

Bowling Green Municipal Utilities
INTERCONNECTION PROCEDURES
FOR RENEWABLE DISTRIBUTED GENERATION

(For Generating Facilities up to 1,000 kW)

Effective June 12, 2018

1. GENERAL PROCEDURES & STANDARDS

1.1. Scope

These procedures describe the steps Interconnection customers (herein after called customer) must follow in order for their renewable distributed generation equipment (DG equipment) to be evaluated and approved for interconnection to the Bowling Green Municipal Utilities (BGMU, herein after called Distributor) electrical system for parallel operation. Requirements for interconnection will be based on the size of the system and will be broken into the following categories: Tier 1 – 10 kW or less; Tier 2 – Greater than 10 kW and less than or equal to 1,000 kW. Tier 3 – Greater than 1,000 kW

These procedures are limited to renewable DG equipment that make exclusive use of UL 1741-listed inverters. All other forms of renewable DG equipment interconnection requests will be considered on a case-by-case basis. No interconnected system may be installed on billboards, light poles, CATV/communication/internet boxes, recreational vehicles, or mobile facilities.

1.2. Application for Interconnection

Each customer must complete the application for interconnection and submit a non-refundable application fee of \$250.00 for Tier 1 systems and \$500.00 for Tier 2 systems to Distributor prior to purchasing any DG equipment. If the system meets the criteria for Tier 1, complete the application in Attachment 1. If the system meets the criteria of Tier 2, complete the application in Attachment 2. Tier 3 systems are beyond the scope of these procedures and will be addressed on a case-by-case basis. Please provide the supporting documents identified with each application. (Note: A contract for additional study and system upgrade expenses may be necessary for some projects. See Figure 1 for Application and Interconnection Process.)

1.3. Requirement for Installers

For participation in this program, solar photovoltaic and wind installations must be completed by installers who have attained Professional Certification from the North American Board of Certified Energy Practitioners (NABCEP) or, at a minimum, completed and passed the NABCEP Associate Program examination for the relevant field. Installers must submit either a copy of their Achievement Award or NABCEP Certification number to BGMU as part of the Application for Interconnection submittal. These requirements apply to upgrades and system changes as well as initial installations.

1.4. Application Processing (See Figure 1)

1.4.1. The Distributor will review the application for sufficiency and completeness and notify the customer that it has received all documents required or indicate how the application is deficient.

1.4.2. The Distributor will determine whether to evaluate the system using the criteria of Section 2, Fast Track Screening Process, or if an interconnection study is necessary. If an interconnection study is needed, or if the project does not pass the Fast Track Screening Process, the requirements outlined in Section 3, Study Process, will be followed. When the agreements have been signed by the Distributor and TVA (if necessary), the Distributor will notify the customer that they may proceed with purchase and installation of the project. The customer will also be notified of any additional requirements. **The Customer will not be allowed to proceed with interconnection and parallel operation until all provisions of these procedures have been met and Distributor has given written notification to proceed with parallel operation.**

1.4.3. After installation, the Customer must return the Certificate of Completion (Attachment 3) to the Distributor. Prior to parallel operation, the Distributor shall inspect the DG equipment for compliance with the proposed design and may require a Commissioning Test in accordance with the procedures defined by the latest version of IEEE 1547.1. The Distributor will have the option of witnessing or participating in the commissioning test or may require documentation from the equipment owner describing which tests were performed and their results.

1.4.4. If the inspection of the completed system and any required commissioning test are satisfactory, the Distributor will notify the Customer in writing that interconnection of the DG Equipment is authorized for parallel operation. If the system does not pass the inspection and/or Commissioning test, the Distributor has the right to lockout the facility. The Customer shall not, under any circumstance, take any action to operate the system in parallel until the problems have been corrected and a new inspection and Commissioning test are performed, or waived by the Distributor.

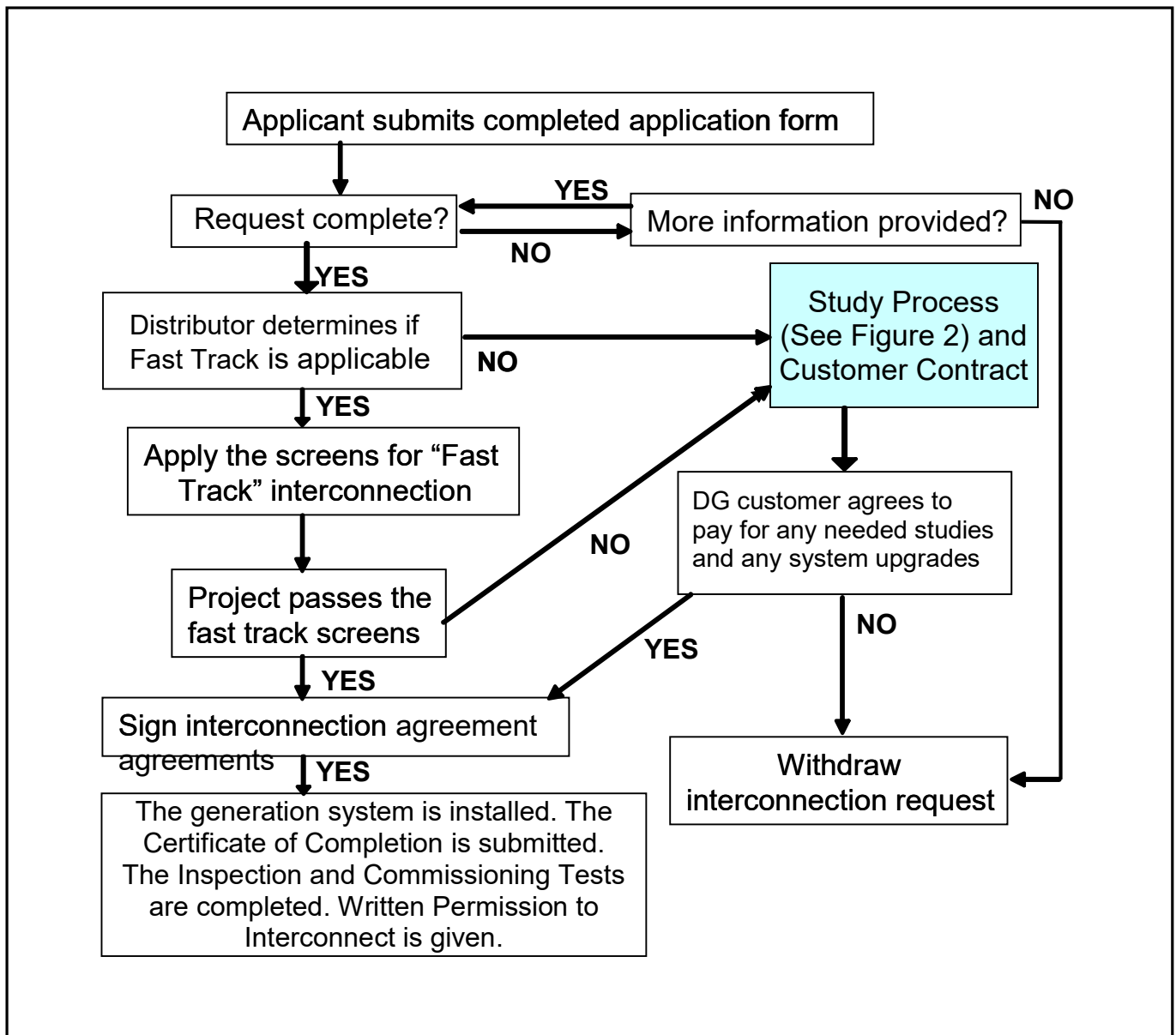


Figure 1. Application and Interconnection Approval Process

1.5. Standards and Certification Criteria

The DG equipment must comply with the latest revision of the following standards and the customer must provide evidence of the certifications with the DG Equipment Application or with the Certificate of Completion:

1.5.1. IEEE1547 Standard for Interconnecting Distributed Resources with Electric Power Systems (including use of IEEE 1547.1 testing protocols to establish conformity)

1.5.2. IEEE1547.1 Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

1.5.3. UL 1741 Inverters, Converters, and Controllers for Use in Independent Power Systems

1.5.4. NFPA 70 National Electrical Code

1.5.5. The DG Equipment shall be considered certified for interconnected operation if the generation equipment and all related interconnection components have been tested and listed by an acceptable Nationally Recognized Testing Laboratory (NRTL certification by Department of Labor) for continuous interactive operation with an electric distribution system in compliance with the codes and standards outlined in 1.5.1 – 1.5.4 above. If NRTL certification is not available, Distributor may, upon request, with supportive information, approve alternative testing procedures at Customer's expense to assure IEEE 1547 performance.

1.5.6. The system must be certified for grid intertie operation by a licensed electrician as meeting all codes and inspections. For systems that meet the size requirements for Tier 2, BGMU may require that the installation and protection designs must be provided by and stamped by a Registered Professional Engineer licensed in the State of Kentucky.

1.5.7. The customer must provide evidence that the installation has been inspected and approved by state or local code officials, as applicable, certified by a licensed electrician, and approved by a registered engineer, as applicable, prior to its operation in parallel. This information will be submitted with the Certification of Completion.

2. FAST TRACK SCREENING PROCESS

2.1. Applicability

BGMU will determine whether the Fast Track process is appropriate, or if the design of the system would require evaluation under the Study Process of Section 3.

2.2. Fast Track Review Screens

After the Distributor has received a sufficient and complete Interconnection Application, the Distributor shall perform an initial review using the screens set forth below and shall notify the Interconnection Customer of the results.

2.2.1. Generation On Circuit As A Percent of Annual Peak and Minimum Loads

The aggregated generation, including the proposed DG Equipment, on the circuit shall not exceed 15 % of the expected peak load or 67% of the expected minimum load of the line section to which it is connected. The line section is that portion of a Distributor's electric circuit serving the customer that is bounded by an upstream automatic sectionalizing device or substation breaker and a downstream automatic sectionalizing device or the end of the distribution line. The line segment might be a feeder or a portion of a feeder that would be automatically disconnected from the main system supply, or might also be the portion of a feeder that would remain energized after a downstream section became de-energized. The total aggregate generation including the proposed generation shall not cause the potential for a portion of the Distributor's electrical system to overload at any time all or a portion of the total generation is not on line.

2.2.2. Maximum Fault Current

The proposed DG Equipment, in aggregation with other generation on the distribution circuit, shall not contribute more than 10% to the distribution circuit's maximum fault current at the point on the high voltage (primary) level nearest the proposed point of interconnection.

2.2.3. Short Circuit Interrupting capability

The proposed DG equipment, in aggregate with other generation on the distribution circuit, shall not cause any distribution protective devices and equipment (including, but not limited to, substation breakers, fuse cutouts, and line reclosers), or Customer equipment on the system to exceed 87.5 % of the short circuit interrupting capability; nor shall the interconnection be considered for a circuit that already exceeds 87.5 % of the short circuit interrupting capability.

2.2.4. Type of Interconnection

The Fast Track Screening process is limited to single-phase interconnections on services fed by a single line-to-ground distribution transformer or to three phase services with a wye-grounded or 3-phase 3 wire secondary connection.

Qualifying system is limited to the use of IEEE 1547 compliant three phase inverters when connected to three phase services. Use of single phase inverters on three phase systems is prohibited. Controls must energize all three phases of generation when generating, and open all three phases of generation when disconnecting the system whether under normal operations or in response to abnormal events.

2.2.5. Maximum AC Output Rating

If the proposed DG Equipment is to be interconnected on single-phase shared secondary or service, the aggregate generation capacity on the shared secondary or service shall not exceed 15 KW. The generating capacity of any individual single phase DG Equipment shall not exceed 15 KW. The generating capacity of any individual three phase DG Equipment shall not exceed 50 kW for fast tracking.

2.2.6. Load Balance

If the proposed DG Equipment is single-phase and is to be interconnected on a center tap neutral of a 240 volt service, its addition shall not create an imbalance between the two sides of the 240 volt service of more than 20 % of the nameplate rating of the service transformer. If the proposed DG equipment is single-phase and is to be interconnected to a three phase service secondary or service, its addition shall not cause the load on any of the individual phases to exceed twice the load on any of the other two phases.

2.2.7. Transient Stability Problems

The DG Equipment, in aggregate with other generation interconnected to the distribution side of a substation transformer feeding the circuit where the DG Equipment proposes to interconnect shall not exceed 10 MW in an area where there are known, or posted, transient stability limitations to generating units located in the general electrical vicinity (e.g., three or four distribution busses from the point of interconnection).

2.2.8. No Upgrades Required

No construction of facilities by the Distributor on its own system shall be required to accommodate the DG Equipment.

2.3. Fast Track Screening Results

If the proposed DG Equipment passes the screens, and the Distributor finds no other potential interconnection problems, the Customer's Application will be approved and the Distributor will provide the Customer an executable interconnection agreement. If the proposed project does not pass the screens, the Customer will be notified and offered the opportunity to attend a meeting where the processes outlined in section 3, Study Process, will be explained and a course of action determined.

3. STUDY PROCESS

The study process (see Figure 2) consists of the minimum engineering review, the system impact study and the facilities study. At an initial meeting, the parties shall determine whether a minimum engineering review is sufficient, or the parties shall proceed directly to a system impact study, or a system upgrade study.

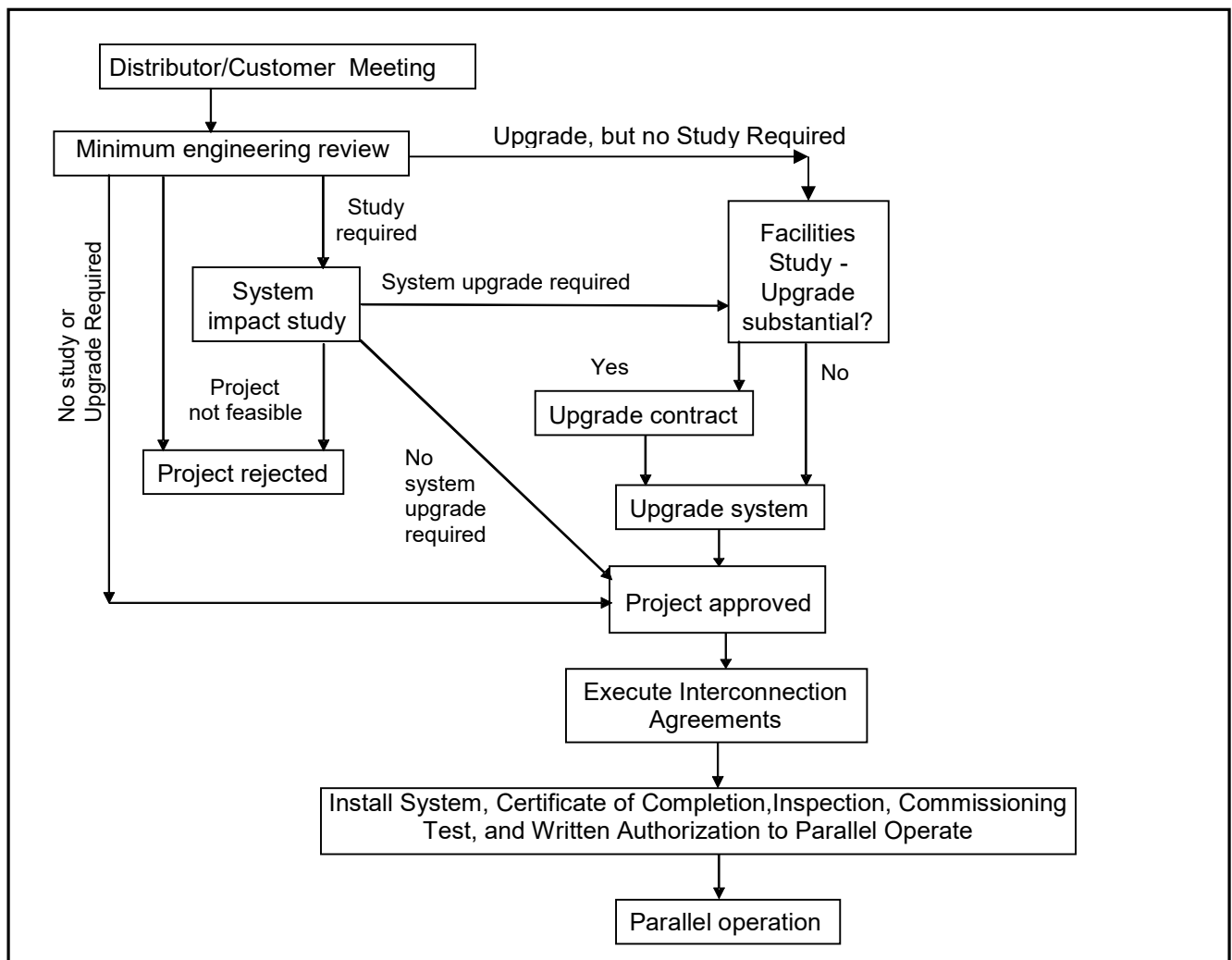


Figure 2. The Study Process

3.1. Minimum Engineering Review

The “Minimum Engineering Review” is designed to identify any adverse system impacts that would result from interconnection of the DG Equipment. Examples of such negative impacts would include exceeding the short circuit capability rating of any breakers, violations of thermal overload or voltage limits, and a review of grounding requirements and electric system protection. Any communications systems limitations, including operations expense concerns, and exceptional metering situations would also be identified. If the Distributor determines that the Minimum Engineering Review will require substantial time or expense, the Distributor will ask the customer to reimburse the Distributor for the costs associated with this review.

3.2. System Impact and Facilities Studies

The minimum engineering review may be sufficient to evaluate the impact of the DG on the electric system. If not, a full study process, the System Impact Study, may be required. A system impact study is more in depth than the minimal engineering review, and is designed to identify and detail the electric system impacts that would result if the proposed project were interconnected without project modifications or electric system modifications. A system impact study evaluates the impact of the proposed interconnection on the reliability of the electric system.

3.2.1. In instances where the system impact study shows potential for adverse impacts to the distribution system, the Distributor shall send the Customer a distribution system impact study agreement, including an outline of the scope of the study and a non-binding good faith estimate of the cost to perform the study, if such a study is required. Once the customer agrees to pay the cost of the study, the process continues.

Once the required system impact study is complete, a facilities study agreement if needed, including an outline of the scope of the study and a non-binding good faith estimate of the cost to perform the facilities study, shall be sent to the customer. Design for any required Interconnection Facilities and/or Upgrades shall be performed under the facilities study agreement. Upon completion of the facilities study, and with the agreement of the Customer to pay for Interconnection Facilities and Upgrades identified in the facilities study, the Distributor shall provide the Customer an executable interconnection agreement.

Attachment 1 -- Application for Interconnection of Distributed Generation

Tier 1 (10 kW or less)

This Application is considered complete when it provides all applicable and correct information required below.

Customer

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone (Day): _____ (Evening): _____

Fax: _____ E-Mail Address: _____

Electric Service Account Number _____

Owner of Building if different than customer _____

Contact (if different from Customer)

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone (Day): _____ (Evening): _____

Fax: _____ E-Mail Address: _____

Owner of System (If different than customer)

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone (Day): _____ (Evening): _____

Fax: _____ E-Mail Address: _____

Installer

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone (Day): _____ (Evening): _____

NABCEP #: _____ E-Mail Address: _____

ELECTRICAL CONTRACTOR (as applicable)

Company: _____

Mailing Address: _____

City: _____ County: _____ State: _____ Zip Code: _____

Phone Number: _____ Representative: _____

Email Address: _____ Fax Number: _____

Contractor's License # _____ City/County/State _____

Generating Facility Information

Location (if different from above): _____

Distributor: _____

Account Number: _____

Inverter Manufacturer: _____ Model _____

Nameplate Rating: _____ (kW) _____ (kVA) _____ (AC Volts) Single Phase _____ Three Phase _____

System Design Capacity: _____ (kW) _____ (kVA)

Energy Source: Solar ☐ Wind ☐ Hydro ☐ Other (describe) _____

Attach support information to show testing and listing by a Nationally Recognized Laboratory for compliance with the codes and standards outlined in 1.4.1 – 1.4.4 for the proposed system .

Estimated Installation Date: _____ Estimated In-Service Date: _____

List components of the Small Generating Facility equipment package that are currently certified:

Equipment Type	Certifying Entity
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____

ADDITIONAL INFORMATION – Single Line Diagram

In addition to the items listed above, please attach a detailed one-line diagram of the proposed facility, all applicable elementary diagrams, major equipment, (generators, transformers, inverters, circuit breakers, protective relays, batteries, number and location of PV Panels, transfer switches, etc.) specifications, test reports, etc., and any other applicable drawings or documents necessary for the proper design of the interconnection. Also describe the address or grid coordinates of the facility.

Permission to Interconnect

Customer must not operate their generating facility in parallel with Distributor's system until they receive written authorization for parallel operation from Distributor. Unauthorized parallel operation could result in injury to persons and /or damage to equipment and/or property for which the customer may be liable.

Interconnection Customer Signature

I hereby certify that, to the best of my knowledge, the information provided in this Application is true.

Signed: _____

Title: _____ Date: _____

**Attachment 2 -- Application for Interconnection of Distributed Generation
Tier 2 (Greater than 10 kW and less than or equal to 1,000 kW)**

This application should be completed and returned to the Distributor representative in order to begin processing the request.

PART 1

CUSTOMER INFORMATION

Name: _____
Mailing Address: _____
City: _____ County: _____ State: _____ Zip Code: _____
Phone Number: _____ Representative: _____
Email Address: _____ Electric Service Account Number _____
Fax Number: _____

PROJECT DESIGN/ENGINEERING (as applicable)

Company: _____
Mailing Address: _____
City: _____ County: _____ State: _____ Zip Code: _____
Phone Number: _____ Representative: _____
Email Address: _____ Fax Number: _____
PE License _____ State _____

Installer

Company: _____
Mailing Address: _____
City: _____ County: _____ State: _____ Zip Code: _____
Phone Number: _____ Representative: _____
Email Address: _____ Fax Number: _____
NABCEP #: _____ State _____

ELECTRICAL CONTRACTOR (as applicable)

Company: _____

Mailing Address: _____

City: _____ County: _____ State: _____ Zip Code: _____

Phone Number: _____ Representative: _____

Email Address: _____ Fax Number: _____

Contractor's License # _____ City/County/State _____

TYPE OF GENERATOR (as applicable)

Photovoltaic _____ Wind _____ Other _____

ESTIMATED LOAD AND GENERATOR RATING INFORMATION

The following information is necessary to help properly design the Distributor customer interconnection.

Total Site Load _____ (Highest kW Demand Last 12 Months)

Residential _____ Commercial _____ Industrial _____

System Rating _____ (kW) Annual Estimated Generation _____ (kWh)

PART 2

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

SYNCHRONOUS GENERATOR DATA

Identification per Single Line Drawing: _____
Total number of units with listed specifications on site: _____
Manufacturer: _____
Type: _____ Date of manufacture: _____
Serial Number (each): _____
Phases: Single Three R.P.M.: _____ Frequency (Hz): _____
Rated Output (for one unit): _____ Kilowatt _____ Kilovolt-Ampere
Rated Power Factor (%): _____ Rated Voltage (Volts): _____ Rated Amperes: _____
Field Volts: _____ Field Amps: _____ Motoring power (kW): _____
Synchronous Reactance (X_d): _____ % on _____ KVA base
Transient Reactance (X'_d): _____ % on _____ KVA base
Sub-transient Reactance (X''_d): _____ % on _____ KVA base
Negative Sequence Reactance (X_2): _____ % on _____ KVA base
Zero Sequence Reactance (X_0): _____ % on _____ KVA base
Neutral Grounding Resistor Size (if applicable): _____
 I_2^2t or K (heating time constant): _____
Additional information: _____
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INDUCTION GENERATOR DATA

Rotor Resistance (R_r): _____ ohms Stator Resistance (R_s): _____ ohms
Rotor Reactance (X_r): _____ ohms Stator Reactance (X_s): _____ ohms
Magnetizing Reactance (X_m): _____ ohms
Short Circuit Reactance (X''_d): _____ ohms and (X'_d): _____ ohms
Design letter: _____ Frame Size: _____
Exciting Current: _____ Temp Rise (deg C°): _____
Reactive Power Required: _____ Vars (no load), _____
Vars (full load) Additional information: _____

PRIME MOVER (Complete all applicable items)

Identification per Single Line Diagram _____ Unit Number: _____
Type: _____
Manufacturer: _____
Serial Number: _____ Date of manufacture: _____
H.P. Rated: _____ H.P. Max.: _____ Inertia Constant: _____ lb.-ft.²
Energy Source (hydro, wind, etc.) _____

INVERTER DATA (if applicable)

Manufacturer: _____ Model: _____
Rated Power Factor (%): _____ Rated Voltage (Volts): _____ Rated Amperes: _____
Inverter Type (ferroresonant, step, pulse-width modulation, etc.): _____
Single or Three Phase _____ Type commutation: forced _____ line _____
Harmonic Distortion: Maximum Single Harmonic (%) _____
Maximum Total Harmonic (%) _____

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POWER CIRCUIT BREAKER (if applicable)

Manufacturer: _____ Model: _____
Rated Voltage (kilovolts): _____ Rated ampacity (Amperes) _____
Interrupting rating (Amperes): _____ BIL Rating: _____
Interrupting medium / insulating medium (ex. Vacuum, gas, oil) _____ / _____
Control Voltage (Closing): _____ (Volts) AC DC
Control Voltage (Tripping): _____ (Volts) AC DC Battery Charged Capacitor
Close energy: Spring Motor Hydraulic Pneumatic Other: _____
Trip energy: Spring Motor Hydraulic Pneumatic Other: _____
Bushings Current Transformers: _____ (Max. ratio) Relay Accuracy Class: _____
Multi ratio? No Yes: (Available taps) _____
Description of Control System _____

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ADDITIONAL INFORMATION – Single Line Diagram

In addition to the items listed above, please attach a detailed one-line diagram of the proposed facility, all applicable elementary diagrams, major equipment, (generators, transformers, inverters, circuit breakers, protective relays, batteries, number and location of PV Panels, transfer switches, etc.) specifications, test reports, etc., and any other applicable drawings or documents necessary for the proper design of the interconnection. Also describe the address or grid coordinates of the facility.

Permission to Interconnect

Customer must not operate their generating facility in parallel with Distributor's system until they receive written authorization for parallel operation from Distributor. Unauthorized parallel operation could result in injury to persons and /or damage to equipment and/or property for which the customer may be liable.

END OF PART 2

SIGN OFF AREA

The customer agrees to provide the Distributor with any additional information required to complete the interconnection.

Applicant

Date

DISTRIBUTOR CONTACT FOR APPLICATION SUBMISSION AND FOR MORE INFORMATION:

Distributor contact: _____

Title: _____

Address: _____

Phone: _____

e-mail: _____

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Attachment 3 - Certificate of Completion

Interconnection Customer: _____

Contact Person: _____

Address: _____

Location of the Small Generating Facility (if different from above):

City: _____ State: _____ Zip Code: _____

Telephone (Day): _____ (Evening): _____

Fax: _____ E-Mail Address: _____

Electrician:

Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Day): _____ (Evening): _____

Fax: _____ E-Mail Address: _____

License number: _____

Inspection:

The Small Generating Facility has been installed and inspected in compliance with the local building/electrical code of _____

Signed (Local electrical wiring inspector, or attach signed electrical inspection):

Print Name: _____ Date: _____

As a condition of interconnection, you are required to provide a copy of this form along with a copy of the signed and approved electrical permit/certificate to:

Name: _____

Company: _____

Address: _____

City, State ZIP: _____