

The Empire District Electric Company

Requirements For Net Metering



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1.0 INTRODUCTION

The Empire District Electric Company constantly strives to maintain a high standard of service to all Customers. This booklet has been prepared for use by Customers, architects, engineers, electrical contractors and local inspecting authorities so they may receive full benefit from our service. Copies are available at the Empire District Electric Company's Corporate office, service centers, and web site. All holders of "Requirements For Net Metering" booklets are encouraged to submit comments to aid in future revisions. Please submit comments as follows:

1. Give section, paragraph and page number to which the comment pertains.
2. Submit comments in writing; giving details, sketches, drawings, and all supporting pertinent information.
3. Mail via USPS to:

THE EMPIRE DISTRICT ELECTRIC COMPANY
Energy Services/Net Metering
P. O. BOX 127
602 South Joplin Avenue
Joplin, MO 64802

The impression generally prevails that compliance with the National Electrical Code (NEC), or the various electrical ordinances guarantees to the Customer a wiring installation complete and adequate for the full use of electric service now and in the future. This is not necessarily the case. The NEC and these guidelines are designed to provide the minimum requirements considered necessary for safety. **(The 2008 NEC, Article 90.1 B itself states, "Compliance therewith and proper maintenance will result in an installation essentially free from hazard, but not necessarily efficient, convenient or adequate for good service for future expansion of electrical use.")** Careful design and installation often results in a wiring system that exceeds NEC requirements.

THE EMPIRE DISTRICT ELECTRIC COMPANY, as a utility, must meet the requirements of the National Electrical Safety Code (NESC), which sometimes differ from the National Electrical Code (NEC).

The Company shall have the right to disconnect or refuse service to any installation which violates local, municipal, NEC or NESC regulations. The Company shall also have the right to disconnect or refuse service for installations that are hazardous to the public, or negatively impacts service to other Customers, or Company facilities.

Except for the installation and maintenance of its own property, THE EMPIRE DISTRICT ELECTRIC COMPANY does not install or repair wiring or equipment beyond the point of delivery. Therefore, EDE is not responsible for the voltage levels beyond the point of delivery and does not assume any responsibility for Customer facilities beyond the point of delivery. Your cooperation will be greatly appreciated and will enable you to receive prompt and satisfactory service.

2.0 DEFINITIONS

Backfeed	When electric power flows in the opposite direction from it's usual flow.
Company	THE EMPIRE DISTRICT ELECTRIC COMPANY.
Customer-Generator*	The owner or operator of a qualified electric energy generation unit which: (a) Is powered by a renewable energy resource; (b) Has an electrical generating system with a capacity of not more that 100kW; (c) Is located on a premises owned, operated, leased, or otherwise controlled by the Customer-Generator; (d) Is interconnected and operates in parallel phase and synchronization with a retail electric supplier and has been approved by said retail electric supplier; (e) Is intended primarily to offset part or all of the Customer-Generator's electrical energy requirements; (f) Meets applicable safety, performance, interconnection, and reliability standards established by the National Electrical Code, the National Electrical Safety Code, the Institute of Electrical and Electronics Engineers, Underwriters Laboratories, the Federal Energy Regulatory Commission, and any local governing authorities; and (g) Contains a mechanism that automatically disables the unit and interrupts the flow of electricity back onto the supplier's electricity lines in the event that service to that Customer-Generator is interrupted.
EDE	THE EMPIRE DISTRICT ELECTRIC COMPANY.
Generator	A machine that converts mechanical energy into electrical energy.
Net Metering	Using metering equipment sufficient to measure the difference between the electrical energy supplied to a Customer-Generator by a retail electric supplier and the electrical energy supplied by the Customer-Generator to the retail electric supplier over the applicable billing period.
Rate Schedule	A schedule of rates, services, and rules approved by the Commission.
Utility-Interactive Inverter	An inverter intended for use in parallel with an electric utility to supply common loads that may deliver power to the utility.

Many of the terms included may have slight variations in the intended specific meaning within the respective state jurisdictions. Terms as defined within the approved tariff will take precedence in the event of any conflict or confusion in meaning.

3.0 NET METERING

3.1 INTRODUCTION

The summary shown below establishes a ready source of basic reference material for currently approved Rate Schedules and Rate Schedule Riders in the states where the Company provides electric service. The respective Commissions for the service areas in the four states provide periodic review of these resulting in revisions and changes to the applicable Schedules or Riders. It is the responsibility of the Customer or Customer-Generator system(s) owner to be in compliance with the approved state's Rate Schedules, Riders, or applicable Regulations which are in effect at the time of the application, installation and revisions. This would include any changes that may occur throughout the useful life of the equipment. This summary is intended as one aid to provide information and assistance in applying for, and the submittal of the minimum documentation to comply with the installing and interconnecting process for a qualified non-utility, renewable fuel sourced electric generation (or distributed electric generation) system(s). Other considerations are manufacturer's recommendations, Codes, ordinances and Company safety or equipment requirements which may apply. Please consult with a Company representative if the facility is over the power limits shown in this document.

Please note that on an existing Point of Service that the application for a qualified non-utility renewable fuel sourced electric generation (or distributed electric generation) system(s) which is to be interconnected through a point of common coupling shall be reviewed by the Company as described in Section 3.6.3 and 3.6.4. As a result of the review process, additional equipment or re-arrangement of all or a portion of the already existing service interface equipment may have to be reconfigured or changed. This may result in additional equipment & labor costs to the Customer (applicant) in order to comply with current safety standards, codes, or laws in effect at the time of the review process. **Please note should there arise any discrepancies or differences between Section 3.0 and an approved Rate Schedule, Tariff, Rider, or approved "Rules and Regulations", whether implied or otherwise, the appropriate Schedule, Tariff, Rider, or "Rules and Regulations" shall take precedence and will govern any action taken.**

3.2 INTERCONNECTION PROCESS

The Company supplies electrical service to Customers located within the four States of Missouri, Kansas, Oklahoma and Arkansas. Each state currently has applicable approved rate schedules, riders, rules and regulations or laws that address utility grid inter-connection for the Company's service area. The applicable governing bodies for the respective states are: Missouri – The Missouri Public Service Commission; Kansas – The State of Kansas Corporation Commission; Oklahoma – Oklahoma Corporation Commission; Arkansas – Arkansas Public Service Commission. Please ensure that you are familiar with and utilize the correct application documents and specific processes defined by the appropriate state agency where your system's installation is located. The Company can assist you if need guidance in this process.

This process applies to new installations and modifications to existing interconnected installations. A "generic" process is shown in Diagram 1. A completed Application shall consist of submitting the appropriate sections of the application with all fields completed, any or all technical material including manufacturer's specifications describing or defining the specific equipment to be installed, and an interconnection wiring diagram or drawing that clearly conveys the appropriate physical locations of the proposed system devices and the necessary electrical details to convey the electrical energy flow path from the proposed Customer-Generator's system source back to the utility's metering location for the premise. **The diagram must clearly show the routing and connection(s) of all conductors, i.e. line one, line two, neutral and ground) in the path from the grid-tie inverter to the load panel and include references to the Company's Point of Service.** Additional wiring detail and grounding from the renewable energy source, i.e. photovoltaic panels to the inverter would also be very helpful. Any application fees would need to be submitted also, should they apply within your state. Please mail the completed application packet via the USPS to the following address:

**THE EMPIRE DISTRICT ELECTRIC COMPANY
Energy Services/Net Metering
P. O. BOX 127
602 South Joplin Avenue
Joplin, MO 64802**

Once the application is received by the Company, there is usually a defined period of time by the state within which EDE is obligated to respond. The obligated response time period can vary depending on your state's requirements. The Company will act to initiate the review process as rapidly as possible so as to meet the time restrictions. Any delays that are the responsibility of the applicant or persons acting on their behalf in performing acts such as securing necessary right-of-ways, governmental permits/inspections or meeting zoning requirements will not be counted in the Company's mandated time to respond.

3.3 APPLY FOR INTERCONNECTION

The applicant must submit to the Company the "Interconnection Application/Agreement for Net Metering Systems/Facilities with a capacity of 100 kW or less". The Application/Agreement will contain technical specifications or references to safety related codes that assist in the safe installation and subsequent operation of a Net Metering system. **The Company encourages the Customer to submit these technical specifications to the Company before investing in any equipment.** This will ensure that the Company's engineering department can approve the proposed equipment and its installation.

The Customer must submit a separate application for each Net Metering system whether or not it is at the current location or another location. The appropriate state application form(s) may be found at <https://www.empiredistrict.com/Customerservice/Electric.aspx>

3.4 INTERCONNECTION APPLICATION REVIEW/STUDY

The Company's engineering department will perform a review of the application materials to determine the impact of the proposed equipment on the Company's system. The Company's engineering department may suggest modifications that are required to allow for safe and reliable interconnection of the Customer's proposed system to Company's utility grid. In addition, a review of the existing Company service and Customer's metering will be conducted to determine if modifications will be required to accommodate the proposed interconnection facility. Additional materials may be requested if the application is deemed incomplete or deficient in documentation.

Written conditional approval or denial with reasons for the decision will be provided within 30 days for generation systems of 10 kW or less and within 90 days for systems greater than 10 kW. An estimate of any interconnection costs will be provided in the same time period. These interconnection cost estimates are related to the installation of the physical facilities which are necessary to permit interconnected operation of the Customer's system with the Company's utility grid and shall only include those corresponding costs, which would not have been normally been incurred by the Company to provide service to the Customer. These costs may be the result of one or more of the following:

- a. additional tests and analyses of the effects of the operation of the proposed interconnected system on the Company's utility grid,
- b. additional metering equipment, and/or
- c. any necessary controls or switches.

Upon receipt of the written conditional approval, the applying Customer shall construct or install the system as submitted within the application as well as any stated modifications within the written response to the application. Any conditionally approved items will be addressed and submitted in writing by the applicant to Company describing how the items will be corrected. This is necessary before any final approval of the application will be made by the Company. Once the Customer's system is in place, the applicant shall provide to the Company the signed Application/Agreement with all items on the Electrical Inspection form completed which will indicate that the necessary electrical inspection has been performed by a qualified person.

3.5 TECHNICAL AND PERFORMANCE STANDARDS

This section will list and explain the functional interconnection requirements that are considered under IEEE 1547 (IEEE Standard for Interconnecting Distributed Resources With Electric Power Systems) as they apply to Customer-Generator net metering interconnection with the EDE power system. **Net metering interconnection equipment, such as power inverters, must be IEEE 1547 compliant as certified by UL 1741 testing in order to be approved by EDE for Net Metering installations. In addition, measurements for operational compliance with any or all of these requirements may be taken at any time by EDE in order to verify that a Customer-Generator's net metering**

interconnection system is performing according to the testing requirements of UL 1741.

Measurements for these requirements would normally be taken at the Customer-Generator metering point in practice, but may also be required at the metering point of a neighboring Customer, in the case where two or more Customers share a service connection from the same transformer.

3.5.1 GENERAL REQUIREMENT

3.5.1.1 VOLTAGE REGULATION

The Customer-Generator's inverter / interconnection equipment shall not actively regulate the voltage at the point of interconnection, neither shall it cause the service voltage of any neighboring EDE Customers to move outside of the nominal voltage +/- 5% range.

3.5.1.2 INTEGRATION OF GROUNDING WITH EDE DISTRIBUTION SYSTEM

The Customer-Generator's equipment grounding scheme shall not cause over-voltages that exceed the rating of the interconnected EDE power system equipment, or the power system equipment of any neighboring EDE Customers. In addition, the Customer-Generator's equipment grounding scheme shall not disrupt the coordination of the ground fault protection for any neighboring EDE Customers.

3.5.1.3 SYNCHRONIZATION

The Customer-Generator's inverter / interconnection equipment shall parallel with the EDE power system without causing a voltage fluctuation of greater than +/-5% of the prevailing power system voltage level, when measured at the point of common coupling with any neighboring EDE Customers, and shall also meet the voltage flicker requirements outlined under the "power quality" section of this document.

3.5.1.4 INADVERTENT ENERGIZATION OF EDE DISTRIBUTION SYSTEM

The Customer-Generator's inverter / interconnected equipment shall not energize any part of the EDE power system when that part of the EDE power system is de-energized.

3.5.1.5 ISOLATION DEVICE

A readily accessible, lockable disconnect shall be installed between the Customer-Generator's inverter / interconnection equipment and the EDE power system. The disconnect shall be knife blade style. If this location is ahead of the main protective device for the Customer's service, the disconnect will be service rated and incorporate the use of Class R type fuse(s), sized to the requirement of the Customer-Generator's inverter / interconnection equipment. The location for the isolation device shall be positioned at the meter socket location to allow EDE service personnel to isolate and lock-out the Customer-Generator's inverter / interconnection equipment when necessary without removing service to normal, non-emergency Customer loads. The isolation device make and model number chosen by the Customer-Generator in a net metering installation shall be conform to those listed in Annex A.

3.5.2 RESPONSE TO ABNORMAL CONDITIONS ON THE EDE DISTRIBUTION SYSTEM

3.5.2.1 FAULTS (SHORT CIRCUITS)

The Customer-Generator's inverter / interconnection equipment shall cease to energize the EDE power system in the event that a detectable fault (short circuit) occurs on the Customer-load side (lower-voltage side) of the EDE distribution transformer to which it is connected.

3.5.2.2 RECLOSING COORDINATION

The Customer-Generator's inverter / interconnection equipment shall cease to energize the EDE power system circuit to which it is connected prior to any reclosure of that circuit by EDE. EDE power system circuits will reclose manually or automatically in the event that the circuit opens and becomes de-energized.

3.5.2.3 VOLTAGE

The protection functions of the Customer-Generator's inverter / interconnection equipment shall detect the effective (rms) or fundamental frequency value of each phase-to-neutral voltage. When any voltage is in a range given in Table 2 (below), the Customer-Generator's inverter / interconnection equipment shall cease to energize the EDE power system within the clearing time as indicated. Clearing time is the time between the start of the abnormal voltage condition and the interconnection equipment ceasing to energize the EDE power system. The measurements for the voltage are applied at the point of the interconnection equipment in practice, and the times represent maximum clearing times for interconnected equipment with peak capacity of 30 kW or less.

Voltage Range (% of base voltage)	Clearing time (seconds)
$V < 50$	0.16
$50 \leq V < 88$	2.00
$110 < V < 120$	1.00
$V \geq 120$	0.16

Table 2 – Interconnection system response to abnormal voltages

3.5.2.4 FREQUENCY

When the EDE system frequency is in a range given in Table 3 (below), the Customer-Generator's inverter / interconnection equipment shall cease to energize the part of the EDE power system to which it is connected. Clearing time is the time between the start of the abnormal frequency condition and the interconnection equipment ceasing to energize the EDE power system. The measurements for frequency are applied at the point of the interconnection equipment in practice, and the times represent maximum clearing times for interconnected equipment with peak capacity of 30 kW or less.

Frequency Range (Hz)	Clearing time (seconds)
> 60.5	0.16
< 59.3	0.16

Table 3 – Interconnection system response to abnormal frequencies

3.5.2.5 AUTOMATIC RECONNECTION

After an EDE power system disturbance, no Customer-Generator inverter / interconnection equipment reconnection shall take place until the EDE power system voltage is within the range of 87% to 106% of nominal, and frequency is in the range of 59.3-Hz to 60.5-Hz. The interconnection equipment shall include an adjustable delay (or a fixed delay of five minutes) that may delay reconnection for up to five minutes after the EDE power system steady-state voltage and frequency are restored to the ranges previously identified.

3.5.3 POWER QUALITY

3.5.3.1 LIMITATION OF DC INJECTION

The Customer-Generator's inverter / interconnection equipment shall not inject DC current greater than 0.5% of the full rated output current when measured at the AC terminals of the interconnection equipment.

3.5.3.2 LIMITATION OF VOLTAGE FLICKER

The Customer-Generator's inverter / interconnection equipment shall not cause objectionable flicker for any neighboring Customers served from the EDE power system. "Objectionable flicker" will be measured against the EDE flicker curve limitations for the normal electric distribution system, which limit voltage fluctuations to neighboring EDE Customers of 2.5% to 3.3% to no more than one event per hour, and voltage fluctuations of 1.75% to 2.5% to no more than 60 events per hour.

3.5.3.3 HARMONICS

When the Customer-Generator's inverter / interconnection equipment is serving balanced linear loads, harmonic current injection into the EDE power system when measured at the Customer meter shall not exceed the limits stated below in Table 4. The harmonic current injections shall be exclusive of any harmonic contents due to harmonic voltage distortion already present in the EDE power system when the Customer-Generator's inverter / interconnection equipment is disconnected.

Individual Odd Harmonic Order (h)**	$h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h$	Total Demand Distortion (TDD)
Percent (%)	4.0	2.0	1.5	0.6	0.3	5.0

Table 4 – Maximum harmonic current distortion in percent of current (I)*

* I = the greater of either the Customer's metered current integrated demand (15 or 30 minutes) when the inverter / interconnection equipment is disconnected, or the inverter / interconnection equipment rated current capacity.

** Even harmonics are limited to 25% of the odd harmonic limits above.

3.5.4 UNINTENTIONAL ISLANDING

For an unintended island in which the Customer-Generator's inverter interconnection equipment energizes a portion of the EDE power system through the Customer metering, the interconnection equipment shall detect the island and cease to energize the EDE power system within two seconds of the formation of an island.

3.6 INTERCONNECTION TEST SPECIFICATIONS

Section 3.6.1 and 3.6.2 outline the testing criteria that are required in order for a specific inverter / interconnection system design and product to be UL 1741 certified at the design and manufacturing levels of industry. **UL 1741 certification of the Customer-Generator's inverter / interconnection equipment is required in order for EDE to approve a net metering installation. In addition, EDE reserves the right to test the Customer-Generator's inverter / interconnection system for compliance with any or all of these requirements at any time in order to verify that the equipment is performing according to the testing requirements of UL 1741.**

Section 3.6.3 refers to the design of the Customer-Generator's inverter / interconnection system as it is presented in the Customer application and documentation provided in the application process. The interconnection system design will be reviewed by EDE during the application process according to the requirements of section 3.6.3. The field installation of the Customer-Generator's inverter / interconnection system will be reviewed according to the requirements of section 3.6.3 and section 3.6.4 at the time of site visit for testing and commissioning, and verification will be made that it is installed according to the design specified in the application. The commissioning tests of section 3.6.4 will then be performed on site by EDE personnel. Section 3.6.5 describes the required maintenance of the Customer-Generator's inverter / interconnection system.

3.6.1 DESIGN TEST

This design test shall be performed as applicable to the specific interconnection system technology. The test shall be performed on a representative sample, either in the factory, at a testing laboratory, or on equipment in the field. This test applies to a packaged interconnection system using embedded components or to an interconnection system that uses an assembly of discrete components. The design test shall be conducted on the same sample in the sequence of Table 5.

Required Order	Design Test Title
1	Response to Abnormal Voltage and Frequency
2	Synchronization
3	Interconnect Integrity
6	Unintentional Islanding
7	Limitation of DC Injection
8	Harmonics

Table 5 Sequence for Conducting Design Test

3.6.1.1 RESPONSE TO ABNORMAL VOLTAGE AND FREQUENCY

This test shall demonstrate that the Customer-Generator's inverter / interconnection equipment ceases to energize the EDE System when the voltage or frequency exceeds the limits as specified in Section 3.5.2. Interconnection systems provided with field adjustable set points shall also be tested at the minimum, midpoint and maximum of the adjustable set point ranges. These tests shall be conducted using either the simulated utility or secondary injection method.

3.6.1.2 SYNCHRONIZATION

Test results conforming to requirements as listed below are accepted as indicating compliance with the requirements of Section 3.5.1.3. This test shall demonstrate that at the moment of the paralleling-device closure, all three parameters in Table 6 are within the stated ranges. This test shall also demonstrate that if any of the parameters are outside of the ranges stated in the table, the paralleling-device shall not close.

Frequency Difference (Δf , Hz)	Voltage Difference (ΔV , %)	Phase Angle Difference ($\Delta\Phi$, °)
0.3	10	20
0.2	5	15
0.1	3	10

Table 6 Synchronization Parameter Limits for Synchronous Interconnection to EDE.

3.6.1.3 INTERCONNECT INTEGRITY TEST

3.6.1.3.1 PROTECTION FROM ELECTROMAGNETIC INTERFERENCE (EMI)

The interconnection system shall be tested in accordance with ANSI/IEEE C37.90.2 to confirm that the interconnection system shall have the capability to withstand electromagnetic interference (EMI) environments as described in ANSI/IEEE C37.90.2. The influence of EMI shall not result in a change in state or mis-operation of the interconnection system.

3.6.1.3.2 SURGE WITHSTAND PERFORMANCE

The interconnection system shall be tested to ensure that it shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE/ANSI C62.41.2 or IEEE C37.90.1 as applicable in all normal operating modes in accordance with IEEE/ANSI C62.45 for equipment rated less than 1000V to confirm that the surge withstand capability is met by using the selected test level(s) from IEEE/ANSI C62.41.2.

3.6.1.3.3 *PARALLELLING DEVICE*

A dielectric test across the open-circuited paralleling device shall be conducted to confirm it will withstand 220% of the interconnection system rated voltage.

3.6.1.4 *UNINTENTIONAL ISLANDING*

A test or field verification shall be conducted to confirm that Section 3.5.4 is met regardless of the selected method of detecting isolation.

3.6.1.5 *LIMITATION OF DC INJECTION*

The Customer-Generator's inverter / interconnection equipment shall be tested to confirm that it does not inject DC current greater than prescribed limits that are listed in Section 3.5.3.1.

3.6.1.6 *HARMONICS*

The intent of the harmonics interconnection test is to assess that under a controlled set of conditions the Customer-Generator's inverter / interconnection equipment meets the harmonic limits specified in Section 3.5.3.3.

The Customer-Generator's inverter / interconnection equipment shall be operated in parallel with a predominantly inductive voltage source with a short circuit current capacity I_{sc} of not less than 20 times the Customer-Generator's inverter / interconnection equipment's rated output current at fundamental frequency. The voltage and frequency output of the voltage source shall correspond to the rated voltage and frequency of the Customer-Generator's inverter / interconnection equipment. The unloaded voltage waveform produced by the EDE or simulated utility voltage source shall have a total harmonic distortion (THD) less than 2.5 %.

The Customer-Generator's inverter / interconnection equipment shall be operated at an output test load current, I_L , of 33%, 66% and at a level as close to 100% of rated output current as practical. Use total rated-current distortion (TRD) in place of TDD. TRD is the total rms value of the sum of the current harmonics created by the Customer-Generator's inverter / interconnection equipment operating into a linear balanced load divided by the greater of the test load current (I_L) demand or the rated current capacity of the Customer-Generator's inverter / interconnection equipment (I_{rated}). The individual harmonic distortion and TRD of the DR output current shall be measured for the first 40 harmonics. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in the EDE system without the Customer-Generator's inverter / interconnection equipment connected. The test results shall not exceed the values in Section 3.5.3.3 Table 3.

3.6.2 *PRODUCTION TESTS*

The inverter / interconnection equipment shall be subjected to requirements of Section 3.5.2 and Section 3.5.1.3. Inverter / interconnection devices with adjustable setpoints shall be tested at a single set of setpoints as specified by the manufacturer. This test may be conducted as a factory test or may be performed as part of a commissioning test.

3.6.3 *INTERCONNECTION INSTALLATION EVALUATION*

3.6.3.1 *GROUNDING INTEGRATION WITH EDE*

System design verification shall be made to ensure that the requirements of Section 3.5.1.2 have been met.

3.6.3.2 *ISOLATION DEVICE*

System design verification shall be made to ensure that the requirements of Section 3.5.1.5 have been met.

3.6.3.3 *EDE FAULTS*

A system design verification shall be made to ensure that the requirements of Section 3.5.2.1 have been met.

3.6.3.4 *EDE RECLOSING COORDINATION*

System design verification shall be made to verify the interconnection system is coordinated with EDE reclosing practices in accordance with Section 3.5.2.2.

3.6.4 COMMISSIONING TEST

A visual inspection shall be made in order to ensure that the grounding coordination requirement of section 3.5.1.2 has been implemented. A visual inspection shall be made to confirm the presence of the isolation device. Initial commissioning tests shall be performed on the installed Customer-Generator's inverter / interconnection equipment as necessary prior to the initial parallel operation of the Customer-Generator's inverter / interconnection equipment. The following tests are required:

- Operability test on the isolation device.
- Response to loss and re-energization of the utility source, specifically according to the requirements of section 3.5.2.5, section 3.5.2.2, and section 3.5.1.4.
- Any other tests of Section 3.5 that EDE deems necessary in order to validate that the functional installation of the Customer-Generator interconnection system is actually performing according to the testing requirements of UL 1741.

EDE reserves the right to repeat the applicable tests of Section 3.5 when functional software or firmware changes have been made on the interconnection system or any hardware component of the interconnection system has been modified in the field, or replaced or repaired with parts different from the tested configuration. EDE also reserves the right to repeat the applicable tests if protection settings have been changed after factory testing or protection functions have been adjusted after the initial commissioning process.

3.6.5 PERIODIC INTERCONNECTION TESTS

All interconnection-related protective functions and associated batteries shall be periodically tested at intervals specified by the manufacturer, system integrator, or the authority who has jurisdiction over the Customer-Generator's inverter / interconnection. Periodic test reports or a log for inspection shall be maintained. These records may be requested by EDE at any time in order to verify that the inverter / interconnection equipment is being properly maintained.

For items not specifically addressed in these drawings, please consult the Company's Residential Requirements for Electric Service and Meter Installations book.

For Approved Disconnect Switches Refer to Annex A.

This placard shall be mounted directly by the switch on the structure, not on the switch. See Figure 4 for details.

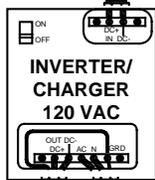
Placard

Ground Bar

Neutral Bar

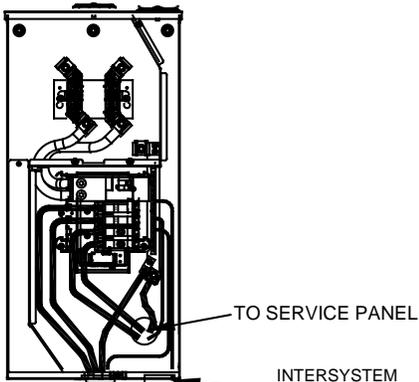
AC SUB-PANEL
THIS PANEL MAY BE USED TO SUPPLY OTHER HOUSE LOADS.

TO RENEWABLES GENERATOR



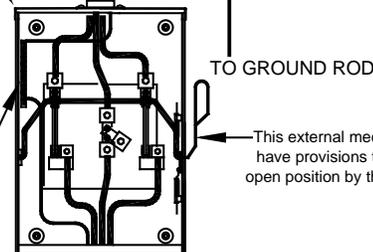
Neutral and Ground are Separated in This Panel

Ground Bar



TO SERVICE PANEL

INTERSYSTEM BONDING BLOCK



TO GROUND ROD

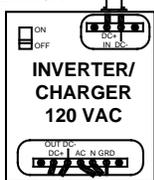
This external mechanical switch will have provisions to be locked in the open position by the use of a padlock.

Neutral and Ground are Separated in This Panel

Ground Bar
This placard shall be placed in this panel as per 2014 NEC Article 705.12 (D) (3) (b).

WARNING
INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

TO RENEWABLE GENERATOR



Neutral Bar

DC PANEL
THIS PANEL SHALL BE LOCATED AS CLOSE AS PRACTICAL TO THE BATTERY BANK

BATTERY BANK

The location of Storage Batteries shall meet NEC Article 480.9 A, B, and C.

This figure is designed to help the Customer who chooses to consider a Renewable Generator. It is not intended as a design schematic. Please refer to NEC Article 690 as well as the applicable parts of Article 90 and 700 as well as Chapter 1,2,3,and 4 which will supplement Article 690. Each Customer's Licensed Electrician will be responsible for providing a schematic for their Installation. This Schematic will specifically address the following issues:

- Grounding for All Devices
- Disconnect Location
- Placarding

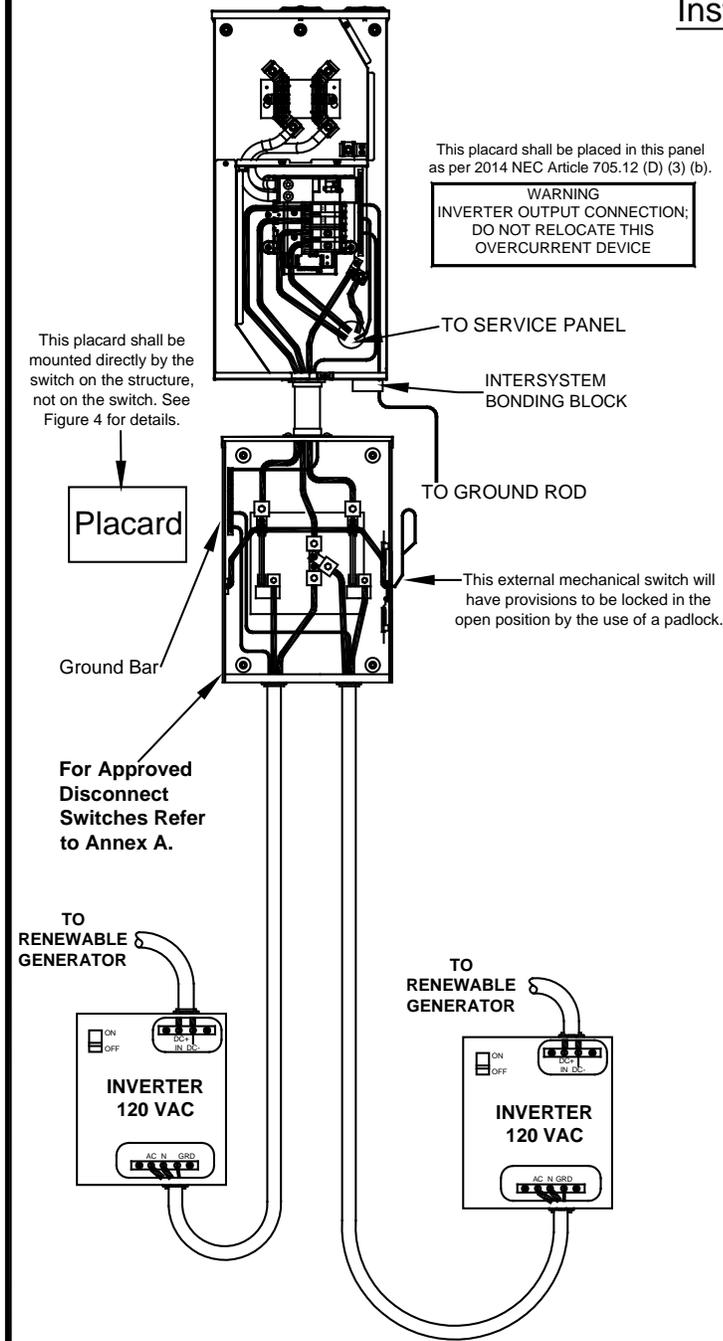
Please note that the placarding described in Article 690 does not apply to the disconnect switch placarding. Follow the specific direction shown in this document.

REVISIONS

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
RENEWABLE GENERATOR WITH CHARGER, BACKUP BATTERIES, AND EMERGENCY PANEL	
DWG. NO.	
DRAWN: SDS	DATE: 12/14/2010
SCALE: NTS	FIGURE 1

Figure 1: Renewable Generator With Charger, Backup Batteries, and Emergency Panel

For items not specifically addressed in these drawings, please consult the Company's Residential Requirements for Electric Service and Meter Installations book.



This figure is designed to help the Customer who chooses to consider a Renewable Generator. It is not intended as a design schematic. Please refer to NEC Article 690 as well as the applicable parts of Article 90 and 700 as well as Chapter 1,2,3,and 4 which will supplement Article 690. Each Customer's Licensed Electrician will be responsible for providing a schematic for their Installation. This Schematic will specifically address the following issues:

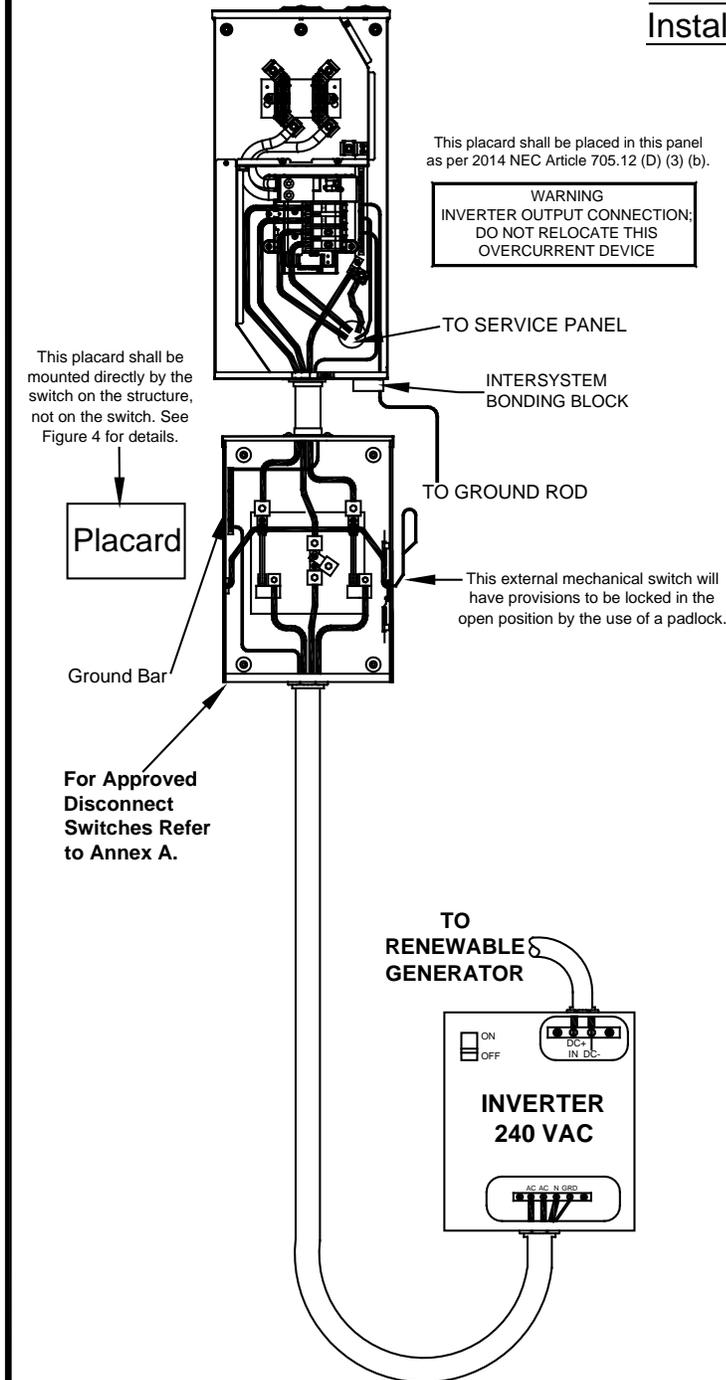
- Grounding for All Devices
- Disconnect Location
- Placarding

Please note that the placarding described in Article 690 does not apply to the disconnect switch placarding. Follow the specific direction shown in this document.

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
RENEWABLE GENERATOR WITHOUT BATTERIES-DIRECT THROUGH INVERTER INTO MAIN PANEL	
DWG. NO.	
DRAWN: SDS	DATE: 12/14/2010
SCALE: NTS	FIGURE 2
REVISIONS	
DWG MOD SDS	6/8/2015

Figure 2: Renewable Generator w/o Batteries – Direct Through Inverter Into Main Panel

For items not specifically addressed in these drawings, please consult the Company's Residential Requirements for Electric Service and Meter Installations book.



This figure is designed to help the Customer who chooses to consider a Renewable Generator. It is not intended as a design schematic. Please refer to NEC Article 690 as well as the applicable parts of Article 90 and 700 as well as Chapter 1,2,3,and 4 which will supplement Article 690. Each Customer's Licensed Electrician will be responsible for providing a schematic for their Installation. This Schematic will specifically address the following issues:

- Grounding for All Devices
- Disconnect Location
- Placarding

Please note that the placarding described in Article 690 does not apply to the disconnect switch placarding. Follow the specific direction shown in this document.

REVISIONS DWG. NO. SDS 10/10/2010	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
	RENEWABLE GENERATOR WITHOUT BATTERIES-DIRECT THROUGH INVERTER INTO MAIN PANEL	
	DWG. NO.	DATE: 12/14/2010
	DRAWN: SDS SCALE: NTS	FIGURE 3

Figure 3: Renewable Generator w/o Batteries – Direct Through Inverter Into Main Panel

3.7 INTERCONNECTION AGREEMENT COMPLETION

A date for conducting any necessary equipment modifications to accomplish the interconnection will be set. Often the same time can be utilized to witness the final mandatory commissioning test of the interconnection facilities which is to demonstrate the system's response to a loss of utility service event. Once the installation is complete, a satisfactory witness of the mandatory commissioning test is completed, and payment of any previously explained costs are made, the formal application/agreement phase will be considered complete. The application/agreement requires that all applicable periodic testing along with the required documentation which is completed by the Customer/Producer be maintained on site. Also the Company shall be notified of any proposed alterations or modifications to the current system or transfer of operational control of the current interconnected system.

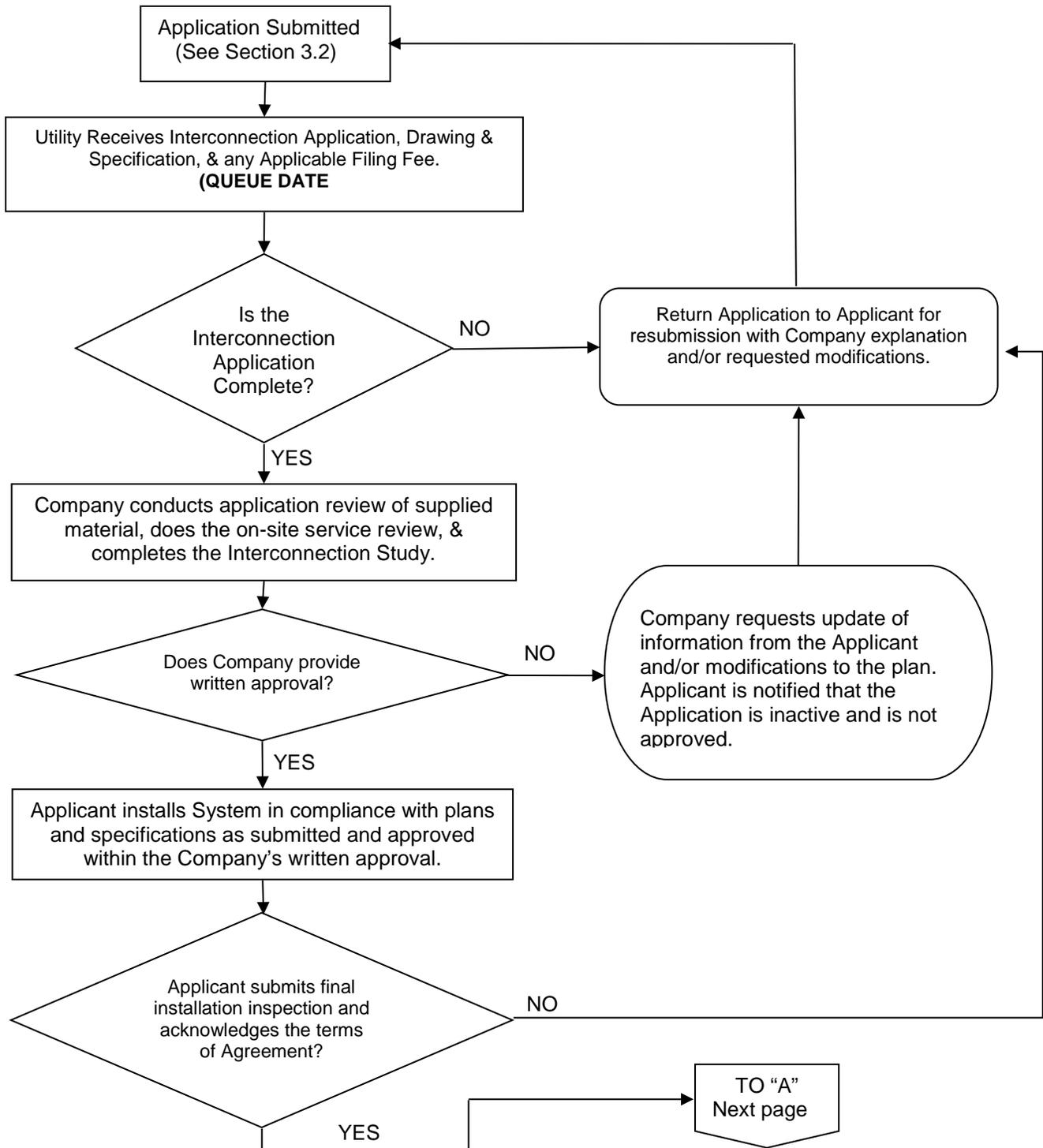


Diagram 1 Generic Interconnection Process

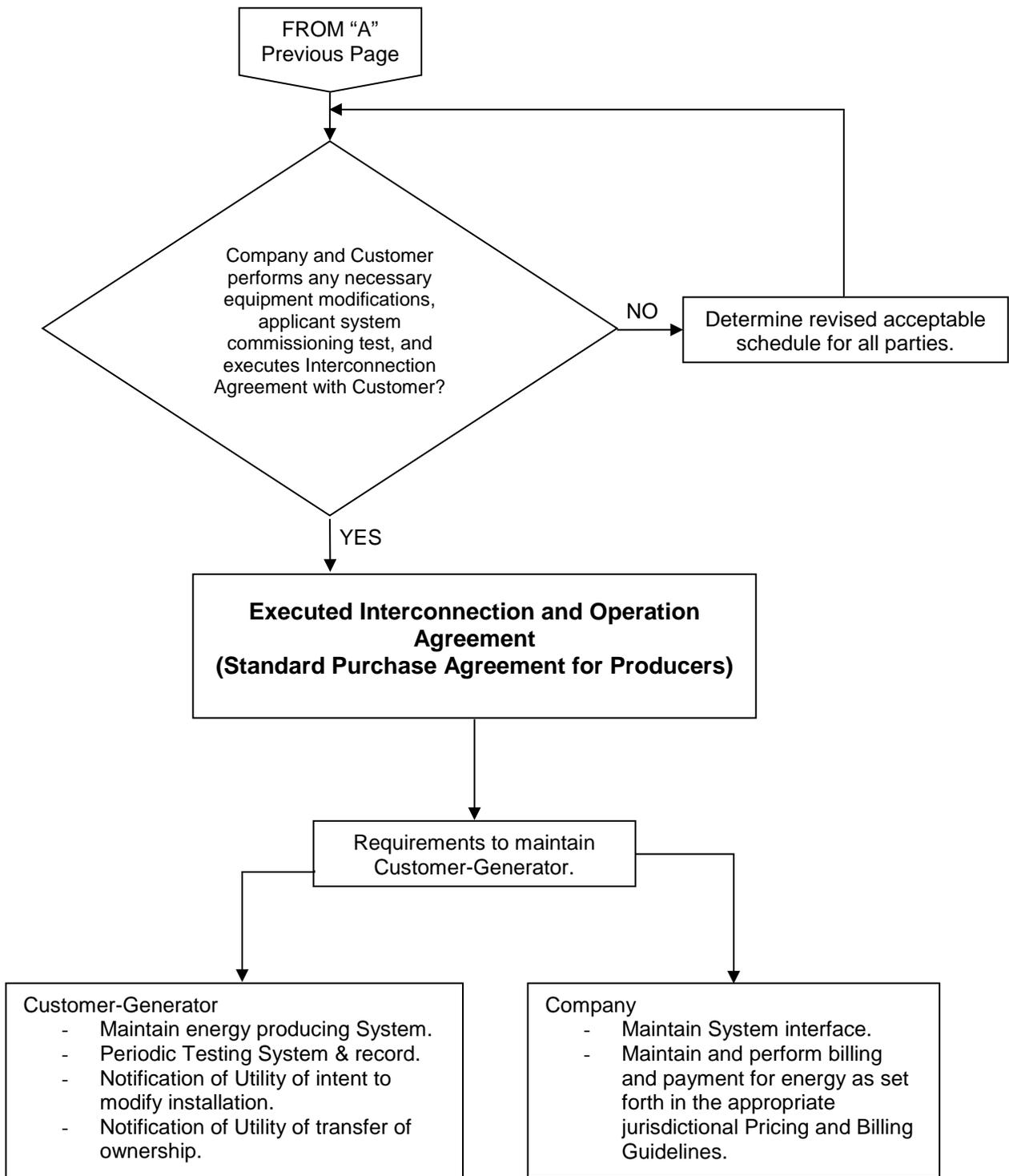


Diagram 1 (Continued) Generic Interconnection Process

3.8 RATE SCHEDULES

3.8.1 MISSOURI – NET METERING RIDER (RIDER NM) – INCLUDING APPLICATION.

www.empiredistrict.com/DocHandler.ashx?id=2509

3.8.2 KANSAS – NET METERING RIDER (RIDER NM) – INCLUDING APPLICATION.

www.empiredistrict.com/DocHandler.ashx?id=2321

3.8.3 OKLAHOMA

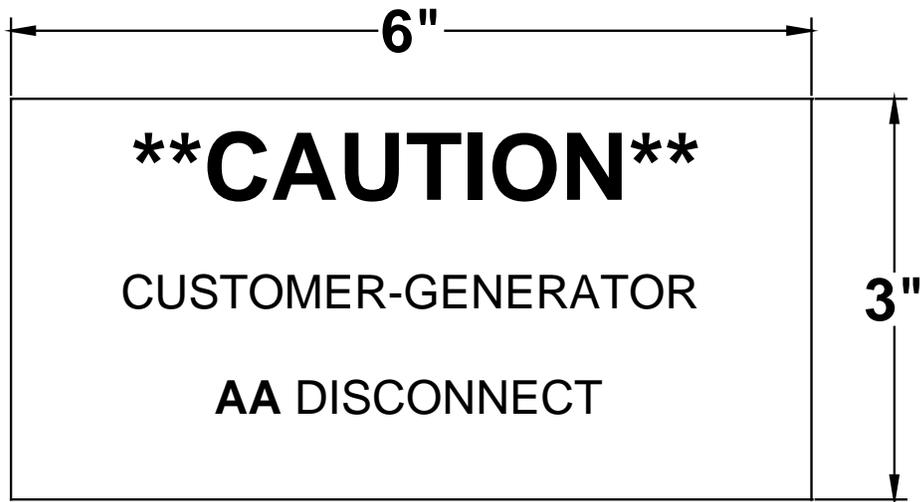
- Optional Net Energy Billing Purchase Rate (Schedule NEB)
- Standard Non-Firm Purchase Rate Schedule (Schedule NFP)
- Standard Firm Purchase Rate Schedule (Schedule FP)
- Standard Terms and Conditions of Purchase from Producers of 100kW or Less. (Section 4; Purchase Agreement)

Please contact your Empire District Electric Representative.

3.8.4 ARKANSAS

- :Net Metering (Part III, Rate Schedule 22)
www.empiredistrict.com/DocHandler.ashx?id=2518
- Standard Interconnection Agreement for Net Metering Facilities– Application. (APSC. Net Metering Rules, Appendix A)

Please contact your Empire District Electric Representative.



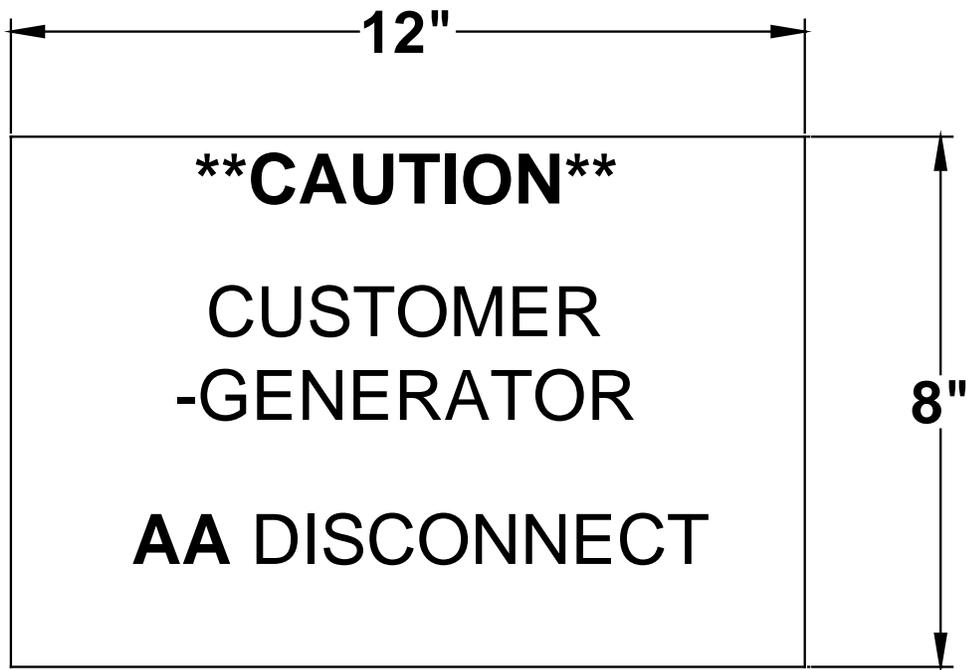
NOTES

1. The sign material shall be an etched laminated plastic. The surface shall be black and the substrate shall be white. This is so specified to have the letters appear as white when they are etched into the plastic.
2. The lettering for the "CAUTION" shall be $\frac{1}{2}$ " tall.
3. All lettering shall be $\frac{1}{4}$ " tall.
4. This placard shall be screwed or bolted externally to the structure as close as practicable to the disconnect. Gluing is not acceptable.
5. The Renewable Energy Type is illustrated by the series of "A"s in the placard diagram above. One of the following abbreviations will be used to describe the source.

PV	Photovoltaic
WG	Wind Generator
HY	Hydroelectric
FC	Fuel Cell

DWG MOD SDS 05/08/2015	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
	RESIDENTIAL: SWITCH LOCATION PLACARD	
	DWG. NO.	
	DRAWN: SDS	DATE: 12/14/2010
	SCALE: NTS	FIGURE 4

Figure 4: Renewable Generator, Residential Switch Location Placard



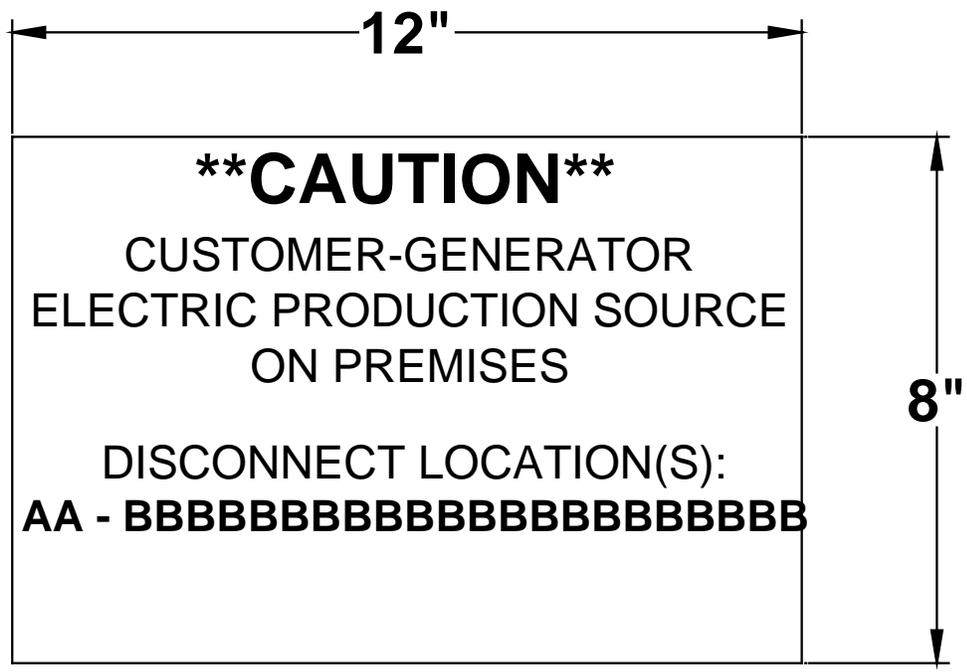
NOTES

1. The sign material shall be an etched laminated plastic. The surface shall be black and the substrate shall be white. This is so specified to have the letters appear as white when they are etched into the plastic.
2. All lettering shall be ¾" tall.
3. This placard shall be screwed or bolted externally to the structure as close as practicable to the disconnect. Gluing is not acceptable.
4. The Renewable Energy Type is illustrated by the series of "A"s in the placard diagram above. One of the following abbreviations will be used to describe the source.

PV	Photovoltaic
WG	Wind Generator
HY	Hydroelectric
FC	Fuel Cell

DWG MOD SDS 04/08/2015	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
	COMMERCIAL & INDUSTRIAL: SWITCH LOCATION PLACCARD	
	DWG. NO.	
	DRAWN: SDS	DATE: 12/14/2010
	SCALE: NTS	FIGURE 5

Figure 5: Renewable Generator, Commercial & Industrial Switch Location Placard



NOTES

1. The sign material shall be an etched laminated plastic. The surface shall be black and the substrate shall be white. This is so specified to have the letters appear as white when they are etched into the plastic.
2. The lettering for the "CAUTION" shall be 3/4" tall.
3. All other lettering shall be 1/2" tall.
4. This placard shall be screwed or bolted externally to the structure at the meter location. If this service is provided by a Padmount Transformer and the meter is at this point, the placard will be provided to EDE for application to the secondary sided of the transformer door set.
5. The Renewable Energy Type is illustrated by the series of "A"s in the placard diagram above. One of the following abbreviations will be used to describe the source.

PV	Photovoltaic
WG	Wind Generator
HY	Hydroelectric
FC	Fuel Cell
6. The location is illustrated by the series of "B"s in the placard diagram above.
For example: FIRST FLOOR SE CORNER

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
COMMERCIAL & INDUSTRIAL REMOTE METER AND SWITCH LOCATIONS	
DWG. NO.	
DRAWN: SDS	DATE: 12/14/2010
SCALE: NTS	FIGURE 6

**Figure 6: Renewable Generator, Commercial & Industrial:
Remote Meter and Switch Location Placard**

Annex A EQUIPMENT LIST

Approved Isolation Switches

Description	Square D	Cutler Hammer	Siemens
NEMA 3R, 2-pole, 240VAC, 30A, non-fusible	DU221RB		
NEMA 3R, 2-pole w/neutral bar, 240VAC, 30A, non-fusible	DU224RB		
NEMA 3R, 2-pole, 240VAC, 60A, non-fusible		DG222URB	
NEMA 3R, 2-pole w/neutral bar, 240VAC, 60A, fusible	D222NRB		
NEMA 3R, 3-pole, 240VAC, 200A, fusible	D324NRB		GF324NR

NOTE – This list will be updated from time to time as new equipment is approved. Check the EDE web site for a complete and up to date list.