

# GENERATOR INTERCONNECTION APPLICATION

**FOR BUY-ALL/SELL-ALL PROJECTS WITH AGGREGATE GENERATOR OUTPUT OF  
MORE THAN 20 KW BUT LESS THAN OR EQUAL TO 1 MW**

## Electric Utility Contact Information

Great Lakes Energy  
Gustavo Paz, P.E.  
Director, Interconnection Services & Agency Compliance  
P.O. Box 70  
1323 Boyne Avenue  
Boyne City, MI 49712  
Interconnection Hotline: 231.487.1308  
Interconnection Email: gpaz@glenergy.com

<b>For Office Use Only</b>

## Customer / Account Information

**Electric Utility Customer Information: ( As shown on utility bill )**

Customer Name ( Last, First, Middle):  
Customer Mailing Address:

Customer E-Mail Address: ( optional )

Electric Service Account #

Electric Service Meter Number:


## Generation System Site Information

Physical Site Service Address (if not Billing Address):

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**Annual Site Requirements Without Generation in Kilowatthours**

kWh/year

**Peak Annual Site Demand in Kilowatts (only for customers billed on demand rates)**

kW/year


**Attached Site Plan:**

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Page #

**Attached Electrical One-Line Drawing (See the Appendix D for a sample Inverter Type Project)**

(Per MPSC Order in Case No. U-15787- The one-line diagram must be signed and sealed by a licensed professional engineer, licensed in the State of Michigan or by an electrical contractor licensed by the State of Michigan with the electrical contractor's license number noted on the diagram.)

**Synchronous/Induction Generators: Must fill out Appendix A or B and provide a Detail One-Line Diagram**

See Appendix E and F for a sample the Detail One-Line Diagram for Synchronous or Induction projects  
Note: The following information on these system components shall appear on the preliminary Detail One-Line Diagram

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- Breakers - Rating, location and normal operating status (open or closed)
- Buses - Operating voltage
- Capacitors - Size of bank in Kvar
- Circuit Switchers - Rating, location and normal operating status (open or closed)
- Current Transformers - Overall ratio, connected ratio
- Fuses - normal operating status, rating (Amps), type
- Generators - Capacity rating (kVA), location, type, method of grounding
- Grounding Resistors - Size (ohms), current (Amps)
- Isolating transformers - Capacity rating (kVA), location, impedance, voltage ratings, primary and secondary connections and method of grounding
- Potential Transformers - Ratio, connection
- Reactors - Ohms/phase
- Relays - Types, quantity, IEEE device number, operator lines indicating the device initiated by the relays.
- Switches - Location and normal operating status (open or closed), type, rating
- Tagging Point - Location, identification

# GENERATOR INTERCONNECTION APPLICATION

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MORE THAN 20 KW BUT LESS THAN OR EQUAL TO 1 MW**

## Generation System - Manufacturer Information

System Type ( Solar, Wind, Biomass, Methane Digester, etc):  
 Generator Type ( Inverter, Induction, Synchronous):  
 Total Generator(s) Nameplate DC Rating (Solar Only):  
 Total Generator(s) Nameplate AC Rating:  
 Expected Annual Output in Kilowatthours  
 AC Output Operating Voltage:  
 Generator Wiring Configuration ( Single Phase, Three Phase):  
 Is the Inverter tested to IEEE1547.1?

kW
kW
kWh/year

Yes    No    Not Applicable

**Inverter Based Systems:**

Manufacturer  
 Model ( Name / Number )  
 Inverter Output Power Rating (kW)  
 No. of Inverter(s)


**Induction & Synchronous Based Systems**

Manufacturer  
 Model ( Name / Number )


## Installation Information

**Project Single Point of Contact: ( Electric Utility Customer, Developer, or other )**

Name:  
 Company ( If Applicable ):  
 Phone Number:  
 E-Mail Address:


Requested In Service Date:

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Licensed Professional Engineer Name (If applicable)

Licensed Electrical Contractor Name (If applicable)

Electrical Contractor/PE Phone #:

Electrical Contractor/PE E-Mail:


## Customer and Contractor Signature and Fees

Attached \$100 Interconnection Application Fee      **(Check # / Money Order #)**

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( Sign and Return complete application with Application Fee to Electric Utility Contact )  
**To the best of my knowledge, all the information provided in this Application Form is complete and correct.**

\_\_\_\_\_ **Customer**

\_\_\_\_\_ **Project Developer/Contractor (If Applicable)**

Note: Refer to the applicable "Michigan Electric Utility Generator Interconnection Procedures" for a detailed explanation of the Interconnection Process, Fees, Timelines, and

## **APPENDICES**

Appendix A: Technical Information for Synchronous-Type Generators  
Appendix B: Technical Information for Induction-Type Generators  
Appendix C: Sample Site Plan  
Appendix D: Sample One-Line diagram for Inverter Type Project  
Appendix E: Sample One-Line diagram for Synchronous Type Project  
Appendix F: Sample One-Line diagram for Induction Type Project

Synchronous Generators

**Generator Information**

- a. Generator Nameplate Voltage
- b. Generator Nameplate Watts or Volt-Amperes
- c. Generator Nameplate Power Factor (pf)
- d. RPM

a.
b.
c.
d.

**Technical Information**

- e. Minimum and Maximum Acceptable Terminal Voltage
- f. Direct axis reactance (saturated)
- g. Direct axis reactance (unsaturated)
- h. Quadrature axis reactance (unsaturated)
- i. Direct axis transient reactance (saturated)
- j. Direct axis transient reactance (unsaturated)
- k. Quadrature axis transient reactance (unsaturated)
- l. Direct axis sub-transient reactance (saturated)
- m. Direct axis sub-transient reactance (unsaturated)
- n. Leakage Reactance
- o. Direct axis transient open circuit time constant
- p. Quadrature axis transient open circuit time constant
- q. Direct axis subtransient open circuit time constant
- r. Quadrature axis subtransient open circuit time constant
- s. Open Circuit saturation curve
- t. Reactive Capability Curve showing overexcited and underexcited limits (Reactive Information if non-synchronous)
- u. Excitation System Block Diagram with values for gains and time constants (Laplace transforms)
- v. Short Circuit Current contribution from generator at the Point of Common Coupling
- w. Rotating inertia of overall combination generator, prime mover, couplers and gear drives
- x. Station Power load when generator is off-line, Watts, pf
- y. Station Power load during start-up, Watts, pf
- z. Station Power load during operation, Watts, pf

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Induction Generators

**Generator Information**

- a. Generator Nameplate Voltage
- b. Generator Nameplate Watts or Volt-Amperes
- c. Generator Nameplate Power Factor (pf)
- d.RPM

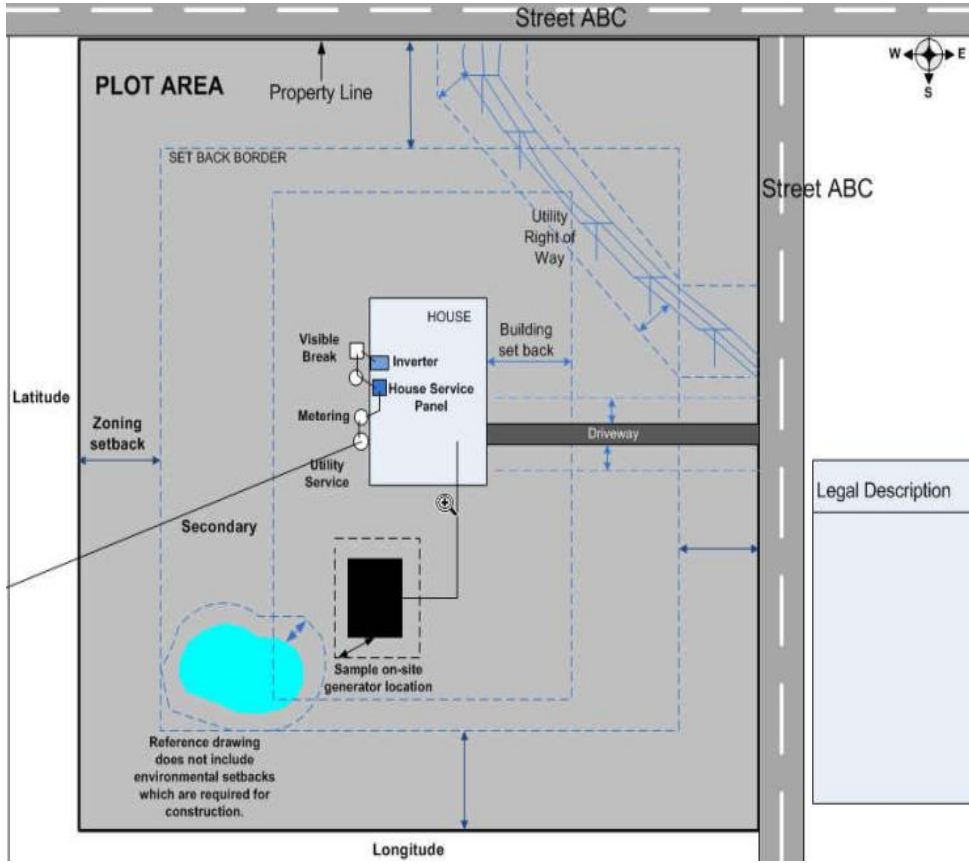
a.
b.
c.
d.

**Technical Information**

- e. Synchronous Rotational Speed
- f. Rotation Speed at Rated Power
- g. Slip at Rated Power
- h. Minimum and Maximum Acceptable Terminal Voltage
- i. Motoring Power (kW)
- j. Neutral Grounding Resistor (If Applicable)
- k.  $I_2^2t$  or K (Heating Time Constant)
- l. Rotor Resistance
- m. Stator Resistance
- n. Stator Reactance
- o. Rotor Reactance
- p. Magnetizing Reactance
- q. Short Circuit Reactance
- r. Exciting Current
- s. Temperature Rise
- t. Frame Size
- u. Design Letter
- v. Reactive Power Required in Vars (No Load)
- w. Reactive Power Required in Vars (Full Load)
- x. Short Circuit Current contribution from generator at the Point of Common Coupling
- y. Rotating inertia, H in Per Unit on kVA Base, of overall combination generator, prime mover, couplers and gear drive
- z. Station Power load when generator is off-line, Watts, pf
- aa. Station Power load during start-up, Watts, pf
- bb. Station Power load during operation, Watts, pf

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Appendix C: Sample Site Plan - Provided for Reference Only



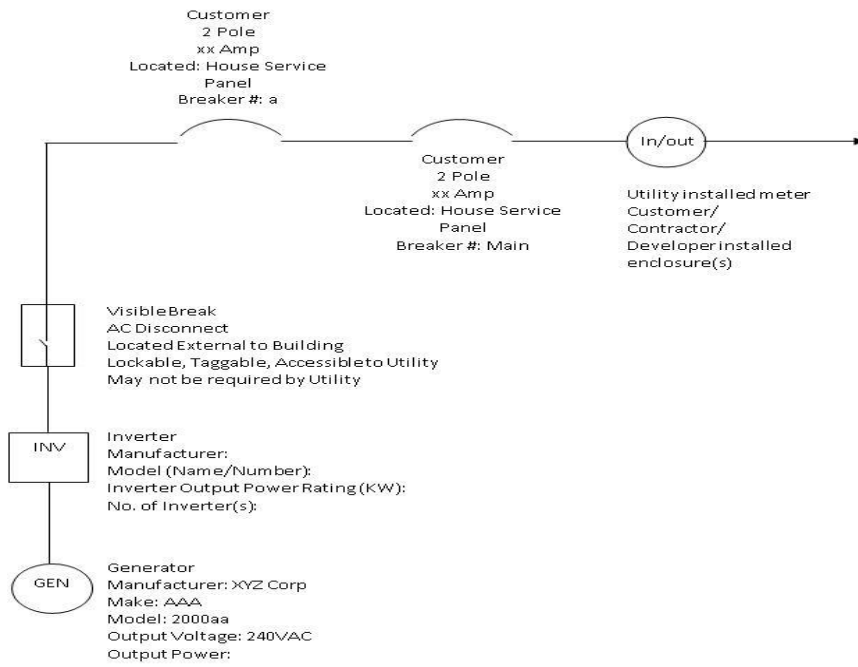
Customer Name: \_\_\_\_\_

Project Site Address: \_\_\_\_\_

Site Plan Prepared By: \_\_\_\_\_

Prepared Date: \_\_\_\_\_

**Appendix D - Sample One Line Drawing for Net Metering Inverter Based Generators**



NOTE: One-line diagram must be signed and sealed by a licensed Professional Engineer, licensed in the State of Michigan or by an electrical contractor licensed by the State of Michigan

Customer Name: \_\_\_\_\_

Project Site Address: \_\_\_\_\_

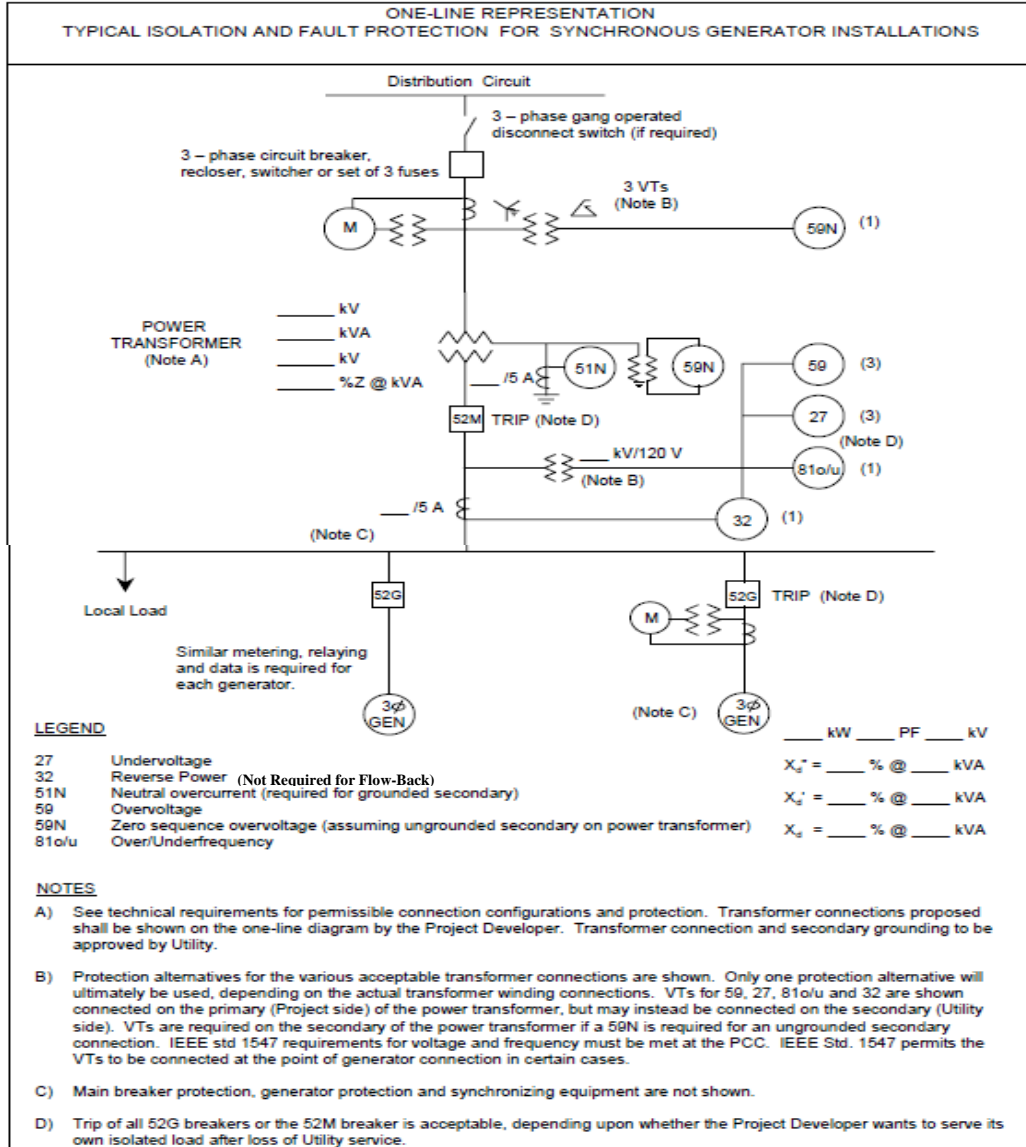
Licensed Professional Engineer Name (If applicable): \_\_\_\_\_

Licensed Professional Engineer Signature: \_\_\_\_\_

Electrical Contractor License Number: \_\_\_\_\_

Date: \_\_\_\_\_

Appendix E: Sample One-Line Drawing for Synchronous Generators



NOTE: One-line diagram must be signed and sealed by a licensed Professional Engineer, licensed in the State of Michigan or by an electrical contractor licensed by the State of Michigan

Customer Name: \_\_\_\_\_

Project Site Address: \_\_\_\_\_

Licensed Professional Engineer Name (If applicable): \_\_\_\_\_

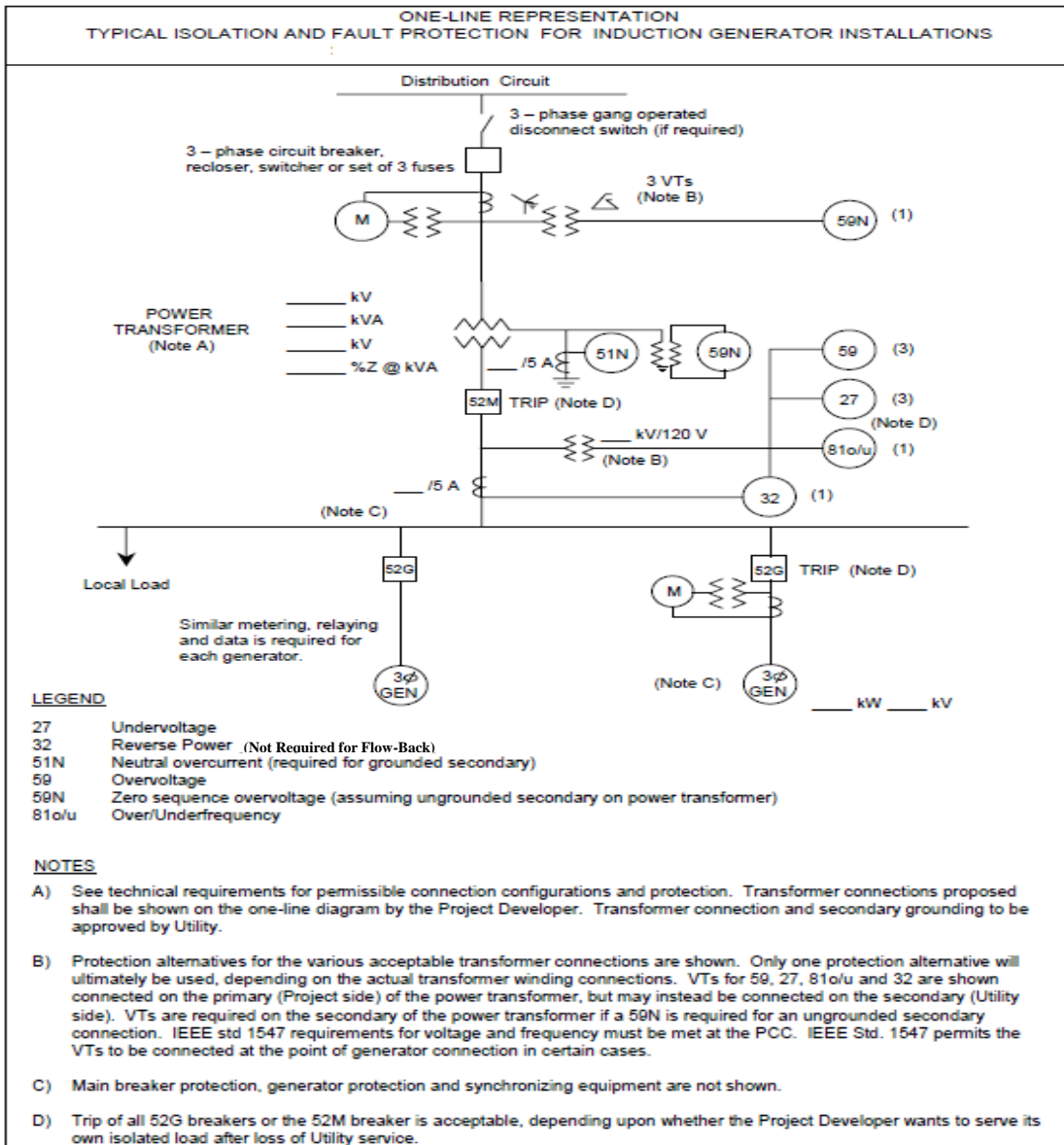
Licensed Professional Engineer Signature: \_\_\_\_\_

Electrical Contractor License Number: \_\_\_\_\_

Date: \_\_\_\_\_



Appendix F: Sample One-Line Drawing for Induction Generators



NOTE: One-line diagram must be signed and sealed by a licensed Professional Engineer, licensed in the State of Michigan or by an electrical contractor licensed by the State of Michigan

Customer Name: \_\_\_\_\_

Project Site Address: \_\_\_\_\_

Licensed Professional Engineer Name (If applicable): \_\_\_\_\_

Licensed Professional Engineer Signature: \_\_\_\_\_

Electrical Contractor License Number: \_\_\_\_\_

Date: \_\_\_\_\_

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**RENEWABLE ENERGY STANDING OFFER LIMITED PURCHASE AND SALE PROGRAM  
(BUY-ALL/SELL-ALL)**

In order to provide for the safety of Member-Consumers, Cooperative personnel, and others, and to ensure reliable electric service consistent with the generation and transmission Cooperative's ("G&T") standing offer for 10 MW of solar and wind renewable energy, the following requirements are established for connection and/or operation of Member-Consumer generation facilities in parallel with the Cooperative's distribution system.

Availability

The Cooperative's Buy-All/Sell-All Program is available on a first come, first serve, limited basis until the G&T's standing offer expires December 31, 2019 or upon full 10 MW subscription.

These requirements govern all Member-Consumer-owned generation facilities, which generate all of their electricity using a solar or wind renewable energy generator ("Member-Consumer Facility"), with a nameplate of 1 MW or less.

Member-Consumers wishing to participate in the Buy-All/Sell-All program shall submit a completed Buy-All/Sell-All Application and the \$100 application fee to the Cooperative for review. Upon approval of the Buy-All/Sell-All Application, the Cooperative shall issue a Buy-All/Sell-All Interconnection and Purchase Agreement ("Agreement") between the Member-Consumer, the Cooperative, and the G&T. Member-Consumers must complete construction and meet commercial operation of the Member-Consumer Facility within 180 days of signing the Buy-All/Sell-All Interconnection and Purchase Agreement.

The nameplate of the renewable energy generator size is limited to 1 MW per Member-Consumer. The Member-Consumer's entire renewable energy generator must fit within the limit and must be located on the Member-Consumer's premises. If a Member-Consumer has more than one renewable energy generator, the generators' ratings must be summed and the sum may not exceed 1 MW.

Upon enrolling in the Buy-All/Sell-All program, the term of the Agreement is 20 years. A participating Member-Consumer may terminate participation in the Buy-All/Sell-All program at any time and for any reason.

If the Member-Consumer does not meet (or, for the term of the Agreement, continue to meet) all of the requirements of the Agreement, as well as the requirements listed below, the Cooperative may require termination of parallel operation and the Member-Consumer shall be liable for any damages or injury resulting from unauthorized or improper connection and/or operation of the Member-Consumer's Facility.

(Continued on Sheet No. D-25.01)

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Issued: **December 14, 2016**  
By **Bill Scott**  
President and CEO  
Boyne City, Michigan

**Effective for bills rendered on and after  
March 1, 2017**

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**RENEWABLE ENERGY STANDING OFFER LIMITED PURCHASE AND SALE PROGRAM  
(BUY-ALL/SELL-ALL)  
(Continued from Sheet 25.00)**

Safety and Reliability Requirements

The Member-Consumer shall submit for the Cooperative's review detailed electric diagrams, equipment nameplate data, including the interface device and control system of the Member-Consumer's power source and a site plan.

The Member-Consumer's control and protection system and site plan must be acceptable to the Cooperative and in accordance with these safety and reliability standards. This system shall provide for immediate automatic shutdown or separation of the Facility and the Cooperative system in the event of momentary or extended loss of power from the Cooperative, including loss of one or more phases if the Member-Consumer is generating three phase power. The shutdown or separation must continue until normal utility service is restored. The shutdown or separation shall occur when frequency, voltage, and/or current deviate from normal utility standards. The Member-Consumer shall be liable if the Member-Consumer's protection system fails to function.

A disconnecting device suitable for use as a protective tag location may be required so as to be accessible and in reasonably close proximity to the billing meter.

The completed installation must meet all local, state and national codes and regulations and is subject to inspection by proper enforcement authorities before commencement of parallel operation. In addition, the Cooperative may, at its discretion, inspect or test the facility at any time.

The Member-Consumer shall advise the Cooperative prior to making any revisions to the Facility, the control system, or the interface between the two power systems after the installation. Any such revision must be acceptable to the Cooperative.

Should the parallel operation of the Facility cause interference or adversely affect voltage, frequency, harmonic content or power factor in the Cooperative's system or other Member-Consumers' service, the Cooperative may require disconnection of parallel operation until the condition has been corrected.

Metering

Separate metering shall be installed to determine generation output. The Member-Consumer Facility must deliver, to the Cooperative's system, all energy generated. The Member-Consumer shall pay the incremental cost of all such metering above the cost for meters provided for similarly situated non-generating Member-Consumers. Any service upgrades or protective equipment/devices necessary to accommodate the output of the generating unit(s), as determined by the Cooperative, shall be at the Member-Consumer's expense.

(Continued on Sheet No. D-25.02)

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Issued: **December 14, 2016**  
By **Bill Scott**  
President and CEO  
Boyne City, Michigan

**Effective for bills rendered on and after  
March 1, 2017**

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**RENEWABLE ENERGY STANDING OFFER LIMITED PURCHASE AND SALE PROGRAM  
(BUY-ALL/SELL-ALL)  
(Continued from Sheet 25.01)**

Reimbursement of Costs

The Member-Consumer shall pay for all costs associated with any addition to (or alteration of) the Cooperative's equipment required for metering and for the safe and reliable operation of the Facility in parallel with the Cooperative's system, as noted above, as well as an interconnection study, at the request of the Cooperative. The Member-Consumer shall also pay for costs of changes required due to safety or adverse effects on other Member-Consumers and/or on the Cooperative caused by the connection and/or operation of the Member-Consumer's renewable energy generator.

The Cooperative may require reasonable and adequate insurance coverage by the interconnecting Member-Consumer and the Member-Consumer shall provide proof of liability coverage as may be required by the Cooperative.

Monthly Charges and Credits

The Member-Consumer shall pay the full retail rate in accordance with the Cooperative's standard service tariff applicable to the Member-Consumer for all energy delivered to the Member-Consumer by the Cooperative, including energy necessary to operate the Member-Consumer's renewable energy generator.

The Cooperative, as agent for the G&T, shall pay the Member-Consumer 10 cents per kWh for all energy delivered to the Cooperative by the Member-Consumer as a credit on the Member-Consumer's monthly bill. The credit will be applied to the total charges of the standard service tariff applicable to the Member-Consumer and will be applied to the bill for that period. Any credit that is not used up during the current billing period shall be carried forward for use in subsequent billing periods.

If a credit accumulates to an amount greater than \$100, the Cooperative may pay the balance to the Member-Consumer as an agent for the G&T.

If a Member-Consumer terminates service with the Cooperative while having a remaining credit amount on their account, the G&T shall pay, through its agent, the Cooperative, the remaining credit amount to the Member-Consumer following a final reading by the Cooperative of the Member-Consumer's meter.

REQUIREMENTS FOR OPERATION OF  
PARALLEL GENERATION FACILITIES  
(COGENERATORS AND SMALL POWER PRODUCERS)

In order to provide for the safety of Member-Consumers, utility personnel, and others, and to assure reliable electric service consistent with the requirements of the Public Utility Regulatory Policies Act of 1978 and the Michigan Public Service Commission's Order in Case No. U-6798, the following requirements are established for connection and/or operation of Member-Consumer generation facilities in parallel with the Cooperative's distribution system:

Availability

These requirements include all Member-Consumer generation facilities under 100 kW. Member-Consumer generation facilities of 100 kW and over will be handled on an individual basis.

If the Member-Consumer does not meet all of the requirements listed below the Cooperative may require termination of parallel operation and the Member-Consumer shall be liable for any damages or injury resulting from unauthorized or improper connection and/or operation of the Member-Consumer's generation facility. These requirements apply to both existing and proposed installations and are subject to change with approval of the Michigan Public Service Commission from time to time.

Safety and Reliability Requirements

The Member-Consumer shall submit for the Cooperative's review detailed electric diagrams, equipment nameplate data, including the inter-face device and control system of the Member-Consumer's power source and a site plan.

The Member-Consumer's control and protection system and site plan must be acceptable to the Cooperative and in accordance with these safety and reliability standards. This system shall provide for immediate automatic shutdown or separation of the Member-Consumer's generation and the Cooperative system in the event of momentary or extended loss of power from the Cooperative, including loss of one or more phases if the Member-Consumer is generating three phase power. The shutdown or separation must continue until normal utility service is restored. The shutdown or separation shall occur when frequency, voltage, and other conditions deviate from normal utility standards. The Member-Consumer shall be liable if the Member-Consumer's protection system fails to function.

A disconnecting device suitable for use as a protective disconnection may be required so as to be accessible and in reasonably close proximity to the billing meter.

The completed installation must meet all local, state and national codes and regulations and is subject to inspection by appropriate enforcement authorities before commencement of parallel operation. In addition, the Cooperative may, at its discretion, inspect the facility at any time.

(Continued on Sheet No. D-3.0 )

Issued: **January 1, 2015**  
By Steven L. Boeckman  
President and CEO  
Boyer City, Michigan

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REQUIREMENTS FOR OPERATION OF  
PARALLEL GENERATION FACILITIES  
(Continued from Sheet No. D-3.00)

The Member-Consumer shall advise the Cooperative prior to making any revisions to the Member-Consumer's generation facility, the control system, or the interface between the two power systems after the installation. Any such revision must be acceptable to the Cooperative.

Should the parallel operation of the Member-Consumer's generation facility cause interference or adversely affect voltage, frequency, harmonic content or power factor in the Cooperative's system or other Member-Consumers' service, the Cooperative may require disconnection of parallel operation until the condition has been corrected.

Reimbursement of Costs

The Member-Consumer shall pay for all costs associated with any addition to or alteration of the Cooperative's equipment required for metering and for the safe and reliable operation of the Member-Consumer's generating equipment in parallel with the Cooperative's system. The Member-Consumer shall also pay for costs of changes required due to safety or adverse effects on other Member-Consumers and/or on the Cooperative caused by the connection and/or operation of the Member-Consumer's generation facility.

The Cooperative may require reasonable and adequate insurance coverage by the interconnecting Member-Consumer and the Member-Consumer shall provide proof of liability coverage as may be required by the Cooperative.

Sales to Cooperative

Member-Consumers wishing to sell power must arrange to do so with the generation and transmission Cooperative which provides all of the Cooperative's power requirements. Rates for such sales will be subject to the G & T's tariff provisions. Member-Consumers selling power to the G & T will be charged 1 mill per kWh sold to cover the Cooperative administrative costs.

Issued: **January 1, 2015**  
By Steven L. Boeckman  
President and CEO  
Boyne City, Michigan