Distributed Generation

Technical Requirements and Interconnection Agreements

February 2005

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Interconnection Process for Distributed Generation Systems

Introduction
This document has been prepared to explain the process established in the State of Minnesota and adopted by Connexus Energy to interconnect a Generation System with Connexus Energy’s Distribution System. This document covers the interconnection process for all types of Generation Systems which are rated less than 10MW’s of total generation Nameplate Capacity; are planned for interconnection with Connexus Energy’s Distribution System; are not intended for wholesale transactions and are not anticipated to affect the transmission system. This Section does not discuss the interconnection Technical Requirements, which are covered in Section 2, “Connexus Energy Distributed Generation Interconnection Technical 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 Connexus Energy’s Distribution System, 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 Key Accounts Representative at Connexus Energy. Since this document has been developed to provide an interconnection process which covers a very diverse range of Generation Systems, the process may appear to be very involved and cumbersome. However, 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 the 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.

GENERAL INFORMATION

A) Definitions

1) “Applicant” is defined as the person or entity who is requesting the interconnection of the Generation System with the Area EPS 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. Note: Typically, an Area EPS has primary access to public rights-of-way, priority crossing of property boundaries, etc. References to the “Area EPS” herein shall be understood as and referenced to Connexus Energy, Connexus Energy’s Distribution System, or Distribution System, as may apply.

3) “Area EPS Operator” is the entity who operates the Area EPS. References to the “Area EPS Operator” herein shall be understood as and referenced to Connexus Energy.

4) “Dedicated Facilities” is the equipment that is installed due to the interconnection of the Generation System and not required to serve other Area EPS members.

5) “Distribution System” is reference to Connexus Energy’s facilities which are not part of the Area EPS Transmission System or any Generation System.

6) “Extended Parallel” means the Generation System is designed to remain connected with the Distribution System 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” or “Key Accounts Representative” is the person or persons designated by Connexus 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 Member” 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.

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 the Distribution System to the generator such that the generator and the Distribution System are never connected together.

14) “Point of Common Coupling” is the point where the Local EPS is connected to the Distribution System.

15) “Quick Closed” is a method of generation transfer which parallels with the Distribution System for a very short duration and has utility grade timers which limit the parallel duration to less then 100 msec.


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, the Parties may then refer the dispute for resolution to the Minnesota Public Utilities Commission, which shall maintain continuing jurisdiction over this process.
C) **Connexus Energy Generation Interconnection Coordinator.**

Connexus Energy shall designate a member **Key Accounts Representative** to provide a single point of contact for an Applicant’s questions on this Generation Interconnection process. This Key Accounts Representation shall coordinate all communication and establishment of contractual relations between Connexus Energy and the Interconnection Member. Other Connexus Energy resources will provide support to the Key Accounts Representative as need for technical, legal, contractual, and economic issues as may be needed.

D) **Engineering Studies**

During the process of design of a Generation System interconnection between a Generation System and the Distribution System, there are several studies which may need to be undertaken. On the Local EPS (Members side of the interconnection) the addition of a Generation System may increase the fault current levels, even if the generation is never interconnected with the Distribution System. The Interconnection Member 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 the Distribution System and special engineering studies may need to be undertaken to evaluate the Distribution System 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, 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 is also less then 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.

4) Generation System does not contribute more than 10% to the distribution circuit’s maximum fault current at the point the nearest interconnection with the Distribution System’s primary distribution voltage.

5) The proposed Generation System total Nameplate Capacity in aggregate with other generation on the distribution circuit will not result in any Distribution System protective devices and equipment being subjected to fault current levels in excess of 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.

7) Generation System will not be interconnected with a “networked” system.
E) Scoping Meeting

During Step 2 of this process, either the Applicant or Connexus Energy has the option to request a scoping meeting 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. Connexus 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 Connexus Energy to complete the preliminary review of the proposed Generation System at the scoping meeting. If a scoping meeting is requested, Connexus Energy shall schedule the scoping meeting within the 15 business day review period allowed for in Step 2. Connexus Energy shall then have an additional 5 days, after the completion of the scoping meeting to complete the formal response required in Step 2. Any applied Applications fees shall cover Connexus Energy’s costs for this scoping meeting. There will be no additional charges imposed by Connexus Energy for this initial scoping meeting.

F) Insurance

1) In connection with the Interconnection Member’s performance of its duties and obligations under this Agreement, the Interconnection Member 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 or equal to 250kW.

   b) One million dollars ($1,000,000) for each occurrence if the Gross Nameplate Rating of the Generation System is greater than or equal to 40kW and less than 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 Member’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 Connexus Energy as an additional insured; (b) contain a severability of interest clause or cross-liability clause; (c) provide that Connexus 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 Connexus 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 Connexus Energy and it total generating capacity is smaller than 40kW, then the endorsements required in Section F.2 shall not apply.

4) The Interconnection Member shall furnish the required insurance certificates and endorsements to Connexus Energy prior to the initial operation of the Generation System. Thereafter, Connexus 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 Connexus Energy.

6) If the Interconnection Member is self-insured with an established record of self-insurance, the Interconnection Member may comply with the following in lieu of Section F.1 – 5:

7) Interconnection Member shall provide evidence of an acceptable plan to self-insure to a level of coverage equivalent to that required under section F.1 to Connexus Energy at least thirty (30) days prior to the date of initial operation.

8) If Interconnection Member ceases to self-insure to the level required hereunder, or if the Interconnection Member is unable to provide continuing evidence of it’s ability to self-insure, the Interconnection Member agrees to immediately obtain the coverage required under section F.1.

9) Failure of the Interconnection Member or Connexus Energy to enforce the minimum levels of insurance does not relieve the Interconnection Member from maintaining such levels of insurance or relieve the Interconnection Member of any liability.

G) Pre-Certification

The most important part of the process to interconnect generation with Local EPS’s and utility owned Distribution Systems 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 supports movement 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 further design review, testing or additional equipment shall not be required 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 Member 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 provided is consistent has undergone testing that is listed 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 Connexus Energy.

The use of Pre-Certified equipment does not automatically qualify the Interconnection Member to be interconnected to the Distribution System. An application must still be submitted and an interconnection review may still need to be performed to insure compatibility of the Generation System with Connexus Energy's Distribution System.

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.

I) Non-Warranty.

Neither by inspection, if any, or non-rejection, nor in any other way, does Connexus 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.

<table>
<thead>
<tr>
<th>Open Transfer</th>
<th>Quick Closed Transfer</th>
<th>Soft Loading Transfer</th>
<th>Extended Parallel Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interconnection Process (This document)</td>
<td>Distributed Generation Interconnection Technical Requirements (Section 2)</td>
<td>Generation Interconnection Application (Section 3)</td>
<td>Engineering Data Submittal (Section 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Interconnection Agreement (Section 5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MISO / FERC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PPA</td>
</tr>
</tbody>
</table>

**Interconnection Process** = “Connexus Energy Interconnection Process for Distributed Generation Systems.” (This document)

**Distributed Generation Interconnection Technical Requirements** = “Connexus Energy Distributed Generation Interconnection Technical 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** = “Connexus Energy 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](http://www.midwestiso.org)

**FERC** = Federal Energy Regulatory Commission, [www.ferc.gov](http://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 Connexus Energy’s Distribution System, the Applicant shall provide a completed Generation Interconnection Application (Section 3) and supply Connexus Energy with the following:

1) One-line diagram showing;
   a) Protective relaying.
   b) Point of Common Coupling.
2) Site plan of the proposed installation.
3) Proposed schedule of the installation.
4) Payment of Application Fee (if applicable; see chart below).

An application fee may be charged to the Applicant by Connexus Energy to cover labor costs for administration, review of the design concept and preliminary engineering screening for the proposed Generation System interconnection.

The size (kW) of the Generation System is the total maximum Nameplate Capacity of the Generation System.

<table>
<thead>
<tr>
<th>Interconnection Type</th>
<th>&lt; 20kW</th>
<th>&gt;20kW &amp; &lt;250kW</th>
<th>&gt;250kW &amp; &lt;500kW</th>
<th>&gt; 500 kW &amp; &lt;1000kW</th>
<th>&gt;1000 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Transfer</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$100</td>
<td>$100</td>
</tr>
<tr>
<td>Quick Closed</td>
<td>$0</td>
<td>$100</td>
<td>$100</td>
<td>$250</td>
<td>$500</td>
</tr>
<tr>
<td>Soft Loading</td>
<td>$100</td>
<td>$250</td>
<td>$500</td>
<td>$500</td>
<td>$1000</td>
</tr>
<tr>
<td>Extended Parallel (Pre Certified System)</td>
<td>$0</td>
<td>$250</td>
<td>$1000</td>
<td>$1000</td>
<td>$1500</td>
</tr>
<tr>
<td>Other Extended Parallel Systems</td>
<td>$100</td>
<td>$500</td>
<td>$1500</td>
<td>$1500</td>
<td>$1500</td>
</tr>
</tbody>
</table>

Step 2   Preliminary Review (By Connexus Energy)

Within 15 business days of receipt of all the information listed in Step 1, the Connexus Energy Key Accounts Representative 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) Identify a single point of contact with the Connexus Energy for this project. (Connexus Energy Key Accounts Representative)

2) Approval or rejection of the generation interconnection request.
   a) Rejection – Connexus 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 Connexus Energy Key Accounts Representative 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 B.
   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.

<table>
<thead>
<tr>
<th>Generation System Size</th>
<th>Engineering Study Maximum Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20kW</td>
<td>$0</td>
</tr>
<tr>
<td>20kW – 100kW</td>
<td>$500</td>
</tr>
<tr>
<td>100kW – 250kW</td>
<td>$1000</td>
</tr>
<tr>
<td>&gt;250kW or not pre-certified equipment</td>
<td>Actual costs</td>
</tr>
</tbody>
</table>

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 Connexus Energy Key Accounts Representative will notify the Applicant that the generation system is not eligible for review through Connexus Energy’s process.

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 Connexus Energy, the Applicant and Connexus Energy will automatically skip this step.

If the Applicant decides NOT to proceed with the engineering studies, the Applicant shall notify the Connexus Energy Key Accounts Representative 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 Connexus Energy Key Accounts Representative:

1) Payment required by Connexus Energy for the specialized engineering studies.

2) Additional information requested by the Connexus Energy to allow completion of the engineering studies.
Step 4  Engineering Studies (By Connexus Energy)
In this step, Connexus 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 Connexus Energy. If additional time is required to complete the engineering studies the Connexus Energy Key Accounts Representative 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 Connexus Energy in step 2, Connexus Energy shall initiate the engineering studies.

<table>
<thead>
<tr>
<th>Generation System Size</th>
<th>Engineering Study Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20kW</td>
<td>20 working days</td>
</tr>
<tr>
<td>20kW – 250kW</td>
<td>30 working days</td>
</tr>
<tr>
<td>250kW – 1MW</td>
<td>40 working days</td>
</tr>
<tr>
<td>&gt; 1MW</td>
<td>90 working days</td>
</tr>
</tbody>
</table>

Connexus Energy will notify the Applicant and 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 if it is determined by Connexus Energy that the actual costs for the engineering studies will exceed the estimated amount by more the 25%. The Applicant shall be given the option of either withdrawing the application, or paying the additional estimated amount to continue with the engineering studies.

Step 5  Study Results and Construction Estimates (By Connexus 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 Connexus Energy Distribution System 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 Distribution System 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 Connexus Energy Key Accounts Representative 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 Connexus Energy Key Accounts Representative.
1) Applicable up-front payment required by Connexus Energy, per Payment Schedule, provided in Step 5. (if applicable)

2) Signed Interconnection Agreement (if applicable).

3) Final proposed schedule, incorporating Connexus 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), Distribution System work, relays set and tested, preliminary vendor testing, final Connexus Energy acceptance testing, and any other major milestones.

4) 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.

5) Detailed information on the proposed equipment, including wiring diagrams, equipment model numbers and types.

6) Proposed relay settings for all interconnection required relays.

7) Detailed site plan of the Generation System.

8) Drawing(s) showing the monitoring system (as required per table 5A and section 5 of the “Connexus Energy Distributed Generation Interconnection Requirements”, including a drawing which shows the interface terminal block with Connexus Energy’s monitoring system.

9) Proposed testing schedule and initial testing procedure, including;
   a) Time of day (after-hours testing required?).
   b) Days required.
   c) Testing steps proposed.

**Step 7  Final Design Review (By Connexus Energy)**

Within 15 business days of receipt of the information required in Step 6, the Connexus Energy Key Accounts Representative will provide the Applicant with an estimated time table 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 then 15 additional business days to complete, for a total of 30 business days.

During this step, Connexus 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 Connexus Energy and the Applicant may be requested to reapply with the revised design.

Upon completion of this step the Connexus Energy Key Account Representative 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 Connexus Energy for review and comments. It is also typical for Connexus Energy to require review and approval of the drawings that cover the interconnection equipment and interconnection protection system. If Connexus Energy 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 Connexus Energy.
4) Provide final relay settings to Connexus Energy.
5) Submit Completed and signed Engineering Data Submittal form.
6) Submit proof of insurance, as required by Connexus Energy tariff(s) or interconnection agreements.
7) Submit required State of Minnesota electrical inspection forms (blue copy) filed with Connexus Energy.
8) Inspecting and functional testing of Generation System components.
9) Work with Connexus Energy personnel and equipment vendor(s) to finalize the installation testing procedure.

By Connexus Energy personnel:

1) Ordering any necessary Connexus 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 Connexus 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 Connexus 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, Connexus Energy’s labor will be billed at overtime wages. During this testing, Connexus Energy may typically run multiple tests, which may differ depending on which type of communication / monitoring system(s) Connexus Energy decides to install at the site.

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

**Step 10 (By Connexus Energy)**

Connexus Energy shall provide written approval for normal operation of the Generation System interconnection within 3 business days upon successful completion of the acceptance tests.

**Step 11 (By Applicant)**

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

**Attachments:**

The following documents may be required for the interconnection process:

Appendix A: Flow chart showing summary of the interconnection process.

Appendix B: Engineering Studies: Brief description of the types of possible Engineering Studies that may be required for the review of the Generation System interconnection

Section 3: Generation Interconnection Application Form.

Section 4: Engineering Data Submittal Form.

APPENDIX A

DISTRIBUTED GENERATION INTERCONNECTION PROCESS SUMMARY

STEP 1
Application & $& Filed with Area EPS Operator

STEP 2
Written Response by Area EPS
- Cost of Engineering Studies

STEP 3
Applicant Decision Proceed or Not?
- $ for Studies

STEP 4 & 5
Area EPS Provides:
- Results of Engineering Studies (if required)
- Estimated Interconnection Costs
- Monitoring and Control Requirements
- Interconnection Agreement (if applicable)
- Special Protection Requirements
- Dedicated Facilities (if required)
- Etc.

STEP 6
The following FINAL Design is provided by the Applicant if they decide to proceed.
- Applicable up-front payment
- Engineering Data Submittal
- Detailed Drawings and plans
  (one-lines, site plan, protection system)
- Signed Interconnection Agreement
- Relay Settings
- Proposed Schedule
- Testing Plan
- Etc.

STEP 7
Area EPS reviews the FINAL plans, and provides final design approval.
Some issues at this step may need to be worked out interactively.

STEP 8
Parties Order Equipment

STEP 9
Construction

STEP 10
Area EPS approval for operation
APPENDIX B

Engineering Studies

For the engineering studies there are primary issues to be addressed:
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 Connexus Energy Engineering 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 which can be applied.

For some of the large and/or more complex generation installation, Connexus Energy may suggest dividing up the engineering studies into the two parts; first to identify the scope of the problems and second to identify solutions. The approach will assist the Applicant to see and understand problems identified in order to make a determination to continue or remove the request for interconnection if the problems are too large and expensive to resolve. Making a decision to discontinue at this point would save the additional costs to the Applicant for the additional engineering studies as may be required to identity 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 Distribution System 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 Distribution System equipment be overloaded:
    - Under normal operation?
    - Under contingant operation? (i.e., Distribution System 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 Distribution System voltage regulation?
  - Will Distribution System 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?
  - 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 on the Distribution System?
- 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?.

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February 2005  
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Foreword

This interconnection requirements document was originally issued by the State of Minnesota to serve as an interconnections requirements guide for all Minnesota electrical utilities. Connexus Energy has adopted the State’s published requirements, and has revised the State’s document to be used by Connexus Energy for all applicable generation utility interconnections.

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 member to that needed to serve the large commercial member. 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.

1. **Safety**
   This standard establishes the technical requirements that must be met to ensure the safety of the general public and of the employees working with Connexus Energy. Proper design of the interconnection system for the safety of the general public will also provide protection for the interconnected equipment.

2. **Economics**
   The interconnection design must be affordable to build. The interconnection standard must be developed such 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.

3. **Reliability**
   The generation system must be designed and interconnected such that the reliability and the service quality for all members of the electrical power systems are not compromised. This applies to all electrical systems, not just Connexus Energy’s system.

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 up to 10MWs.
1. Introduction

This standard has been developed to document the technical requirements for the interconnection between a Generation System and Connexus Energy’s Distribution System. This standard covers 3 phase Generation Systems with an aggregate capacity of 10 MW's or less and single phase Generation Systems with a aggregate capacity of 40kW or less at the Point of Common Coupling. This standard covers Generation Systems that are interconnected with Connexus Energy’s distribution facilities and does not cover Generation Systems that are directly interconnected with the Transmission System supplying Connexus Energy’s distribution system. Contact Connexus Energy for Transmission System interconnection standards.

This standard provides the technical requirements for interconnecting a Generation System with a typical radial distribution system, and does not cover additional special requirements for networked systems. Connexus Energy’s distribution system is strictly a radial system at the time of this Interconnection Requirements revision, and therefore such special requirements are not applicable.

Connexus Energy has the right to limit the maximum size of any Generation System or number of Generation Systems that may be requested for interconnection if the Generation System or Systems would reduce the reliability to the other members connected to Connexus Energy’s Distribution System.

This standard covers only 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 Section 1 “Connexus Energy 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 obtain copies of Connexus Energy’s tariffs applicable to generation interconnection, which will include rates, costs, and standard interconnection agreements. Involving Connexus Energy early in the planning and design of the Generation Interconnection will help the interconnection process progress smoothly and prevent having to add in requirements later in the design and construction process.
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 D11, or are repeated from the IEEE 1547 D11 standard.

i) “Area EPS” an electric power system (EPS) that serves Local EPS’s. Note. Typically, an Area EPS has primary access to public rights-of-way, priority crossing of property boundaries, etc. NOTE: The Area EPS of interest in this document shall be referenced to and understood as “Connexus Energy” or “Connexus Energy’s Distribution System” or “Distribution System” as applicable within the context of the reference.

ii) “Generation” 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.

iii) “Generation System” 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 Member” 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” an electric power system (EPS) contained entirely within a single premises or group of premises.

vi) “Point of Common Coupling” the point where the Local EPS is connected to Connexus Energy’s distribution system.


viii) “Type-Certified” 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 Connexus Energy.

B) Interconnection Requirements Goals

This standard defines the minimum technical requirements for the implementation of the electrical interconnection between the Generation System and Connexus Energy’s distribution system. 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 members and the general public.
iii) Protect and minimize the possible damage to the electrical power system and other members’ property.

iv) Ensure proper operation to minimize adverse operating conditions on the electrical power system.

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 the Distribution System 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 Distribution System.

iii) The location of generating equipment on the Distribution System.

D) Distribution System Modifications

Depending upon the match between the Generation System and Distribution System and how the Generation System is operated, certain modifications and/or additions may be required to the existing Distribution System with the addition of the Generation System. To the extent possible, this standard describes the modifications which could be necessary to the Distribution System for different types of Generation Systems. Additional and/or different protective devices, system modifications and/or additions may be required by Connexus Energy for unique situations. Connexus Energy will identify and determine such requirements during the application review process.

E) Generation System Protection

The Interconnection Member is solely responsible for providing protection for the Generation System. Protection systems required in this standard are structured to protect the Distribution 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 Connexus Energy’s Distribution System. Connexus Energy does not assume responsibility for protection of the Generation System equipment or of any portion of the Local EPS.

F) Electrical Code Compliance

Interconnection Member 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, Connexus Energy will require proof of compliance with the National Electrical Code through installation approval by an electrical inspector recognized by the Minnesota State Board of Electricity before the interconnection is made.

The Interconnection Member’s Generation System and installation shall comply with latest revisions of the ANSI/IEEE standards applicable to the installation, especially IEEE 1547 Draft D11 “Standard for Interconnecting Distributed Resources with Electric Power Systems”. See the reference section in this document for a partial list of the standards, which apply to the generation
installations covered by this standard.

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”


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


NESC – “National Electrical Safety Code”. ANSI C2-2000, Published by the Institute of Electrical and Electronics Engineers, Inc.
3. Types of Interconnections

A) Types of interconnections are defined based on the manner in which the Generation System is connected to and disconnected from the Distribution System. Most transfer systems normally operate using one of the following five methods of transferring the load from the Distribution System to the Generation System.

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

i) Open Transition (Break-Before-Make) Transfer Switch – With this transfer switch, the load to be supplied from the Distributed Generation is first disconnected from the Distribution System 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 may shut down and need to be reset. The transfer switch typically consists of a standard UL approved transfer switch with mechanical interlocks between the two source contactors that drop the Distribution System before the Distributed Generation is connected to supply the load.

   (1) To qualify as an Open Transition switch with limited protective requirements, mechanical interlocks are required between the two source contacts to ensure that one of the contacts is always open and the Generation System is never operated in parallel with the Distribution System. 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 due to possible voltage flicker problems created on the Distribution System when the load is removed from or returned to the Distribution System source. This level may be larger or smaller than the 500kW level, depending upon the Distribution System’s stiffness.

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

ii) Quick Open Transition (Break-Before-Make) Transfer Switch – The load to be supplied from the Distributed Generation is first disconnected from the Distribution System 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 Distribution System source before the Distributed Generation is connected to supply the load.

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

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

   (3) Figure 1 at the end of this document includes a specific note added pertaining to synchronizing requirements for fast transitions.
iii) **Closed Transition (Make-Before-Break) Transfer Switch** – The Distributed Generation is synchronized with the Distribution System source prior to the transfer occurring. The transfer switch then parallels with the Distribution System for a short time (100 msec. or less) and then the Generation System and load is disconnected from the Distribution System. 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 Distribution System is lost. With this type of transfer, the Distribution System or the Distributed Generation is always supplying the load.

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

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

iv) **Soft Loading Transfer Switch**

(1) **With Limited Parallel Operation** – The Distributed Generation is paralleled with the Distribution System for a limited amount of time (generally less then 1-2 minutes) to gradually transfer the load from the Distribution System 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 provides typical one-line diagrams of this type of installation and shows the required protective elements.

(2) **With Extended Parallel Operation** – The Generation System is paralleled with the Distribution System in continuous operation. Special design, coordination and agreements are required before any extended parallel operation will be permitted. The interconnection study performed by Connexus Energy 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 with the required protective elements for this type of interconnection. It must be emphasized that this is a typical installation 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 Distribution System. Small Generation Systems may utilize inverters for the interface. Solar, wind, and fuel cells are some examples of Generation which typically use inverters. The design of such inverters shall either contain all necessary protection to prevent unintentional islanding, or the Interconnection Member 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 illustrates 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. Additional design review of the inverter should not be necessary by Connexus Energy once this Type Certification is completed for the specific model applied.

(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 point of interconnection to the Distribution System.

(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 Connexus Energy must be performed to determine any additional protection systems, metering or other needs. The issues will be identified by Connexus Energy during the interconnection study process.
4. Interconnection Issues and Technical Requirements

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

i) Visible Disconnect - A disconnecting device shall be installed to electrically isolate the Distribution System 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 the Interconnection Member’s Generation and the Distribution System in order to establish the safety isolation required for work on the Distribution System. This disconnecting device shall be readily accessible 24 hours per day by Connexus Energy field personnel and shall be capable of padlocking by Connexus Energy field personnel. The disconnecting device shall be lockable in the open position.

The visible disconnect shall be a UL approved or National Electrical Manufacturer’s Association (NEMA) 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 may be used as a visual open.

The visible disconnect shall be labeled “Generation Disconnect” to inform Connexus Energy field personnel.

ii) Energization of Equipment by Generation System – The Generation System shall not energize a de-energized Distribution System. The Interconnection Member 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 Distribution 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 paralleled with the Distribution System as measured at the Point of Common Coupling.

(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 Connexus Energy and the Interconnection Member.

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 Member 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 Connexus 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. Connexus 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 the Distribution System 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 members connected to the Distribution System, the Generation System shall meet the Voltage, Frequency, Harmonic and Flicker operating criteria as defined in the IEEE 1547 D11 standard during periods when the Generation System is operated in parallel with the Distribution System.

If the Generation System creates voltage changes greater than 4% on the Distribution System, it is the responsibility of the Interconnection Member to correct these voltage sag/swell problems caused by the operation of the Generation System. If the operation of the interconnected Generation System causes problems for other members interconnected to the Distribution System due to flicker resulting from voltage fluctuations, the Interconnection Member is responsible for correcting the problem.

iii) Flicker - The operation of Generation System is not allowed to produce excessive flicker to adjacent members. See the IEEE 1547 D11 standard for a more complete discussion on this requirement.

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

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

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

Even though the Distributed Generation does not electrically parallel with the Distribution System for quick open transition systems, synchronizing across the switch is still required. This is particularly important if there are motor loads with a high amount or rotational inertia present. When source power is removed from the motor load, the motor may actually produce AC voltage and energize the load bus for a short duration. Without no synchronizing, it is possible to close the Distributed Generator source on to the load bus out of phase with voltage present from the spinning motor load, potentially resulting in severe damage to the Distributed Generation and/or spinning motors. The synchronizing controls or synch check relay will greatly minimize such an out-of-phase transfer condition.

(2) To prevent unnecessary voltage fluctuations on the Distribution System, it is required that the synchronizing equipment be capable of closing the Distributed Generation into the Distribution System within the limits defined in IEEE 1547 D11. 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 Distribution System to be disconnected from the rest of the Distribution 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 typically not possible to successfully reconnect the energized isolated circuit to the rest of the Distribution System since there are generally 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 Distribution System immediately by protective relays for any condition that would cause the Distribution System to be de-energized. The Generation System must either isolate from the Distribution System with the member’s load, or trip. The Generation System must also be blocked from closing back into the Distribution System until the Distribution System is reenergized and the Distribution 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 Distribution System source(s) to remotely trip the generation interconnection to prevent islanding for certain conditions.

vi) **Disconnection** – Connexus Energy may refuse to connect or may disconnect a Generation System from the Distribution 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 Connexus Energy personnel (Safety).

(5) Routine maintenance, repairs and modifications to the Distribution System. Connexus Energy shall coordinate planned outages with the Interconnection Member 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 Distribution System operational needs, the requirements for metering, monitoring and control listed in this document are the expected maximum requirements that Connexus Energy will apply to the Generation System. It is important to note that for some Generation System installations, Connexus 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, which require more monitoring than larger capacity typically urban feeders.

Another factor which will affect the metering, monitoring, and control requirements will be the tariff under which the Interconnection Member is supplied by Connexus Energy. Table 5A has been written to cover most applications. Check with Connexus Energy to see if applicable tariffs may have greater or less metering, monitoring and control requirements than as shown in Table 5A.
<table>
<thead>
<tr>
<th>Generation System Capacity at Point of Common Coupling</th>
<th>Metering</th>
<th>Generation Remote Monitoring</th>
<th>Generation Remote Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 40 kW with all sales to Connexus Energy</td>
<td>Bi-Directional metering at the point of common coupling</td>
<td>None Required</td>
<td>None Required</td>
</tr>
<tr>
<td>&lt; 40 kW with Sales to a party other than Connexus Energy</td>
<td>Recording metering on the Generation System and a separate recording meter on the load</td>
<td>Interconnection Member supplied direct dial phone line.</td>
<td>None Required</td>
</tr>
<tr>
<td>40 up to 100 kW with open transition or limited parallel</td>
<td>Detented Connexus Energy Metering at the Point of Common Coupling</td>
<td>None Required</td>
<td>None Required</td>
</tr>
<tr>
<td>40 up to 100 kW with extended parallel</td>
<td>Recording metering on the Generation System and a separate recording meter on the load</td>
<td>Interconnection Member supplied direct dial phone line. Connexus Energy to supply its own monitoring equipment</td>
<td>Required</td>
</tr>
<tr>
<td>100 up to 1000 kW with open transition or limited parallel</td>
<td>Recording metering on the Generation System and a separate recording meter on the load.</td>
<td>Interconnection Member supplied direct dial phone line and monitoring points available – SCADA may be applied. See B (i)</td>
<td>Required – SCADA may be applied</td>
</tr>
<tr>
<td>100 up to 1000 kW With extended parallel operation</td>
<td>Recording metering on the Generation System and a separate recording meter on the load.</td>
<td>Interconnection Member supplied direct dial phone line and monitoring points available – SCADA may be applied. See B (i)</td>
<td>Required – SCADA may be applied</td>
</tr>
<tr>
<td>1000 kW &amp; larger With limited parallel Operation</td>
<td>Recording metering on the Generation System and a separate recording meter on the load.</td>
<td>Required Connexus Energy SCADA monitoring system. See B (i)</td>
<td>Direct Control via SCADA by Connexus Energy</td>
</tr>
<tr>
<td>1000 kW &amp; larger With extended parallel operation</td>
<td>Recording metering on the Generation System and a separate recording meter on the load.</td>
<td>Required Connexus Energy SCADA monitoring system See B (i)</td>
<td>Direct Control via SCADA by Connexus Energy</td>
</tr>
</tbody>
</table>

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

i) The requirements for metering as shown in Table 5A will depend upon the type and capacity of generation and the type of interconnection. For most installations, the requirement is a single point of metering at the Point of Common Coupling. Connexus Energy will install a metering 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 is required to be supplied to the meter for Connexus Energy's use to read the metering. Some monitoring may be done through the meter and the dedicated direct dial phone line such that in many installations the remote monitoring and the meter reading can be done using the same dial-up phone line.

ii) Additional metering requirements may be applicable depending upon the tariff applied to the members' load and Generation System. Contact Connexus Energy for tariff requirements. In some cases, Connexus Energy may waive the direct dial-phone line requirement for smaller Generation Systems.

iii) All Connexus Energy's revenue meters shall be supplied, owned and maintained by Connexus Energy. All voltage transformers (VT) and current transformers (CT) used for revenue metering shall be approved and/or supplied by Connexus Energy. Connexus 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 40kW in size or larger, 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. Connexus Energy is required to report to the regional reliability council (MAPP) 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 Connexus Energy.

v) For Generation Systems which are less than 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 Connexus Energy's Distribution System 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, Connexus Energy may use a single meter to record the bi-directional flow or may elect to use two detented meters, each one to record the flow of energy in one direction.

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

The difference 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 Connexus Energy's system operator 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 as a minimum:

(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 the Connexus 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) Member load from Connexus Energy's service (kW and kVAR).

(5) Control of interconnection breaker (Required for extended parallel operation).

When telemetry is required, the Interconnection Member must provide the communications medium to Connexus Energy’s Control Center. This could be radio, dedicated phone circuit or other form of communication. If a telephone circuit is used, the Interconnection Member must also provide the telephone circuit protection. The Interconnection Member shall coordinate the RTU (remote terminal unit) addition with the Connexus Energy.
6. Protective Devices and Systems

A) Protective devices required to permit safe and proper operation of the Distribution System while interconnected with member’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 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 which has the greatest protection requirements will establish the protection requirements for that transfer system.

The Interconnection Member shall provide protective devices and systems to detect the Voltage, Frequency, Harmonic and Flicker levels as defined in the IEEE 1547 D11 standard during periods when the Generation System is operated in parallel with the Distribution System. The Interconnection Member 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 Connexus Energy for review and approval to ensure proper coordination between the generation system and Connexus Energy's Distribution 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 less than 40kW at the Point of Common Coupling.

(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 D11, and meet other requirements as specified in Connexus Energy’s 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 D11.

(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 member’s equipment so that no protective devices will operate on the Distribution System. 51V is a voltage restrained or controlled over-current relay and may be required to provide proper coordination with the Distribution System.

(b) **Over-voltage relays** (IEEE Device 59) shall operate to trip the Distributed Generation per the requirements of IEEE 1547 D11.

(c) **Under-voltage relays** (IEEE Device 27) shall operate to trip the Distributed Generation per the requirements of IEEE 1547 D11.

(d) **Over-frequency relays** (IEEE Device 81O) shall operate to trip the Distributed Generation off-line per the requirements of IEEE 1547 D11.

(e) **Under-frequency relay** (IEEE Device 81U) shall operate to trip the Distributed Generation off-line per the requirements of IEEE 1547 D11. 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 the Distribution System is required for this setting.

The Distribution System 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 the Distribution System) 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.

(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 reset the lockout relay before that device can be reclosed. These relays are used to ensure that a de-energized 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 the Distribution System when the Distribution System is disconnected from its source to avoid unintentional islanding. With larger Generation Systems that remain in parallel with the Distribution System, a transfer trip system may be required to sense the loss of the Distribution System source. When the Distribution System source is lost, a signal is sent to the Generation System to separate the Generation from the Distribution System. The size of the Generation System vs the capacity and minimum loading on the feeder will dictate the need for transfer trip installation. Connexus Energy’s interconnection study will identify the specific requirements.

If multiple Distribution System sources are available or multiple points of sectionalizing exist on the Distribution System with reference to the Point of Common Coupling, then more than one transfer trip system may be required. Connexus Energy’s interconnection study will identify the specific requirements. For some installations, the alternate Distribution System source(s) may not be utilized except in rare occasions. If this is the situation, the Interconnection Member may elect to have the Generation System locked out when the alternate source(s) are utilized, if
agreeable to Connexus Energy.

(i) Parallel limit timing relay (IEEE Device 62PL) set at a maximum of 120 seconds for soft transfer installations and set no longer then 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.

(j) Sych Check Relay (IEEE Device 25) is a device that blocks closure of the interconnecting breaker or transfer switch until the voltage phase angle of the Distributed Generation is in phase within a preset value of the Distribution System voltage phase angle, as measure across the contacts of the interconnecting breaker or transfer switch. The synch check relay shall be set to block closure of the interconnecting device until the respective voltage phase angles are within 10 degrees.
## Table 6A
### Summary of Relaying Requirements

<table>
<thead>
<tr>
<th>Type of Interconnection</th>
<th>Over-current (50/51)</th>
<th>Voltage (27/59)</th>
<th>Frequency (81 0/U)</th>
<th>Reverse Power (32)</th>
<th>Lockout (86)</th>
<th>Parallel Limit Timer</th>
<th>Sync Check (25)</th>
<th>Transfer Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Transition</td>
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<td>Quick Open Transition</td>
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<td>Mechanically</td>
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<td>Interlocked (Fig. 2)</td>
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<td>Parallel Operation (Fig.3)</td>
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<td>Extended Parallel</td>
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<td>&lt; 250 kW (Fig. 4)</td>
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<td>Soft Loading</td>
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<td>Extended Parallel</td>
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<td>&gt; 250 kW (Fig. 4)</td>
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<tr>
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<td>Yes</td>
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<td>Yes</td>
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<tr>
<td>40 kW – 250 kW</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<td>Yes</td>
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<tr>
<td>&gt; 250 kW</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<td>Yes</td>
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</tbody>
</table>
7. Agreements

A) Interconnection Agreement – This agreement is required for all Generation Systems that parallel with Connexus Energy’s Distribution 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 Connexus Energy’s Distribution System. Issues covered in the interconnection agreement include:

i) Construction Process

ii) Testing Requirements

iii) Maintenance Requirements

iv) Firm Operating Requirements such as Power Factor

v) Access requirements for the Connexus 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 the Distribution System, an agreement separate from the interconnection agreement called the “Operating Agreement” may be usually created. The Operating Agreement is created for the benefit of both the Interconnection Member and Connexus 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 Connexus Energy’s Distribution System. The items typically included in the Operating Agreement are as follows:

i) Emergency and normal contact information for both Connexus Energy’s operations center and for the Interconnection Member

ii) Procedures for periodic Generation System test runs.

iii) Procedures for maintenance on the Distribution System that effect the Generation System.

iv) Emergency Generation Operation Procedures
8. Testing Requirements

A) Pre-Certification of equipment

The most important part of the process to interconnect generation with Local EPS’s and utility owned Distribution Systems 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 supports movement 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 be 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 Member 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 provided is consistent with and has undergone testing listed 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 Connexus Energy.

The use of Pre-Certified equipment does not automatically qualify the Interconnection Member to be interconnected to the Distribution System. An application must still be submitted and an interconnection review may still need to be performed to insure compatibility of the Generation System with Connexus Energy's Distribution System.

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 Distribution System.
(b) The Generation may not close into a de-energized Distribution System and protection must be provided to prevent this from occurring. It is the Interconnection Member’s responsibility to provide a final design and to install the protective measures required by Connexus Energy. Connexus 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. The Interconnection Member shall obtain Connexus Energy’s written approval prior to ordering protective equipment for parallel operation. The Interconnection Member will own these protective measures installed at their facility.

(c) The Interconnection Member shall obtain prior approval from Connexus Energy for any revisions to the specified relay calibrations after calibrations have been previously approved.

C) Commissioning Testing

The following tests shall be completed by the Interconnection Member. All of the required tests in each section shall be completed prior to moving on to the next section of tests. Connexus 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. Connexus Energy shall be notified with sufficient lead time to allow the opportunity for Connexus 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 of the Generator or the Distribution System. 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 an “*”.

(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.

(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 Connexus Energy.

(6) Trip Checks - Protective relaying shall be 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 prove that the relay element trips the required breaker and lockout relay, or provides the correct signal to the next control element. Trip circuits shall be proven through the entire scheme, including an actual trip of the breaker.

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 Member shall work with Connexus Energy to complete the phase test and ensure proper phase rotation of the Generation and wiring.

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 Distribution 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 D11. This test shall also demonstrate that if 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.

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

Generation System functionality shall be verified for applicable interconnections as follows:

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

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

(b) The Distribution System source shall be removed by opening a switch, breaker, or other applicable interconnecting device.

(c) The Generation System shall either separate from the Distribution System and supply the local load in isolated mode, or trip.

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

(1) To ensure the safety of the public, all interconnected member 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, Connexus Energy shall be notified. This notification shall, if possible, be with sufficient notification such that Connexus 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 Connexus Energy personnel will depend upon the complexity of the Generation System and the component being replaced and/or modified. Since the Interconnection Member and Connexus 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 Connexus Energy's Distribution System.

(2) All interconnection-related protection systems shall be periodically tested and maintained by the Interconnection Member 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 Member and made available to Connexus Energy upon request. Connexus Energy shall be notified prior to period testing of the protective systems so that Connexus Energy personnel may witness the testing if so desired.

(a) Verification of inverters rated 15 kVA and less may be completed as follows; The Interconnection Member 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 closed back in.

(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."
SOURCE - AREA EPS

AREA EPS

LOCAL EPS

SERVICE ENTRANCE EQUIPMENT
ACCESSIBLE, VISIBLE & LOCKABLE DISCONNECT DEVICE
OPTIONAL, BUT RECOMMENDED

LOAD

METERING (SEE TABLE 5A)

ACCESSIBLE, VISIBLE & LOCKABLE DISCONNECT DEVICE
(OPTIONAL BUT RECOMMENDED)

25sc

DEVICE NO. 25sc
FUNCTION
Synch Check Relay
REQUIRED FOR QUICK OPEN TRANSITION

NOTE: BREAK-BEFORE-MAKE
AUTOMATIC TRANSFER
SWITCHES SHALL BE
MECHANICALLY INTERLOCKED

OPEN TRANSITION
"BREAK-BEFORE-MAKE"

DATE: JAN 2003

Figure 1
SECTION 2

Figure 2

```
Device No. | Function       | Trips |
-----------|----------------|-------|
25         | Synchronizer   |       |
25SC       | *Synch-check Relay |     |
50 / 51    | Phase Overcurrent | 66/A |
51N        | Ground Overcurrent |      |
62FL       | *Parallel Limit Timer | 86/A |
86         | *Lockout Relay  |       |

(1) (2) (3) Indicates Number of Phases to be Monitored
* Indicates Minimum Required Protection
Other Relays Shown are Recommended for Generator Protection.
```

QUICK OPEN OR CLOSED TRANSITION
"MAKE-BEFORE-BREAK"

DATE: JAN 2003

February, 2005  Page 27
PROTECTION SHOWN IS FOR GROUNDED WYE - GROUNDED WYE TRANSFORMER
FOR OTHER TRANSFORMER CONNECTIONS CONTACT THE
AREA EPS OPERATOR FOR POSSIBLE ADDITIONAL
PROTECTIVE REQUIREMENT

METERING (SEE TABLE 5A)

SERVACE ENTRANCE EQUIPMENT
(ACCESSIBLE, VISIBLE & LOCKABLE DISCONNECT DEVICE)
BREAKER A MAY SERVE AS VISIBLE DISCONNECT DEVICE IF
DRAW-OUT BREAKER.

DEVICE NO.  FUNCTION  TRIPS
25  Synchronizer  Trip
25SC  *Synch-check Relay  66A
27/59  *Under/Over Voltage  66A/B
32  *Reverse Power (Trip
for power toward Area EPS  66A/B
47  Negative Sequence  66A
50 / 51  *Phase Overcurrent  66A
51N  *Ground Overcurrent  66A
62PL  *Parallel Limit Timer  66A
67  Directional Overcurrent  66A
81  *Over/Under Frequency  66A
86A  *Lockout Relay  A
86B  *Lockout Relay  B
TT  *Transfer Trip  66A

TT is not required for Generation Systems smaller than 250kW

DEPENDING UPON
THE RELATIVE SIZE
OF THE LOAD TO THE
GENERATION,
BREAKER B MAY BE
TRIPPED INSTEAD OF
BREAKER A, FOR
SOME OR ALL OF THE
PROTECTIVE
FUNCTIONS.

BREAKER B' MAY
SERVE AS VISIBLE
DISCONNECT
DEVICE IF DRAW-OUT
BREAKER.

ACCESSIBLE, VISIBLE &
LOCKABLE DISCONNECT DEVICE
(OPTIONAL BUT RECOMMENDED)

DATE: JAN 2003
Figure 4
SECTION 2

PROTECTION SHOWN IS FOR GROUNDED WYE - GROUNDED WYE TRANSFORMER FOR OTHER TRANSFORMER CONNECTIONS CONTACT THE AREA EPS FOR POSSIBLE ADDITIONAL PROTECTIVE REQUIREMENTS

METERING (SEE TABLE 5A)

Area EPS

SERVICE ENTRANCE EQUIPMENT (ACCESSIBLE, VISIBLE & LOCKABLE DISCONNECT DEVICE)

Local EPS

UL LISTED NON-ISLANDING INVERTER

LOAD

GENERATOR

REVIEW NEC CODE FOR OTHER PROTECTIVE DEVICES REQUIRED TO PROTECT THE LOCAL EPS

FOR INVERTER CONNECTED GENERATION SYSTEMS, GREATER THEN 250KW, TRANSFER TRIP MAY BE REQUIRED BY THE AREA EPS OPERATOR

<table>
<thead>
<tr>
<th>Device No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/50</td>
<td>*Under/Over Voltage</td>
</tr>
<tr>
<td>47</td>
<td>Negative Sequence</td>
</tr>
<tr>
<td>50 / 51</td>
<td>Phase Overcurrent</td>
</tr>
<tr>
<td>51N</td>
<td>Ground Overcurrent</td>
</tr>
<tr>
<td>810/U</td>
<td>*Over/Under Frequency</td>
</tr>
</tbody>
</table>

(1) (2) (3) Indicates Number of Phases Monitored
* Indicates Minimum Required Protection.
Other Relays Shown are Recommended for Generator Protection.

INVERTER CONNECTED

DATE: JAN 2003

Figure 5
WHO SHOULD FILE THIS APPLICATION: Anyone expressing interest to install generation which will interconnect with Connexus Energy’s Distribution System. This application should be completed and returned to the Connexus Energy Member Service Key Account Representative in order to begin processing the request.

INFORMATION: This application is used by Connexus 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 “Connexus Energy Interconnection Process for Distributed Generation Systems”.

<table>
<thead>
<tr>
<th>OWNER/APPLICANT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Company / Applicant’s Name:</td>
<td></td>
</tr>
<tr>
<td>Representative:</td>
<td>Phone Number:</td>
</tr>
<tr>
<td>Title:</td>
<td>FAX Number:</td>
</tr>
<tr>
<td>Mailing Address:</td>
<td>Email Address:</td>
</tr>
</tbody>
</table>

| LOCATION OF GENERATION SYSTEM INTERCONNECTION | |
| Street Address, legal description or GPS coordinates: | |

| PROJECT DESIGN / ENGINEERING (if applicable) | |
| Company: | |
| Representative: | Phone: |
| FAX Number: | |
| Mailing Address: | Email Address: |

| ELECTRICAL CONTRACTOR (if applicable) | |
| Company: | |
| Representative: | Phone: |
| FAX Number: | |
| Mailing Address: | Email Address: |

| GENERATOR | |
| Manufacturer: | Model: |
| Type (Synchronous Induction, Inverter, etc): | Phases: 1 or 3 |
| Rated Output (Prime kW): | (Standby kW): |
| Rated Power Factor (%): | Rated Voltage (Volts): |
| Energy Source (gas, steam, hydro, wind, etc.) | Rated Current (Amperes): |

| TYPE OF INTERCONNECTED OPERATION | |
| Interconnection / Transfer method: | |
| ☐ Open | ☐ Quick Open | ☐ Closed | ☐ Soft Loading | ☐ Inverter |
| ☐ Peak Reduction | ☐ Standby | ☐ Energy Sales | |
| ☐ Cover Load | Duration Parallel: | |
| ☐ None | ☐ Limited | ☐ Continuous |

| Pre-Certified System: | Yes / No (Circle one) | Exporting Energy | Yes / No (Circle one) |
## ESTIMATED LOAD INFORMATION

The following information will be used to help properly design the interconnection. This Information is not intended as a commitment or contract for billing purposes.

<table>
<thead>
<tr>
<th>Minimum anticipated load (generation not operating):</th>
<th>kW:</th>
<th>kVA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum anticipated load (generation not operating):</td>
<td>kW:</td>
<td>kVA:</td>
</tr>
</tbody>
</table>

## ESTIMATED START/COMPLETION DATES

<table>
<thead>
<tr>
<th>Construction start date:</th>
<th>Completion (operational) date:</th>
</tr>
</thead>
</table>

## 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 disclose if the Applicant intends to sell power and energy or ancillary services and/or wheel power over Connexus Energy facilities. If there is an intent to sell power and energy, also define the target market.
SIGN OFF AREA:

With this Application, we are requesting that Connexus Energy review the proposed Generation System Interconnection. We request that Connexus Energy identify 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 Connexus Energy will be estimated using the information provided. We also agree that we will supply, as requested, additional information, to allow Connexus Energy to better review this proposed Generation System interconnection. We have read the “Connexus Energy Distributed Generation Interconnection Requirements” and will design the Generation System and interconnection to meet those requirements.

<table>
<thead>
<tr>
<th>Applicant Name (print):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Applicant Signature:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SEND THIS COMPLETED & SIGNED APPLICATION AND ATTACHMENTS TO THE CONNEXUS ENERGY KEY ACCOUNT REPRESENTATIVE
WHO SHOULD FILE THIS SUBMITTAL: Anyone in the final stages of interconnecting a Generation System with Connexus Energy's Distribution System. This submittal shall be completed and provided to the Connexus Energy Key Accounts Representative during the design of the Generation System, as established in the "Connexus Energy 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**

<table>
<thead>
<tr>
<th>Company / Applicant:</th>
<th>Phone Number:</th>
<th>FAX Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representative:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email Address:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PROPOSED LOCATION OF GENERATION SYSTEM INTERCONNECTION**

Street Address, Legal Description or GPS coordinates:

**PROJECT DESIGN / ENGINEERING (if applicable)**

<table>
<thead>
<tr>
<th>Company:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representative:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>FAX Number:</td>
</tr>
<tr>
<td>Mailing Address:</td>
</tr>
<tr>
<td>Email Address:</td>
</tr>
</tbody>
</table>

**ELECTRICAL CONTRACTOR (if applicable)**

<table>
<thead>
<tr>
<th>Company:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representative:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>FAX Number:</td>
</tr>
<tr>
<td>Mailing Address:</td>
</tr>
<tr>
<td>Email Address:</td>
</tr>
</tbody>
</table>

**TYPE OF INTERCONNECTED OPERATION**

<table>
<thead>
<tr>
<th>Interconnection / Transfer method:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Open □ Quick Open □ Closed □ Soft Loading □ Inverter</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed use of generation: (Check all that may apply)</th>
<th>Duration Parallel:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Peak Reduction □ Standby □ Energy Sales □ Cover Load</td>
<td>□ None □ Limited □ Continuous</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Certified System: Yes / No (Circle one)</th>
<th>Exporting Energy Yes / No (Circle one)</th>
</tr>
</thead>
</table>
### GENERATION SYSTEM OPERATION / MAINTENANCE CONTACT INFORMATION

<table>
<thead>
<tr>
<th>Maintainance Provider:</th>
<th>Phone #:</th>
<th>Pager #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator Name:</td>
<td>Phone #:</td>
<td>Pager #:</td>
</tr>
</tbody>
</table>

Person to Contact before remote starting of units

<table>
<thead>
<tr>
<th>Contact Name:</th>
<th>Phone #:</th>
<th>Pager #:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24hr Phone #:</th>
</tr>
</thead>
</table>

### GENERATION SYSTEM OPERATING INFORMATION

<table>
<thead>
<tr>
<th>Fuel Capacity (gals):</th>
<th>Full Fuel Run-time (hrs):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Cool Down Duration (Minutes):</td>
<td>Start time Delay on Load Shed signal:</td>
</tr>
<tr>
<td>Start Time Delay on Outage (Seconds):</td>
<td></td>
</tr>
</tbody>
</table>

### 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: |

### REQUESTED CONSTRUCTION START/COMPLETION DATES

<table>
<thead>
<tr>
<th>Design Completion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Start Date:</td>
</tr>
<tr>
<td>Footings in place:</td>
</tr>
<tr>
<td>Primary Wiring Completion:</td>
</tr>
<tr>
<td>Control Wiring Completion:</td>
</tr>
<tr>
<td>Start Acceptance Testing:</td>
</tr>
<tr>
<td>Generation operational (In-service):</td>
</tr>
</tbody>
</table>
### SYNCHRONOUS GENERATOR (if applicable)

<table>
<thead>
<tr>
<th>Unit Number</th>
<th>Total number of units with listed specifications on site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Type: 1 or 3</td>
</tr>
<tr>
<td>Serial Number (each)</td>
<td>Date of manufacture: Speed (RPM): Freq. (Hz):</td>
</tr>
<tr>
<td>Rated Output (each unit) kW</td>
<td>Standby: Prime: kVA:</td>
</tr>
<tr>
<td>Rated Power Factor (%)</td>
<td>Rated Voltage (Volts): Rated Current (Amperes):</td>
</tr>
<tr>
<td>Field Voltage (Volts): Field Current (Amperes): Motoring Power (kW):</td>
<td></td>
</tr>
<tr>
<td>Synchronous Reactance ($X_d$):</td>
<td>% on kVA base</td>
</tr>
<tr>
<td>Transient Reactance ($X'_d$):</td>
<td>% on kVA base</td>
</tr>
<tr>
<td>Subtransient Reactance ($X''_d$):</td>
<td>% on kVA base</td>
</tr>
<tr>
<td>Negative Sequence Reactance ($X_s$):</td>
<td>% on kVA base</td>
</tr>
<tr>
<td>Zero Sequence Reactance ($X_0$):</td>
<td>% on kVA base</td>
</tr>
<tr>
<td>Neutral Grounding Resistor (if applicable):</td>
<td></td>
</tr>
<tr>
<td>$I^2t$ or $K$ (heating time constant):</td>
<td></td>
</tr>
<tr>
<td>Exciter data:</td>
<td></td>
</tr>
<tr>
<td>Governor data:</td>
<td></td>
</tr>
<tr>
<td>Additional Information:</td>
<td></td>
</tr>
</tbody>
</table>

### INDUCTION GENERATOR (if applicable)

<table>
<thead>
<tr>
<th>Rotor Resistance ($R_r$): Ohms</th>
<th>Stator Resistance ($R_s$): Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor Reactance ($X_r$): Ohms</td>
<td>Stator Reactance ($X_s$): Ohms</td>
</tr>
<tr>
<td>Magnetizing Reactance ($X_m$): Ohms</td>
<td>Short Circuit Reactance ($X_{d''}$): Ohms</td>
</tr>
<tr>
<td>Design Letter:</td>
<td>Frame Size:</td>
</tr>
<tr>
<td>Exciting Current:</td>
<td>Temp Rise (deg C°):</td>
</tr>
<tr>
<td>Rated Output (kW):</td>
<td></td>
</tr>
<tr>
<td>Reactive Power Required:</td>
<td>k Vars (no Load) kVars (full load)</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Unit Number</th>
<th>Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer:</td>
<td></td>
</tr>
<tr>
<td>Serial Number: Date of Manufacture:</td>
<td></td>
</tr>
<tr>
<td>H.P. Rated: H.P. Max: Inertia Constant:</td>
<td>lb.-ft.$^2$</td>
</tr>
<tr>
<td>Energy Source (hydro, steam, wind, wind etc.):</td>
<td></td>
</tr>
</tbody>
</table>

### INTERCONNECTION (STEP-UP) TRANSFORMER (If applicable)
<table>
<thead>
<tr>
<th>Manufacturer:</th>
<th>kVA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Manufacture:</td>
<td>Serial Number:</td>
</tr>
<tr>
<td>High Voltage:</td>
<td>kV</td>
</tr>
<tr>
<td>Low Voltage:</td>
<td>kV</td>
</tr>
<tr>
<td>Transformer Impedance (Z):</td>
<td>% on</td>
</tr>
<tr>
<td>Transformer Resistance (R):</td>
<td>% on</td>
</tr>
<tr>
<td>Transformer Reactance (X):</td>
<td>% on</td>
</tr>
</tbody>
</table>

Neutral Grounding Resistor (if applicable)

### TRANSFER SWITCH (If applicable)

<table>
<thead>
<tr>
<th>Model Number:</th>
<th>Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer:</td>
<td>Rating(amps):</td>
</tr>
</tbody>
</table>

### INVERTER (If applicable)

<table>
<thead>
<tr>
<th>Manufacturer:</th>
<th>Model:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Power Factor (%):</td>
<td>Rated Voltage (Volts):</td>
</tr>
<tr>
<td>Inverter Type (ferroresonant, step, pulse-width modulation, etc.):</td>
<td></td>
</tr>
<tr>
<td>Type of Commutation: forced line</td>
<td>Minimum Short Circuit Ratio required:</td>
</tr>
<tr>
<td>Minimum voltage for successful commutation:</td>
<td></td>
</tr>
<tr>
<td>Current Harmonic Distortion</td>
<td>Maximum Individual Harmonic (%):</td>
</tr>
<tr>
<td>Voltage Harmonic Distortion</td>
<td>Maximum Individual Harmonic (%):</td>
</tr>
<tr>
<td>Describe capability, if any, to adjust reactive output to provide voltage regulation:</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Attach all available calculations, test reports, and oscillographic prints showing inverter output voltage and current waveforms.

### POWER CIRCUIT BREAKER (if applicable)

<table>
<thead>
<tr>
<th>Manufacturer:</th>
<th>Model:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (kilovolts):</td>
<td>Rated Ampacity (Amperes):</td>
</tr>
<tr>
<td>Interrupting Rating (Amperes):</td>
<td>BIL Rating:</td>
</tr>
<tr>
<td>Interrupting Medium (vacuum, oil, gas, etc.)</td>
<td>Insulating Medium (vacuum, oil, gas, etc.)</td>
</tr>
<tr>
<td>Control Voltage (Closing):</td>
<td>(Volts) AC DC</td>
</tr>
<tr>
<td>Control Voltage (Tripping):</td>
<td>(Volts) AC DC Battery Charged Capacitor</td>
</tr>
<tr>
<td>Close Energy (circle one):</td>
<td>Spring Motor Hydraulic Pneumatic Other</td>
</tr>
<tr>
<td>Trip Energy (circle one):</td>
<td>Spring Motor Hydraulic Pneumatic Other</td>
</tr>
<tr>
<td>Bushing Current Transformers (Max. ratio):</td>
<td>Relay Accuracy Class:</td>
</tr>
<tr>
<td>CT’S Multi Ratio? (circle one):</td>
<td>No / Yes: (Available taps):</td>
</tr>
</tbody>
</table>
### Sign Off Area

This Engineering Data Submittal documents the equipment and design of the Generation System. We agree to supply Connexus 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 “Connexus Energy Distributed Generation Interconnection Requirements”.

<table>
<thead>
<tr>
<th>Applicant Name (printed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Applicant Signature ________________ Date: __________________
Interconnection Agreement
For the Interconnection of Extended Parallel Distributed
Generation Systems with Connexus Energy

This Generating System Interconnection Agreement is entered into by and between Connexus
Energy and the Interconnection Member “____________________________”. The
Interconnection Member and Connexus 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 Member to interconnect and operate a Generation System with a
total Nameplate Capacity of less than 10MW in parallel with Connexus Energy’s
Distribution System 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 Member may interconnect the Generation System to
Connexus Energy’s Distribution System. This Agreement does not authorize the
Interconnection Member to export power or constitute an agreement to purchase or
wheel the Interconnection Member’s power. Other services that the Interconnection
Member may require from Connexus 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 Connexus 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
Connexus 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 known as “Connexus Energy Distributed Generation
Interconnection Requirements”. A copy has been made available to the Interconnection
Member and incorporated and made part of this Agreement by this reference

II. DEFINITIONS

A) “Area EPS” an electric power system (EPS) that serves Local EPS’s. References to the
“Area EPS (Electric Power Supplier) herein shall be understood as and referenced to Connexus Energy and its electrical Distribution System. Note: Typically, an Area EPS has primary access to public rights-of-way, priority crossing of property boundaries, etc.

B) “Area EPS Operator” the entity that operates the Area EPS. References to the “Area EPS Operator” herein shall be understood as and referenced to Connexus Energy.

C) “Dedicated Facilities” the equipment that is installed due to the interconnection of the Generation System and not required to serve other Area EPS members.

D) “EPS” (Electric Power System) 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 the Distribution System for an extended period of time.

F) “Generation” any device producing electrical energy, i.e., rotating generators driven by wind, steam turbines, internal combustion engines, hydraulic turbines, or stationary devices such as solar, fuel cells, etc.; or any other electric producing device, including energy storage technologies.

G) “Generation Interconnection Coordinator” the person or persons designated by Connexus Energy to provide a single point of coordination with the Applicant for the generation interconnection process.

H) “Generation System” the interconnected generator(s), controls, relays, switches, breakers, transformers, inverters and associated wiring and cables, up to the Point of Common Coupling.

I) “Interconnection Member” 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” an electric power system (EPS) contained entirely within a single premises or group of premises.

K) “Nameplate Capacity” 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.

L) “Point of Common Coupling” the point where the Local EPS is connected to the Distribution System.

M) “Point of Delivery” 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” Connexus Energy Requirements for Interconnection of Distributed Generation
III. DESCRIPTION OF INTERCONNECTION MEMBER’S GENERATION SYSTEM

A) A description of the Generation System, including a single-line diagram showing the general arrangement of how the Interconnection Member’s Generation System is interconnected with Connexus 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 Member shall construct, operate and maintain the Generation System in accordance with the applicable manufactures recommend maintenance schedule, the Technical Requirements and in accordance with this Agreement

C) Connexus 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 Member is responsible for the actual costs to interconnect the Generation System with the Distribution System, including, but not limited to any Dedicated Facilities attributable to the addition of the Generation System, Connexus
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 Member, even if they exceed the estimated amount(s). All costs for which the Interconnection Member is responsible must be reasonable under the circumstances of the design and construction.

1) Dedicated Facilities
   a) During the term of this Agreement, Connexus Energy shall design, construct and install the Dedicated Facilities outlined in Exhibit B. The Interconnection Member 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 Connexus Energy and all costs associated with the operating and maintenance of the Dedicated Facilities once the Generation System is operational shall be the responsibility of Connexus Energy, unless otherwise agreed.

   c) By executing this Agreement, the Interconnection Member grants permission for Connexus 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 the Generation System project is canceled or modified for any reason such that any or all of the Dedicated Facilities are not required, the Interconnection Member shall be responsible for all costs incurred by Connexus Energy, including, but not limited to the additional costs to remove and/or complete the installation of the Dedicated Facilities. The Interconnection Member 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 Member shall provide written notice to Connexus Energy of cancellation. Upon receipt of a cancellation notice, Connexus Energy shall take reasonable steps to minimize additional costs to the Interconnection Member, where reasonably possible.

2) Payments
   a) The Interconnection Member 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 Connexus Energy’s 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 Connexus Energy’s Distribution System.

      iii. Remainder of actual costs incurred by Connexus Energy shall be due within 30 days from the date the bill is mailed by Connexus 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 Connexus 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.

2) Exhibit B – Estimated installation and testing costs payable by the Interconnection Member. Included in this listing shall be the description and estimated costs for the required Dedicated Facilities being installed by Connexus Energy for the interconnection of the Generation System and a description and estimate for the final acceptance testing work to be done by Connexus 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 Member and Connexus 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 Member may terminate this agreement at any time by written notice to Connexus Energy prior to the completion of the final acceptance testing of the Generation System by Connexus Energy. Once the Generation System is operational then VII.A.3 applies. Upon receipt of a cancellation notice, Connexus Energy shall take reasonable steps to minimize additional costs to the Interconnection Member, where reasonably possible.

3) Once the Generation System is operational, the Interconnection Member may terminate this agreement after 30 days' written notice to Connexus Energy, unless otherwise agreed to within the Exhibit D, Operating Agreement; or
4) Connexus Energy may terminate this agreement after 30 days’ written notice to the Interconnection Member if:

   a) The Interconnection Member fails to interconnect and operate the Generation System per the terms of this Agreement; or

   b) The Interconnection Member fails to take all corrective actions specified Connexus 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 Member fails to complete Connexus Energy’s final acceptance testing of the generation system within 24 months of the date proposed under section III.A.5.

B) Upon termination of this Agreement, the Generation System shall be disconnected from Connexus Energy’s Distribution System. 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 which it now or hereafter may own, unless otherwise specified.

A) Technical Standards: The Generation System shall be installed and operated by the Interconnection Member 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: Connexus Energy’s personnel shall at times 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 Distribution System safely and to provide service to its members. If necessary for the purposes of this Agreement, the Interconnection Member shall allow Connexus Energy access to Connexus Energy’s equipment and facilities located on the premises.

C) Electric Service Supplied: Connexus Energy will supply the electrical requirements of Connexus Energy that are not supplied by the Generation System. Such electric service shall be supplied to the Interconnection Member’s Local EPS under the rate schedules applicable to the Member’s class of service as revised from time to time by Connexus Energy.

D) Operation and Maintenance: The Generation System shall be operated and maintained by the Interconnection Member in accordance with the Technical Standards and any additional requirements of Exhibit D and Exhibit E attached to this document as amended in writing periodically.
E) **Cooperation and Coordination:** Both Connexus Energy and the Interconnection Member shall communicate and coordinate their operations, so that the normal operation of the Distribution 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 Distribution System. Under abnormal operations of either the Generation System or the Distribution 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:** Connexus Energy may disconnect the Generation System as necessary, for termination of this Agreement; non-compliance with this Agreement; system emergency, imminent danger to the public or Connexus Energy personnel; routine maintenance, repairs and modifications to the Distribution System. When reasonably possible, Connexus Energy shall provide prior notice to the Interconnection Member explaining the reason for the disconnection. If prior notice is not reasonably possible, Connexus Energy shall after the fact, provide information to the Interconnection Member as to why the disconnection was required. It is agreed that Connexus 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. Connexus 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 Member where reasonably possible.

G) **Modifications to the Generation System** – When reasonably possible the Interconnection Member shall notify Connexus Energy in writing of plans for any modifications to the Generation System interconnection equipment, including all information needed by Connexus 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 Connexus Energy. When reasonably possible the Interconnection Member agrees not to commence installation of any modifications to the Generating System until Connexus Energy has approved the modification in writing, which approval shall not be unreasonably withheld. Connexus Energy shall have a minimum of five (5) business days to review and respond to the planned modification. Connexus Energy shall not take longer then 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 Member to provide prior written notice, the Interconnection Member shall provide written notice to Connexus Energy as soon as reasonably possible after the completion of the modification(s).

H) **Permits and Approvals:** The Interconnection Member shall obtain all environmental and other permits lawfully required by governmental authorities prior to the construction of the Generation System. The Interconnection Member 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 Connexus Energy’s provision of electric service to any member including the Interconnection Member, Connexus Energy’s liability to such member shall be limited as set forth in Connexus 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.

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) In connection with the Interconnection Member’s performance of its duties and obligations under this Agreement, the Interconnection Member 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 equal to or 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 Member’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 Connexus Energy as an additional insured; (b) contain a severability of interest
clause or cross-liability clause; (c) provide that Connexus 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 Connexus Energy prior to cancellation, termination, alteration, or material change of such insurance.

C) If the Generation System is connected to an account receiving residential service from Connexus Energy and its total generating capacity is smaller than 40kW, then the endorsements required in Section XI.B shall not apply.

D) The Interconnection Member shall furnish the required insurance certificates and endorsements to Connexus Energy prior to the initial operation of the Generation System. Thereafter, Connexus 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 Connexus Energy.

F) If the Interconnection Member is self-insured with an established record of self-insurance, the Interconnection Member may comply with the following in lieu of Section XI.A – E:

1) Interconnection Member shall provide to Connexus 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 Member ceases to self-insure to the level required hereunder, or if the Interconnection Member is unable to provide continuing evidence of its ability to self-insure, the Interconnection Member agrees to immediately obtain the coverage required under Section XI.A.

G) Failure of the Interconnection Member or Connexus Energy to enforce the minimum levels of insurance does not relieve the Interconnection Member from maintaining such levels of insurance or relieve the Interconnection Member 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 following:

Connexus Energy  
Attention: Key Accounts Representative  
14601 Ramsey Boulevard  
Ramsey, MN 55303

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, 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.

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) If to Connexus Energy
      Connexus Energy
      Attention: Key Accounts Representative
      14601 Ramsey Boulevard
      Ramsey, MN 55303

   b) If to Interconnection Member
      (Interconnection Member Address)

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.

C) ASSIGNMENT

The Interconnection Member shall not assign its rights nor delegate its duties under this Agreement without Connexus Energy’s written consent. Any assignment or delegation the Interconnection Member makes without Connexus Energy’s written consent shall not be valid. Connexus 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 AREA EPS OPERATOR’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 Connexus Energy, whose tariff schedules and rules are hereby incorporated into this Agreement by this reference.

3) Notwithstanding any other provisions of this Agreement, Connexus Energy shall have the right to unilaterally file with its Board of Directors, pursuant to Connexus Energy’s rules, regulations and by-laws, 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 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 Connexus 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 Member or leased by the Interconnection Member 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.

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 Member

By: ______________________________
Name: _____________________________
Title: ______________________________
Date: _____________________________

By: ______________________________
Name: _____________________________
Title: ______________________________
Date: _____________________________
EXHIBIT A

GENERATION SYSTEM DESCRIPTION
AND SINGLE-LINE DIAGRAM
EXHIBIT B

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

This Exhibit shall provide the estimated total costs that will be the responsibility of the Interconnection Member. 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. Other costs than those listed below may be included by Connexus Energy, provided that those costs are a direct result from the request to interconnect the Generation System. The following list is only a guideline. Connexus Energy will create 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
EXHIBIT C

ENGINEERING DATA SUBMITTAL

Attach a completed Engineering Data Submittal form from Appendix C of “Connexus Energy Interconnection Process for Distributed Generation Systems".
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 Connexus 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 Connexus Energy and the Interconnection Member, 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 which 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 Connexus 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 – Description of dispatch requirements operation of Distributed Generation by Connexus Energy, including communication means to the Interconnection Member for notice of operation, intended hours of operation per incidence, and any other operational considerations that may be applicable to a given situation.

F) Outages of Distribution System – Description or identification of requirements for handling outages, emergency or otherwise, pertaining to installation, testing, or other operation of the Distributed Generation, including scheduling of such outage, work required after hours, and payment of Connexus Energy crew labor and overtime labor as may be required.

G) Notification / Contacts – Identification of communications needs, including primary contacts of either Party, notification means, and for what reasons and when should notification of events take place, including but not limited to:
1) Starting of the Generation

2) Dispatching of Generation

3) Notification of failures (Distribution System and Generation System failures)

H) Documentation of Operational Settings – Fuel the generation System typically have on hand, available run time with this fuel capacity; Generation system operational settings for Distribution System power failures, including failures that may occur during peak shaving operation by Connexus Energy. These types of issues should be documented in the Operating Agreement. The following are a couple of examples:

1) “The Generation System will monitor Connexus Energy Distribution System 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 Distribution System’s frequency and voltage before it will automatically reconnect to the Distribution System.”

I) Cost of testing for future failures – The Parties shall determine the process and responsibility for replacement and retesting of the Generation System if any component or part of the system that affects interconnection with the Distribution System should fail and need, and who pays for the additional costs to Connexus Energy to work with the Interconnection Member to resolve these problems and/or to complete retesting of the modified equipment.

J) Right of Access: At all times, Connexus 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 Distribution System safely and to provide service to its members at all times. If necessary for the purpose of this Agreement, the Interconnection Member shall allow Connexus Energy access to Connexus Energy’s equipment and facilities located on the premises.
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 Connexus Energy and the Interconnection Member, 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 which 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 Member shall notify Connexus 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 Connexus Energy. The Interconnection Member agrees not to commence installation of any modifications to the Generating System until Connexus Energy has approved the modification in writing. Connexus 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.