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# Generator Interconnection Process

August 15th, 2018

# Outline



- Definitions
- Category Size and Net Metering Program Eligibility
- Category 1 & 2
  - Process Flow Chart
  - Generator Interconnection Application
  - Site Plan and One-line Diagram
  - Complete and Incomplete Applications
  - Commissioning Test
- Contact Information
- Question & Answer

# Definitions

- **Parallel Operation*** – The operation, for longer than 100 milliseconds, of a project connected to the energized distribution system.
- **Interconnection*** - The process undertaken by an electric utility to construct the electrical facilities necessary to connect a project with a distribution system so that parallel operation can occur.
- **Working Days*** – Days excluding Saturdays, Sundays, and other days when the offices of the electric utility are not open to the public.
- **True Net Metering** – means a utility billing method that applies the full retail rate to the net of the bidirectional flow of kW hours across the customer interconnection with the utility distribution system, during a billing period or time-of-use pricing period. (Category 1)
- **Modified Net Metering** – means a utility billing method that applies the power supply component of the full retail rate to the net of the bidirectional flow of kWh across the customer interconnection with the utility distribution system during a billing period or time-of-use pricing. (Category 2)

*Definitions from Generator Interconnection Requirements

# Interconnection Category Sizes and Program Eligibility

- **Category 1** - Aggregate Generation that is less than or equal to 20kW*
  - True Net Metering (Eligible upon review)
  - May opt for Interconnection Only to offset usage
- **Category 2** – Aggregate Generation that is greater than 20kW but less than or equal to 150kW
  - Modified Net Metering (Eligible upon review)
  - May opt for Interconnection Only to offset usage
- **Category 3** – Aggregate Generation that is greater than 150kW but less than or equal to 550kW
  - Modified Net Metering for Methane Digester Only (Eligible upon review)
  - Power Purchase Agreement (PPA) to determine compensation for sale of flow-back generation
  - May opt for Interconnection Only to offset usage
- **Category 4** – Aggregate Generation that is greater than 550kW but less than or equal to 2 MW
  - NOT Net Metering Eligible
  - Power Purchase Agreement (PPA) to determine compensation for sale of flow-back generation
  - May opt for Interconnection Only to offset usage

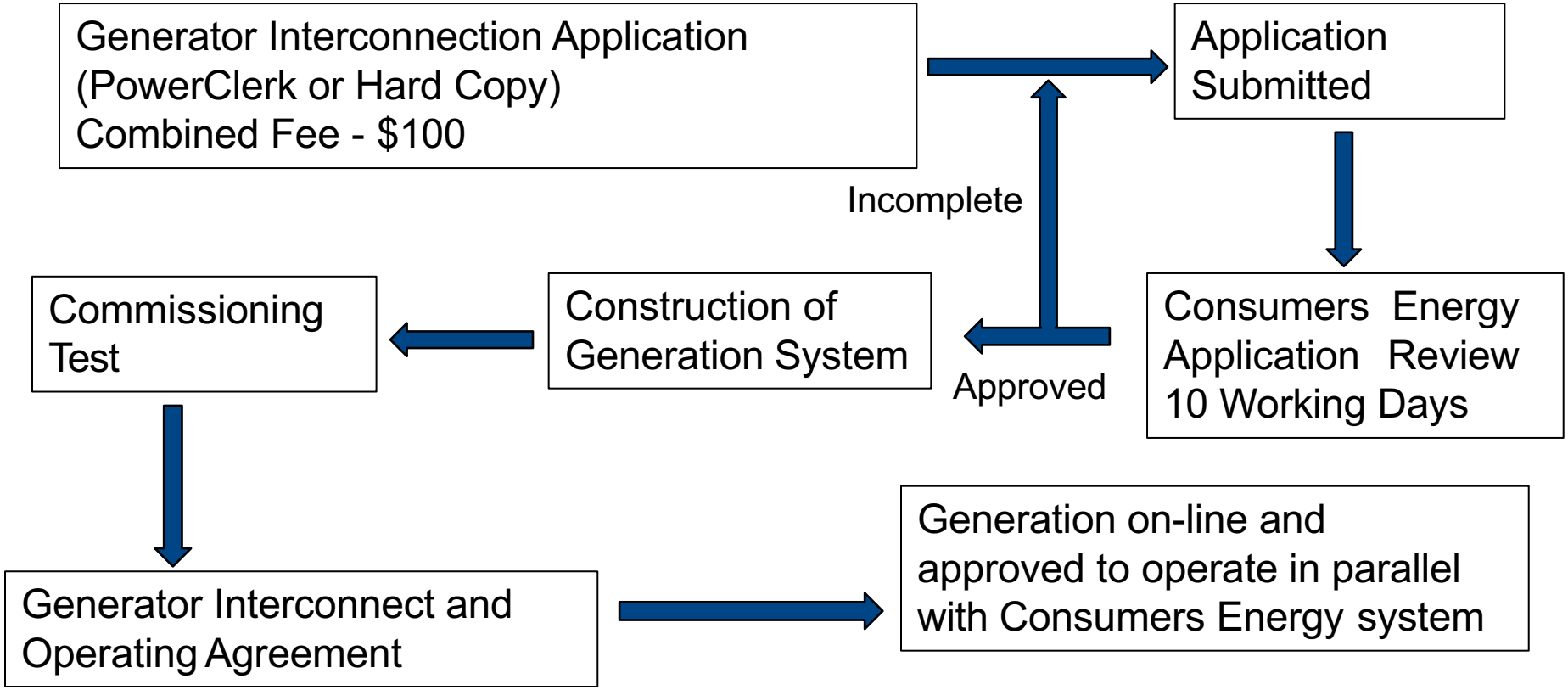
* Generator Output has to be certified for anti-islanding in compliance with IEEE1547 standard et seq

# Net Metering Category Sizes and Compensation Rate

| | Category 1 | Category 2 | Category 3 |
|---|---|---|---|
| **System Size** | ≤ 20 kW | > 20 to ≤150 kW | > 150 to ≤550 kW (Anaerobic digestion only) |
| **Meter Requirement** | Single Meter | Two Meters | Two Meters |
| **Billing** | Net power supply and net delivery charges in addition to other fixed fees | Net power supply and net delivery charges in addition to other fixed fees | Net power supply and net delivery charges in addition to other fixed fees |
| **Credit** | Excess energy credited at power supply and delivery rate | Excess energy credited at power supply rate only | Excess energy credited at power supply rate only |

# Process Flow Chart – Category 1& 2 Interconnection





# Category 1 – Combined Form

- Residential systems use the *Combined Generator Interconnection Application and Category 1 Net Metering* form.
  - Category 1: generation with a nameplate rating of 20kW or less
  - Category 2: generation with a nameplate rating between 20kW and 150kW

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**GENERATOR INTERCONNECTION APPLICATION**
**For All Projects with Aggregate Generator Output 20 kW or Less**
**Also Serves as Application for Category 1 Net Metering**

| ELECTRIC UTILITY CONTACT INFORMATION | FOR OFFICE USE ONLY |
|---|---|
| Consumers Energy<br>Interconnection Coordinator<br>1945 West Parnall Road (Room P14-205)<br>Jackson, MI 49201<br>(517)788-1432<br>Interconnection E-mail: customer_generation@cmsenergy.com | Application Number<br>Date and Time Application Received |

| CUSTOMER / ACCOUNT INFORMATION<br>Electric Utility Customer Information (As shown on utility bill) | |
|---|---|
| Customer Name (Last, First, Middle) | Customer Mailing Address |
| Customer Phone Number<br>( ) | Customer E-mail Address (Optional) |
| Electric Service Account Number | Electric Service Meter Number |
| **Are You Applying for the Net Metering Program?**<br>☐ Yes ☐ No | **Are you interested in Selling Renewable Energy Credits (REC's)?**<br>☐ Yes ☐ No |
| **Will you have an Alternative Electric Supplier?**<br>☐ Yes ☐ No If Yes, Name _____ | |
| **Notes:** Enter name ONLY if your energy is supplied by a 3rd party, not the utility.<br>You must apply to both the Distribution Utility and your Alternate Energy Provider (if applicable) for Net Metering | |

| GENERATION SYSTEM SITE INFORMATION | |
|---|---|
| Physical Site Service Address (If Not Billing Address) | |
| Annual Site Requirements Without Generation in Kilowatt Hours<br>kWh/year | Peak Annual Site Demand in Kilowatts (only for customers billed on Demand Rates)<br>kW |
| Attached Site Plan<br>Page # | Attached Electrical One-Line Drawing<br>Page # |

| GENERATION SYSTEM – MANUFACTURER INFORMATION | |
|---|---|
| System Type (Solar, Wind, Biomass, Fuel Cell, Geothermal, etc.) | Generator Type (Inverter, Induction, Synchronous) |
| Total Generator(s) Nameplate DC Rating (Solar Only)<br>kW | Total Generator Nameplate AC Rating<br>kW |
| Generator AC Operating Voltage | Wiring Configuration (Single Phase, Three Phase) |
| Certified Test Record No (Testing to Standard UL1741 Scope 1.1a) | |

| INVERTER BASED SYSTEMS | | | |
|---|---|---|---|
| Manufacturer | Model (Name/Number) | Inverter Power Rating (kW)<br>kW | Number of Inverters<br>kW |

| INDUCTION AND SYNCHRONOUS BASED SYSTEMS | | |
|---|---|---|
| Manufacturer | Model Name | Model Number |

# Category 2

- **Category 2: Aggregate generation nameplate rating is between 20kW and 150kW.**
- **May Require Formal Engineering Review**
  - Voltage impact to other customers can be significant
  - Customer Generation Meter also required between the inverter and the AC Disconnect
  - A stamped One-Line Diagram by a Professional Engineer or Licensed Electrical Contractor
  - Customer is responsible for cost of upgrades if necessary

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**GENERATOR INTERCONNECTION APPLICATION**
**Category 2 (Combined)**
**For All Projects with Aggregate Generator Output of More Than 20 kW but Less Than or Equal to 150 kW**
**Also Serves as Application for Category 2 Net Metering**
**(Note: Category 2 Net Metering Program only available to Renewable Generator Projects)**

| ELECTRIC UTILITY CONTACT INFORMATION | FOR OFFICE USE ONLY |
|---|---|
| Consumers Energy<br>Interconnection Coordinator<br>1945 West Parnall Road (Room P14-205)<br>Jackson, MI 49201<br>(517)788-1432<br>Net Metering E-mail: net_metering@cmsenergy.com | Application Number<br>Date and Time Application Received |

| CUSTOMER / ACCOUNT INFORMATION<br>Electric Utility Customer Information (As shown on utility bill) | |
|---|---|
| Customer Name (Last, First, Middle) | Customer Mailing Address |
| Customer Phone Number<br>( ) | Customer E-mail Address (Optional) |
| Electric Service Account Number | Electric Service Meter Number |
| Are you applying for the Net Metering Program?<br>☐ Yes ☐ No | Are you interested in selling Renewable Energy Credits (REC's)?<br>☐ Yes ☐ No |
| Do you have an Alternative Electric Supplier?<br>☐ Yes ☐ No If Yes, Name _____ | |

Notes: Enter name ONLY if your energy is supplied by a 3rd party, not the utility.
You must apply to both the Distribution Utility and your Alternate Energy Provider (if applicable) for Net Metering

| GENERATION SYSTEM SITE INFORMATION | | |
|---|---|---|
| Physical Site Service Address (If Not Billing Address) | | |
| Annual Site Requirements Without Generation in kWh<br>kWh/year | Peak Annual Site Demand in kW (only for customers billed on Demand Rates)<br>kW | Attached Site Plan<br>Page # _____ |
| Attached Electrical One-Line Drawing<br>Page # _____ | | |

(Per MPSC Order in Case No. U-15787 – The One-Line Drawing 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 drawing.)

- **See page 5 for sample Site Plan**
- **See Page 6 for sample of Inverter Generator Electrical One-Line Drawing**
- **See Page 7 for sample of Synchronous Generator Electrical One-Line Drawing**
- **See Page 8 for sample of Induction Generator Electrical One-Line Drawing**

| 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)<br>kW | Total Generator(s) Nameplate AC Rating<br>kW |
| A.C. Operating Voltage | Wiring Configuration (Single Phase, Three Phase) |
| Expected Annual Output in Kilowatt Hours<br>kWh/year | Is the Inverter tested to IEEE 1547.1?<br>☐ Yes ☐ No ☐ Not Applicable |

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# Category 2 Generation Interconnection



- The Category 2 Interconnection Application is similar to the Category 1 application

| INSTALLATION INFORMATION<br>Project Single Point of Contact: (Electric Utility Customer, Developer or Other) | | |
|---|---|---|
| Name | Company (If Applicable) | Phone Number<br>(  ) |
| E-Mail Address | | Requested in Service Date |
| Licensed Professional Engineer Name, if applicable (Last, First, MI) | Licensed Electrical Contractor Name, if applicable (Last, First, MI) | |
| Contractor/PE Phone Number<br>(  ) | Contractor/PE E-mail | |

**CUSTOMER AND PROJECT DEVELOPER/CONTRACTOR SIGNATURES AND FEES**

***Sign and Return Completed Application to Electric Utility Contact***

**To the best of my knowledge, all the information provided in this application form is complete and correct.**

Customer Signature _____ Date _____

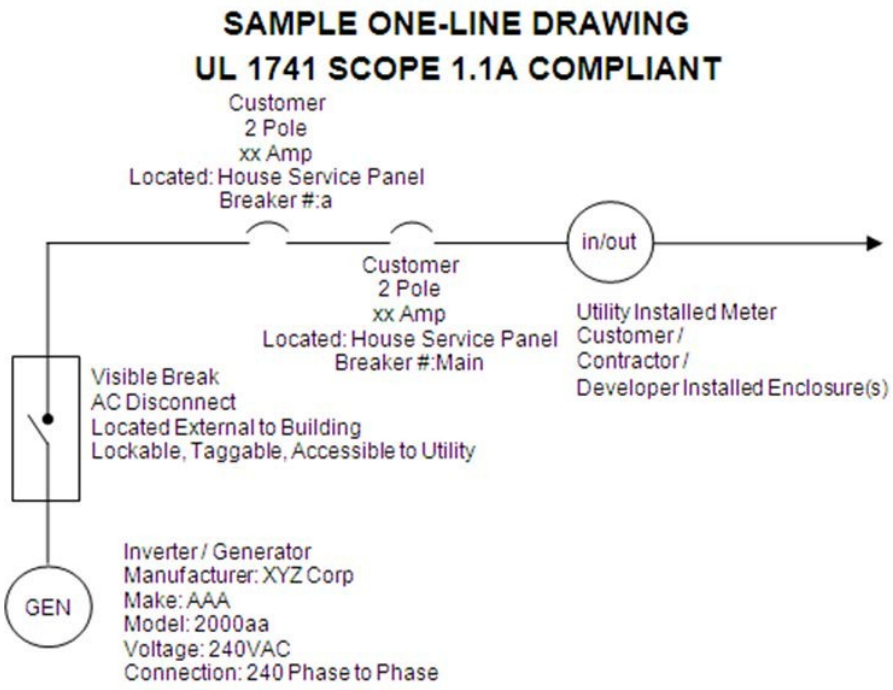
Project Developer/Contractor Signature (If Applicable) _____ Date _____

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

# One-line Diagram

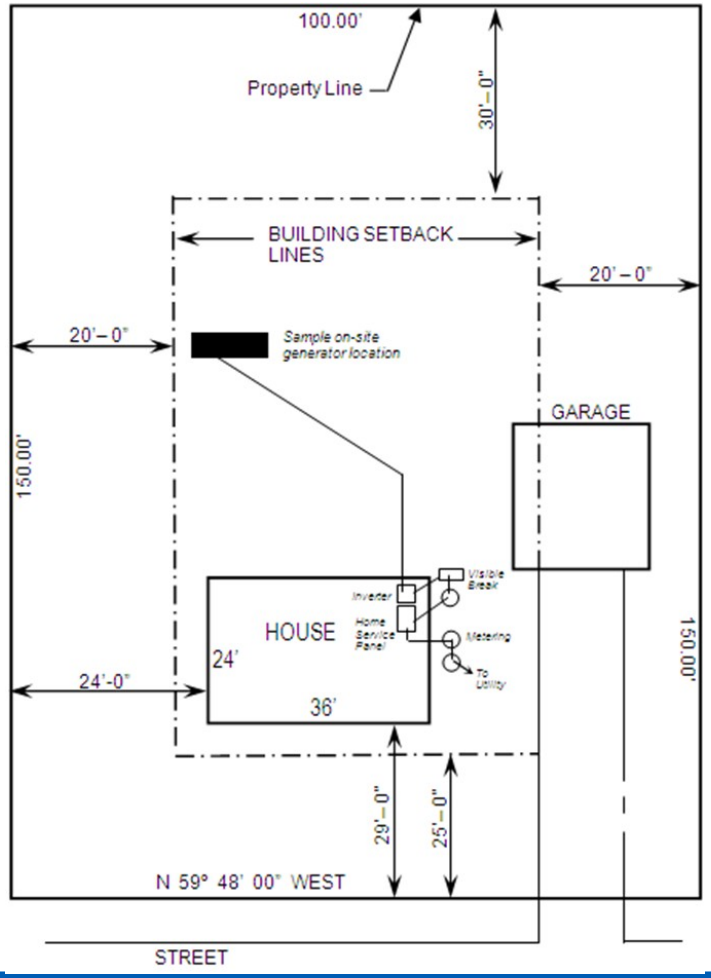


- A sample one-line diagram is provided in the Generator Interconnection Application.
  - Shows electrical connectivity
  - Clarifies location of equipment.
  - Provides additional equipment ratings.



# Site Plan

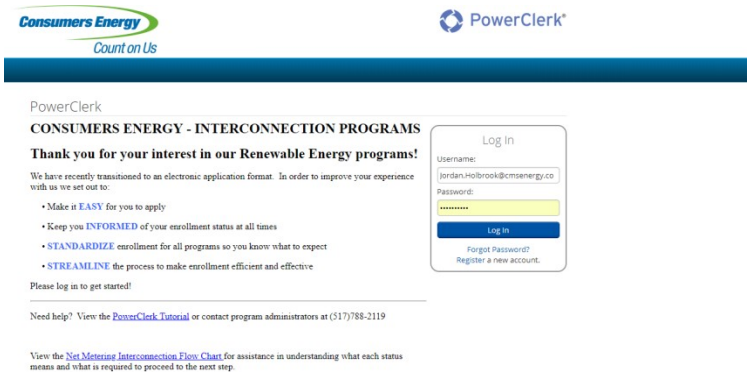
- Property Information:
  - Buildings
  - Location of Generator
  - Driveway & Streets
- Electrical Information
  - Inverter location
  - Meter locations
  - A/C Disconnect location
    - Adjacent to meter
    - Accessible by Consumers Energy
    - Visible Break
    - Lockable & Taggable
- Hand-drawn is acceptable



# Submitting the Application



- An application may either be submitted through PowerClerk or by mail to Consumers Energy Interconnection Coordinator.
  - Payment must still be mailed in to the Interconnection Coordinator to be processed manually. This payment can either be check or money order.
  - https://consumersenergy.powerclerk.com



# Submitting the Application



- A review of the application is conducted within 10 working days after the application and payment are received per MPSC requirements.
  - Impact on adjacent customers
- The customer is emailed or mailed the results of the review depending how the application was submitted.
  - Incomplete
  - Complete

# Incomplete Application



- An incomplete letter is emailed or mailed to the customer
  - States what was missing, or incorrect information, from the original application
- Customer re-submits application with requested information or corrections.
- The results of the re-review are emailed or mailed to the customer.

# Complete Application



- Project will be reviewed by Net Metering Team in parallel with the application review (if applicable) to determine eligibility for the program.
- Once the Category 1 application is approved the project moves to the Design and Construction Phase.
- Once the Category 2-4 application is approved the project moves to Formal Engineering Review Phase if needed.
  - Provides voltage fluctuation results to the system
  - Determines if system upgrades are necessary and conceptual cost
  - Provides Short Circuit data

# Commissioning Test

- Verification the system shuts-down as expected upon loss of utility voltage
- The updated form can be found on our website
- Consumers Energy still reserves the right to witness the Commissioning Test

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**COMMISSIONING TEST REPORT**
**For Inverter-Based, Category 1 – 3 Interconnections**

MAIL TO: Interconnection Coordinator P14-206, Consumers Energy, 1945 W Parnall Rd, Jackson MI 49201-8643
OR E-MAIL TO: customer.generation@cmsenergy.com.

| CUSTOMER INFORMATION (As shown on energy bill) | |
|---|---|
| Customer Name | |
| Generator Site Address (Street Address) | Generator Site Address (City, State, Zip Code) |
| Customer Account Number | |
| **COMMISSIONING TEST INFORMATION** | |
| Date of Commissioning Test | Time of Commissioning Test (e.g., 2:30 PM) |
| Method Used To Identify That The System Is Generating | |
| Device Opened To Break Parallel Between Generator And Utility System | |
| Time Duration Before The Generator Ceases To Generate ( in cycles / seconds), After Breaking The Parallel Operation (i.e. opening disconnect switch or other device) _____ | |
| Device Used to Measure Time Duration | |
| Test Performed By (Signature) | Test Performed By (Print) |

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# Billing and Meter Set Initiation



- Smart Meters possess bi-directional capabilities and do not have to be replaced. Customer generation is read automatically.

- Electromechanical Meters have to be replaced with a:
  - Smart Meter

- Is Consumers Energy Receiving the customer's generation?
  - Code Id: 03 kWH Delivered
  - Code Id: 50 kWH Total Received

# Contact Information

- PPA Questions - Jarrod Hafner or Keith Troyer
  - Jarrod Hafner: JARROD.HAFNER@cmsenergy.com
  - Keith Troyer: KEITH.TROYER@cmsenergy.com

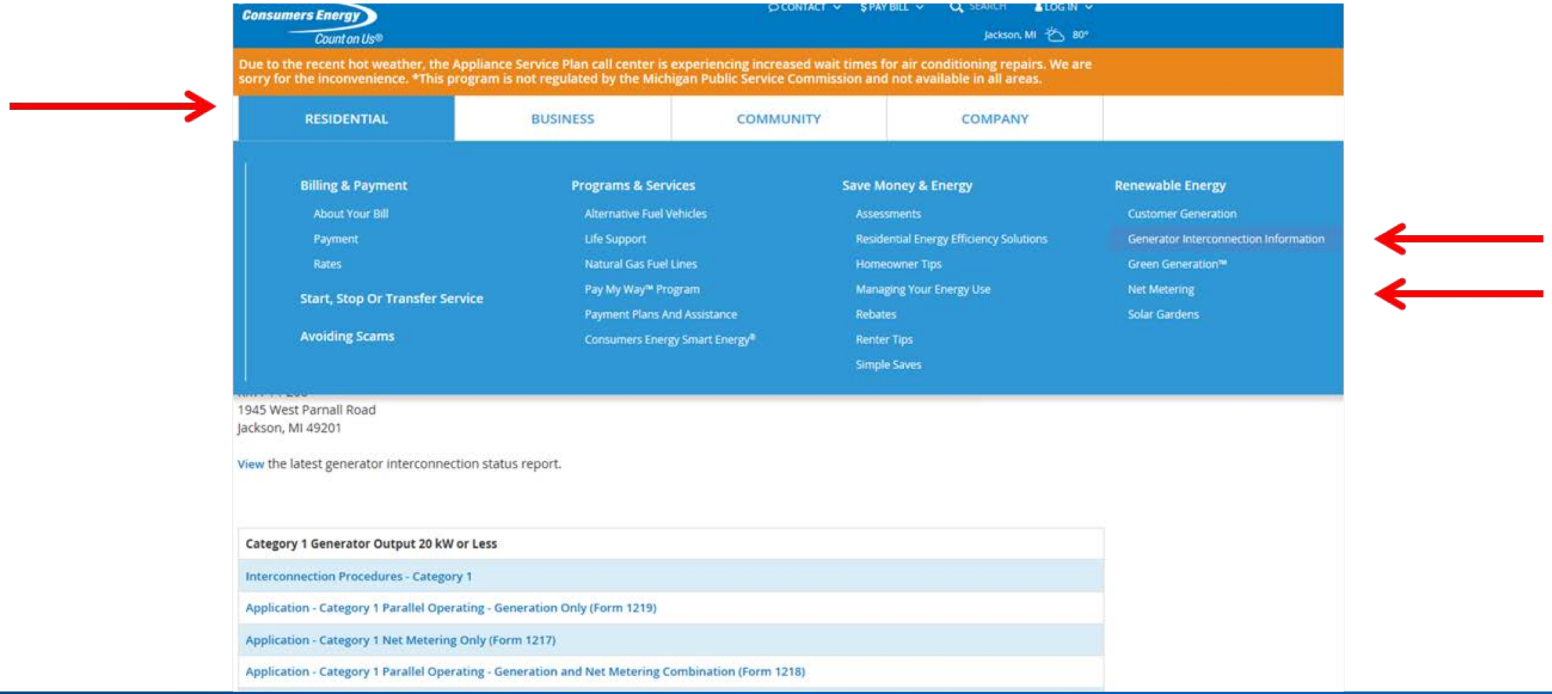
- Interconnection Coordinators (Nicholas Tenney)
- Address: 1945 West Parnall Road (Room P14-206)
  Jackson MI, 49201
  Phone: (517) 788-1432
  Email: customer.generation@cmsenergy.com

Net Metering Email: net_metering@cmsenergy.com
Net Metering Phone: (517) 788-2119

# Questions



- Generator Interconnection Applications and Net Metering Information can be found online at: www.ConsumersEnergy.com

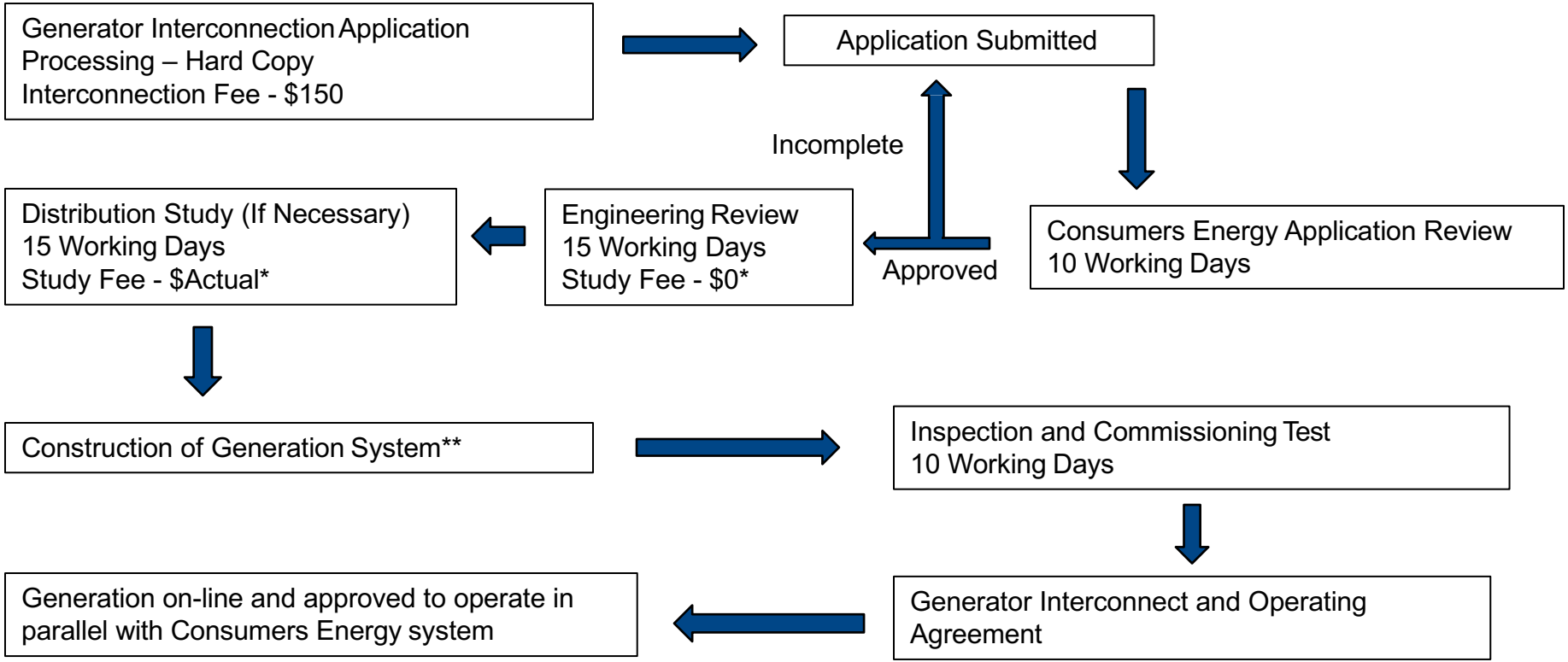


# Appendix

- Category 3 Information
- Category 4 Information

# Process Flow Chart – Category 3 Interconnection






* Costs are subject to change.

** A Facilities Agreement for facilities upgrades may be necessary.

# Category 3



- **Category 3: Aggregate generation nameplate rating is between 150kW and 550kW.**
- **Submitted Hard Copy Processing**
- **Requires Formal Engineering Review**
  - Voltage impact to other customers can be significant
  - Customer Generation Meter also required (Net Metering Eligible Only)
  - A stamped One-Line Diagram by a Professional Engineer or Licensed Electrical Contractor
  - Customer is responsible for cost of upgrades if necessary

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**GENERATOR INTERCONNECTION APPLICATION**
Category 3
For All Projects with Aggregate Generator Output of
More Than 150 kW but Less Than or Equal to 550 kW

| ELECTRIC UTILITY CONTACT INFORMATION | FOR OFFICE USE ONLY |
|---|---|
| Consumers Energy<br>Interconnection Coordinator<br>1945 West Parnall Road (Room P14-205)<br>Jackson, MI 49201<br>(517)788-1432<br>Net Metering E-mail: net_metering@cmsenergy.com | Application Number<br><br>Date and Time Application Received |

**CUSTOMER / ACCOUNT INFORMATION**
Electric Utility Customer Information (As shown on utility bill)

| | |
|---|---|
| Customer Name (Last, First, Middle) | Customer Mailing Address |
| Customer Phone Number<br>( ) | Customer E-mail Address (Optional) |
| Electric Service Account # | Electric Service Meter Number |

**Are you interested in selling Renewable Energy Credits (REC's)?**
☐ Yes ☐ No

**GENERATION SYSTEM SITE INFORMATION**

Physical Site Service Address (If Not Billing Address)

| Annual Site Requirements Without Generation in kWh | Peak Annual Site Demand in kW (only for customers billed on Demand Rates) | Attached Site Plan |
|---|---|---|
| kWh/year | kW | Page # _____ |

Attached Electrical One-Line Drawing
Page # _____

(Per MPSC Order in Case No. U-15787 – The One-Line Drawing 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.)

- **See Page 5 for sample Site Plan**
- **See Page 6 for sample of Inverter Generator Electrical One-Line Drawing**
- **See Page 7 for sample of Synchronous Generator Electrical One-Line Drawing**
- **See Page 8 for sample of Induction Generator Electrical One-Line Drawing**

**GENERATION SYSTEM MANUFACTURER INFORMATION**

| | |
|---|---|
| System Type (Solar, Wind, Biomass Methane Digester, etc) | Generator Type (Inverter, Induction, Synchronous) |
| Generator Nameplate Rating<br>kW | Expected Annual Output in Kilowatt Hours<br>kWh/year |
| A.C. Operating Voltage | Wiring Configuration (Single Phase, Three Phase) |

Certified Test Record No. (Testing to Standard UL1741 scope 1.1a)

**INVERTER GENERATOR - BASED SYSTEMS**

| Manufacturer | Model (Name/Number) | Inverter Power Rating (kW) |
|---|---|---|
| | | kW |

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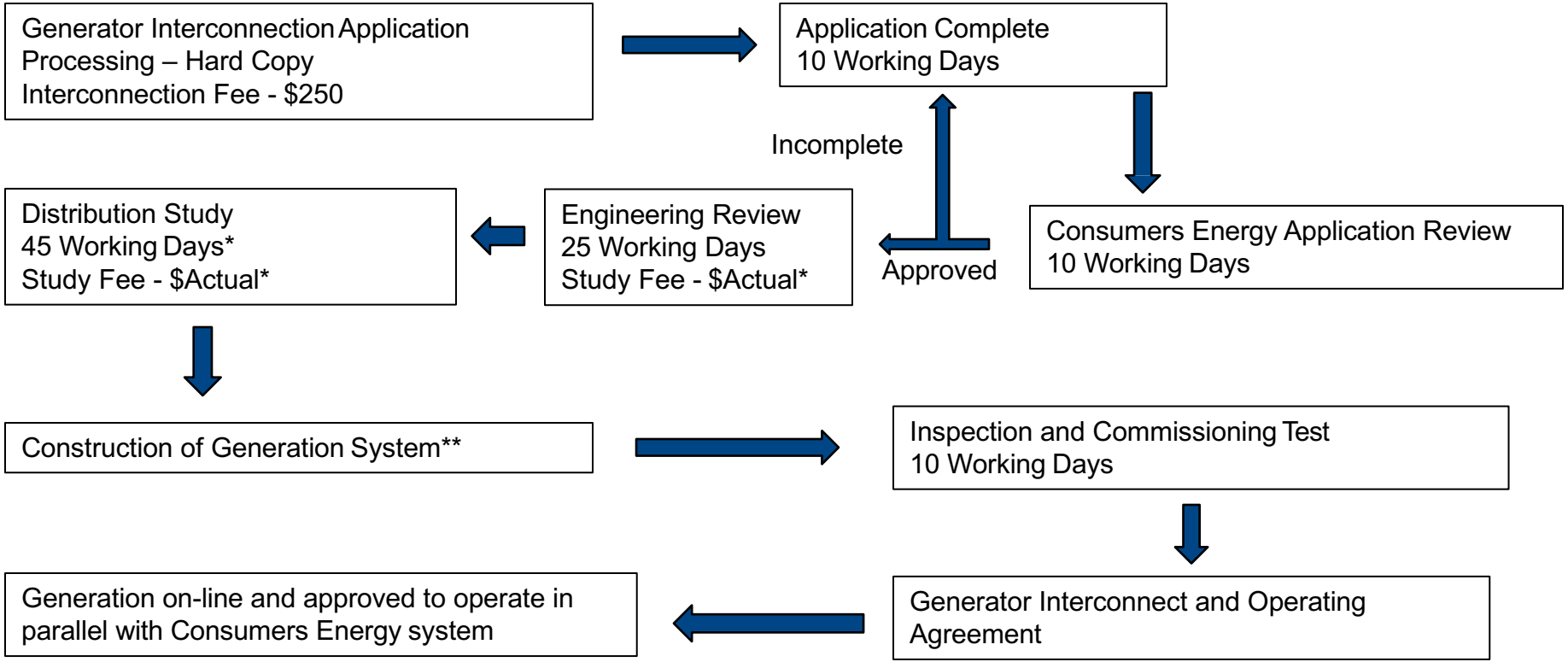
# Process Flow Chart – Category 4 Interconnection






* Costs are subject to change. Dates may change if mutually agreed upon.

** A Facilities Agreement for facilities upgrades may be necessary.

# Category 4



- **Category 4: Aggregate generation nameplate rating is between 550kW and 2 MW.**
- **Submitted Hard Copy Processing**
- **Requires Formal Engineering Review**
  - Voltage impact to other customers can be significant
  - Telemetry and Disturbance Monitoring is required
  - A stamped One-Line Diagram by a Professional Engineer or Licensed Electrical Contractor
  - Customer is responsible for cost of upgrades if necessary
  - Additional relaying equipment is required

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**GENERATOR INTERCONNECTION APPLICATION**
**Category 4**
**For All Projects with Aggregate Generator Output of More Than 550 kW but Less Than or Equal to 2 MW**

| ELECTRIC UTILITY CONTACT INFORMATION | FOR OFFICE USE ONLY |
|---|---|
| Consumers Energy<br>Interconnection Coordinator<br>1945 West Parnall Road (Room P14-205)<br>Jackson, MI 49201<br>517-788-1432<br>Interconnection E-mail: customer.generation@cmsenergy.com | Application Number<br><br>Date and Time Application Received |

| CUSTOMER / ACCOUNT INFORMATION<br>Electric Utility Customer Information (As shown on utility bill) | |
|---|---|
| Customer Name (Last, First, Middle) | Customer Mailing Address |
| Customer Phone Number<br>( ) | Customer E-mail Address (Optional) |

| INSTALLATION INFORMATION<br>Project Developer/Single Point of Contact | | |
|---|---|---|
| Name | Phone Number<br>( ) | Fax Number<br>( ) |
| Address | | |
| E-Mail Address | | |
| Project Site Address | | |

| GENERATION SYSTEM SITE INFORMATION | |
|---|---|
| Project Type (Base load, Peaking, Intermediate) | Energization Date for Project Interconnection Facilities |
| First Parallel Operation Date for Testing | Project Commercial Operation Date |
| Estimated Project Cost | Operation Mode |
| Attached Customer's Proof of General Liability Insurance for a minimum of $1,000,000<br>Page # _____<br><br>(Per MPSC Order in Case No. U-15787 – Customer must maintain a minimum of $1,000,000 General Liability Insurance.) | |
| Attached Site Plan<br>Page # _____ | |
| Attached Electrical One-Line Drawing<br>Page # _____<br><br>(Per MPSC Order in Case No. U-15787 – The One-Line Drawing must be signed and sealed by a licensed professional engineer, licensed in the State of Michigan.)<br>• **See Page 6 for sample Site Plan**<br>• **See Page 7 for sample of Synchronous Generator Electrical One-Line Drawing**<br>• **See Page 8 for sample of Induction Generator Electrical One-Line Drawing** | |
| Attached Specification for Equipment<br>Page # _____ | |

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# Category 4 – Cont.



| ISOLATING TRANSFORMER(S) BETWEEN GENERATOR(S) AND UTILITY | |
|---|---|
| Transformer Model Number | Transformer Manufacturer |
| Rated kV and connection (delta, wye, wye-gnd) of each winding | kVA of each winding (kW) |
| BIL of each winding | Fixed taps available for each winding (kW) |
| Positive/Negative range for any LTC windings | %Z impedance on transformer self cooled rating (kW) |
| Percent Excitation current at rated kV | Load Loss Watts at full load or X/R ratio (kW) |

**SYNCHRONOUS, INDUCTION AND INVERTER GENERATOR - BASED SYSTEMS**
**(Must complete Page 3, Page 4 or Page 5 and attach Electrical One-Line Drawing**

**The following information on these system components shall appear on the Electrical One-Line Drawing:**

- **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**

| Manufacturer | Model Name | Model Number |
|---|---|---|
| | | |

**CUSTOMER AND PROJECT DEVELOPER/CONTRACTOR SIGNATURES AND FEES**

☐ **Attached $250 Interconnection Application Fee**

☐ Check # _____ ☐ Money Order # _____

***Sign and Return Completed 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 Signature: _____ Date _____

Project Developer/Contractor Signature (if applicable): _____ Date _____

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

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| INVERTER GENERATORS | |
|---|---|
| **GENERATOR INFORMATION** | |
| System Type (Solar, Wind, Biomass, Methane Digester, etc) | Generation Nameplate Rating (kW or MVA) |
| AC Operation Voltage | Manufacturer |
| Model (Name/Number) | Attached Grid Configuration<br>Page # _____ |