Hydro Québec

Guideline
Standard

Title of the guideline	Number of the guideline	Effective YYYY-MM-DD
Requirements for connecting distributed generation of 100 kW or less using certified inverters to the Hydro-Québec low-voltage distribution system	**E.12-07**	**2025-07-10**

Field of application

Unit(s) concerned

Exploitation et infrastructures
Planification énergétique et expérience client

Process(es) covered

Connecting a customer-generator to Hydro-Québec's distribution system

Details on the field of application

This standard defines the minimum requirements and technical specifications for distributed generation connected to Hydro-Québec's low-voltage (LV) distribution system using one or more certified inverters having a total cumulative power of 100 kW or less.

It applies to facilities that do not have a transformer between the inverter and the customer's connection point.

It is intended for customer-generators and experts who design, build and test electricity generating facilities. It is also intended for companies that distribute equipment for electricity generation.

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Definitions

backup power supply	Power supply to be used only in the event of a temporary shutdown of Hydro-Québec's system and capable of supplying all essential loads.
customer-generator	Customer that generates electricity in a facility that it owns and operates to meet all or part of its needs.
low voltage	Connection voltage of 120/240 volts single-phase or 347/600 volts three-phase.
to block	In the context of operating an inverter-based resource, blocking refers to when an inverter discontinues current injection while remaining in service. The inverter must be able to resume electricity generation as soon as the voltage and frequency are once again within the defined operating ranges.
communicating meter	A meter with two-way communication that can receive and send information by radio-frequency or through a telephone connection.
to trip	In the context of operating an inverter-based resource, tripping refers to when an inverter discontinues current injection and shuts down. After it shuts down, the inverter cannot be reconnected until all the start-up conditions are met.
microgrid interconnection device	Device that enables a group of electrical components found within a given perimeter and having one or more sources of backup power supply to disconnect from Hydro-Québec's power system and reconnect to it.
islanding	The separation of a power system into subsystems, including load and generation or even generation and Hydro-Québec facilities (with or without load), that occurs following a disturbance or switching operation.
electricity generating facility	Facility designed to generate electricity and connected to Hydro-Québec's power system. Includes electricity generation equipment, auxiliary services and instrumentation and protection equipment.
master electrician	A member of the Corporation des maîtres électriciens as defined in the *Master Electricians Act* (CQLR, c. M-3).
certified inverter	Inverter that is compliant with standards UL 1741-SB and IEEE 2030.5 (see Section 6.1).
multimode inverter	Inverter that combines the functionalities of an inverter connected to the system and those of a stand-alone inverter. It can function in either system-synchronized mode or islanded mode.
continuous operation	State during which an electricity generating facility is connected to the power system and injecting current into it, or available to do so, as long as the voltage and frequency are within the range of normal or extreme operating conditions.

to remain in operation	In the context of operating an inverter-based resource, remaining in operation refers to when an inverter continues to inject current into the power system, as it is expected to do, even while experiencing a disturbance.

Acronyms and abbreviations

LV	Low-voltage
EGF	Electricity generating facility
DERMS	Distributed energy resource management system
MID	Microgrid interconnection device

1 Purpose and application

This standard defines the minimum requirements and technical specifications for distributed generation connected to Hydro-Québec's low-voltage (LV) distribution system using one or more certified inverters having a total cumulative power of 100 kW or less. It is aimed at certified inverters connected to an electricity generation source, including an energy storage system or electric vehicle.

To simplify the text, the term inverter is used in the singular throughout this document. However, the standard's requirements apply to any facility composed of either one or several inverters. The singular should be substituted with the plural, as applicable.

This standard applies to facilities that do not have a transformer between the inverter and the customer's connection point.

An electricity generating facility (EGF) that does not meet all the requirements set out in this standard must refer to the technical requirements for connection defined in standard *E.12-05 Exigences relatives au raccordement de la production décentralisée au réseau basse tension d'Hydro-Québec* [requirements for connection of distributed generation to Hydro-Québec's low-voltage grid]. Therefore, if an inverter is equipped with a transformer, the connection will have to be compliant with Standard E.12-05.

Given the uniqueness of each facility and possible connection methods and power system constraints, including a high penetration level of distributed generation on part of its grid, Hydro-Québec may define specific requirements at the time each case is studied.

Hydro-Québec's off-grid systems are permanently not connected to the main grid. Their electricity supply is generated locally. Therefore, although this standard must be respected when connecting an EGF to a Hydro-Québec off-grid system, specific requirements must also be issued for each project.

2 Scope

This standard is intended for customer-generators and experts who design, build and test electricity generating facilities. It is intended for companies that distribute equipment for electricity generation.

3 Related guidelines

This standard is one in a series of documents governing the technical requirements for connecting electricity generating facilities to the Hydro-Québec distribution system, which also includes the following:

E.12-01, Exigences relatives au raccordement de la production décentralisée au réseau de distribution moyenne tension d'Hydro-Québec [specific requirements for connecting distributed generation to the Hydro-Québec medium-voltage system]

E.12-05, Exigences relatives au raccordement de la production décentralisée au réseau de distribution basse tension d'Hydro-Québec [specific requirements for connecting distributed generation to the Hydro-Québec low-voltage system]

E.21-10, Service d'électricité en basse tension [low-voltage electricity service]

E.21-11, Service d'électricité en basse tension à partir des postes distributeurs [low-voltage electrical service from distribution substations]

ISBN 978-2-550-88673-0, Conditions of Service

ISBN 978-2-555-00778-9, Electricity Rates Effective April 1, 2025

4 Distribution system characteristics

4.1 General information

The connection of an electricity generating facility (EGF) to the low-voltage distribution system may be single-phase or three-phase. It is carried out at a nominal voltage of 120, 120/240 or 347/600 V. In this Standard, an EGF must be designed to be able to connect at one of the voltages presented in Table 1, in accordance with Table 2 of Standard CSA C235-R2019 *Preferred voltage levels for AC systems up to 50,000 V*.

Table 1: Nominal voltage range at the connection point

Nominal voltage	Voltage variation limits at the connection point			
	Extreme operating conditions	Normal operating conditions		Extreme operating conditions
Single-phase 120/240	106/212	110/220	125/250	127/254
Three-phase 347/600	306/530	318/550	360/625	367/635

Under normal operating conditions, the frequency of Hydro-Québec's integrated power system is maintained between 59.4 Hz and 60.6 Hz, as set out in the document *Caractéristiques de la tension fournie par les réseaux moyenne et basse tension d'Hydro-Québec* [characteristics of the voltage supplied by the Hydro-Québec medium- and low-voltage systems].

4.2 Overhead LV system

The overhead LV system is comprised of triplex conductors (two insulated and one bare) in the case of the 120/240-V system, and of quadruplex conductors (three insulated and one bare) in the case of the 347/600-V system. It extends to the connection point of the last customer to be connected.

4.3 Underground LV system

The underground LV system is comprised of three insulated conductors (one neutral and two phase conductors) in the case of the 120/240-V system, and of four insulated conductors (one neutral and three phase conductors) in the case of the 347/600-V system.

4.4 Connection point

The connection point acts as a dividing line between the Hydro-Québec system and the customer's facility. In this standard, the connection point is as illustrated in Standard *E.21-10 Service d'électricité en basse tension* [LV electricity service] ("Blue Book") or Standard *E.21-11 Service d'électricité en basse tension à partir des postes distributeur*s [LV electricity service from distribution substations] ("Green Book") by replacing the term "customer" by "customer-generator."

5 General requirements

The integration of an electricity generating facility (EGF) into Hydro-Québec's distribution system must not, under any circumstances:

- compromise the safety of Hydro-Québec employees or the public
- substantially alter the quality of the voltage delivered to Hydro-Québec customers
- substantially alter service continuity for Hydro-Québec customers

5.1 Total maximum nominal power

For the purposes of this standard, the total maximum nominal power of an EGF is:

- 40 kW for a 120/240-V connection
- 100 kW for a 347/600-V connection

This maximum power is the sum of the nominal power amounts for each of the EGF's inverters. In some cases, Hydro-Québec may limit the maximum power of the EGF to a lower value.

The power generated at each of the phases must be balanced when the connection point of an EGF to Hydro-Québec's system is three-phase.

In the case of a 347/600-V three-phase connection, a three-phase inverter must be used. Three single-phase inverters (one per phase) can be installed, if these devices have been designed and certified for a three-phase installation. In the latter case, the tripping of one of the inverters during a disturbance on a single phase (Section 7) must also activate the tripping of the inverters on the two sound phases.

5.2 Design, construction and operation of customer-generation facilities

The owner of the EGF must comply with Hydro-Québec's *Conditions of Service* in accordance with the *Hydro-Québec Act* (CQLR, c H-5). The EGF must be designed in such a way that it remains safe for Hydro-Québec personnel and the public under all circumstances.

The EGF and its equipment must comply with the codes, standards and rules applicable in Québec, and with Good Utility Practice. The EGF owner must ensure that the EGF is compliant with Québec's *Construction Code*, Chapter V – Electricity (CSA C22.10) and with the applicable standards in the *Canadian Electrical Code*, parts II and III (CSA standards of series C22.2 and C22.3), including Standard CSA C22.3 No. 9 *Interconnection of distributed energy resources and electricity supply systems*.

5.3 Municipal and government authorizations

Prior to the connection, the EGF owner must obtain all necessary municipal, provincial and federal authorizations.

For example, a building permit may be required at the municipal level for the installation of solar panels or a wind turbine. A permit from the Québec Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs may be required to install a small-power hydraulic turbine.

5.4 Information required by Hydro-Québec before equipment installation

The following information must be sent to Hydro-Québec with the request for connection to ensure compliance with EGF-related technical requirements and connection conditions:

a) The form *Demande de raccordement d'équipements de production d'électricité au réseau d'Hydro-Québec* [request to connect electricity generating equipment to Hydro-Québec's grid] (See Appendix A);

b) The single-line diagram for connecting the facility (see Appendix B) signed by a member of the following professional association or order:

- Corporation des maîtres électriciens du Québec (CMEQ), in accordance with the *Master Electricians Act* (CQLR, c M-3);
- Ordre des ingénieurs du Québec (OIQ), in accordance with the *Engineers Act* (CQLR, c I-9).

c) The certificate showing that the inverter is compliant with Standard UL1741-SB;

d) The certificate showing that the inverter is compliant with Standard IEEE 2030.5 Sunspec Common Smart Inverter Profil (CSIP) version 2.1 or more recent.

5.5 Construction and connection to the Hydro-Québec grid

The EGF owner must obtain written authorization from Hydro-Québec to connect the EGF to the power system. Only a master electrician may install and connect the inverter to the distribution panel.

Once the construction of the EGF is complete, if the connection authorization has not been issued by Hydro-Québec, the master electrician must lock out the EGF in the open position at the isolation point. The padlock used must be a single-key padlock, and the master electrician must keep the only key. A tag must be placed on the padlock stating that the use of the electricity generating equipment is forbidden.

5.6 Posting of safety notices

The following safety notices must be posted in any building containing an EGF:

- A notice stating that an EGF is present in the building must be posted either on the meter socket cabinet or the Hydro-Québec metering cabinet. An example of such a notice is provided in Figure 1 of Appendix D.
- A notice must be posted on the disconnect point used to lock out the EGF, which may be a lockable disconnect switch, lockable switch or lockable circuit breaker. An example of such a notice is provided in Figure 2 of Appendix D.

Safety notices must:

- be printed or made with durable material
- be resistant to the environment in which they are located
- remain legible for the planned useful life of the EGF
- be affixed using a permanent adhesive or permanent fasteners

5.7 Inspection and verification testing

Once the connection has been authorized, and before the commissioning of electricity generating equipment or after changes to the EGF, the master electrician must conduct tests to verify the compliance of the inverter (see Appendix C).

The master electrician must:

a) Verify the information sent by the EGF owner, including the firmware version of the inverter, the protection settings and other parameters of the inverter.

b) Check that the facilities are compliant with the connection diagram.

c) Check the connection of the neutral wire to the inverter's neutral connection terminal and then inspect the neutral inverter from the customer's connection point to the inverter. The inspection results must include confirmation that the neutral inverter is installed in accordance with standards and that the connections and accessories are compliant, safe and properly tightened.

d) Take a picture of the connection of the neutral wire to the inverter's neutral connection terminal and write the number of the connection request on it.

e) Take a picture or a screenshot of the inverter's trip settings for voltage and frequency protection and write the number of the connection request on it.

f) Check that the generating equipment are connected on the load side of the service box.

Once the compliance tests are complete, the master electrician must fill out and sign the verification report. Then, they must email Hydro-Québec at *HQ_Autoproduction@hydro.qc.ca* to send the following documents:

- The verification report, duly filled out and signed.
- A picture of the connection of the neutral wire to the inverter's neutral connection terminal with the number of the connection request written on it.
- A picture or a screenshot of the inverter's trip settings for voltage and frequency protection with the number of the connection request written on it.

Hydro-Québec may decide to be present during such tests should it deem it necessary.

5.8 Change to a facility

The EGF owner must obtain written authorization from Hydro-Québec before making any modifications to the hardware, software, protection settings and/or other parameters of the inverter or any refurbishment of the EGF.

A written request must be sent to Hydro-Québec, along with the documents required in Section 5.4. Only a master electrician can make the changes to the inverter and connect the inverter to the distribution panel.

Once an EGF has been modified, an inspection and verification tests may be required and will need to be carried out by a master electrician or a Hydro-Québec representative.

5.9 Maintenance

The EGF owner must make sure that the EGF equipment is kept in good operating condition. The EGF's generation and protection equipment must be maintained in accordance with the manufacturer's recommendations.

5.10 Dismantling

An EGF that is connected to Hydro-Québec's distribution system and has not generated any electricity for over 12 months must be dismantled. Exceptionally, in the event of a force majeure, this grace period may be extended following an agreement to that effect with Hydro-Québec.

When an EGF is dismantled, the EGF owner must:

- Complete all the work required to remove the facility from Hydro-Québec's system. To do so, the EGF owner must have someone remove the mechanical piece(s) required, such as electrical equipment or conductors, to break the electrical connection between the inverter and Hydro-Québec's system.
- Notify Hydro-Québec that the EGF has been dismantled.

6 Requirements related to the electricity generation equipment

6.1 Certification of the inverter

Every inverter must:

- Be certified in accordance with Standard UL1741-SB (or more recent version) to guarantee advanced grid support functions, interoperability functions and overvoltage protection during a phase-to-ground short circuit or a load loss.
- Have passed the tests in UL1741-SB, Section SB-4.3.5.17 Limitation of overvoltage contribution, showing that the inverters are compliant with Standard IEEE 1547-2018, Section 7.4 Limitation of overvoltage contribution, to ensure an effectively grounded system. This means that the testing carried out on the inverter must show that, for an overvoltage of 138% or more, the inverter ceases to inject current in less than one cycle.
- Be compliant with Standard IEEE 2030.5 Sunspec Common Smart Inverter Profile (CSIP) version 2.1 or more recent with TCP/IP connectivity to meet the distribution system's needs for visibility, predictability and controllability. Standard IEEE 2030.5 CSIP defines the requirements stemming from the protocols needed to collect and communicate the EGF's consumption and generation data in real time.[1]

The requirements applicable to the inverter are those in categories B and III in Standard IEEE 1547 (2018). Category B specifies the performance criteria needed for voltage regulation during a high level of penetration of distributed energy resources. Category III specifies the gating criteria during undervoltage, overvoltage and frequency variations.

6.2 Update of inverter firmware

Updating of inverter firmware is considered a modification to the EGF (see Section 5.8). The firmware is an integral part of the inverter and its certification. The inverter's certificate of compliance to Standard UL1741-SB is specific to the inverter's model and firmware version, which are referenced. Therefore, a firmware update cancels the inverter's effective certification.

Prior written authorization from Hydro-Québec is required to update the firmware of the EGF's inverter.

To obtain this authorization, the EGF owner must send Hydro-Québec a written request and include a certificate of compliance to UL1741-SB for the relevant inverter with updated firmware.

6.3 Connection

Electricity generating equipment must be installed on the load side of the customer's service box and on the load side of any disconnecting or metering equipment used by Hydro-Québec.

[1] Hydro-Québec recommends that compliance with Standard IEEE 2030.5 be embedded in the inverter or in a locally installed communications gateway. The use of a cloud software to ensure compliance with Standard IEEE 2030.5 could increase the inverter's response time and lead to connectivity issues and to long-term compatibility issues if the supplier were to go out of business. If cloud software is used to ensure compliance with Standard IEEE 2030.5, the service must be free-of-charge for Hydro-Québec.

6.4 Neutral system

The EGF's neutral system must be effectively grounded. Any neutral system that is not effectively grounded is not accepted. In addition, for three-phase facilities, the EGF's connection must be built with five conductors (three phases, neutral and bonding) up to the inverter. A connection without neutral wire is not accepted.

The inverter must be equipped with a terminal block for the neutral wire and this block must be connected to the neutral bar on the customer's distribution panel.[2]

The inverter's neutral terminal must only be used to measure the phase-to-neutral voltage. Using the inverter as a source of zero-sequence current is prohibited.

6.5 Electrical protection of the EGF

The EGF owner must adequately protect its equipment. It must ensure that equipment is protected under the power system's normal and extreme operating conditions (see Section 4.1). It must protect equipment from all types of events that may occur on Hydro-Québec's system, including short circuits, load losses, overvoltage, undervoltage, overfrequency and underfrequency. The EGF owner must also adequately protect its equipment from potential load and voltage unbalances resulting from certain operating conditions.

The inverter must be immune to voltage unbalances normally present on the system, as defined in the document *Caractéristiques de la tension fournie par les réseaux moyenne et basse tension d'Hydro-Québec* [characteristics of the voltage supplied by the Hydro-Québec medium- and low-voltage systems].

The EGF protection functions must be designed and set so they are not initiated within the must-not-trip zones (sections 7.1 and 7.2). They must ensure the safety of the public and Hydro-Québec personnel without tripping during transient events on the Hydro-Québec system.

7 Inverter settings

7.1 Voltage protection

The inverter must maintain active power injection and tolerate undervoltage and overvoltage for a minimum duration. Table 2 and Figure 1 show the trip settings for voltage protection and for tolerating overvoltage and undervoltage. These thresholds apply to line-to-ground, line-to-neutral and line-to-line voltages.

[2] The presence of a neutral terminal on the inverter ensures the reading of phase-to-neutral overvoltages that may occur during a short circuit or load loss. It also ensures that the overvoltage protection trip threshold, as set out in Section SB.4.3.5.17 of Standard UL1741-SB, was tested to a value of 138%.

Table 2: Minimum duration of tolerance when undervoltage and overvoltage occur

Voltage (% of nominal voltage)[1]	Minimum duration of tolerance[2]	Mode of operation[3]
137% < V	Instantaneous[4]	Can block or trip
120% < V ≤ 137%	Instantaneous[4]	Can block or trip
110% < V ≤ 120%	12 seconds	Must block
88% ≤ V ≤ 110%	Tripping prohibited	Continuous operation
70% ≤ V < 88%	20 seconds	Must remain in operation
50% ≤ V < 70%	10 seconds	Must remain in operation
V < 50%	1 second	Must block

1. Voltage (RMS) at fundamental frequency for single-phase inverter. Voltage (RMS) phase-to-ground, phase-to-neutral and phase-to-phase for each of the phases for three-phase inverters. If one of the phases reaches the trip threshold, the inverter must trip on all three phases.
2. Minimum durations for which the inverter must remain in service without tripping (tripping prohibited) following a disturbance.
3. Expected inverter behaviour during the time that it is tolerating a disturbance.
4. The term “instantaneous” refers to permission to issue a tripping order without intentional delay.
5. A UL1741-SB certified inverted is considered compliant.

Table 3: Voltage protection settings

Voltage (% of nominal voltage)[1]	Trip threshold[2]
120%	0.16 seconds[3]
110%	13 seconds
88%	21 seconds
50%	2 seconds

1. Voltage (RMS) at fundamental frequency for single-phase inverter. Voltage (RMS) phase-to-ground, phase-to-neutral and phase-to-phase for each of the phases for three-phase EGF. If one of the phases reaches the trip threshold, the inverter must trip on all three phases.
2. Maximum durations for which the inverter can remain in service (tripping obligatory) after a disturbance.
3. The inverter must block or trip in 0.017 seconds for a voltage of 137% or more of the nominal voltage.

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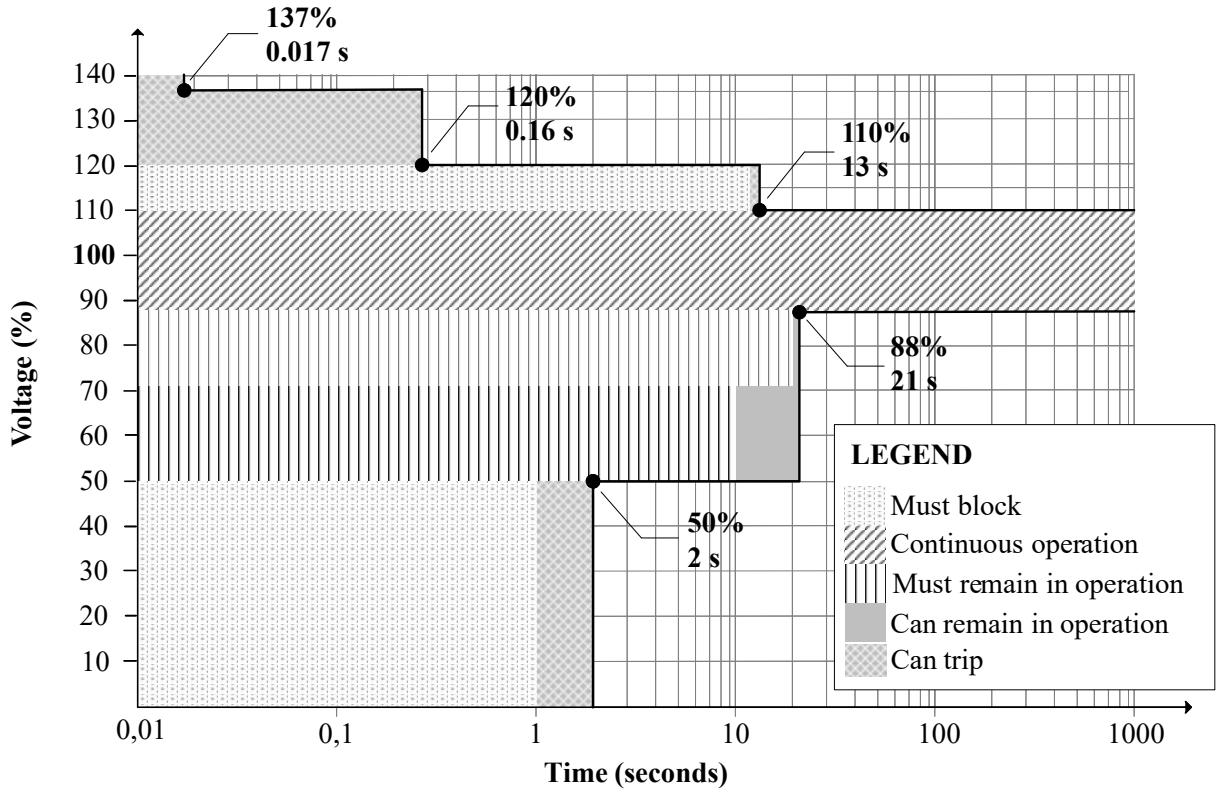

Figure 1: Inverter trip settings for voltage protection and for tolerating overvoltage and undervoltage

7.2 Frequency protection

Table 4, Table 5 and Figure 2 present the trip settings of the EGF's inverter for frequency protection and for tolerating frequency variations.

Table 4: Minimum duration of tolerance for frequency variations

Frequency (Hz)	Duration of tolerance[1]	Mode of operation[3]
61.7 ≤ f	Instantaneous[2]	Can remain in operation or trip
61.5 < f < 61.7	90 seconds	Must remain in operation
60.6 < f ≤ 61.5	660 seconds	Must remain in operation
59.4 ≤ f ≤ 60.6	Tripping prohibited	Continuous operation
58.5 ≤ f < 59.4	660 seconds	Must remain in operation
57.5 ≤ f < 58.5	90 seconds	Must remain in operation
57.0 ≤ f < 57.5	10 seconds	Must remain in operation
56.5 ≤ f < 57.0	2 seconds	Must remain in operation
55.5 ≤ f < 56.5	0.35 seconds	Must remain in operation
f < 55.5	Instantaneous[2]	Can remain in operation or trip

1. Minimum durations for which the inverter must remain in service without tripping (tripping prohibited) following a disturbance.
2. The term "instantaneous" refers to permission to trip without intentional delay.
3. Expected inverter behaviour during the time that it is tolerating a disturbance.
4. A UL1741-SB certified inverted is considered compliant.

Table 5: Frequency protection settings

Frequency (Hz)	Trip threshold[1]
61.7	0.35 seconds
61.5	180 seconds
58.5	180 seconds
55.5	0.35 seconds

1. Maximum durations for which the inverter can remain in service (tripping obligatory) after a disturbance.

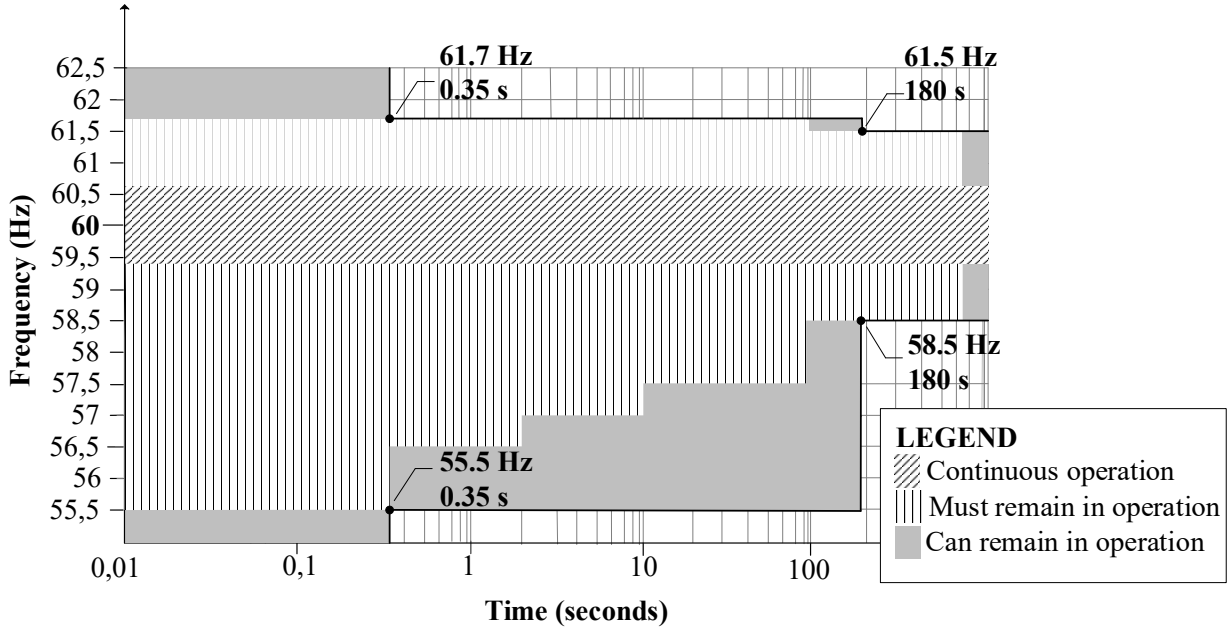

Figure 2: EGF inverter settings for frequency protection and for tolerating frequency variations

7.3 Synchronization delay

For an inverter to be able to synchronize to the power system and start to generate power:

a) The voltage at the inverter terminals must be stabilized within the range of extreme operating conditions presented in Table 1, for a minimum duration of 5 minutes.

b) The frequency must be stabilized within the range of normal operating conditions defined in Section 4.1.

This delay must be applied when the inverter is started up, after an inverter trips or after an outage on the Hydro-Québec distribution system.

7.4 Voltage regulation

Unless otherwise indicated, the inverter must not actively regulate the voltage when it is connected to the LV distribution system. The voltage regulator must be in ‘power factor’ mode and set to 1 (unity).

7.5 Locking of settings and parameters

The settings ensuring the protection of the Hydro-Québec system and voltage regulation must not be adjusted without authorization from Hydro-Québec. Locking by means of passwords is acceptable to Hydro-Québec. Access to protection settings and parameters must be restricted to master electricians.

8 Requirements related to remote monitoring and control

The EGF owner must, at its own expense, provide a telecommunications link that will allow Hydro-Québec's distributed energy management system (DERMS) to communicate with the inverter. The EGF owner must also configure its facility to ensure constant connectivity between the inverter and Hydro-Québec's DERMS. The connections of the telecommunications system within the EGF must be wired. A wireless connection is not authorized for safety and reliability reasons.

8.1 Configuration of inverter settings

Hydro-Québec can modify the voltage and frequency protection settings and the voltage and frequency regulation settings on the EGF's inverter, manually or remotely, at any time and without notice, to ensure voltage quality, electricity service continuity and the safety of Hydro-Québec's employees and the public.

8.2 Limit generation command

Hydro-Québec may, manually or remotely, limit the generation of an EGF, at any time and without notice, to correct system constraints or when work is being carried out.

8.3 Shut down generation command

Hydro-Québec may, manually or remotely, shut down the generation of an EGF and disconnect it from the power system, at any time and without notice, in emergency cases, to correct system constraints or when work is being carried out.

8.4 Metering of electricity

The metering equipment provided by Hydro-Québec must be a communicating meter[3] to allow Hydro-Québec's DERMS to maintain constant connectivity with the meter.

[3] See Chapter 3 – Metering of Electricity in Hydro-Québec's *Conditions of Service*.

9 Islanded generation

Hydro-Québec does not allow islanded generation on loads other than the customer's, for facilities covered by this standard (see Section 10).

10 Backup power supply

The EGF owner can use its EGF for backup power to supply its own loads during an outage. To do so, its facility must meet the following conditions:

1. Be compliant with Section *15.2.5 Protection for backup generator* of Hydro-Québec's *Conditions of Service*. The EGF must be designed in such a way that, if the inverter is shut down, critical loads can be supplied by Hydro-Québec's system. Therefore, a switching device with a mechanical interlock system is required if the shut down of the inverter prevents the supply of critical loads by Hydro-Québec's system. This switching device must fall within one of the four following categories (see Figure 10, Appendix B):

    a. Device equipped with a mechanical interlock system.[4]

    b. Double throw safety switch certified under CSA C22.2 No. 4 or UL 98.

    c. Manual transfer switch certified under CSA C22.2 No. 178.1 or UL 1008.

    d. Automatic transfer switch certified under CSA C22.2 No. 178.1 or UL 1008.

2. If a manual or automatic transfer switch is used, the source of backup generation can only be connected to the 'emergency' terminal of the transfer switch. Connecting a source of electricity generation to the 'load' terminal of the transfer switch is prohibited.[5]

3. If the EGF does not have a Microgrid Interconnect Device (MID), the inverter must be equipped with two distinct connection terminals: one to connect to the distribution system and the other to connect to the customer's critical loads. Each of the connection terminals must include a connection point for the neutral wire.

4. The backup supply to the inverter must be exclusively from a DC power source.[6]

5. If a backup generator is installed, Hydro-Québec requires that it have a switching device with a mechanical interlock system. The inverter must not be used as a transfer switch.

[4] The mechanical interlock system must be installed permanently and in such a way that it cannot be removed or bypassed by the final user without the help of tools.

[5] Connecting a source of electricity generation to the 'load' terminal of the transfer switch could lead to an out-of-step closing of the transfer switch, which would cause overvoltages and damage to the customer's equipment, the source of electricity generation and the Hydro-Québec system.

[6] Multimode inverters are not certified under Standard CSA C22.2 No. 178.1, *Transfer Switch Equipment*. They can therefore not be used to connect a backup generator within a customer's facilities. Not complying with this guideline could lead to damage to the inverter or injuries to Hydro-Québec employees. In such cases, the customer would be held liable for the damage.

In addition, when an EGF has an MID:

6. The inverted and MID must be set up exactly as described in the manufacturer's manual.

7. If the setup of the inverter and MID corresponds to Figure 8 in Appendix B, the certificate showing compliance with Standard UL1741-SB, as described in Section 5.4 c), must also show compliance of the inverter and MID.

8. If the setup of the inverter and MID corresponds to Figure 9 in Appendix B, the certificate showing compliance with Standard UL1741-SB, as described in Section 5.4 c), must also show compliance of the inverter and MID. The customer must also submit, as part of its request for a connection, a certificate showing that the inverter and MID are compliant with UL1741 CRD for multimode.

9. If the setup of the inverter and MID does not correspond to Figure 8 or Figure 9 of Appendix B, a special analysis from Hydro-Québec will be required. It is possible that the connection may not be authorized.

Hydro Québec

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Standard

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Requirements for connecting distributed generation of 100 kW or less using certified inverters to the Hydro-Québec low-voltage distribution system	**E.12-07**	**2025-07-10**

Revision history

Date (YYYY-MM-DD)	Modification	Lead (administrative unit)
2005/07/15	Initial draft (in French only)	Éric Le Courtois, Eng. (Orientations du réseau)
2024/06/20	Complete revision (in French only)	Dominique Boulé-Racine, Eng. (Innovation du système énergétique – Croissance du réseau)
2025/07/10	Changes to French version: New section *5.6 Posting of safety notices* Update of *5.7 Inspection and verification test* New section *5.10 Dismantling* Update of *10 Backup power supply* Figures added to Appendix B New appendices D and E	Alexandre Gagné, Eng. (Stratégies et projets d'innovation – Système énergétique)

Document follow-up and authentication

Responsibilities

Responsibility for application
All employees of the Direction – Conception intégrée et optimale du système énergétique

Prepared by

First and last name, title and administrative unit of persons signing this section	Signature	Date YYYY-MM-DD
Alexandre Gagné, Eng. Engineer, Stratégies et projets d'innovation – Système énergétique		**2025/07/04**

Verified by

First and last name, title and administrative unit of persons signing this section	Signature	Date YYYY-MM-DD
Philippe Venne, Eng. Engineer, Stratégies et projets d'innovation – Système énergétique		**2025/07/04**

Administrative approval

First and last name, title and administrative unit of persons signing this section	Signature	Date YYYY-MM-DD
Michaël Fauchon Director, Solutions d'innovations appliquées et expertises sectorielles		**2025/07/07**

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Collaboration

First and last name, job title, name of unit and field

The members of Hydro-Québec's expert committee on distributed generation:

Steeve Beaulieu, engineer, Conception du réseau de distribution.
David Bélanger, technician, Conception du réseau de distribution.
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David Cécire, engineer, Stratégies et projets d'innovation – Système énergétique
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Eve Desharnais, technician, Conception du réseau de distribution.
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Cynthia Morneau, technician, Conception du réseau de distribution.
François Noiseux, engineer, Stratégie et encadrement régionaux - Exploitation
Martin Raymond, manager, Conception du réseau de distribution.
Mathieu Rohmer, engineer, Système énergétique de l'avenir.
Yannick Roy, engineer, Évolution du système énergétique.
Philippe Venne, engineer, Stratégies et projets d'innovation – Système énergétique

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Appendix A

Form (in French only):

Demande de raccordement d'équipements de production d'électricité au réseau d'Hydro-Québec [request to connect electricity generating equipment to Hydro-Québec's grid]

https://www.hydroquebec.com/self-generation/documentation.html

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Appendix B

Typical one-line connection diagrams

(For information purposes only)

List of figures

ATTENTION

The figures presented in Appendix B are for information purposes only. They must not be used as definitive instructions for the design, installation or construction of an EGF. The customer or its authorized representative remains responsible for the implementation and operation of the EGF and the issues or disturbances it might cause.

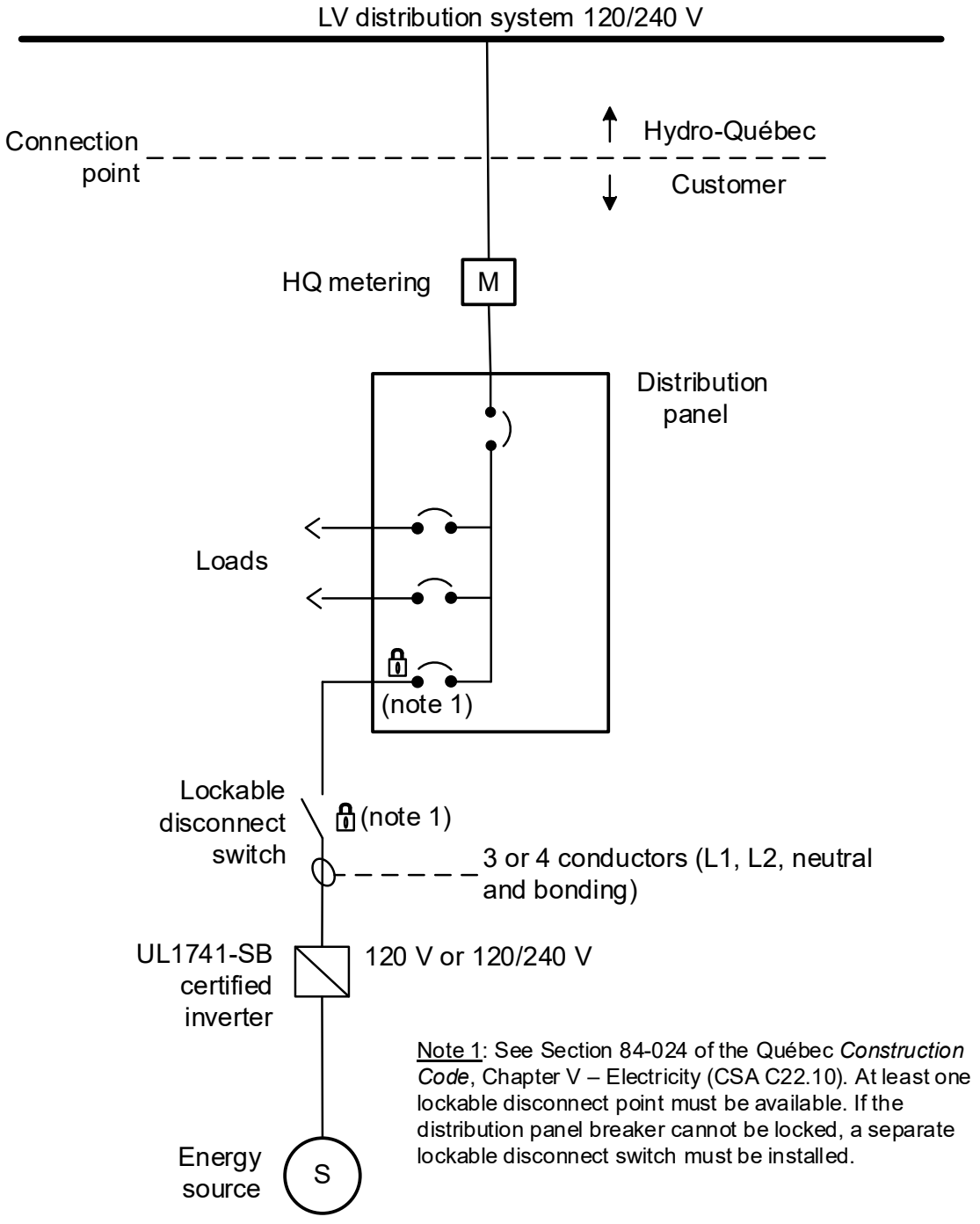

Figure 1: Typical connection diagram for an EGF with a 120/240-V single-phase inverter

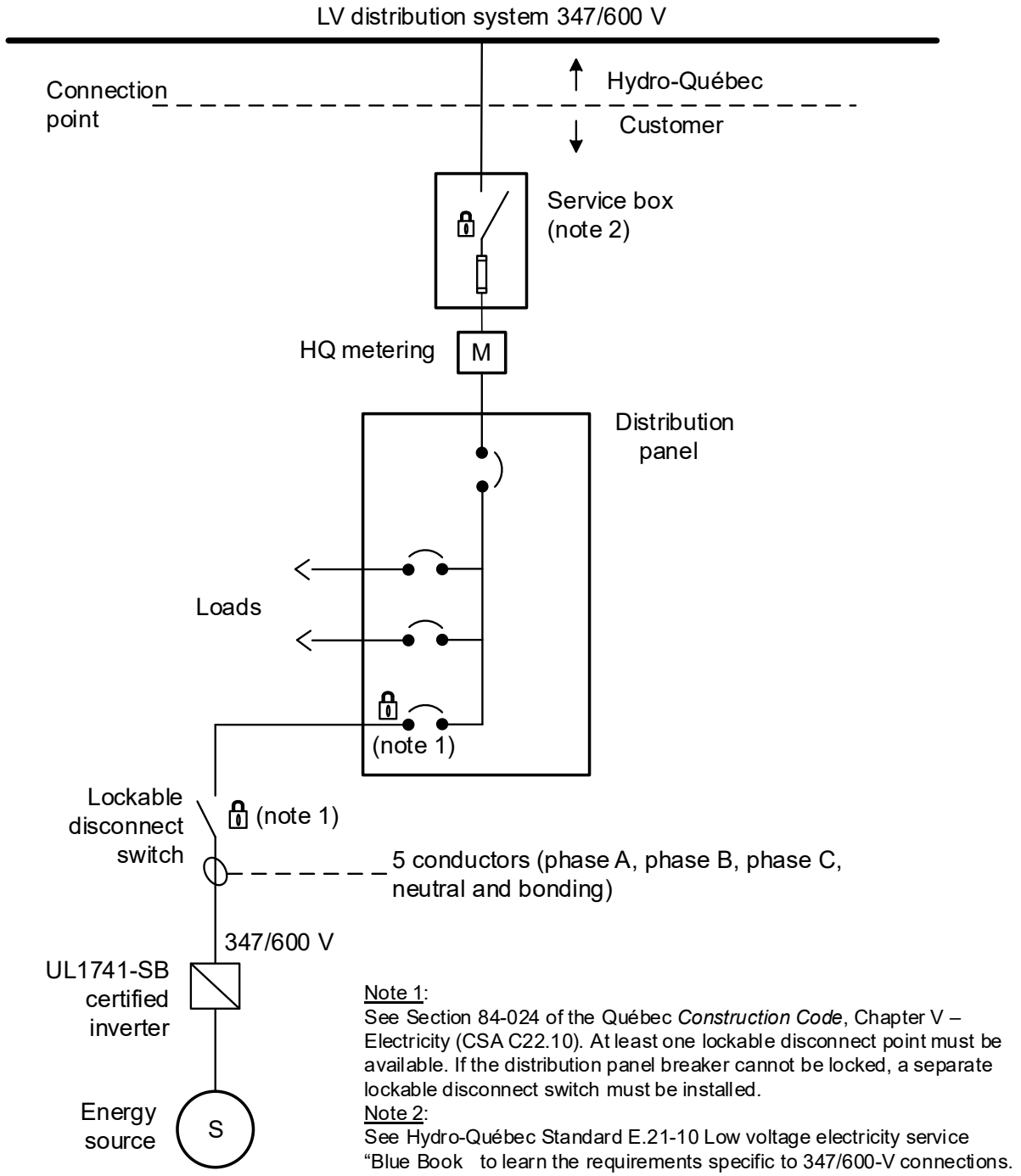

Figure 2: Typical connection diagram for an EGF with a 347/600-V three-phase inverter

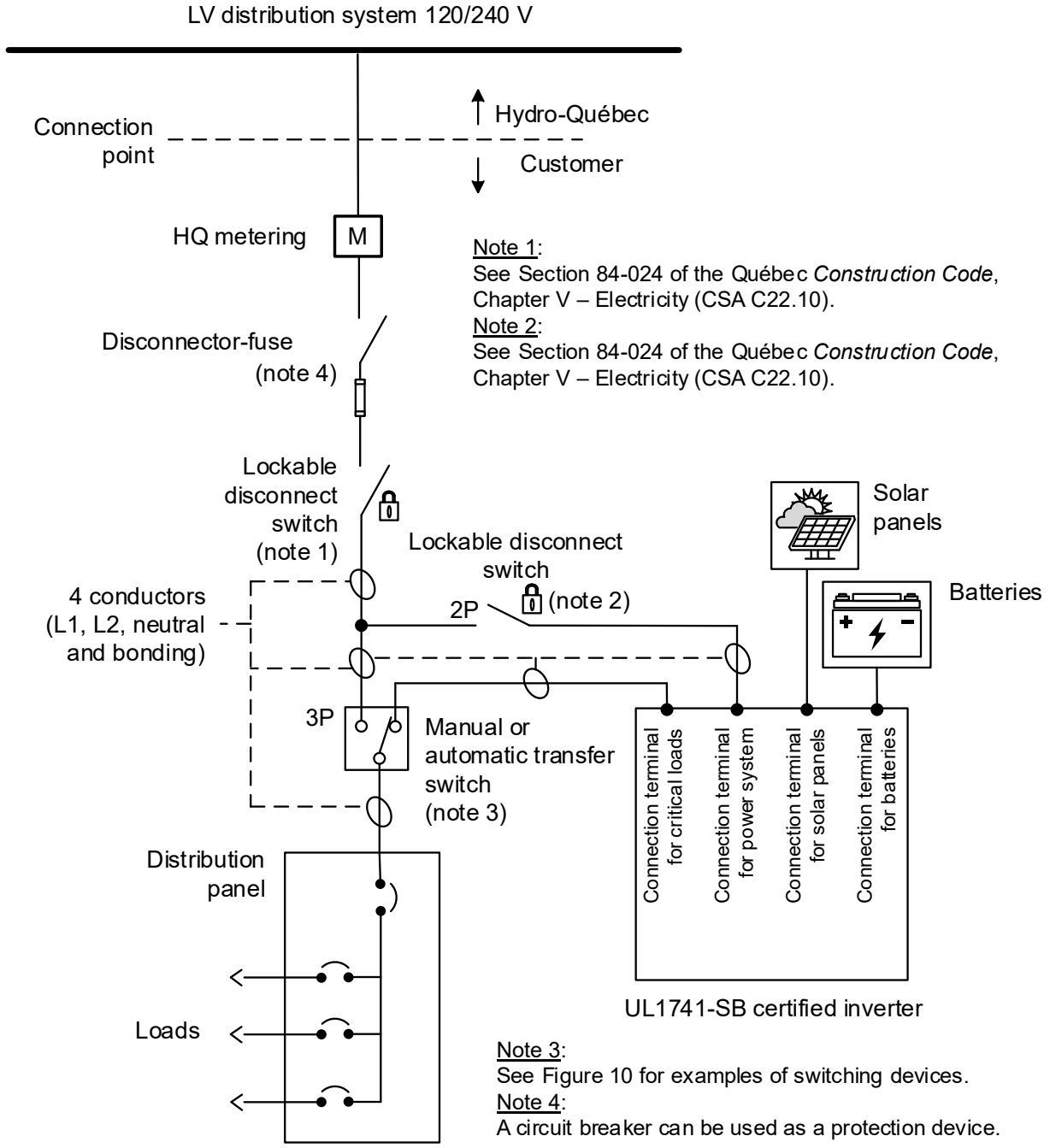

Figure 3: Typical connection diagram with multimode inverter upstream of the electrical panel in a 120/240-V facility

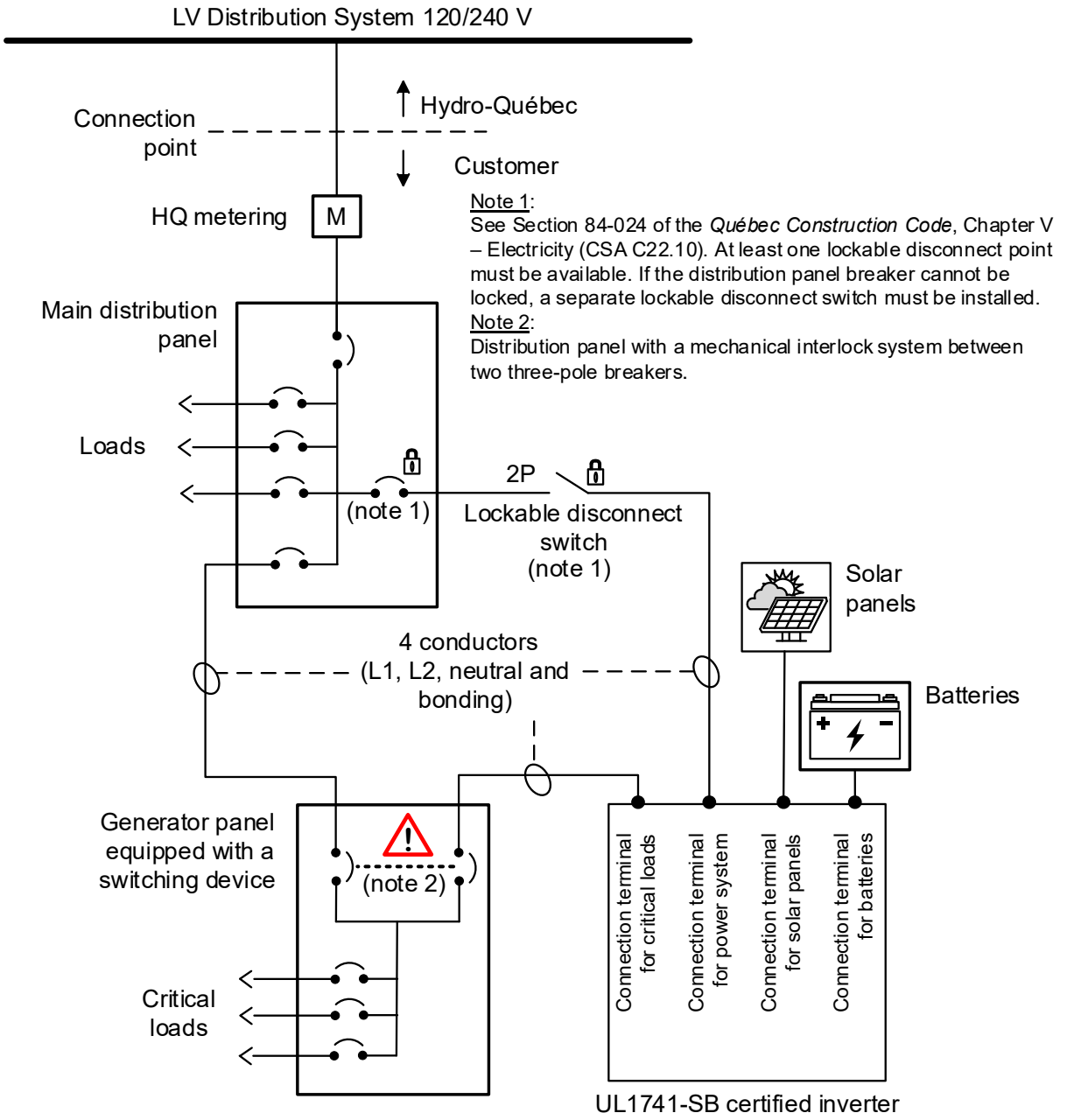

Figure 4: Typical connection diagram with multimode inverter and generator panel for a 120/240-V facility

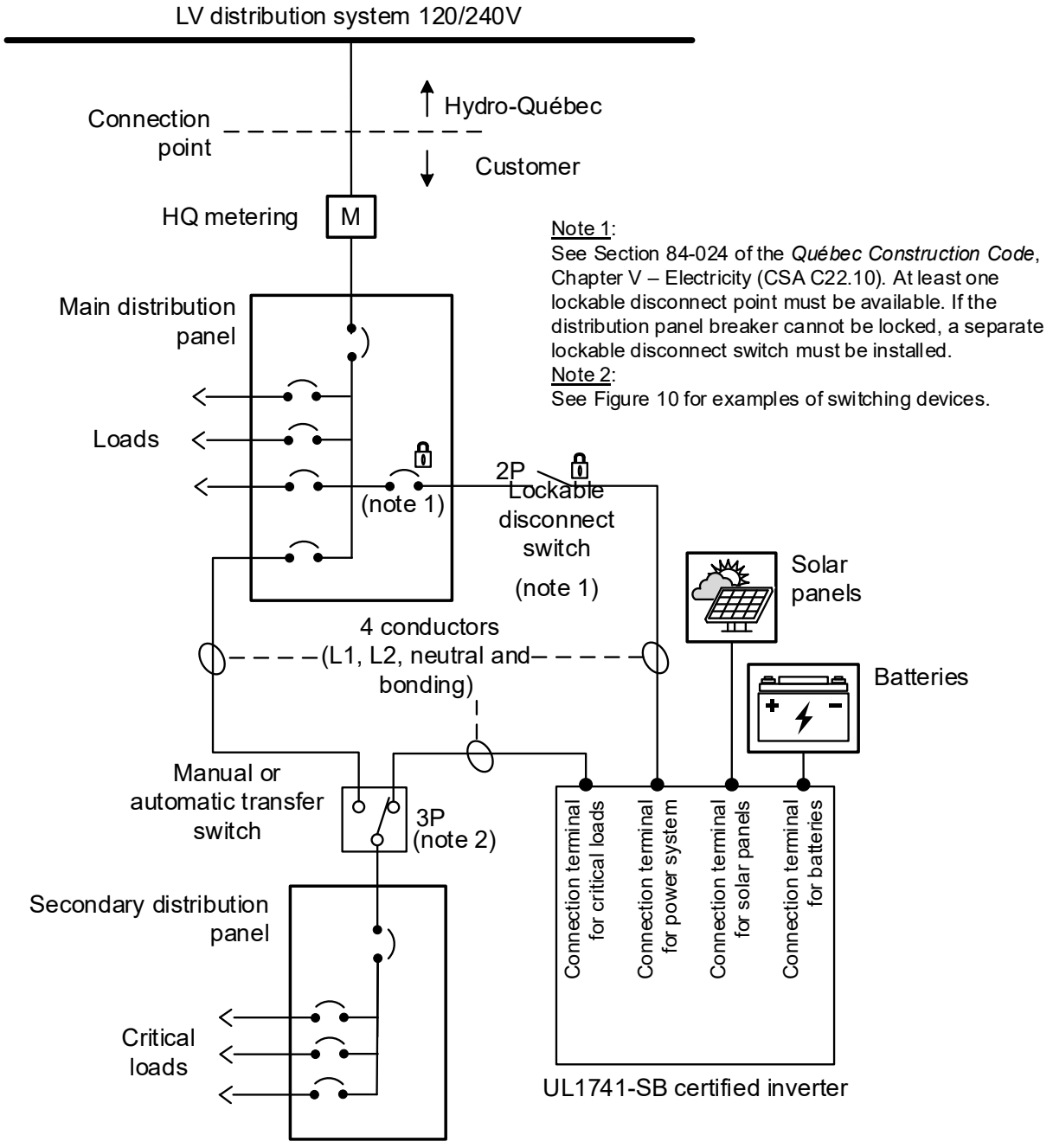

Figure 5: Typical connection diagram with multimode inverter and secondary distribution panel for a 120/240-V facility

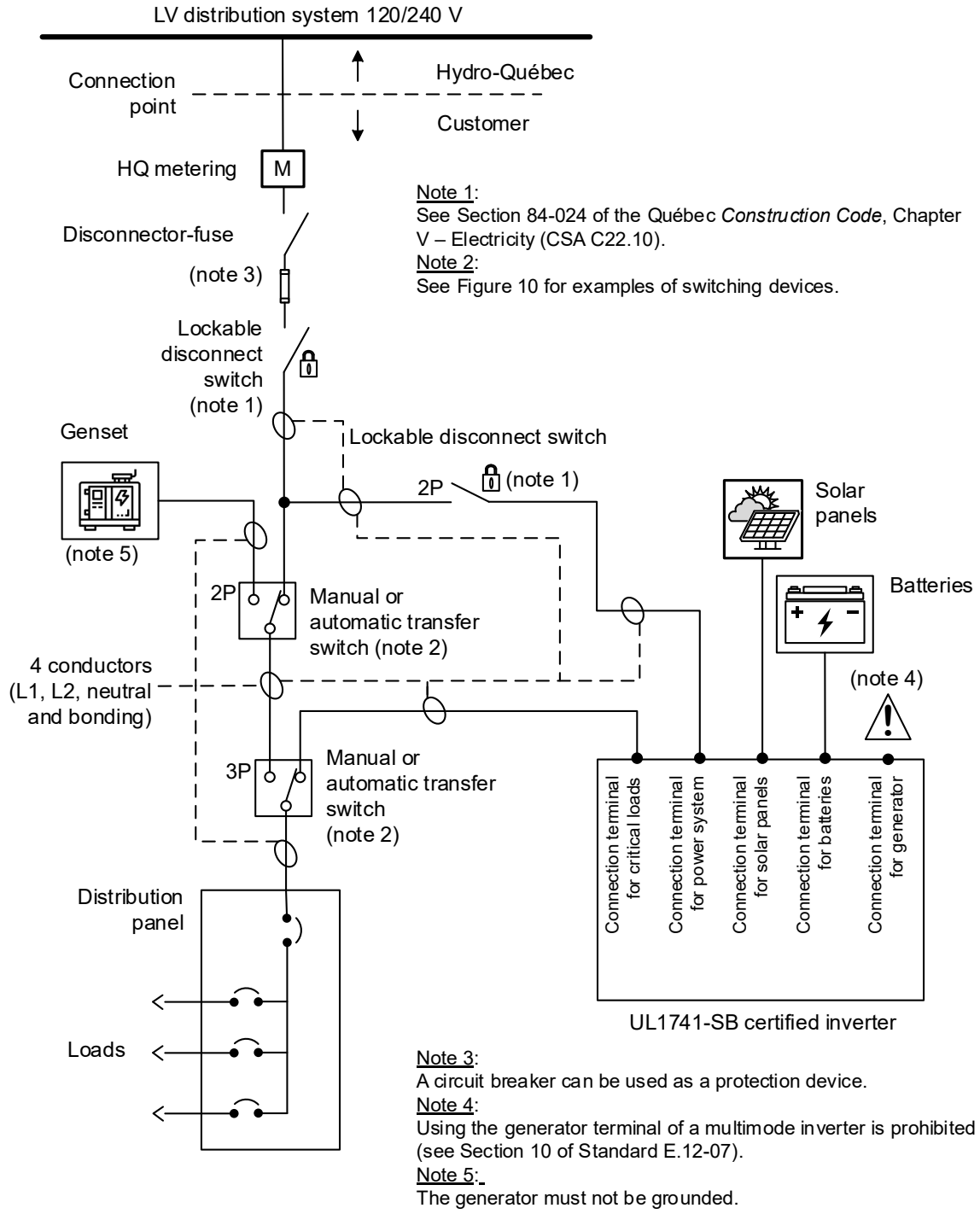

Figure 6: Typical connection diagram with multimode inverter upstream of the distribution panel in a 120/240-V facility equipped with a generating set

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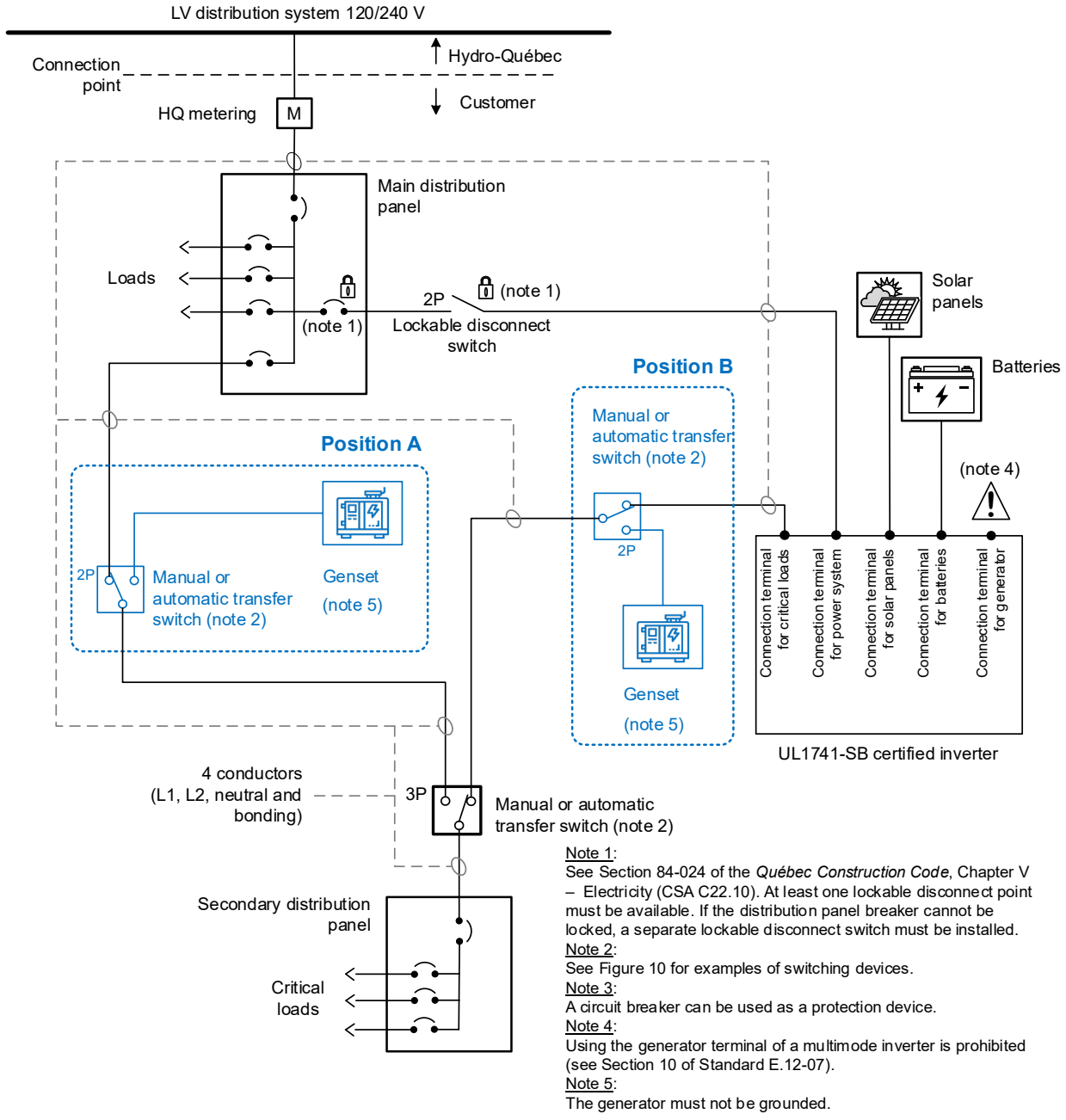


Figure 7: Typical connection diagram with multimode inverter downstream of the main distribution panel in a 120/240-V facility equipped with a generating set

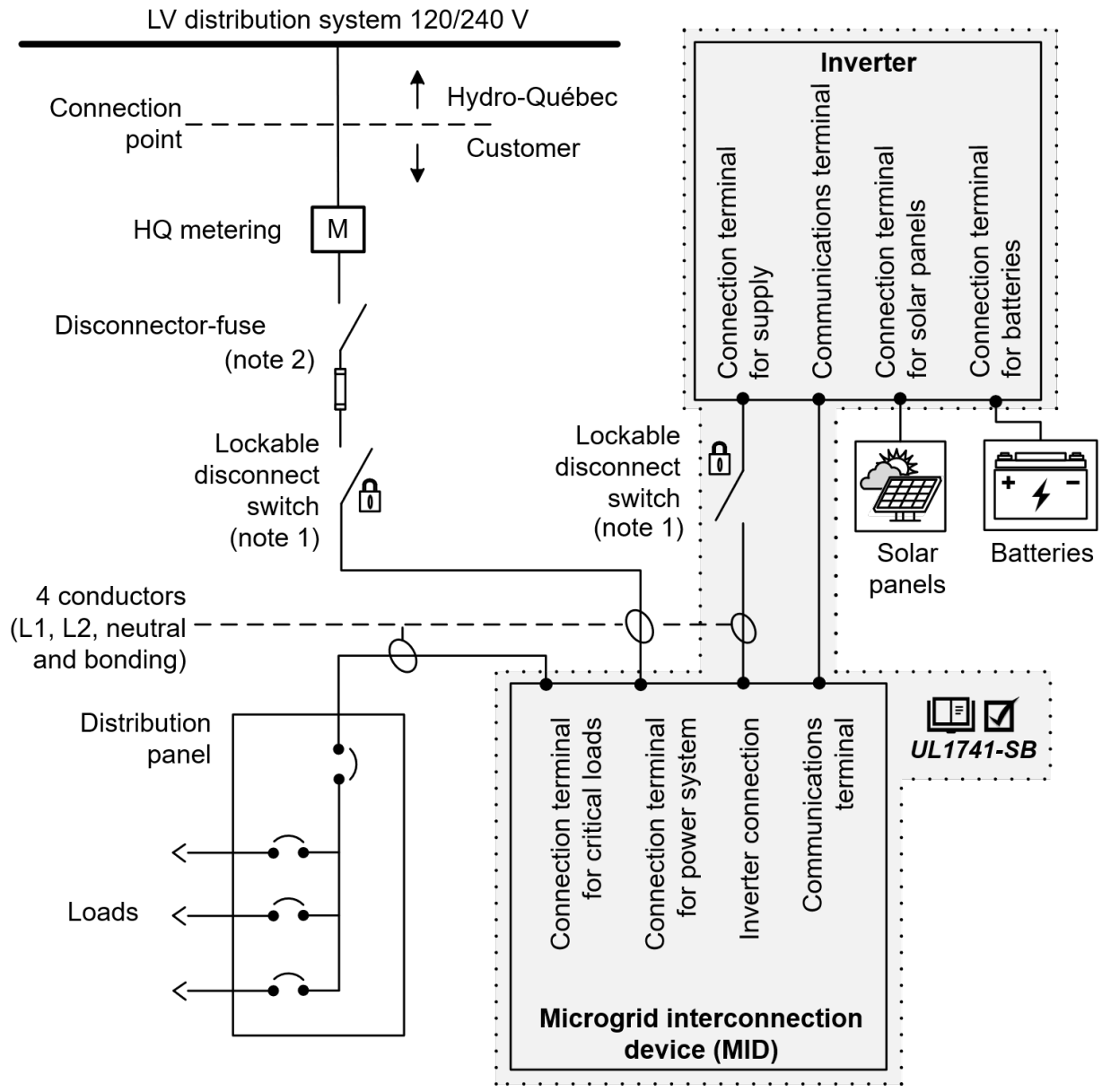


Figure 8: Typical connection diagram for an EGF with an MID upstream of the main distribution panel

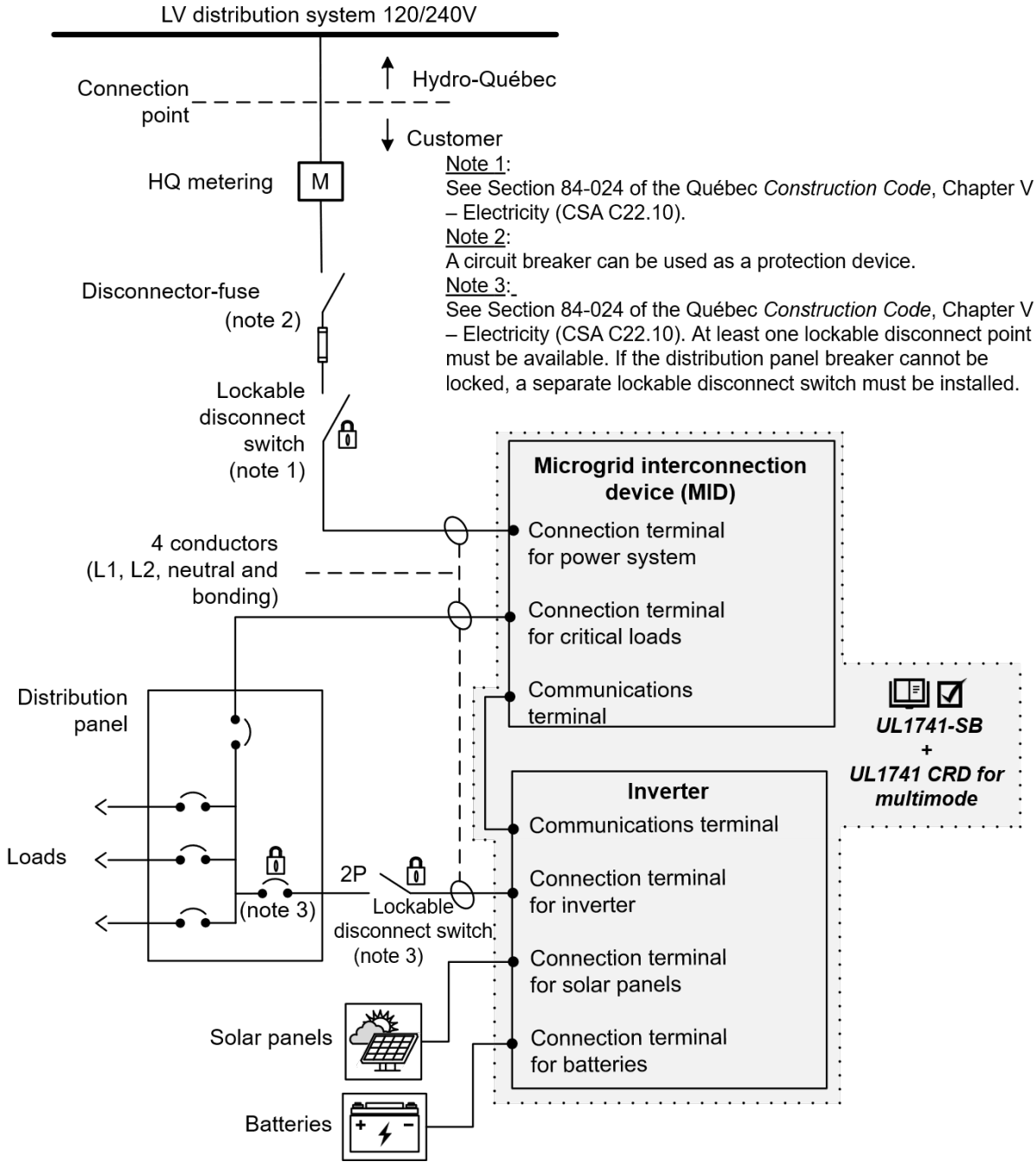
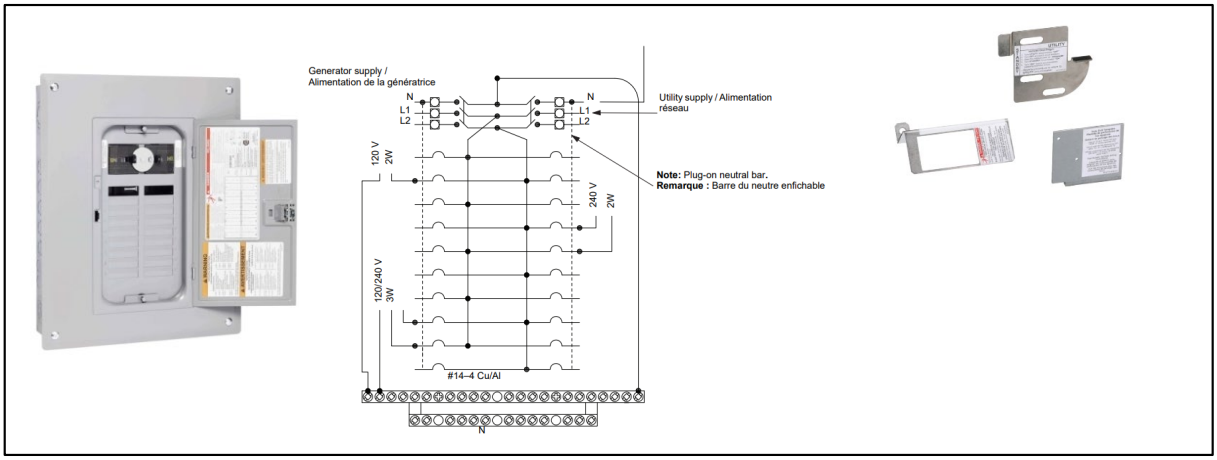
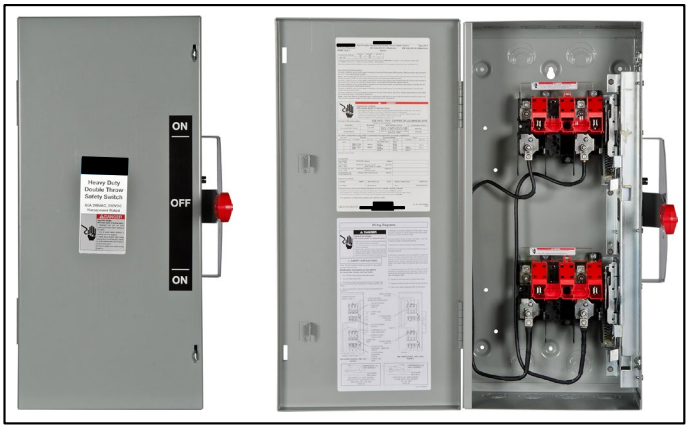


Figure 9: Typical connection diagram for a multimode system upstream of the main distribution panel

(a) Switching device with a mechanical interlock system



(b) Double throw safety switch certified under CSA C22.2 No. 4 or UL 98



(c) Manual transfer switch certified under CSA C22.2 No. 178.1 or UL 1008

(d) Automatic transfer switch certified under CSA C22.2 No. 178.1 or UL 1008

Figure 10: Examples of switching devices equipped with a mechanical interlock system

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Appendix C

Verification report (in French only):
Rapport de vérification des onduleurs de faible puissance visés par la norme E.12-07 d'Hydro-Québec [verification report for low-power inverters covered by Hydro-Québec Standard E.12-07]

https://www.hydroquebec.com/data/cmeq/pdf/rapport-verification-onduleurs.pdf

Appendix D

Examples of tags and safety notices

(For information purposes only)

List of figures

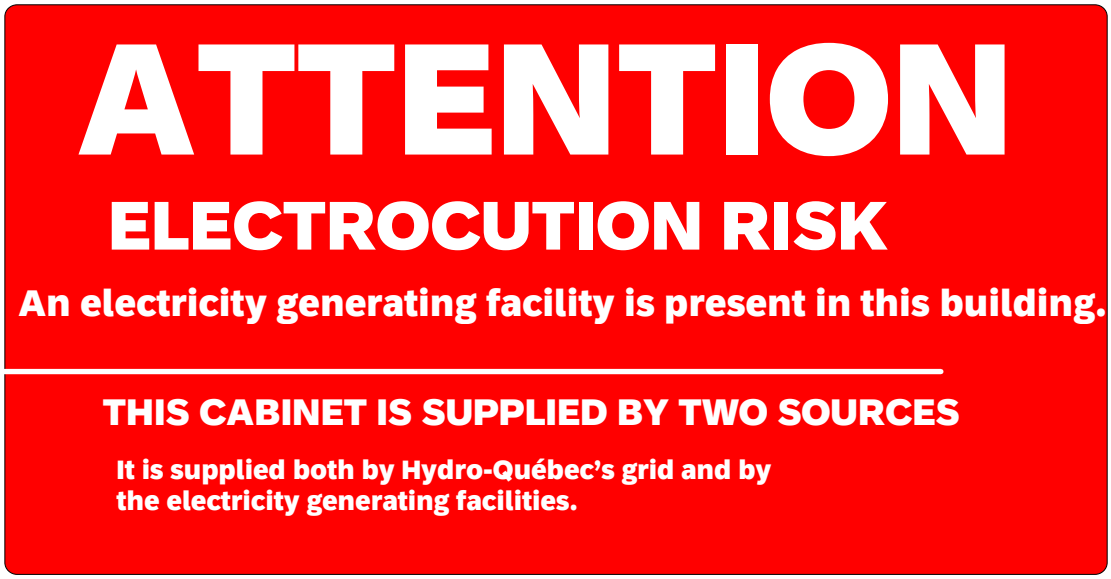

Figure 1: Notice of the presence of an EGF

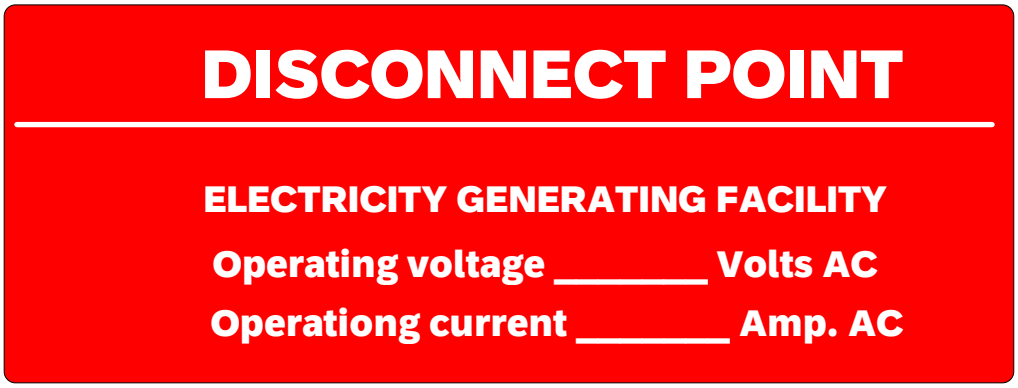

Figure 2: Notice to be posted on the disconnect point of an EGF

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Appendix E

(For information purposes only)

Checklist of main considerations for an EGF connection

- ☐ There is no power transformer between the inverter and the customer's connection point.
- ☐ The total maximum power is 40 kW for a 120/240-V connection or 100 kW for a 347/600-V connection (Section 5.1).
- ☐ Inverter(s) is(are) certified UL1741-SB and IEEE 2030.5 (sections 6.1 and 8).
- ☐ Neutral wire is connected to the inverter's neutral terminal (Section 6.4).
- ☐ Inverter protection settings for voltage and frequency are compliant (Section 7).
- ☐ A lockable disconnect device is located upstream of the EGF (Section 84-024 of Québec's *Construction Code*, Chapiter V – Electricity (CSA C22.10)).
- ☐ Safety notices have been posted (Section 5.6).

In addition, if the EGF will be used for backup power supply (Section 10):

- ☐ The shutting down of the inverter allows critical loads to be supplied by Hydro-Québec's system.
- ☐ The backup energy source is connected to the "backup" terminal of the transfer switch, if applicable.
- ☐ If the EGF does not have an MID, the inverter has two distinct connection terminals.
- ☐ A DC source is used for the backup supply.
- ☐ If a generator is installed, it is not connected to the inverter's "generator" terminal and a transfer switch is used (Figure 10 of Appendix B).

In addition, when the EGF has an MID (Section 10):

- ☐ The inverter and MID are certified under UL1741-SB.
- ☐ The inverter and MID are connected in accordance with the manufacturer's manual.
- ☐ If the inverter and MID are installed as in Figure 9, certification under "UL1741 CRD for multimode" was sent with the connection request.