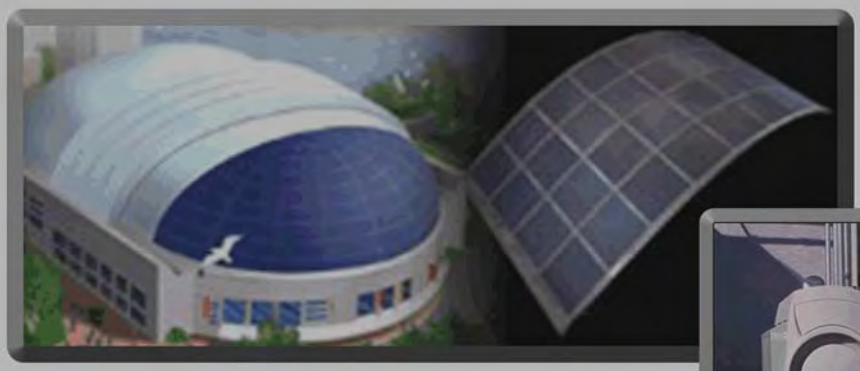
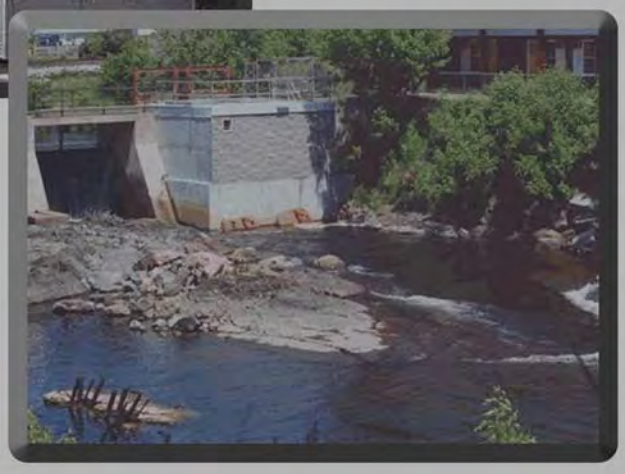


Connecting Embedded Generation to Niagara Peninsula Energy's Distribution System



This document was prepared by:

AESI Acumen Engineered Solutions International Inc.
775 Main St. East, Suite 1B,
Milton, ON
L9T 3Z3
Tel: (905) 875 2075
www.aesi-inc.com

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Introduction

As the Local Distribution Company (LDC) responsible for supplying, distributing and metering electricity within its licensed area, Niagara Peninsula Energy has prepared this information package for those parties interested in connecting Embedded Generation ("EG[1]") facilities to its Distribution System.

In the past, most electricity generation was provided from centrally located generating plants connected to a provincial high voltage transmission grid that moved electricity around the province to the supply locations where it would be distributed to individual customers.

Today many home, farm and small business owners are considering the installation of alternative forms of electricity generation such as renewable electricity generation (embedded generation) and connecting it to run in parallel with the Local Distribution Company (LDC) electrical system. Examples are the installation of small wind turbines, photovoltaic (solar) systems, micro-hydro turbines or renewable bio-mass, bio-fuel, bio-gas or water power. These systems are intended not only to reduce the amount of power purchased from the local electricity distribution company but also to export electricity to the LDC to generate revenue for the owners/operators. Where these systems are powered from renewable sources such as wind, flowing water or sunlight they also provide environmental benefits.

Technological improvements, regulatory reform, increased environmental consciousness, and Ontario's goal of increasing Renewable Electricity Generation capacity by 8000 Megawatts (MW) before the year 2025 has provided an opportunity to introduce wind, solar, bioenergy, and small hydro generation systems into the provincial energy mix. In order to encourage development of micro, small, and medium sized Renewable Energy Generation facilities, the Provincial Government has introduced the Standard Offer Program for Renewable Energy Supply in addition to Net Metering options for those interested in supplying renewable energy through their local electricity distribution system. EG is any type of electrical generator or static inverter producing alternating current that has the capability of parallel operation with Niagara Peninsula Energy's Distribution System, or is designed to operate separately from Niagara Peninsula Energy's Distribution System and can supply a load that can also be fed by Niagara Peninsula Energy's system.

Although this information package primarily addresses the emerging role of EG through the sale of some or all of the electricity generated by exporting it through Niagara Peninsula Energy's electricity Distribution System, some EG is intended to provide electricity solely for a customer's own use, such as stand-by or load displacement

[1] Embedded Generation is also referred to as Distributed Generation or ("DG") or Parallel Generation

generation. Where the EG is not intended to export electricity to a Distribution System only certain sections of this document will apply.

EG also varies in design and fuels and while the Ontario Government's program only includes renewable energy such as wind turbines, photo voltaic cells, biogas and hydroelectric sources this guide is still applicable to generation from diesel or natural gas standby generators and natural gas co-generation. A further variable is size, from very small (micro) wind and photovoltaic units in the under 10 kilowatt (kW) range to larger generation in excess of10 megawatts (MW).

The variability and breadth of scope in potential projects and the range of understanding of EG developers make it a challenge to provide information on connecting EG to Niagara Peninsula Energy's Distribution System and those interested in connecting EG may or may not have an appreciation of the technical requirements and the complexity of electrical systems.

This guide contains an overview of the Ontario electricity transmission system, Niagara Peninsula Energy's Distribution System and safety, power quality, protection and other technical issues related to new generation.

This information package contains the following information:

- A description of the way electricity is typically generated, transmitted, and distributed in Ontario and the resulting technical implications for prospective EG developers generators.

- An overview of the options available for connecting different types of EG to Niagara Peninsula Energy's Distribution System and the different programs in Ontario through which generators can sell their electrical output.

- An overview of the technical, safety, and regulatory considerations that prospective distributed generators must be aware of.

- A description of the administrative process for connecting EG facilities to Niagara Peninsula Energy's Distribution System.

- A section on the financial compensation process for EG supplied by Niagara Peninsula Energy.

- The Initial Consultation Request form that starts the connection process.

- The Application Form to request a more detailed Connection Impact Assessment if a prospective EG developer wishes to pursue a project further.

- Links to publicly available web sites where additional documents, information and self help materials on electricity generation, applicable standards, regulations etc are available and other helpful resources for EG developers.

This information package is intended as a starting point for those interested in connecting EG to Niagara Peninsula Energy's Distribution System. It provides high level outlines and simplifications of processes and regulations that are described in detail in a number of publicly available documents, the content of which will change from time to time. Some of these documents are included as Appendices; others are available from various agencies and organizations, some of which are listed in Appendix 1. It is recommended that anyone interested in connecting EG to Niagara Peninsula Energy's Distribution System read all relevant documentation carefully. Should there be a conflict between this information package and the rules, regulations, and specific information as laid out in relevant documents regarding the connection of EG facilities to a Distribution System in Ontario, the rules, regulations, and specific documents shall take precedence.

EG proponents should also visit available websites and information sources to check if updated material is available or if changes have been made. Appendix 2 contains a number of definitions and terms that are used in this document.

If you are interested in connecting an EG facility to Niagara Peninsula Energy's Distribution System or have any questions about the content of this information package please get in touch with the Contact Person named on Page 19 of this document.

Agencies and Organizations involved with Ontario's Electricity System

Some of the agencies and organizations involved in electricity in Ontario that EG developers might deal with in projects are

Agency/Organization	**Roles and Responsibilities**
The Ontario Government and the Ontario Ministry of Energy	• Establish public policy, pass legislation and regulations relating to electricity • Create other agencies IESO, OPA, OEB, etc., and determine public policy for the existence of Hydro One, OPG and LDCs • Significant legislation: Electricity Act, 1998 and Regulations, Ontario Energy Board Act 1998, Electricity Restructuring Act 2004

Independent Electricity System Operator (IESO)	• The Independent Electricity System Operator (IESO) operates and manages Ontario's electricity system at the generation and transmission level. It does not design, build or own the system; it coordinates how the system interacts and performs and it monitors the performance, reliability and future adequacy of the system to provide electricity to Ontarians. The IESO creates electricity market rules, matches generation with load 24/7, establishes the Hourly Ontario Energy Price (HOEP) and settles wholesale electricity payments.
Ontario Power Authority (OPA)	• Although, the IESO operates the electricity system the Ontario Power Authority (OPA) forecasts, plans and is responsible for bringing new resources onto the system in the medium and long term so that the IESO has adequate resources to manage. It is also involved in demand management, conservation and renewable energy activities as directed by its mandate and government.
Ontario Energy Board (OEB)	• The Ontario Energy Board (OEB) is the province's electricity regulator and is responsible for protecting the interests of consumers with respect to prices, reliability, adequacy and quality of electricity service and to promote economic efficiency of generation, transmission and distribution. The OEB approves the rates charged by transmitters (greater than 50 kV) and distributors (less than 50 kV) and creates codes and regulations for certain aspects of how transmitters and distributors conduct their business. • The OEB issues licenses for generators, transmitters, distributors, and retailers. • The OEB does not set rates for generation; that is a competitive process either through the Hourly Ontario Energy Price or third party contracts, but it has set prices for small consumers
Ontario Power Generation (OPG)	• Ontario Power Generation (OPG) owns and operates most of Ontario's generating capacity. The Province of Ontario owns OPG.
Hydro One Networks (HONI)	• Hydro One is the province's largest transmission company and owns the provincial transmission grid. Hydro One also distributes electricity outside of the major urban centres. It supplies LDCs from Transformer Stations (TSs) at 13.8kV, 27.6kV and 44kV or Distribution Stations (DSs) at lower voltages. EG directly or indirectly connected to Hydro One TSs or DSs may require co-ordination with Hydro One. The Province of Ontario owns Hydro One.
Electrical Safety Authority (ESA)	• The Electrical Safety Authority (ESA) is responsible for ensuring that electrical equipment is installed safely and meets required standards in accordance with the Ontario Electrical Safety Code (OESC).

Measurement Canada (MC)	• Measurement Canada (MC) is a federal agency of Industry Canada with the mandate of regulating meters and metering throughout the country. MC administers the Electricity and Gas Inspection Act. R.S. 1985, C.E-4.
Ontario Ministry of Environment (MOE)	• The Ontario Ministry of Environment (MOE) sets environmental standards for electricity projects in Ontario and ensures that generators, distributors and transmitters follow rules and standards when constructing and operating facilities.
Niagara Peninsula Energy	• We are a Local (electricity) Distribution Company (LDC). We are regulated by the Ontario Energy Board and operate under all of the legislation, codes, rules and regulations set by the agencies, authorities and companies listed above. An LDC's core business is the distribution of electricity. Since we do not generate electricity and earn our revenue through transporting electricity across our wires we are impartial to the source of generation. The local municipality is the sole shareholder of Niagara Peninsula Energy.

Ontario's Electricity Transmission & Distribution System

In the past, and predominantly today, Ontario's electricity system consists of large, centrally located generating stations linked with load centres over long distances by high voltage transmission lines. Transmission voltages are greater than 50 kV, which are more efficient for transmitting large amounts of power, but impractical for delivering power to many utilization points therefore, the voltage must be reduced to supply end users of electricity such as homes and businesses. Transformer Stations reduce the voltage to a level suitable for distribution (under 50 kV) at which point the electricity supply becomes distribution lines owned and operated by "Local Distribution Companies" (LDCs) such as Niagara Peninsula Energy.

Niagara Peninsula Energy's electricity Distribution System delivers power to end users through 27.6 kV and 13.8 kV primary distribution lines. These lines deliver electricity to large (industrial scale), medium (institutional scale) and small (home scale) consumers, respectively.

For those unfamiliar with electricity transmission and distribution systems, it can help to compare them to a system of roads. The transmission system is analogous to Highway 401, carrying large volumes of electricity to an area. The exits off the 401 into our community represent transformer stations that allow electricity to travel safely onto our community's main arterial roads at lower volumes. These main arterial roads in turn are linked to residential streets and deliver smaller quantities of electricity to our residential neighbourhoods.

Unlike roads in our community most electricity lines have in the past been one-way streets. While the system is designed primarily to deliver electricity from the transmission grid to end users, with EGs it is now possible for electricity to be fed into

the Distribution System to supply local loads and, in some cases, all the way back to the transmission grid. Just as a residential street can't handle a large volume of traffic without disturbing the local residents, lower voltage distribution lines cannot handle large amounts of electricity generation without disrupting electricity service to other customers.

In general the maximum amount of EG that can be connected to Niagara Peninsula Energy's distribution lines is as follows:

Under 5 kV lines - small amounts of EG possibly up to 500 kW.
Over 5kV lines – possibly up to 10 MW

The above examples presume the existence of three phase primary distribution facilities with sufficient conductor size and load levels to permit the presence of EG. Inadequate conductor size or certain load levels could restrict the amount of EG that can be accommodated. Niagara Peninsula Energy also has many other distribution facilities such as single-phase primary lines and secondary conductors which can handle very small amounts of EG but would need to be upgraded for larger EG installations. The actual ability of Niagara Peninsula Energy's lines to accept EG can only be determined by a thorough engineering review.

An LDC's distribution feeder capacity to accommodate EG can be limited depending on where the EG is to be located along the feeder. There could be a lesser capacity at the end of a long feeder than at the beginning, closer to the supply. At a low capacity site, the impact of the EG can be great enough to disturb other local customers. This is not acceptable. For this reason, it is sometimes necessary to reinforce the network, or connect the EG to a higher voltage or higher capacity part of the network at an alternate location.

The systems required to protect Niagara Peninsula Energy's Distribution System from faults and disturbances that can occur with an EG connected will also vary by EG size and distribution line parameters. This means that similar EG projects connected at different locations could have different protection requirements based on different local load conditions, as well as on Niagara Peninsula Energy's feeder and transformer characteristics.

Depending on the size, type, fuel, and location of an EG project, the Ministry of the Environment (MOE) may require that the EG developer complete an environmental assessment. Please contact the MOE for more information.

Details of Niagara Peninsula Energy's Distribution System are available, on request, to assist a potential EG developer to determine the approximate capacity of Niagara Peninsula Energy's line in the area of interest for an EG location.

Size classifications for EG facilities

The first step in connecting EG to a Distribution System is to determine the size of the facility that is being planned. The connection process, technical considerations for

connection, connection costs, and regulatory issues each vary depending on the size of the EG.

Micro

A Micro generation facility is defined as an EG with a nameplate generation capacity of 10kW or less. All but the very largest of home-based energy generation systems will fit into this category. If the generation facility is non-renewable, its owners can receive financial benefits by displacing energy consumption from the grid. If it is a renewable energy generation facility, its owners can participate in either Net Metering or the Standard Offer Program. The technical and financial requirements of other financial settlement options are often too onerous for Micro generators to consider. Micro generation is often subject to a simplified connection process due to its relatively minimal impacts on the electricity Distribution System when installed and less demanding ESA specifications.

Small

Small generation facilities are defined as having a nameplate capacity of 500 kW or less when connected to Distribution System voltages less than 15 kV, or as having a nameplate capacity of 1 MW or less when connected to Distribution System voltages of more than 15 kV. These facilities can include larger solar arrays, small biogas, wind, and co-generation facilities, commercial scale wind turbines, or industrial sized backup electricity generators. If eligible, small renewable energy generators can participate in any one of the financial settlement options listed in this guide.

Depending on the results of a Preliminary Review with Niagara Peninsula Energy, prospective Small Generators may be subject to a simplified connection process otherwise Small Generators will have to go through the Connection Impact Assessment process and pay the cost of any upgrades, connection costs or metering changes required to connect to the Niagara Peninsula Energy Distribution System.

Mid-Sized

Mid-sized generation facilities have total connected nameplate capacities of more than 500 kW when connected to a Distribution System voltage of under 15 kV or more than 1 MW when connected to Distribution System voltages over 15 kV up to 10MW. Mid-Sized generation facilities are typically commercial or industrial scale endeavors. The capital cost for these facilities can range from hundreds of thousands of dollars to the multi-million dollar range.

Mid-sized projects can experience complex technical and financial issues and the EG developer may need to acquire engineering and technical resources with experience in the connection of mid to large-scale generation. In order to connect mid-sized generators, Niagara Peninsula Energy may require system upgrades, metering changes and protective relaying modifications to be made at the generator's expense. Mid-size

generators are not eligible for Net Metering, but can participate in all other financial settlement mechanisms.

Large

Large distributed EG projects are those with total connected nameplate capacities of over 10 MW. These facilities are typically only connected to the highest distribution voltages, are subject to the most complex and costly connection process. They typically earn financial returns by supplying very large energy consumers or retailers, taking the wholesale Hourly Ontario Energy Price, or by bidding into tenders by the Ontario Power Authority for electricity supply.

Large EG projects are multi-million dollar initiatives requiring a high level of technical and financial sophistication. Large sized generators are not eligible for Net Metering or the Standard Offer Program.

Safety, Power Quality and Protection

Technical details are the heart of the interconnection process with safety, power quality, and system reliability being the primary utility concerns and responsibilities. Reference materials that determine the requirements for these interconnections have been prepared by a number of bodies and agencies including the OEB, ESA, the Institute of Electrical and Electronics Engineers (IEEE), and The Canadian Standards Association (CSA). This section summarizes safety and technical issues to help describe where they fit and why in the context of the interconnection process. The goal here is to provide background and rationale, while not going into extensive technical detail, therefore, where appropriate, references are given for those seeking additional details. A web search of EG interconnection will present a wealth of valuable information. See Appendix 2 for links to a few resources.

The OEB's Distribution System Code Appendix F.2 outlines the technical requirements for connecting a generator to an electricity distributor's system. Appendix 3 of this document specifies the Technical Requirements for an EG that is proposing to connect to Niagara Peninsula Energy's Distribution System. As part of Appendix 3 the relevant sections of Appendix F.2 have been cross-referenced as they relate to safety, power quality and protection.

Safety

Any system that produces even small amounts of electricity can be potentially dangerous, creating the possibility of electrocution and fire hazards. Improperly installed systems will create serious safety hazards to property owners, their friends, family, employees and local electric distribution company workers and can damage connected electric equipment. For this reason EG systems require protection devices to protect the Distribution System, utility workers, utility customers and the general public. Large industrial customers have been generating power on-site for many years, but

interconnecting photo voltaic, wind turbines, co-generation, micro turbines, and other relatively small generation systems to operate in parallel with the grid at residential and commercial locations is an increasing and recent trend. Before installing any type of EG, whether it is stand-alone or connected to the grid, it is important to understand the safety requirements.

Utilities are concerned about the potential for EG sources – not under their control – supplying energy to one of their lines that is otherwise thought to be de-energized. This is known as islanding and is discussed below.

Distinctions between types of EG

It is difficult to generalize safety issues with regard to EG because of the variety of types of generators, for example: solid-state or static inverters, induction machines, and synchronous machines.

Many smaller renewable energy systems produce acceptable quality AC power through an inverter and are therefore typically grouped together.

Induction and synchronous generators, on the other hand, are generally grouped together as "rotating machines," but their different configurations do give them different start-up and operational characteristics. For example, induction machines cannot operate in standalone mode and generally require the presence of the grid for rotor excitation and normally have a lagging power factor. Synchronous machines on the other hand can operate without the grid and can have a zero or leading power factor.

In practice, it is much more difficult for inverter-based generators to power an island and inverters can feed far less current into a fault. This means that inverter-based and rotating generators are treated differently in the codes and standards, with very small inverter-based devices requiring less – if any – additional protection equipment. Larger inverter based systems would require supplementary protection devices and breakers as described later and in Appendix 3.

Where EG is intended solely for load displacement and it can de demonstrated that it cannot and will never be connected, paralleled or export electricity to the Distribution System, Niagara Peninsula Energy must still be advised of its presence but the approvals required are primarily from ESA.

Islanding

One of the biggest concerns utilities have about EG is to avoid a condition known as islanding. Islanding happens when a section of the utility system containing both loads and an EG source becomes separated from the remainder of the utility system but remains energized.

This could happen where a fault occurs on the Distribution System and automatic isolation of a utility protective device occurs. Since automatic reclosing is normally used on Distribution Systems to clear temporary faults it is essential that the EG disconnects from the Distribution System before the first automatic reclosure occurs. The EG must be disconnected automatically before the utility protective device recloses otherwise a) the EG may feed into the fault and b) when the utility protective device tries to reclose it will be closing back in on a line that is being supplied by EG resulting in possible equipment damage to the EG, overloading or power quality issues

With central generation, transmission lines and transformer stations a utility knows that if an electrical circuit is isolated "upstream" and is not being fed from an alternative source it is de-energized. With EG, utilities need to come to terms with multiple sources of electricity supply on their systems and to deal with the change in operating conditions that result.

The utility may want to isolate a section of line for maintenance purposes. Opening switches would normally accomplish this. While a utility can be sure all of its own electricity sources are either shut down or isolated from the area that needs work they must now factor in the EG to ensure that it too is isolated and not supplying the line section.

EG creates a source of energy inputs to our utility system that we do not control and if the EG is potentially capable of islanding it can back feed electricity to our Distribution System.

Power Quality

Power quality is a significant technical concern for Niagara Peninsula Energy and its customers. Utility power is consistently supplied at a standard voltage and frequency. In North America, residences receive single-phase alternating current (AC) power at 120/240 Volts at 60 cycles per second (60 Hz), and commercial buildings typically receive either single phase or three-phase power depending on the size of the building and the types of loads in the building.

Power quality is important because electronic devices and appliances have been designed to receive power at or near rated voltage and frequency standards and deviations may cause appliance malfunction or damage. Additional power quality considerations include harmonics, power factor, DC injection, and voltage flicker.

Each type of EG device has its own output characteristics based on its technology therefore some will have more power quality issues than others.

Voltage Fluctuations and Voltage Regulation

Voltage fluctuations can result from an EG being connected to or disconnected from the utility system or because of its generation operating characteristics. The standards set

certain limits which must be achieved for events that occur within the EG's operating cycle. Whether the utility actively or passively regulates their voltages to maintain an acceptable range, the presence of EG must have no detrimental impact on that regulation. Normally the EG must not try to regulate the voltage and frequency on the utility line but instead must follow the utility voltage and frequency and disconnect for any abnormality.

Voltage Unbalance

Utilities try to operate their three phase lines with voltages in the three phases balanced as closely as possible. The presence of a distributed generator should not contribute to additional voltage unbalance. See Appendix 3 for specifications.

Frequency

Frequency variations are a reliability and power quality issue and must be maintained within the range specified in Appendix 3.

Harmonics

Harmonics generically refer to distortions in the voltage and current waveforms caused by the overlapping of the standard sinusoidal waveforms at 60 hertz (Hz) with waves at other frequencies that are other multiples of 60 Hz. Harmonics can be caused by the electronic equipment used in some EG such as soft start units and inverters. Harmonics can cause equipment to fail or overheat and to degrade the service of other customers. Distributed generators must not impose harmonic distortions on Niagara Peninsula Energy's Distribution System in excess of applicable standards. See Appendix 3 for further details and references.

Power Factor

Power factor is a measure of apparent power delivered when the voltage and current waveforms are out of synch. Power factor is the ratio of true electric power, as measured in kilowatts (kW), to the apparent power, as measured in kilovolt-amperes (kVA). The power factor can range from a worst case of zero when the current and voltage are completely out of synch to the optimal value of 100% when the current and voltage are entirely in synch. The terms "leading" and "lagging" refer to whether the current wave is ahead of or behind the voltage wave and are a contributor to the efficiency or inefficiency of the utility's electrical system. See Appendix 3 for specifications.

DC injection

DC Injection is a potential issue for inverters where an inverter passes unwanted DC current into the AC or output side. This can be prevented by the incorporation of equipment and design to prevent or limit the effect. See Appendix 3 for further details.

Voltage Flicker

Somewhat like voltage fluctuations, voltage flicker refers to short-lived spikes or dips in the line voltage that are noticeable to the eye and annoying. It can occur when the outputs from an EG vary, for example with some wind turbines if the wind is gusting or turbulent.

Protection of EG Facility

The EG developer will be responsible for protecting it's EG facility equipment in such a manner that any Distribution System faults - such as outages, short circuits, automatic reclosing of distribution circuits, or other disturbances - do not damage the EG facility equipment. The equipment protection shall also prevent the EG facility from adversely affecting the Distribution System's capability of providing reliable service to other customers.

Monitoring

For EG greater than 250 kW Niagara Peninsula Energy may require remote monitoring of the EG connection status, real power output, reactive power output and voltage at the point of generator connection. For EG greater than 10 MW the monitoring must be in real time.

Standardized or Certified Equipment

The design for an EG installation must be approved by a professional engineer and all equipment must be CSA approved and inspected by the ESA. If the interface equipment used is a standard package or certified for use (by Underwriter's Laboratories (UL) or CSA or some other recognized approving body) as is the case with some inverters and the certification and certifying body are acceptable to Niagara Peninsula Energy this will expedite and simplify the interconnection process. This is especially applicable at the lower EG output levels and will reduce the amount of technical information required.

Protective Devices

The safety, power quality and reliability of interconnected EG is ensured through design, standards, inspection, testing and the provision of switches, breakers and protective relaying incorporated into the EG or as auxiliary equipment. A brief summary is as follows:

- An interconnection device that is manual, lockable, has visible disconnection and is accessible to Niagara Peninsula Energy staff.

- An interrupting device capable of interrupting the maximum available fault current at the EG location.

- A generator disconnect device including disconnect device failure protection.

- A protective relay that will operate the main load interruption device with the following features:
  - Over-voltage trip
  - Under-voltage trip
  - Over/under frequency trip
  - Over current protection
  - Ground fault protection

- Reclosing co-ordination to ensure that the EG ceases to energize prior to the reclosure of an upstream LDC device including lock out protection.

- Anti islanding protection.

- Power Factor correction (if required).

- Synchronizing equipment that will limit voltage fluctuation, frequency variation and phase angle when the EG parallels with the Distribution System.

- Transfer Trip may be required depending on the loading of the distribution feeder and the output rating of the EG relative to the feeder loading.

- Feeder Relay Directioning to prevent inadvertent tripping of a protective device for faults not associated with the protection zone of the device.

- Protection against power swings.

See Appendix 3 for further descriptions and details.

Niagara Peninsula Energy will provide three phase fault levels at the preliminary review stage or Connection Impact Assessment stage. A protection co-ordination study will be required which may involve alternate supplies from different sources. Protection design and ratings should account for these variables.

Grounding

EG facilities must be grounded in accordance with any equipment manufacturers' requirements, the OESC and Niagara Peninsula Energy's requirements.

The EG must not disrupt any coordination of ground fault protection or cause over-voltages that exceed the rating of equipment connected to the Niagara Peninsula Energy Distribution System.

Generation Connection Process

The process that Niagara Peninsula Energy is required to follow for connecting an EG to its Distribution System is detailed in the OEB's Distribution System Code, Appendix F. The starting point is for potential EG developers to complete the form attached as Appendix 4 and return it to Niagara Peninsula Energy.

Designated Point of Contact

The initial contact person at Niagara Peninsula Energy will be Tom Sielicki.

Contact information is:

Niagara Peninsula Energy Inc.
7447 Pin Oak Drive
Niagara Falls, ON L2E 6S9

E mail: tom.sielicki@npei.ca

Phone: (905) 356-2681 Ext. 6016 Fax: (905) 356-2831

Preliminary Review, Connection Impact Assessment, Technical Review

The following process is described in more detail in the OEB's Distribution System Code and Appendix F of the Code.

Preliminary Review

In the very early stages where an EG developer is considering site selection, Niagara Peninsula Energy will provide a Preliminary Review and high level advice and guidance based on the limited parameters from your completed Appendix 4 - "Application for Preliminary Review of a request to connect Embedded Generation to the Niagara Peninsula Energy Distribution System" such as:

- Potential sites
- The name-plate rated capacity of each unit of the proposed generation facility and the total name-plate rated capacity of the proposed generation facility at the connection point
- Type of technology to be used
- Fuel type

- Generator generic description and design type

And considering:

- Voltage, capacity and loading of distribution lines adjacent to potential sites

After receiving and reviewing the application, Niagara Peninsula Energy will advise on

- The basic feasibility of the project.
- A range of cost estimates that might be encountered if changes or upgrades were required.
- The additional application forms and materials required.

Niagara Peninsula Energy Connection Impact Assessment

Where the EG project is over 10 kW and where required, Niagara Peninsula Energy will perform a Connection Impact Assessment (CIA) at the EG developer's cost. The CIA looks at:

- The impact of the EG on Distribution System short circuit levels, load flows, current loading, voltage levels and voltage flicker under a variety of Distribution System and EG output conditions to ensure there are no adverse effects.
- The preliminary design of the protection systems being proposed for the EG to assess their adequacy to protect the public, utility employees working on the Distribution System and Distribution System equipment under a variety of fault and operational circumstances.
- A more detailed assessment and cost estimate of the connection feasibility and any upgrades required.

The EG developer submits a completed Appendix 6 – "Request for a Connection Impact Assessment Review/Update To connect Embedded Generation to Niagara Peninsula Energy's Electrical Distribution System". The technical information required for the CIA includes:

EG Description

- Site
- Type of EG
- Output including seasonal and daily variations

- Number of units initially and ultimately, if future expansion is applicable
- Time line for construction and commissioning

Single Line Electrical Diagrams (with ratings or sizes) detailing:

- Point of connection to the Distribution System
- Manual interconnection disconnection device
- Generator
- Generator disconnect device
- Protective relaying and functions and description of how the protection relaying will interface with the generation and the Distribution System under fault or transient events
- Interface Transformer
- Protective isolating device(s)
- Generator breaker
- Voltage levels
- Fusing

Niagara Peninsula Energy will advise the EG developer of the CIA results. If the impact of the EG is within acceptable limits the next step in the connection process can be commenced. If upgrades or changes are required the commencement to the next step will require a Connection Cost Recovery Agreement ("CCRA") between Niagara Peninsula Energy and the EG developer on costs. The EG developer should not order any equipment or make commitments to the project until the CIA has been satisfactorily completed and an Offer to Connect has been made.

Hydro One Impact Assessment

Where Niagara Peninsula Energy Distribution Lines are supplied by or are capable of being supplied by a Hydro One Transformer Station, EG's greater than 1 MW and less than 10 MW connected to Niagara Peninsula Energy's Distribution System may have an impact on Hydro One's Transmission Facilities and will require their separate **Connection** Impact Assessment at an additional cost over and above Niagara Peninsula Energy's CIA cost. An EG greater than 10 MW and connected to Niagara Peninsula Energy's Distribution System will also require a **Customer** Impact

Assessment from Hydro One to determine the impact on Hydro One's other transmission customers and an assessment of the impact on Hydro One's Transmission facilities.

IESO Impact Assessment

An EG developer proposing new generation with an output greater than 10 MW requires the IESO to complete a Transmission System impact assessment. The EG developer will be responsible for this additional cost.

Merging Preliminary Review and Connection Impact Assessment

Where an EG developer is confident of the site for development and wishes to expedite the process it can save time to dispense with the formal Preliminary Review and move to the Connection Impact Assessment immediately.

ESA Approval

The EG developer must submit plans to the ESA for approval of the project. The timing is up to the developer and may depend on the level of confidence and finality of the design but no EG project can be connected without ESA approval.

Technical Review

Once a location has been determined, a CIA completed, costs have been determined, approvals commenced or received and commitments have been made the project can proceed with a full Technical Review. The Technical Review will establish Niagara Peninsula Energy's requirements for the EG at the specific location expanding on and supplementing the information provided for the CIA. The Technical Review will require the EG developer to confirm and finalize the technical information provided for the CIA.

Additional information that may be requested or need to be confirmed at this stage is as follows:

Nameplate data or manufacturers specs on:

- Protective relays
- Synchronizing device
- Fault calculations, protective relay settings, fuse specification
- Short circuit and voltage drop studies
- Station service and battery system details

- Grounding studies
- Load interrupter switch or circuit breaker
- Dedicated interconnection transformer
- Isolating device for interconnection
- Protection system and operating procedures including schematics

Charges

There is no charge for the Preliminary Review. The EG developer will be required to pay a deposit of $15,000 for Niagara Peninsula Energy's Connection Impact Assessment. Actual costs will be billed when the assessment is completed. This deposit includes the amount required for Hydro One's Connection Impact Assessment and Transmission Facilities Impact Review. It does not include the cost of an IESO Transmission System Impact Assessment. An estimate for the Technical Review will be provided when the CIA has been completed.

Niagara Peninsula Energy will charge actual costs for labour and materials for any Distribution System upgrades or line extensions required including but not limited to increased transformer capacity requirement, primary or secondary conductor, line extensions, switches and associated distribution hardware.

Where the EG is used for load displacement of existing load a standby charge may be applicable as approved by the OEB.

Timelines

Niagara Peninsula Energy will comply with the timelines laid down in the OEB Distribution System Code for tasks for which it is responsible but the elapsed time will only start when any payments required by Niagara Peninsula Energy have been received and all technical information or any other data required for reviews, assessments or studies have been received to the satisfaction of Niagara Peninsula Energy. The queue position with Hydro One will be established when Niagara Peninsula Energy notifies Hydro One of any EG developer that has requested a CIA. Niagara Peninsula Energy accepts no responsibility and makes no guarantees of the time required for other parties to complete their reviews or provide assessments, approvals or inputs.

Metering

Metering requirements will be determined by Niagara Peninsula Energy and will depend on the type and size of generation and the load, if any, where the EG is also a customer, at the EG location. Where the EG is exporting power a bi-directional meter capable of

measuring electricity received from and sent to the Distribution System is required. The cost of all metering cabinets, instrument transformers, meters and if necessary a telephone line will be the responsibility of the EG developer. Niagara Peninsula Energy will supply and own the instrument transformers and meters.

Approvals

Before any EG can be connected to Niagara Peninsula Energy's Distribution System it must have received as a minimum the following approvals plus any additional approvals identified in the Preliminary or Technical Reviews, or the Impact Assessments by Niagara Peninsula Energy and Hydro One:

- Niagara Peninsula Energy's Offer to Connect
- CSA or UL or recognized certification of all equipment installed
- ESA approval
- A Connection Agreement with Niagara Peninsula Energy
- Witnessing and Testing of EG facilities if required by Niagara Peninsula Energy

Earning revenue from EG facilities

Ontario's electricity market offers a number of different methods for financial settlement with distributed electricity generators depending on their individual choices of generator size, fuel source, technical sophistication, and financial risk tolerance. Prospective EG developers should become aware of the numerous costs associated with connecting facilities to the grid and the potential earning revenue through the financial settlement methods listed below.

Load displacement

The function of load displacement EG is to reduce the amount of electricity purchased from the electricity market. Load displacement facilities are not eligible to be net metered. They are also not eligible to receive payments from Niagara Peninsula Energy, the Ontario Power Authority, or the wholesale market for the electricity they produce. Since load displacement facilities may qualify under other government programs to encourage energy conservation, they may be eligible for government funding related to conservation. Please visit the Ontario Ministry of Energy and Ontario Power Authority's Conservation Bureau websites for more information about conservation programs. Web links to these sites are contained in Appendix 2.

Hourly Ontario Energy Price – The Wholesale Market In Ontario

The wholesale market for electricity is an open market administered by the IESO. Throughout the day and night, Ontario electricity suppliers submit offers to sell electricity. The IESO then uses these offers and bids to match electricity supply with demand, establishing the Hourly Ontario Energy Price (HOEP) paid by wholesale customers. This spot market energy price changes from hour to hour, day to night, from season to season, and for short periods in response to high levels of demand or sudden changes on the IESO-controlled grid. Every five minutes, the IESO calculates a new spot market price by balancing the supply of electricity with demand. As demand increases, more expensive offers from generators are accepted, which raises the price of electricity. As demand drops, only the less expensive offers are accepted, which reduces the price.

An EG facility that is not eligible for other financial settlement options could, perhaps, because of its size or fuel or operating characteristics, offer its energy for sale in the wholesale market in a number of different ways. The wholesale market requires a relatively advanced understanding of Ontario's energy market and the acceptance of increased levels of both risk and reward that correspond with no guarantee of a long term contract for energy supply and no fixed pricing.

Financial settlement options for renewable electricity generators

Renewable Electricity Generation is electricity generated from any one or a combination of the following sources: wind, solar thermal, solar photovoltaic; renewable biomass; biogas, bio-fuel, landfill gas, or water.

Renewable electricity generation facilities are eligible to participate in Net Metering and Standard Offer Programs developed by Ontario's government to encourage the amount of electricity generated by these sources. Some renewable electricity sources are eligible for additional federal incentives and can generate emission reduction credits for their owners if certified through programs such as EcoLogo™.

Net Metering

Net Metering is a simplified financial settlement process for those who are interested in generating a portion of their own energy needs with embedded renewable electricity generation. Net Metering is convenient for those who are looking to avoid the need for expensive batteries or backup generators often necessary for off-grid renewable electricity systems. Net Metering may also be a good option for those not interested in the more complex application process required to participate in the Standard Offer Program. Net Metering is only available to those who are installing renewable EG systems up to 500 kW nameplate capacity.

A net metered EG will be billed for the difference between the amount of electricity exported to the Distribution System and the amount of electricity taken from the Distribution System each month. Regulated electricity charges will only apply to the net consumption of electricity. If the difference reflects zero energy consumption or a net export of electricity by the customer, only the fixed monthly customer charge will apply and a credit for the value of the energy exported will appear on the Net Metered customer's bill. Energy credits can be carried forward for one year and will be applied to future bills.

Since credits can only be carried forward for one year, there is no incentive for installing EG facilities that consistently export more power to the grid than is consumed by the net metered customer. Net Metering customers cannot participate in other forms of financial settlement, although a Net Metering customer can cancel a Net Metering agreement with 90 days notice if they wish to expand their systems and/or participate in other programs.

If the prospective EG decides to be net metered after an initial consultation with Niagara Peninsula Energy staff, a simplified connection process may be applicable depending on the size of the EG. For those electricity customers that have electricity supply contracts with licensed retailers other than Niagara Peninsula Energy, consultation with the retailer will be required before any net-metering arrangement can be made.

Standard Offer Program

In order to encourage embedded (distributed) renewable electricity generation, the Government of Ontario has introduced a "Standard Offer" Program for Renewable Energy Supply. The goal of this program is to give Ontario renewable energy developers the long-term financial security they require to develop facilities under 10 MW in nameplate capacity. The program avoids the complexity, costs, and administrative burdens of a competitive bidding process for provincial energy tenders, providing Ontario businesses, community power groups, farmers, and others the ability to contribute towards the province's energy needs while realizing a reasonable financial return. Prospective generators interested in supplying electricity under the Standard Offer Program should carefully review the program rules available from the OPA.

If a renewable energy facility fits the Standard Offer Program eligibility criteria, it is entitled to receive a base rate (2008) of 11.08 ¢/kWh for electricity produced by wind, bio-energy, or water power. There is a 3.52 ¢/kWh premium paid to facilities that can reliably deliver electricity during "on-peak" hours for production from water power or bio-energy during these hours. Solar Photovoltaic projects will receive a price of 42 ¢/kWh (2008). Once a generator is approved for a Standard Offer Contract, they receive a power purchase agreement with the OPA for 20 years.

As a pre-requisite for applying to the OPA for a 20 year power purchase contract, a prospective EG developer must have progressed through the connection process described later in this document to the point where they have completed a Connection Impact Assessment from Niagara Peninsula Energy, unless their facilities have a capacity of 10kW or less.

Eligibility criteria, program rules, further pricing information, and metering requirements can be found on the OPA's website, listed in Appendix 2.

Once an EG is connected to the Distribution System and is producing electricity, Niagara Peninsula Energy will pay the EG owner the Standard Offer price per kWh delivered. Niagara Peninsula Energy will then settle accounts with the OPA for the difference between the Standard Offer price paid to the generator and the HOEP. This may require more technically complex metering equipment than would be applicable for Net Metered customers.

Other considerations

Costs and risks for prospective EG developers are not limited to the purchase, installation, and operation of generation equipment. There are costs and risks associated with technical considerations listed previously, connection to Niagara Peninsula Energy's Distribution System, obtaining regulatory approvals, gaining the necessary licences and contracts associated with their preferred financial settlement option, and potential tax and business structuring issues. Prospective EG developers

are advised not to purchase or commence installation of any electricity generation equipment until they have fully apprised themselves of all approvals, regulations, licences, costs and risks that may be encountered.

Acknowledgements

In compiling this document, AESI acknowledges the incorporation of material from the following sources which, to the best of AESI's knowledge, is publicly available reference information:

Hydro One Networks Inc.
Toronto Hydro-Electric System Ltd.
Kingston Electricity Distribution Limited
The Interstate Renewable Energy Council, and
The Wisconsin Interconnection Co-operative

Appendices

Appendix 1: Resource Links

Appendix 2: Definitions

Appendix 3 Technical Requirements for Embedded Generation Applicants requesting connection to Niagara Peninsula Energy's Distribution System

Appendix 4: Application Form – Preliminary Review

Appendix 5: Application Form – Technical Review – Under 10 kW

Appendix 6: Application Form – Connection Impact Assessment Over 10 kW and under 10 MW

Appendix 7: Micro Generation Facilities Guidelines*

Appendix 8: OEB Generator Application Form*

Appendix 9: Standard Offer Program Metering Options*

Appendix 10: Interconnection Matrices*

Appendix 11 Standard Offer Program Generator Licence Application*

* Where Appendices are provided from external sources they are to demonstrate the scope of what is covered. They should be checked for accuracy and current revisions before they are used or relied on for information.

Appendix 1

Resource Links for Embedded Generators

The Ontario Energy Board - http://www.oeb.gov.on.ca/index.html

Distribution System Code & Retail Settlement Code
http://www.oeb.gov.on.ca/html/en/industryrelations/rulesguidesandforms_regulatory.htm#electricity

Licensing Information for Generators
http://www.oeb.gov.on.ca/html/en/licences/applyforalicence.htm#electricity

The Ontario Power Authority - http://www.powerauthority.on.ca/

Requests for Proposals for Electricity Supply
http://www.ontarioelectricityrfp.ca/

Standard Offer Program for Renewable Energy
http://www.powerauthority.on.ca/Page.asp?PageID=924&SiteNodeID=132

Conservation Bureau & Conservation Requests for Proposals
http://www.conservationbureau.on.ca/

The Ontario Ministry of Energy - http://www.energy.gov.on.ca/

Information on Ontario's electricity markets, government programs, and the Net Metering Option.

Independent Electricity System Operator - http://www.ieso.ca/

Ontario's wholesale market operator – information about selling distributed energy generation to the grid at the Hourly Ontario Electricity Price.

Electrical Safety Authority http://www.esa-safe.com/

Safe Generator Installation – Vital information for prospective distributed generators
http://www.esa-safe.com/GeneralPublic/sgi_001.php?s=22

Ontario Ministry of the Environment - http://www.ene.gov.on.ca/index.htm
Guide to Environmental Assessment Requirements for Electricity Projects
http://www.ene.gov.on.ca/envision/gp/4021e.pdf

Industry Associations and Other Resources

Ontario Sustainable Energy Association – http://www.ontario-sea.org

Power Connect – information for distributed generators – http://www.powerconnect.ca

Canadian Solar Industries Association - http://www.cansia.ca

Canadian Wind Energy Association – http://www.canwea.ca

Ontario Water Power Association – http://www.owa.ca

Association of Power Producers of Ontario – http://www.appro.org

Canadian Standards Association – http://www.csa.ca

APPENDIX 2

Definitions

Anti Islanding (See Islanding) - The generator shall cease to generate power in the event of loss of LDC supply, and will not provide backup power in the event of loss of LDC supply

Applicant — same as EG Developer

Back-up Power — Electric energy or capacity supplied by an LDC to replace energy ordinarily generated by embedded generation facility equipment during an unscheduled outage of the distribution system.

CSA – Canadian Safety Association, Canada's nationally recognized testing and certification body.

Certified Equipment — A generating, control or protective system that has been certified by a nationally recognized testing laboratory or standard, such as CSA, Underwriters Laboratory (UL), IEEE, as meeting acceptable safety and reliability standards.

Commissioning Test — The initial process of documenting and verifying the performance of an embedded generation facility so that it operates in conformity with the design specifications.

Conductor – An electrical wire that carries electricity

Connection Agreement — a written set of operating procedures to specify how the embedded generator facility will interact with the LDC's distribution system and the responsibilities and accountabilities of the parties

Connection Impact Assessment (CIA) – a review done by the LDC to determine what impact an EG will have on its distribution facilities with respect to voltage, equipment loading, short circuits up to and including the transmission system wich may be owned and operated by others requiring additional and separate assessments.

Customer — Any person who is receiving electric service from an LDC's distribution system.

Designated Point of Contact — Each LDC shall designate one point of contact for all customer inquiries related to embedded generation facilities and from which interested parties can obtain a copy of interconnection guidelines - which include the appropriate application forms and interconnection agreements.

Distributed Generation — same as Embedded Generation

Distribution Feeder/Line — An electric line from an LDC substation or other supply point to customers that is operated at 50 kV or less, or as determined by the LDC.

Distribution Substation — A facility that reduces the voltage of the electricity supply from sub transmission voltages less than 50 kV to even lower distribution voltages less than 50 kV.

Distribution System — All electrical wires, equipment, and other facilities owned or provided by an LDC that are normally operated at 50 kV or less.

Distribution System Code (DSC) — A code issued by the Ontario Energy Board that prescribes the requirements for local distribution companies and customers who are served by the distribution system. Specifically, Appendices F of the code outlines the procedures to be followed for processing and connecting embedded generation facilities and F.2 is an overview of the technical requirements. http://www.oeb.gov.on.ca/documents/dscappf_100304.pdf

Distribution System Study — A study to determine if a distribution system upgrade is needed to accommodate the proposed embedded generation facility and to determine the cost of any such upgrade.

Embedded Generation (EG) Developer — The legally responsible person applying to an LDC to interconnect an embedded generation facility to the LDC's distribution system.

Embedded Generation (EG) Facility — A facility for the generation of electricity that is located near the point where the electricity will be used or is in a location that will support the functioning of the electric power distribution grid. Also known as Distributed Generation ("DG") and Parallel Generation

Engineering Review — A study that may be undertaken by an LDC, in response to its receipt of a completed standard application form for interconnection, to determine the suitability of the installation.

ESA – Electrical Safety Authority

Fault — An equipment failure, conductor failure, short circuit, or other condition resulting from abnormally high amounts of current from the power source.

Feeder – a common term to describe an electrical distribution line.

Grid – a generic term that describes the electricity system. While normally referring to the transmission system it is occasionally used to refer to the distribution system.

HOEP — The Hourly Ontario Energy Price is an average of the market price set at each five-minute interval within that hour.

IEEE — Institute of Electrical and Electronics Engineers.

Independent Electricity System Operator (IESO) — An entity supervising the collective transmission facilities of a power region; the IESO is charged with nondiscriminatory coordination of market transactions, system-wide transmission operation, and network reliability.

Interconnection — The physical connection of an embedded generation facility to the distribution system so that parallel operation can occur.

Interconnection Disconnect Switch — A mechanical device used to disconnect an embedded generation facility from a distribution system. Also known as an isolation device.

Inverter — A machine, device or system that converts direct current power to alternating current power.

Islanding — A condition on the distribution system in which an embedded generation facility delivers power to customers using a portion of the distribution system that is electrically isolated from the remainder of the distribution system.

kV – kilovolt (1000 volts)

kW – kilowatt (1000 watts)

Load displacement: - a generation facility which connected on the customer side of the electricity meter generates power for their own use and not for the purpose of sale. The EG systems that provide load displacement are intended to reduce the amount of electricity purchased from the LDC and are not intended to provide surplus electricity into the LDC's electricity system.

Local Distribution Company — A local distribution company or LDC manages and operates the electricity distribution system and currently bills for electricity services at the retail level in Ontario.

MW – megawatt (1000 kW)

Material Modification – Any modification that changes the maximum electrical output of an embedded generation facility or changes the interconnection equipment, including:

a) Changing from certified to non-certified devices.
b) Replacing a component with a component of different functionality or UL or CSA listing.
c) Changes to the Interconnection Point

Nationally Recognized Testing Laboratory — Any testing laboratory recognized by the ESA or CSA as having an approved equipment accreditation program.

Net metering — An arrangement where EG facilities can offset their associated load consumption and are compensated for any extra energy delivered to the electricity system. In Ontario, legislation permits embedded generation facilities using renewable resources with a capacity of 500 kW or less to be eligible for net metering.

OEB — Ontario Energy Board

Parallel Operation — The operation, for a finite time, of an embedded generation facility while the facility is connected to the energized distribution system.

Parallelling Equipment — The generating and protective equipment system that interfaces and synchronizes an embedded generation facility with the distribution system.

Point of Common Coupling (PCC) — The point where the electrical conductors of the distribution system are connected to the customer's conductors and where any transfer of electric power between the customer and the distribution system takes place.

Point of Interconnection — The point where the embedded generation facility is electrically connected to the customer’s electrical system.

Preliminary Review — A review at the feasibility stage to determine the suitability of an embedded generation site and the LDC distribution facilities available for connection

Protective Equipment — Devices used on a Distribution System or at an EG facility that, using hardware and software, are designed to prevent unsafe operating conditions from occurring and to protect personnel and equipment from electrical faults on the distribution system or within the EG.

Single Phase Electricity – single phase electricity is where the alternating current power is carried by two wires – a “live” and a neutral. More wires are visible on many residences because the single phase is split.

Supervisory Control and Data Acquisition (SCADA) — A system of remote control and telemetry used to monitor and control the electric system.

Switchgear — Components for switching, protecting, monitoring and controlling electric power systems.

Synchronize — The process of connecting two previously separated alternating current apparatuses after matching frequency, voltage, phase angles, etc. (e.g., paralleling a generator to the electric system).

Technical Review — a more comprehensive evaluation of the embedded generation proposal than the preliminary review to establish that the proposal and the equipment meet the technical guidelines for safety, power quality and reliability.

Telemetry — The transmission of embedded generation operating data using telecommunications techniques.

Three Phase Electricity - three phase electricity is where the alternating current power is carried by three wires and the waveforms of current and voltage are 120 degrees apart.

Transfer Switch — A switch designed so that it will disconnect the load from one power source and reconnect it to another source.

Transformer – a piece of electrical equipment that converts electricity from one voltage to another, usually down in a distribution system.

Transformer Station — A facility that reduces the voltage of the electricity supply from transmission voltages greater than 50 kV to distribution voltages less than 50 kV.

Transmission Lines/System – the network of wires and towers that operate at over 50 kV to move electricity over long distances form generating station to large load centres.

UL — Underwriters Laboratories.

Unit — same as embedded generation facility.

Appendix 3

Technical Requirements

For

Embedded Generators

Wanting To Connect

To

Niagara Peninsula Energy's

Electrical Distribution System

Introduction

These technical requirements for Embedded Generation ("EG") are to ensure public and employee safety, protect the integrity of Niagara Peninsula Energy's system, and guarantee reliable and quality service to Niagara Peninsula Energy customers. The technical requirements in this document are for the protection of Niagara Peninsula Energy's facilities, and the EG should satisfy itself as to any requirements for the protection of its own facilities.

The requirements below are primarily from Appendix F.2 of the Distribution System Code's ("DSC"), Institute of Electrical and Electronics Engineers ("IEEE") Standard 1547, and CAN/CSA C22.2 No. 257-06. EG developers are encouraged to consult the listed references for more details.

Additional requirements may be necessary to address unique situations, and EG developers will be advised of any additional requirements at the appropriate assessment stage.

Niagara Peninsula Energy accepts no responsibility or liability for any of the information provided in this document, which has been provided for guidance purposes only. Meeting these requirements does not necessarily constitute an acceptable facility design. Niagara Peninsula Energy reserves the right to amend any of these requirements at any time.

1. Connection Impact Assessment – Initial Review

Technical requirements for interconnection of the EG with Niagara Peninsula Energy are checked during the Connection Impact Assessment stage. This initial review is intended to determine the viability of the EG developer's project and to provide the applicant an opportunity to evaluate the situation before making further investments.

1.1. Facility Design Overview

1.1.1. Single Line Diagram ("SLD")

For the initial review, a high-level single line diagram of the proposed facilities is required.

Major equipment such as the transformer, disconnection device, generator and their respective ratings should be included. Please see the *Embedded Generation Connection Application Form* for information to be submitted. Appendix 6.

A typical arrangement of a generation facility connected to the utility distribution system is shown below in Figure 1. The actual design may vary due to local circumstances, design requirements and generation facility use.

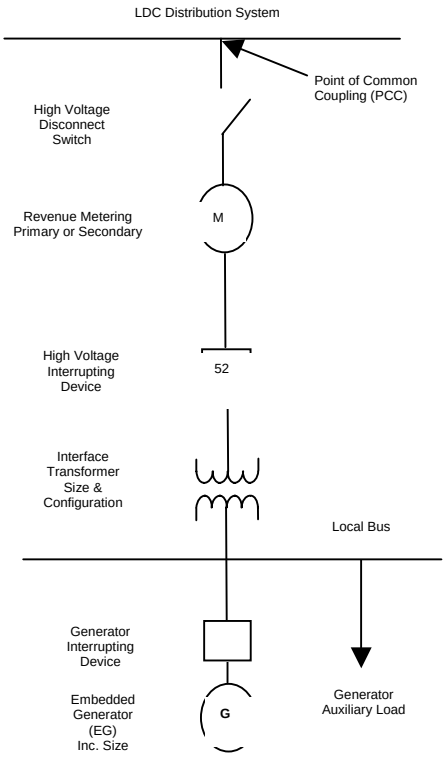

Figure 1 Typical Single Line Diagram Required at the Connection Impact Assessment Stage

1.1.2. Point of Disconnection – Safety

A point of disconnection is required to isolate the EG for the purpose of work protection for Niagara Peninsula Energy crews. Switching, lockout and tagging procedures shall be coordinated with Niagara Peninsula Energy.

The disconnect or isolation device must be

- Readily accessible by Niagara Peninsula Energy.
- Lockable
- Gang operated
- Visible open point
- Located between the PCC and the EG
- Have visible warning signs that inside parts can be energized when the switch is open

Reference codes and standards that apply to the disconnect or isolation device are as follows: Ontario Electrical Safety Code ("OESC") rule 84-026, IEEE Standard 1547 Clause 4.1.7, CAN/CSA-C22.2 No. 257-06 Clause 5.3.4 and DSC Appendix F.2 Section 1.

1.1.3. Preferred Interface Transformer Configuration and HV Interrupting Device

The table below lists the configuration that will normally be required by Niagara Peninsula Energy for the EG facility interface transformer. The interface transformer connection significantly affects the EG interaction with the distribution system under steady state and fault conditions therefore the specification is critical to avoid adverse effects.

Selecting an appropriate configuration is dependent on the local distribution system at the point of connection. The configurations suggested are applicable for the majority of connections. Niagara Peninsula Energy will assess each connection individually to determine the required configuration based on the local conditions. In some situations an EG neutral impedance or grounding transformer may be required. Effective grounding criteria of the distribution system must be maintained so that the maximum overvoltage on the distribution system under fault conditions is less than 125% of the nominal steady state voltage. The HV interrupting device should be a breaker capable of withstanding 220% of the interconnection system rated voltage.

EG Rating	Distribution System Grounding Impedance (Low, High*)	Interface Transformer Configuration (HV:LV)
> 1 MW	Low	Wye Ground / Delta
> 1 MW	High	Delta / Wye Ground
< 1 MW	Low	Wye Ground / Wye Ground

* Low impedance grounding is where effective multi point grounding can be achieved.
High impedance grounding is where effective multi point grounding cannot be achieved.

<table>
<tr><th>Requirements</th><th>Reference</th></tr>
<tr><td>1.2 Equipment Rating and Requirements Reference</td><td></td></tr>
<tr><td>The generation facility interface equipment shall be compatible with Niagara Peninsula Energy equipment design and ratings under all operating conditions.

Equipment ratings to be reviewed, but are not limited to, are:

- Equipment thermal loading limits. This equipment includes feeder conductor/cable, station breaker and transformer ratings.
- Impact of generation facility fault contribution on equipment rating - If power is to be exported to the distribution system then all metering devices shall be suitable for bi-directional flow.</td><td>DSC Appendix F.2 Section 5</td></tr>
<tr><td>1.3 Voltage Regulation Reference</td><td></td></tr>
<tr><td>Voltage variations at the point of common coupling (“PCC”) are limited to +/- 6% of the nominal voltage.

The generation facility should not actively regulate the voltage at the PCC (not including regulation to maintain power factor).

During normal operation, the generation facilities, particularly multiple units, must be loaded and unloaded gradually to allow adequate time for regulating devices to respond and avoid excessive voltage fluctuation.

The generation facility must not further deteriorate existing unbalanced conditions.

The generation facility shall not cause objectionable voltage and current unbalance conditions. The generation facility shall not cause voltage unbalance beyond 3% and current unbalance beyond 10% at the PCC.</td><td>CSA CAN3-C235
IEEE 1547 Clause 4.1.1
DSC Appendix F.2 Section 3
CAN CSA C22.2 No. 257-06 Section 5.2.3</td></tr>
<tr><td>1.4 Synchronization Reference</td><td></td></tr>
<tr><td>The generation facility shall parallel with the distribution system without causing a voltage fluctuation of +/- 4% of the prevailing voltage at the PCC

Interconnection shall take place only when the differences in frequency, voltage and phase angle are within the limits shown below.

Table 2
<table>
<tr><th>Total Generator System Capacity</th><th>Frequency Difference</th><th>Voltage Difference</th><th>Phase Angle Difference</th></tr>
<tr><td>0-500 kVA</td><td>0.3 Hz</td><td>10 %</td><td>20°</td></tr>
<tr><td>>500-1500 kVA</td><td>0.2 Hz</td><td>5 %</td><td>15°</td></tr>
<tr><td>> 1500 kVA</td><td>0.1 Hz</td><td>3 %</td><td>10°</td></tr>
</table></td><td>CAN CSA C22.2 No. 257-06 Section 5.3.21
IEEE 1547 Clauses 4.1.3, 5.1.2
DSC Appendix F.2 Section 3.2
OESC rule 84-006</td></tr>
</table>

1.5 Feeder Relay Directioning	
To prevent sympathetic tripping of the EG feeder due to faults on adjacent feeders, breaker protection may need a directional feature for reverse fault current conditions. Aggregate generation facility size connected to feeders with reclosers may need to be limited to prevent coordination problems and trips for reverse/adjacent feeder faults. Transmission Station relay settings may need to be changed so that protection systems are co-ordinated.	DSC Appendix F.2 Section 8 Niagara Peninsula Energy requirement
1.6 Monitoring Reference	
A generation facility with total capacity rated **greater than 250 kVA** at the PCC, shall have ***provision*** for monitoring items a) to d) below. If monitoring data is not required at the time of connection, the design shall include provisions for future installation. a) Connection status b) Real power output c) Reactive power output d) Voltage at PCC or aggregate connection For a generation facility with total capacity rated **2.5 MW or greater**, items a) to d) shall be ***actively monitored***. In this case, monitoring typically includes status of load interrupting switches, circuit breakers and interface protection annunciation. Communication media options will be mutually agreed upon.	DSC Appendix F.2 Section 9 IEEE 1547 Clause 4.1.6 CAN CSA C22.2 No. 257-06 Clause 5.3.22
1.7 Power Factor Reference	
The generation facility operation shall not adversely affect voltage at the PCC. The preferred power factor range of operation is **0.9 lag to 0.95 lead**. This range may be narrower if required in some situations. Systems of 30 kW or less are generally not required to be capable of adjusting power factor. For large facilities that have an impact on the IESO, the EG units shall have sufficient reactive power compensation such that there is no material increase at the transmission system terminal station.	DSC Appendix F.2 Section 4 CAN CSA C22.2 No. 257-06 Clause 5.3.13

2 Design Review

The design review ensures detailed engineering is in compliance with Niagara Peninsula Energy requirements. It is recommended that this review be completed before proceeding with equipment purchase.

A sample single line diagram below provides the details required at this stage.

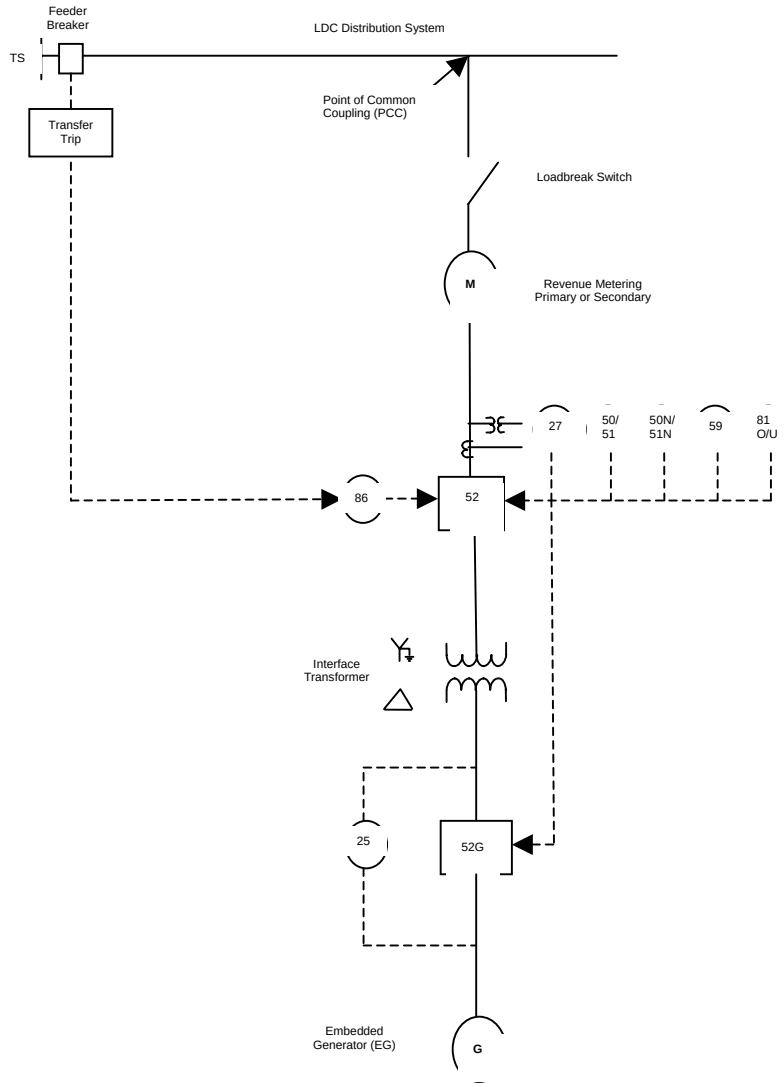

Figure 2 Typical Single-Line Diagram Required at the Design Review Stage

<table>
<tr><th>Requirement</th><th>Reference</th></tr>
<tr><td>2.1 Cease to Energize Reference</td><td></td></tr>
<tr><td>2.1.1 Distribution System Faults and Customer Facility Faults

Interface protection of the generation facility shall cease to energize Niagara Peninsula Energy's distribution system under the following conditions:

Internal Faults within the EG facility.
External Faults on the Niagara Peninsula Energy Distribution System.

Equipment and Conductors energized from both directions shall have suitable protection from each supply source.</td><td>DSC Appendix F.2
Section 6.4
IEEE 1547 Clause
4.2.1
OESC 84-014
CAN CSA C22.2
No. 257-06
Clause 5.3.8</td></tr>
<tr><td>2.1.2 Feeder Breaker Reclosing Coordination

The generation facility shall cease to energize Niagara Peninsula Energy's feeder before automatic reclosing of the breaker takes place.

Niagara Peninsula Energy's 27.6 kV and 13.8kV feeders incorporate an auto reclose operation typically 1.5 seconds in duration.</td><td>IEEE 1547 Clause
4.2.2
DSC Appendix F.2
Section 6
CAN CSA C22.2
No. 257-06
Clause 5.2.9</td></tr>
<tr><td>2.1.3 Over-Voltage and Under-Voltage Protection

The typical range of protection settings shall comply with the following table:

Response to abnormal voltages
<table>
<tr><td>Voltage at PCC</td><td>Clearing Time Range</td></tr>
<tr><td>V < 50%</td><td>Instantaneous to 0.16 s</td></tr>
<tr><td>50% ≤ V < 88%</td><td>Instantaneous to 2 s*</td></tr>
<tr><td>110% < V ≤ 120%</td><td>Instantaneous to 1 s</td></tr>
<tr><td>V > 120%</td><td>Instantaneous to 0.16 s*</td></tr>
</table>
* To satisfy system requirements, two over-voltage and under-voltage set points may be required.

The actual clearing times may vary within the above range due to distribution system conditions and generation facility protection design.</td><td>IEEE 1547 Clause
4.2.3
DSC Appendix F.2
Section 6.5
CAN CSA C22.2
No. 257-06
Clause 5.3.9
Niagara Peninsula Energy
Requirement</td></tr>
<tr><td>2.1.4 Over-Frequency and Under-Frequency Protection

The generation facility shall cease to energize Niagara Peninsula Energy's distribution system at the frequency set points and clearing times outlined in the table below.

Response to abnormal frequency
<table>
<tr><td>Generator Size</td><td>Frequency Range</td><td>Maximum Clearing Time</td></tr>
<tr><td rowspan="2">≤ 30 kW</td><td>> 60.5 Hz</td><td>0.16 s</td></tr>
<tr><td>< 59.3 Hz</td><td>0.16 s</td></tr>
<tr><td rowspan="3">> 30kW</td><td>> 60.5 Hz</td><td>0.16 s</td></tr>
<tr><td>< {59.8 – 57.0 Hz}
(adjustable set point)</td><td>Adjustable 0.166 to 300 s</td></tr>
<tr><td>< 57.0 Hz</td><td>0.16 s</td></tr>
</table></td><td>IEEE 1547 Clause
4.2.4
DSC Appendix F.2
Section 6.5
CAN CSA C22.2
No. 257-06
Clause 5.3.10
Niagara Peninsula Energy
Requirement</td></tr>
</table>

To satisfy system requirements two over-frequency and under-frequency set points may be required.	
2.1.5 Interface Protection System	
The interface protection study shall include coordination of key interface protection elements, along with the proposed relays and settings to be used at the PCC. The protection study submission shall include required AC & DC schematics and wiring diagram.	DSC Appendix F.2 Section 6 Niagara Peninsula Energy Requirement
2.2 Connection to Niagara Peninsula Energy System Reference	
Connection to Niagara Peninsula Energy's System following a grid disturbance shall take place only when the voltage at the PCC is within 6% and frequency between 59.3 and 60.5 Hz. The generation facility shall reconnect no less than 5 minutes after the system has stabilized within the above voltage and frequency ranges. Where multiple units on the same feeder are involved, staggering the reconnection times may be required. For mid-sized generating facilities that incorporate transfer trip protection, a lockout relay (86) shall prevent resynchronization until enabled by Niagara Peninsula Energy.	DSC Appendix F.2 Section 6 IEEE 1547 Clause 4.2.6 Niagara Peninsula Energy Requirement
2.3 Anti-Islanding Protection and Transfer Trip Requirements Reference	
The generation facility shall disconnect from Niagara Peninsula Energy's System upon the loss of utility supply voltage in one or more phases. Local islanding protection at the generation facility is required. For mid-sized generating facilities or aggregated generation facilities with capacity greater than 50% of the minimum feeder load or where the reclosing interval is less than 1.0 second, the design shall include a Transfer Trip scheme to prevent islanding. In this case, Embedded Generator End Open (EGEO) logic is to be included to supervise the auto reclose operation of the feeder breaker.	DSC Appendix F.2 Section 6.1.2 IEEE 1547 Clause 4.4.1 OESC rule 84-008 CAN CSA C22.2 No. 257-06 Clause 5.3.11 Niagara Peninsula Energy Requirement
2.4 Grounding at the Generation Facility Reference	
The generation facility's grounding scheme shall not cause over voltages that exceed the rating of Niagara Peninsula Energy equipment. The generation facility will not disrupt the co-ordination of ground fault protection of Niagara Peninsula Energy's distribution system Generation and interconnection facilities must be grounded as per manufacturer's specifications and the OESC. Generation facilities may be restricted from connecting to the distribution system neutral.	DSC Appendix F.2 Section 2 IEEE 1547 Clause 4.1.2 OESC rule 84-030 CAN CSA C22.2 No. 257-06 Clause 5.3.6 Niagara Peninsula Energy Requirement

3 Additional Generator Obligations

Niagara Peninsula Energy will not be assessing these requirements at the preliminary stage but information may be requested during the Connection Impact Assessment or design review stage. If there are negative impacts once the generation facility is in service, it will be required to disconnect until the problem is resolved.

3.1 Power Quality	
The generation facility must not negatively impact the power quality of Niagara Peninsula Energy's distribution system.	
3.1.1 Limitation of DC injection The maximum DC injection value is limited to **0.5%** of the full rated output current (RMS) at the generation facility PCC after a period of six cycles following the parallelling with Niagara Peninsula Energy's distribution system.	DSC Appendix F.2 Section 10.3 IEEE 1547 Clause 4.3.1
3.1.1 Limitation of flicker The generation facility must not create objectionable flicker for other customers on Niagara Peninsula Energy's distribution system.	DSC Appendix F.2 Section 10.1 IEEE 1547 Clause 4.3.2 CAN/CSA-C61000-3-7
3.1.1 Limitation of harmonics Voltage distortions in percent of nominal voltage must not exceed the limits specified in IEC 610000-3-6	IEC 61000-3-6 DSC Appendix F.2 Section 10.2 IEEE 1547 Clause 4.3.3 CAN/CSA-C61000-3-6

3 Warning Signs and Diagrams

The following warning sign shall be posted on the point of disconnection, generator feeder cell and switch room door to warn people of the presence of EG:

WARNING
TWO POWER SOURCE
PARALLEL SYSTEM

As well, a single line, permanent and legible diagram of the switching arrangement shall be placed at the Customer's control room and the switch room to indicate the position of the embedded generators and isolation points with their interlocking arrangements.

Operating designations will be assigned to the switching equipment of the generation system as required by Niagara Peninsula Energy. The Customer shall update the single line electrical diagram and operating diagram to include the assigned operating designations, and the switching equipment shall be identified by the operating designations as well.

4 Commissioning and Witnessing Requirements

The Customer shall apply for ESA electrical inspection and provide Niagara Peninsula Energy with the Certificate of Inspection once requirements are satisfied. Following this Niagara Peninsula Energy will also receive a copy of the Authorization to Connect from ESA.

Prior to commencing with commissioning and placing the EG facility in-service, Niagara Peninsula Energy shall be given an opportunity to review and confirm the proposed commissioning plan meets system requirements.

In addition, before the EG is brought into synchronization, as per the DSC 6.2.19, Niagara Peninsula Energy will require a utility representative to:

• Witness successful tests of the protection system as far as it affects the interconnection of the EG to the Niagara Peninsula Energy's distribution system.
• Verify interface equipment and test associated interlocking facilities.

The customer shall advise Niagara Peninsula Energy a minimum of fifteen working days in advance of scheduled commissioning tests, exclusive of Saturday, Sunday and Statutory Holidays, to enable Niagara Peninsula Energy to witness the commissioning tests. All testing shall be completed during Niagara Peninsula Energy's normal working hours with the Customer being responsible for all costs incurred for time spent beyond said hours.

Alternatively, Niagara Peninsula Energy may elect to accept a commissioning test report certified by a Professional Engineer. The commissioning verification report shall contain all interface protection settings and confirm key protective functions and interlocking

requirements as previously agreed to by Niagara Peninsula Energy. The commissioning report shall be submitted for approval before the parallel operation of the EG facility.

On small generating units (less than 500 kVA), Niagara Peninsula Energy may elect to forego witness testing. All results shall be documented and a copy forwarded to Niagara Peninsula Energy.

Appendix 4

Application for Preliminary Review of a request to connect Embedded Generation to the Niagara Peninsula Energy Distribution System

1. Applicant's Contact Information (the party that will be contractually obligated for this generating facility)

Name _____

Company (if any) _____

Mailing Address _____

Phone Number (Main) _____ Cell _____

Fax Number _____ Email _____

2. Location of Interest for Embedded Generation

_____

Street Address or Closest Location Description _____

3. Generator Information

Generation Type: (Check One) ☐ Synchronous ☐ Induction ☐ Inverter ☐ Other:_____

Number of Phases: (Check One) ☐ Single Phase ☐ Three Phase

Primary Energy Source: Renewable:_____ Non Renewable_____
Type:_____

Do you intend to participate in any OPA programs? ☐ Yes ☐ No
Details: _____

Output capacity: _____ kW

Load displacement? ☐ Yes ☐ No Existing or New Load? _____

4. Other Information that may be relevant or assist in preliminary review. Use additional sheet if more information is required.

_____

_____

_____

- **Return this form to: Niagara Peninsula Energy Inc., 7447 Pin Oak Drive, Niagara Falls, ON L2E 6S9. Attn: Tom Sielicki**
- **E mail: tom.sielicki@npei.ca**
- **Phone: (905) 356-2681 Ext. 6016 Fax: (905) 356-2831**

Appendix 5

Application Form to connect 10 kW or less of Embedded Generation to Niagara Peninsula Energy's Distribution System

1. Applicant's Contact Information (the party that will be contractually obligated for this generating facility)

Name _____

Company (if any) _____

Mailing Address _____

Phone Number (Main) _____ Cell _____

Fax Number _____ Email _____

2. Location of the Generation Facility

Street Address _____

Lot _____

Concession _____

County _____

Niagara Peninsula Energy Account Number (if any) _____

3. Applicant's Ownership Interest in the Generation System

☐ Owner ☐ Co-owner ☐ Lease ☐ Other

4. Primary Intent of the Generation System

☐ On-site Use of Power ☐ Net Metering ☐ Ontario Power Authority Standard Offer Program ☐ Other

5. Electricity Use, Production and Purchases

(A) Anticipated annual electricity consumption of the facility or site _____ kWh/yr

(B) Anticipated annual electricity production of the generation system. _____ kWh/yr

(C) Anticipated annual electricity exports (i.e. (B) minus (A) _____ kWh/yr

Value will be negative if there are no net sales to the distribution system.

6. Installing Contractor Information

Contractor Name _____

Mailing Address _____

Name of Contractor Contact _____

Phone Number (Main) _____ Cell _____

Fax Number _____ Email _____

Appendix 5

Application Form to connect 10 kW or less of Embedded Generation to Niagara Peninsula Energy's Distribution System

7. Requested In-Service Date

_____

Provide One-Line Schematic Diagram of the System:

☐ Schematic is attached

Number of Pages _____

8. Generator Information

Manufacturer _____ Model No. _____

Version No. _____ Serial No. _____

Generation Type:
☐ Single Phase ☐ Three Phase ☐ Synchronous ☐ Induction ☐ Inverter ☐
Other:_____

Primary Energy Source:

Renewable:_____ Type:_____

Eligible for standard offer contract? ☐ Yes ☐ No

Non-Renewable _____ Type _____
NOTE: If there is more than one generator and/or inverter, attach an additional sheet describing each.

9. Site Plan Showing Location of the External Disconnect Switch (attach additional sheets as needed)

Appendix 5

Application Form to connect 10 kW or less of Embedded Generation to Niagara Peninsula Energy's Distribution System

10. Design Requirements

a) Has the proposed distribution generation Parallelling Equipment been certified?

☐ Yes ☐ No

b) If not certified, does the proposed distributed generator meet the operating limits defined in Niagara Peninsula Energy's EG Technical Requirements, Appendix 3

☐ Yes ☐ No

For items 12(a) and 12(b), if your answer is yes, please furnish details (e.g., copies of manufacturer's specifications). If your answer is no, it is recommended you contact the equipment manufacturer and determine the status.

Status of certification and compliance with operating limits where answer to 10 (a) and/or (b) is no.

_____
_____
_____
_

11. Other Comments, Specifications and Exceptions (attach additional sheets if needed)

_____
_____
_____
_____
_____

12. Applicant and Installer Signature

To the best of my knowledge, all the information provided in this Application Form is complete and correct.

Applicant Signature Date

_____

Installer Date

_____

- **Return this form to: Niagara Peninsula Energy Inc., 7447 Pin Oak Drive, Niagara Falls, ON L2E 6S9. Attn: Tom Sielicki**
- **E mail: tom.sielicki@npei.ca**
- **Phone: (905) 356-2681 Ext. 6016 Fax: (905) 356-2831**

Appendix 6 Part A

Request for a Connection Impact Assessment Review / Update To Connect Embedded Generation to Niagara Peninsula Energy's Electrical Distribution System

Please highlight in yellow any information below that has changed since previously providing the information.

Section 1: General Connection Information

Note: ALL of the information in "*Section 1: General Connection Information*" must be completed in full. Failure to provide complete information may delay the processing of the data.

All technical documents must be signed and sealed by a licensed Ontario Professional Engineer.

Date: _____ (dd / mm / yyyy)

1. **Project Name:** _____

2. **Project Dates:** Proposed Start of Construction: _____ (dd/mm/yyyy**)**
   Proposed In-Service: _____ (dd/mm/yyyy)

3. **Project Size:** Number of Units _____
   Nameplate Rating of Each Unit _____ kW
   Number of Phases (1 or 3) _____
   Proposed Total Capacity _____ kW

4. **Project Location:** Address: _____
   _____

5. **Niagara Peninsula Energy Account Number (if applicable):**

6. **Project Information:**

Project Developer:

Company/Person:	
Contact Person:	
Mailing Address:	
Telephone:	
Fax:	
Email	

Project Owner (if not same as Project Developer):

Company/Person:	
Contact Person:	
Mailing Address:	
Telephone:	
Fax:	
Email	

Engineering Consultant (Electrical)

Company/Person:	
Contact Person:	
Mailing Address:	
Telephone:	
Fax:	
Email	

8. Project Type: ☐ Wind Turbine ☐ Hydraulic Turbine ☐ Steam Turbine ☐ Solar
☐ Diesel Engine ☐ Gas Turbine ☐ Fuel Cell ☐ Biomass
☐ Co-generation/CHP (Combined Heat & Power)
☐ Other (Please Specify) _____

9. Mode of Operation:

☐ 24 hour or Base Load ☐ Peak Period Only ☐ Load Displacement

☐ Emergency Backup

Will Emergency Backup generator be synchronized to Niagara Peninsula Energy's system at any time

☐ Yes ☐ No ☐ Other, please specify_____

10. Intent of Generation:

☐ Sale of Power ☐ Load Displacement

11. Location and Site Plan

Provide Site Plan with approximate line routings for connection to nearby Niagara Peninsula Energy facilities. The Site Plan should include roads, concession and lot numbers and nearby power lines.

Drawing / Sketch No. _____, Rev. _____

12. Proposed connection voltage to Niagara Peninsula Energy's distribution system (if known) : _____ kV

Section 2: Connection Impact Assessment Information

Note:

(a) It is important that the Generator provide ALL the information requested below, if applicable. All information is required to complete the first step of the process to move to the new Queue structure. Indicate "Not Applicable" where appropriate.

(b) In certain circumstances, Niagara Peninsula Energy may require additional information to conduct the Connection Impact Assessment. Should this be the case the Generator will be duly advised.

Provide detailed and updated SLD of the EG facility including the interface point to the Niagara Peninsula Energy distribution system. This drawing shall include as a minimum:

- Electrical equipment at EG's facilities, their principal ratings, impedances, winding configurations, neutral grounding methods etc.
- Protective relaying, synchronizing and revenue metering arrangements. The device numbers should be in accordance with those adopted in the ANSI / IEEE Standard C37.2 – 1979: IEEE Standard Electrical Power System Device Function Numbers.

The SLD shall include the following, as applicable:

- Disconnecting device at the interface (connection) point with the Niagara Peninsula Energy distribution system
- Load break switches
- Fuses
- Circuit breakers
- Interface step-up transformer
- Intermediate transformer(s)
- CTs and VTs (quantity, location, connection, ratio)
- Generators (rotating / static)
- Power factor correction capacitors and their switching arrangements (particularly for induction units)
- Motors
- Power cables
- Surge arresters
- Any other relevant electrical equipment.

- SLD Drawing Number: _____, Rev. _____
  ☐ Attached
  ☐ Mailed Separately

1. Generator Facility Fault Contributions for Faults at the Interface Point/PCC

All values to be at the nominal connection voltage to Niagara Peninsula Energy's distribution system, i.e. the high voltage side of the Facility interface (step-up) transformer.

Maximum Symmetrical (all generators online)

- Three phase fault _____ kA
- Phase-to-phase fault _____ kA
- Single Phase to ground fault _____ kA

2. Generator Characteristics:

a. Number of generating unit(s): _____
b Manufacturer / Type or Model No. _____ / _____
c. Rated capacity of each unit

Gross _____kW _____ kVA
Net _____kW _____ kVA

If unit outputs are different, please fill in additional sheets to provide the information.

d. Type of generating unit:
☐ Synchronous ☐ Induction ☐ Static Power Converters (SPC)
☐ Other, please specify _____

e. Rated frequency _____ Hz

f. Number of phases ☐ one ☐ three

g. **For Synchronous Units:**
i) Generation voltage _____ kV
ii) Rated current _____ A
iii) Rated power factor of generating unit (s) _____ p.u
iv) Type and characteristics of exciter
_____
_____
_____
v) Minimum power limit for stable operation _____ kW
vi) Unsaturated reactances on: _____ kVA base _____kV base
Direct axis synchronous reactance, Xd _____ pu
Direct axis transient reactance, Xd' _____ pu
Direct axis subtransient reactance, Xd'' _____pu
Negative sequence reactance, X2 _____ pu
Zero sequence reactance, X0 _____pu

vii) Limits of range of reactive power
Lagging (over-excited) _____kVAR
Leading (under-excited) _____kVAR

viii) Provide a plot of generator capability curve
(MW output vs MVAR)
Document Number: _____, Rev._____

h. **For Induction Units:**
i) Generation voltage _____kV
ii) Rated design power factor _____p.u
iii) Rated speed _____ RPM
iv) Slip regulation interval _____ %
v) Rated slip _____%
vi) Actual power factor at delivery point (after p.f. correction):
- Full output _____ p.u.
- No output _____ p.u.
vii) Generator reactive power requirements:
- Full output _____kVAR
- No output _____ kVAR
viii) Total power factor correction installed _____ kVAR
- Number of regulating steps _____
- Power factor correction switched per step _____ kVAR
- Power factor correction capacitors are automatically switched off when generator breaker opens ☐ Yes ☐ No
ix) Starting inrush current limited to (multiple of full load current) _____p.u.
x) Locked rotor current (at rated voltage) _____ p.u.
xi) Fault current vs time curves (for various types of faults near the generator) _____ Dwg No

i. **For SPC / Inverter type units:**
   i) Terminal voltage _____ V
   ii) Line - interactive type (i.e. intended for parallel operation with electric utility) ☐ Yes ☐ No
   iii) Power factor _____
   iv) Battery backup provided ☐ Yes ☐ No
   v) Maximum fault current for terminal faults _____ A
   vi) Standards according to which built _____
   vii) Provide Manufacturer's technical brochure and specification sheet_____ Doc. No

j. Niagara Peninsula Energy uses distribution modeling software from Dromey Design DESS v 6.1.4. Describe how your equipment should be modeled for load flow, voltage study and short circuit analysis.

_____

_____

_____

3. Interface Step-Up Transformer Characteristics:

a. Transformer rating _____ kVA
b. Manufacturer _____
c. Nominal voltage of high voltage winding _____kV
d. Lightning impulse level of high voltage winding, full wave _____ kV
e. Nominal voltage of low voltage winding _____ kV
f. Number of phases _____
g. Construction (core or shell) _____
h. Number of legs _____
i. Impedances on: _____ kVA base _____ kV base
   R: _____ p.u. X: _____ p.u.
j. High voltage winding connection ☐ delta ☐ star
   Grounding method of star connected high voltage winding neutral
   ☐ Solid ☐ Ungrounded ☐
   Impedance: R_____X_____ ohms
k. Low voltage winding connection ☐ delta ☐ star
   Grounding method of star connected low voltage winding neutral
   ☐ Solid ☐ Ungrounded ☐ Impedance: R_____X_____ ohms

l. Tapping range, location and type of tap changer _____
m. Expected tap settings HV_____ kV, LV _____ kV

Note: The term 'High Voltage' refers to the connection voltage to LDC's distribution system and 'Low Voltage' refers to the generation or any other intermediate voltage.

4. Intermediate Transformer Characteristics (if applicable):

a. Transformer rating _____ kVA
b. Manufacturer _____
c. Nominal voltage of high voltage winding _____ kV
d. Nominal voltage of low voltage winding _____kV
e. High voltage winding connection ☐ delta ☐ star
   Grounding method of star connected high voltage winding neutral
   ☐ Solid ☐ Ungrounded ☐ Impedance: R_____X_____ ohms
f. Low voltage winding connection ☐ delta ☐ star
   Grounding method of star connected low voltage winding neutral

☐ Solid ☐ Ungrounded ☐ Impedance: R_____X_____ ohms

g. Impedances on _____ kVA base _____ kV base
R: _____ p.u. X: _____ p.u.

h. Tapping range, location and type of tap changer _____

i. Expected tap settings HV_____ kV, LV _____ kV

Note: The term 'High Voltage' refers to the intermediate voltage that is input to the interface step-up transformer, and 'Low Voltage' refers to the generation voltage.

Note:

(a) The term "High Voltage", used above, refers to the intermediate voltage that is input to the interface step-up transformer, and "Low Voltage", used above, refers to the generation voltage.

4. Generating Facility Load Information

a. Maximum continuous load:
- Total: _____ kVA _____ kW
- Generator Auxiliary Load Only: _____ kVA _____ kW

b. Maximum start up load: _____ kVA _____ kW

a. Largest motor size that would be started: _____ HP _____ kW

b. Maximum inrush current of the motor (multiple of full-load current): _____ p.u.

c. For load displacement generators:
- Max. present load at Generator's facility: _____ kVA _____ kW
- Max. future load at Generator's facility (excluding Auxiliary Loads): _____ kVA _____ kW
- Indicate the means by which injection of power into Niagara Peninsula Energy's system will be prevented. _____

5. Operation Information:

- Annual Capacity Factor: _____ %
- Prospective number of annual scheduled starts / stops, and timing: _____

6. Expected Monthly Generation, Consumption and Output From the Facility:

Expected:	**Total Generation (a)**		**Total Internal Consumption (b)**		**Total Output (To Niagara Peninsula Energy' Distribution System) (a-b)***	
	kWh	**Peak kW**	**kWh**	**Peak kW**	**kWh**	**Peak kW**
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

* This value would be negative when the generators are not in operation or when the internal consumption exceeds generation.

7. Protection Design, Philosophy and Logic

- Provide a document describing the protection philosophy for detecting and clearing:
- Internal faults within the EG facility;
- External phase and ground faults (in LDC's distribution system);
- Certain abnormal system conditions such as over / under voltage, over / under frequency, open phase(s);
- Islanding

Document Number:

_____, Rev._____

- Include a tripping matrix or similar information in the document.

Note: EG shall install utility grade relays for the interface protection. The protection design shall incorporate facilities for testing and calibrating the relays by secondary injection.

Please do not feel inhibited by the space provided here. Use as much space and as many additional sheets as are required to describe how the Generator protection will deal with faults, outages, disturbances or other events on the distribution system and for the generator itself.

Protective Device	Range of Available Settings	Trip Time	Trip Set Point	Describe operation for disconnecting the generator or inverter in the event of a distribution system outage	Describe operation for disconnecting the generator or inverter in the event of a distribution system short circuit (three phase and single phase to ground)
27 Phase Undervoltage Instantaneous					
27 Phase Undervoltage					
50 Phase Instantaneous Overcurrent					
50Gground Instantaneous Overcurrent:					
51 Phase Time Overcurrent					
51G Ground Time Overcurrent					
59 Phase Overvoltage Instantaneous					

59 Phase Overvoltage					
81 Under Frequency					
81 Over Frequency					
87 Transformer Differential					
Other					

8. Connection and Operation Information

a. Synchronizing and paralleling scheme / procedure _____Doc. / Dwg. No.

b. The generator is designed with auto-connection scheme ☐ Yes ☐ No

9. Document List

Item No.	Description	Reference No.	No. of Pages
1			
2			
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16			
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27			
28			
29			
30			

10. Drawing List

Item No.	Description	Reference No.	No. of Pages
1			
2			
3			
4			
5			
6			
7			
8			
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10			
11			
12			
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19			
20			

11. Other Comments, Specifications and Exceptions (attach additional sheets if needed)

12. Applicant and Project Design / Engineering Signature

To the best of my knowledge, all the information provided in this Application Form is complete and correct.

Applicant Signature Date

Project Design / Engineering Date

- **Return this form to: Niagara Peninsula Energy Inc., 7447 Pin Oak Drive, Niagara Falls, ON L2E 6S9. Attn: Tom Sielicki**
- **E mail: tom.sielicki@npei.ca**
- **Phone: (905) 356-2681 Ext. 6016 Fax: (905) 356-2831**

Appendix 6 Part B

LDC Supplemental Information

1. LDC Name: Niagara Peninsula Energy

Contact Person: Tom Sielicki

Mailing Address: 7447 Pin Oak Drive
Niagara Falls, ON L2E 6S9

Telephone: (905) 356-2681 Ext. 6016
Fax: (905) 356-2831
E-mail: tom.sielicki@npei.ca

2. Feeder Details:

Provide details of the distribution feeder to which the proposed EG facility is to be connected.

Feeder Name: _____
Transformer Station Name: _____
Feeder Conductor size and configuration (3 wire or 4 wire): _____
Feeder Max Load (Ampere): _____
Feeder Minimum Load (Ampere): _____
[Note: Feeder maximum/minimum load is the recorded maximum/minimum load of the feeder for the last two years]
Any other generator connected on the feeder ☐ Yes ☐ No (Provide details below)
Total number of Generator customers on the feeder (other than the proposed generator)
Number of units _____ Total Capacity: _____ kW _____ kVA

3. Provide LDC Connection Impact Assessment of the EG facility up to Hydro One TS

4. Load information

Maximum load of the facility _____ kVA _____ kW
Maximum load current (referred to the nominal voltage at the connection point to the NPEI system) _____ A
Maximum inrush current (referred to the nominal voltage at the connection point to the NPEI system) _____A

5. Expected Monthly Generation, Consumption and Output From the Facility:

Expected:	Total Generation (a)		Total Internal Consumption Niagara Peninsula Energy (b)		Total Output (To Hydro One Transmission Station) (a-b)*	
	kWh	Peak kW	kWh	Peak kW	kWh	Peak kW
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

* This value would be negative when the generators are not in operation or when the internal consumption exceeds generation.

Electrical Guidelines for Inverter-Based Micro-Generating Facility

10 KW and Smaller

Electrical Safety Authority

Cover**: Photos courtesy of Balance Solutions for Today Inc**

OVERVIEW

Today many home, farm and small business owners are considering the installation of alternative forms of electricity generation (distributed generation) and connecting them to run in parallel with the Local Distribution Company (utility) electrical system. This may include the installation of small wind turbines, photovoltaic (solar) systems, micro-hydro turbines or fuel cells. These systems are intended to reduce the amount of power purchased from the local electricity distribution company and where they are powered from renewable sources such as wind, flowing water or sunlight they also provide environmental benefits.

Any system that produces even small amounts of electricity can be potentially dangerous, creating the possibility of electrocution and fire hazards. Improperly installed systems will create serious safety hazards to property owners, their friends, family, employees and local electric distribution company workers.

Before installing any type of distributed generation, whether it is stand-alone or connected to the grid, it is important to understand the safety requirements. The safety regulations, the codes and the associated safety technical standards can be confusing and difficult to understand. This guideline is intended to simplify these and provide basic safety advice to home, farm and business owners who are considering the installation of distributed generation systems.

This guideline is based on the requirements of the Electrical Safety Authority's Ontario Electrical Safety Code (OESC) and the Ontario Energy Board's Distribution System Code.

With the introduction of amendments to the Distribution System Code it is currently much easier to connect generators to the distribution systems. These amendments will allow for standardization, consistency and clarity with regards to procedures and requirements for facilitating connection of new generation facilities to local distribution systems. The intent is to facilitate the installation and connection of alternative or renewable sources of energy generation, such as photovoltaic systems, wind generators, micro turbines, and fuel cell technologies.

This guideline is intended to serve a very specific need of inverter based micro embedded load displacement generation and is in no way intended to be used as a substitute for the Ontario Electrical Safety Code. Omission of any requirements presently in the OESC does not in any way affect the OESC, nor should these omitted requirements be considered unimportant. They are essential to the OESC and its intended application, that is, its use by those who design, install, and inspect electrical installations.

TYPES OF DISTRIBUTED GENERATION

The Distribution System Code describes four categories of distributed generation.

Generator Classification	Rating
Micro	**≤ 10 kW, for customer's own use**
Small	(a) ≤ 500 kW connected on distribution system voltage < 15 kV (b) ≤ 1 MW connected on distribution system voltage ≥ 15 kV
Mid-Sized	(a) < 10 MW but > 500 kW connected on distribution system voltage < 15 kV (b) > 1 MW but < 10 MW connected on distribution system voltage ≥ 15 kV
Large	≥ 10 MW

This guideline deals only with the installation of micro generation facilities for load displacement. The larger generator units are more complex and require design and installation plans. For these larger installations, plans will have to be submitted to the Local Distribution Company and the Electrical Safety Authority for review and approval before any installation work begins.

TYPICAL MICRO GENERATION SYSTEM

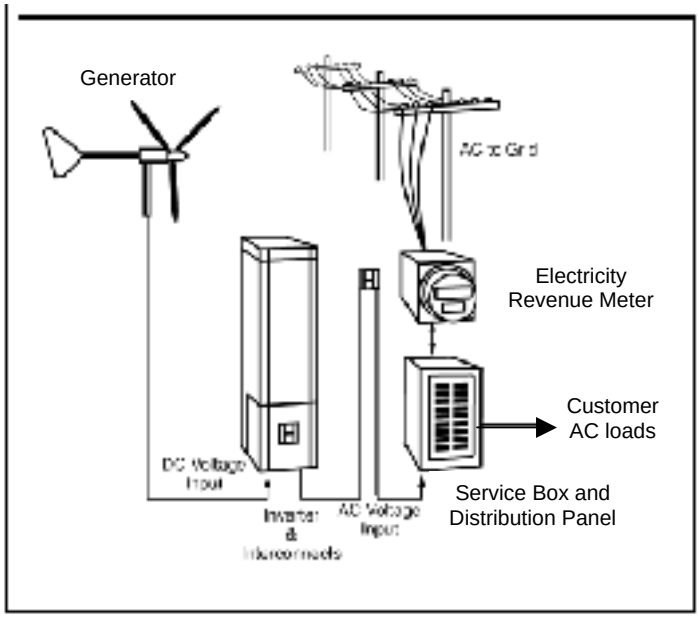


FIGURE 1. Diagram of a grid-tied wind electric system with "DG system disconnect"
(*Source: Phantom Electron Corp*.)

DEFINITIONS

Anti Islanding: The generator shall cease to generate power in the event of loss of LDC supply, and will not provide backup power in the event of loss of LDC supply

Approved Electrical Equipment: All electrical equipment must, by law, be approved by, and bear a certification mark of one of the accredited certification organizations labels affixed to the electrical equipment, The presence of a mark or label confirms to the user that the equipment is in compliance with the Ontario regulations. . (Refer to Appendix A of this document or ESA Bulletin 2-7-# for examples of the marks of accredited certification organizations)

If the equipment you are considering does not have one of these certification marks identified in appendix A, its safety cannot be assured and it shall not be installed or used.

Disconnecting means: A device, group of devices, or other means whereby the conductors of a circuit can be disconnected from their source of supply

Distributed Generator (DG) Source Disconnect: Every installation shall have a disconnecting switch or other approved disconnecting device. The disconnect is required to enable the disconnection of the generating system from the home, farm or buildings electrical wiring system and from the utility system.

Distributed Generator (DG) System Disconnect: Many LDC's will require a second disconnect. This disconnect will usually be located near the electricity meter and should be accessible to local electric utility staff. This disconnect is required to ensure the safety of electrical utility workers. This disconnect will allow utility staff to disconnect the generator from the utility system in case they have to service or repair the electrical supply to your home, farm or business. This disconnect provides an assurance to the utility workers that your generator cannot energize the electrical wires while they are working on them. The local electric utility will specify the location of this disconnect means.

Distributed Generator (DG): Electric generation facilities connected to a Distribution System through a point of common coupling (PCC).

> **Generator:** The generator could be a wind turbine, photovoltaic array, micro-generator, or fuel cell. These generators normally produce Direct Current (DC) power.

Distribution Panel: The distribution panel contains overcurrent devices and distributes electricity to the various electrical circuits and equipment in your home, farm or business. The distribution panel may be connected to both the LDC supply system and the Micro-embedded load displacement generation facility.

Distribution System Code (DSC): sets out the minimum conditions that an electricity distributor must meet in carrying out its obligations. All licensed electricity distributors in Ontario must comply with the provisions of the DSC as a condition of their license.

Electricity Revenue Meter: The Local Distribution Company supplies and installs the electricity meter that measures consumption of electrical energy supplied by the LDC to the customer.

Electrical Wiring: Electrical wiring, properly sized and installed to meet the requirements of the Electrical Safety Code connects these various pieces of electrical equipment together and allows the electricity to move through the electrical system. The electrical wiring is colour coded. The red, blue or black coloured conductor is the line or “hot” conductor. The white conductor is the neutral. The green coloured conductor is the bond conductor, or commonly referred to as the “ground” conductor.

Embedded load displacement generation facility means a generation facility connected on the customer side of the electricity meter and the customer generates power for their own use and not for the purpose of sale. These types of systems are intended to reduce the amount of electricity purchased from the local electrical utility, but they are not intended to provide surplus electricity into the utility’s electricity system.

> **Micro-embedded load displacement generation facility** means an embedded load displacement generation facility that produces 10 kW of electricity or less.

Inverter: means a device that converts DC electricity into AC electricity Electrical equipment, appliances, tools, machines and lights connected to the wiring in your home, farm or business use alternating current (AC) power.

> **Stand-Alone Inverter:** An inverter that operates only in stand-alone mode and thus contains no facility to synchronise its output energy from a Local Distribution Company.
>
> **Grid Connected Inverter:** An inverter that is able to operate in grid parallel mode. Also known as a grid interconnect or a grid tie inverter.
>
> **Grid Dependent Inverter:** An inverter that is able to operate in parallel to the distribution system and in order to operate there must be power available from the electric utility’s electricity grid. Loss of power from the grid will initiate a shutdown of the inverter to prevent islanding. Distributed generation systems using a grid dependent inverter will not provide back-up power during a utility power outage.

Local Distribution Company (LDC): The distribution of electricity to end use customers is carried out by Ontario's local electrical utilities or LDC’s. These utilities are responsible for maintaining their community's network of distribution wires. They also "step down" the voltage of electricity to make it safe for use by customers and provide electricity to end-users at market rates.

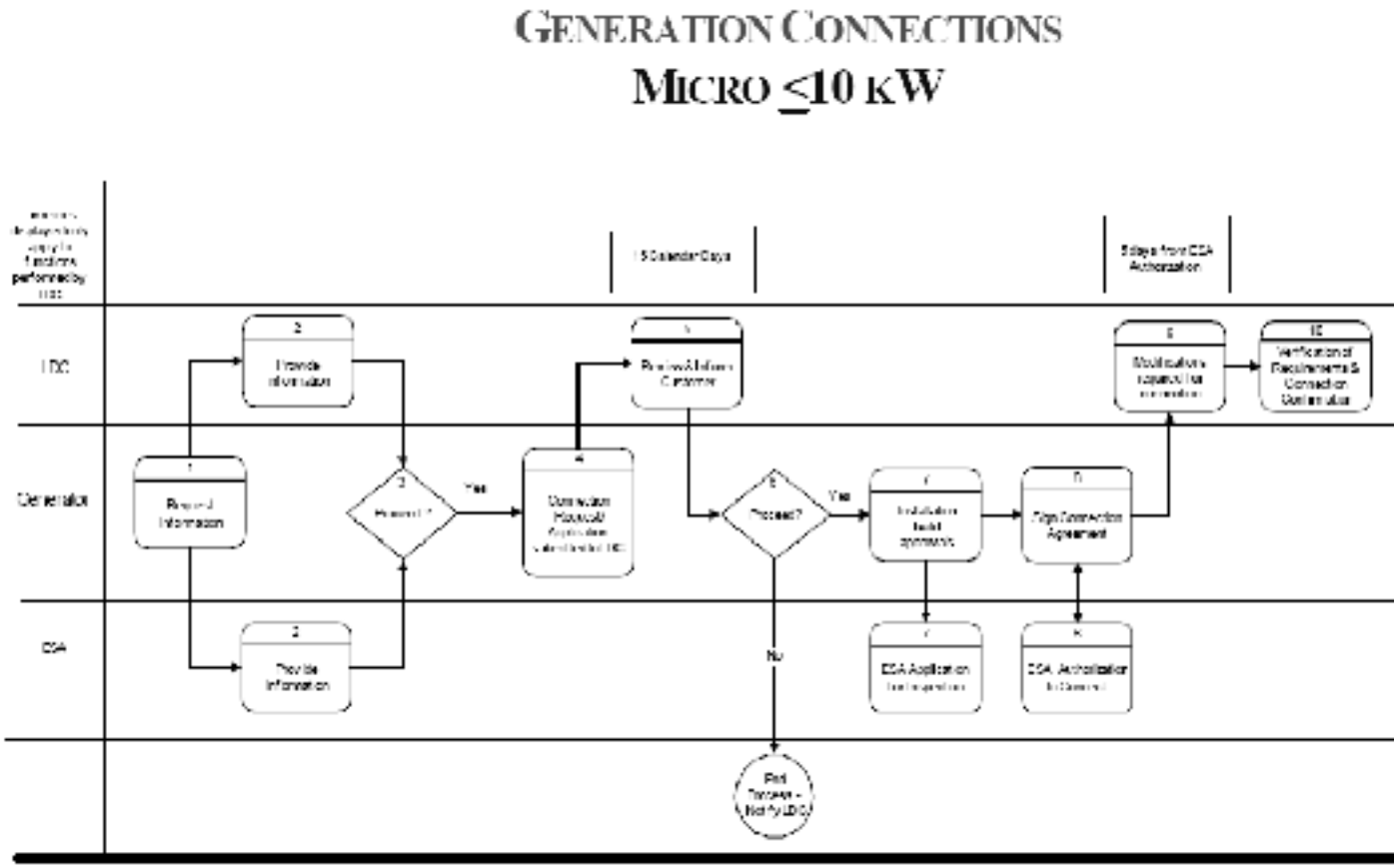
Ontario Electrical Safety Code (OESC): provides the standards for the safe installation of all temporary and permanent electrical wiring and equipment. The OESC applies to all homes, businesses, farms and industry in Ontario.

Overcurrent Device: A fuse or circuit breaker. An approved fuse or circuit breaker is required to protect people and the electrical system from a short circuit or overload failures. This is an important safety device.

PLANNING AN INSTALLATION

Before you begin any installation work or make any commitments to purchase equipment or have equipment installed, it is very important that you do your homework first.

The Ontario Energy Board's Distribution System Code (Appendix F) provides an outline for the micro-generation connection process, as follows.



(Source: OEB's Process and Technical Requirements for Connecting Embedded Generation Facilities)

1. Request information from ESA and your Local Distribution Company.

2. Review these Electrical Safety Authority Guidelines.

Be sure to review and understand the Electrical Safety Authority guidelines, including the requirements for electrical inspection and approval. If you are undertaking the electrical work yourself (not recommended) you will be required to submit an “Application for Inspection”.

Review the Local Distribution Company Information Package.

The information package from the electric utility may include:

- A description of the connection process, timing and contact information.
- Approvals needed by the distributor for connection;
- Technical requirements including metering;
- Contractual requirements (Micro-Embedded Load Displacement Connection Agreement); and
- Application forms.

Some questions to consider when contacting the local electric utility are:

- Is a service upgrade required to accommodate the installation of an alternative generator?
- Is a utility disconnecting means required for isolation of generator?
- Where should the disconnecting means be located?
- Are there any other special technical requirements?
- Will the revenue meter need replacing?
- What are the charges for this connection?

Consult with one or more qualified electrical contractors.

The Electrical Safety Authority recommends that all electrical work be done by a qualified electrical contractor/electrician. Installing an alternative generation system is beyond the ability of most do-it-yourself projects.

Check for any local bylaw or permit requirements.

In addition to ensuring that you understand the electrical safety requirements you should also check with you local municipality, township or county about any bylaw or permit requirements that might apply depending on the type of installation.

3. After the above information has been gathered and reviewed, you make a decision whether to proceed further or not.

4. Complete and submit the necessary application to the LDC

The application should include the following information:

- The name-plate rated capacity of each unit of the proposed generation facility and the total name-plate rated capacity of the proposed generation facility at the connection point;
- The fuel type of the proposed generation facility;
- The type of technology to be used; and
- The location of the proposed generation facility including address and account number with the distributor where available.

5. After receiving and reviewing your application, and assuming that it meets the requirements, the local distribution company will confirm that the generator can be installed and connected.

6. After review and acceptance by the LDC, you again make a decision whether to proceed or not.

7. Proceeding With the Installation

i) Select Your Electrical Contractor.

Prior to hiring an Electrical Contractor the Electrical Safety Authority recommends that you ensure that they:

- Hold a current certificate of qualification from the Ministry of Training, Colleges and Universities
- Have a Municipal business and/or contractors license (where required)
- Carry adequate liability insurance
- Can provide references
- Are prepared to take out the necessary “Application for Inspection”. If the person you are considering for the installation tells you that an electrical inspection is not required or suggests that you apply for the inspection on his or her behalf find someone else to do the work.
- Will provide a written estimate of the cost of the work.
- Ask about the amount of experience the electrical contractor/electrician has installing alternative generation systems. These systems are relatively new and not all electrical contractors/electricians have experience installing these types of systems.
- If the electrical contractor is providing the electrical equipment as part of the installation ensure that they are providing and installing approved equipment.
- Will provide you with a copy of the “Certificate of Inspection”. The Local Distribution Company will require a copy of the Certificate of Inspection before they will finalize the connection agreement with you. You may wish to hold back final payment until you this certificate.

ii) File a Completed Application for Inspection with the Electrical Safety Authority

Before beginning the electrical work (or within 48 hours), your electrical contractor must file an application for inspection with the Electrical Safety Authority and pay the appropriate fees. For the installation of micro-generation systems the submission and approval of plans is not required. If you are doing the work yourself (not recommended) you are responsible for filing the application for inspection.

1-877-ESA-SAFE (1-877-372-7233)

An Electrical Inspector will inspect the installation to determine if it meets the requirements of the OESC.

If the installation meets the safety requirements identified in the OESC, then a "Connection Authorization" will be issued to the LDC and a "Certificate of Inspection" will be provided to the electrical contractor. These documents provide assurance that the installation was inspected by ESA, was found in compliance with the requirements of the OESC, and may be connected and used.

8. **Contact the Local Distribution Company and finalize the Connection Agreement**

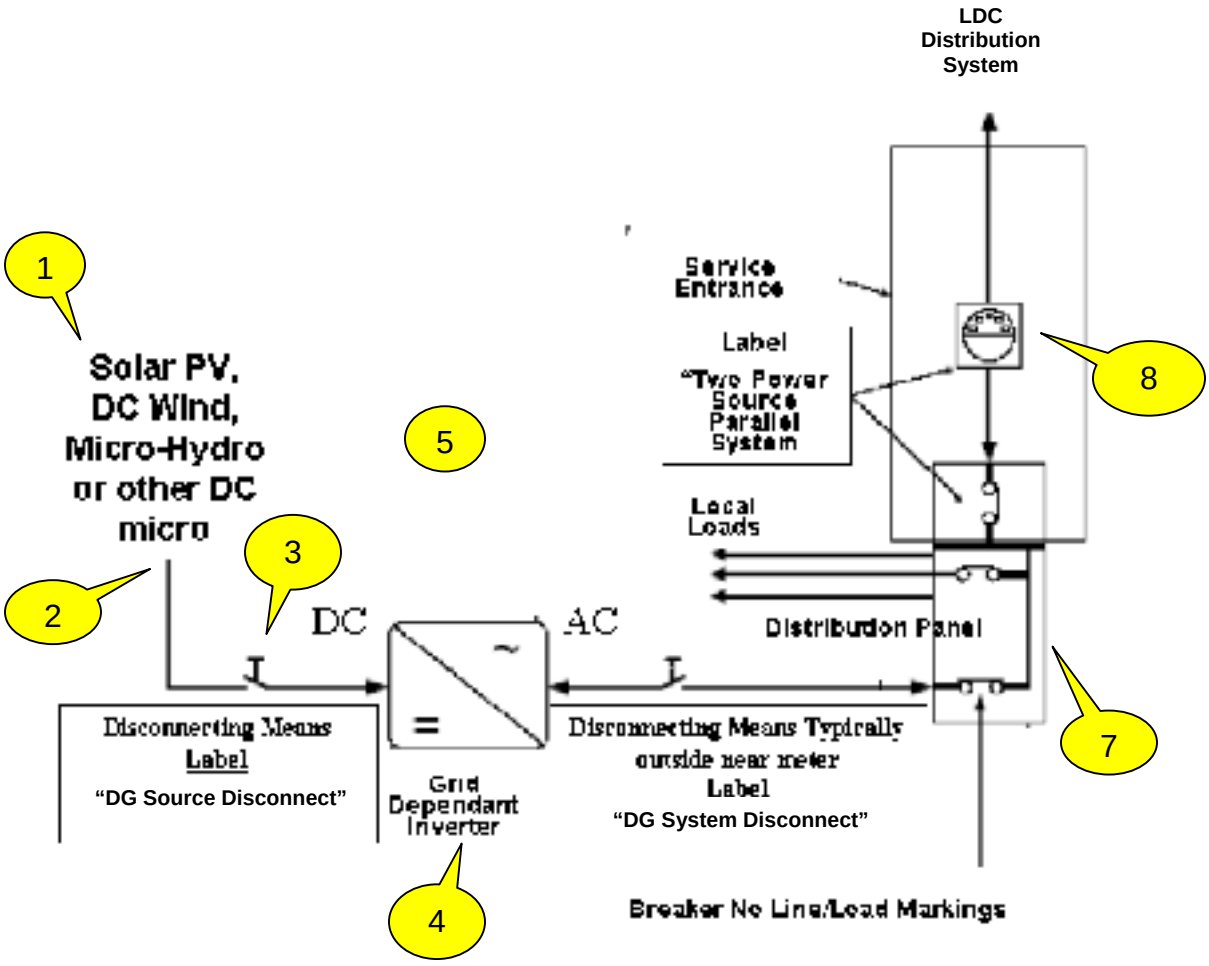
   Following completion of the inspection(s) by the Electrical Safety Authority and the issuance of a certificate of inspection contact the local electric utility. Finalise the connection agreement and provide the LDC a copy the ESA certificate of inspection.

9. **Local Distribution Company makes any modifications that may be required to the meter or electrical supply to your home, farm or business.**

10. **Verification and completion.**

ELECTRICAL INSPECTION PROCESS

Before the generator can be connected to the electrical system it must be inspected and approved by the Electrical Safety Authority. The OESC requires an Application for Inspection to be submitted by the contractor doing the electrical installation. The inspection provides assurance that the installation meets the safety requirements of the OESC and does not pose a hazard to you, your family, friends, or employees. It also provides an assurance that the installation will not pose a hazard to the local utility workers who may be required to service or repair the electrical supply to your farm, home or business.



With reference to the above diagram, the Inspector will look for the following requirements when inspecting the alternative generation installation.

1. Generator type and characteristics

The generator shall be approved for use in Canada, whether it is wind powered, photovoltaic, micro-hydro, etc. The inspector will look for a valid approval mark. The Inspector will also check the nameplate and note the generator electrical characteristics.

2. Overcurrent Device(s)

Where required by the OESC for protection of downstream conductors and equipment from overcurrent (short circuit or overload). The Inspector will check the rating and type for compliance with the OESC based on the generator nameplate ratings and the downstream conductors and equipment.

3. Disconnecting Means – Generator or Distributed Generation (DG) Source

The disconnecting means must be approved for use in Canada. The inspector will look for a valid certification mark.

The disconnecting means shall be sized to safely handle the output of the generator unit. The OESC provides information on the sizing requirements and a qualified electrical contractor will be familiar with these. The disconnecting means shall have a label marked “DG SOURCE DISCONNECT”. The inspector will look for proper sizing, installation, and labelling.

Some Inverters units might have the disconnecting means built into the inverter unit. In that case the label “DG SOURCE DISCONNECT” will be on the inverter unit. If this is the case a separate disconnecting means is not required.

4. Grid Dependent Inverter

An approved Grid Dependent Inverter is required. The inspector will look for a valid certification mark that indicates that the inverter meets the requirements of the Canadian Standards Association’s Standard C22.2 # 107.1 or the Underwriters Laboratory’s standard UL 1741.

The inverter shall also bear a label stating “UTILITY-INTERCONNECTED” indicating it meets the section of the standard for utility interconnected inverters.

As it is possible for electricity to flow to the inverter from both the generator and the distribution panel, the inverter shall also be marked “WARNING — POWER FED FROM MORE THAN ONE SOURCE”. This label serves as a warning and reminder to anyone that might service or repair the inverter to ensure the power to the inverter is disconnected from both the generator supply and from the distribution panel.

The inverter nameplate shall also contain the following information,

- Range of operating dc input current;
- Maximum output fault current; and
- Maximum utility back feed current

5. Wiring Methods

Wiring shall be installed in accordance with requirements set out in Section 12 of the OESC.

6. Disconnecting Means — Distributed Generation (DG) System

The inspector will verify that a second disconnect means (intended to protect utility workers) is installed in the location specified by the Local Distribution Company.

The inspector will verify that this disconnect is properly sized to handle the electrical output from the inverter and that it is wired so that it will simultaneously disconnect all ungrounded conductors of the distributed generator from the distribution supply system.

The inspector will verify that disconnect has a label marked “DG SYSTEM DISCONNECT”

7. Distribution Panel

The circuit breaker in the distribution panel that connects to the distributed generation system shall not have any Line/Load markings. The Inspector will check to see that the circuit breaker is of adequate ampere and voltage rating and has an interrupt rating greater than the available fault current from the distribution system. The circuit breaker shall be clearly labelled to indicate its purpose. The main circuit breaker or disconnecting means for the distribution panel shall be labelled “WARNING – TWO POWER SOURCES – PARALLEL SYSTEM”.

8. Electricity Revenue Meter

The electricity meter is the responsibility of the electrical utility and is installed to meet their requirements.

The inspector will verify that a label marked “WARNING – TWO POWER SOURCES – PARALLEL SYSTEM” is affixed in a location adjacent to the electricity meter. This label provides a warning to utility workers that your generator is capable of providing electricity into the utility system. It alerts them that they should disconnect the generator from the electrical supply system before beginning any work on the electrical system supplying your home, farm or business.

In addition to this warning label the inspector will verify that a single line diagram is posted at the electrical service. This single line diagram must be plainly and permanently marked, show the switching arrangements, the locations of the disconnects, and the location and type of generator.

OTHER SOURCES OF INFORMATION

- Ontario Electrical Safety Code
- CSA C22.2 #107.1 General Use Power Supplies
- UL 1741 Inverters, Converters, and Controllers for Use in Independent Power Systems
- MicroPower Connect Interconnection Guidelines
- The Renewable Energy Handbook for Homeowners by William H. Kemp
- $mart Power; an urban guide to renewable energy and efficiency The Renewable Energy Handbook for Homeowners by William H. Kemp
- Distribution System Code published by OEB

- Standby Generators and Emergency Power Information By Ministry of Agriculture and Food
    - Generator Handbook
    - Generator fact sheets
    - www.gov.on.ca/OMAFRA/english/engineer/generators
    -
- Electricity Generation Using Small Wind Turbines At Your Home Or Farm, by S. Clarke of the Ministry of Agriculture

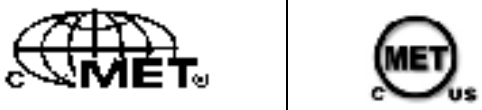
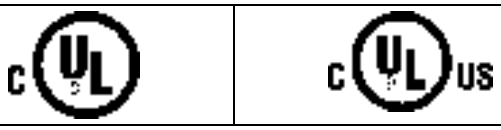
.

To file for an Application for Inspection call: **1-877-ESA-SAFE (372-7233)**

www.esasafe.com

Appendix A

Certification marks acceptable under the OESC of the Province of Ontario are,

Canadian Standards Association (CSA)	
Entela	 
Intertek Testing Services	
Met Laboratories Inc. (MET)	
OMNI Environmental Services Inc.	
Quality Auditing Institute	
QPS	
TUV America	
TUV Rheinland	
Underwriters Laboratories Inc. (UL)	
Underwriters' Laboratories of Canada (ULC)	

Application Instructions

1. Purpose of this form

The purpose of this form is to collect information to determine whether the Applicant will be granted issuance of a licence to generate electricity for sale.

2. Structure of the Application Form

This form contains the following sections:
A. General Information
B. Corporate and Technical Information
C. Information about Key Individuals within the organization
D. Notice and Consent
E. Acknowledgement of Other Market Conditions

Note: The information in sections B and C shall be kept confidential, with the exception of names and positions held of key individuals. All other information filed as part of this application will be considered public. Where the Applicant objects to public disclosure of information, the Applicant must follow the Ontario Energy Board's approved Guidelines for Treatment of Filing made in Confidence, effective March 19, 2001.

3. Completion Instructions

PRINT CLEARLY or TYPE all information in **BLACK**. Please send 2 copies of the completed form and attachments to:

Board Secretary
Ontario Energy Board
2300 Yonge Street
P.O. Box 2319, 26th Floor
Toronto, ON M4P 1E4

Applications not completed in full will be returned to the Applicant. If you have any questions on completing this application, please contact the Market Operations Hotline at 416-440-7604 or 1-888-632-6273 or email Market Operations at oeb.gov.on.ca.

4. Licence Fees:

Application Fees:
A non-refundable application fee of $800.00, in Canadian funds, is required to process your application. Please enclose a cheque or money order made payable to the **ONTARIO ENERGY BOARD**.

Note: If a licence is issued, the Licensee may be required to pay an annual fee of $800.00. For further information, please refer to the Board's website at: www.oeb.gov.on.ca/html/en/licences/applyforalicence.htm

5. Important Information:

As a licenced Electricity Generator, the licencee may be subject to additional obligations as required by a distributor, transmitter or the Independent Electricity System Operator (IESO) and as established under section 70 of the *Ontario Energy Board Act, 1998.*

The issuance of an electricity generator licence does not guarantee accreditation by the IESO or connection to a transmission or distribution system.

REMARQUE:
Ce document est disponible en français.

For Office Use Only	
Application Number	EB- RP-
Date Received	

A. General information

1. Applicant's Name

Name to appear on Licence:

2. Primary Contact for this Application

Mr. ☐ Mrs. ☐ Miss ☐ Ms. ☐ Other: _____	Last Name:	Full First Name:	Initial:
	Position Held:		
Contact Address (if R.R., give Lot, Concession No. and Township)			
City	Prov.	Country	Postal/Zip Code
Phone Number	FAX Number	E-mail Address (if applicable)	

3. Type of Application

New licence ☐	
Renewal ☐	Licence No.

4. Business Classification

Sole Proprietor	☐
Partnership	☐
Corporation	☐
Other (describe)_____	☐

5. Applicant Information

Full Legal Name of Applicant	Ontario Corporation Number, Canadian Corporation Number or Business Registration Number	Date of Formation or Incorporation

a) Business Address (if different from Contact Address in A2 above).

Street

City	Province/State	Country	Postal/Zip Code

Phone Number	FAX Number	E-Mail Address (if applicable)

b) Address for service in Ontario (if different from Business Address in 5a above). If R.R., give Lot, Concession No. and Township.

Street

City	Prov.	Country	Postal/Zip Code

Phone Number	FAX Number	E-Mail Address (if applicable)

6. Licensing History

a) Has the Applicant or an affiliate been licensed by the Ontario Energy Board? If yes, please provide the following information:

Yes ☐ No ☐

Company Name	Business Activity	Licence No.	Is the Licence valid? If No, please provide date of expiration.		
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	
			Yes ☐	No ☐	

b) Has the Applicant or an affiliate undertaken any electricity sector activities in any other jurisdiction? If yes, provide the following information:

Yes ☐ No ☐

Company Name	Jurisdiction	Business Activity	Licence/ Registration No.	Is the Licence valid? If No, please provide date of expiration.		
				Yes ☐	No ☐	
				Yes ☐	No ☐	
				Yes ☐	No ☐	
				Yes ☐	No ☐	
				Yes ☐	No ☐	

B. Corporate and Technical Information

7. Business Activities

a) Please describe the Applicant's business as it relates to this application.

b) Please provide a current corporate organization chart showing the name of the applicant and affiliated companies.

c) Is the applicant an affiliate of an electrical distribution or transmission company? If yes, please provide the name of licensee and licence number granted by the Ontario Energy Board. Yes ☐ No ☐

d) If answer is yes to c), has the applicant given notice of its proposal to the Ontario Energy Board under the requirements of Section 81 of the *Ontario Energy Board Act, 1998*.

8. Intended Services and Markets

a) Please provide a high level description of the Applicant's business plan for the generation and sale of Electricity in Ontario.

b) Does the Applicant intend to sell power into the IMO-administered market? Yes ☐ No ☐

c) Does the Applicant intend to settle with the distributor for the power injected into the distribution system in accordance with the retail settlement system? If yes, please identify the distributor. Yes ☐ No ☐

d) If yes to 8 c), has the Applicant entered into a connection agreement and a service agreement for settlement purposes with the distributor?	Yes ☐	No ☐
e) Does the Applicant intend to sell electricity to a consumer defined as a person who uses for own consumption, electricity that the person did not generate?	Yes ☐	No ☐
f) If the applicant answered yes to 8 e), has the Applicant applied for a retailer licence?	Yes ☐	No ☐
g) Has the applicant entered into a contract with the Ontario Power Authority?	Yes ☐	No ☐

9. Technical Capability

a) Please describe the Applicant's technical ability to carry out the activities applied for, including the Applicant's specific experience in Ontario. Please identify key technical and operational personnel, including names, titles and experience
b) Please describe the Applicant's experience in the electric industry in Ontario and other jurisdictions.

10. Legal Proceeding

	Yes	No
a) Has this organization ever been declared bankrupt or is it presently party to a bankruptcy proceeding? 1) Where this organization is an undischarged bankrupt, provide a copy of the Assignment in Bankruptcy and a list of creditors. 2) Where this organization is a discharged bankrupt, provide proof of discharge.	☐	☐
b) Are there any unpaid judgments against this organization? If answered yes, provide a copy of each judgment. State amount outstanding and repayment arrangements.	☐	☐
c) Has this organization been found guilty or convicted of a criminal offence under any law in the past 5 years or are any charges now pending? This includes where a conditional discharge or an absolute discharge has been ordered. If yes, provide full particulars in a separate, signed and dated statement.	☐	☐
d) Has this organization ever had a licence or registration of any kind refused, suspended, revoked or canceled? If yes, attach particulars.	☐	☐

11. Transmission and Distribution Assets

Transmission Assets *The Electricity Act, 1998* defines a transmission system as a system used to convey electricity at voltages above 50 kilovolts (kv).

	Yes	No
a) Does the Applicant own or operate any transmission equipment?	☐	☐
b) If answered yes in a), does the Applicant own or operate transmission equipment that is used only for the purpose of conveying electricity from the generation facility(ies) to the IESO-controlled grid?	☐	☐
c) Does the Applicant own or operate transmission equipment that is used to convey electricity from the generation facility(ies) for purposes other than what is described in 11 b). Please provide details.	☐	☐

d) If answered yes in 11 c), explain the purpose of the equipment and identify the person to whom the electricity is conveyed.

	Yes	No
e) Does the applicant intend to obtain from the Ontario Energy Board an Order granting leave to construct under Section 92 of the *Ontario Energy Board Act, 1998*. If not, why?	☐	☐

Distribution Assets *The Electricity Act, 1998* defines a distribution system as a system used to convey electricity at voltages of 50 kV or less.

	Yes	No
f) Does the Applicant own or operate any distribution equipment?	☐	☐
g) If answered yes in e), does the Applicant own or operate distribution equipment that is used only for the purpose of conveying electricity from the generation facility(ies) to the distribution network?	☐	☐
h) Does the Applicant own or operate distribution equipment that is used to convey electricity from the generation facility(ies) for purposes other than what is described in 11 f).	☐	☐

i) If answered yes in 11 g), explain the purpose of the equipment and identify the person to whom the electricity is conveyed.

12. Generation Facilities

Please complete this section for each generation facility. For the purposes of this form, please consider each separate property where electricity will be generated for sale as a "facility". If there is insufficient space below, please provide this information as an attachment to this form.

Fuel Type (Please circle):

a) Water b) Natural Gas c) Wood d) Coal e) Diesel f) Other (please specify):	g) Back-up fuel source:

Facility Name & Address	Project Status (% Complete)			Connection point to the IESO or distributor grid	In-Service Date
	Planning	Financing	Construction		

Number of Units:	Installed Capacity:

For the following five year period, please provide an estimate of the maximum generating capacity (MW) for each generation facility.

Year 1:	Year 2:	Year 3:	Year 4:	Year 5:

Please indicate Ownership/Operation:

Owned and Operated ☐	Owned Only ☐	Operated only ☐

13. Financial Information

a) If the Applicant is a public corporation, please provide annual reports for the last two fiscal years.

b) Please provide the most recent prospectus and quarterly reports that are available.

c) If audited financial statements are not available, please provide the most recent 2 years of audited financial statements signed by the proprietor or by at least one director or partner.

d) If unaudited statements are not available, please provide information that indicates the applicant's financial state of affairs. This may include one, or more of the following: balance sheets; income statements; pro forma statements; letter of reference from the applicant's bank; or a parental guarantee. An officer of the company must sign documents that have not been audited.

e) Are any of the facilities listed in answer to Question 12 to be constructed or existing facilities to be upgraded or retro-fitted? Yes ☐ No ☐

f) If answered yes in 13 d), please provide projected capital cost relating to this undertaking. Please explain the financial arrangement of how the Applicant finance the activities authorized by its licence if the application were granted.

14. Other Regulatory Approvals

Please list any other approvals that are required in order for the facilities listed in Question 12 to commence operation. Indicate the status of these approvals.

C. Information About Each Key Individual

15. Personal Information

Mr. ☐ Mrs. ☐ Miss ☐ Ms. ☐ Other: _____	Last Name:	Full First Name:	Initial:
	Position Held:		

16. Personal Experience in Energy Industry

a) Has this person been a proprietor, partner, officer or director of a business that was granted an licence under the *Ontario Energy Board Act, 1998.* If yes, provide business names, type of licence and licence number(s).	Yes ☐	No ☐
b) Has this person been a proprietor, partner, officer, or director of an energy business that was registered or licenced under this or any other statues of Canada or U.S. If yes, identify the legislation, province/state in which the legislation applies, and the associated business activities.	Yes ☐	No ☐
c) Has this person been a proprietor, partner, officer or director of an energy business that had a registration or licence of any kind refused, suspended, revoked or cancelled? If yes, please provide company name and describe the situation, including the jurisdiction and type of licence.	Yes ☐	No ☐

Signature of key individual	Date signed

Note:
Attach a copy of Section C for each key Individual; each officer and director (for a corporation); each partner (for a partnership); or each proprietor (for a partnership).

D. Notice and Consent

AS REQUIRED BY THE FREEDOM OF INFORMATION AND PROTECTION OF INDIVIDUAL PRIVACY ACT

In order to complete or verify the information provided on this form, it may be necessary for the Ontario Energy Board to collect additional information from some or all of the following sources: federal, provincial/state and municipal governments; licensing bodies; law enforcement agencies; banks; professional and industry associations; and former and current employers. **Only information relevant to your application will be collected.**

The public official who can answer questions about the collection of information is:

Board Secretary
Ontario Energy Board
2300 Yonge Street
P.O. Box 2319
Toronto, Ontario M4P 1E4

Tel: 416-314-2455 or 1-877-632-2727

NOTE: This application must be signed by the proprietor or by at least one partner, officer or director of the organization.

WARNING: It is an offence to knowingly provide false information on this application.

I/We consent to the collection of this information as authorized under the *Ontario Energy Board Act, 1998*. Yes ☐

I/We understand that this information will be used to determine whether I am/we are qualified for the licence for which I am/we are applying. Yes ☐

Print Name and Title	Signature of Applicant(s)	Date Signed

E. Acknowledgment of Other Market Conditions

NOTE: This acknowledgment must be signed by the proprietor or by at least one partner, officer or director of the organization.

I understand and acknowledge that, as a licenced electricity generator, I may have to meet requirements to disclose information to consumers in accordance with any government regulation made or standard set by the Board.

I understand and acknowledge that, if I intend to operate in the Independent Market Operator (IMO) administered markets and settle bilateral contracts through the IMO, I may have to post security (i.e., financial guarantee bond, security deposit) with the IMO to meet its prudential requirements.

I understand and acknowledge that, if I choose to settle the wholesale cost of electricity consumed or sold by my customers through a distributor's settlement system, I may have to meet prudential requirements as set out in the Retail Settlement Code.

I understand and acknowledge that, as a licenced electricity generator, I must enter into a connection agreement with the distributor or transmitter to whom my facilities are connected.

Note: The issuance of an electricity generator licence does not guarantee accreditation by the IMO, or connection to a transmission or distribution system.

Print Name and Title	Signature of Applicant(s)	Date Signed

CHECKLIST

Have You:

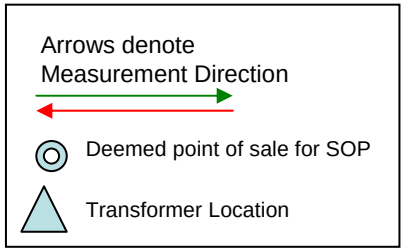
1.	Properly and fully completed this form? (Illegible, incomplete or improperly completed forms do not qualify for registration and will be delayed or returned).	☐
2.	Enclosed a cheque or money order payable to the **ONTARIO ENERGY BOARD** in the amount prescribed ($800.00)?	☐
3.	Attached 2 copies of the completed application form and attachments?	☐
4.	Attached Section D, the **signed** "Notice and Consent" form, as specified?	☐
5.	Attached Section E, the **signed** "Acknowledgement" form, as specified?	☐

Please send the completed form and all attachments to:

Board Secretary
Ontario Energy Board
Attn: Licence Processing
2300 Yonge Street
P.O. Box 2319 , 26th Floor
Toronto, ON M4P 1E4

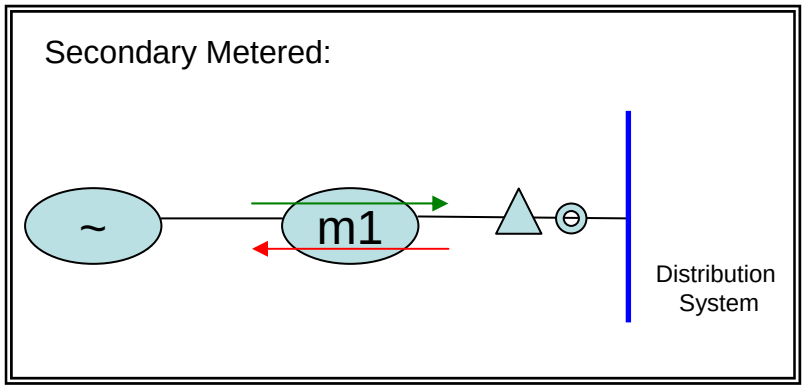
NOTE: You are not required to return the cover page or this checklist to the Ontario Energy Board.

Revised April 30, 2003



Standard Offer Program
Meter Configuration Options

1. Pure Generator Customer



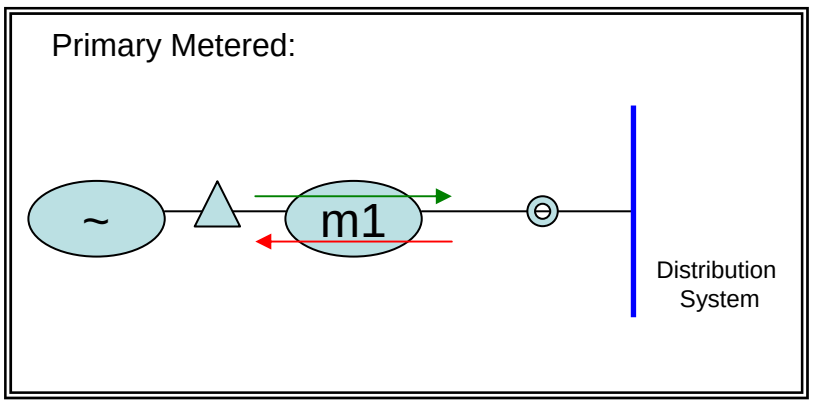
Settlements:

Energy delivered reduced by Site Specific Losses. Paid @ SOP Rate

(Kwh / (1+SSL)) x SOP Rate

Energy consumed increased by LDC approved loss factor. Billed at HOEP.

(Kwh x (1+LDCL)) x HOEP



Settlements:

Energy delivered- No adjustment required. Paid @ SOP Rate.

Kwh x SOP Rate

Energy consumed increased by LDC approved loss factor less 1% for primary metering discount. Billed @ HOEP.

(Kwh x (1+LDCL)) x .99 x HOEP

Note: Load Customer (Station Service) is also required to pay for additional energy related charges: WMSC, DRC, Network Service, Line & Transformation, and Distribution Variable Charges.

Note: Load Customer is also required to pay for additional energy related charges: WMSC, DRC, Network Service, Line & Transformation, and Distribution Variable Charges.

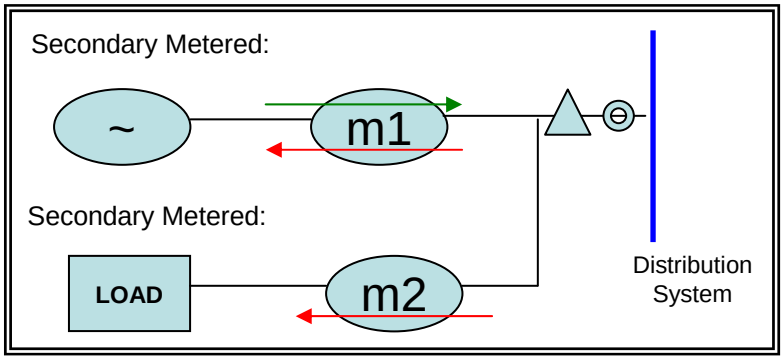
Arrows denote Measurement Direction

Deemed point of sale for SOP

Transformer Location

Standard Offer Program Meter Configuration Options

2. Generator and Load Customer – 2 Meters



Settlements - Generator:

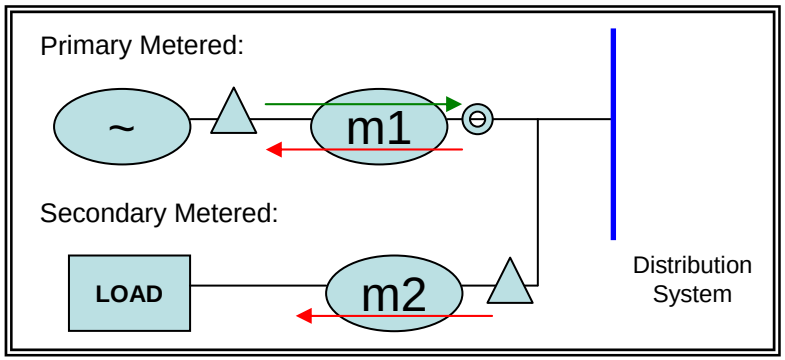
Energy delivered reduced by Site Specific Losses (Kwh / (1+SSL)) x SOP Rate

Energy consumed increased by LDC approved loss factor (Kwh x (1+LDCL)) x HOEP

Settlements - Load:

Energy consumed increased by LDC approved loss factor.

(Kwh x (1+LDCL)) x HOEP or (Kwh x (1+LDCL)) x RPP



Settlements - Generator:

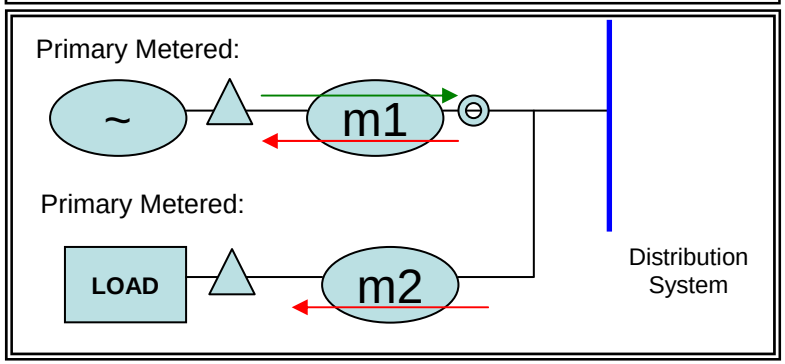
Energy delivered no adjustment required Kwh x SOP Rate

Energy consumed increased by LDC approved loss factor less 1% Primary Metering discount. (Kwh x (1+LDCL)) x .99 x HOEP

Settlements - Load:

Energy consumed increased by LDC approved loss factor.

(Kwh x (1+LDCL)) x HOEP or (Kwh x (1+LDCL)) x RPP



Settlements - Generator:

Energy delivered no adjustment required Kwh x SOP Rate

Energy consumed increased by LDC approved loss factor less 1% Primary Metering discount. (Kwh x (1+LDCL)) x .99 x HOEP

Settlements - Load:

Energy consumed increased by LDC approved loss factor less 1% Primary Metering Discount.

(Kwh x (1+LDCL)) x .99 x HOEP or (Kwh x (1+LDCL)) x .99 x RPP

Arrows denote
Measurement Direction

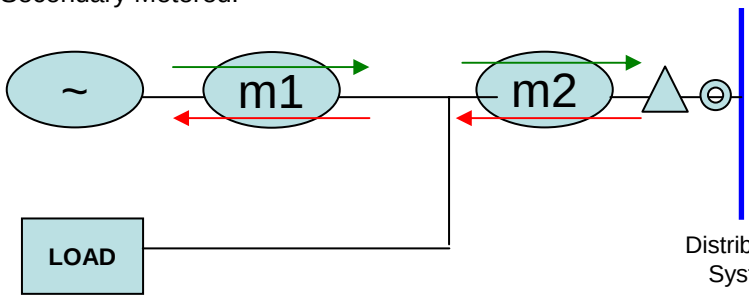
Deemed point of sale for SOP

Transformer Location

Standard Offer Program
Meter Configuration Options

Embedded Generator and Load Customer (under exceptional circumstances only)
(See spreadsheet for calculation formulas and methodology)

Secondary Metered:



Settlements - Generator:

Energy delivered reduced by Site Specific Losses Energy consumed increased by LDC approved loss factor

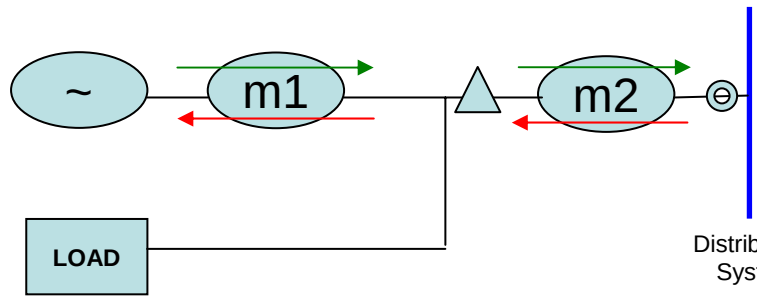
Settlements – Load:

Energy consumed increased by LDC approved loss factor.

Settlements – Load: (when m1 delivered coincident with m2 consumed or m2 consumed = 0 coincident with m1 delivered)

Energy consumed increased by LDC approved loss factor.

Primary Metered:



Settlements – Generator: (same as above)

Settlements – Load

Energy consumed increased by LDC approved loss factor.

Settlements – Load: (when m1 delivered coincident with m2 consumed or m2 consumed = 0 coincident with m1 delivered)

Energy consumed increased by LDC approved loss factor.

Note: Load Customer is also required to pay for additional energy related charges: WMSC, DRC, Network Service, Line & Transformation, and Distribution Variable Charges.

Arrows denote
Measurement Direction

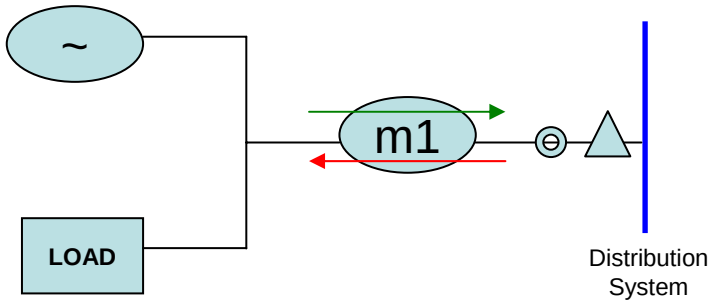
Deemed point of sale for SOP

Transformer Location

Standard Offer Program
Meter Configuration Options

4. Generator and Load Customer – 1 Meter (Simple Net Metering)

Secondary Metered:



Settlements:

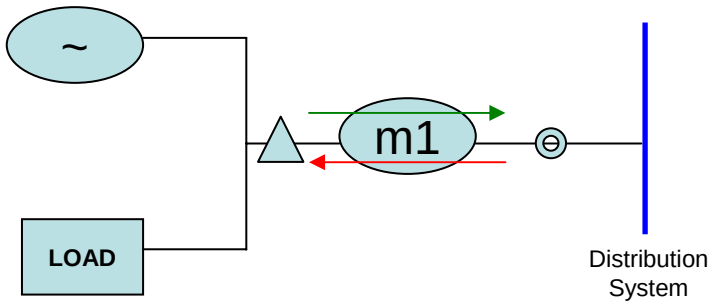
Energy delivered with no adjustment for Losses. (*O. Reg. 541/05, s. 8 (2)*)

Kwh x (RPP or HOEP) Rate

Energy consumed increased by LDC approved loss factor.

(Kwh x (1+LDCL)) x (RPP or HOEP) Rate

Primary Metered:



Settlements:

Energy delivered with no adjustment for losses. (*O. Reg. 541/05, s. 8 (2)*)

Kwh x (RPP or HOEP) Rate

Energy consumed increased by LDC approved loss factor less 1% for primary metering discount. Billed @ HOEP.

(Kwh x (1+LDCL)) x .99 x (RPP or HOEP) Rate

Note: Net Metering Regulations also require calculating credit to customer on Additional Charges: WMSC, DRC, Network Service, Line & Transformation, and Distribution Variable Charges.

Appendix 10 Interconnection Matrices

SUMMARY STANDARD OFFER CONTRACTS (SOC)

Description	Micro Embedded	Small Embedded	Mid Size	Large
Fuel	Fuel is solely from a renewable resource*	Fuel is solely from a renewable resource*	Fuel is solely from a renewable resource*	Fuel is solely from a renewable resource*
Size	Less than 10 kW	10 kW to 1 MW connected at less than 15 kV	1 MW to 10 MW connected at less than 15 kV	Greater than 10 MW
		Up to 1 MW connected at greater than 15 kV	Greater than 1 MW to 10 MW connected at greater than 15 kV	
Bi-directional Metering Required	Yes	Yes	Yes	Yes
Connection Agreement with LDC or Supply Authority Required	Yes	Yes	Yes	Yes
All equipment must be CSA approved or have ESA special approval	Yes	Yes	Yes	Yes
ESA Inspection Required	Yes	Yes	Yes	Yes
OEB Generation Licence Required	Yes	Yes	Yes	Yes
IESO Market Participant**	No	No	No	No
Commodity (Electricity) Charge received for generation	SOC	SOC	SOC	SOC
Payment for generation received from***	LDC	LDC	LDC	LDC
Relay Protection required	Yes - Disconnect	Yes - Disconnect	Yes - Disconnect or Transfer Trip	Yes - Disconnect or Transfer Trip
Monthly Distribution Fixed Charge****	No reduction	No reduction	No reduction	No reduction

* Wind, drop in water elevation, solar radiation, agricultural bio mass or any combination

** Any generator has the right to be a market participant and some may be required to be a market participant for technical reasons. It has been assumed for these smaller examples that generators would prefer to be embedded

*** While the payment will likely be received from the LDC the LDC will in turn settle with either the IESO or the OPA for the variance between the SOC price and the HOEP

**** Where the distributed generation is connected at a Niagara Peninsula Energy distribution service account and is not a free standing facility

Appendix 10 Interconnection Matrices

SUMMARY LOAD DISPLACEMENT GENERATION

Description	Embedded Load Displacement primarily for own use*****	Micro Embedded Load Displacement	Small Embedded Load Displacement	Mid Size Embedded Load Displacement	Large Embedded Load Displacement	Embedded Load Displacement Generation that displaces New Load
Fuel	Fuel is solely from a renewable resource*	Non renewable resource	Non renewable resource	Non renewable resource	Non renewable resource	Non renewable resource
Size	Less than 500 kW**	Less than 10 kW	10 kW to 500 kW connected at less than 15 kV Up to 1 MW connected at greater than 15 kV	500 kW to 10 MW connected at less than 15 kV Greater than 1 MW to 10 MW connected at greater than 15 kV	Greater than 10 MW	Any size
Net metering allowed**	Yes	No	No	No	No	No
Connection Agreement with LDC or Supply Authority Required	Yes	Yes	Yes	Yes	Yes	Yes
All equipment must be CSA approved or have ESA special approval	Yes	Yes	Yes	Yes	Yes	Yes
ESA Inspection Required	Yes	Yes	Yes	Yes	Yes	Yes
OEB Generation Licence Required if exporting to distribution system	No	Yes	Yes	Yes	Yes	Yes
IESO Market Participant***	No	No	No	No	No	No
Relay Protection required	Yes - Disconnect	Yes - Disconnect	Yes - Disconnect	Yes - Disconnect and/or Transfer Trip	Yes - Disconnect and/or Transfer Trip	Yes - Disconnect and/or Transfer Trip
Monthly Distribution Fixed Charge	No reduction	No reduction	No reduction	No reduction	No reduction	No reduction
Distribution Variable Charge	Net	Net	Net	Net	Net	Net
Commodity (Electricity) Charge paid for electricity delivered	Net (where eligible)	Gross	Gross	Gross	Gross	Gross
Commodity (Electricity) Charge received for generation		HOEP	HOEP	HOEP	HOEP	HOEP
Payment for generation received from		LDC	LDC	LDC	LDC	LDC
Regulatory Charges	Net	Net	Net	Net	Net	Net
Debt Retirement Charge	Net	Gross	Gross	Gross	Gross	Net
				500 kW to 1 MW		
Transmission Charges - Network	Net	Net	Net	Net	Net	Net
				Over 1 MW		Over 1 MW
Transmission Charges - Connection	Net	Gross	Gross	Gross	Gross	Gross
			Over 50 kW	Over 5 MW		Over 50 kW
Fixed Standby Charge****	No	No	Yes	Yes	Yes	Yes
Variable Standby Charge****	No	No	Yes	Yes	Yes	Yes

* wind, drop in water elevation, solar radiation, agricultural bio mass or any combination

** Niagara Peninsula Energy has a limit on its obligation to connect net metering on a first come, first served basis

*** Any generator has the right to be a market participant and some may be required to be a market participant for technical reasons. It has been assumed for these smaller examples that generators would prefer to be embedded

**** If an OEB Rate Order exists

***** If distributed generator elects not to pursue standard offer contract.

Print Form

Ontario Energy Board
Commission de l'Énergie de l'Ontario

Application for Electricity Generator Licence
Standard Offer Program

Ontario
Ontario Energy Board / Commission de l'énergie de l'Ontario

Application Instructions

1. Purpose of this Form

This form is to be used to apply for a licence that would enable the applicant to generate electricity for sale under the Standard Offer Program.

2. Completion Instructions

This form is available as writable PDF. Type or clearly print answers to all questions.

- This form contains interactive form fields. The applicant will type answers to all questions. The applicant will print two copies and sign both copies.
- Alternatively, the applicant may print a copy of the form and clearly print answers to all questions. The applicant will make a copy and sign both copies.

Please send two signed copies of the completed form and attachments to:

Board Secretary
Ontario Energy Board
P.O. Box 2319
2300 Yonge Street
27th Floor
Toronto ON M4P 1E4

If you have any questions on completing this application, please contact the Market Operations Hotline at 416-440-7604 or 1-888-632-6273 or email at market.operations@oeb.gov.on.ca .

The Board may require information that is additional or supplementary to the information filed in this form. Applications not completed in full may be returned to the Applicant.

3. Licence Fee

A non-refundable application fee is required to process your application. Please enclose a cheque or money order made payable to the ONTARIO ENERGY BOARD. The amount of the application fee is indicated on the "Apply for a Licence" portion of the Board's website at www.oeb.gov.on.ca.

4. Confidentiality

Information filed in Section A of this application will be placed on the public record. All other information will be treated as confidential. Where the Applicant objects to public disclosure of Section A information, the Applicant must follow the Ontario Energy Board's rules regarding the treatment of confidential filings.

5. Important Information

As a licensed electricity generator under the Standard Offer Program, the licensee may be subject to additional obligations as required by a distributor or the Ontario Power Authority or as established by the Ontario Energy Board.

Ontario Energy Board de
P.O. Box 2319
2300 Yonge Street
27th Floor
Toronto ON M4P 1E4
Telephone: 1-888-632-6273
Facsimile: (416) 440-7656

Commission de l'Énergie l'Ontario
C.P. 2319
2300, rue Yonge
27e étage
Toronto ON M4P 1E4
Téléphone: 1-888-632-6273
Télécopieur: (416) 440-7656

Ontario
Ontario Energy Board / Commission de l'énergie de l'Ontario

Application for Electricity Generator Licence Standard Offer Program

For Office Use Only	
Application Number	EB -
Date Received	

A. Applicant Information

1. Name to Appear on Licence

2. Applicant's Business Information

◯ Sole Proprietor ◯ Partnership ◯ Corporation ◯ Other	Ontario Corporation Number/ Business Registration Number	Date of Formation

Contact Address (if RR, give Lot, Concession No. and Township)

City	Province/State	Country	Postal/Zip Code

Phone Number	Fax Number	E-mail Address

3. Key Individual (Officer, Director, Partner, Proprietor)

Mr. ◯ Mrs. ◯ Miss ◯ Ms. ◯ Other	Last Name	First Name	Initial
	Position Held		

4. Primary Contact for this Application

Mr. ◯ Mrs. ◯ Miss ◯ Ms. ◯ Other	Last Name	First Name	Initial
	Position Held and Company Name if different from Name to Appear on Licence		

Contact Address (if RR, give Lot, Concession No. and Township), or indicate as above in item 2 ☐

City	Province/State	Country	Postal/Zip Code

Phone Number	Fax Number	E-mail Address

5. Generation Facility

Describe the generation facility by providing the following information. If the Applicant has more than one facility, provide the information on additional facilities as an attachment.

Renewable Resource Type: ◯ Wind ◯ Small Hydro-Electric ◯ Solar ◯ Bio-Mass
◯ Other

Number of Units | Total Installed Capacity | ◯ kW ◯ MW | In Service Date

Facility Name and Address

Responsibilities of Applicant: ◯ Own and Operate ◯ Own Only ◯ Operate Only

6. Licensing History

Has the Applicant been licensed by the Ontario Energy Board? If yes, please provide the licensed company name, address and licence number.

Yes	No
◯	◯

7. Distribution Company

Identify the distributor to whose system the generation facility will be connected (directly or indirectly):

The Applicant may need to acquire distribution structures and distribution equipment to connect the generation facility to the distributor listed above. Please note that in this instance the Applicant will need to advise the Board of its proposal to acquire distribution assets. Please contact the Market Information Hotline at 416-440-7604 or 1-888-632-6273 or email at market.operations@oeb.gov.on.ca for further information.

B. Current Status of Assessments and Contracts

8. **Connection Impact Assessment**

Confirm the current status of the Applicant's connection impact assessment with the distributor noted in item 7 above.

- ○ (a) Connection impact assessment is not required. Provide explanation:
- ○ (b) Distributor has completed connection impact assessment
- ○ (c) Applicant has requested connection impact assessment
- ○ (d) Applicant has not requested connection impact assessment but has initiated contact with the distributor
- ○ (e) Process has not been initiated

If the Applicant has selected 8(d) or 8(e), please explain what work, if any, has been done (i.e. initial consultation with the distributor, development of plan, etc.) and provide a summary of any communication that has taken place between the Applicant and the distributor.

Indicate when the Applicant will request a connection impact assessment.

9. **Standard Offer Program Contract**

Confirm the current status of the Applicant's Standard Offer Program contract arrangements with the Ontario Power Authority.

- ○ (a) Applicant has entered into contract
- ○ (b) Applicant has filed application
- ○ (c) Process has not been initiated

If the Applicant has selected 9(c), please explain what work, if any, has been done with respect to the preparation of the application and indicate when the Applicant may be filing the application with the Ontario Power Authority

C. Legal Proceedings

10. Has the Applicant ever had a licence or registration refused, suspended, revoked or cancelled? If yes, provide details.	Yes	No
	☐	☐

D. Notice and Consent

AS REQUIRED BY THE FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

In order to complete or verify the information provided on this form, it may be necessary for the Ontario Energy Board to collect additional information from some or all of the following sources: federal, provincial/state and municipal governments; licensing bodies; law enforcement agencies; credit bureaus; and banks. Only information relevant to your application will be collected. The official who can answer questions about collection of information is:

Board Secretary
Ontario Energy Board
P.O. Box 2319
2300 Yonge Street, 27th Floor
Toronto, ON M4P 1E4

WARNING: It is an offence to knowingly provide false or misleading information on this application.

	Yes
I consent to the collection of this information as authorized under the *Ontario Energy Board Act, 1998*.	☐
I understand that this information will be used to determine whether I am qualified for the licence for which I am applying.	☐

Print Name of Applicant	Signature of Applicant	Date Signed

E. Acknowledgement of Other Market Conditions

I understand and acknowledge that, as a licensed electricity generator, I may have to meet requirements to disclose information to consumers in accordance with any government regulation made or standard set by the Board.

I understand and acknowledge that, as a licensed electricity generator, I must enter into agreements with the distributor to whom my facilities are connected.

Note: The issuance of an electricity generator licence does not guarantee contractual arrangements with the Ontario Power Authority or connection to a distribution system.

Print Name of Applicant	Signature of Applicant	Date Signed