribution voltages and who operate a qualifying distributed generating (DG) facility, as defined below, with nameplate rating of 10,000 kW or less, which is operated in parallel with Company's distribution system. Such DG facilities may be up to 35,000 volts at three-phase. Single-phase DG facilities, generally, must not exceed a nameplate rating of 25 kW. Single phase facilities larger than 25 kW may be permitted if the capacity of the DG facility does not exceed the customer's single phase service capacity. Company will evaluate and approve all DG facility interconnection plans on case-by-case basis.

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QUALIFICATION

1. Qualifying DG facilities may include but are not limited to, fuel cell, wind, solar, micro turbine generators and other utility industry accepted DG technologies, subject to Company's approval.
2. Qualifying DG facilities may be those which do not qualify as "Qualifying Facilities" (QFs) under the Public Utility Regulatory Policy Act of 1978 (PURPA) or those which are QFs but where the customer elects not to exercise its rights to the pricing provided for under PURPA.
3. Qualifying DG facilities must be a permanently installed or similarly dedicated mobile generator serving the customer receiving retail electric service from the Company at the same site.

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APPLICATION

Customer seeking to interconnect and to operate a DG facility in parallel with the Company's system must complete and submit to Company a signed Generation Interconnection Application Form ("Interconnection Application") along with the applicable Interconnection Application Fee. The schedule for Generation Interconnection Application Fees, are provided under "*Process for Interconnection Step 1 Application (By Applicant)*" of this tariff. Company will initiate a review of the DG project upon receipt of complete information needed for Interconnection Application.

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STUDIES

Interconnection study or studies are required and shall be conducted by Company as part of the terms and conditions of service under this tariff. See the Process for Interconnection of this tariff for more information regarding these studies. See the Generation Interconnection Application Fees under the *Process for Interconnection Step 1 Application (By Applicant)* of this tariff. A fee for the engineering studies will also be assessed as provided for under the "*Process for Interconnection Step 2 Preliminary Review*" of this tariff. Any other studies and services provided pursuant to agreement between the customer and Company, may be subject to Commission review. All review and study fees are non-refundable, whether or not the customer decides to pursue the project.

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(Continued on Sheet No. 10-74)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
4th Revised Sheet No. 74

CONTRACTS

Customers must execute an Interconnection Agreement to provide for the interconnection of DG facilities. The Interconnection Agreement form is provided in Appendix "E" of this tariff, which addresses the costs and responsibilities associated with making interconnection of the DG facility with the Company's distribution system. If customer intends to sell energy and capacity to the Company, customer must also execute a Power Purchase Agreement (PPA) with the Company. The term of these agreements may be up to 20 years. Each customer DG project under this tariff will be evaluated on a customer-specific and site-specific basis, to determine eligibility, system reliability and impact on Company's transmission and distribution systems.

To qualify for a contract under this tariff, the customer must be doing one of the following: (1) Selling all of the DG energy to the Company, (2) Supplying all of the DG energy to itself, or (3) Self generating part of its needs and selling the remaining energy to the Company. The Company shall purchase all electricity generated and offered for sale to the Company by the DG facility pursuant to the terms, conditions and price schedule provided in the PPA. Under certain circumstances the customer may qualify for a Distribution Facility Credit, which shall be governed under the Interconnection Agreement.

STANDBY SERVICE REQUIREMENTS

As indicated above, customer may sell the DG energy to the Company or use the DG energy to serve customer's own load. There is no requirement to contract for Standby Services if all of the DG energy is sold to the Company. There is also no requirement to contract for Standby Services in cases where the customer uses the DG energy to serve their own load, provided the maximum capacity of the DG is 100 kW or less. See the Company's Standby Service Rider tariff for details concerning the provision of Standby Service.

A customer choosing to use DG to serve more than 100 kW of their own load must either contract for Standby Services under the Company's Standby Service Rider or choose to be a "physical assurance" customer. A physical assurance customer is a customer who agrees to not require standby services and has a mechanical device that ensures that standby service is not taken. The cost of the physical assurance device, is to be paid by the DG customer.

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(Continued on Sheet No. 10-75)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
2nd Revised Sheet No. 75

DISTRIBUTION FACILITY CREDIT

Customer may also be eligible for a Distribution Facility Credit (DFC). Upon request, a list of substation areas or feeders that may be candidates for distribution credits, as determined through the Company's normal distribution planning process, shall be provided to the Customer. The terms and conditions of such credit shall be determined from a case-specific study of avoided distribution costs. Such study shall include review of both avoided distribution lines and avoided distribution transformers.

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The value of the DFC shall be equal to the Company's avoided distribution costs resulting from the installation of the DG facility. The avoided distribution costs are based on Company's annual distribution capacity planning study that identifies capacity needs, any corresponding required upgrades and load growth on area distribution feeders. Upon receiving a DG application, and as part of the case specific study, the Company will perform an initial screen of the DG project to determine if the project is located on a distribution feeder that has potential for a DFC. The DG customer is responsible for the cost of such screening study. If the screening study shows that there exists potential for a DFC, the Company shall, at its own cost, pursue further study to determine the DFC, as part of an annual distribution capacity study. Once established by contract and accepted by Company and customer, DFC shall be fixed over the term of the contract.

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LINE LOSS CREDITS

If Customer requests the Company to provide a specific line loss study, Customer may be eligible for additional line loss credits if the study supports such credits. The Customer is responsible for the cost of the study, regardless of the study's outcome.

RENEWABLE ENERGY AND EMISSION CREDITS

The definition of and the ownership rights to any and all renewable energy credits, emissions reduction credits, or allowances associated with the energy purchased by the Company from the DG customer will be specified by the terms and conditions of the PPA.

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(Continued on Sheet No. 10-76)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
1st Revised Sheet No. 76

POWER PURCHASE AGREEMENT TERMS

Energy and Capacity Purchase Payments

Energy Payment: The energy payment rate schedule shall be based on Company's expected average marginal energy costs for on-peak and off-peak periods for each month of the year. The energy payment rate shall be updated annually. The table below is intentionally left blank. However, upon written request by customer and after signing a confidentiality agreement, Company shall provide Customer the current schedule of energy payments.

Payment Schedule for Energy Delivered to Company
Energy Payment per kWh

Month	On-Peak	Off-Peak
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

(Continued on Sheet No. 10-77)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
1st Revised Sheet No. 77

Energy and Capacity Purchase Payments (Continued)

Capacity Payment: The capacity payment shall be based on the total accredited DG capacity made available to the Company. The capacity payment rate shall be set for the term of the PPA agreement based on the year in which the agreement is signed and that rate may escalate during the term of the agreement.

The total dollar capacity payment shall be the product of the monthly accredited capacity in kW for the billing month and the capacity payment rate. The procedure to determine monthly accredited capacity is defined in the PPA and the method of determining the capacity payment rate is indicated below.

Upon written request of the customer, which includes the required customer specified parameters, Company shall determine the capacity payment rate. The starting value for capacity payment rate will be taken from the Company's *Annual Filing of Cogeneration and Small Power Production Tariffs* and will be adjusted based on project specifics characteristics as described below. The fixed escalation rate is 2.5% per year to be applied on the anniversary of the commercial operation date.

- 1) The need for capacity is established in the utility's most recent integrated resource plan (IRP). A need exists if the utility shows a deficit at any year of the 5-year planning period.
- 2) Capacity payments should be made for the total accredited DG capacity, regardless of when the power is delivered to the system.
- 3) The expected life of a capacity addition is the expected life of the specific capacity addition from the utility's most recently approved integrated resource plan (IRP).
- 4) If the contract to purchase power from a DG source happens to begin at the time the utility needs the capacity, the full capacity payment is made and would be adjusted only for the length of the contract (i.e., in such a case, there is no discount to the capacity payment for adding capacity sooner than IRP indicates that it is needed).
- 5) The formula for potential adjustments to capacity payments based on the timing difference between IRP indicated need and the actual DG in-service date is:

$$A2 = \frac{(1+i)^m - 1}{(1+i)^n - 1} \cdot \frac{(1+i)^{n-a} - (1+e)^{n-a}}{(1+i)^m - (1+e)^m} \cdot A1$$

Where:

A1 = Levelized annual value of a capacity purchase at the time of need.

A2 = Levelized annual value of the capacity paid for in a power purchase contract.

m = Expected lifetime of ordinary (alternative) future capacity addition.

n = Length of power purchase contract.

i = Utility Cost of Capital.

e = Escalation rate affecting value of new capacity additions.

a = Length of time between beginning of contract and time of need for capacity.

(Continued on Sheet No. 10-78)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
1st Revised Sheet No. 78

Definition of Peak Periods

The on-peak period is defined as those hours between 9:00 a.m. and 9:00 p.m. Monday through Friday, except the following holidays: New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

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When a designated holiday occurs on a Saturday, the preceding Friday will be designated a holiday. When a designated holiday occurs on a Sunday, the following Monday will be designated a holiday. The off-peak period is defined as all other hours not designated as on-peak hours.

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Summer months are July and August; Non-Summer months are all other months. Definition of on-peak and off-peak periods is subject to change with change in Company's system operating characteristics or electric energy market standards.

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TERMS AND CONDITIONS OF SERVICE

1. Electric service provided by Company to customer at the same site during the same billing period shall be billed in accordance with the appropriate retail electric rates; thus, supplemental load service shall be provided to the DG customer through the Company's base electric rates. Company shall pay customer each month according to the applicable Energy and Capacity Purchase Payments and any applicable Distribution Facility Credit, established in the contracts under this tariff.
2. The customer must enter an Interconnection Agreement with the Company for the interconnection and parallel operation of any qualifying DG facility under this tariff.
3. In order to receive energy and capacity payments, the customer must execute a Power Purchase Agreement with Company.
4. Customer is responsible for any applicable study fees and interconnection costs. The customer must pay all such costs as specified in the Interconnection Agreement.
5. The customer shall be responsible for all costs associated with the installation, operation, and maintenance of the facility.
6. Company may assess a monthly fee for metering and billing the Energy and Capacity Purchase Payments and any applicable Distribution Facility Credit transactions. Typical costs for meter reading and billing are shown below. For most DG installations, two meters are required. The appropriate metering options available are determined on a project-by-project basis. For further information, please see "Generation, Metering, Monitoring and Control" beginning on tariff sheet 147 of the Interconnection Process for Distributed Generation Systems.
7. The voltage and phase of customer's distributed generation facility must be consistent with existing retail service configuration and is approved by the Company in accordance with the Company's interconnection requirements.
8. The customer must maintain a power factor close to unity as possible or as specified in the "Power Factor" provision of the "Distributed Generation Interconnection Requirements" section of this tariff.

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(Continued on Sheet No. 10-79)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
2nd Revised Sheet No. 79

TERMS AND CONDITIONS OF SERVICE (Continued)

9. Customer's DG facility shall not commence parallel operation until it has established, to the satisfaction of the Company that it complies with and has met the standards set forth in any applicable Commission or the Midwest Reliability Organization (MRO) or any successor organization rules, as well as the requirements specified in the *"Distributed Generation Interconnection Requirements"* section of this tariff. If the interconnecting device is not Type-Certified or if multiple devices are operated in parallel at the facility, review and approval of the interconnecting devices and protection systems by a Professional Electrical Engineer, registered in the State of Minnesota, is required. T
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10. In addition to an automatic fail-safe device, the Company will require an accessible, company approved disconnection device having the capability of isolating the energy generated by each distributed generation facility. This device may be operated by either party at any time in order to maintain safe operating conditions.
11. The DG customer shall be responsible for any additional expense not covered in the terms and conditions of the Interconnection Agreement, which may be incurred by the Company on behalf of the customer or as a result of the customer's DG facility. The range of typical DG interconnection costs is shown below along with typical modifications and upgrades included in the interconnection cost. T
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12. During the term of the Interconnection Agreement the DG customer shall maintain liability insurance which insures customer against all claims for property damage and for personal injury or death arising out of, resulting from, or in any manner connected with the installation, operation, and maintenance of the DG facility. The amount of such insurance coverage shall be as specified in the Interconnection Agreement.
13. The Company is under no obligation to revise or transfer customer's existing Qualifying Facility (QF) contract(s) still in effect to an alternative PPA, which is subsequently made available. T
14. In order to be eligible to receive a capacity payment, the facility must meet the requirements for capacity accreditation in the Midwest Reliability Organization (MRO) or any successor organization, as specified in the rules and procedures of the Midwest Reliability Organization (MRO) or any successor organization. T
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15. The Company shall have the right to seek capacity accreditation through its own effort with its affiliated power pool and customer will provide reasonable cooperation.
16. The Company shall recover energy costs associated with these purchases pursuant to the provisions of the Fuel Clause Rider.

(Continued on Sheet No. 10-80)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
1st Revised Sheet No. 80

TYPICAL COSTS FOR METER READING AND BILLING

Meter Reading	\$1.00
Billing	\$5.00
Total Monthly Cost	\$6.00

Notes:

1. See Table 5a, Section 10, Sheet 148 of Tariff for further information on metering.
2. Costs in the table do not include the initial cost of metering and installation costs.
3. Costs in the table do not include services and metering provided to the customer under a traditional, non-DG tariffed rate.
4. Additional customer requested meters, special configurations, or severe access problems that are not covered in the tariff are not included in the table and may result in higher monthly fees.
5. Meter costs provided are on a per meter basis.
6. Billing costs provided are on a per billing account basis.
7. Arrangements not covered in the tariff are not included in the table and may result in higher monthly fees.
8. The above does not include monthly telemetry costs.

Range of Typical DG Interconnection Costs

DG Size Range	Limited Parallel	Extended Parallel
0 - <40 kW	\$300 to \$10,000	\$300 to \$10,000
40 - 250 kW	\$500 to \$15,000	\$500 to \$20,000
>250 – 1000 kW	\$2,000 to \$25,000	\$2,000 to \$150,000
>1 MW	\$5,000 to \$35,000	\$5,000 to \$1,000,000

Notes:

1. All costs are scoping estimates. Actual circumstances and detailed studies, as specified in the tariff, will determine the actual requirements and costs.
2. Costs provided for Limited Parallel interconnections assume no intentional power flowing to Xcel Energy and the parallel operation is of limited duration such as during a closed transition load transfer.
3. Cost provided for > 1 MW does not include telemetry costs.
4. The minimum cost value entails a simple interconnection with no system modifications required.
5. The maximum cost value provides a high-end estimate that includes significant system modifications. The values assume that the generation facility is of a size that is easily accommodated by an existing system. Generation facilities that are large compared to the "strength" (load capacity and fault current capability) of the distribution system can require extensive system upgrades far in excess of the cost values provided in the table.
6. Costs provided do not include additional expenses imposed by local government requirements. For example, a local ordinance that requires all new distribution to be built underground may result in significant costs beyond those represented in the table.

(Continued on Sheet No. 10-81)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
1st Revised Sheet No. 81

Types of Typical Modifications and Upgrades Included in the Interconnection Cost Range Table

0 – 40 kW

- Larger distribution transformer
- Re-conductoring of secondary loop
- Separation of DG from non-DG customers on secondary

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40 – 250 kW

- Relocation of fuse
- Relocation of line re-closer
- Line re-closer setting changes
- Additional distribution transformer for DG

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250 – 1000 kW

- Relocation of fuse
- Relocation, installation, or removal of line re-closer
- Line re-closer and/or substation setting changes
- Replacement of line re-closer or sectionalizer with electronic controlled re-closer to provide additional protective functions
- Re-conductoring of short line segments
- Conversion of short line segments from single-phase to three-phase
- Construction of new line segments
- Additional distribution transformer for DG

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> 1000 kW

- Relocation of fuse
- Relocation, installation, or removal of line re-closer
- Line re-closer and/or substation setting changes
- Replacement of line re-closer, sectionalizer, and/or substation feeder re-closer with electronic controlled re-closer to provide additional protective functions
- Installation of a transfer trip ("TT") from the substation breaker to the customer required for most DG installations of this size.
- Addition of voltage supervision of reclosing to substation breaker
- Re-conductoring of line segments or construction of new line segments
- Conversion of line segments from single-phase to three-phase
- Additional distribution transformer for DG

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Types of Typical Modifications and Upgrades Included in the Interconnection Cost Range Table (Continued)

Note: The modifications indicated above are typical and are not all inclusive. Specific field conditions may require other, non-typical changes. Modifications are determined and justified in the facility studies, as specified in the tariff. Depending on the generation facility size, location, type, and existing facilities, none to all of the above could be included.

(Continued on Sheet No. 10-82)

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Minneapolis, Minnesota 55401

MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 82

Typical Telemetry Cost Range

(When Required for > 1 MW)

\$ 25,000 to \$ 100,000

Note: This does not include the initial and/or continuing cost of the communication channel.

Unusual Costs That May Apply

When a generation facility is large compared to the substation or transmission capacity, the DG may have a transmission impact. In these cases, transmission requirements may be imposed by the transmission company or system operator (MISO). These cost are in accordance with the reliability and operation requirements as governed by FERC and posted publicly by the transmission company or system operator.

(Continued on Sheet No. 10-83)

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Northern States Power Company, a Minnesota corporation
and wholly owned subsidiary of Xcel Energy Inc.
Minneapolis, Minnesota 55401

MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 83

**State of Minnesota
Interconnection Process
for Distributed Generation Systems**

INTRODUCTION

This document has been prepared to explain the process established in the State of Minnesota, to interconnect a Generation System with Xcel Energy. This document covers the interconnection process for all types of Generation Systems which are rated 10MW's or less of total generation Nameplate Capacity; are planned for interconnection with Xcel Energy; are not intended for wholesale transactions and aren't anticipated to affect the transmission system. This document does not discuss the interconnection Technical Requirements, which are covered in the **"State of Minnesota Distributed Generation Interconnection Requirements"** document. This other interconnection requirements document also provides definitions and explanations of the terms utilized within this document. To interconnect a Generation System with Xcel Energy, there are several steps that must be followed. This document outlines those steps and the Parties' responsibilities. At any point in the process, if there are questions, please contact the Generation Interconnection Coordinator at Xcel Energy. Since this document has been developed to provide an interconnection process which covers a very diverse range of Generation Systems, the process appears to be very involved and cumbersome. For many Generation Systems the process is streamlined and provides an easy path for interconnection.

The promulgation of interconnection standards for Generation Systems by the Minnesota Public Utilities Commission (MPUC) must be done in the context of a reasonable interpretation of the boundary between state and federal jurisdiction. The Federal Energy Regulatory Commission (FERC) has asserted authority in the area, at least as far as interconnection at the transmission level is concerned. This, however, leaves open the question of jurisdiction over interconnection at the distribution level. The Midwest Independent System Operator's (MISO) FERC Electric Tariff, (first revised volume 1, August 23,2001) Attachment R (Generator Interconnection Procedures and Agreement) states in section 2.1 that "Any existing or new generator connecting at transmission voltages, sub-transmission voltages, or distribution voltages, planning to engage in the sale for resale of wholesale energy, capacity, or ancillary services requiring transmission service under the Midwest ISO OATT must apply to the Midwest ISO for interconnection service". Further in section 2.4 it states that "A Generator not intending to engage in the sale of wholesale energy, capacity, or ancillary services under the Midwest ISO OATT, that proposes to interconnect a new generating facility to the distribution system of a Transmission Owner or local distribution utility interconnected with the Transmission System shall apply to the Transmission Owner or local distribution utility for interconnection". It goes on further to state "Where facilities under the control of the Midwest ISO are affected by such interconnection, such interconnections may be subject to the planning and operating protocols of the Midwest ISO...."

Through discussions with MISO personnel and as a practical matter, if the Generation System Nameplate Capacity is not greater in size than the minimum expected load on the distribution substation, that is feeding the proposed Generation System, and Generation System's energy is not being sold on the wholesale market, then that installation may be considered as not "affecting" the transmission system and the interconnection may be considered as governed by this process. If the Generation System will be selling energy on the wholesale market or the Generation System's total Nameplate Capacity is greater than the expected distribution substation minimum load, then the Applicant shall contact MISO (Midwest Independent System Operator) and follow their procedures.

(Continued on Sheet No. 10-84)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 84

GENERAL INFORMATION

A. Definitions

1. "Applicant" is defined as the person or entity who is requesting the interconnection of the Generation System with Xcel Energy and is responsible for ensuring that the Generation System is designed, operated and maintained in compliance with the Technical Requirements.
2. "Area EPS" is defined as an electric power system (EPS) that serves Local EPS's. For the purpose of this tariff, the Xcel Energy system is the Area EPS. Note. Typically, Xcel Energy has primary access to public rights-of-way, priority crossing of property boundaries, etc.
3. "Area EPS Operator" is the entity who operates the electric power system. For the purpose of this tariff, Xcel Energy is the Area EPS Operator.
4. "Dedicated Facilities" is the equipment that is installed due to the interconnection of the Generation System and not required to serve other Xcel Energy customers.
5. "Distribution System" is the Xcel Energy facilities that are not part of the Xcel Energy Transmission System or any Generation System.
6. "Extended Parallel" means the Generation System is designed to remain connected with Xcel Energy for an extended period of time.
7. "Generation" is defined as any device producing electrical energy, i.e., rotating generators driven by wind, steam turbines, internal combustion engines, hydraulic turbines, solar, fuel cells, etc.; or any other electric producing device, including energy storage technologies.
8. "Generation Interconnection Coordinator" is the person or persons designated by Xcel Energy to provide a single point of coordination with the Applicant for the generation interconnection process.
9. "Generation System" is the interconnected generator(s), controls, relays, switches, breakers, transformers, inverters and associated wiring and cables, up to the Point of Common Coupling.
10. "Interconnection Customer" is the party or parties who will own/operate the Generation System and are responsible for meeting the requirements of the agreements and Technical Requirements. This could be the Generation System applicant, installer, owner, designer, or operator.

(Continued on Sheet No. 10-85)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 85

GENERAL INFORMATION (Continued)

A. Definitions (Continued)

11. "Local EPS" is an electric power system (EPS) contained entirely within a single premises or group of premises.
12. "Nameplate Capacity" is the total nameplate capacity rating of all the Generation included in the Generation System. For this definition the "standby" and/or maximum rated kW capacity on the nameplate shall be used.
13. "Open Transfer" is a method of transferring the local loads from Xcel Energy to the generator such that the generator and Xcel Energy are never connected together.
14. "Point of Common Coupling" is the point where the Local EPS is connected to Xcel Energy.
15. "Quick Closed" is a method of generation transfer which does not parallel or parallels for less than 100msec with Xcel Energy and has utility grade timers which limit the parallel duration to less than 100 msec with Xcel Energy.
16. "Technical Requirements" is the State of Minnesota Distributed Generation Interconnection Requirements".
17. "Transmission System" means those facilities as defined by using the guidelines established by the Minnesota State Public Utilities Commission; "In the Matter of Developing Statewide Jurisdictional Boundary Guidelines for Functionally Separating Interstate Transmission from Generation and Local Distribution Functions" Docket No. E-015/M-99-1002.

B. Dispute Resolution

The following is the dispute resolution process to be followed for problems that occur with the implementation of this process.

1. Each Party agrees to attempt to resolve all disputes arising hereunder promptly, equitably and in a good faith manner.
2. In the event a dispute arises under this process, and if it cannot be resolved by the Parties within thirty (30) days after written notice of the dispute to the other Party, the Parties shall submit the dispute to mediation by a mutually acceptable mediator, in a mutually convenient location in the State of Minnesota. The Parties agree to participate in good faith in the mediation for a period of 90 days. If the parties are not successful in resolving their disputes through mediation, then the Parties may refer the dispute for resolution to the Minnesota Public Utilities Commission, which shall maintain continuing jurisdiction over this process.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 86

GENERAL INFORMATION (Continued)

C. Xcel Energy Generation Interconnection Coordinator

Xcel Energy shall designate a Generation Interconnection Coordinator(s) and this person or persons shall provide a single point of contact for an Applicant's questions on this Generation Interconnection process. Xcel Energy may have several Generation Interconnection Coordinators assigned, due to the geographical size of its electrical service territory or the amount of interconnection applications. This Generation Interconnection Coordinator will typically not be able to directly answer or resolve all of the issues involved in the review and implementation of the interconnection process and standards, but shall be available to provide coordination assistance with the Applicant

D. Engineering Studies

During the process of design of a Generation System interconnection between a Generation System and Xcel Energy, there are several studies which may need to be undertaken. On the Local EPS (Customers side of the interconnection) the addition of a Generation System may increase the fault current levels, even if the generation is never interconnected with Xcel Energy's system. The Interconnection Customer may need to conduct a fault current analysis of the Local EPS in conjunction with adding the Generation System. The addition of the Generation System may also affect Xcel Energy, and special engineering studies may need to be undertaken looking at Xcel Energy with the Generation System included. Appendix D, lists some of the issues that may need to receive further analysis for the Generation System interconnection.

While, it is not a straightforward process to identify which engineering studies are required, we can at least develop screening criteria to identify which Generation Systems may require further analysis. The following is the basic screening criteria to be used for this interconnection process.

- 1) Generation System total Nameplate Capacity does not exceed 5% of the radial circuit expected peak load. The peak load is the total expected load on the radial circuit when the other generators on that same radial circuit are not in operation.
- 2) The aggregate generation's total Nameplate Capacity, including all existing and proposed generation, does not exceed 25% of the radial circuit peak load and that total is also less than the radial circuit minimum load.
- 3) Generation System does not exceed 15% of the Annual Peak Load for the Line Section, which it will interconnect with. A Line Section is defined as that section of the distribution system between two sectionalizing devices within the distribution system.
- 4) Generation System does not contribute more than 10% to the distribution circuit's maximum fault current at the point at the nearest interconnection with Xcel Energy's primary distribution voltage.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 87

GENERAL INFORMATION (Continued)

D. Engineering Studies (Continued)

- 5) The proposed Generation System total Nameplate Capacity, in aggregate with other generation on the distribution circuit, will not cause any distribution protective devices and equipment to exceed 85 percent of the short circuit interrupting capability.
- 6) If the proposed Generation System is to be interconnected on a single-phase shared secondary, the aggregate generation Nameplate Capacity on the shared secondary, including the proposed generation, does not exceed 20kW.

1. Generation System will not be interconnected with a "networked" system

E. Scoping Meeting

During Step 2 of this process, the Applicant or Xcel Energy has the option to request a scoping meeting. The purpose of the scoping meeting shall be to discuss the Applicant's interconnection request and review the application filed. This scoping meeting is to be held so that each Party can gain a better understanding of the issues involved with the requested interconnection. Xcel Energy and Applicant shall bring to the meeting personnel, including system engineers, and other resources as may be reasonably required, to accomplish the purpose of the meeting. The Applicant shall not expect Xcel Energy to complete the preliminary review of the proposed Generation System at the scoping meeting. If a scoping meeting is requested, Xcel Energy shall schedule the scoping meeting within the 15-business day review period allowed for in Step 2. Xcel Energy shall then have an additional 5 days, after the completion of the scoping meeting, to complete the formal response required in Step 2. The Application fee shall cover Xcel Energy's costs for this scoping meeting. There shall be no additional charges imposed by Xcel Energy for this initial scoping meeting

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 88

GENERAL INFORMATION (Continued)

F. Insurance

1. At a minimum, in connection with the Interconnection Customer's performance of its duties and obligations under this Agreement, the Interconnection Customer shall maintain, during the term of the Agreement, general liability insurance, from a qualified insurance agency with a B+ or better rating by "Best" and with a combined single limit of not less than:
 - a) Two million dollars (\$2,000,000) for each occurrence if the Gross Nameplate Rating of the Generation System is greater than 250kW.
 - b) One million dollars (\$1,000,000) for each occurrence if the Gross Nameplate Rating of the Generation System is between 40kW and 250kW.
 - c) Three hundred thousand (\$300,000) for each occurrence if the Gross Nameplate Rating of the Generation System is less than 40kW.
 - d) Such general liability insurance shall include coverage against claims for damages resulting from (i) bodily injury, including wrongful death; and (ii) property damage arising out of the Interconnection Customer's ownership and/or operating of the Generation System under this agreement.
2. The general liability insurance required shall, by endorsement to the policy or policies, (a) include Xcel Energy as an additional insured; (b) contain a severability of interest clause or cross-liability clause; (c) provide that Xcel Energy shall not by reason of its inclusion as an additional insured incur liability to the insurance carrier for the payment of premium for such insurance; and (d) provide for thirty (30) calendar days' written notice to Xcel Energy prior to cancellation, termination, alteration, or material change of such insurance.
3. If the Generation System is connected to an account receiving residential service from Xcel Energy, and its total generating capacity is smaller than 40kW, then the endorsements required in Section F.2 shall not apply.
4. The Interconnection Customer shall furnish the required insurance certificates and endorsements to Xcel Energy prior to the initial operation of the Generation System. Thereafter, Xcel Energy shall have the right to periodically inspect or obtain a copy of the original policy or policies of insurance.
5. Evidence of the insurance required in Section F.1. shall state that coverage provided is primary and is not excess to or contributing with any insurance or self-insurance maintained by Xcel Energy.
6. If the Interconnection Customer is self-insured with an established record of self-insurance, the Interconnection Customer may comply with the following in lieu of Section F.1 – 5.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 89

GENERAL INFORMATION (Continued)

F. Insurance (Continued)

7. Interconnection Customer shall provide to Xcel Energy, at least thirty (30) days prior to the date of initial operation, evidence of an acceptable plan to self-insure to a level of coverage equivalent to that required under section F.1.
8. If Interconnection Customer ceases to self-insure to the level required hereunder, or if the Interconnection Customer is unable to provide continuing evidence of its ability to self-insure, the Interconnection Customer agrees to immediately obtain the coverage required under section F.1.
9. Failure of the Interconnection Customer or Xcel Energy to enforce the minimum levels of insurance does not relieve the Interconnection Customer from maintaining such levels of insurance or relieve the Interconnection Customer of any liability.

G. Pre-Certification

The most important part of the process to interconnect generation with Local EPS and Xcel Energy is safety. One of the key components of ensuring the safety of the public and employees is to ensure that the design and implementation of the elements connected to the electrical power system operate as required. To meet this goal, all of the electrical wiring in a business or residence, is required by the State of Minnesota to be listed by a recognized testing and certification laboratory, for its intended purpose. Typically we see this as "UL" listed. Since Generation Systems have tended to be uniquely designed for each installation they have been designed and approved by Professional Engineers. This process has been set up to be able to deal with these uniquely designed systems. As the number of Generation Systems installed increase, vendors are working towards creating equipment packages that can be tested in the factory and then will only require limited field testing. This will allow us to move towards "plug and play" installations. For this reason, this interconnection process recognizes the efficiency of "pre-certification" of Generation System equipment packages that will help streamline the design and installation process.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 90

GENERAL INFORMATION (Continued)

G. Pre-Certification (Continued)

An equipment package shall be considered certified for interconnected operation if it has been submitted by a manufacture, tested and listed by a nationally recognized testing and certification laboratory (NRTL) for continuous utility interactive operation in compliance with the applicable codes and standards. Presently generation paralleling equipment that is listed by a nationally recognized testing laboratory as having met the applicable type-testing requirements of UL 1741 and IEEE 929 shall be acceptable for interconnection without additional protection system requirements. An "equipment package" shall include all interface components including switchgear, inverters, or other interface devices and may include an integrated generator or electric source. If the equipment package has been tested and listed as an integrated package which includes a generator or other electric source, it shall not required further design review, testing or additional equipment to meet the certification requirements for interconnection. If the equipment package includes only the interface components (switchgear, inverters, or other interface devices), then the Interconnection Customer shall show that the generator or other electric source being utilized with the equipment package is compatible with the equipment package and consistent with the testing and listing specified for the package. Provided the generator or electric source combined with the equipment package is consistent with the testing ad listing performed by the nationally recognized testing and certification laboratory, no further design review, testing or additional equipment shall be required to meet the certification requirements of this interconnection procedure. A certified equipment package does not include equipment provided by Xcel Energy.

The use of Pre-Certified equipment does not automatically qualify the Interconnection Customer to be interconnected to Xcel Energy. An application will still need to be submitted and an interconnection review may still need to be performed, to determine the compatibility of the Generation System with Xcel Energy.

H. Confidential Information

Except as otherwise agreed, each Party shall hold in confidence and shall not disclose confidential information, to any person (except employees, officers, representatives and agents, who agree to be bound by this section). Confidential information shall be clearly marked as such on each page or otherwise affirmatively identified. If a court, government agency or entity with the right, power, and authority to do so, requests or requires either Party, by subpoena, oral disposition, interrogatories, requests for production of documents, administrative order, or otherwise, to disclose Confidential Information, that Party shall provide the other Party with prompt notice of such request(s) or requirements(s) so that the other Party may seek an appropriate protective order or waive compliance with the terms of this Agreement. In the absence of a protective order or waiver the Party shall disclose such confidential information which, in the opinion of its counsel, the party is legally compelled to disclose. Each Party will use reasonable efforts to obtain reliable assurance that confidential treatment will be accorded any confidential information so furnished.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 91

GENERAL INFORMATION (Continued)

I. Non-Warranty

Neither by inspection, if any, or non-rejection, nor in any other way, does Xcel Energy give any warranty, expressed or implied, as to the adequacy, safety, or other characteristics of any structures, equipment, wires, appliances or devices owned, installed or maintained by the Applicant or leased by the Applicant from third parties, including without limitation the Generation System and any structures, equipment, wires, appliances or devices pertinent thereto.

J. Required Documents

The chart below lists the documents required for each type and size of Generation System proposed for interconnection.

Find your type of Generation System interconnection, across the top, then follow the chart straight down, to determine what documents are required as part of the interconnection process.

NERATION INTERCONNECTION DOCUMENT SUMMARY					
Open Transfer	Quick Closed Transfer	Soft Loading Transfer	Extended Parallel Operation		
			QF facility <40kW	Without Sales	With Sales
Interconnection Process (This document)					
State of Minnesota Distributed Generation Interconnection Requirements					
Generation Interconnection Application (Appendix B)					
		Engineering Data Submittal (Appendix C)			
			Interconnection Agreement (Appendix E)		
				MISO / FERC	
					PPA

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 92

GENERAL INFORMATION (Continued)

J. Required Documents (Continued)

Interconnection Process = "State of Minnesota Interconnection Process for Distributed Generation Systems."
(This document)

State of Minnesota Distributed Generation Interconnection Requirements = "State of Minnesota Distributed
Generation Interconnection Requirements"

Generation Interconnection Application = The application form in Appendix B of this document.

Engineering Data Submittal = The Engineering Data Form/Agreement, which is attached as Appendix C of
this document.

Interconnection Agreement = "Minnesota State Interconnection Agreement for the Interconnection of
Extended Parallel Distributed Generation Systems with Electric Utilities", which is attached as Appendix E to
this document.

MISO = Midwest Independent System Operator, www.midwestiso.org.

FERC = Federal Energy Regulatory Commission, www.ferc.gov.

PPA = Power Purchase Agreement.

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 Xcel
Energy, the Applicant shall supply Xcel Energy with the following information:

- 1) Completed Generation Interconnection Application (Appendix B), 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.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 93

Process for Interconnection (Continued)

Step 1 Application (By Applicant) (Continued)

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 Xcel Energy'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.

Step 2 Preliminary Review (By Xcel Energy)

Within 15 business days of receipt of all the information listed in Step 1, the Xcel Energy Generation Interconnection Coordinator shall respond to the Applicant with the information listed below. (If the information required in Step 1 is not complete, the Applicant will be notified, within 10 business days of what is missing and no further review will be completed until the missing information is submitted. The 15-day clock will restart with the new submittal)

As part of Step 2 the proposed Generation System will be screened to see if additional Engineering Studies are required. The base screening criteria is listed in the general information section of this document.

- 1) A single point of contact with Xcel Energy for this project. (Generation Interconnection Coordinator)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 94

Process for Interconnection (Continued)

Step 2 Preliminary Review (By Xcel Energy) (Continued)

- 2) Approval or rejection of the generation interconnection request.
 - a) Rejection – Xcel Energy shall supply the technical reasons, with supporting information, for rejection of the interconnection Application.
 - b) Approval - An approved Application is valid for 6 months from the date of the approval. The Generation Interconnection Coordinator may extend this time if requested by the Applicant
- 3) If additional specialized engineering studies are required for the proposed interconnection, the following information will be provided to the Applicant. Typical Engineering Studies are outlined in Appendix D. The costs to the Applicant, for these studies shall be not exceed the values shown in the following table for pre-certified equipment.

Generation System Size	Engineering Study Maximum Costs
<20kW	\$0
20kW – 100kW	\$500
100kW – 250kW	\$1000
>250kW or not pre-certified equipment	Actual costs

- a) General scope of the engineering studies required.
 - b) Estimated cost of the engineering studies.
 - c) Estimated duration of the engineering studies.
 - d) Additional information required to allow the completion of the engineering studies.
 - e) Study authorization agreement.
- 4) Comments on the schedule provided.
- 5) If the rules of MISO (Midwest Independent System Operator) require that this interconnection request be processed through the MISO process, the Generation Interconnection Coordinator will notify the Applicant that the generation system is not eligible for review through the State of Minnesota process.

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INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

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Original Sheet No. 95

Process for Interconnection (Continued)

Step 3 Go-No Go Decision for Engineering Studies (By Applicant)

In this step, the Applicant will decide whether or not to proceed with the required engineering studies for the proposed generation interconnection. If no specialized engineering studies are required by Xcel Energy, Xcel Energy and the Applicant will automatically skip this step.

If the Applicant decides NOT to proceed with the engineering studies, the Applicant shall notify the Generation Interconnection Coordinator, so other generation interconnection requests in the queue are not adversely impacted. Should the Applicant decide to proceed, the Applicant shall provide the following to the Generation Interconnection Coordinator:

- 1) Payment required by Xcel Energy for the specialized engineering studies.
- 2) Additional information requested by Xcel Energy to allow completion of the engineering studies.

Step 4 Engineering Studies (By Xcel Energy)

In this step, Xcel Energy will be completing the specialized engineering studies for the proposed generation interconnection, as outlined in Step 2. These studies should be completed in the time frame provided in step 2, by Xcel Energy. It is expected that Xcel Energy shall make all reasonable efforts to complete the Engineering Studies within the time frames shown below. If additional time is required to complete the engineering studies the Generation Interconnection Coordinator shall notify the Applicant and provide the reasons for the time extension. Upon receipt of written notice to proceed, payment of applicable fee, and receipt of all engineering study information requested by Xcel Energy in step 2, Xcel Energy shall initiate the engineering studies.

Generation System Size	Engineering Study Completion
<20kW	20 working days
20kW – 250kW	30 working days
250kW – 1MW	40 working days
> 1MW	90 working days

Once it is known by Xcel Energy that the actual costs for the engineering studies will exceed the estimated amount by more the 25%, then the Applicant shall be notified. Xcel Energy shall then provide the reason(s) for the studies needing to exceed the original estimated amount and provide an updated estimate of the total cost for the engineering studies. The Applicant shall be given the option of either withdrawing the application, or paying the additional estimated amount to continue with the engineering studies.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 96

Process for Interconnection (Continued)

Step 5 Study Results and Construction Estimates (By Xcel Energy)

Upon completion of the specialized engineering studies, or if none was necessary, the following information will be provided to the Applicant.

- 1) Results of the engineering studies, if needed.
- 2) Monitoring & control requirements for the proposed generation.
- 3) Special protection requirements for the Generation System interconnection.
- 4) Comments on the schedule proposed by the Applicant.
- 5) Distributed Generation distribution constrained credits available
- 6) Interconnection Agreement (if applicable).
- 7) Cost estimate and payment schedule for required Xcel Energy work, including, but not limited to;
 - a) Labor costs related to the final design review.
 - b) Labor & expense costs for attending meetings
 - c) Required Dedicated Facilities and other Xcel Energy modification(s).
 - d) Final acceptance testing costs.

Step 6 Final Go-No Go Decision (By Applicant)

In this step, the Applicant shall again have the opportunity to indicate whether or not they want to proceed with the proposed generation interconnection. If the decision is NOT to proceed, the Applicant will notify the Generation Interconnection Coordinator, so that other generation interconnections in the queue are not adversely impacted. Should the Applicant decide to proceed, a more detailed design, if not already completed by the Applicant, must be done, and the following information is to be supplied to the Generation Interconnection Coordinator:

- 1) Applicable up-front payment required by Xcel Energy, per Payment Schedule, provided in Step 5 (if applicable).
- 2) Signed Interconnection Agreement (if applicable).

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

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Process for Interconnection (Continued)

Step 6 Final Go-No Go Decision (By Applicant) (Continued)

- 3) Final proposed schedule, incorporating Xcel Energy's comments. The schedule of the project should include such milestones as foundations poured, equipment delivery dates, all conduit installed, cutover (energizing of the new switchgear/transfer switch), Xcel Energy work, relays set and tested, preliminary vendor testing, final Xcel Energy acceptance testing, and any other major milestones.
- 4) Final proposed schedule, incorporating Xcel Energy's comments. The schedule of the project should include such milestones as foundations poured, equipment delivery dates, all conduit installed, cutover (energizing of the new switchgear/transfer switch), Xcel Energy work, relays set and tested, preliminary vendor testing, final Xcel Energy acceptance testing, and any other major milestones.
- 5) Detailed one-line diagram of the Generation System, including the generator, transfer switch/switchgear, service entrance, lockable and visible disconnect, metering, protection and metering CT's / VT's, protective relaying and generator control system.
- 6) Detailed information on the proposed equipment, including wiring diagrams, models and types.
- 7) Proposed relay settings for all interconnection required relays.
- 8) Detailed site plan of the Generation System.
- 9) Drawing(s) showing the monitoring system (as required per table 5A and section 5 of the "State of Minnesota Distributed Generation Interconnection Requirements". Including a drawing which shows the interface terminal block with the Xcel Energy monitoring system.
- 10) Proposed testing schedule and initial procedure, including:
 - a) Time of day (after-hours testing required?).
 - b) Days required.
 - c) Testing steps proposed.

Step 7 Final Design Review (By Xcel Energy)

Within 15 business days of receipt of the information required in Step 6, The Generation Interconnection Coordinator will provide the Applicant with an estimated timetable for final review. If the information required in Step 6 is not complete, the Applicant will be notified, within 10 business days of what information is missing. No further review may be completed until the missing information is submitted. The 15-business day clock will restart with the new submittal. This final design review shall not take longer than 15 additional business days to complete, for a total of 30 business days.

(Continued on Sheet No. 10-98)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 98

Process for Interconnection (Continued)

Step 7 Final Design Review (By Xcel Energy) (Continued)

During this step, Xcel Energy shall complete the review of the final Generation System design. If the final design has significant changes from the Generation System proposed on the original Application that invalidate the engineering studies or the preliminary engineering screening, the Generation System Interconnection Application request may be rejected by Xcel Energy, and the Applicant may be requested to reapply with the revised design.

Upon completion of this step the Generation Interconnection Coordinator shall supply the following information to the Applicant.

- 1) Requested modifications or corrections of the detailed drawings provided by the Applicant.
- 2) Approval of and agreement with the Project Schedule. (This may need to be interactively discussed between the Parties, during this Step).
- 3) Final review of Distributed Generation Credit amount(s) (where applicable).
- 4) Initial testing procedure review comments. (Additional work on the testing process will occur during Step 8, once the actual equipment is identified).

Step 8 Order Equipment and Construction (By Both Parties)

The following activities shall be completed during this step. For larger installations this step will involve much interaction between the Parties. It is typical for approval drawings to be supplied by the Applicant to Xcel Energy for review and comments. It is also typical for Xcel Energy to require review and approval of the drawings that cover the interconnection equipment and interconnection protection system. If Xcel Energy also requires remote control and/or monitoring, those drawings are also exchanged for review and comment.

By the Applicant's personnel:

- 1) Ordering of Generation System equipment.
- 2) Installing Generation System.
- 3) Submit approval drawings for interconnection equipment and protection systems, as required by Xcel Energy.
- 4) Provide final relay settings provided to Xcel Energy.
- 5) Submit Completed and signed Engineering Data Submittal form.
- 6) Submit proof of insurance, as required by Xcel Energy tariff(s) or interconnection agreements.
- 7) Submit required State of Minnesota electrical inspection forms ("blue Copy) filed with Xcel Energy.
- 8) Inspecting and functional testing Generation System components.
- 9) Work with Xcel Energy personnel and equipment vendor(s) to finalize the installation testing procedure.

(Continued on Sheet No. 10-99)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 99

Process for Interconnection (Continued)

Step 8 Order Equipment and Construction (By Both Parties) (Continued)

By Xcel Energy personnel:

- 1) Ordering any necessary Xcel Energy equipment.
- 2) Installing and testing any required equipment.
 - a) Monitoring facilities.
 - b) Dedicated Equipment.
- 3) Assisting Applicant's personnel with interconnection installation coordination issues
- 4) Providing review and input for testing procedures.

Step 9 Final Tests (By Xcel Energy / Applicant)

(Due to equipment lead times and construction, a significant amount of time may take place between the execution of Step 8 and Step 9.) During this time the final test steps are developed and the construction of the facilities are completed.

Final acceptance testing will commence when all equipment has been installed, all contractor preliminary testing has been accomplished and all Xcel Energy preliminary testing of the monitoring and dedicated equipment is completed. One to three weeks prior to the start of the acceptance testing of the generation interconnection the Applicant shall provide, a report stating:

- that the Generation System meets all interconnection requirements.
- all contractor preliminary testing has been completed.
- the protective systems are functionally tested and ready.
- and provides a proposed date that the Generation System will be is ready to be energized and acceptance tested.

For non-type certified systems a Professional Electrical Engineer registered in the State of Minnesota is required to provide this formal report.

For smaller systems scheduling of this testing may be more flexible, as less testing time is required than for larger systems.

In many cases, this testing is done after hours to ensure no typical business-hour load is disturbed. If acceptance testing occurs after hours, Xcel Energy labor will be billed at overtime wages. During this testing, Xcel Energy will typically run three different tests. These tests can differ depending on which type of communication / monitoring system(s) Xcel Energy decides to install at the site.

(Continued on Sheet No. 10-100)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 100

Process for Interconnection (Continued)

Step 9 Final Tests (By Xcel Energy / Applicant) (Continued)

For problems created by Xcel Energy or any Xcel Energy equipment that arise during testing, Xcel Energy will fix the problem as soon as reasonably possible. If problems arise during testing that are caused by the Applicant or Applicant's vendor or any vendor supplied or installed equipment, Xcel Energy will leave the project until the problem is resolved. Having the testing resume will then be subject to Xcel Energy personnel time and availability.

Step 10 (By Xcel Energy)

After all of Xcel Energy's acceptance testing has been accomplished and all requirements are met, Xcel Energy shall provide written approval for normal operation of the Generation System interconnection, within 3 business days of successful completion of the acceptance tests.

Step 11 (By Applicant)

Within two (2) months of interconnection, the Applicant shall provide Xcel Energy with updated drawings and prints showing the Generation System as it were when approved for normal operation by Xcel Energy. The drawings shall include all changes that were made during construction and the testing process.

ATTACHMENTS:

Attached are several documents, which may be required for the interconnection process. They are as follows:

Appendix A	Flow-chart showing summary of the interconnection process.
Appendix B	Generation Interconnection Application Form.
Appendix C	Engineering Data Submittal Form.
Appendix D	Engineering Studies: Brief description of the types of possible Engineering Studies that may be required for the review of the Generation System interconnection.
Appendix E	State of Minnesota Interconnection Agreement for the Interconnection of Extended Paralleled Distributed Generation Systems with Electric Utilities.

(Continued on Sheet No. 10-101)

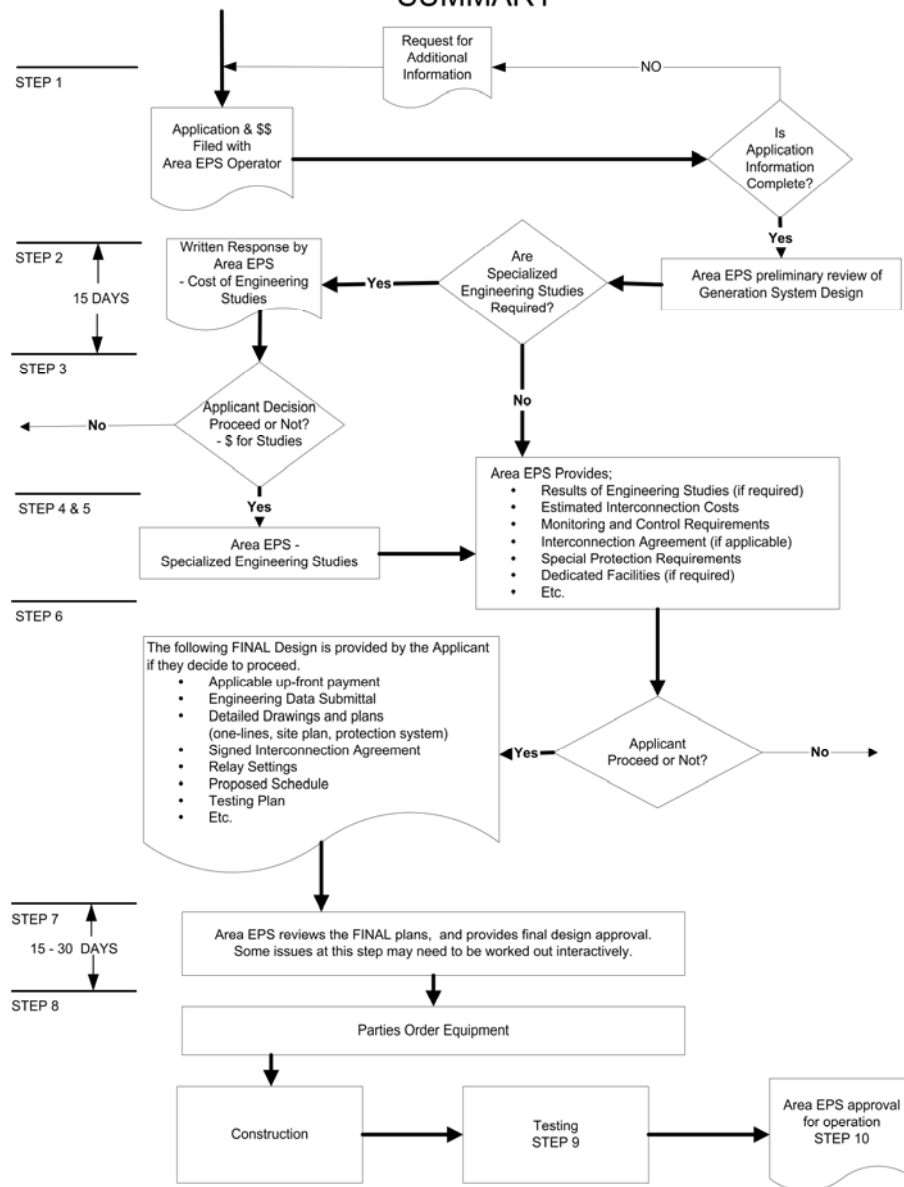
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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 101

**APPENDIX A
DISTRIBUTED GENERATION INTERCONNECTION PROCESS
SUMMARY**



(Continued on Sheet No. 10-102)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 102

APPENDIX B: Generation Interconnection Application Form

WHO SHOULD FILE THIS APPLICATION: Anyone expressing interest to install generation which will interconnect with Xcel Energy (Local electric utility). This application should be completed and returned to the Generation Interconnection Coordinator, in order to begin processing the request.

INFORMATION: This application is used by Xcel Energy 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:		

(Continued on Sheet No. 10-103)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 103

APPENDIX B: Generation Interconnection Application Form (Continued)

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: <input type="checkbox"/> Open <input type="checkbox"/> Quick Open <input type="checkbox"/> Closed <input type="checkbox"/> Soft Loading <input type="checkbox"/> Inverter		
Proposed use of generation: (Check all that may apply) <input type="checkbox"/> Peak Reduction <input type="checkbox"/> Standby <input type="checkbox"/> Energy Sales <input type="checkbox"/> Cover Load		Duration Parallel: <input type="checkbox"/> None <input type="checkbox"/> Limited <input type="checkbox"/> 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 Xcel Energy facilities? If there is an intent to sell power and energy, also define the target market.		

(Continued on Sheet No. 10-104)

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Section No. 10
Original Sheet No. 104

APPENDIX B: Generation Interconnection Application Form (Continued)

SIGN OFF AREA:	
With this Application, we are requesting Xcel Energy to review the proposed Generation System Interconnection. We request that Xcel Energy 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 Xcel Energy, will be estimated using the information provided. We also agree that we will supply, as requested, additional information, to allow Xcel Energy 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:
SEND THIS COMPLETED & SIGNED APPLICATION AND ATTACHMENTS TO THE GENERATION INTERCONNECTION COORDINATOR	

(Continued on Sheet No. 10-105)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 105

APPENDIX C: Engineering Data Submittal Form

WHO SHOULD FILE THIS SUBMITTAL: Anyone in the final stages of interconnecting a Generation System with Xcel Energy. This submittal shall be completed and provided to the Generation Interconnection Coordinator during the design of the Generation System, as established in the "State of Minnesota Interconnection Process for Distributed Generation Systems".

INFORMATION: This submittal is used to document the interconnected Generation System. The Applicant shall complete as much of the form as applicable. The Applicant will be contacted if additional information is required.

OWNER / APPLICANT		
Company / Applicant:		
Representative:	Phone Number:	FAX Number:
Title:		
Mailing Address:		
Email Address:		

PROPOSED 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:		

(Continued on Sheet No. 10-106)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 106

APPENDIX C: Engineering Data Submittal Form (Continued)

TYPE OF INTERCONNECTED OPERATION	
Interconnection / Transfer method: <input type="checkbox"/> Open <input type="checkbox"/> Quick Open <input type="checkbox"/> Closed <input type="checkbox"/> Soft Loading <input type="checkbox"/> Inverter	
Proposed use of generation: (Check all that may apply) <input type="checkbox"/> Peak Reduction <input type="checkbox"/> Standby <input type="checkbox"/> Energy Sales <input type="checkbox"/> Cover Load	Duration Parallel: <input type="checkbox"/> None <input type="checkbox"/> Limited <input type="checkbox"/> Continuous
Pre-Certified System: Yes / No (Circle one)	Exporting Energy Yes / No (Circle one)

GENERATION SYSTEM OPERATION / MAINTENANCE CONTACT INFORMATION		
Maintenance Provider:	Phone #:	Pager #:
Operator Name:	Phone #:	Pager #:
Person to Contact before remote starting of units		
Contact Name:	Phone #:	Pager #:
	24hr Phone #:	

GENERATION SYSTEM OPERATING INFORMATION	
Fuel Capacity (gals):	Full Fuel Run-time (hrs):
Engine Cool Down Duration (Minutes):	Start time Delay on Load Shed signal:
Start Time Delay on Outage (Seconds):	

ESTIMATED LOAD		
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:

(Continued on Sheet No. 10-107)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 107

APPENDIX C: Engineering Data Submittal Form (Continued)

REQUESTED CONSTRUCTION START/COMPLETION DATES	
Design Completion:	
Construction Start Date:	
Footings in place:	
Primary Wiring Completion:	
Control Wiring Completion:	
Start Acceptance Testing:	
Generation operational (In-service):	

(Complete all applicable items. Copy this page as required for additional generators.)

SYNCHRONOUS GENERATOR (if applicable)			
Unit Number:	Total number of units with listed specifications on site:		
Manufacturer:	Type:	Phases: 1 or 3	
Serial Number (each)	Date of manufacture:	Speed (RPM):	Freq. (Hz);
Rated Output (each unit) kW Standby:	kW Prime:	kVA:	
Rated Power Factor (%):	Rated Voltage(Volts):	Rated Current (Amperes):	
Field Voltage (Volts):	Field Current (Amperes):	Motoring Power (kW):	
Synchronous Reactance (Xd):	% on	kVA base	
Transient Reactance (X'd):	% on	kVA base	
Subtransient Reactance (X''d):	% on	kVA base	
Negative Sequence Reactance (Xs):	% on	kVA base	
Zero Sequence Reactance (Xo):	% on	kVA base	
Neutral Grounding Resistor (if applicable):			
$I^2 t$ or K (heating time constant):			
Exciter data:			
Governor data:			
Additional Information:			

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 108

APPENDIX C: Engineering Data Submittal Form (Continued)

INDUCTION GENERATOR (if applicable)			
Rotor Resistance (Rr):	Ohms	Stator Resistance (Rs):	
Rotor Reactance (Xr):	Ohms	Ohms	
Magnetizing Reactance (Xm):	Ohms	Stator Reactance (Xs):	
		Ohms	
		Short Circuit Reactance (Xd):	
		Ohms	
Design Letter:		Frame Size:	
Exciting Current:		Temp Rise (deg C°):	
Rated Output (kW):			
Reactive Power Required:		kVars (no Load)	kVars (full load)
If this is a wound-rotor machine, describe any external equipment to be connected (resistor, rheostat, power converter, etc.) to rotor circuit, and circuit configuration. Describe ability, if any, to adjust generator reactive output to provide power system voltage regulation.			
Additional Information:			
PRIME MOVER (Complete all applicable items)			
Unit Number:		Type:	
Manufacturer:			
Serial Number:		Date of Manufacture:	
H.P. Rated:		H.P. Max:	
		Inertia Constant:	lb.-ft. ²
Energy Source (hydro, steam, wind, wind etc.):			

INTERCONNECTION (STEP-UP) TRANSFORMER (If applicable)			
Manufacturer:		kVA:	
Date of Manufacture:	Serial Number:		
High Voltage: kV	Connection: delta	wye	Neutral solidly grounded?
Low Voltage: kV	Connection: delta	wye	Neutral solidly grounded?
Transformer Impedance (Z):		% on	kVA base
Transformer Resistance (R):		% on	kVA base
Transformer Reactance (X):		% on	kVA base
Neutral Grounding Resistor (if applicable)			

(Continued on Sheet No. 10-109)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 109

APPENDIX C: Engineering Data Submittal Form (Continued)

TRANSFER SWITCH (If applicable)	
Model Number:	Type:
Manufacturer:	Rating (amps):

INVERTER (If applicable)	
Manufacturer:	Model:
Rated Power Factor (%):	Rated Voltage (Volts):
Rated Current (Amperes):	
Inverter Type (ferroresonant, step, pulse-width modulation, etc.):	
Type of Commutation: forced line	Minimum Short Circuit Ratio required:
Minimum voltage for successful commutation:	
Current Harmonic Distortion	Maximum Individual Harmonic (%):
	Maximum Total Harmonic Distortion (%):
Voltage Harmonic Distortion	Maximum Individual Harmonic (%):
	Maximum Total Harmonic Distortion (%):
Describe capability, if any, to adjust reactive output to provide voltage regulation:	
NOTE: Attach all available calculations, test reports, and oscillographic prints showing inverter output voltage and current waveforms.	

POWER CIRCUIT BREAKER (if applicable)	
Manufacturer:	Model:
Rated Voltage (kilovolts):	Rated Ampacity (Amperes):
Interrupting Rating (Amperes):	BIL Rating:
Interrupting Medium (vacuum, oil, gas, etc.)	Insulating Medium (vacuum, oil, gas, etc.)
Control Voltage (Closing):	(Volts) AC DC
Control Voltage (Tripping):	(Volts) AC DC Battery Charged Capacitor
Close Energy (circle one):	Spring Motor Hydraulic Pneumatic Other
Trip Energy (circle one):	Spring Motor Hydraulic Pneumatic Other
Bushing Current Transformers (Max. ratio):	Relay Accuracy Class:
CT'S Multi Ratio? (circle one); No / Yes: (Available taps):	

(Continued on Sheet No. 10-110)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 110

APPENDIX C: Engineering Data Submittal Form (Continued)

MISCELLANEOUS (Use this area and any additional sheets for applicable notes and comments)

SIGN OFF AREA
This Engineering Data Submittal documents the equipment and design of the Generation System. We agree to supply Xcel Energy with an updated Engineering Data Submittal any time significant changes are made in the equipment used or the design of the proposed Generation System. The Applicant agrees to design, operate and maintain the Generation System within the requirements set forth by the "State of Minnesota Distributed Generation Interconnection Requirements".
Applicant Name (print):
Applicant Signature: Date:
SEND THIS COMPLETED & SIGNED ENGINEERING DATA SUBMITTAL AND ANY ATTACHMENTS TO THE GENERATION INTERCONNECTION COORDINATOR

(Continued on Sheet No. 10-111)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 111

APPENDIX D: Engineering Studies

For the engineering studies there are two main parts of the study: 1. Does the distributed generator cause a problem? and 2. What would it cost to make a change to handle the problem? The first question is relatively straightforward to determine, as Xcel Energy reviews the proposed installation. The second question typically has multiple alternatives and can turn into an iterative process. This iterative process can become quite large for more complex generation installations. For the Engineer there is no "cook book" solution that can be applied.

For some of the large generation installations and/or the more complex interconnections, Xcel Energy may suggest dividing up the engineering studies into the two parts: identify the scope of the problems and attempt to identify solutions to resolve the problems. By splitting the engineering studies into two steps, it will allow for the Applicant to see the problems identified and to provide the Applicant the ability to remove the request for interconnection if the problems are too large and expensive to resolve. This would then save the additional costs to the Applicant for the more expensive engineering studies; to identify ways to resolve the problem(s).

This appendix provides an overview of some of the main issues that are looked at during the engineering study process. Every interconnection has its unique issues, such as relative strength of the distribution system, ratio of the generation size to the existing area loads, etc. Thus many of the generation interconnections will require further review of one or several of the issues listed.

- Short circuit analysis – the system is studied to make sure that the addition of the generation will not over stress any of the Xcel Energy equipment, and that equipment will still be able to clear during a fault. It is expected that the Applicant will complete their own short circuit analysis on their equipment to ensure that the addition of the generation system does not overstress the Applicant's electrical equipment.
- Power Flow and Voltage Drop
 - Reviews potential islanding of the generation
 - Will Xcel Energy Equipment be overloaded
 - Under normal operation?
 - Under contingent operation? With backfeeds?
- Flicker Analysis –
 - Will the operation of the generation cause voltage swings?
 - When it loads up? When it off loads?
 - How will the generation interact with Xcel Energy voltage regulation?
 - Will Xcel Energy capacitor switching affect the generation while on-line
- Protection Coordination
 - Reclosing issues – this is where the reclosing for the distribution system and transmission system are looked at to see if the Generation System protection can be set up to ensure that it will clear from the distribution system before the feeder is reenergized.
 - Is voltage supervision of reclosing needed?

(Continued on Sheet No. 10-112)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 112

APPENDIX D: Engineering Studies (Continued)

- Protection Coordination (Continued)
 - Is transfer-trip required?
 - Do we need to modify the existing protection systems? Existing settings?
 - At which points do we need "out of sync" protection?
 - Is the proposed interconnection protection system sufficient to sense a problem with Xcel Energy?
 - Are there protection problems created by the step-up transformer?
- Grounding Reviews
 - Does the proposed grounding system for the Generation System meet the requirements of the NESC? "National Electrical Safety Code" published by the Institute of Electrical and Electronics Engineers (IEEE)
- System Operation Impact.
 - Are special operating procedures needed with the addition of the generation?
 - Reclosing and out of sync operation of facilities.
 - What limitations need to be placed on the operation of the generation?
 - Operational Var requirements?

(Continued on Sheet No. 10-113)

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By: Cynthia L. Leshner

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President and CEO of Northern States Power Company

Docket No. E002/GR-05-1428

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Northern States Power Company, a Minnesota corporation
and wholly owned subsidiary of Xcel Energy Inc.
Minneapolis, Minnesota 55401

MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 113

APPENDIX E: Interconnection Agreement

**State of Minnesota
Proposed Interconnection Agreement**

For the Interconnection of Extended Parallel Distributed Generation Systems With Electric Utilities

This Generating System Interconnection Agreement is entered into by and between Xcel Energy, "_____" and the Interconnection Customer "_____". The Interconnection Customer and Xcel Energy are sometimes also referred to in this Agreement jointly as "Parties" or individually as "Party".

In consideration of the mutual promises and obligations stated in this Agreement and its attachments, the Parties agree as follows:

I. SCOPE AND PURPOSE

- A. Establishment of Point of Common Coupling. This Agreement is intended to provide for the Interconnection Customer to interconnect and operate a Generation System with a total Nameplate Capacity of 10MWs or less in parallel with Xcel Energy at the location identified in Exhibit C and shown in the Exhibit A one-line diagram.
- B. This Agreement governs the facilities required to and contains the terms and condition under which the Interconnection Customer may interconnect the Generation System to Xcel Energy. This Agreement does not authorize the Interconnection Customer to export power or constitute an agreement to purchase or wheel the Interconnection Customer's power. Other services that the Interconnection Customer may require from Xcel Energy, or others, may be covered under separate agreements.
- C. To facilitate the operation of the Generation System, this agreement also allows for the occasional and inadvertent export of energy to Xcel Energy. The amount, metering, billing and accounting of such inadvertent energy exporting shall be governed by Exhibit D (Operating Agreement). This Agreement does not constitute an agreement by Xcel Energy to purchase or pay for any energy, inadvertently or intentionally exported, unless expressly noted in Exhibit D or under a separately executed power purchase agreement (PPA).
- D. This agreement does not constitute a request for, nor the provision of any transmission delivery service or any local distribution delivery service.
- E. The Technical Requirements for interconnection are covered in a separate Technical Requirements document know as, the "State of Minnesota Distributed Generation Interconnection Requirements", a copy of which as been made available to the Interconnection Customer and incorporated and made part of this Agreement by this reference.

(Continued on Sheet No. 10-114)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 114

APPENDIX E: Interconnection Agreement (Continued)

II. DEFINITIONS

- A. "Area EPS" is an electric power system (EPS) that serves Local EPS's. For the purpose of this agreement, the Xcel Energy system is the Area EPS. Note: Typically, Xcel Energy has primary access to public rights-of-way, priority crossing of property boundaries, etc.
- B. "Area EPS Operator" is the entity that operates the electric power system. For purpose of this agreement, Xcel Energy is the Area EPS Operator.
- C. "Dedicated Facilities" is the equipment that is installed due to the interconnection of the Generation System and not required to serve other Xcel Energy customers.
- D. "EPS" (Electric Power System) are facilities that deliver electric power to a load. Note: This may include generation units.
- E. "Extended Parallel" means the Generation System is designed to remain connected with Xcel Energy for an extended period of time.
- F. "Generation" is any device producing electrical energy, i.e., rotating generators driven by wind, steam turbines, internal combustion engines, hydraulic turbines, solar, fuel cells, etc.; or any other electric producing device, including energy storage technologies.
- G. "Generation Interconnection Coordinator" is the person or persons designated by Xcel Energy to provide a single point of coordination with the Applicant for the generation interconnection process.
- H. "Generation System" is the interconnected generator(s), controls, relays, switches, breakers, transformers, inverters and associated wiring and cables, up to the Point of Common Coupling.
- I. "Interconnection Customer" is the party or parties who will own/operate the Generation System and are responsible for meeting the requirements of the agreements and Technical Requirements. This could be the Generation System applicant, installer, owner, designer, or operator.
- J. "Local EPS" is an electric power system (EPS) contained entirely within a single premises or group of premises.
- K. "Nameplate Capacity" is the total nameplate capacity rating of all the Generation included in the Generation System. For this definition the "standby" and/or maximum rated kW capacity on the nameplate shall be used.

(Continued on Sheet No. 10-115)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 115

APPENDIX E: Interconnection Agreement (Continued)

II. DEFINITIONS (Continued)

- L. "Point of Common Coupling" is the point where the Local EPS is connected to Xcel Energy
- M. "Point of Delivery" is the point where the energy changes possession from one party to the other. Typically this will be where the metering is installed but it is not required that the Point of Delivery is the same as where the energy is metered
- N. "Technical Requirements" are the State of Minnesota Requirements for Interconnection of Distributed Generation

III. DESCRIPTION OF INTERCONNECTION CUSTOMER'S GENERATION SYSTEM

- A) A description of the Generation System, including a single-line diagram showing the general arrangement of how the Interconnection Customer's Generation System is interconnected with Xcel Energy's distribution system, is attached to and made part of this Agreement as Exhibit A. The single-line diagram shows the following:
 - 1) Point of Delivery (if applicable)
 - 2) Point of Common Coupling
 - 3) Location of Meter(s)
 - 4) Ownership of the equipment
 - 5) Generation System total Nameplate Capacity _____ kW
 - 6) Scheduled operational (on-line) date for the Generation System.

IV. RESPONSIBILITIES OF THE PARTIES

- A) The Parties shall perform all obligations of this Agreement in accordance with all applicable laws and regulations, operating requirements and good utility practices.
- B) Interconnection Customer shall construct, operate and maintain the Generation System in accordance with the applicable manufacturer's recommended maintenance schedule, the Technical Requirements and in accordance with this Agreement.

(Continued on Sheet No. 10-116)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 116

APPENDIX E: Interconnection Agreement (Continued)

IV. RESPONSIBILITIES OF THE PARTIES (Continued)

- C) Xcel Energy shall carry out the construction of the Dedicated Facilities in a good and workmanlike manner, and in accordance with standard design and engineering practices.

V. CONSTRUCTION

The Parties agree to cause their facilities or systems to be constructed in accordance with the laws of the State of Minnesota and to meet or exceed applicable codes and standards provided by the NESC (National Electrical Safety Code), ANSI (American National Standards Institute), IEEE (Institute of Electrical and Electronic Engineers), NEC (National Electrical Code), UL (Underwriter's Laboratory), Technical Requirements and local building codes and other applicable ordinances in effect at the time of the installation of the Generation System.

A) Charges and payments

The Interconnection Customer is responsible for the actual costs to interconnect the Generation System with Xcel Energy, including, but not limited to any Dedicated Facilities attributable to the addition of the Generation System, Xcel Energy labor for installation coordination, installation testing and engineering review of the Generation System and interconnection design. Estimates of these costs are outlined in Exhibit B. While estimates, for budgeting purposes, have been provided in Exhibit B, the actual costs are still the responsibility of the Interconnection Customer, even if they exceed the estimated amount(s). All costs, for which the Interconnection Customer is responsible for, must be reasonable under the circumstances of the design and construction.

1) Dedicated Facilities

- a) During the term of this Agreement, Xcel Energy shall design, construct and install the Dedicated Facilities outlined in Exhibit B. The Interconnection Customer shall be responsible for paying the actual costs of the Dedicated Facilities attributable to the addition of the Generation System.
- b) Once installed, the Dedicated Facilities shall be owned and operated by Xcel Energy, and all costs associated with the operating and maintenance of the Dedicated Facilities, after the Generation System is operational, shall be the responsibility of Xcel Energy, unless otherwise agreed.
- c) By executing this Agreement, the Interconnection Customer grants permission for Xcel Energy to begin construction and to procure the necessary facilities and equipment to complete the installation of the Dedicated Facilities, as outlined in Exhibit B. If for any reason, the Generation System project is canceled or modified, so that any or all of the Dedicated Facilities are not required, the Interconnection Customer shall be responsible for all costs incurred by Xcel Energy,

(Continued on Sheet No. 10-117)

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APPENDIX E: Interconnection Agreement (Continued)

V. CONSTRUCTION (Continued)

including, but not limited to the additional costs to remove and/or complete the installation of the Dedicated Facilities. The Interconnection Customer may, for any reason, cancel the Generation System project, so that any or all of the Dedicated Facilities are not required to be installed. The Interconnection Customer shall provide written notice to Xcel Energy of cancellation. Upon receipt of a cancellation notice, Xcel Energy shall take reasonable steps to minimize additional costs to the Interconnection Customer, where reasonably possible.

2) Payments

- a) The Interconnection Customer shall provide reasonable adequate assurances of credit, including a letter of credit or personal guaranty of payment and performance from a creditworthy entity acceptable under Xcel Energy credit policy and procedures for the unpaid balance of the estimated amount shown in Exhibit B.
- b) The payment for the costs outlined in Exhibit B, shall be as follows:
 - i. 1/3 of estimated costs, outlined in Exhibit B, shall be due upon execution of this agreement.
 - ii. 1/3 of estimated costs, outlined in Exhibit B, shall be due prior to initial energization of the Generation System, with Xcel Energy.
 - iii. Remainder of actual costs, incurred by Xcel Energy, shall be due within 30 days from the date the bill is mailed by Xcel Energy after project completion.

VI. DOCUMENTS INCLUDED WITH THIS AGREEMENT

- A) This agreement includes the following exhibits, which are specifically incorporated herein and made part of this Agreement by this reference: *(if any of these Exhibits are deemed not applicable for this Generation System installation, they may be omitted from the final Agreement by Xcel Energy.)*
- 1) Exhibit A – Description of Generation System and single-line diagram. This diagram shows all major equipment, including, visual isolation equipment, Point of Common Coupling, Point of Delivery for Generation Systems that intentionally export, ownership of equipment and the location of metering.

(Continued on Sheet No. 10-118)

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APPENDIX E: Interconnection Agreement (Continued)

VI. DOCUMENTS INCLUDED WITH THIS AGREEMENT (Continued)

- 2) Exhibit B – Estimated installation and testing costs payable by the Interconnection Customer. Included in this listing shall be the description and estimated costs for the required Dedicated Facilities being installed by Xcel Energy for the interconnection of the Generation System and a description and estimate for the final acceptance testing work to be done by Xcel Energy.
- 3) Exhibit C – Engineering Data Submittal – A standard form that provides the engineering and operating information about the Generation System.
- 4) Exhibit D – Operating Agreement – This provides specific operating information and requirements for this Generation System interconnection. This Exhibit has a separate signature section and may be modified, in writing, from time to time with the agreement of both parties.
- 5) Exhibit E – Maintenance Agreement – This provides specific maintenance requirements for this Generation System interconnection. This Exhibit has a separate signature section and may be modified, in writing, from time to time with the agreement of both parties.

VII. TERMS AND TERMINATION

- A) This Agreement shall become effective as of the date when both the Interconnection Customer and Xcel Energy have both signed this Agreement. The Agreement shall continue in full force and effect until the earliest date that one of the following events occurs:
 - 1) The Parties agree in writing to terminate the Agreement; or
 - 2) The Interconnection Customer may terminate this agreement at any time, by written notice to Xcel Energy, prior to the completion of the final acceptance testing of the Generation System by Xcel Energy. Once the Generation System is operational, then VII.A.3 applies. Upon receipt of a cancellation notice, Xcel Energy shall take reasonable steps to minimize additional costs to the Interconnection Customer, where reasonably possible.
 - 3) Once the Generation System is operational, the Interconnection Customer may terminate this agreement after 30 days written notice to Xcel Energy, unless otherwise agreed to within the Exhibit D, Operating Agreement; or

(Continued on Sheet No.10-119)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
1st Revised Sheet No. 119

APPENDIX E: Interconnection Agreement (Continued)

VII. TERMS AND TERMINATION

- 4) Xcel Energy may terminate this agreement after 30 days written notice to the Interconnection Customer if:
- a) The Interconnection Customer fails to interconnect and operate the Generation System per the terms of this Agreement; or
 - b) The Interconnection Customer fails to take all corrective actions specified in Xcel Energy's written notice that the Generation System is out of compliance with the terms of this Agreement, within the time frame set forth in such notice, or
 - c) If the Interconnection Customer fails to complete Xcel Energy's final acceptance testing of the generation system within 24 months of the date proposed under section III.A.6.

- B) Upon termination of this Agreement the Generation System shall be disconnected from Xcel Energy. The termination of this Agreement shall not relieve either Party of its liabilities and obligations, owed or continuing, at the time of the termination.

VIII. OPERATIONAL ISSUES

Each Party will, at its own cost and expense, operate, maintain, repair and inspect, and shall be fully responsible for, the facilities that it now or hereafter may own, unless otherwise specified.

- A) Technical Standards: The Generation System shall be installed and operated by the Interconnection Customer consistent with the requirements of this Agreement; the Technical Requirements; the applicable requirements located in the National Electrical Code (NEC); the applicable standards published by the American National Standards Institute (ANSI) and the Institute of Electrical and Electronic Engineers (IEEE); and local building and other applicable ordinances in effect at the time of the installation of the Generation System.
- B) Right of Access: At all times, Xcel Energy's personnel shall have access to the disconnect switch of the Generation System for any reasonable purpose in connection with the performance of the obligations imposed on it by this Agreement, to meet its obligation to operate the electric power system safely and to provide service to its customers. If necessary for the purposes of this Agreement, the Interconnection Customer shall allow Xcel Energy access to Xcel Energy's equipment and facilities located on the premises.

(Continued on Sheet No. 10-120)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 120

APPENDIX E: Interconnection Agreement (Continued)

VIII. OPERATIONAL ISSUES (Continued)

- C) Electric Service Supplied: will supply the electrical requirements of the Local EPS that are not supplied by the Generation System. Such electric service shall be supplied, to the Interconnection Customer's Local EPS, under the rate schedules applicable to the Customer's class of service as revised from time to time by Xcel Energy.
- D) Operation and Maintenance: The Generation System shall be operated and maintained, by the Interconnection Customer in accordance with the Technical Standards and any additional requirements of Exhibit D and Exhibit E, attached to this document, as amended, in writing, from time to time.
- E) Cooperation and Coordination: Both Xcel Energy and the Interconnection Customer shall communicate and coordinate their operations, so that the normal operation of the electric power system does not unduly effect or interfere with the normal operation of the Generation System and the Generation System does not unduly effect or interfere with the normal operation of the electric power system. Under abnormal operations of either the Generation System or the Xcel Energy system, the responsible Party shall provide reasonably timely communication to the other Party to allow mitigation of any potentially negative effects of the abnormal operation of their system.
- F) Disconnection of Unit: Xcel Energy may disconnect the Generation System as reasonably necessary, for termination of this Agreement; non-compliance with this Agreement; system emergency, imminent danger to the public or Xcel Energy personnel; routine maintenance, repairs and modifications to the electric power system. When reasonably possible, Xcel Energy shall provide prior notice to the Interconnection Customer explaining the reason for the disconnection. If prior notice is not reasonably possible, Xcel Energy shall after the fact, provide information to the Interconnection Customer as to why the disconnection was required. It is agreed that Xcel Energy shall have no liability for any loss of sales or other damages, including all consequential damages for the loss of business opportunity, profits or other losses, regardless of whether such damages were foreseeable, for the disconnection of the Generation System per this Agreement. Xcel Energy shall expend reasonable effort to reconnect the Generation System in a timely manner and to work towards mitigating damages and losses to the Interconnection Customer where reasonably possible.
- G) Modifications to the Generation System: When reasonably possible the Interconnection Customer shall notify Xcel Energy, in writing, of plans for any modifications to the Generation System interconnection equipment, including all information needed by Xcel Energy as part of the review described in this paragraph, at least twenty (20) business days prior to undertaking such modification(s). Modifications to any of the interconnection equipment, including, all interconnection required protective systems, the generation control systems, the transfer switches/breakers, interconnection protection VT's & CT's, and Generation System capacity, shall be included in the notification to Xcel Energy. When reasonably possible the

(Continued on Sheet No. 10-121)

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APPENDIX E: Interconnection Agreement (Continued)

VIII. OPERATIONAL ISSUES (Continued)

Interconnection Customer agrees not to commence installation of any modifications to the Generating System until Xcel Energy has approved the modification, in writing, which approval shall not be unreasonably withheld. Xcel Energy shall have a minimum of five (5) business days to review and respond to the planned modification. Xcel Energy shall not take longer than a maximum of ten (10) business days, to review and respond to the modification after the receipt of the information required to review the modifications. When it is not reasonably possible for the Interconnection Customer to provide prior written notice, the Interconnection Customer shall provide written notice to Xcel Energy as soon as reasonably possible, after the completion of the modification(s).

- H) Permits and Approvals: The Interconnection Customer shall obtain all environmental and other permits lawfully required by governmental authorities prior to the construction of the Generation System. The Interconnection Customer shall also maintain these applicable permits and compliance with these permits during the term of this Agreement.

IX. LIMITATION OF LIABILITY

- A) Each Party shall at all times indemnify, defend, and save the other Party harmless from any and all damages, losses, claims, including claims and actions relating to injury or death of any person or damage to property, costs and expenses, reasonable attorneys' fees and court costs, arising out of or resulting from the Party's performance of its obligations under this agreement, except to the extent that such damages, losses or claims were caused by the negligence or intentional acts of the other Party.
- B) Each Party's liability to the other Party for failure to perform its obligations under this Agreement, shall be limited to the amount of direct damage actually incurred. In no event shall either Party be liable to the other Party for any punitive, incidental, indirect, special, or consequential damages of any kind whatsoever, including for loss of business opportunity or profits, regardless of whether such damages were foreseen.
- C) Notwithstanding any other provision in this Agreement, with respect to Xcel Energy's provision of electric service to any customer including the Interconnection Customer, the Xcel Energy's liability to such customer shall be limited as set forth in Xcel Energy's tariffs and terms and conditions for electric service, and shall not be affected by the terms of this Agreement.

X. DISPUTE RESOLUTION

- A) Each Party agrees to attempt to resolve all disputes arising hereunder promptly, equitably and in a good faith manner.

(Continued on Sheet No. 10-122)

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APPENDIX E: Interconnection Agreement (Continued)

X. DISPUTE RESOLUTION (Continued)

- B) In the event a dispute arises under this Agreement, and if it cannot be resolved by the Parties within thirty (30) days after written notice of the dispute to the other Party, the Parties agree to submit the dispute to mediation by a mutually acceptable mediator, in a mutually convenient location in the State of Minnesota. The Parties agree to participate in good faith in the mediation for a period of 90 days. If the parties are not successful in resolving their disputes through mediation, then the Parties may refer the dispute for resolution to the Minnesota Public Utilities Commission (MPUC), which shall maintain continuing jurisdiction over this Agreement.

XI. INSURANCE

- A) At a minimum, In connection with the Interconnection Customer's performance of its duties and obligations under this Agreement, the Interconnection Customer shall maintain, during the term of the Agreement, general liability insurance, from a qualified insurance agency with a B+ or better rating by "Best" and with a combined single limit of not less than:
- 1) Two million dollars (\$2,000,000) for each occurrence, if the Gross Nameplate Rating of the Generation System is greater than 250kW.
 - 2) One million dollars (\$1,000,000) for each occurrence if the Gross Nameplate Rating of the Generation System is between 40kW and 250kW.
 - 3) Three hundred thousand (\$300,000) for each occurrence if the Gross Nameplate Rating of the Generation System is less than 40kW.
 - 4) Such general liability insurance shall include coverage against claims for damages resulting from (i) bodily injury, including wrongful death; and (ii) property damage arising out of the Interconnection Customer's ownership and/or operating of the Generation System under this agreement.
- B) The general liability insurance required shall, by endorsement to the policy or policies, (a) include Xcel Energy as an additional insured; (b) contain a severability of interest clause or cross-liability clause; (c) provide that Xcel Energy shall not by reason of its inclusion as an additional insured incur liability to the insurance carrier for the payment of premium for such insurance; and (d) provide for thirty (30) calendar days' written notice to Xcel Energy prior to cancellation, termination, alteration, or material change of such insurance.

(Continued on Sheet No. 10-123)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 123

APPENDIX E: Interconnection Agreement (Continued)

XI. INSURANCE (Continued)

- C) If the Generation System is connected to an account receiving residential service from Xcel Energy and its total generating capacity is smaller than 40kW, then the endorsements required in Section XI.B shall not apply.
- D) The Interconnection Customer shall furnish the required insurance certificates and endorsements to Xcel Energy prior to the initial operation of the Generation System. Thereafter, Xcel Energy shall have the right to periodically inspect or obtain a copy of the original policy or policies of insurance
- E) Evidence of the insurance required in Section XI.A. shall state that coverage provided is primary and is not excess to or contributing with any insurance or self-insurance maintained by Xcel Energy.
- F) If the Interconnection Customer is self-insured with an established record of self-insurance, the Interconnection Customer may comply with the following in lieu of Section XI.A – E:
 - 1) Interconnection Customer shall provide to Xcel Energy, at least thirty (30) days prior to the date of initial operation, evidence of an acceptable plan to self-insure to a level of coverage equivalent to that required under section XI.A.
 - 2) If Interconnection Customer ceases to self-insure to the level required hereunder, or if the Interconnection Customer is unable to provide continuing evidence of it's ability to self-insure, the Interconnection Customer agrees to immediately obtain the coverage required under Section XI.A.
- G) Failure of the Interconnection Customer or Xcel Energy to enforce the minimum levels of insurance does not relieve the Interconnection Customer from maintaining such levels of insurance or relieve the Interconnection Customer of any liability.
- H) All insurance certificates, statements of self-insurance, endorsements, cancellations, terminations, alterations, and material changes of such insurance shall be issued and submitted to the Generation Interconnection Coordinator assigned.

XII. MISCELLANEOUS

A) FORCE MAJEURE

- 1) An event of Force Majeure means any act of God, act of the public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, any curtailment, order,

(Continued on Sheet No. 10-124)

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APPENDIX E: Interconnection Agreement (Continued)

XII. MISCELLANEOUS (Continued)

regulation or restriction imposed by governmental, military or lawfully established civilian authorities, or any other cause beyond a Party's control. An event of Force Majeure does not include an act of negligence or intentional wrongdoing. Neither Party will be considered in default as to any obligation hereunder if such Party 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 shall make all reasonable efforts to perform its obligations hereunder.

- 2) Neither Party will be considered in default of any obligation hereunder if such Party 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 shall make all reasonable efforts to perform its obligations hereunder.

B) NOTICES

- 1) Any written notice, demand, or request required or authorized in connection with this Agreement ("Notice") shall be deemed properly given if delivered in person or sent by first class mail, postage prepaid, to the person specified below:
 - a) Generation Interconnection Coordinator assigned
 - b) If to Interconnection Customer:

A Friendly Interconnection Customer
Attention: Generation Coordinator
12345 Interconnection Drive.
Anytown, MN 55000
- 2) A Party may change its address for notices at any time by providing the other Party written notice of the change, in accordance with this Section.
- 3) The Parties may also designate operating representatives to conduct the daily communications, which may be necessary or convenient for the administration of this Agreement. Such designations, including names, addresses, and phone numbers may be communicated or revised by one Party's notice to the other Party.

(Continued on Sheet No. 10-125)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 125

APPENDIX E: Interconnection Agreement (Continued)

C) ASSIGNMENT

The Interconnection Customer shall not assign its rights nor delegate its duties under this Agreement without Xcel Energy's written consent. Any assignment or delegation the Interconnection Customer makes without Xcel Energy's written consent shall not be valid. Xcel Energy shall not unreasonably withhold its consent to the Generating Entities assignment of this Agreement.

D) NON-WAIVER

None of the provisions of this Agreement shall be considered waived by a Party unless such waiver is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any of the provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or the relinquishment of any such rights for the future, but the same shall continue and remain in full force and effect.

E) GOVERNING LAW AND INCLUSION OF XCEL ENERGY'S TARIFFS AND RULES.

- 1) This Agreement shall be interpreted, governed and construed under the laws of the State of Minnesota as if executed and to be performed wholly within the State of Minnesota without giving effect to choice of law provisions that might apply to the law of a different jurisdiction.
- 2) The interconnection and services provided under this Agreement shall at all times be subject to the terms and conditions set forth in the tariff schedules and rules applicable to the electric service provided by Xcel Energy, which tariff schedules and rules are hereby incorporated into this Agreement by this reference.
- 3) Notwithstanding any other provisions of this Agreement, Xcel Energy shall have the right to unilaterally file with the MPUC, pursuant to the MPUC's rules and regulations, an application for change in rates, charges, classification, service, tariff or rule or any agreement relating thereto.

F) AMENDMENT AND MODIFICATION

This Agreement can only be amended or modified by a writing signed by both Parties.

G) ENTIRE AGREEMENT

This Agreement, including all attachments, exhibits, and appendices, constitutes the entire Agreement between the Parties with regard to the interconnection of the Generation System of the Parties at the Point(s) of Common Coupling expressly provided for in this Agreement and supersedes all prior agreements.

(Continued on Sheet No. 10-126)

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President and CEO of Northern States Power Company

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 126

APPENDIX E: Interconnection Agreement (Continued)

G) ENTIRE AGREEMENT (Continued)

or understandings, whether verbal or written. It is expressly acknowledged that the Parties may have other agreements covering other services not expressly provided for herein, which agreements are unaffected by this Agreement. Each party also represents that in entering into this Agreement, it has not relied on the promise, inducement, representation, warranty, agreement or other statement not set forth in this Agreement or in the incorporated attachments, exhibits and appendices.

H) CONFIDENTIAL INFORMATION

Except as otherwise agreed or provided herein, each Party shall hold in confidence and shall not disclose confidential information, to any person (except employees, officers, representatives and agents, who agree to be bound by this section). Confidential information shall be clearly marked as such on each page or otherwise affirmatively identified. If a court, government agency or entity with the right, power, and authority to do so, requests or requires either Party, by subpoena, oral disposition, interrogatories, requests for production of documents, administrative order, or otherwise, to disclose Confidential Information, that Party shall provide the other Party with prompt notice of such request(s) or requirements(s) so that the other Party may seek an appropriate protective order or waive compliance with the terms of this Agreement. In the absence of a protective order or waiver the Party shall disclose such confidential information which, in the opinion of its counsel, the party is legally compelled to disclose. Each Party will use reasonable efforts to obtain reliable assurance that confidential treatment will be accorded any confidential information so furnished.

I) NON-WARRANTY

Neither by inspection, if any, or non-rejection, nor in any other way, does Xcel Energy give any warranty, expressed or implied, as to the adequacy, safety, or other characteristics of any structures, equipment, wires, appliances or devices owned, installed or maintained by the Interconnection Customer or leased by the Interconnection Customer from third parties, including without limitation the Generation System and any structures, equipment, wires, appliances or devices appurtenant thereto.

J) NO PARTNERSHIP

This Agreement shall not be interpreted or construed to create an association, joint venture, agency relationship, or partnership between the Parties or to impose any partnership obligation or partnership liability upon either Party. Neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

(Continued on Sheet No. 10-127)

Date Filed: 11-02-05

By: Cynthia L. Leshner
President and CEO of Northern States Power Company

Effective Date: 02-01-07

Docket No. E002/GR-05-1428

Order Date: 09-01-06

Northern States Power Company, a Minnesota corporation
and wholly owned subsidiary of Xcel Energy Inc.
Minneapolis, Minnesota 55401

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 127

APPENDIX E: Interconnection Agreement (Continued)

XIII. SIGNATURES

IN WITNESS WHEREOF, the Parties hereto have caused two originals of this Agreement to be executed by their duly authorized representatives. This Agreement is effective as of the last date set forth below.

Interconnection Customer

By: _____

Name: _____

Title: _____

Date: _____

Xcel Energy

By: _____

Name: _____

Title: _____

Date: _____

(Continued on Sheet No. 10-128)

Date Filed: 11-02-05

By: Cynthia L. Leshner

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 128

EXHIBIT A

**GENERATION SYSTEM DESCRIPTION
AND SINGLE-LINE DIAGRAM**

(Continued on Sheet No. 10-129)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 129

EXHIBIT B

**SUMMARY OF XCEL ENERGY COSTS AND DESCRIPTION OF DEDICATED FACILITIES BEING INSTALLED BY
XCEL ENERGY FOR THE INTERCONNECTION OF THE GENERATION SYSTEM**

This Exhibit shall provide the estimated total costs that will be the responsibility of the Interconnection Customer. It is assumed that the Initial application has been filed and the engineering studies have been paid for and completed. So those costs are not included on this listing.

What is listed below is a general outline of some of the major areas where costs could occur. Costs other than those listed below may be included by Xcel Energy, provided that those costs are a direct result from the request to interconnect the Generation System. The following list is only a guideline and Xcel Energy, for each installation will be creating a unique Exhibit B that is tailored for that specific Generation System interconnection.

- A) Dedicated Facilities (equipment, design and installation labor)
- B) Monitoring & Control System (equipment, design and installation labor)
- C) Design Coordination and Review
- D) Construction Coordination labor costs
- E) Testing (development of tests and physical testing)
- F) Contingency

(Continued on Sheet No. 10-130)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 130

EXHIBIT C

ENGINEERING DATA SUBMITTAL

Attach a completed Engineering Data Submittal form from Appendix C of "State of Minnesota Interconnection Process for Distributed Generation Systems".

(Continued on Sheet No. 10-131)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 131

EXHIBIT D

OPERATING AGREEMENT

Each Generation System interconnection will be unique and will require a unique Operating Agreement. The following is a listing of some of the possible areas that will be covered in an operating agreement. The following has not been developed into a standard agreement due to the unique nature of each Generation System. It is envisioned that this Exhibit will be tailored by Xcel Energy for each Generation System interconnection. It is also intended that this Operating Agreement Exhibit will be reviewed and updated periodically, to allow the operation of the Generation System, to change to meet the needs of both Xcel Energy and the Interconnection Customer, provided that the change does not negatively affect the other Party. There may also be operating changes required by outside issues, such as changes in FERC and MISO requirements and/or policies which will require this Operating Agreement to be modified.

The following items are provided to show the general types of items that may be included in this Operating Agreement. The items included in the Operating Agreement shall not be limited to the items shown on this list.

- A) Applicable Xcel Energy Tariffs: discussion on which tariffs are being applied for this installation and possibly how they will be applied.
- B) Var Requirements: How will the Generation System be required to operate so as to control the power factor of the energy flowing in either direction across the interconnection?
- C) Inadvertent Energy: This Operating Agreement needs to provide the method(s) that will be used to monitor, meter and account for the inadvertent energy used or supplied by the Generation System. Tariffs and operating rules that apply for this Generation System interconnection shall be discussed in this Operating Agreement.
- D) Control Issues: Starting and stopping of the generation, including the remote starting and stopping, if applicable.
- E) Dispatch of Generation Resources: What are the dispatch requirements for the Generation System, Can it only run during Peak Hours? Are there a limited number of hours that it can run? Is it required to have met an availability percentage? This will greatly depend upon the PPA and other requirements. Is the Interconnection Customer required to coordinate outages of the Generation System, with Xcel Energy?
- F) Outages of Distribution System: How are emergency outages handled? How are other outages scheduled? If the Interconnection Customer requires Xcel Energy to schedule the outages during after-hours, who pays for Xcel Energy's overtime?

(Continued on Sheet No. 10-132)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 132

EXHIBIT D (Continued)

OPERATING AGREEMENT (Continued)

- G) Notification / Contacts: Who should be notified? How should they be notified? When should they be notified? For what reasons, should the notification take place?
- 1) Starting of the Generation
 - 2) Dispatching of Generation
 - 3) Notification of failures (both Xcel Energy and Generation System failures)
- H) Documentation of Operational Settings: How much fuel will the generation System typically have on hand? How long can it run with this fuel capacity? How is the generation system set to operate for a power failure? These may be issues that should be documented in the Operating Agreement. The following are a couple of examples:
- 1) "The Generation System will monitor the Xcel Energy phase voltage and after 2 seconds of any phase voltage below 90% the generation will be started and the load transferred to the generator, if the generation is not already running."
 - 2) "The Generation System will wait for 30 minutes after it senses the return of the Xcel Energy frequency and voltage, before it will automatically reconnect to Xcel Energy."
- I) Cost of testing for future failures: If a component of the Generation System fails or needs to be replaced, which effects the interconnection with Xcel Energy, what is the process for retesting, and for replacement? Who pays for the additional costs of Xcel Energy to work with the Interconnection Customer to resolve these problems and/or to complete retesting of the modified equipment?
- J) Right of Access: At all times, Xcel Energy shall have access to the disconnect switch of the Generation System for any reasonable purpose in connection with the performance of the obligations imposed on it by this Agreement, to meet its obligation to operate the Xcel Energy system safely and to provide service to its customers, at all times. If necessary for the purposed of this Agreement, the Interconnection Customer shall allow Xcel Energy access to Xcel Energy's equipment and facilities located on the premises.

(Continued on Sheet No. 10-133)

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Northern States Power Company, a Minnesota corporation
and wholly owned subsidiary of Xcel Energy Inc.
Minneapolis, Minnesota 55401

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 133

EXHIBIT D (Continued)

OPERATING AGREEMENT (Continued)

SIGNATURES

IN WITNESS WHEREOF, the Parties hereto have caused two originals of this Agreement to be executed by their duly authorized representatives. This Agreement is effective as of the last date set forth below.

Interconnection Customer

By: _____

Name: _____

Title: _____

Date: _____

Xcel Energy

By: _____

Name: _____

Title: _____

Date: _____

(Continued on Sheet No. 10-134)

Date Filed:	11-02-05	By: Cynthia L. Leshner	Effective Date:	02-01-07
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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 134

EXHIBIT E

MAINTENANCE AGREEMENT

Each Generation System interconnection will be unique and will require a unique Maintenance Agreement. It is envisioned that this Exhibit will be tailored for each Generation System interconnection. It is also intended that this Maintenance Agreement Exhibit will be reviewed and updated periodically, to allow the maintenance of the Generation System be allowed to change to meet the needs of both Xcel Energy and the Interconnection Customer, provided that change does not negatively affect the other Party. There may also be changes required by outside issues; such as changes in FERC and MISO requirements and/or policies that will require this agreement to be modified.

A) Routine Maintenance Requirements –

- 1) Who is providing maintenance – Contact information
- 2) Periods of maintenance

B) Modifications to the Generation System - The Interconnection Customer shall notify Xcel Energy, in writing of plans for any modifications to the Generation System interconnection equipment at least twenty (20) business days prior to undertaking such modification. Modifications to any of the interconnection equipment, including all required protective systems, the generation control systems, the transfer switches/breakers, VT's & CT's, generating capacity and associated wiring shall be included in the notification to Xcel Energy. The Interconnection Customer agrees not to commence installation of any modifications to the Generating System until Xcel Energy has approved the modification, in writing. Xcel Energy shall have a minimum of five (5) business days and a maximum of ten (10) business days, to review and respond to the modification, after the receipt of the information required to review the modifications.

SIGNATURES

IN WITNESS WHEREOF, the Parties hereto have caused two originals of this Agreement to be executed by their duly authorized representatives. This Agreement is effective as of the last date set forth below.

Interconnection Customer

Xcel Energy

By: _____

By: _____

Name: _____

Name: _____

Title: _____

Title: _____

Date: _____

Date: _____

(Continued on Sheet No. 10-135)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF
(Continued)**

Section No. 10
1st Revised Sheet No. 135

STATE OF MINNESOTA
DISTRIBUTED GENERATION INTERCONNECTION REQUIREMENTS

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(Continued on Sheet No. 10-136)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 136

FOREWORD

Electric distribution system connected generation units span a wide range of sizes and electrical characteristics. Electrical distribution system design varies widely from that required to serve the rural customer to that needed to serve the large commercial customer. With so many variations possible, it becomes complex and difficult to create one interconnection standard that fits all generation interconnection situations.

In establishing a generation interconnection standard there are three main issues that must be addressed; Safety, Economics and Reliability.

The first and most important issue is safety; the safety of the general public and of the employees working on the electrical systems. This standard establishes the technical requirements that must be met to ensure the safety of the general public and of the employees working with Xcel Energy. Typically designing the interconnection system for the safety of the general public will also provide protection for the interconnected equipment.

The second issue is economics; the interconnection design must be affordable to build. The interconnection standard must be developed so that only those items, that are necessary to meet safety and reliability, are included in the requirements. This standard sets the benchmark for the minimum required equipment. If it is not needed, it will not be required.

The third issue is reliability; the generation system must be designed and interconnected such that the reliability and the service quality for all customers of the electrical power systems are not compromised. This applies to all electrical systems, not just Xcel Energy.

Many generation interconnection standards exist or are in draft form. The IEEE, FERC and many states have been working on generation interconnection standards. There are other standards such as the National Electrical Code (NEC) that, establish requirements for electrical installations. The NEC requirements are in addition to this standard. This standard is designed to document the requirements where the NEC has left the establishment of the standard to "the authority having jurisdiction" or to cover issues which are not covered in other national standards.

This standard covers installations, with an aggregated capacity of 10MW's or less. Many of the requirements in this document do not apply to small, 40kW or less generation installations. As an aid to the small, distributed generation customer, these small unit interconnection requirements have been extracted from this full standard and are available as a separate, simplified document titled: "Standards for Interconnecting Generation Sources, Rated Less than 40kW with Minnesota Electric Utilities".

1. Introduction

This standard has been developed to document the technical requirements for the interconnection between a Generation System and an area electrical power system "Utility system or Xcel Energy". This standard covers 3 phase Generation Systems with an aggregate capacity of 10 MW's or less and single phase Generation Systems

(Continued on Sheet No. 10-137)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 137

1. Introduction (Continued)

with an aggregate capacity of 40kW or less at the Point of Common Coupling. This standard covers Generation Systems that are interconnected with Xcel Energy's distribution facilities. This standard does not cover Generation Systems that are directly interconnected with Xcel Energy's Transmission System. Contact Xcel Energy for their Transmission System interconnection standards.

While, this standard provides the technical requirements for interconnecting a Generation System with a typical radial distribution system, it is important to note that there are some unique electric power systems, which have special interconnection needs. One example of a unique electric power system would be one operated as a "networked" system. This standard does not cover the additional special requirements of those systems. The Interconnection Customer must contact the Owner/Operator of the electric power system with which the interconnection is intended, to make sure that the Generation System is not proposed to be interconnected with a unique electric power system. If the planned interconnection is with a unique electric power system, the Interconnection Customer must obtain the additional requirements for interconnecting with Xcel Energy.

Xcel Energy has the right to limit the maximum size of any Generation System or number of Generation Systems that may want to interconnect, if the Generation System would reduce the reliability to the other customers connected to Xcel Energy.

This standard only covers the technical requirements and does not cover the interconnection process from the planning of a project through approval and construction. Please read the companion document "[State of Minnesota Interconnection Process for Distributed Generation Systems](#)" for the description of the procedure to follow and a generic version of the forms to submit. It is important to also get copies of Xcel Energy's tariff's concerning generation interconnection which will include rates, costs and standard interconnection agreements. The earlier the Interconnection Customer gets Xcel Energy involved in the planning and design of the Generation System interconnection the smoother the process will go.

A) Definitions

The definitions defined in the "[IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems](#)" (1547 Draft Ver. 11) apply to this document as well. The following definitions are in addition to the ones defined in IEEE 1547, or are repeated from the IEEE 1547 standard.

- i) "[Area EPS](#)" is an electric power system (EPS) that serves Local EPS's. For the purposes of this tariff, the Xcel Energy system is the Area EPS. Note. Typically, Xcel Energy has [primary access to public rights-of-way, priority crossing of property boundaries, etc.](#)
- ii) "[Generation](#)" is any device producing electrical energy, i.e., rotating generators driven by wind, steam turbines, internal combustion engines, hydraulic turbines, solar, fuel cells, etc.; or any other electric producing device, including energy storage technologies.

(Continued on Sheet No. 10-138)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 138

A) Definitions (Continued)

- iii) "Generation System" is the interconnected Distributed Generation(s), controls, relays, switches, breakers, transformers, inverters and associated wiring and cables, up to the Point of Common Coupling.
- iv) "Interconnection Customer" is the party or parties who are responsible for meeting the requirements of this standard. This could be the Generation System applicant, installer, designer, owner or operator.
- v) "Local EPS" is an electric power system (EPS) contained entirely within a single premises or group of premises.
- vi) "Point of Common Coupling" is the point where the Local EPS is connected to Xcel Energy.
- vii) "Transmission System" are those facilities as defined by using the guidelines established by the Minnesota State Public Utilities Commission; "In the Matter of Developing Statewide Jurisdictional Boundary Guidelines for Functionally Separating Interstate Transmission from Generation and Local Distribution Functions" Docket No. E-015/M-99-1002.
- viii) "Type-Certified" is Generation paralleling equipment that is listed by an OSHA listed national testing laboratory as having met the applicable type testing requirement of UL 1741. At the time this document was prepared this was the only national standard available for certification of generation transfer switch equipment. This definition does not preclude other forms of type-certification if agreeable to Xcel Energy.

B) Interconnection Requirements Goals

This standard defines the minimum technical requirements for the implementation of the electrical interconnection between the Generation System and Xcel Energy. It does not define the overall requirements for the Generation System. The requirements in this standard are intended to achieve the following:

- i) Ensure the safety of utility personnel and contractors working on the electrical power system.
- ii) Ensure the safety of utility customers and the general public.
- iii) Protect and minimize the possible damage to the electrical power system and other customer's property.
- iv) Ensure proper operation to minimize adverse operating conditions on the electrical power system.

(Continued on Sheet No. 10-139)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 139

C) Protection

The Generation System and Point of Common Coupling shall be designed with proper protective devices to promptly and automatically disconnect the Generation from Xcel Energy in the event of a fault or other system abnormality. The type of protection required will be determined by:

- i) Size and type of the generating equipment.
- ii) The method of connecting and disconnecting the Generation System from the electrical power system.
- iii) The location of generating equipment on the electric power system.

D) Xcel Energy Modifications

Depending upon the match between the Generation System, Xcel Energy and how the Generation System is operated, certain modifications and/or additions may be required to the existing electric power system with the addition of the Generation System. To the extent possible, this standard describes the modifications which could be necessary to the electric power system for different types of Generation Systems. For some unique interconnections, additional and/or different protective devices, system modifications and/or additions will be required by Xcel Energy. In these cases Xcel Energy will provide the final determination of the required modifications and/or additions. If any special requirements are necessary they will be identified by Xcel Energy during the application review process.

E) Generation System Protection

The Interconnection Customer is solely responsible for providing protection for the Generation System. Protection systems required in this standard, are structured to protect Xcel Energy's electrical power system and the public. The Generation System Protection is not provided for in this standard. Additional protection equipment may be required to ensure proper operation for the Generation System. This is especially true while operating disconnected, from Xcel Energy. Xcel Energy does not assume responsibility for protection of the Generation System equipment or of any portion of a Local EPS.

F) Electrical Code Compliance

Interconnection Customer shall be responsible for complying with all applicable local, independent, state and federal codes such as building codes, National Electric Code (NEC), National Electrical Safety Code (NESC) and noise and emissions standards. As required by Minnesota State law, Xcel Energy will require proof of complying with the National Electrical Code before the interconnection is made, through installation approval by an electrical inspector recognized by the Minnesota State Board of Electricity.

The Interconnection Customer's Generation System and installation shall comply with latest revisions of the ANSI/IEEE standards applicable to the installation, especially IEEE 1547; "Standard for Interconnecting Distributed Resources with Electric Power Systems". See the reference section in this document for a partial list of the standards that apply to the generation installations covered by this standard.

(Continued on Sheet No. 10-140)

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Minneapolis, Minnesota 55401

MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 140

2. References

The following standards shall be used in conjunction with this standard. When the stated version of the following standards is superseded by an approved revision then that revision shall apply.

IEEE Std 100-2000, "IEEE Standard Dictionary of Electrical and Electronic Terms"

IEEE Std 519-1992, "IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems"

IEEE Std 929-2000, "IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems"

IEEE Std 1547, "IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems"

IEEE Std C37.90.1-1989 (1995), "IEEE Standard Surge Withstand Capability (SEC) Tests for Protective Relays and Relay Systems"

IEEE Std C37.90.2 (1995), "IEEE Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers"

IEEE Std C62.41.2-2002, "IEEE Recommended Practice on Characterization of Surges in Low Voltage (1000V and Less) AC Power Circuits"

IEEE Std C62.42-1992 (2002), "IEEE Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000V and less) AC Power Circuits"

ANSI C84.1-1995, "Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)"

ANSI/IEEE 446-1995, "Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications"

ANSI/IEEE Standard 142-1991, "IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems – Green Book"

UL Std. 1741 "Inverters, Converters, and Controllers for use in Independent Power Systems"

NEC – "National Electrical Code", National Fire Protection Association (NFPA), NFPA-70-2002

NESC – "National Electrical Safety Code". ANSI C2-2000, Published by the Institute of Electrical and Electronics Engineers, Inc.

(Continued on Sheet No. 10-141)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 141

3. Types of Interconnections

- A) The manner in which the Generation System is connected to and disconnected from Xcel Energy can vary. Most transfer systems normally operate using one of the following five methods of transferring the load from Xcel Energy 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 Xcel Energy 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 Xcel Energy 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 Xcel Energy. 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 than 500kW. This is due to possible voltage flicker problems created on the electric power system, when the load is removed from or returned to the Xcel Energy source. Depending upon Xcel Energy's stiffness this level may be larger or smaller than 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 Xcel Energy 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 Xcel Energy 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.

(Continued on Sheet No. 10-142)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 142

3. Types of Interconnections (Continued)

(2) As a practical point of application this type of transfer switch is typically used for loads less than 500kW. This is due to possible voltage flicker problems created on the electric power system, when the load is removed from or returned to the Xcel Energy source. Depending upon Xcel Energy'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 Xcel Energy prior to the transfer occurring. The transfer switch then parallels with Xcel Energy for a short time (100 msec. or less) and then the Generation System and load is disconnect from Xcel Energy. 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 Xcel Energy is lost. With this type of transfer, the load is always being supplied by Xcel Energy or the Distributed Generation.

(1) As a practical point of application this type of transfer switch is typically used for loads less than 500kW. This is due to possible voltage flicker problems created on the electric power system, when the load is removed from or returned to the Xcel Energy source. Depending upon Xcel Energy's stiffness this level may be larger or smaller than 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 Xcel Energy for a limited amount of time (generally less than 1-2 minutes) to gradually transfer the load from Xcel Energy 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.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 143

3. Types of Interconnections (Continued)

(2) With Extended Parallel Operation – The Generation System is paralleled with Xcel Energy in continuous operation. Special design, coordination and agreements are required before any extended parallel operation will be permitted. The Xcel Energy 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 Xcel Energy. Solar, wind and fuel cells are some examples of Generation which typically use inverters to connect to Xcel Energy. 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 Xcel Energy.

(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 electric power system 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 Xcel Energy must be performed to determine any additional protection systems, metering or other needs. The issues will be identified by Xcel Energy during the interconnection study process.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 144

4. Interconnection Issues and Technical Requirements

- A) General Requirements - The following requirements apply to all interconnected generating equipment. Xcel Energy shall be the source side and the customer's system shall be the load side in the following interconnection requirements.

- i) Visible Disconnect - A disconnecting device shall be installed to electrically isolate Xcel Energy from the Generation System. The only exception for the installation of a visible disconnect is if the generation is interconnected via a mechanically interlocked open transfer switch and installed per the NEC (702.6) "so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment."

The visible disconnect shall provide a visible air gap between Interconnection Customer's Generation and Xcel Energy in order to establish the safety isolation required for work on the electric power system. This disconnecting device shall be readily accessible 24 hours per day by Xcel Energy field personnel and shall be capable of padlocking by Xcel Energy field personnel. The disconnecting device shall be lockable in the open position.

The visible disconnect shall be a UL approved or National Electrical Manufacture's Association approved, manual safety disconnect switch of adequate ampere capacity. The visible disconnect shall not open the neutral when the switch is open. A draw-out type circuit breaker can be used as a visual open.

The visible disconnect shall be labeled, as required by Xcel Energy to inform Xcel Energy field personnel.

- ii) Energization of Equipment by Generation System – The Generation System shall not energize a de-energized electric power system. The Interconnection Customer shall install the necessary padlocking (lockable) devices on equipment to prevent the energization of a de-energized electrical power system. Lock out relays shall automatically block the closing of breakers or transfer switches on to a de-energized electric power system.

- iii) Power Factor - The power factor of the Generation System and connected load shall be as follows;

- (1) Inverter Based interconnections – shall operate at a power factor of no less than 90% at the inverter terminals.
- (2) Limited Parallel Generation Systems, such as closed transfer or soft-loading transfer systems shall operate at a power factor of no less than 90%, during the period when the Generation System is parallel with Xcel Energy, as measured at the Point of Common Coupling.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 145

4. Interconnection Issues and Technical Requirements (Continued)

- (3) Extended Parallel Generation Systems shall be designed to be capable of operating between 90% lagging and 95% leading. These Generation Systems shall normally operate near unity power factor (+/-98%) or as mutually agreed between Xcel Energy and the Interconnection Customer.

iv) Grounding Issues

- (1) Grounding of sufficient size to handle the maximum available ground fault current shall be designed and installed to limit step and touch potentials to safe levels as set forth in "IEEE Guide for Safety in AC Substation Grounding", ANSI/IEEE Standard 80.
- (2) It is the responsibility of the Interconnection Customer to provide the required grounding for the Generation System. A good standard for this is the IEEE Std. 142-1991 "Grounding of Industrial and Commercial Power Systems"
- (3) All electrical equipment shall be grounded in accordance with local, state and federal electrical and safety codes and applicable standards

- v) Sales to Xcel Energy or other parties— Transportation of energy on the Transmission system is regulated by the area reliability council and FERC. Those contractual requirements are not included in this standard. Xcel Energy will provide these additional contractual requirements during the interconnection approval process.

B) For Inverter based, closed transfer and soft loading interconnections, the following additional requirements apply:

- i) Fault and Line Clearing - The Generation System shall be removed from Xcel Energy for any faults, or outages occurring on the electrical circuit serving the Generation System
- ii) Operating Limits in order to minimize objectionable and adverse operating conditions on the electric service provided to other customers connected to Xcel Energy, the Generation System shall meet the Voltage, Frequency, Harmonic and Flicker operating criteria as defined in the IEEE1547 standard during periods when the Generation System is operated in parallel with Xcel Energy.

If the Generation System creates voltage changes greater than 4% on the electric power system, it is the responsibility of the Interconnection Customer to correct these voltage sag/swell problems caused by the operation of the Generation System. If the operation of the interconnected Generation System causes flicker, which causes problems for others customer's interconnected to Xcel Energy, the Interconnection Customer is responsible for correcting the problem.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 146

4. Interconnection Issues and Technical Requirements (Continued)

- iii) Flicker - The operation of Generation System is not allowed to produce excessive flicker to adjacent customers. See the IEEE 1547 standard for a more complete discussion on this requirement.

The stiffer the electric power system, the larger a block load change that it will be able to handle. For any of the transfer systems, the Xcel Energy voltage shall not drop or rise greater than 4% when the load is added or removed from Xcel Energy. It is important to note, that if another interconnected customer complains about the voltage change caused by the Generation System, even if the voltage change is below the 4% level, it is the Interconnection Customer's responsibility to correct or pay for correcting the problem. Utility experience has shown that customers have seldom objected to instantaneous voltage changes of less than 2% on the electric power system, so most Area EPS Operators use a 2% design criteria.

- iv) Interference - The Interconnection Customer shall disconnect the Distributed Generation from Xcel Energy if the Distributed Generation causes radio, television or electrical service interference to other customers, via the EPS or interference with the operation of Xcel Energy. The Interconnection Customer shall either effect repairs to the Generation System or reimburse Xcel Energy for the cost of any required Xcel Energy modifications due to the interference.

- v) Synchronization of Customer Generation

(1) An automatic synchronizer with synch-check relaying is required for unattended automatic quick open transition, closed transition or soft loading transfer systems.

(2) To prevent unnecessary voltage fluctuations on the electric power system, it is required that the synchronizing equipment be capable of closing the Distributed Generation into the electric power system within the limits defined in IEEE 1547. Actual settings shall be determined by the Registered Professional Engineer establishing the protective settings for the installation.

(3) Unintended Islanding – Under certain conditions with extended parallel operation, it would be possible for a part of the Xcel Energy system to be disconnected from the rest of the Xcel Energy system and have the Generation System continue to operate and provide power to a portion of the isolated circuit. This condition is called "islanding". It is not possible to successfully reconnect the energized isolated circuit to the rest of the Xcel Energy system since there are no synchronizing controls associated with all of the possible locations of disconnection. Therefore, it is a requirement that the Generation System be automatically disconnected from the Xcel Energy system immediately by protective relays for any condition that would cause the Xcel Energy system to be de-energized. The Generation System must either isolate with the customer's load or trip. The Generation System must also be blocked from closing back into the Xcel Energy system until the Xcel Energy system is reenergized and the Xcel Energy system voltage is within Range B of ANSI C84.1 Table 1 for a minimum of 1 minute. Depending upon the size of the Generation System it may be necessary to install direct transfer trip equipment from the Xcel Energy system source(s) to remotely trip the generation interconnection to prevent islanding for certain conditions.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 147

4. Interconnection Issues and Technical Requirements (Continued)

vi) Disconnection –Xcel Energy may refuse to connect or may disconnect a Generation System from Xcel Energy system under the following conditions:

- (1) Lack of approved Standard Application Form and Standard Interconnection Agreement.
- (2) Termination of interconnection by mutual agreement.
- (3) Non-Compliance with the technical or contractual requirements.
- (4) System Emergency or for imminent danger to the public or Xcel Energy personnel (Safety).
- (5) Routine maintenance, repairs and modifications to the Xcel Energy system. Xcel Energy shall coordinate planned outages with the Interconnection Customer to the extent possible.

5. Generation Metering, Monitoring and Control

Metering, Monitoring and Control – Depending upon the method of interconnection and the size of the Generation System, there are different metering, monitoring and control requirements Table 5A is a table summarizing the metering, monitoring and control requirements.

Due to the variation in Generation Systems and the Xcel Energy system operational needs, the requirements for metering, monitoring and control listed in this document are the expected maximum requirements that Xcel Energy will apply to the Generation System. It is important to note that for some Generation System installations Xcel Energy may wave some of the requirements of this section if they are not needed. An example of this is with rural or low capacity feeders that require more monitoring then larger capacity, typically urban feeders.

Another factor which will effect the metering, monitoring and control requirements will be the tariff under which the Interconnection Customer is supplied by Xcel Energy. Table 5A has been written to cover most application, but some Xcel Energy tariffs may have greater or less metering, monitoring and control requirements then, as shown in Table 5A.

(Continued on Sheet No. 10-148)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 148

5. Generation Metering, Monitoring and Control (Continued)

TABLE 5A: Metering, Monitoring and Control Requirements			
Generation System Capacity at Point of Common Coupling	Metering	Generation Remote Monitoring	Generation Remote Control
< 40 kW with all sales to Xcel Energy	Bi-Directional metering at the point of common coupling	None Required	None Required
< 40 kW with Sales to a party other than Xcel Energy	Recording metering on the Generation System and a separate recording meter on the load	Interconnection Customer supplied direct dial phone line.	None Required
40 – 250kW with limited parallel	Detented Xcel Energy Metering at the Point of Common Coupling	None Required	None Required
40 – 250kW with extended parallel	Recording metering on the Generation System and a separate recording meter on the load	Interconnection Customer supplied direct dial phone line. Xcel Energy to supply it's own monitoring equipment	None Required
250 – 1000 kW with limited parallel	Detented Xcel Energy Metering at the Point of Common Coupling	Interconnection Customer supplied direct dial phone line and monitoring points available. See B (i)	None Required
250 – 1000 kW With extended parallel operation	Recording metering on the Generation System and a separate recording meter on the load.	Required Xcel Energy remote monitoring system See B (i)	None Required
>1000 kW With limited parallel Operation	Detented Xcel Energy Metering at the Point of Common Coupling	Required Xcel Energy SCADA monitoring system. See B (i)	None required
>1000 kW With extended parallel operation	Recording metering on the Generation System and a separate recording meter on the load.	Required Xcel Energy SCADA monitoring system See B (i)	Direct Control via SCADA by Xcel Energy of interface breaker.

"Detented" = A meter which is detented will record power flow in only one direction.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
1st Revised Sheet No. 149

5. Generation Metering, Monitoring and Control (Continued)

A) Metering

- i) As shown in Table 5A the requirements for metering will depend up on the type of generation and the type of interconnection. For most installations, the requirement is a single point of metering at the Point of Common Coupling. Xcel Energy will install a special meter that is capable of measuring and recording energy flow in both directions, for three phase installations or two detented meters wired in series, for single phase installations. A dedicated - direct dial phone line may be required to be supplied to the meter for Xcel Energy's use to read the metering. Some monitoring may be done through the meter and the dedicated – direct dial phone line, so in many installations the remote monitoring and the meter reading can be done using the same dial-up phone line.
- ii) Depending upon which tariff the Generation System and/or customer's load is being supplied under, additional metering requirements may result. Contact Xcel Energy for tariff requirements. In some cases, the direct dial-phone line requirement may be waived by Xcel Energy for smaller Generation Systems.
- iii) All Xcel Energy's revenue meters shall be supplied, owned and maintained by Xcel Energy. All voltage transformers (VT) and current transformers (CT), used for revenue metering shall be approved and/or supplied by Xcel Energy. Xcel Energy's standard practices for instrument transformer location and wiring shall be followed for the revenue metering.
- iv) For Generation Systems that sell power and are greater then 40kW in size, separate metering of the generation and of the load is required. A single meter recording the power flow at the Point of Common Coupling for both the Generation and the load, is not allowed by the rules under which the area transmission system is operated. Xcel Energy is required to report to the regional reliability council (the Midwest Reliability Organization (MRO) and MAPP or any successor organization) the total peak load requirements and is also required to own or have contracted for, accredited generation capacity of 115% of the experienced peak load level for each month of the year. Failure to meet this requirement results in a large monetary penalty for Xcel Energy.
- v) For Generation Systems which are less then 40kW in rated capacity and are qualified facilities under PURPA (Public Utilities Regulatory Power Act – Federal Gov. 1978), net metering is allowed and provides the generation system the ability to back feed Xcel Energy at some times and bank that energy for use at other times. Some of the qualified facilities under PURPA are solar, wind, hydro, and biomass. For these net-metered installations, Xcel Energy may use a single meter to record the bi-directional flow or Xcel Energy may elect to use two detented meters, each one to record the flow of energy in one direction.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 150

5. Generation Metering, Monitoring and Control (Continued)

- B) Monitoring (SCADA) is required as shown in table 5A. The need for monitoring is based on the need of the system control center to have the information necessary for the reliable operation of Xcel Energy. This remote monitoring is especially important during periods of abnormal and emergency operation.

The difference in Table 5A between remote monitoring and SCADA is that SCADA typically is a system that is in continuous communication with a central computer and provides updated values and status, to Xcel Energy, within several seconds of the changes in the field. Remote monitoring on the other hand will tend to provide updated values and status within minutes of the change in state of the field. Remote monitoring is typically less expensive to install and operate.

- i) Where Remote Monitoring or SCADA is required, as shown in Table 5A, the following monitored and control points are required:
- (1) Real and reactive power flow for each Generation System (kW and kVAR). Only required if separate metering of the Generation and the load is required, otherwise #4 monitored at the point of Common Coupling will meet the requirements.
 - (2) Phase voltage representative of Xcel Energy's service to the facility.
 - (3) Status (open/close) of Distributed Generation and interconnection breaker(s) or if transfer switch is used, status of transfer switch(s).
 - (4) Customer load from Xcel Energy service (kW and kVAR).
 - (5) Control of interconnection breaker - if required by Xcel Energy.

When telemetry is required, the Interconnection Customer must provide the communications medium to Xcel Energy's Control Center. This could be radio, dedicated phone circuit or other form of communication. If a telephone circuit is used, the Interconnection Customer must also provide the telephone circuit protection. The Interconnection Customer shall coordinate the RTU (remote terminal unit) addition with Xcel Energy. Xcel Energy may require a specific RTU and/or protocol to match their SCADA or remote monitoring system.

(Continued on Sheet No. 10-151)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 151

6. Protective Devices and Systems

- A) Protective devices required to permit safe and proper operation of the electric power system while interconnected with customer's Generation System are shown in the figures at the end of this document. In general, an increased degree of protection is required for increased Distributed Generation size. This is due to the greater magnitude of short circuit currents and the potential impact to system stability from these installations. Medium and large installations require more sensitive and faster protection to minimize damage and ensure safety.

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.

The Interconnection Customer shall provide protective devices and systems to detect the Voltage, Frequency, Harmonic and Flicker levels as defined in the IEEE 1547 standard during periods when the Generation System is operated in parallel with Xcel Energy. The Interconnection Customer shall be responsible for the purchase, installation, and maintenance of these devices. Discussion on the requirements for these protective devices and systems follows:

i) Relay settings

- (1) If the Generation System is utilizing a Type-Certified system, such as a UL listed inverter a Professional Electrical Engineer is not required to review and approve the design of the interconnecting system. If the Generation System interconnecting device is not Type-Certified or if the Type-Certified Generation System interconnecting device has additional design modifications made, the Generation System control, the protective system, and the interconnecting device(s) shall be reviewed and approved by a Professional Electrical Engineer, registered in the State of Minnesota.
- (2) A copy of the proposed protective relay settings shall be supplied to Xcel Energy for review and approval, to ensure proper coordination between the generation system and Xcel Energy system.

ii) Relays

- (1) All equipment providing relaying functions shall meet or exceed ANSI/IEEE Standards for protective relays, i.e., C37.90, C37.90.1 and C37.90.2.
- (2) Required relays that are not "draw-out" cased relays shall have test plugs or test switches installed to permit field testing and maintenance of the relay without unwiring or disassembling the equipment. Inverter based protection is excluded from this requirement for Generation Systems <40kW at the Point of Common Coupling.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 152

6. Protective Devices and Systems (Continued)

- (3) Three phase interconnections shall utilize three phase power relays, which monitor all three phases of voltage and current, unless so noted in the appendix one-lines.
- (4) All relays shall be equipped with setting limit ranges at least as wide as specified in IEEE 1547, and meet other requirements as specified in the Xcel Energy interconnect study. Setting limit ranges are not to be confused with the actual relay settings required for the proper operation of the installation. At a minimum, all protective systems shall meet the requirements established in IEEE 1547.
- (a) Over-current relays (IEEE Device 50/51 or 50/51V) shall operate to trip the protecting breaker at a level to ensure protection of the equipment and at a speed to allow proper coordination with other protective devices. For example, the over-current relay monitoring the interconnection breaker shall operate fast enough for a fault on the customer's equipment, so that no protective devices will operate on the electric power system. 51V is a voltage restrained or controlled over-current relay and may be required to provide proper coordination with the Xcel Energy system.
- (b) Over-voltage relays (IEEE Device 59) shall operate to trip the Distributed Generation per the requirements of IEEE 1547.
- (c) Under-voltage relays (IEEE Device 27) shall operate to trip the Distributed Generation per the requirements of IEEE 1547.
- (d) Over-frequency relays (IEEE Device 81O) shall operate to trip the Distributed Generation off-line per the requirements of IEEE 1547.
- (e) Under-frequency relay (IEEE Device 81U) shall operate to trip the Distributed Generation off-line per the requirements of IEEE 1547. For Generation Systems with an aggregate capacity greater than 30kW, the Distributed Generation shall trip off-line when the frequency drops below 57.0-59.8 Hz. typically this is set at 59.5 Hz, with a trip time of 0.16 seconds, but coordination with Xcel Energy is required for this setting.
- Xcel Energy will provide the reference frequency of 60 Hz. The Distributed Generation control system must be used to match this reference. The protective relaying in the interconnection system will be expected to maintain the frequency of the output of the Generation.
- (f) Reverse power relays (IEEE Device 32) (power flowing from the Generation System to Xcel Energy) shall operate to trip the Distributed Generation off-line for a power flow to the system with a maximum time delay of 2.0 seconds.

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 153

6. Protective Devices and Systems (Continued)

(g) Lockout Relay (IEEE Device 86) is a mechanically locking device which is wired into the close circuit of a breaker or switch and when tripped will prevent any close signal from closing that device. This relay requires that a person manually resets the lockout relay before that device can be reclosed. These relays are used to ensure that a deenergized system is not reenergized by automatic control action, and prevents a failed control from auto-reclosing an open breaker or switch.

(h) Transfer Trip – All Generation Systems are required to disconnect from Xcel Energy when the Xcel Energy system is disconnected from its source, to avoid unintentional islanding. With larger Generation Systems, which remain in parallel with Xcel Energy, a transfer trip system may be required to sense the loss of the Xcel Energy source. When the Xcel Energy source is lost, a signal is sent to the Generation System to separate the Generation from the Xcel Energy system. The size of the Generation System vs. the capacity and minimum loading on the feeder will dictate the need for transfer trip installation. The Xcel Energy interconnection study will identify the specific requirements.

If multiple Xcel Energy sources are available or multiple points of sectionalizing on the electric power system, then more than one transfer trip system may be required. The Xcel Energy interconnection study will identify the specific requirements. For some installations the alternate Xcel Energy source(s) may not be utilized except in rare occasions. If this is the situation, the Interconnection Customer may elect to have the Generation System locked out when the alternate source(s) are utilized, if agreeable to Xcel Energy.

(i) Parallel limit timing relay (IEEE Device 62PL) set at a maximum of 120 seconds for soft transfer installations and set no longer than 100ms for quick transfer installations, shall trip the Distributed Generation circuit breaker on limited parallel interconnection systems. Power for the 62 PL relay must be independent of the transfer switch control power. The 62PL timing must be an independent device from the transfer control and shall not be part of the generation PLC or other control system.

(Continued on Sheet No. 10-154)

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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 154

6. Protective Devices and Systems (Continued)

TABLE 6A SUMMARY OF RELAYING REQUIREMENTS								
Type of Interconnection	Over-current (50/51)	Voltage (27/59)	Frequency (81 0/U)	Reverse Power (32)	Lockout (86)	Parallel Limit Timer	Sync-Check (25)	Transfer Trip
Open Transition Mechanically Interlocked (Fig. 1)	—	—	—	—	—	—	—	—
Quick Open Transition Mechanically Interlocked (Fig. 2)	—	—	—	—	Yes	Yes	Yes	—
Closed Transition (Fig. 2)	—	—	—	—	Yes	Yes	Yes	—
Soft Loading Limited Parallel Operation (Fig. 3)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—
Soft Loading Extended Parallel < 250 kW (Fig. 4)	Yes	Yes	Yes	—	Yes	—	Yes	—
Soft Loading Extended Parallel >250kW (Fig.4)	Yes	Yes	Yes	—	Yes	—	Yes	Yes
Inverter Connection (Fig. 5)								
< 40 kW	Yes	Yes	Yes	—	Yes	—	—	—
40 kW – 250kW	Yes	Yes	Yes	—	Yes	—	—	—
> 250 kW	Yes	Yes	Yes	—	Yes	—	—	Yes

(Continued on Sheet No. 10-155)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 155

7. Agreements

- A) Interconnection Agreement – This agreement is required for all Generation Systems that parallel with Xcel Energy. Each of Xcel Energy's tariffs contain standard interconnection agreements. There are different interconnection agreements depending upon the size and type of Generation System. This agreement contains the terms and conditions upon which the Generation System is to be connected, constructed and maintained, when operated in parallel with Xcel Energy. Some of the issues covered in the interconnection agreement are as follows:
- i. Construction Process
 - ii. Testing Requirements
 - iii. Maintenance Requirements
 - iv. Firm Operating Requirements such as Power Factor
 - v. Access requirements for Xcel Energy personnel
 - vi. Disconnection of the Generation System (Emergency and Non-emergency)
 - vii. Term of Agreement
 - viii. Insurance Requirements
 - ix. Dispute Resolution Procedures
- B) Operating Agreement – For Generation Systems that normally operate in parallel with Xcel Energy, an agreement separate from the interconnection agreement, called the "operating agreement", is usually created. This agreement is created for the benefit of both the Interconnection Customer and Xcel Energy and will be agreed to between the Parties. This agreement will be dynamic and is intended to be updated and reviewed annually. For some smaller systems, the operating agreement can simply be a letter agreement for larger and more intergraded Generation Systems the operating agreement will tend to be more involved and more formal. The operating agreement covers items that are necessary for the reliable operation of the Local EPS and the Xcel Energy system. The items typically included in the operating agreement are as follows:
- i. Emergency and normal contact information for both the Xcel Energy operations center and for the Interconnection Customer
 - ii. Procedures for periodic Generation System test runs
 - iii. Procedures for maintenance on the electric power system that affects the Generation System.
 - iv. Emergency Generation Operation Procedures

(Continued on Sheet No. 10-156)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 156

8. Testing Requirements

A) Pre-Certification of equipment

The most important part of the process to interconnect generation with Local EPS and the Xcel Energy system is safety. One of the key components of ensuring the safety of the public and employees is to ensure that the design and implementation of the elements connected to the electrical power system operate as required. To meet this goal, all of the electrical wiring in a business or residence, is required by the State of Minnesota to be listed by a recognized testing and certification laboratory, for its intended purpose. Typically we see this as "UL" listed. Since Generation Systems have tended to be uniquely designed for each installation they have been designed and approved by Professional Engineers. As the number of Generation Systems installed increase, vendors are working towards creating equipment packages that can be tested in the factory and then will only require limited field testing. This will allow us to move towards "plug and play" installations. For this reason, this standard recognizes the efficiency of "pre-certification" of Generation System equipment packages that will help streamline the design and installation process.

An equipment package shall be considered certified for interconnected operation if it has been submitted by a manufacture, tested and listed by a nationally recognized testing and certification laboratory (NRTL) for continuous utility interactive operation in compliance with the applicable codes and standards. Presently generation paralleling equipment that is listed by a nationally recognized testing laboratory as having met the applicable type-testing requirements of UL 1741 and IEEE 929, shall be acceptable for interconnection without additional protection system requirements. An "equipment package" shall include all interface components including switchgear, inverters, or other interface devices and may include an integrated generator or electric source. If the equipment package has been tested and listed as an integrated package which includes a generator or other electric source, it shall not required further design review, testing or additional equipment to meet the certification requirements for interconnection. If the equipment package includes only the interface components (switchgear, inverters, or other interface devices), then the Interconnection Customer shall show that the generator or other electric source being utilized with the equipment package is compatible with the equipment package and consistent with the testing and listing specified for the package. Provided the generator or electric source combined with the equipment package is consistent with the testing ad listing performed by the nationally recognized testing and certification laboratory, no further design review, testing or additional equipment shall be required to meet the certification requirements of this interconnection procedure. A certified equipment package does not include equipment provided by Xcel Energy.

The use of Pre-Certified equipment does not automatically qualify the Interconnection Customer to be interconnected to the Xcel Energy system. An application will still need to be submitted and an interconnection review may still need to be performed, to determine the compatibility of the Generation System with the Xcel Energy system.

(Continued on Sheet No. 10-157)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 157

8. Testing Requirements (Continued)

B) Pre-Commissioning Tests

i) Non-Certified Equipment

(1) Protective Relaying and Equipment Related to Islanding

- (a) Distributed generation that is not Type-Certified (type tested), shall be equipped with protective hardware and/or software designed to prevent the Generation from being connected to a de-energized Xcel Energy system.
- (b) The Generation may not close into a de-energized Xcel Energy system and protection provided to prevent this from occurring. It is the Interconnection Customer's responsibility to provide a final design and to install the protective measures required by Xcel Energy. Xcel Energy will review and approve the design, the types of relays specified, and the installation. Mutually agreed upon exceptions may at times be necessary and desirable. It is strongly recommended that the Interconnection Customer obtain Xcel Energy written approval prior to ordering protective equipment for parallel operation. The Interconnection Customer will own these protective measures installed at their facility.
- (c) The Interconnection Customer shall obtain prior approval from Xcel Energy for any revisions to the specified relay calibrations.

C) Commissioning Testing

The following tests shall be completed by the Interconnection Customer. All of the required tests in each section shall be completed prior to moving on to the next section of tests. Xcel Energy has the right to witness all field testing and to review all records prior to allowing the system to be made ready for normal operation. Xcel Energy shall be notified, with sufficient lead time to allow the opportunity for Xcel Energy personnel to witness any or all of the testing.

- i) Pre-testing - The following tests are required to be completed on the Generation System prior to energization by the Generator or Xcel Energy. Some of these tests may be completed in the factory if no additional wiring or connections were made to that component. These tests are marked with a "**".
- (1) Grounding shall be verified to ensure that it complies with this standard, the NESC and the NEC.
- (2) * CT's (Current Transformers) and VT's (Voltage Transformers) used for monitoring and protection shall be tested to ensure correct polarity, ratio and wiring.

(Continued on Sheet No. 10-158)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 158

8. Testing Requirements (Continued)

- (3) CT's shall be visually inspected to ensure that all grounding and shorting connections have been removed where required.
- (4) Breaker / Switch tests – Verify that the breaker or switch cannot be operated with interlocks in place or that the breaker or switch cannot be automatically operated when in manual mode. Various Generation Systems have different interlocks, local or manual modes etc. The intent of this section is to ensure that the breaker or switches controls are operating properly.
- (5) * Relay Tests – All Protective relays shall be calibrated and tested to ensure the correct operation of the protective element. Documentation of all relay calibration tests and settings shall be furnished to Xcel Energy.
- (6) Trip Checks - Protective relaying shall functionally tested to ensure the correct operation of the complete system. Functional testing requires that the complete system is operated by the injection of current and/or voltage to trigger the relay element and proving that the relay element trips the required breaker, lockout relay or provides the correct signal to the next control element. Trip circuits shall be proven through the entire scheme (including breaker trip)
- For factory-assembled systems, such as inverters the setting of the protective elements may occur at the factory. This section requires that the complete system including the wiring and the device being tripped or activated is proven to be in working condition through the injection of current and/or voltage.
- (7) Remote Control, SCADA and Remote Monitoring tests – All remote control functions and remote monitoring points shall be verified operational. In some cases, it may not be possible to verify all of the analog values prior to energization. Where appropriate, those points may be verified during the energization process
- (8) Phase Tests – the Interconnection Customer shall work with Xcel Energy to complete the phase test to ensure proper phase rotation of the Generation and wiring.
- (9) Synchronizing test – The following tests shall be done across an open switch or racked out breaker. The switch or breaker shall be in a position that it is incapable of closing between the Generation System and the Xcel Energy system for this test. This test shall demonstrate that at the moment of the paralleling-device closure, the frequency, voltage and phase angle are within the required ranges, stated in IEEE 1547. This test shall also demonstrate that is any of the parameters are outside of the ranges stated; the paralleling-device shall not close. For inverter-based interconnected systems this test may not be required unless the inverter creates fundamental voltages before the paralleling device is closed.

(Continued on Sheet No. 10-159)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 159

8. Testing Requirements (Continued)

- ii) On-Line Commissioning Test – the following tests will proceed once the Generation System has completed Pre-testing and the results have been reviewed and approved by Xcel Energy. For smaller Generation Systems, Xcel Energy may have a set of standard interconnection tests that will be required. On larger and more complex Generation Systems the Interconnection Customer and Xcel Energy will get together to develop the required testing procedure. All on-line commissioning test shall be based on written test procedures agreed to between Xcel Energy and the Interconnection Customer.

Generation System functionally shall be verified for specific interconnections as follows:

- (1) Anti-Islanding Test – For Generation Systems that parallel with the utility for longer than 100msec.

(a) The Generation System shall be started and connected in parallel with the Xcel Energy source

(b) The Xcel Energy source shall be removed by opening a switch, breaker etc.

(c) The Generation System shall either separate with the local load or stop generating

(d) The device that was opened to remove the Xcel Energy source shall be closed and the Generation System shall not re-parallel with Xcel Energy for at least 5 minutes.

- iii) Final System Sign-off.

- (1) To ensure the safety of the public, all interconnected customer owned generation systems which do not utilize a Type-Certified system shall be certified as ready to operate by a Professional Electrical Engineer registered in the State of Minnesota, prior to the installation being considered ready for commercial use.

- iv) Periodic Testing and Record Keeping

- (1) Any time the interface hardware or software, including protective relaying and generation control systems are replaced and/or modified, Xcel Energy shall be notified. This notification shall, if possible, be with sufficient warning so that Xcel Energy personnel can be involved in the planning for the modification and/or witness the verification testing. Verification testing shall be completed on the replaced and/or modified equipment and systems. The involvement of Xcel Energy personnel will depend upon the complexity of the Generation System and the component being replaced and/or modified. Since the Interconnection Customer and Xcel Energy are now operating an interconnected system. It is important for each to communicate changes in operation, procedures and/or equipment to ensure the safety and reliability of the Local EPS and the Xcel Energy system.

(Continued on Sheet No. 10-159.1)

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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
Original Sheet No. 159.1

8. Testing Requirements (Continued)

- (2) All interconnection-related protection systems shall be periodically tested and maintained, by the Interconnection Customer, at intervals specified by the manufacture or system integrator. These intervals shall not exceed 5 years. Periodic test reports and a log of inspections shall be maintained, by the Interconnection Customer and made available to Xcel Energy upon request. Xcel Energy shall be notified prior to the period testing of the protective systems, so that Xcel Energy personnel may witness the testing if so desired.
- (a) Verification of inverter connected system rated 15kVA and below may be completed as follows;
The Interconnection Customer shall operate the load break disconnect switch and verify the Generator automatically shuts down and does not restart for at least 5 minutes after the switch is close
- (b) Any system that depends upon a battery for trip/protection power shall be checked and logged once per month for proper voltage. Once every four years the battery(s) must be either replaced or a discharge test performed. Longer intervals are possible through the use of "station class batteries" and Xcel Energy's approval.

(Continued on Sheet No. 10-159.2)

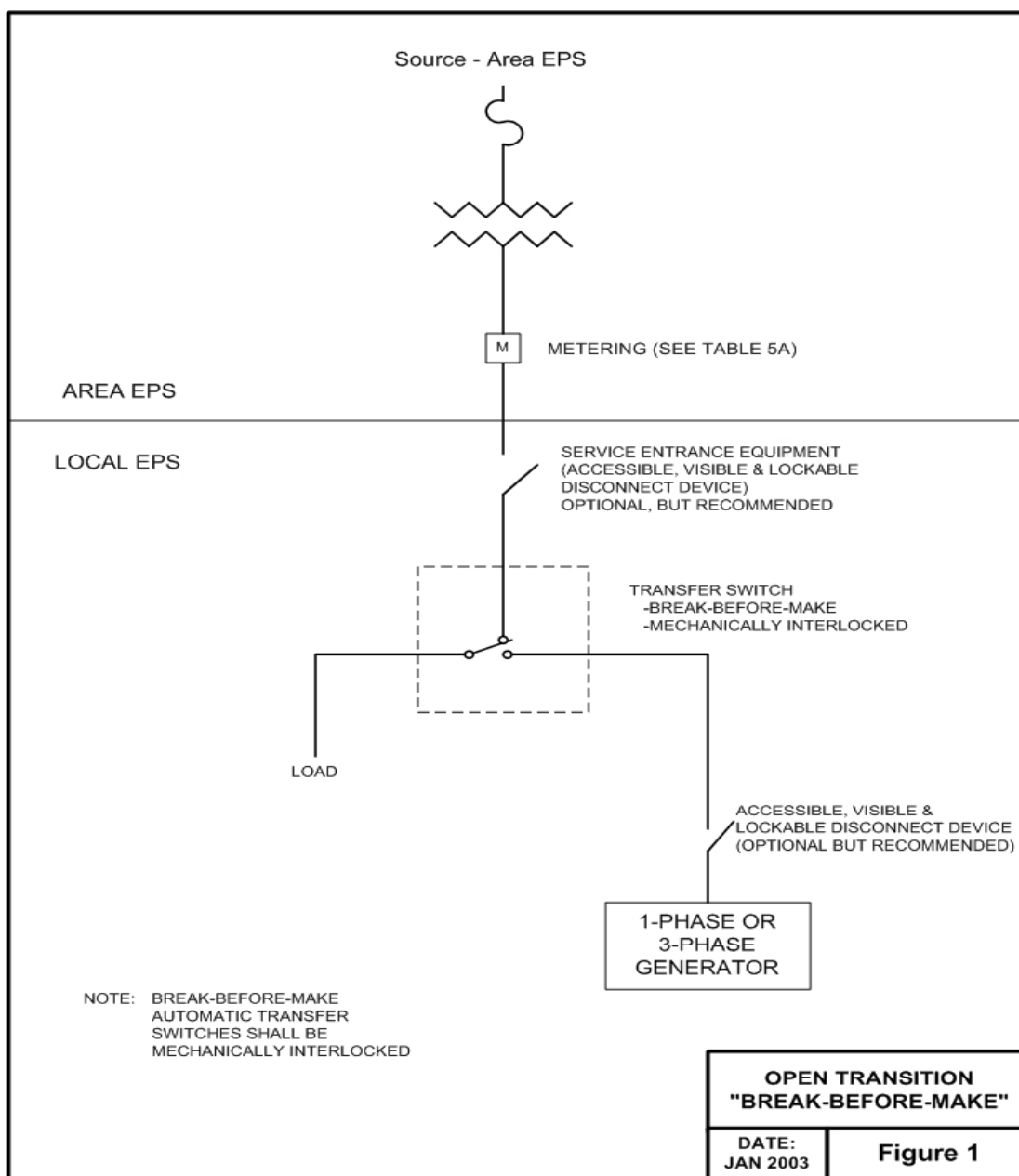
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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
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8. Testing Requirements (Continued)



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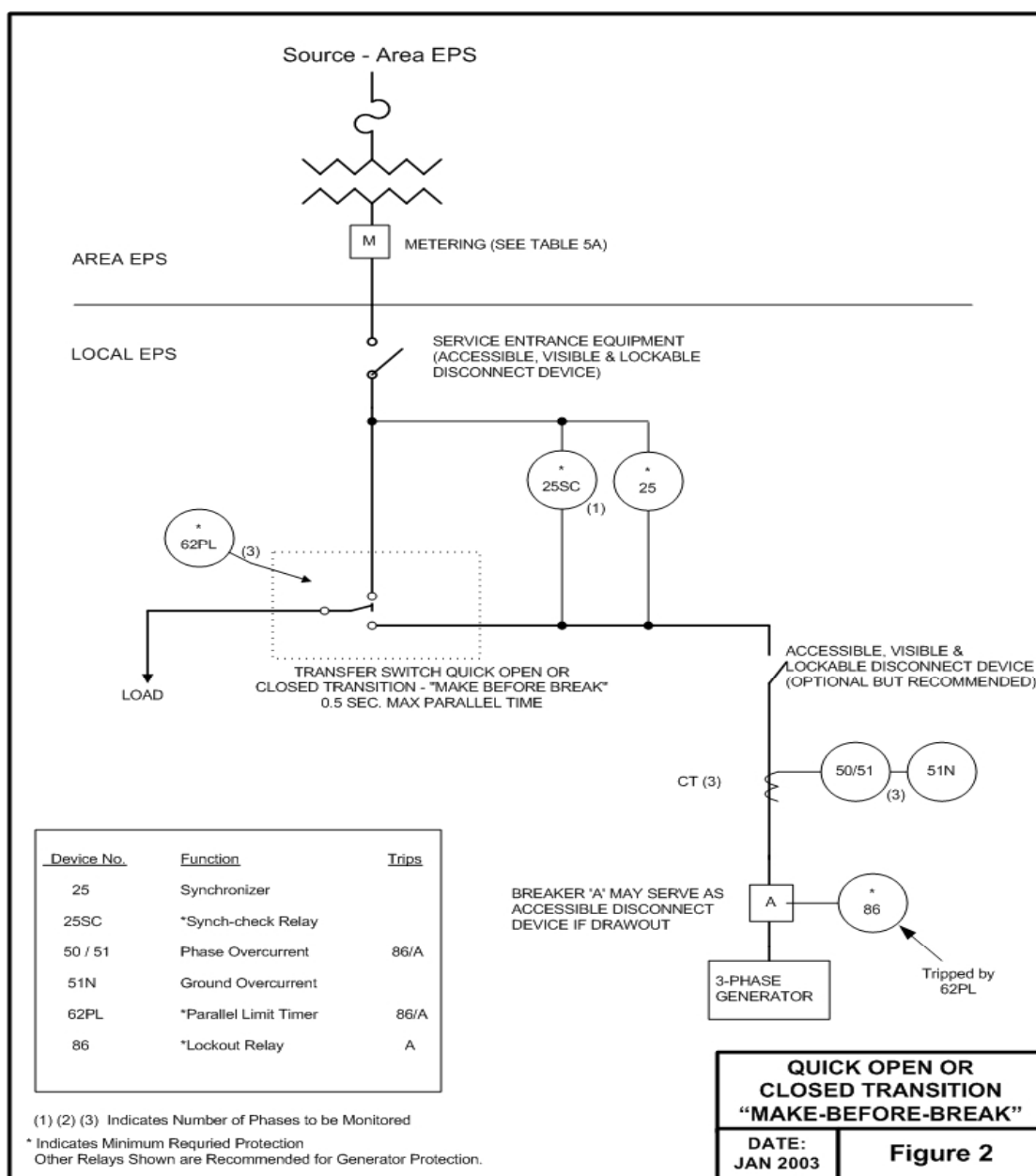
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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

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8. Testing Requirements (Continued)



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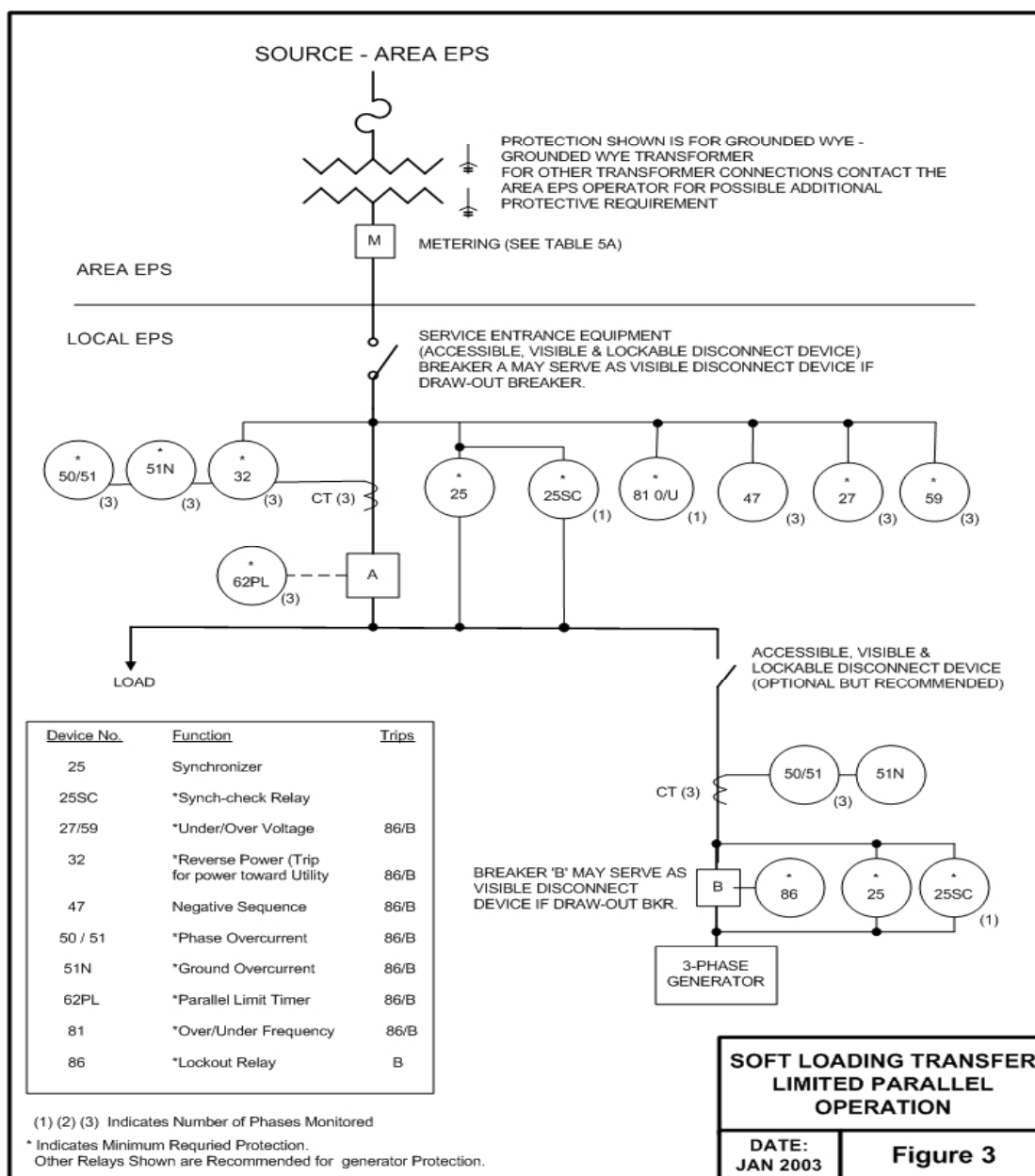
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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

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8. Testing Requirements (Continued)



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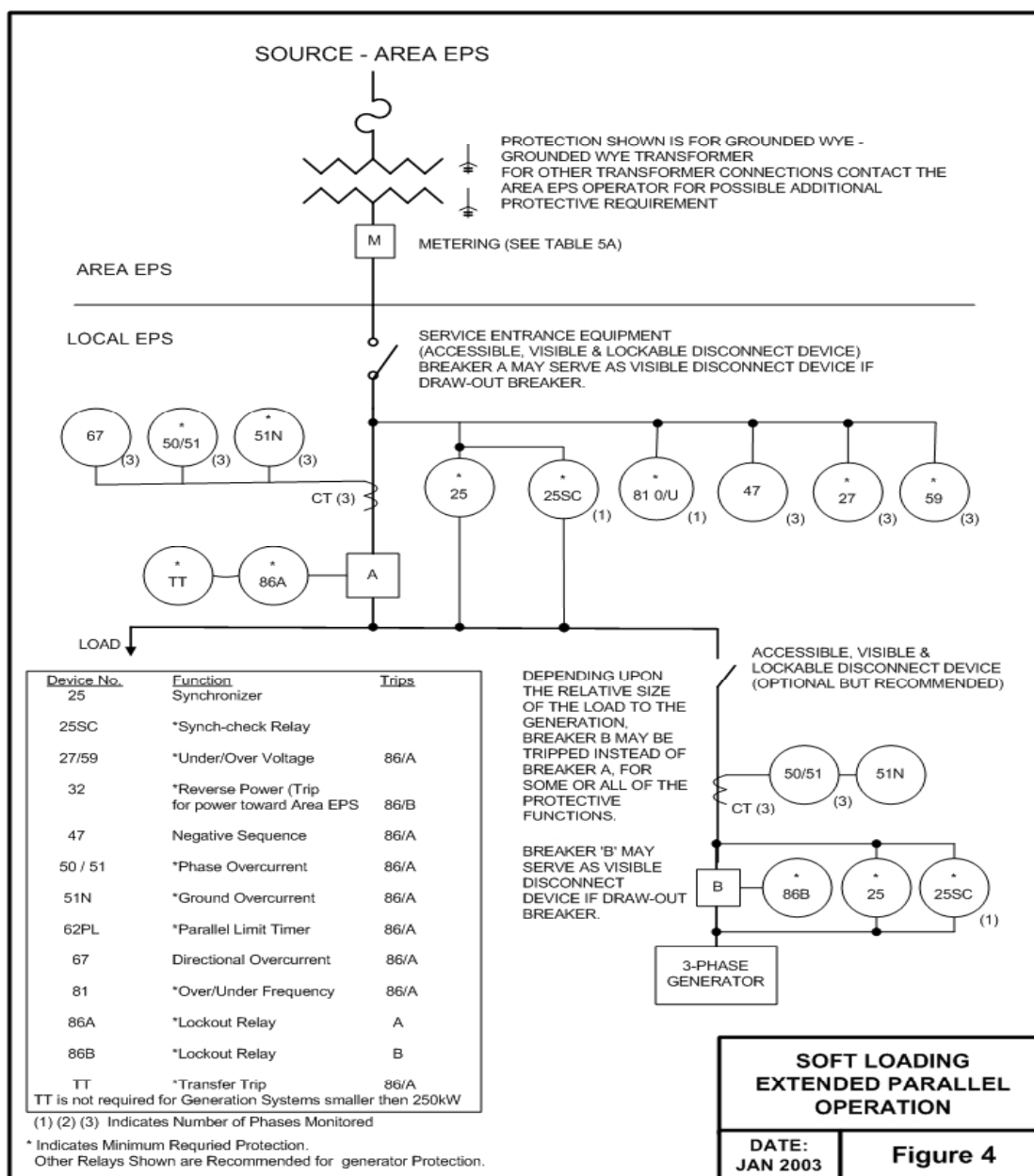
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**DISTRIBUTED GENERATION STANDARD
INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

Section No. 10
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8. Testing Requirements (Continued)



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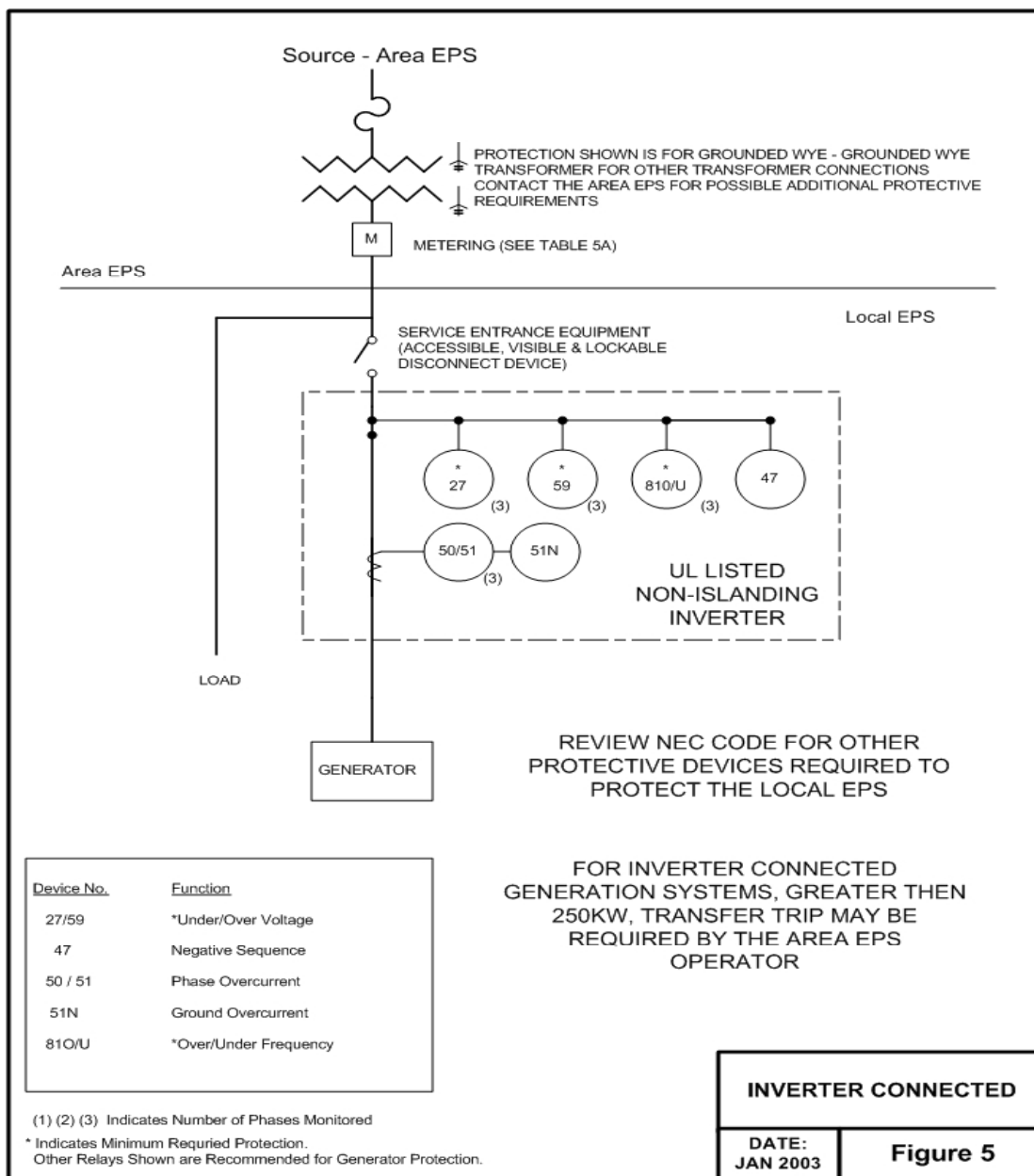
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INTERCONNECTION AND POWER PURCHASE TARIFF (Continued)**

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8. Testing Requirements (Continued)



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MINNESOTA ELECTRIC RATE BOOK - MPUC NO. 2

COMMUNITY-BASED ENERGY DEVELOPMENT (C-BED) TARIFF

Section No. 10
2nd Revised Sheet No. 160

AVAILABILITY

Any qualifying community energy partnership, as defined by section 216B.1612 subdivision 8, or community-based renewable power developer who owns a electric generating facility in Minnesota meeting the requirements of this tariff and deliver and sell the renewable energy output to NSP up to the quantity established in the most recent resource plan may apply to the Company for selection. "Renewable" refers to technologies as defined by section 216B.1691, subdivision 1, paragraph (a). The Company must receive Commission approval for all power purchase agreements under this tariff. Purchase power agreements for projects greater than 10 MW installed nameplate may require an exception from the commission Orders relating to competitive bidding for NSP. A project that is operating under a power purchase agreement under a C-BED tariff is not eligible for net energy billing under section 216B.164, subdivision 3, Net Energy Billing Service Rate Code A50, or for production incentives under section 216C.41. The following information provides guidelines for the negotiated purchase power agreements for service under this tariff. Nothing in this schedule shall be construed to obligate Company to enter into a power purchase agreement. In the alternative, at the discretion of a qualifying beneficiary, the qualifying beneficiary and Company may negotiate a power purchase agreement with terms different from this schedule. Company must receive Minnesota Public Utilities Commission approval of a power purchase agreement for a C-BED project. In addition, service may be provided under the terms described in Section 9 and Section 10 of the Minnesota Electric Rate Book.

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QUALIFYING BENEFICIARY

A qualifying beneficiary must be at least one of the following: (1) a Minnesota resident individually or as a member of a Minnesota limited liability company organized under Chapter 322B and formed for the purpose of developing a C-BED project, (2) a Minnesota nonprofit organization organized under chapter 317A of Minnesota state laws; (3) a Minnesota cooperative association organized under chapter 308A or 308B of Minnesota state law, including a rural electric cooperative association or a generation and transmission cooperative on behalf of and at the request of a member distribution utility; (4) a Minnesota political subdivision or local government including, but not limited to, a municipal electric utility, or a municipal power agency on behalf of and at the request of a member distribution utility; the office of the commissioner of Iron Range resources and rehabilitation; a county, statutory or home rule charter city, town, school district, or public or private higher education institution or any other local or regional governmental organization such as a board, commission or association, or (5) a tribal council; or (6) a legal (i) entity formed for a purpose other than to participate in C-BED projects; (ii) whose principal place of business or principal executive office is located in Minnesota; and (iii) that provides labor, services, equipment, components, or debt financing to a C-BED project.

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JOINT VENTURE

A qualifying beneficiary, or any combination of qualifying beneficiaries, may develop a joint venture project with a nonqualifying renewable energy project developer. However, the terms of the C-BED tariff may only apply to the portion of the energy production of the total project output that is directly proportional to the equity share of the project owned by the qualifying beneficiaries. The qualifying beneficiary shall not transfer the C-BED project during the initial term of a power purchase agreement if the transfer will result in the project's no longer qualifying under section 216B.1612, subdivision 2, paragraph (h).

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(Continued on Sheet No. 10-161)

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COMMUNITY-BASED ENERGY DEVELOPMENT (C-BED) TARIFF
(Continued)

Section No. 10
2nd Revised Sheet No. 161

QUALIFIED BENEFICIARY BENEFITS

No single qualifying beneficiary, including any parent company or subsidiary of the qualifying beneficiary, may own more than 15 percent of a C-BED wind energy project unless (1) the C-BED wind energy project consists of only one or two turbines; or (2) the qualifying owner is a public entity listed under Minnesota Statute 216B.1612, subd. 2(c), clause (5). Projects must demonstrate that at least 51% of the gross revenues from a power purchase agreement over the life of the project are qualifying revenues. Additionally, projects must demonstrate they have resolution of support adopted by the county board of each county in which the project is to be located, or in the case of a project located within the boundaries of a reservation, the tribal council for that reservation.

CONTRACT

C-BED developers must enter into a power purchase agreement under this program for a term of 20 years, subject to Commission approval. At the discretion of the developer, a community based projects developer and the Company may negotiate a power purchase agreement with the Company that differs from these rate provisions.

RATE

The Company shall pay the developer according to a rate schedule such that the payments over the 20-year life of the agreement compares reasonably to the ranges of prices obtained in recent solicitations and executed power purchase agreements. The rate shall normally be higher in the first ten years of the agreement than in the last ten years. The discount rate required to calculate the net present value is the ten-year United States Treasury Yield as quoted in the Wall Street Journal as of the date of application for determination under subdivision 10, plus five percent; except that the discount rate applicable to any qualifying revenues contingent upon an equity investor earning a specified internal rate of return is the ten-year United States Treasury Yield, plus eight percent. The payment of this rate includes payment for the property rights of all renewable attributes (or, in the event of the development of a Commission-approved renewable energy tracking system, the renewable energy credits) associated with the generation from the C-BED project. That is, receipt of this payment constitutes a transfer of the property rights of all renewable attributes (or renewable energy credits) associated with the generation from the C-BED project to Company, unless otherwise agreed to by the qualifying owners of the project and Company.

SECURITY

Qualifying and nonqualifying beneficiaries must provide sufficient security to secure performance under the power purchase agreement.

(Continued on Sheet No. 10-162)

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COMMUNITY-BASED ENERGY DEVELOPMENT (C-BED) TARIFF
(Continued)

Section No. 10
1st Revised Sheet No. 162

PARTICIPATION

To the extent possible, the developer of a C-BED project must provide, in writing, an opportunity to invest in the C-BED project to each property owner on whose property a high-voltage transmission line is constructed that will transmit the energy generated by the C-BED project to market, if the property is located and the owner resides in the county where the C-BED project is located. In addition, developers may include opportunities to invest for property owners on whose property a high voltage transmission line transmitting the energy generated by the C-BED project to market currently exists and who resides in the county where the C-BED project is located or in an adjacent county.

BID PRIORITY

Periodically, the Company may elect to purchase renewable energy from C-BED projects. When evaluating which C-BED projects to purchase from, the Company will consider the net present value of rate after adding the expected cost of curtailments and, if anticipated, wheeling costs. When the Company needs to construct new generation or purchase the output from new generation, then in order to fulfill its obligations under Minnesota Statute 216B.1691, the Company will make a good faith effort to determine if one or more C-BED projects would meet the utility's cost and reliability requirements, applying standard reliability criteria, to fulfill some or all of the identified need at minimal impact to current customers. Standard reliability criteria means the project: (1) can be safely integrated into and operated within the utility's grid without causing any adverse or unsafe consequences; and (2) is consistent with the utility's resource needs as identified in its most recent resource plans submitted under section 216B.2422. Aggregation of C-BED projects is encouraged. Nothing in this section shall be construed to obligate the Company to enter into a power purchase agreement under a C-Bed tariff.

TERMS AND CONDITIONS OF SERVICE

1. A C-BED project must be capable of being integrated into the electric system and operate in a safe manner as determined by the transmission or delivery service provider.
2. The C-BED owner(s) must enter into an appropriate interconnection agreement with the transmission or delivery service provider meeting all applicable technical specifications and interconnection requirements.
3. A power purchase agreement between the Company and the project must be executed and approved by the Minnesota Public Utilities Commission pursuant to Minnesota Statute 216B.1612.

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