

# WEST BOYLSTON MUNICIPAL LIGHT PLANT



4 CRESCENT STREET  
WEST BOYLSTON, MA 01583

## Requirements for Interconnection of Non-Utility Generators And Distributed Generation

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**WEST BOYLSTON MUNICIPAL LIGHT PLANT**  
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## 1.0 Introduction

### 1.1 Applicability

This Document (“Requirements for Interconnection of Non-Utility Generators and Distributed Generation”) describes the process and requirements for an Interconnecting Customer to connect a power-generating facility to the West Boylston Municipal Light Plant (“WBMLP”) Electric Power System (“EPS”), including discussion of technical and operating requirements, metering options, and other matters.

The procedure for momentary paralleling to the WBMLP EPS with back-up generation is described within Section 4.0 Interconnection Requirements.

If the Facility will always be isolated from the WBMLP’s EPS, (i.e., it will never operate in parallel to the WBMLP’s EPS), then these Requirements do not apply.

### 1.2 Definitions

The following words and terms shall be understood to have the following meanings when used in these Interconnection Requirements:

**Anti-Islanding:** Describes the ability of a Facility to avoid unintentional islanding through some form of active control technique.

**Area EPS:** The WBMLP EPS. This term is used in the Institute of Electrical and Electronics Engineers (IEEE) Standard 1547, “IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems” (“IEEE Standard 1547”).

**WBMLP:** West Boylston Municipal Light Plant (WBMLP).

**WBMLP EPS:** The electric power system owned, controlled or operated by the WBMLP used to provide distribution service to its Customers.

**Customer:** WBMLP’s retail customer; host site or premises, may be the same as Interconnecting Customer.

**Department:** The Massachusetts Department of Public Utilities (DPU0, formerly the Department of Telecommunications and Energy (DTE).

**Detailed Impact Study & Engineering Review:** An engineering study, if necessary, conducted by the WBMLP to determine substantial System Modifications to its EPS, resulting in project cost estimates for such modifications that will be required to provide the requested interconnection service.

**DG:** Distributed Generation.

**Facility:** A source of electricity owned by the Interconnecting Customer that is located on the Interconnecting Customer’s side of the PCC, and all facilities ancillary and appurtenant thereto, including interconnection equipment, which the Interconnecting Customer requests to interconnect to the WBMLP EPS.

**FERC:** Federal Energy Regulatory Commission.

**Good Utility Practice:** Any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good

business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather to be acceptable practices, methods, or acts generally accepted in the region.

**In-Service Date:** The date on which the Facility and System Modifications (if applicable) are complete and ready for service, even if the Facility is not placed in service on or by that date.

**Interconnecting Customer:** Entity who owns and/or operates the Facility interconnected to the WBMLP EPS.

**Interconnection Service Agreement:** An agreement for interconnection service, between the Interconnecting Customer and the WBMLP.

**Islanding:** A situation where electrical power remains in a portion of an electrical power system when the WBMLP's transmission or distribution system has ceased providing power for whatever reason (emergency conditions, maintenance, etc.) Islanding may be intentional, such as when certain segregated loads in WBMLP's premises are provided power by a Facility after being isolated from the WBMLP EPS after a power failure. Unintentional Islanding, especially past the PCC, is to be strictly avoided.

**ISO-New England, Inc ("ISO-NE"):** The Independent System Operator established in accordance with the NEPOOL Agreement and applicable FERC approvals, which is responsible for managing the bulk power generation and transmission systems in New England.

**Isolated:** The state of operating the Facility when electrically disconnected from the WBMLP EPS on the Interconnecting Customer's side of the PCC.

**Local EPS:** The customer premises within which are contained the Facility. This term is used in the IEEE Standard 1547.

**Metering Point:** For meters that do not use instrument transformers, the point at which the billing meter is connected. For meters that use instrument transformers, the point at which the instrument transformers are connected.

**NEPOOL:** New England Power Pool.

**Net Metering:** A customer of the WBMLP with an on-site Facility (less than a kW size as determined by WBMLP present policy and tariff) exercising the option to run the meter backward and thus choosing to receive a credit from the WBMLP equal to the average monthly market price of generation per kilowatt hour in any month during which there was a positive net difference between kilowatt hours generated and consumed.

**Non-Islanding:** Describes the ability of a Facility to avoid unintentional islanding through the operation of its interconnection equipment.

**NPCC:** Northeast Power Coordinating Council.

**On-Site Generating Facility:** A class of Interconnecting Customer-owned generating Facilities with peak capacity below the present policy limit of WBMLP.

**Parallel:** The state of operating the Facility when electrically connected to the WBMLP EPS (sometimes known as grid-parallel).

**Parties:** The WBMLP and the Interconnecting Customer.

**Point of Common Coupling (PCC):** The point where the Interconnecting Customer's local electric power system connects to the WBMLP EPS, such as the electric power revenue meter or premises service transformer. See the WBMLP for the location at a particular Interconnecting Customer site.

**Point of Delivery:** A point on the WBMLP EPS where the Interconnecting Customer makes capacity and energy available to the WBMLP. The Point of Delivery shall be specified in the Interconnection Service Agreement.

**Point of Receipt:** A point on the WBMLP EPS where the WBMLP delivers capacity and energy to the Interconnecting Customer. The Point of Receipt shall be specified in the Interconnection Service Agreement.

**Radial Distribution Circuit:** Electrical service from an EPS consisting of one primary circuit extending from a single substation or transmission supply point arranged such that the primary circuit serves Interconnecting Customers in a particular local area.

**Screen(s):** Criteria by which the WBMLP will determine if a proposed Facility's installation will adversely impact the WBMLP EPS in the Processes as set forth in Section 3.0.

**System Modification:** Modifications or additions to distribution-related WBMLP facilities that are integrated with the WBMLP EPS for the benefit of the Interconnecting Customer.

**Unintentional Islanding:** A situation where the electrical power from the Facility continues to supply a portion of the WBMLP EPS past the PCC when the WBMLP's transmission or distribution system has ceased providing power for whatever reason (emergency conditions, maintenance, etc.).

**Witness Test:** The WBMLP's right to witness the commissioning testing. Commissioning testing is defined in IEEE Standard 1547.

### 1.3 Forms and Agreements

The following documents for the interconnection process are included as Exhibits:

1. Application Forms (Exhibit A)
2. Drawings (Exhibit B)
  - Inverter-based DG Systems (up to 10kW)
  - Single-Phase Non-Inverter Based DG System (up to 60kW)
  - Three-Phase Non-Synchronous Generators (up to 60kW)
  - Three-Phase Generators (60kW – 1000kW)
  - Three-Phase Generators (1000kW – 6000kW)

## 2.0 Basic Understandings

Interconnecting Customer intends to install a Facility on the Customer's side of the PCC that will be connected electrically to the WBMLP EPS and operate in parallel, synchronized with the voltage and frequency maintained by the WBMLP during all operating conditions. It is the responsibility of the Interconnecting Customer to design, procure, install, operate, and maintain all necessary equipment on its property for connection to the WBMLP EPS.

The Interconnecting Customer and the WBMLP shall enter into an Interconnection Service Agreement to provide for parallel operation of an Interconnecting Customer's Facility with WBMLP EPS. If the Interconnecting Customer is not the Customer, a Third Party Owner Agreement must be signed and included as an attachment to the Interconnection Service Agreement.

The interconnection of the Facility with the WBMLP EPS must be reviewed for potential impact on the WBMLP EPS and meet the technical requirements in Section 4.0, and must be operated as described under Section 6.0 In order to meet these requirements, an upgrade or other modifications to the WBMLP EPS may be necessary. Subject to the requirements contained in this Document, the WBMLP or its Affiliate shall modify the WBMLP EPS accordingly.

Unless otherwise specified, the WBMLP will build and own, as part of the WBMLP EPS, all facilities necessary to interconnect the WBMLP EPS with the Facility up to and including terminations at the PCC. The Interconnecting Customer shall pay all System Modification costs. The Interconnecting Customer should consult the WBMLP before designing, purchasing and installing any generation equipment, in order to verify the nominal utilization voltages, frequency, and phase characteristics of the service to be supplied, the capacity available, and the suitability of the proposed equipment for operation at the intended location. Attempting to operate a generator at other than its nameplate characteristics may result in unsatisfactory performance or, in certain instances, injury to personnel and/or damage to equipment.

The Interconnecting Customer will be responsible for ascertaining from the WBMLP, and the WBMLP will diligently cooperate in providing, the service characteristics of the WBMLP EPS at the proposed PCC. The WBMLP will in no way be responsible for damages sustained as a result of the Interconnecting Customer's failure to ascertain the service characteristics at the proposed PCC.

The Facility should operate in such a manner that does not compromise, or conflict with, the safety or reliability of the WBMLP EPS. The Interconnecting Customer should design its equipment in such a manner that faults or other disturbances on the WBMLP EPS do not cause damage to the Interconnecting Customer's equipment.

Authorization to interconnect will be provided once the Interconnecting Customer has met all terms of the interconnection process as outlined herein. These Requirements do not cover general distribution service needed to serve the Interconnecting Customer.

WBMLP's most common primary distribution voltage is 13.8 kV. The majority of the distribution circuits are "effectively grounded" and are used for four-wire distribution (phase to neutral) connected loads. Transmission voltages are 69 kV. Contact WBMLP for information on the specific circuit that will serve an Interconnecting Customer's proposed facility. WBMLP maintains effective grounding on most of its distribution systems as defined by IEEE Std. 142.

### 3.0 Process Overview

All proposed new sources of electric power without respect to generator ownership, dispatch control, or prime mover that plan to operate in parallel with the WBMLP EPS must submit a completed application and pay the appropriate application fee to the WBMLP with which it wishes to interconnect. The application will be acknowledged by the WBMLP, and the Interconnecting Customer will be notified of the application's completeness.

The Standard Process for review and approval is as follows:

- a. The WBMLP will conduct an initial review that includes a scoping meeting/discussion with the Interconnecting Customer (if necessary) to review the application. After the scoping meeting the WBMLP will provide pertinent information such as:
  - The available fault current at the proposed location;
  - The existing peak loading on the lines in the general vicinity of the Facility;
  - The configuration of the distribution lines.
- b. WBMLP provides a cost estimate for a Detailed Impact Study and Engineering Review (if necessary). An estimate of the time to complete the Impact Study will also be provided.
- c. Once the Interconnecting Customer executes an Agreement and pays pursuant to the terms thereof, the WBMLP will conduct the Impact Study and Engineering Review.
- d. If the WBMLP determines, in accordance with Good Utility Practice, that the System Modifications to the WBMLP EPS are not substantial, the Impact Study and Engineering Review will determine the scope and cost of the modifications as defined in Section 5.0. If the WBMLP determines, in accordance with Good Utility Practice, that the System Modifications to the WBMLP EPS are substantial, the Impact Study and Engineering Review will produce an estimate for the modification costs (within  $\pm 25\%$ ).
- e. Upon completion of any necessary studies, the WBMLP shall send the Interconnecting Customer an executable Interconnection Service Agreement including a quote for any required System Modifications and reasonable Witness Test costs.
- f. Interconnecting Customer returns signed Interconnection Service Agreement and pays estimate.
- g. Interconnecting Customer completes installation and WBMLP completes System Modifications, if required.
- h. WBMLP inspects completed installation for compliance with requirements and attends Witness Test, if required.
- i. Interconnecting Customer sends written notification of completion of installation to WBMLP and intent to generate electricity.

## **4.0 Interconnection Requirements**

### **4.1 General Design Considerations**

Interconnecting Customer shall design and construct the Facility in accordance with the applicable manufacturer's recommended maintenance schedule, in compliance with all aspects of the WBMLP's requirement. Interconnecting Customer agrees to cause its Facility to be constructed in accordance with applicable specifications that meet or exceed those provided under this Section of these Requirements.

#### **4.1.1 Transient Voltage Conditions**

Because of unusual events in the WBMLP's EPS, there will be transient voltage fluctuations, which will result in voltages exceeding the limits of the stated and standard ranges. These transient voltage fluctuations, which generally last only a few milliseconds, arise due to EPS disturbances including, but not limited to, lightning strikes, clearing of faults, and other switching operations. The magnitude of transient voltage fluctuations varies with EPS configuration, grounding methods utilized, local short circuit availability, and other parameters, which vary from point-to-point and from time-to-time on the distribution EPS.

The fluctuations may result in voltages exceeding the limits of the stated ranges and occur because of EPS disturbance, clearing of faults and other switching operations. These unavoidable transients are generally of too short duration and insufficient magnitude to have any adverse effects on general service applications. They may, however, cause malfunctions in equipment highly sensitive to voltage changes, and protective devices may operate to shut down such devices. The magnitude, duration and frequency of transient fluctuations will vary due to EPS configuration and/or circuit arrangement. In addition, disturbances of indeterminate magnitude and duration may occur on infrequent occasions due to short circuits, faults, and other unpredictable conditions. Transient voltages should be evaluated in the design of the Facility.

#### **4.1.2 Noise and Harmonics**

The introduction of abnormal noise/harmonics can cause abnormal neutral current flow, and excessive heating of electrical equipment. The permissible level of harmonics is dependent upon the voltage level and short circuit ratio at a given location. IEEE Standard 1547 provides these levels at the PCC. In requiring adherence to IEEE Standard 1547 the WBMLP is in no way making a recommendation regarding the level of harmonics that a given piece of equipment can tolerate nor is it making a recommendation as to the permissible level in the Interconnecting Customer's Facility.

#### **4.1.3 Frequency**

The interconnected electric power system in North America, which is maintained at 60 hertz ("Hz") frequency on its alternating current services, is subject to certain deviations. The usual maximum instantaneous deviation from the standard 60 Hz is  $\pm 2/10$  cycle ( $\pm 0.33\%$ ), except on infrequent occasions when the deviation may reach  $\pm 1/10$  cycle ( $\pm 0.17\%$ ). The usual normal deviation is approximately  $\pm 1/20$  cycle ( $\pm 0.083\%$ ). These conditions are subject to occur at any time of the day or night and should be considered in the design of the Facility. All are measured on a 60 Hz base.

#### **4.1.4 Voltage Level**

All electricity flow across the PCC shall be in the form of single-phase or three-phase 60 Hz alternating current at a voltage class determined by mutual agreement of the Parties.

#### **4.1.5 Machine Reactive Capability**

Facilities less than 1 megawatt ("MW") will not be required to provide reactive capability, except as may be provided by the retail rate schedule under which the Customer takes service.

Facilities greater than or equal to 1 MW interconnected with the WBMLP EPS may be required to provide reactive capability to regulate and maintain EPS voltage at the PCC as per NEPOOL requirements. The WBMLP and

NEPOOL shall establish a scheduled range of voltages to be maintained by the Facility. The reactive capability requirements shall be reviewed as part of the Impact Study and Engineering Review.

The power factor (PF) for Renewable Energy Sources must be measured at the point of interconnection, which is typically, but not always, the metering point and be PF > 0.95 under all kW (real power) loading conditions.

## 4.2 Protection Requirements

### 4.2.1 General Requirements

Any Facility desiring to interconnect with the WBMLP EPS or modify an existing interconnection must meet minimum specifications, where applicable, as set forth in the following documents and standards and requirements in this Section.

- IEEE Standard 1547, “IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems.”
- UL Standard 1741, “Inverters, Converters and Charge Controllers for Use in Independent Power Systems.”
- IEEE Standard 929, “IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems.”

The specifications and requirements listed herein are intended to mitigate possible adverse impacts caused by the Facility on the WBMLP’s equipment and personnel and on other Interconnecting Customers of the WBMLP. They are not intended to address protection of the Facility itself or its internal load. It is the responsibility of the Facility to comply with the requirements of all appropriate standards, codes, statutes and authorities to protect itself and its loads.

The WBMLP shall not be responsible for the protection of the Facility. The Facility shall be responsible for protection of its system against possible damage resulting from parallel operation with the WBMLP so long as the WBMLP adheres to Good Utility Practice. If requested by the Interconnecting Customer, the WBMLP will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information contained herein is provided exclusively for use by the Interconnecting Customer to evaluate protection of its Facility during parallel operation.

At its sole discretion, the WBMLP may consider approving alternatives that satisfy the intent of the requirements contained in this Section.

### 4.2.2 Protection Requirements

All Facilities must meet performance requirements set forth in relevant sections of IEEE Standard 1547. **The following italicized text is excerpted from IEEE Standard 1547. The numbering is also from IEEE Standard 1547 and therefore is not in sequence with the “WBMLP Requirements for Interconnection Non-Utility Generators and Distributed Generation” numbering.**

#### ***4.1.1 Voltage regulation***

*The DR [distributed resource] shall not actively regulate the voltage at the PCC [unless required by NEPOOL’s operating procedures]. The DR shall not cause the Area EPS service voltage at other Local EPSs to go outside the requirements of ANSI C84.1-1995, Range A.*

#### ***4.1.2 Integration with Area EPS grounding***

*The grounding scheme of the DR interconnection shall not cause overvoltages that exceed the rating of the equipment connected to the Area EPS and shall not disrupt the coordination of the ground fault protection on the Area EPS.*

#### 4.1.3 Synchronization

The DR unit shall parallel with the Area EPS without causing a voltage fluctuation at the PCC greater than  $\pm 5\%$  of the prevailing voltage level of the Area EPS at the PCC, and meet the flicker requirements of 4.3.2.

#### 4.1.8.2 Surge withstand performance

The interconnection system shall have the capability to withstand voltage and current surges in accordance with the environments defined in IEEE Std C62.41.2-2002 or IEEE C37.90.1-2002 as applicable.

#### 4.2 Response to Area EPS abnormal conditions

Abnormal conditions can arise on the Area EPS that require a response from the connected DR. This response contributes to the safety of utility maintenance personnel and the general public, as well as the avoidance of damage to connected equipment, including the DR. All voltage and frequency parameters specified in these subclauses shall be met at the PCC, unless otherwise stated.

#### 4.2.1 Area EPS faults

The DR unit shall cease to energize the Area EPS for faults on the Area EPS circuit to which it is connected.

#### 4.2.2 Area EPS reclosing coordination

The DR shall cease to energize the Area EPS circuit to which it is connected prior to reclosure by the Area EPS.

#### 4.2.3 Voltage

The protection functions of the interconnection system shall detect the effective (rms) or fundamental frequency value of each phase-to-phase voltage, except where the transformer connecting the Local EPS to the Area EPS is a grounded wye-wye configuration, or single phase installation, the phase-to-neutral voltage shall be detected. When any voltage is in a range given in Table 1, the DR shall cease to energize the Area EPS within the clearing time as indicated. Clearing time is the time between the start of the abnormal condition and the DR ceasing to energize the Area EPS. For DR less than or equal to 30 kW in peak capacity, the voltage set points and clearing times shall be either fixed or field adjustable. For DR greater than 30 kW the voltage set points shall be field adjustable.

The voltages shall be detected at either the PCC or the point of DR connection when any of the following conditions exist:

- (a) The aggregate capacity of DR systems connected to a single PCC is less than or equal to 30 kW,
- (b) the interconnection equipment is certified to pass a non-islanding test for the system to which it is to be connected,
- (c) the aggregate DR capacity is less than 50% of the total Local EPS minimum annual integrated electrical demand for a 15 minute time period, and export of real or reactive power by the DR to the Area EPS is not permitted.

Voltage range (% of base voltage) <sup>a</sup>	Clearing time(s) <sup>b</sup>
$V < 50$	0.16
$50 \leq V < 88$	2.00
$110 < V < 120$	1.00
$V \geq 120$	0.16

<sup>a</sup> Base voltages are the nominal system voltages stated in ANSI C84.1-1995, Table 1.  
<sup>b</sup> DR  $\leq 30$  kW, maximum clearing times; DR  $> 30$  kW, default clearing times

#### 4.2.4 Frequency

When the system frequency is in a range given in Table 2, the DR shall cease to energize the Area EPS within the clearing time as indicated. Clearing time is the time between the start of the abnormal condition and the DR ceasing to energize the Area EPS. For DR less than or equal to 30 kW in peak capacity, the

frequency set points and clearing times shall be either fixed or field adjustable. For DR greater than 30 kW, the frequency set points shall be field adjustable.

Adjustable under-frequency trip settings shall be coordinated with Area EPS operations.

<b>Table 2 – Interconnection system response to abnormal frequencies</b>		
<b>DR size</b>	<b>Frequency range (Hz)</b>	<b>Clearing time (s)</b>
≤ 30 kW	> 60.5	0.16
	< 59.3	0.16
> 30 kW	> 60.5	0.16
	< (59.8 – 57.0) adjustable setpoint	0.16 - 300
	< 57.0	0.16
<i><sup>a</sup>DR ≤ 30 kW, maximum clearing times; DR &gt; 30 kW, default clearing times</i>		

#### **4.2.5 Loss of synchronism**

Loss of synchronism protection is not required except as necessary to meet 4.3.2.

#### **4.2.6 Reconnection to Area EPS**

After an Area EPS disturbance, no DR reconnection shall take place until the Area EPS voltage is within Range B of ANSI C84.1-1995, Table 1, and frequency range of 59.3Hz to 60.5Hz.

The DR interconnection system shall include an adjustable delay (or a fixed delay of five minutes) that may delay reconnection for up to five minutes after the Area EPS steady-state voltage and frequency are restored to the ranges identified above.

#### **4.3.1 Limitation of dc injection**

The DR and its interconnection system shall not inject dc current greater than 0.5% of the full rated output current at the point of DR connection.

#### **4.3.2 Limitation of flicker induced by the DR**

The DR shall not create objectionable flicker for other customers on the Area EPS.

#### **4.3.3 Harmonics**

When the DR is serving balanced linear loads, harmonic current injection into the Area EPS at the PCC shall not exceed the limits stated in Table 3 IEEE Std 1547. The harmonic current injections shall be exclusive of any harmonic currents due to harmonic voltage distortion present in the Area EPS without the DR connected.

#### **4.4.1 Unintentional islanding**

For an unintentional island in which the DR energizes a portion of the Area EPS through the PCC, the DR interconnection system shall detect the island and cease to energize the Area EPS within two seconds of the formation of an island.

### **4.2.2.1 Inverter-Based Facilities (10kW or less)**

- a. **External Disconnect Switch:** WBMLP shall require an external disconnect switch (or comparable device by mutual agreement of the Parties) at the PCC with the WBMLP or at another mutually agreeable point that is accessible to WBMLP personnel at all times and that can be opened for isolation if the switch is required.

The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the WBMLP side by WBMLP personnel. The visible break requirement can be met by opening the enclosure to observe the contact separation. The WBMLP shall have the right to open this disconnect switch in accordance with these Interconnection Requirements.

#### 4.2.2.2 All Other Facilities (More than 10kW)

##### 4.2.2.2.1 General Requirements

- a. **Non Export Power:** If the Parties mutually agree that non-export functionality will be part of the interconnection protection equipment then it will include one of the following:
  - (1) a reverse power relay with mutually agreed upon delay intervals, or
  - (2) a minimum power function with mutually agreed upon delay intervals, or
  - (3) other mutually agreeable approaches, for example, a comparison of nameplate rating versus certified minimum Customer premises load.
- b. The ISO-NE is responsible for assuring compliance with NPCC criteria. For the interconnection of some larger units, the NPCC criteria may additionally require:

**NPCC Protective Relaying Requirements:** The WBMLP may require the Facility to be equipped with two independent, redundant relaying systems in accordance with NPCC criteria, where applicable, for the protection of the bulk power system if the interconnection is to the bulk power system or if it is determined that delayed clearing of faults within the Facility adversely affects the bulk power system. Relays to be utility grade, meeting the ANSI C37.90 surge withstand requirements. Inverter and wind turbine internal controls and PLC's do not qualify as utility-grade protection.

**NPCC Requirements:** During system conditions where local area load exceeds system generation, NPCC Emergency Operation Criteria requires a program of phased automatic under frequency load shedding of up to 25% of area load to assist in arresting frequency decay and to minimize the possibility of system collapse. Depending on the point of connection of the Facility to the WBMLP's EPS and in conformance with the NPCC Emergency Operating Criteria, the Facility may be required to remain connected to the EPS during the frequency decline to allow the objectives of the automatic load shedding program to be achieved, or to otherwise provide compensatory load reduction, equivalent to the Facility's generation lost to the system, if the Interconnecting Customer elects to disconnect the Facility at a higher under-frequency set point.

- c. **Disconnect Switch:** The Facility shall provide a disconnect switch (or comparable device mutually agreed upon by the Parties) at the point of Facility interconnection that can be opened for isolation. The switch shall be in a location easily accessible to WBMLP personnel at all times. The switch shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the WBMLP side by WBMLP personnel. The visible break requirement can be met by opening the enclosure to observe the contact separation. The WBMLP shall exercise such right in accordance with Section 7.0 of these Requirements.

##### 4.2.2.2.2 Requirements for Induction and Synchronous Generator Facilities

- a. **Interconnection Interrupting Device:** An interconnection Interrupting Device such as a circuit breaker shall be installed to isolate the Facility from the WBMLP's EPS. If there is more than one Interrupting Device, this requirement applies to each one individually. The Interconnection Interrupting Device must be capable of interrupting the current produced when the Facility is connected out of phase with the WBMLP's EPS, consistent with Section 4.1.8.3 of IEEE Standard 1547 which states, "the interconnection system paralleling-device shall be capable of withstanding 220% of the interconnection system rated voltage."
- b. **Synchronizing Devices:** The Interconnecting Customer shall designate one or more Synchronizing Devices such as motorized breakers, contactor/breaker combinations, or a fused contactor (if mutually agreeable) to be used to connect the Facility's generator to the WBMLP's EPS. This Synchronizing Device could be a device other than the interconnection Interrupting

Device. The Synchronizing Device must be capable of interrupting the current produced when the Facility is connected out of phase with the WBMLP's EPS, consistent with Section 4.1.8.3 of IEEE Standard 1547 which states, "the interconnection system paralleling-device shall be capable of withstanding 220% of the interconnection system rated voltage."

- c. **Transformers:** The WBMLP reserves the right to specify the winding connections for the transformer between the WBMLP's voltage and the Facility's voltage ("Step-Up Transformer") as well as whether it is to be grounded or ungrounded at the WBMLP's voltage. In the event that the transformer winding connection is grounded-wye / grounded-wye the WBMLP reserves the right to specify whether the generator stator is to be grounded or not grounded. The Interconnecting Customer shall be responsible for procuring equipment with a level of insulation and fault-withstand capability compatible with the specified grounding method.
- d. **Voltage relays:** Voltage relays shall be frequency compensated to provide a uniform response in the range of 40 to 70 Hz.
- e. **Protective Relaying Redundancy:** For induction generators greater than 1/15 of on-site minimum verifiable load that is not equipped with on-site capacitors or that is greater than 200 kW, and for all synchronous generators, protective relays utilized by the Facility shall be sufficiently redundant and functionally separate so as to provide adequate protection, consistent with WBMLP practices and standards, upon the failure of any one component.
- f. **Protective Relay Hard-Wire Requirement:** Unless authorized otherwise by the WBMLP, protective relays must be hardwired to the device they are tripping. Further, interposing computer or programmable logic controller or the like is not permitted in the trip chain between the relay and the device being tripped.
- g. **Protective Relay Supply:** Where protective relays are required in this Section, their control circuits shall be DC powered from a battery/charger system or a UPS. Solid-state relays shall be self-powered, or DC powered from a battery/charger system or a UPS. If the Facility uses a WBMLP-acceptable non-latching interconnection contactor, AC powered relaying shall be allowed provided the relay and its method of application are fail safe, meaning that if the relay fails or if the voltage and/or frequency of its AC power source deviate from the relay's design requirements for power, the relay or a separate fail-safe power monitoring relay acceptable to the WBMLP will immediately trip the generator by opening the coil circuit of the interconnection contactor.
- h. **Current Transformers ("CT"):** CT ratios and accuracy classes shall be chosen such that secondary current is less than 100 amperes and transformation errors are consistent with WBMLP practices. CT's used for revenue class metering must have a secondary current of 20 amperes or less.
- i. **Voltage Transformers ("VT")s and Connections:** The Facility shall be equipped with a direct voltage connection or a VT, connected to the WBMLP side of the Interrupting Device. The voltage from this VT shall be used in an interlock scheme, if required by the WBMLP. For three-phase applications, a VT for each phase is required. All three phases must be sensed either by three individual relays or by one relay that contains three elements. If the voltage on any of the three phases is outside the bounds specified by the WBMLP the unit shall be tripped.

If the Facility's Step-Up Transformer is ungrounded at the WBMLP voltage, this VT shall be a single three-phase device or three single-phase devices connected from each phase to ground on the WBMLP's side of the Facility's Step-Up Transformer, rated for phase-to-phase voltage and provided with two secondary windings. One winding shall be connected in open delta, have a loading resistor to prevent ferroresonance, and be used for the relay specified in these requirements.

#### 4.2.2.2.3 Additional Requirements for Synchronous Generator Facilities

- a. **Ungrounded Transformers:** If the Facility's Step-Up Transformer connection is ungrounded, the Facility shall be equipped with a zero-sequence over-voltage relay fed from the open delta of the three-phase VT.
- b. **High-Speed Protection:** The Facility may be required to use high-speed protection if time-delayed protection would result in degradation in the existing sensitivity or speed of the protection systems on the WBMLP's EPS.
- c. **Breaker Failure Protection:** The Facility may be required to be equipped to provide local breaker failure protection which may include direct transfer tripping to the WBMLP's line terminal(s) in order to detect and clear faults within the Facility that cannot be detected by the WBMLP's back-up protection.
- d. **Communications Channels:** The Interconnecting Customer is responsible for procuring any communications channels necessary between the Facility and the WBMLP's stations, and for providing protection from transients and over-voltages at all ends of these communication channels. The Interconnecting Customer will also bear the ongoing cost to lease these communication channels. Examples include, but are not limited to, connection to a line using high-speed protection, transfer tripping, generators located in areas with low-fault currents, or back up for generator breaker failure.

#### 4.2.3 Protection System Testing and Maintenance

The WBMLP shall have the right to witness the commissioning testing as defined in IEEE Standard 1547 at the completion of construction and to receive a copy of all test data. The Facility shall be equipped with whatever equipment is required to perform this test.

Testing typically includes, but is not limited to:

- CT and CT circuit polarity, ratio, insulation, excitation, continuity and burden tests,
- VT and VT circuit polarity, ratio, insulation and continuity tests,
- Relay pick-up and time delay tests,
- Functional breaker trip tests from protective relays,
- Relay in-service test to check for proper phase rotation and magnitudes of applied currents and voltages,
- Breaker closing interlock tests, and
- Paralleling and disconnection operation.

Prior to final approval by the WBMLP or anytime thereafter, the WBMLP reserves the right to test the generator relaying and control related to the protection of the WBMLP's EPS.

The Interconnecting Customer has the full responsibility for the proper periodic maintenance of its generating equipment and its associated control, protective equipment and interrupting devices. The Interconnecting Customer is responsible for the periodic maintenance of those relays, interrupting devices, control schemes, and batteries that involve the protection of the WBMLP's EPS. A periodic maintenance program, mutually agreeable to both the WBMLP and to the Interconnecting Customer is to be established in each case. The WBMLP shall have the right to monitor the periodic maintenance performed.

For relays installed in accordance with the NPCC Criteria for the Protection of the Bulk Power System, maintenance intervals shall be in accordance with such criteria.

#### 4.2.4 Protection Requirements – Momentary Paralleling of Standby Generators

Protective relays to isolate the Facility for faults in the WBMLP EPS are not required if the paralleling operation is automatic and takes place for less than one-half of a second. An Interrupting Device with a half-second timer (30 cycles) is required as a fail-safe mechanism.

Parallel operation of the Facility with the WBMLP EPS shall be prevented when the WBMLP's line is dead or out of phase with the Facility.

The control scheme for automatic paralleling must be submitted by the Interconnecting Customer for review and acceptance by the WBMLP prior to the Facility being allowed to interconnect with the WBMLP EPS.

#### **4.2.5 Protection System Changes**

The Interconnecting Customer must provide the WBMLP with reasonable advance notice of any proposed changes to be made to the protective relay system, relay settings, operating procedures or equipment that affect the interconnection. The WBMLP will determine if such proposed changes require re-acceptance of the interconnection per the requirements of this Section.

In the future, should the WBMLP implement changes to the EPS to which the Facility is interconnected, the Interconnecting Customer will be responsible at its own expense for identifying and incorporating any necessary changes to its protection equipment. These changes to the Facility's protection equipment are subject to review and approval by the WBMLP.

## **5.0 Responsibility for Costs of Interconnecting a Facility**

### **5.1 Review and Study Costs**

The Interconnecting Customer shall be responsible for the reasonably incurred costs of the review by the WBMLP and any interconnection studies and engineering reviews conducted to determine the requirements of interconnecting a Facility with the WBMLP EPS.

### **5.2 Interconnection Equipment Costs**

The Interconnecting Customer shall be responsible for all costs associated with the installation and construction of the Facility and associated interconnection equipment on the Interconnecting Customer's side of the PCC.

### **5.3 System Modification Costs**

The Interconnecting Customer shall also be responsible for all costs reasonably incurred by WBMLP attributable to the proposed interconnection project in designing, engineering, constructing, operating and maintaining the System Modifications.

### **5.4 Separation of Costs**

Should the WBMLP combine the installation of System Modifications with additions to the WBMLP's EPS to serve other customers or interconnecting customers, the WBMLP shall not include the costs of such separate or incremental facilities in the amounts billed to the Interconnecting Customer for the System Modifications required.

The Interconnecting Customer shall only pay for that portion of the interconnection costs resulting solely from the System Modifications required to allow for safe, reliable parallel operation of the Facility with the WBMLP EPS.

### **5.5 Normal Payment Procedure**

All application, study fees and System Modification costs (except as noted below) are due in full prior to the execution of the work as outlined in these Requirements. At the request of the Interconnecting Customer, the WBMLP will break the costs into phases in which the costs will be collected prior to WBMLP expenditures for each phase of the engineering study and/or construction including ordering equipment.

### **5.6 Security and Creditworthiness**

In order for the WBMLP to agree to any payment plan where some work may be performed in advance of payment, the WBMLP may require the Interconnecting Customer to provide evidence of creditworthiness.

## **6.0 Operating Requirements**

### **6.1 General Operating Requirements**

Interconnecting Customer shall operate and maintain the Facility in accordance with the applicable manufacturer's recommended maintenance schedule, in compliance with all aspects of the WBMLP's Interconnection Requirements. The Interconnecting Customer will continue to comply with all applicable laws and requirements after interconnection has occurred. In the event the WBMLP has reason to believe that the Interconnecting Customer's installation may be the source of problems on the WBMLP EPS, the WBMLP has the right to install monitoring equipment at a mutually agreed upon location to determine the source of the problems. If the Facility is determined to be the source of the problems, the WBMLP may require disconnection.

### **6.2 No Adverse Effects; Non-interference**

WBMLP shall notify Interconnecting Customer if there is evidence that the operation of the Facility could cause disruption or deterioration of service to other Customers served from the same WBMLP EPS or if operation of the Facility could cause damage to WBMLP EPS. The deterioration of service could be, but is not limited to, harmonic injection in excess of IEEE Standard 1547, as well as voltage fluctuations caused by large step changes in loading at the Facility.

The WBMLP will operate the EPS in such a manner so as to not unreasonably interfere with the operation of the Facility. The Interconnecting Customer will protect itself from normal disturbances propagating through the WBMLP EPS, and such normal disturbances shall not constitute unreasonable interference unless the WBMLP has deviated from Good Utility Practice. Examples of such disturbances could be, but are not limited to, single-phasing events, voltage sags from remote faults on the WBMLP EPS, and outages on the WBMLP EPS.

### **6.3 Safe Operations and Maintenance**

Each Party shall operate, maintain, repair, and inspect, and shall be fully responsible for, the facility or facilities that it now or hereafter may own unless otherwise specified in this Document. Each Party shall be responsible for the maintenance, repair and condition of its respective lines and appurtenances on their respective side of the PCC. The WBMLP and the Interconnecting Customer shall each provide equipment on its respective side of the PCC that adequately protects the WBMLP's EPS, personnel, and other persons from damage and injury.

### **6.4 Access**

The WBMLP shall have access to the disconnect switch of the Facility at all times.

#### **6.4.1 WBMLP and Interconnecting Customer Representatives**

Each Party shall provide and update as necessary the telephone number that can be used at all times to allow either Party to report an emergency.

#### **6.4.2 WBMLP Right to Access WBMLP-Owned Facilities and Equipment**

If necessary for the purposes of this Interconnection Requirements and in the manner it describes, the Interconnecting Customer shall allow the WBMLP access to the WBMLP's equipment and the WBMLP's facilities located on the Interconnecting Customer's or Customer's premises. To the extent that the Interconnecting Customer does not own all or any part of the property on which the WBMLP is required to locate its equipment or facilities to serve the Interconnecting Customer under this Interconnection Requirements, the Interconnecting Customer shall secure and provide in favor of the WBMLP the necessary rights to obtain access to such equipment or facilities, including easements if the circumstances so require.

### **6.4.3 Right to Review Information**

The WBMLP shall have the right to review and obtain copies of Interconnecting Customer's operations and maintenance records, logs, or other information such as, unit availability, maintenance outages, circuit breaker operation requiring manual reset, relay targets and unusual events pertaining to Interconnecting Customer's Facility or its interconnection with the WBMLP EPS. This information will be treated as customer-confidential.

## 7.0 Disconnection

### 7.1 Temporary Disconnection

- a. **Emergency Conditions.** WBMLP shall have the right to immediately and temporarily disconnect the Facility without prior notification in cases where, in the reasonable judgment of WBMLP, continuance of such service to Interconnecting Customer is imminently likely to (i) endanger persons or damage property or (ii) cause a material adverse effect on the integrity or security of, or damage to, WBMLP EPS or to the electric systems of others to which the WBMLP EPS is directly connected. WBMLP shall notify Interconnecting Customer promptly of the emergency condition.

Interconnecting Customer shall notify WBMLP promptly when it becomes aware of an emergency condition that affects the Facility that may reasonably be expected to affect the WBMLP EPS. To the extent information is known, the notification shall describe the emergency condition, the extent of the damage or deficiency, or the expected effect on the operation of both Parties' facilities and operations, its anticipated duration and the necessary corrective action.

- b. **Routine Maintenance, Construction and Repair.** WBMLP shall have the right to disconnect the Facility from the WBMLP EPS when necessary for routine maintenance, construction and repairs on the WBMLP EPS. The WBMLP shall provide the Interconnecting Customer reasonable notice, if possible.

Any additional notification requirements will be specified by mutual agreement in the Interconnection Service Agreement.

- c. **Forced Outages.** During any forced outage, WBMLP shall have the right to suspend interconnection service to effect immediate repairs on the WBMLP EPS; provided, however, WBMLP shall use reasonable efforts to provide the Interconnecting Customer with prior notice. Where circumstances do not permit such prior notice to Interconnecting Customer, WBMLP may interrupt Interconnection Service and disconnect the Facility from the WBMLP EPS without such notice.
- d. **Non-Emergency Adverse Operating Effects.** The WBMLP may disconnect the Facility if the Facility is having an adverse operating effect on the WBMLP EPS or other customers that is not an emergency.
- e. **Modification of the Facility.** WBMLP shall notify Interconnecting Customer if there is evidence of a material modification to the Facility and shall have the right to immediately suspend interconnection service in cases where such material modification has been implemented without prior written authorization from the WBMLP.
- f. **Re-connection.** Any curtailment, reduction or disconnection shall continue only for so long as reasonably necessary. The Interconnecting Customer and the WBMLP shall cooperate with each other to restore the Facility and the WBMLP EPS, respectively, to their normal operating state as soon as reasonably practicable following the cessation or remedy of the event that led to the temporary disconnection.

### 7.2 Permanent Disconnection

The Interconnecting Customer has the right to permanently disconnect at any time with 30 days written notice to the WBMLP.

The WBMLP may permanently disconnect the Facility upon termination of the Interconnection Service Agreement in accordance with the terms thereof.

## **8.0 Metering, Monitoring, and Communication**

This Section sets forth the rules, procedures and requirements for metering, monitoring and communication between the Facility and the WBMLP EPS where the Facility exports power or is net metered or is otherwise subject to NEPOOL requirements. Interconnecting Customer will be responsible for all reasonable and necessary costs incurred by WBMLP for the purchase, installation, operation, maintenance, testing, repair and replacement of metering and data acquisition equipment.

### **8.1 Metering, Related Equipment and Billing Options**

The WBMLP shall furnish, read and maintain all revenue metering equipment. The Interconnecting Customer shall furnish and maintain all meter mounting equipment such as or including meter sockets, test switches, conduits, and enclosures. Except as provided below, the WBMLP shall own the meter and the Interconnecting Customer shall pay to the WBMLP a monthly charge to cover taxes, meter maintenance, incremental reading and billing costs, the allowable return on the invoice cost of the meter and the depreciation of the meter.

The Interconnecting Customer shall provide suitable space within the Facility for installation of the metering, and communication equipment at no cost to the WBMLP.

All metering equipment installed pursuant to this Interconnection Requirements and associated with the Facility shall be routinely tested by the WBMLP at Interconnecting Customer's expense, in accordance with applicable WBMLP and/or ISO-NE criteria, rules and standards. If, at any time, any metering equipment is found to be inaccurate by a margin greater than that allowed under applicable criteria, rules and standards, the WBMLP shall cause such metering equipment to be made accurate or replaced. The cost to repair or replace the meter shall be borne by the WBMLP, if the WBMLP owns the meter. Meter readings for the period of inaccuracy shall be adjusted so far as the same can be reasonably ascertained.

Each Party shall comply with any reasonable request of the other concerning the sealing of meters, the presence of a representative of the other Party when the seals are broken and the tests are made, and other matters affecting the accuracy of the measurement of electricity delivered from the Facility. If either Party believes that there has been a meter failure or stoppage, it shall immediately notify the other.

If the Metering Point and the Point of Receipt or Point of Delivery are not at the same location, the metering equipment shall record delivery of electricity in a manner that accounts for losses occurring between the Metering Point and the Point of Receipt or Point of Delivery.

The type of metering equipment to be installed at a Facility is dependent on the Category (size) of the Facility and how and if the Facility plans to export power or net meter. For those that will export power or net meter, the available equipment options and associated requirements are:

- Net Metering – For net metered facilities, unless the Interconnecting Customer elects another form of metering, the Facilities will be equipped with net metering in which metering equivalent to or replicating that of a standard distribution class meter is installed and is enabled to run in a normal direction during periods of net consumption and to run backwards during periods of net generator output. All metering equipment included in this type of installation, including self-contained meters and instrument transformers and meters, shall meet ANSI C12.1 Metering Accuracy Standards and ANSI C57.13 accuracy requirements for instrument transformers. WBMLP will determine whether a facility qualifies for net metering based on present policies.
- Bi-directional, non-interval meter without remote access – in which a distribution class meter with multiple registers is installed. One set of registers will record energy flows from the WBMLP to the Facility during periods when the Facility is a net consumer of energy (the other register will record no flow during these periods) and a second set of registers will record energy flows from the Facility to the WBMLP during periods when the Facility is a net producer of energy (the other register will record no flow during these periods). Each set of registers will record total flows in accordance with the Customer's specific rate classification. All metering equipment included in this type of installation, including self-

contained meters and instrument transformers and meters, shall meet ANSI C12.1 Metering Accuracy Standards and ANSI C57.13 accuracy requirements for instrument transformers.

**Units under 60 kW:** Will be equipped with a bi-directional meter. Such meter may have remote access capability and may be an interval meter based on Customer rate class. For single phase projects under 10kW, a separate From 2S generation meter will be installed.

**Units over 60 kW:** Shall be equipped with bi-directional, interval meters with remote access (if necessary). In addition, Facilities which are 5 MW or greater are required by NEPOOL Operating Procedure No. 18 to provide communication equipment and to supply accurate and reliable information to system operators regarding metered values for MW, MVAR, volt, amp, frequency, breaker status and all other information deemed necessary by ISO-NE and the NEPOOL Satellite (REMVEC).

## **8.2 Additional Monitoring and Communication Requirements**

As the amount of distributed generation on the WBMLP EPS grows significantly, additional monitoring and communication may be required by the Massachusetts DPU and need to be installed at the Customer's expense.

## **9.0 Insurance Requirements**

Insurance requirements will be set forth by the WBMLP for the Interconnecting Customer to maintain, on an individual project basis, given the size, cost and complexity of the Distributed Generation project.

No insurance is required for Facilities less than or equal to ten (10) kW. However, the WBMLP recommends that the Interconnecting Customer obtain adequate insurance to cover potential liabilities.

### **9.1 Insurer Requirements and Endorsements**

All required insurance shall be carried by reputable insurers qualified to underwrite insurance in MA having a Best Rating of "A-". In addition, all insurance shall,

- (a) include WBMLP as an additional insured;
- (b) contain a severability of interest clause or cross-liability clause;
- (c) provide that WBMLP shall not incur liability to the insurance carrier for payment of premium for such insurance; and
- (d) provide for thirty (30) calendar days' written notice to WBMLP prior to cancellation, termination, or material change of such insurance;

### **9.2 Evidence of Insurance**

Evidence of the insurance required shall state that coverage provided is primary and is not in excess to or contributing with any insurance or self-insurance maintained by Interconnecting Customer.

The Interconnecting Customer is responsible for providing the WBMLP with evidence of insurance in compliance with this Interconnection Requirements on an annual basis.

Prior to the WBMLP commencing work on System Modifications, the Interconnecting Customer shall have its insurer furnish to the WBMLP certificates of insurance evidencing the insurance coverage required.

## **Summary of WBMLP “Requirements for Interconnection of Non-Utility Generators”**

The following is a listing of the major steps required for Customers to interconnect non-utility generators (NUG) and distributed generation (DG) to the WBMLP distribution system. *Please refer to the complete interconnection requirements document for additional information.*

1. Interconnecting Customer should complete and submit the Application Form to the WBMLP based on the proposed size of the distributed generation (either <10kW or >10kW).
2. Interconnecting Customer should submit to WBMLP copies of drawings, specifications, plans, etc. for proposed installation. WBMLP will review the proposed installation to determine potential impact to WBMLP distribution system and any required system construction necessary to support DG. See Section 3.0 of the WBMLP Interconnection Requirements document.
3. Interconnecting Customer should design DG facility to meet the intent of Section 4.0 of the WBMLP Interconnection Requirements document, along with appropriate industry standards, including the National Electric Code and IEEE Std 1547 “*Standard for Interconnecting Distributed Resources with Electric Power Systems*”.
4. WBMLP will provide cost estimates for any engineering design, review and construction costs associated with interconnecting the Customer’s DG to the WBMLP Electric Power System (EPS). WBMLP will also provide an Interconnection Services Agreement for customer signature, prior to the start of any construction on the WBMLP EPS. Interconnecting Customer is responsible for the payment of all fees, studies, design and construction costs to interconnect their DG, including costs incurred by WBMLP for studies and system modifications.
5. The Interconnecting Customer should consult the WBMLP before designing, purchasing and installing any generation equipment, in order to verify the nominal utilization voltages, frequency, and phase characteristics of the service to be supplied, the capacity available, and the suitability of the proposed equipment for operation at the intended location. The following should also be noted:
  - a. Voltage, Frequency, Harmonic and Noise thresholds and limits must be maintained by the DG at all times. See Section 4.0 of the WBMLP Interconnection Requirements document and the latest edition of IEEE Std 1547.
  - b. WBMLP will determine protection requirement for each DG project individually. Interconnecting Customer will provide and install utility-grade protective relaying to control either generator circuit breaker, or utility intertie circuit breaker, in order to trip the generator off-line for abnormal conditions, or to prevent reverse power flow into the WBMLP EPS (if agreed upon). All relaying shall be designed and set by the Interconnecting Customer and approved by WBMLP. Relaying to meet ANSI C37.90 surge withstand ratings.
  - c. An external disconnect switch (or compatible device) shall be installed and be accessible to and lockable by WBMLP. WBMLP shall have the right to open the disconnect switch in accordance with the Interconnection Requirements, or in times of emergency.

6. Metering of the DG facility will be via net-metering or bi-directional metering, as by WBMLP tariffs, rates, policies in place at the time of the application. Interconnecting Customer is responsible for installation of metering equipment (sockets, CT's etc.). WBMLP to provide meter.
7. Once the DG facility is constructed and all modifications to the WBMLP EPS have been made, the Interconnecting Customer should notify WBMLP of their intent to commission the DG. Commissioning of DG equipment shall be in accordance with the latest edition of IEEE Std 1547 and the latest edition of the InterNational Electric Testing Association (NETA) Acceptance Testing Specifications (ATS) documents. WBMLP to inspect completed installation and witness commissioning.
8. Authorization to interconnect will be provided once the Interconnecting Customer has met all terms of the interconnection process as outlined in the WBMLP Interconnection Requirements document. Interconnecting Customer shall send written notification of completion of installation to WBMLP and intent to generate electricity.
9. The Interconnecting Customer shall operate the DG facility in a safe manner with no adverse effects to the WBMLP EPS or other Customers. The WBMLP will operate the EPS in such a manner so as to not unreasonably interfere with the operation of the Facility. The Interconnecting Customer shall maintain their facility and equipment in accordance with current industry recommendations. WBMLP shall have the right to witness or review maintenance tests.

**WEST BOYLSTON MUNICIPAL LIGHT PLANT**  
**Non-Utility Generation Interconnection Application**  
**for Facilities with Inverter Capacity of 10 kW or Less**

**Contact Information:**

Legal Name and address of Interconnecting Customer (or, Company name, if appropriate)

Customer or Company Name (print): \_\_\_\_\_ Contact Person, if Company: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Telephone (Daytime): \_\_\_\_\_ (Evening): \_\_\_\_\_

Facsimile Number: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**Alternative Contact Information** (e.g., system installation contractor or coordinating company, if appropriate):

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

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Telephone (Daytime): \_\_\_\_\_ (Evening): \_\_\_\_\_

Facsimile Number: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**Electrical Contractor Contact Information** (if appropriate):

Name: \_\_\_\_\_ Telephone: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

**Ownership Information** (include % ownership by any electric utility): \_\_\_\_\_

**Facility Information:**

Address of Facility: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Electric Service Company: \_\_\_\_\_ Account Number (if available): \_\_\_\_\_

Inverter Manufacturer: \_\_\_\_\_ Model Name and Number: \_\_\_\_\_ Quantity: \_\_\_\_\_

Nameplate Rating: \_\_\_\_\_ (kW) \_\_\_\_\_ (kVA) \_\_\_\_\_ (AC Volts) Single \_\_\_ or Three \_\_\_ Phase

System Design Capacity: \_\_\_\_\_ (kW) \_\_\_\_\_ (kVA)

Prime Mover: Photovoltaic Reciprocating Engine Fuel Cell Turbine Other \_\_\_\_\_

Energy Source: Solar Wind Hydro Diesel Natural Gas Fuel Oil Other \_\_\_\_\_

UL 1741 Listed? Yes \_\_\_ No \_\_\_

Estimated Install Date: \_\_\_\_\_ Estimated In-Service Date: \_\_\_\_\_

**Customer Signature**

I hereby certify that, to the best of my knowledge, all of the information provided in this application is true and I agree to the WBMLP Standard Terms and Conditions:

Interconnecting Customer Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

*Please attach any documentation provided by the inverter manufacturer describing the inverter's UL 1741 listing.*

**WEST BOYLSTON MUNICIPAL LIGHT PLANT**  
**Non-Utility Generation Interconnection Application**  
**for Facilities with Capacity of More Than 10 kW**

**Contact Information**

**Legal Name and address of Interconnecting Customer (or, Company name, if appropriate)**

Customer or Company Name: \_\_\_\_\_ Contact Person, if Company: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Telephone (Daytime): \_\_\_\_\_ (Evening): \_\_\_\_\_

Facsimile Number: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**Alternative Contact Information (e.g. system installation contractor or coordinating company)**

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

Mailing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Telephone (Daytime): \_\_\_\_\_ (Evening): \_\_\_\_\_

Facsimile Number: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

**Ownership** (include % ownership by any electric utility): \_\_\_\_\_

**Generating Facility Information**

Address of Facility: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Electric Service Company: \_\_\_\_\_ Account Number (if available): \_\_\_\_\_

Type of Generating Unit: Synchronous \_\_\_\_\_ Induction \_\_\_\_\_ Inverter \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Model: \_\_\_\_\_

Nameplate Rating: \_\_\_\_\_ (kW) \_\_\_\_\_ (kVAr) \_\_\_\_\_ (Volts) Single \_\_\_\_\_ or Three \_\_\_\_\_ Phase

Prime Mover: Fuel Cell \_\_\_\_\_ Recip Engine \_\_\_\_\_ Gas Turb \_\_\_\_\_ Steam Turb \_\_\_\_\_ Microturbine \_\_\_\_\_ PV \_\_\_\_\_ Other \_\_\_\_\_

Energy Source: Solar \_\_\_\_\_ Wind \_\_\_\_\_ Hydro \_\_\_\_\_ Diesel \_\_\_\_\_ Natural Gas \_\_\_\_\_ Fuel Oil \_\_\_\_\_ Other \_\_\_\_\_  
(Specify)

UL 1741 Listed? Yes \_\_\_\_\_ No \_\_\_\_\_ Need an air quality permit from DEP? Yes \_\_\_\_\_ No \_\_\_\_\_ Not Sure \_\_\_\_\_

If "yes", have you applied for it? Yes \_\_\_\_\_ No \_\_\_\_\_

Planning to Export Power? Yes \_\_\_\_\_ No \_\_\_\_\_ A Cogeneration Facility? Yes \_\_\_\_\_ No \_\_\_\_\_

Anticipated Export Power Purchaser: \_\_\_\_\_

Export Form? Simultaneous Purchase/Sale \_\_\_\_\_ Net Purchase/Sale \_\_\_\_\_ Net Metering \_\_\_\_\_ Other \_\_\_\_\_  
(Specify)

Est. Install Date: \_\_\_\_\_ Est. In-Service Date: \_\_\_\_\_ Agreement Needed By: \_\_\_\_\_

**Application Process**

I hereby certify that, to the best of my knowledge, all of the information provided in this application is true:

Interconnecting Customer Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

The information provided in this application is complete:

Company Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

**Generating Facility Technical Detail**

List components of the generating facility that are currently certified and/or listed to national standards

	Equipment Type	Manufacturer	Model	National Standard
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____

Total Number of Generating Units in Facility? \_\_\_\_\_

Generator Unit Power Factor Rating: \_\_\_\_\_

Max Adjustable Leading Power Factor? \_\_\_\_\_ Max Adjustable Lagging Power Factor? \_\_\_\_\_

Generator Characteristic Data (for all inverter-based machines)

Max Design Fault Contribution Current? \_\_\_\_\_ Instantaneous \_\_\_or RMS? \_\_\_\_\_

Harmonics Characteristics: \_\_\_\_\_

Start-up power requirements: \_\_\_\_\_

Generator Characteristic Data (for all rotating machines)

Rotating Frequency: \_\_\_\_\_(rpm) Neutral Grounding Resistor (If Applicable): \_\_\_\_\_

Additional Information for Synchronous Generating Units

Synchronous Reactance, Xd: \_\_\_\_\_(PU) Transient Reactance, X'd: \_\_\_\_\_(PU)

Subtransient Reactance, X''d: \_\_\_\_\_(PU) Neg Sequence Reactance, \_\_\_\_\_(PU)

Zero Sequence Reactance, \_\_\_\_\_(PU) kVA Base: \_\_\_\_\_

Field Voltage: \_\_\_\_\_(Volts) Field Current: \_\_\_\_\_(Amps)

Additional information for Induction Generating Units

Rotor Resistance, Rr: \_\_\_\_\_ Stator Resistance, Rs: \_\_\_\_\_

Rotor Reactance, Xr: \_\_\_\_\_ Stator Reactance, Xs: \_\_\_\_\_

Magnetizing Reactance, Xm: \_\_\_\_\_ Short Circuit Reactance, Xd'': \_\_\_\_\_

Exciting Current: \_\_\_\_\_ Temperature Rise: \_\_\_\_\_

Frame Size: \_\_\_\_\_

Total Rotating Inertia, H: \_\_\_\_\_ Per Unit on kVA Base: \_\_\_\_\_

Reactive Power Required In Vars (No Load): \_\_\_\_\_

Reactive Power Required In Vars (Full Load): \_\_\_\_\_

Additional information for Induction Generating Units that are started by motoring

Motoring Power: \_\_\_\_\_(kW) Design Letter: \_\_\_\_\_

**Interconnection Equipment Technical Detail**

Will a transformer be used between the generator and the point of interconnection? Yes \_\_\_ No \_\_\_

Will the transformer be provided by Interconnecting Customer? Yes \_\_\_ No \_\_\_

Transformer Data (if applicable, for Interconnecting Customer-Owned Transformer):

Nameplate Rating: \_\_\_\_\_(kVA) Single \_\_\_ or Three \_\_\_Phase

Transformer Impedance: \_\_\_\_\_(%) on a \_\_\_\_\_ kVA Base

If Three Phase:

Transformer Primary: \_\_\_\_\_(Volts) \_\_\_Delta \_\_\_ Wye \_\_\_\_\_ Wye Grounded \_\_\_ Other

Transformer \_\_\_\_\_ (Volts) \_\_\_Delta \_\_\_ Wye \_\_\_\_\_ Wye Grounded \_\_\_ Other

Transformer Fuse Data (if applicable, for Interconnecting Customer-Owned Fuse):

(Attach copy of fuse manufacturer’s Minimum Melt & Total Clearing Time-Current Curves)

Manufacturer: \_\_\_\_\_Type: \_\_\_\_\_Size: \_\_\_\_\_ Speed: \_\_\_\_\_

Interconnecting Circuit Breaker (if applicable):

Manufacturer: \_\_\_\_\_Type: \_\_\_\_\_Load Rating: \_\_\_\_\_ Interrupting Rating: \_\_\_\_\_ Trip Speed: \_\_\_\_\_  
(Amps) (Amps) (Cycles)

Interconnection Protective Relays (if applicable):

(If microprocessor-controlled)

List of Functions and Adjustable Setpoints for the protective equipment or software:

Setpoint Function	Minimum	Maximum
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____

(If discrete components)

(Enclose copy of any proposed Time-Overcurrent Coordination Curves)

Manufacturer: \_\_\_\_\_Type: \_\_\_\_\_Style/Catalog No.: \_\_\_\_\_Proposed Setting: \_\_\_\_\_

Current Transformer Data (if applicable):

(Enclose copy of Manufacturer’s Excitation & Ratio Correction Curves)

Manufacturer: \_\_\_\_\_Type: \_\_\_\_\_Accuracy Class: \_\_\_\_\_Proposed Ratio Connection: \_\_\_\_\_

Manufacturer: \_\_\_\_\_Type: \_\_\_\_\_Accuracy Class: \_\_\_\_\_Proposed Ratio Connection: \_\_\_\_\_

Potential Transformer Data (if applicable):

Manufacturer: \_\_\_\_\_Type: \_\_\_\_\_Accuracy Class: \_\_\_\_\_Proposed Ratio Connection: \_\_\_\_\_

Manufacturer: \_\_\_\_\_Type: \_\_\_\_\_Accuracy Class: \_\_\_\_\_Proposed Ratio Connection: \_\_\_\_\_

**General Technical Detail**

Enclose 3 copies of site electrical One-Line Diagram showing the configuration of all generating facility equipment, current and potential circuits, and protection and control schemes with a Massachusetts Registered Professional Engineer (PE) stamp.

Enclose 3 copies of any applicable site documentation that indicates the precise physical location of the proposed generating facility (e.g., USGS topographic map or other diagram or documentation).

Proposed Location of Protective Interface Equipment on Property:  
(Include Address if Different from Application Address)

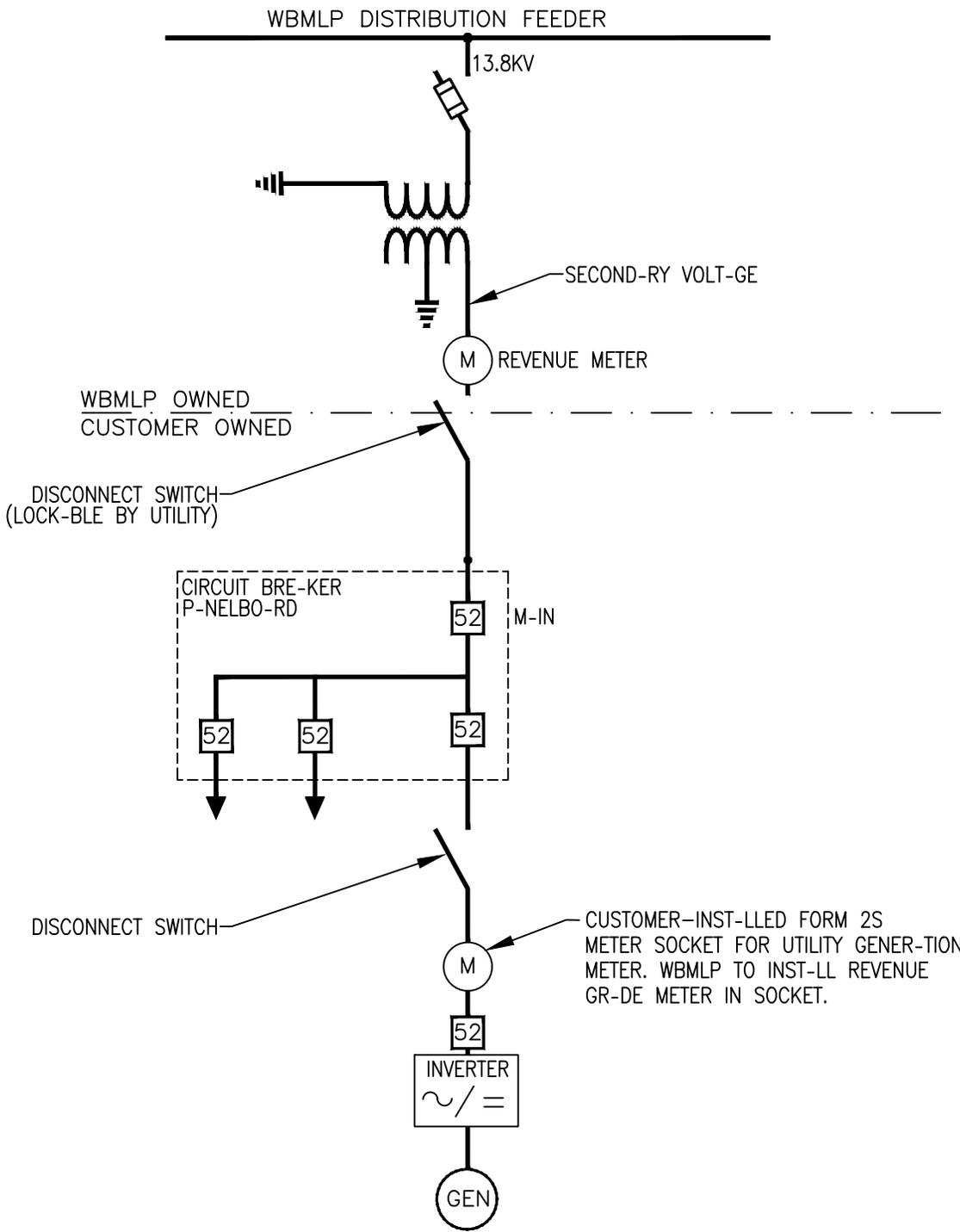
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Enclose copy of any applicable site documentation that describes and details the operation of the protection and control schemes.

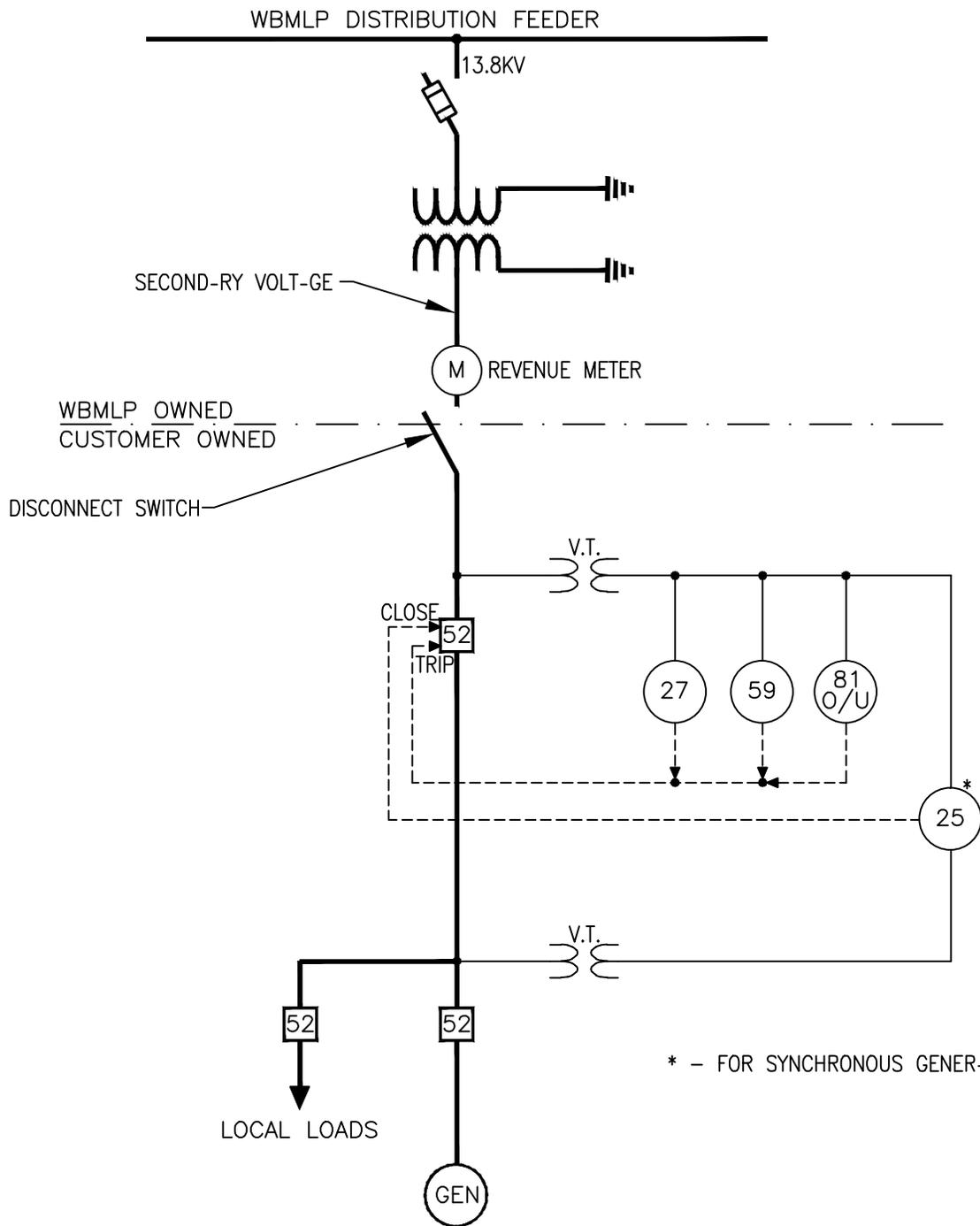
Enclose copies of applicable schematic drawings for all protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable).

Please enclose any other information pertinent to this installation.



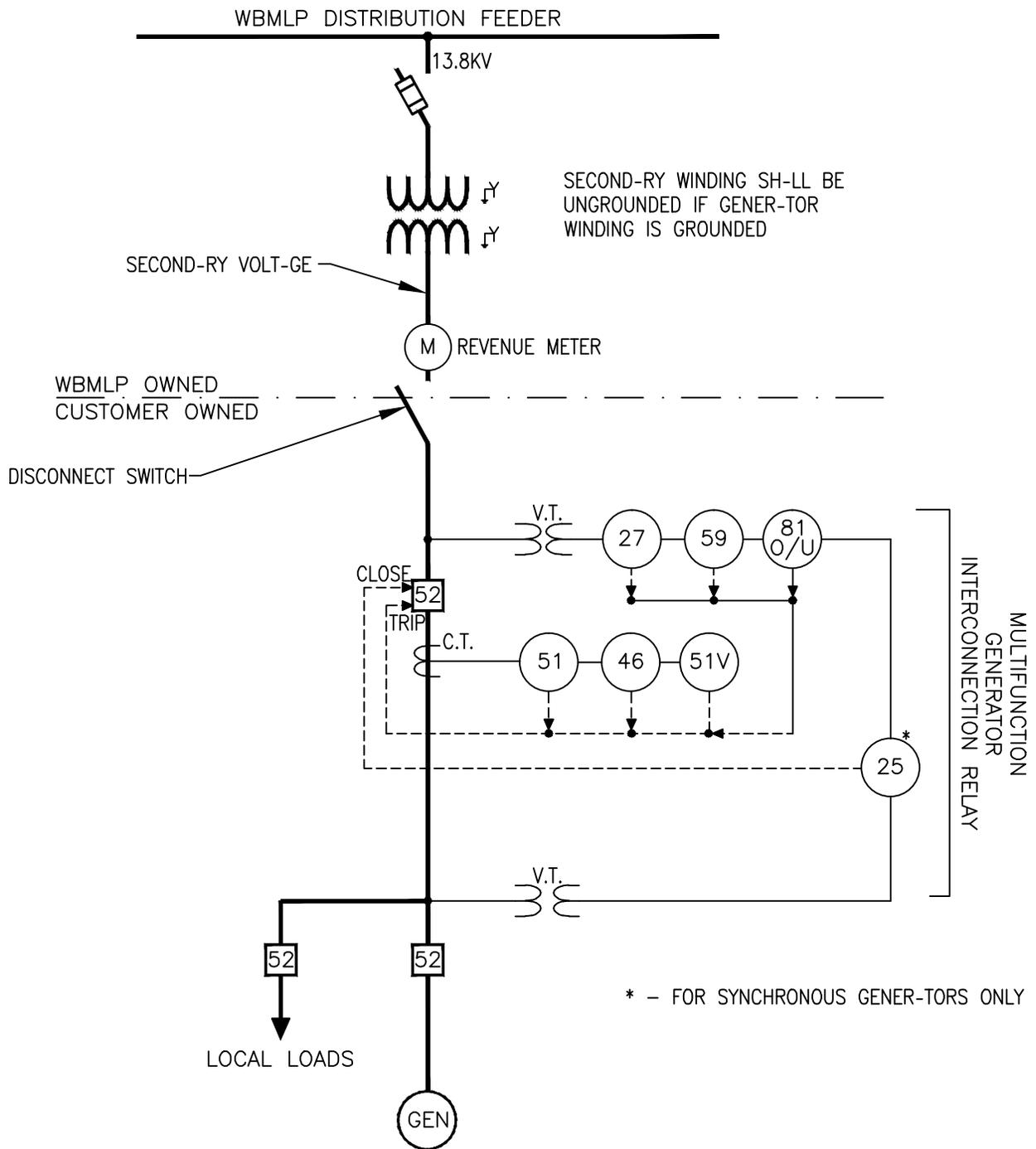
DEVICE	FUNCTION
52	-C. CIRCUIT BRE-KER (LOW VOLTAGE)

INTERCONNECTION REQUIREMENTS 1Ø INVERTER-BASED GENERATOR LESS THAN 10KW		
WEST BOYLSTON MUNICIPAL LIGHT PLANT WEST BOYLSTON, MA		
DWG. B1	REV. 1	DATE 5-20-2019



DEVICE	FUNCTION
25	SYNCHRONIZING REL-Y
27	UNDervOLT-GE REL-Y
52	-C. CIRCUIT BRE-KER (LOW VOLT-GE)
59	OVERVOLT-GE REL-Y
81 O/U	OVER/UNDER FREQUENCY REL-Y
V.T.	VOLT-GE TR-NSFORMER (IF NEEDED)

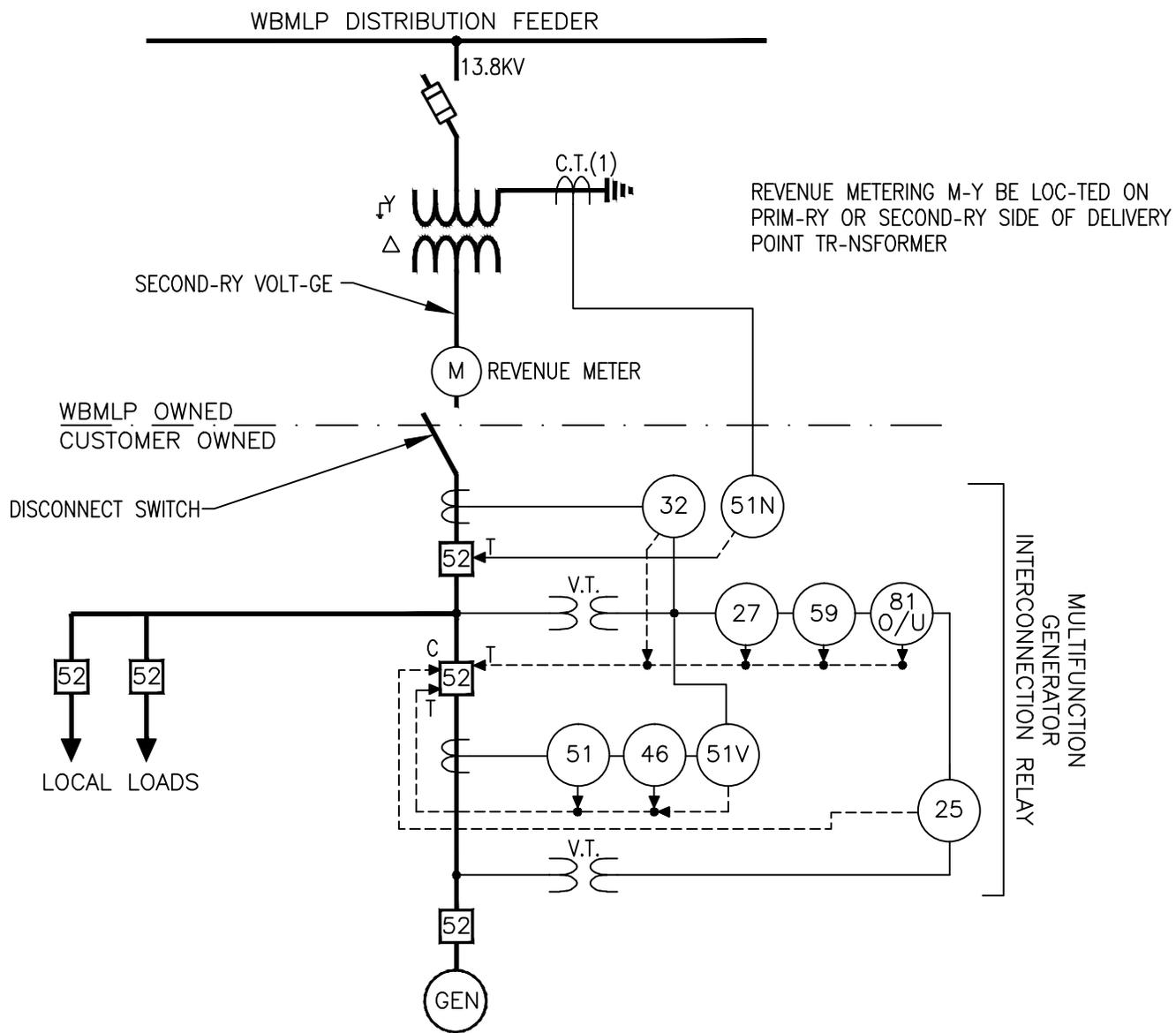
INTERCONNECTION REQUIREMENTS		
1Ø GENERATOR 10KW TO 60KW		
WEST BOYLSTON MUNICIPAL LIGHT PLANT WEST BOYLSTON, MA		
DWG. B2	REV. 0	DATE 11-9-2011



\* - FOR SYNCHRONOUS GENER-TORS ONLY

DEVICE	FUNCTION
25	SYNCHRONIZING REL-Y
27	UNDervOLT-GE REL-Y
52	-C. CIRCUIT BRE-KER (LOW VOLT-GE)
59	OVERVOLT-GE REL-Y
81 O/U	OVER/UNDER FREQUENCY REL-Y
51	OVERCURRENT REL-Y
51V	VOLT. RESTR-INT TIME OC REL-Y
46	NEQ. SEQ. OVERCURRENT REL-Y
V.T.	VOLT-GE TR-NSFORMER (IF NEEDED)

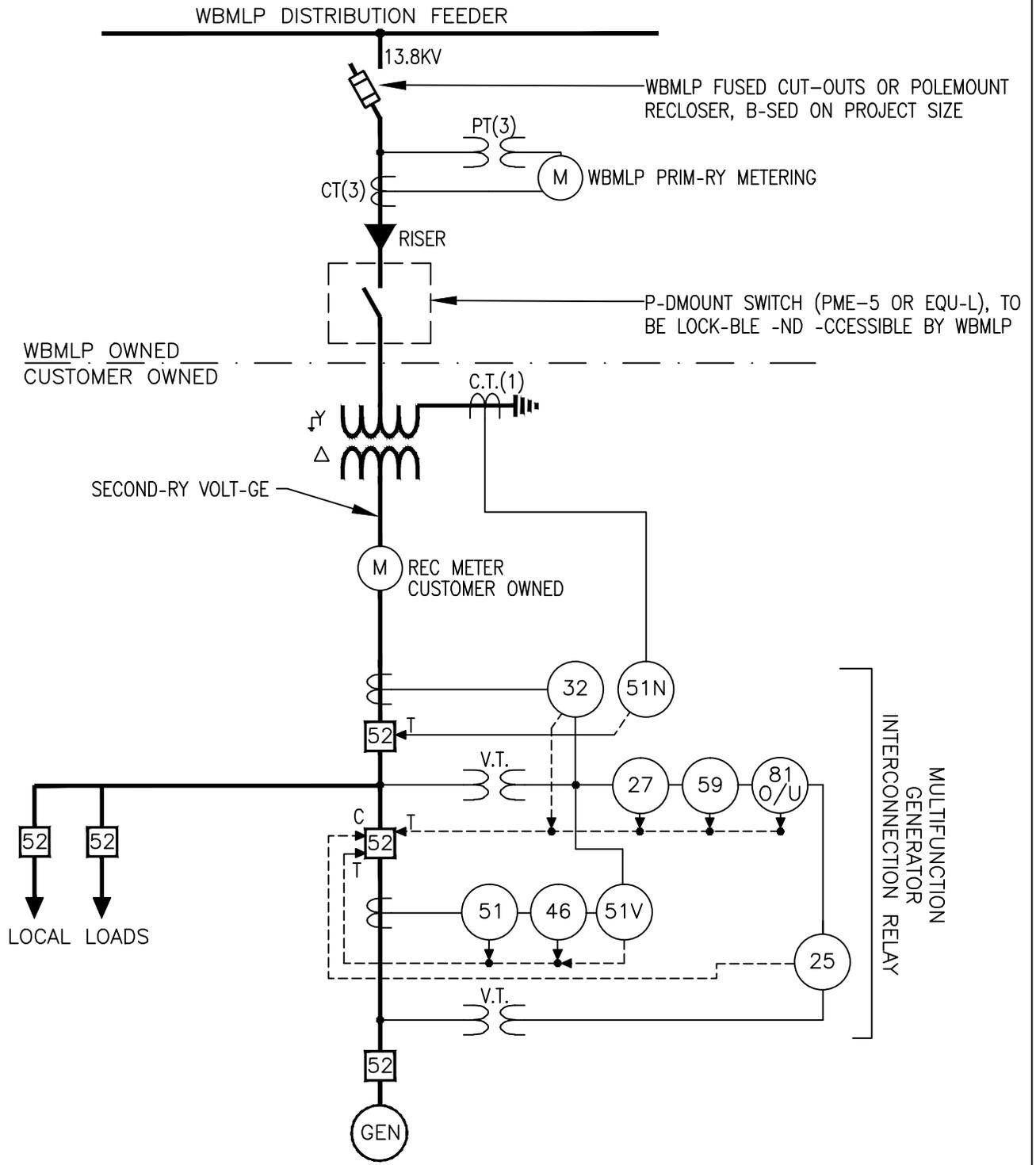
INTERCONNECTION REQUIREMENTS 3Ø GENERATOR 10KW TO 60KW		
WEST BOYLSTON MUNICIPAL LIGHT PLANT WEST BOYLSTON, MA		
DWG. B3	REV. 0	DATE 11-9-2011



VOLT-GE TR-NSFORMER CONNECTIONS M-Y BE EITHER BROKEN DELT-, SLG DEPENDING ON -PPLIC-TION

DEVICE	FUNCTION
25	SYNCHRONIZING RELAY
27	UNDervOLT-GE REL-Y
52	-C. CIRCUIT BRE-KER (LOW VOLT-GE)
59	OVERVOLT-GE REL-Y
81 O/U	OVER/UNDER FREQUENCY REL-Y
51N	GROUND OVERCURRENT REL-Y
32	REVERSE POWER REL-Y
46	PH-SE UNBAL-NCED (NEQ. SEQ. CURRENT)
51	TIME OVERCURRENT REL-Y
V.T.	VOLT-GE TR-NSFORMER (IF NEEDED)

INTERCONNECTION REQUIREMENTS 3Ø GENERATOR 60KW TO 1000KW		
WEST BOYLSTON MUNICIPAL LIGHT PLANT WEST BOYLSTON, MA		
DWG. B4	REV. 0	DATE 11-9-2011



VOLT-GE TR-NSFORMER CONNECTIONS M-Y BE EITHER BROKEN DELT-, SLG DEPENDING ON -PPLIC-TION

DEVICE	FUNCTION
25	SYNCHRONIZING REL-Y
27	UNDervOLT-GE REL-Y
52	-C. CIRCUIT BRE-KER (LOW VOLT-GE)
59	OVERVOLT-GE REL-Y
81 O/U	OVER/UNDER FREQUENCY REL-Y
51N	GROUND OVERCURRENT REL-Y
32	REVERSE POWER REL-Y
46	PH-SE UNB-L-NCED (NEQ. SEQ. CURRENT)
51	TIME OVERCURRENT REL-Y
V.T.	VOLT-GE TR-NSFORMER (IF NEEDED)

INTERCONNECTION REQUIREMENTS 3Ø GENERATOR 1000KW - 6000KW		
WEST BOYLSTON MUNICIPAL LIGHT PLANT WEST BOYLSTON, MA		
DWG. B5	REV. 0	DATE 11-9-2011