Guidelines for Applicants
Connecting Distributed Generation

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Guidelines for Applicants Connecting Distributed Generation

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Introduction

The mission of Halton Hills Hydro as a Local Distribution Company (LDC) is to provide safe, reliable, efficient delivery of electricity within our service area while being accountable to our shareholders…usually the Council and citizens of the municipality.

Halton Hills Hydro is committed to providing information, advice and direction to Generators who wish to connect to HHH's electricity distribution system.

This guide contains an overview of the Ontario electricity transmission system, typical LDC Hydro distribution systems and safety, power quality, protection and other technical issues related to new generation.

This guide has two goals:

- To provide the technical requirements of connecting distributed generation to an HHH's distribution system
- To outline the necessary administrative procedures

Distributed generation is any type of electrical generator or static inverter producing alternating current that has the capability of Parallel Operation with the LDC distribution system, or is designed to operate separately from the LDC system and can supply a load that can also be fed by the LDC distribution system.

The Ontario government's policy on purchase of electricity through Feed in Tariffs (FIT) creates an opportunity for a significant increase in the interest and presence of distributed generation throughout the province.

Although some distributed generation is intended to provide electricity solely for a customer's own use, such as stand-by or load displacement generation, this guide also covers the emerging role of distributed generation in supplying Ontario's generation needs through the sale of some or all of the electricity generated by exporting it through the LDC's electricity distribution system.

Distributed generation also varies in design and fuels from diesel or natural gas standby generators to natural gas co-generation to wind turbines, photo voltaic cells, bio gas and hydro electric generation. A further variable is size, from very small (micro) wind and photo voltaic units in the under 10 kilowatt (kW) range to generation in the multi megawatt (MW) range.

Due to the variability, size and complexity of each generation project, this guide provides only general information on connecting to HHH's distribution system.

In this introductory guide we have kept the content at a fairly high level providing references to enable access to more specific details. We have used plain language and simple examples to illustrate the points.

Should there be conflicts or contradictions between the simplified examples in this guide and specific information, the specific information will take precedence.

Net Metering Program

With the rising costs energy, you may have thought about reducing your electricity costs by generating your own electricity. If so, Halton Hills Hydro's (HHH) Net metering program might be for you. The following outlines our Net Metering program for generation of 500kW or less and shows you in general the steps involved.

What is Net metering?

- Net metering measures the consumption of electricity you use against the amount of electricity you generate resulting in a "net" total from which your bill is calculated.
- Net Metering is ideal for those looking to reduce electricity costs.
- Under our Net Metering Agreement, excess generation credits can be carried forward up to twelve months to offset future electricity costs.

What type of generation can I use?

To qualify for our Net metering program, the type of generation must come from a Renewable Energy Technologies (RET), which are derived from natural resources that for practical purposes cannot be depleted. Any combination of wind, water, solar radiation or agricultural biomass with a total nameplate rating of 500 kW or less qualifies as an RET.

What's the process to connect to HHH's Distribution System?

- HHH recommends that all generator equipment be certified by the Canadian Standards Association (CSA). If it isn't, equipment must be site certified by the ESA.
- Installation of all generation facilities must be approved by the ESA and Connection Authorization provided to HHH prior to connection.
- To comply with Section 84 of the Ontario Electrical Safety Code, you are required to have an isolation switch (visible, accessible and lockable) located between the meter and your equipment.

Agreements for Net Metering

- Our Connection Review Application Forms (Appendices 2, 3, and 4 as applicable)
- Our Net Metering Connection Agreement must be signed and complied with (Appendix 8).

Technical

- Generator Protective Relay settings must be set as per the tables in the Agreement.
- Halton Hills may choose to perform a Connection Impact Assessment at your expense.

Metering

In order to bill you on a net metering basis and comply with the requirements of Measurement Canada, meter replacement is required. You will be responsible for costs associated with HHH upgrading the meter for your installation.

Your generator of less than or equal to 500kW:

Halton Hills Hydro will install a dual register meter capable of measuring your consumption from Halton Hills Hydro's distribution system and the amount of generation you supply into Halton Hills Hydro's distribution system. Credit for electricity generated will be incorporated into your regular bills. Halton Hills Hydro will determine meter reading frequency and method.

Connection Costs

You will be responsible for the costs of any modifications to Halton Hills Hydro's distribution system, including transformer changes needed to connect your generation facility.

How will my bill be calculated?

HHH will continue to read your meter as we do now. The bill you see will reflect the difference between the value of the electricity you return to the grid and the value of electricity you consume from the grid. If your net consumption for a billing period is zero, or results in a credit, the delivery portion of your bill will not include kilowatt-hour based charges and the net credit will be carried forward to the next billing cycle.

What do I need to do to get started?

When you call, make sure you have the following information ready:

- Your Halton Hills Hydro account number
- Service address (location of generator: lot/ concession/ township/ street address)
- Size of generator (kW)
- Type of generator (must be an RET)
- Planned in service date
- Fax number and/ or email address
- Contact our Customer Service or Engineering Departments at (519) 853-3700, Monday to Friday from 7:30 a.m. to 4:00 p.m.

What if I want to sell generated power to the distribution system?

Halton Hills Hydro will purchase power generated by you; however, you will be required to enter into a different connection process not covered by our Net metering program. General requirements for this application require you to:

- Review the information provided to you in the following pages of this guideline.
- Contact Halton Hills Hydro to inform us of your proposed project.

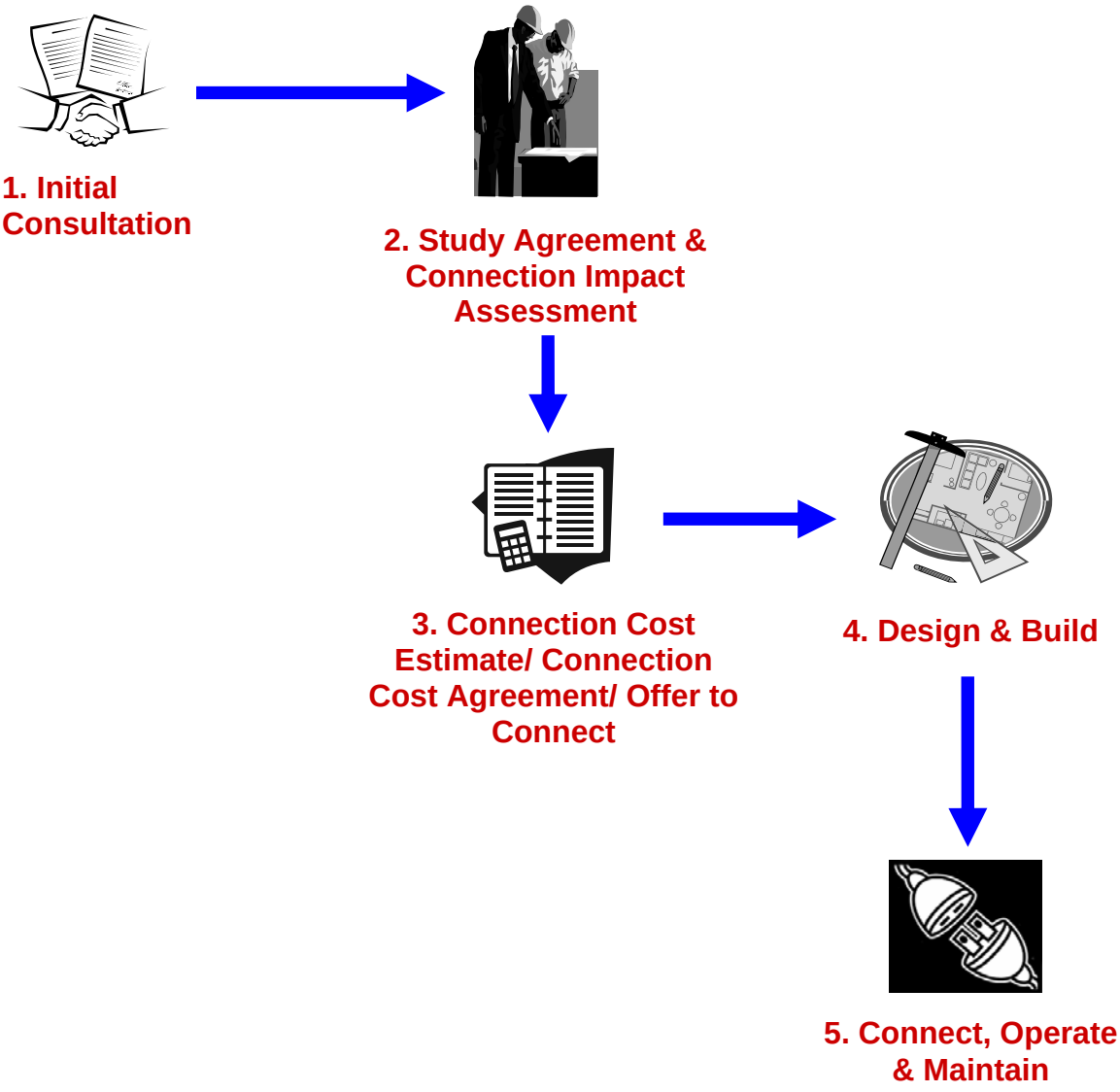
- Meet with Halton Hills Hydro personnel to discuss the project.
- Enter into a Connection Agreement and undergo a Connection Impact Assessment if required.
- Obtain a Generators License from the Ontario Energy Board (OEB).
- Purchase and install a distribution transformer.
- Purchase and install a four-quadrant interval meter acceptable to Halton Hills Hydro or pay Halton Hills Hydro for this service.
- The installation must conform to Halton Hills Hydro's Conditions of Service and meet the requirements of Halton Hills Hydro and the Electrical Safety Authority (ESA).
- Commissioning of installation witnessed by Halton Hills Hydro personnel and ESA.
- Contact the Ontario Power Authority (OPA) if you wish to take part in their Feed in Tariff Program.

Can I use my own power during an outage?

If you wish to run your generator during a Halton Hills Hydro power outage, your generator must have special transfer and isolating capabilities installed to ensure your generation facility cannot feed into Halton Hills Hydro's distribution system during an outage.

Connection Process Flowchart

Connection Process



The process that HHH will follow for connecting a distributed generator to HHH's distribution system is detailed in the Ontario Energy Board's (OEB) Distribution System Code, Appendix F. (http://www.oeb.gov.on.ca)

Connection Process Overview

Initial Consultation

Halton Hills Hydro meets with the prospective Generator to discuss their plans, provide preliminary information on the connection options and explain the connection process. The Generator is required to complete and submit the Connection Review Application Form (Appendix 2) and provide other supporting documents to Halton Hills Hydro's Engineering Department.

Connection Impact Assessment

After reviewing the Connection Review Application Form and other technical data submitted during the initial consultation, the project will then be discussed with the Generator in a face-to-face meeting. The aim of this meeting is to discuss issues of mutual interest early in the Generator's review of the feasibility of the project. The Generator is then required to submit a completed Generator Connection Assessment Review Form. (Appendix 3 for a generator of 10kW or less or Appendix 4 for a generator rated at between 10kW to 10MW). Where applicable, the Generator is required to submit a Study Agreement (Appendix 9) with payment to enact the Connection Impact Assessment.

Connection Cost Estimate

After all required assessments are complete (including assessment by Hydro One, if required), the scope of work required to connect new generation can be developed and estimates prepared. The Generator is required to make the appropriate payment to Halton Hills Hydro that could include fees for: processing and reviewing the application; technical review and impact assessment; and production and commissioning testing as necessary.

Design and Build

Once agreement of the scope, cost and timing are reached, the Generator is required to sign a Connection Cost Recovery Agreement. After submitting the agreement and payment, detailed design and construction may begin.

Connect, Operate and Maintain

After all of the required work and approvals are completed, Halton Hills Hydro and the Generator execute the Distribution Connection Agreement (Appendix 8). This Agreement provides an outline of the connection as well as the roles and responsibilities of each party.

The Ontario Electricity Transmission & Distribution System

In general, Ontario's electricity system consists of large centrally located generating stations linked by high voltage transmission lines over long distances at 500 kV, 230 kV and 115 kV. As the electricity is moved around the province the voltage is reduced as the electricity gets closer to the point of end use. Transformer stations reduce the voltage to 27.6 kV and 44 kV lines which transfer the electricity to distribution stations that reduce voltage again down to as low as 4 kV for routing electricity around streets.

It is likely that the location for distributed generation will be at the lower voltage levels and the ability of the distribution network to accommodate the distributed generation will depend on the "strength" of the network at that point and the normal loads that it supplies. Another name for the "strength" of the network is the "fault current".

The fault current is the amount of current that will flow when there is a fault on a network. The fault level at the end of a long electricity circuit is much lower than closer to the upstream supply. At a low fault level site, the impact of the distributed generation can be great enough to disturb other local consumers. For this reason, it is sometimes necessary to reinforce the network, or connect the distributed generation to a higher voltage or stronger part of the network further away.

Higher-voltage systems such as the 230 kV or 500 kV transmission systems have high fault levels. In general, the lower the voltage, the weaker the system. The weaker the system the less distributed generation can be connected. Halton Hills Hydro's distribution system operates at 27.6 kV, 44 kV, 8.32kV, 4.16kV. As a general rule the voltage levels might have capacity for the maximum following amounts of distributed generation.

- 4.16/ 2.4 kV possibly between 500 kW and 1 MW
- 8.32/ 4.8 kV possibly between 1 MW and 3 MW
- 27.6/ 16.0 kV possibly between 6 MW and 10 MW
- 44 kV possibly between 15 MW and 20 MW

The above examples assume the presence of single-phase and where required three-phase lines with adequate conductor size and inherent load levels. The actual capacity of the lines to accept distributed generation can only be determined by an engineering review.

The necessary protection systems to protect Halton Hills Hydro's distribution system from events that can occur with distributed generation connected will also vary by generation size and distribution line characteristics. Therefore, similar units connected at different locations could have different protection requirements based on varying load conditions, as well as on HHH's Hydro One feeder supply and transformer characteristics.

Depending on the size, type, fuel, and location of generation facilities, the Ministry of the Environment (MOE) may require that the customer carry out an environmental assessment. Please contact the MOE for more information.

Distinctions Between Types of Distributed Generation

There are a number of distinct types of generators as far as the distribution system is concerned, these include: (a) solid-state or static inverters, (b) induction machines, and (c) synchronous machines.

Many smaller renewable energy systems produce grid 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.

As a practical matter, 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 little – if any – additional protection equipment.

Safety, Power Quality & Protection

As part of the interconnection process, safety, power quality, and system reliability are 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, IEEE, CSA and ESA. This section therefore addresses safety and technical issues in the abstract and how to streamline the interconnection process. The purpose of this section is to provide background and rationale, without going into great technical detail.

The OEB's Distribution System Code (DSC) Appendix F.2, CSA C22.3 No. 9-08 "Interconnection of Distributed Resources and Electricity Supply Systems", and IEEE 1547 "Standard for Interconnecting of Distributed Resources with Electric Supply Systems" outlines the technical requirements for connecting a generator to an electricity distributor's system. We have identified specific sections of Appendix F.2 as they relate to safety, power quality and protection.

The link to the OEB DSC is at http://www.oeb.gov.on.ca

Safety

Like any source of electricity, distributed generation systems have the potential to be dangerous to both people and property, and 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 recent trend. Utilities are concerned with generators supplying energy to one of their lines that is otherwise thought to be de-energized. This is known as islanding.

Islanding

One of the most important issues for distributed generation is to avoid a condition known as islanding. Islanding is a situation where a portion of the utility system that contains both loads and a distributed generation source becomes separated from the remainder of the utility system but remains energized.

The primary concern is a situation 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

distributed generation disconnects from the distribution system before the first automatic reclose occurs. The concern is that if the distributed generation does not disconnect fast enough: a) the distributed generation may feed the fault; and b) when the utility protective device(s) tries to reclose, it will be closing back in on a line that is being supplied by distributed generation resulting in possible equipment damage, overloading or power quality issues.

Historically with central generation and transmission an LDC could be sure that if an electrical circuit was isolated "upstream" and was not being fed from an alternative source that it was de-energized.

Halton Hills Hydro may want to isolate the section of line for maintenance purposes and would normally do that through opening switches. While a utility can be sure that all of its own electricity sources are either shut down or isolated from the area that needs work, we must now factor in distributed generation to ensure that it too is isolated and not supplying the line section.

Distributed generation creates a source of energy inputs to the utility system that Halton Hills Hydro does not control and if the distributed generation is potentially capable of islanding it can backfeed electricity to the our distribution system.

Grounding

Distributed generators must be grounded in accordance with equipment manufacturers, the OESC and HHH requirements.

The distributed generation must not disrupt any coordination of ground fault protection or cause over-voltages that exceed the rating of equipment connected to HHH's distribution system.

Power Quality

Power quality is another significant technical concern for utilities and customer-generators. 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 120/240 Volts 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 equipment and appliance malfunction or damage. Additional power quality considerations include harmonics, power factor, DC injection, and voltage flicker.

Each type of distributed generation 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 a distributed generator connecting to or disconnecting 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 distributed generation's operating cycle. Whether the utility actively or passively regulates their voltages to maintain an acceptable range, the presence of a distributed generation should have no detrimental impact on that regulation. The distributed generation 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.

Ref: OEB DSC, Appendix F.2, Section 3

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.

Ref: OEB DSC, Appendix F.2, Section 3.2

Frequency

As with voltage fluctuations frequency variations are a reliability and power quality issue. Distributed generation shall operate within the range of 59.3 to 60.5 Hz.

Ref: OEB DSC, Appendix F.2, Section 6.5

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 distributed generators 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 Halton Hills Hydro's distribution system in excess of applicable standards.

Ref: OEB DSC, Appendix F.2, Section 10.2, CAN/CSA-C61000-3-6, IEEE 1547

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. Distributed generators connected to the distribution system must operate in the range 0.9 lagging to 0.95 leading power factor.

Ref: OEB DSC, Appendix F.2, Section 4

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.

Ref: OEB DSC, F.2, Section 10.3

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 a distributed generator vary for example with some wind turbines if the wind is gusting or turbulent.

Ref: OEB DSC, Appendix F.2, Section 10.1

Protection of Distributed Generation Facility

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

Ref: OEB DSC, Appendix F.2, Section 2

Monitoring

For distributed generation greater than 250 kW Halton Hills Hydro may require remote monitoring of the distributed generation connection status, real power output, reactive power output and voltage at the point of generator connection. For distributed generation greater than 10 MW the monitoring must be in real time.

Ref DSC Appendix F.2, Section 9

Standardized or Certified Equipment

It is a requirement that the design for a distributed generation installation be approved by a professional engineer and that all equipment be CSA approved and inspected by the ESA. However, if the interface equipment used is a standard package or certified for use (by UL or CSA or some other recognized approving body), as is the case with some inverters, this will expedite and simplify the interconnection process. This is especially applicable at the lower distributed generation output levels and will reduce the amount of technical information required.

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

- An interrupting device capable of interrupting the maximum available fault current at the distributed generation location.
  Ref DSC Appendix F.2, Section 1
- An interconnection device that is manual, lockable, has visible disconnection and is accessible to HHH staff. Ref DSC Appendix F.2, Section 1
- A generator disconnect device. Ref DSC Appendix F.2, Section 1
- Anti islanding protection. Ref DSC Appendix F.2, Section 6.1.2
- A protective relay that will operate the load interruption device with the following features
  - Over-voltage trip. Ref DSC Appendix F.2, Section 1
  - Under-voltage trip. Ref DSC Appendix F.2, Section 1
  - Over/underfrequency trip. Ref DSC Appendix F.2, Section 6.5
  - Over current protection. Ref DSC Appendix F.2, Section 6.4
  - Ground fault protection. Ref DSC Appendix F.2, Section 2
- Reclosing co-ordination to ensure that the distributed generation ceases to energize prior to the reclosure of an upstream HHH device. Ref DSC Appendix F.2, Section 6
- Power Factor correction (if required). Ref DSC Appendix F.2, Section 4
- Synchronizing equipment that will limit voltage fluctuation, frequency variation and phase angle when the distributed generation parallels with the distribution system. Ref DSC Appendix F.2, Section 3.2
- Transfer Trip may be required depending on the loading of the distribution feeder and the output rating of the distributed generation 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.

Halton Hills Hydro will provide approximate three phase fault levels at the preliminary review 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.

Preliminary Review, Technical Review, Impact Assessment

Generation Connection Process

As stated previously, the process that Halton Hills Hydro will follow for connecting a distributed generator to HHH's distribution system is detailed in the OEB's Distribution System Code, Appendix F. The starting point is for potential Generators to complete the Connection Review Application Form (Appendix 2), and return it to Halton Hills Hydro's Engineering Department.

Preliminary Review

In the very early stages where a Generator may be considering site selection, Halton Hills Hydro will provide a preliminary review and high level advice and guidance based on limited parameters such as:

- Potential sites
- Output capacity of distributed generation
- Fuel type
- Generator generic description and design type

To better assist you in determining the feasibility of your proposed generation facility and if you can make money generating electricity from renewable energy projects, visit the Canadian Government's RETScreen International Clean Energy Decision Support Centre at *http://www.retscreen.net/ang/d_o_view.php*. This free, online tool will provide a financial analysis of your small scale energy *project*. Halton Hills Hydro only offers this as a reference and shall not be held liable for the information it contains, information gathered from it, or decision making based on information gathered from this Government of Canada's service.

Technical Review

Once a location has been determined, the Generator must complete an application form Appendix 3: Generator Connection Assessment Review Form (10 kW or Less) or Appendix 4: Generator Connection Assessment Review Form (10 kW to 10MW) requesting a full technical review. The technical review will establish HHH's requirements for the distributed generation at the specific location and determine the need for an Impact Assessment.

The technical review will require the distributed generation developer to provide the following details of the project certified by a licensed professional engineer:

Distributed Generation Description

- Site
- Type of distributed generation
- 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
- Generator
- Generator disconnect device
- Protective relaying and functions
- Transformer
- Protective isolating device
- Generator breaker
- Manual interconnection disconnection device
- Voltage levels
- Fusing

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

LDC Impact Assessment

Where required, Halton Hills Hydro will perform an impact assessment and advise the Generator of compliance and permission to proceed or of problems that need to be addressed. The Generator should not order any equipment or make commitments to the project until the impact assessment has been satisfactorily completed and a Distribution Connection Agreement has been executed. When a Generators licence is required, Halton Hills Hydro will require a copy of the Generators Generator Licence.

The impact assessment shall set out the impact of the proposed generation facility on the distribution system and any customers of the distributor including:

a. any voltage impacts, impacts on current loading settings and impacts on fault currents;
b. the connection feasibility;
c. the need for any line or equipment upgrades;
d. the need for transmission system protection modifications; and e. any metering requirements.

The technical submission for projects greater than 10kW (single line diagram, Generation Connection Assessment Form, site plan, etc…) must by signed and sealed by a Professional Engineer licensed by the Professional Engineers of Ontario.

Hydro One Impact Assessment

Distributed generation greater than 1 MW connected to HHH's 27.6 kV and 44 kV systems may have an impact on Hydro One's electrical supply system and will require their separate impact assessment.

Hydro One may request or be required to perform their own impact assessment on any size project connecting to HHH's distribution system. Any costs incurred by HHH applying to Hydro One on behalf of a Generator will be borne by the Generator.

Costs

The Generator will be required to pay Halton Hills Hydro for processing and reviewing any application, technical review and impact assessment. The cost may vary from a fixed fee approved by the OEB to actual costs for time required. Contact Halton Hills Hydro for details.

In addition Halton Hills Hydro will add any costs incurred for reviews or assessments required by Hydro One.

Halton Hills Hydro 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 distributed generation is used for load displacement of existing load, a standby charge may be applicable as approved by the OEB.

The Generator is solely responsible for the purchasing, installing, inspections, testing/ commissioning and other related items for their generation facility. Halton Hills Hydro shall not be held liable for the costs incurred by the Generator during the course of the project.

Production and Commissioning Tests

Prior to a generation facility of size 10kW or larger being allowed to connect to the distribution system, the Generator in coordination with Halton Hills Hydro must complete a "Commissioning and Equipment Verification Report" found in Appendix 7 of these Guidelines. Areas of this Report not shaded must be completed by the Generator and/ or their representatives. The Report must be signed and sealed by a Professional Engineer who is acting on the Generator's behalf and who is registered with the Professional Engineers of Ontario.

The Applicant should submit their Commissioning Plan to HHH at least 5 business days prior to the commissioning test date.

Commissioning and Verification tests shall be performed per CSA C22.3 No. 9-08 "Interconnection of Distributed Resources and Electricity Supply Systems", IEEE 1547 "Standard for Interconnecting of Distributed Resources with Electric Supply Systems" and The OEB Distribution System Code Appendix F.2 "Technical Requirements".

The Generator will be required to pay the costs related to production and commissioning tests if these tests are required.

Commissioning Test and ESA Connection Authorization, Ref DSC 6.2.19, 6.2.20, and Appendix F.

Termination of Process (Prior to Connection)

If at any time during the course of the project, prior to enacting the Connection Agreement and connecting the generation the Generator decides for whatever reason that they do not wish to proceed any further, the Generator shall notify Halton Hills Hydro in writing of their intent to terminate the process. Once notification is received, Halton Hills Hydro personnel will contact the Generator to confirm the termination notification and proceed with terminating the processes of Halton Hills Hydro's involvement. However, due to equipment and man hour costs, Halton Hills Hydro reserves the right to determine what funds will be reimbursed to the Generator assuming payment for the work was made to the utility by the Generator prior to terminating the process.

Metering

Metering requirements will be determined by Halton Hills Hydro and will depend on the type and size of generation and the load, if any, where the distributed generator is also a customer, at the distributed generation location. Where the distributed generator is exporting power a bi-directional meter capable of measuring electricity received from and sent to the distribution system is required. All metering cabinets, instrument transformers, and if necessary a telephone line will be supplied by the Generator and owned by Halton Hills Hydro. Halton Hills Hydro will purchase and supply an appropriate sealed meter at the Generator's expense once a connection cost recovery agreement has been completed by Halton Hills Hydro, signed by the Generator, and returned to the Hydro office.

The metering may be installed at the Demarcation Point of connection of the Distributed Generation Facility to the Distribution System. The point of demarcation for a Distributed Generation Facility is the primary live line clamp or lines switch that is installed on or at Halton Hills Hydro's Distribution line. If this is not practical, Halton Hills Hydro shall apply loss factors to the generation output in accordance with the loss factors applied for Retail settlements and billing. Appendix 6 shows the metering location and configuration options under the Feed in Tariff Programs.

Any Generator has the right to be a participant in the IESO-controlled wholesale market for settlements. Participants in the wholesale market must meet the requirements as specified in Chapter 6 Wholesale Metering of the Market Rules. In general, the metering requirements for wholesale market participants are more stringent than those required for HHH retail revenue purposes. In both wholesale and retail markets, all meters and instrument transformers must be Measurement Canada approved and connected in accordance with Measurement Canada and OEB policies and procedures. However, in the wholesale market, the IESO requires that market participants engage the services of a Meter Service Provider (MSP) to install and maintain the metering system. In addition, the IESO specifies the number and types of meters that must be used for revenue purposes and requires the submission of an emergency instrument transformer restoration plan.

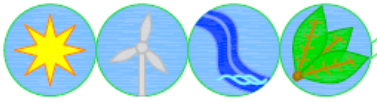
Unless otherwise specified for micro-generation projects, meter wiring shall follow ESA Specification 004 "Guidelines for Inverter-Based Micro Generating Facilities" where the line side of the meter is connected to HHH's distribution system and the load side of the meter is connected to the generation output.

It should be noted that all metering installations including FIT Generators, present and future, are subject to the Government of Ontario's Smart Metering Initiative and as such provisions and installation of a smart meter may be required at time of installation or at a to be determined future date. Halton Hills Hydro will inform the Generator of the requirements for installation of a smart meter as applicable.

Approvals

Before any distributed generation can be connected to Halton Hills Hydro's distribution system it must have received as a minimum the following approvals plus any additional approvals identified by Halton Hills Hydro and Hydro One:

- LDC Distribution Connection Agreement
- CSA or UL or recognized certification of all equipment installed
- ESA approval



Feed in Tariff (FIT) Programs

Feed in Tariff Programs (microFIT and FIT)

The Green Energy and Economy Act, 2009 has introduced new Feed in Tariff programs managed by the Ontario Power Authority (OPA). These programs will allow generation facilities using a renewable source to generate power and sell that power back to the grid. These programs are designed to encourage and facilitate a greater use of renewable resources such as solar, wind, water, and biomass for generating electricity. Such generating projects would be connected into a local utilities distribution system.

In taking part in the Ontario Power Authority's Feed in Tariff Programs, you will be able to generate electricity using an environmentally friendly source and be paid for the electricity you generate a special rates set by the OPA. The OPA has set specific rates based on the method of generation and the amount of electricity you supply back into the utilities distribution system.

What is a Renewable Project? Some examples are:

- wind turbines
- roof-top or ground mounted solar PV panels/ arrays
- waterpower project situated on a watercourse and waterfall
- a generator fueled by biomass on a farm

There are two separate programs with slightly different rules and requirements based on the size of the generation facility. To be eligible for the FIT program the project must have a gross nameplate capacity of no more than 10,000kW. Projects eligible for the microFIT program must have a gross nameplate capacity of no more than 10 kW.

To be eligible for either program, your generation project must:

- Use a renewable resource for generation (ex. solar, wind, water, biomass)
- Must be located in the Province of Ontario
- Must be connected to an eligible electricity distribution system voltage in Ontario of 50kV or less.
- Apply to the OPA and receive approval from the OPA to enter into a contract to take part in the microFIT or FIT programs as applicable.
- Have a separate meter suitable for data collection and settlement purposes.

Please keep in mind that the above are only a few of the general requirements. You will need to consult the OPA for their complete list of current requirements.

As the Generator, you are responsible for coordinating with all agencies to ensure you meet their regulatory requirements (including associated costs). You will also be responsible for coordinating with Halton Hills Hydro to determine the appropriate metering configuration and other connection requirements. You will be responsible for the cost of connecting and metering as determined by Halton Hills Hydro in compliance with the Ontario Energy Boards (OEB's) Distribution System Code, the Ontario Power Authorities microFIT and FIT programs, and the Green Energy Act. Contract payments will be based on the electricity delivered from you generation project and successfully injected into the distribution system. Please note that the payment amount may be subject to adjustments to metered electricity output to account for site-specific losses and other specifics if applicable.

All generation projects require a separate meter and will be metered to account for generation delivered into the distribution system. Halton Hills Hydro will supply at your expense a meter (as outlined by the OPA and OEB) appropriate for accurately measuring electricity received from and delivered into our distribution system. For projects with a gross nameplate capacity of more that 10kW, the generator may be responsible for supplying a separate phone line connection to the metering point to allow for data to be transmitted hourly. Generation projects with a gross nameplate capacity of 10kW or less do not require transmittal of hourly data unless directly connected to a Load Customer where both the generation facility and Load Customer's meters must transmit hourly data, or at such time as Halton Hills Hydro requires. In order to be eligible for the On-Peak Performance Incentive (presently not available to Solar PV and wind generation as they are deemed intermittent) the Contract Facility's meter must provide hourly data, including Contract Facilities of 10kW or less.

In addition to the requirements of the OPA and OEB, the Generator will be expected to comply with the requirements of Halton Hills Hydro as outlined in this document and our Conditions of Service (latest revision), the Electrical Safety Authority, and all other regulatory bodies, laws, by-laws, and guidelines that may apply. As an initial step in applying to Halton Hills Hydro, you will be required to complete the "Connection Review Application Form" (Appendix 2) and return the form to the Hydro office after which an initial meeting between all relevant parties will be arranged. You will be further required to complete a "Generator Connection Assessment Review Form (Appendix 3 or 4 as applicable to the size of generation). A separate Connection Impact Assessment may also need to be conducted which will be determined by the size of generation facility you are proposing. Where a Connection Impact Assessment is required, the Generator shall enter into a Study Agreement (Appendix 9). Halton Hills Hydro will need to assess its distribution system to ensure that your generation facility will be able to integrate into the distribution system. Any costs due to upgrades or changes to the distribution system may be payable or partially payable by the applicant. In this case, a "Cost Recovery Agreement" will be required.

Summary of Requirements:
In general to participate in the Feed in Tariff Programs, the Generator's requirements include, but are not limited to:

- Complete a "Connection Review Application Form" (Appendix 2) to be reviewed by Halton Hills Hydro.
- Complete "Generator Connection Assessment Form" (Appendices 3 or 4 as applicable) to be reviewed by Halton Hills Hydro.
- Enter into a study agreement where a Connection Impact Assessment is required (Appendix 9).
- Complete a "Connection Agreement" (Appendix 8) to be reviewed by Halton Hills Hydro.
- Enter into a "Cost Recovery Agreement" with Halton Hills Hydro once the utility has assessed the connection requirements.
- Obtain an inspection Certificate from the Ontario Electrical Safety Authority (ESA) and provide ESA Connection Authorization to Halton Hills Hydro.
- Provide Halton Hills Hydro with a copy of their Generators Licence (where applicable) which they can apply to the OEB for.
- Apply to the OPA to make a renewable connection and the proposal must pass the Transmission Assessment Test, Distribution Assessment Test, and Economic Connection Test (where applicable).
- Supply Halton Hills Hydro Inc. with the OPA assigned microFIT/ FIT tracking number for file reference.
- Engage Halton Hills Hydro Inc. in a Connection Impact Assessment to determine impacts to the distribution system.
- Enter into a Feed In Tariff contract with the OPA by applying to the OPA and having their application receive approval. Halton Hills Hydro will require documentation supporting the OPA's acceptance of the contract proposal.

If you currently have a Net metering contract with Halton Hills Hydro Inc. it is possible to switch over to the OPA's microFIT or FIT program as applicable. You will need to contact the OPA regarding their processes and as well a second meter will need to be installed to measure the amount of generated power produced by your renewable project. As well, a new connection agreement between yourself and Halton Hills Hydro pertaining to the microFIT or FIT program.

For further information and requirements about the Ontario Power Authorities Feed in Tariff Programs, please visit the Feed in Tariff Programs website: http://www.powerauthority.on.ca/FIT/ or contact the Ontario Power Authority (contact information contained in Appendix 10).

For further information and requirements about the Ontario Energy Board, please visit the OEB's website: http://www.oeb.gov.on.ca/ or contact the Ontario Energy Board (contact information contained in Appendix 10).

Appendices

Appendix 1 (a): Definitions

Appendix 1 (b): Who's Who in Ontario Electricity

APPENDIX 1 (a)

Definitions

Applicant — The legally responsible person applying to an LDC to interconnect a distributed generation facility to the LDC's distribution system.

Application Review — A review by the LDC of the completed standard interconnection application form for interconnection, to determine if an engineering review or distribution system study is needed.

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

Certified Equipment — A generating, control or protective system that has been certified by a nationally recognized testing laboratory (NRTL) as meeting acceptable safety and reliability standards.

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

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 distributed 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 (DG) Facility — A facility for the generation of electricity with a capacity of no more than 15 megawatts 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.

Distributed Generation Developer — same as Applicant.

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 — 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 distributed 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 distributed generation facility and to determine the cost of any such upgrade.

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.

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.

Impact Assessments — if warranted by the size, type location or other factors impact assessments may be required by an LDC and in some cases Hydro One where the distribution lines connect to Hydro One transformer stations.

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 a distributed generation facility to the distribution system so that parallel operation can occur.

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

Interconnection Disconnect Switch — A mechanical device used to disconnect a distributed 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 a distributed 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)

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 a distributed 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 Underwriters Laboratories 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 distributed generation facilities can offset their associated load consumption and are compensated for any extra energy delivered to the electricity system. In Ontario, legislation permits distributed 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 a distributed generation facility while the facility is connected to the energized distribution system.

Paralleling Equipment — The generating and protective equipment system that interfaces and synchronizes a distributed generation facility with the distribution system.

Point of Common Coupling — 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 distributed generation facility is electrically connected to the customer's electrical system.

Preliminary Review — A review at the feasibility stage to determine the suitability of a distributed generation site and the LDC's facilities available for connection

Protective Function — A function of a distributed generation facility, carried out using hardware and software, designed to prevent unsafe operating conditions from occurring before, during, and after the interconnection to a distribution system.

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 distributed 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 distributed generation operating data using telecommunications techniques.

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

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.

UL — Underwriters Laboratories.

Unit — same as distributed generation facility.

APPENDIX 1 (b)

Who's Who in Ontario Electricity

Sometimes it's difficult to figure out who's who and what they do in Ontario's electricity system. Here's a brief overview:

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 establish raison d'etre for Hydro One, OPG and LDCs • Significant legislation: Electricity Act, 1998 and Regulations, Ontario Energy Board Act 1998, Electricity Restructuring Act 2004 • Shareholder of Hydro One and OPG
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)	• The Ontario Power Authority (OPA) is an agency of the government of Ontario. The 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 can also be involved in demand management, conservation and renewable energy activities as directed by its mandate and government.
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.

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. It is owned by the Province of Ontario.
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 TSs at 27.6 kV and 44 kV or DSs at lower voltages. Some distributed generation connected to Hydro One TSs or DSs will require co-ordination with Hydro One. Hydro One is owned by the Province of Ontario.
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.
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.

Appendix 2

Connection Review Application Form

HALTON HILLS HYDRO INC.
Connection Review Application Form

Application for Preliminary Review of Distributed Generation to be located within Halton Hills Hydro's Distribution System and connected to the 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 Distribution 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 Net Metering Program? ☐ Yes ☐ No
(If Yes is this Existing or New Load?) _____

☐ OPA microFIT/ FIT Program & Contract No.: _____

☐ OPA peak incentive program

☐ Community Price Adder to apply? ☐ Aboriginal Price Adder to apply?

4. Other Information that may be relevant or assist in preliminary review

_____

_____

_____

_____

_____

_____

*** Return this form to Halton Hills Hydro Inc., Engineering Department***

Appendix 3

Generator Connection Assessment Review Form

10kW or Less

HALTON HILLS HYDRO INC.
Generator Connection Assessment Review Form
10 kW or less

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 System

Street Address _____

Lot _____

Concession _____

County _____

Hydro 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 ☐ Commercial power sales to a third party

☐ Participate in OPA or other government incentive program

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 _____

7. Requested In-Service Date _____

8. Provide One-Line Schematic Diagram of the System:

☐ Schematic is attached

Number of Pages _____

9. Generator Information (complete for each generator)

Manufacturer _____ Model No. _____

Version No. _____ Serial No. _____

Generation Type:

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

Primary Energy Source:

Renewable:_____ Type:_____

Eligible for microFIT contract? ☐ Yes ☐ No OPA microFIT Contract No.: _____

Non-Renewable _____ Type _____

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

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

11. Metering Configuration and Connection

☐ Parallel ☐Series ☐Direct

12. Liability Insurance

Carrier _____ Limits _____

Agent Name _____ Phone Number _____

The Applicant, (Site Owner or Operator, both if different) shall provide a Certificate of Insurance, demonstrating that this liability insurance is in place.

13. Design Requirements

a) Has the proposed distribution generation paralleling equipment been certified?

☐ Yes ☐ No

b) If not certified, does the proposed distributed generator meet the operating limits defined in Halton Hills Hydro's DG Technical Specifications?

☐ Yes ☐ No

For items 13(a) and 13(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 13 (a) and/or (b) is no.

_____
_____
_____
_____

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

_____
_____
_____
_____
_____
_____

15. 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 (yyyy/mm/dd)

_____

Installer Date (yyyy/mm/dd)

_____

16. Release of Personal Project Related Information (check applicable)

☐ I hereby grant Halton Hills Hydro Inc. permission to correspond with, meet, and release project related information to the installer of my project.

☐ I hereby request that once prepared, Halton Hills Hydro Inc. sends the Connection Cost Agreement, Offer to Connect, and Connection Agreement to my installer rather than myself.

Applicant Signature Date (yyyy/mm/dd)

_____

Please complete and return this form to Halton Hills Hydro Inc., Engineering Department.

Appendix 4

Generator Connection Assessment Review Form

10kW to 10MW

HALTON HILLS HYDRO INC.
Generator Connection Assessment Review Form
10 kW to 10 MW

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

Company Name _____

Street Address _____

Mailing Address (if different) _____

Representative Name _____

Representative Title _____

Phone Number (Main) _____ Cell _____

Fax Number _____ Email _____

2. Facility Contact Information (where the generating facility will be installed)

Company Name _____

Street Address _____

Mailing Address (if different) _____

Representative Name _____

Representative Title _____

Phone Number (Main) _____ Cell _____

Fax Number _____ Email _____

Hydro Account Number (if any) _____

3. Project Design / Engineering (where the generating facility will be installed)

Company _____

Street Address _____

Mailing Address (if different) _____

Representative Name _____

Representative Title _____

Phone Number (Main) _____ Cell _____

Fax Number _____ Email _____

4. Electrical Contractor

Company _____

Street Address _____

Mailing Address (if different) _____

Representative Name _____

Representative Title _____

Phone Number (Main) _____ Cell _____

Fax Number _____ Email _____

5. Applicant's Ownership Interest in the Generation System

☐ Owner ☐ Co-owner ☐ Lease ☐ Other

6. Primary Intent of the Generation System

☐ On-site Use of Power ☐ Net Metering ☐ Commercial power sales to a third party

☐ Participate in OPA or other government incentive program

If on-site use of power, please describe the mode of operation:

Peak shaving/demand management _____

Primary power/base load _____

If load displacement (new or existing) _____

Combined heat and power or cogeneration _____

Standby/emergency/backup _____

Other: _____

7. Interconnection Request is for:

☐ A proposed new generation facility ☐ An increase in generation capacity or a material modification of an existing facility

8. Type of Interconnection Operation

☐ Parallel Operation ☐ Momentary Parallel Operation ☐ Isolated Operation
(if checked, no application necessary)

9. Electricity Use, production and Purchases

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

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

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

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

10. Estimated Construction Start and Completion Dates

Start Date _____

Target in-service date _____

11. Electricity Use, production and Purchases

(a) Provide single line schematic diagram of the system: show generator size and all protective relaying and control equipment using IEEE or Hydro One terminology and symbols.

(b) AC & DC Control Schematics: for projects with induction or synchronous generators show the detailed wiring and device numbers of all protective relays and control functions and which devices they operate using IEEE or Hydro One terminology and symbols.

(c) Site Plan: show major equipment, electric service entrance, electric meter, location of distributed generation and interface equipment, location of disconnect switch, adjoining street name, and street address of distributed generation.

12. Design Requirements

(a) Has the proposed distributed generation paralleling equipment been certified?

☐ Yes ☐ No

(b) If not certified does the proposed distributed generator meet the operating limits defined in your LDC's technical specifications?

☐ 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, please either contact the equipment manufacturer and determine the status of certification or advise of your plans to demonstrate compliance.

_____

_____

13. Generator Information (complete for each generator)

Generator No. 1

Manufacturer _____ Model No. _____

Version No. _____ Serial No. _____

Generation Type:

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

Prime Mover / Energy Source:

☐ Wind ☐ Water ☐ Sun ☐ Biomass ☐ Natural Gas ☐ Steam ☐ Other:_____

Eligible for OPA FIT contract? ☐ Yes ☐ No OPA FIT Contract No.: _____

Ratings: Prime _____ Standby _____ kW _____ kVA _____ volts (output)

Rated Current _____ amps Frequency _____ hertz Rated Power Factor _____ %

Power Factor Adjustment Range: _____ Min _____ Max

If three-phase, winding configuration: ☐ 3 wire delta ☐ 4 wire wye

Generator No. 2

Manufacturer _____ Model No. _____

Version No. _____ Serial No. _____

Generation Type:

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

Prime Mover / Energy Source:

☐ Wind ☐ Water ☐ Sun ☐ Biomass ☐ Natural Gas ☐ Steam ☐ Other:_____

Eligible for OPA FIT contract? ☐ Yes ☐ No OPA FIT Contract No.: _____

Ratings: Prime _____ Standby _____ kW _____ kVA _____ volts (output)

Rated Current _____ amps Frequency _____ hertz Rated Power Factor _____ %

Power Factor Adjustment Range: _____ Min _____ Max

If three-phase, winding configuration: ☐ 3 wire delta ☐ 4 wire wye

Neutral grounding system used:

☐ Ungrounded ☐ Solidly grounded ☐ ground resistor (ohms)

For synchronous generators (per unit rated KVA base)

Note: If information requested is not applicable, indicate by marking N/A

Synchronous reactance - saturated	(X_{dv} %)	Synchronous reactance - unsaturated	(X_{di} %)
Transient reactance - saturated	(X'_{dv} %)	Transient reactance - unsaturated	(X'_{di} ' %)
Sub-transient reactance - saturated	(X''_{dv} %)	Sub-transient reactance - unsaturated	(X''_{di} %)
Zero sequence reactance – saturated	($X0_v$ %)	Zero sequence reactance – unsaturated	($X0_i$ %)
Negative sequence reactance - saturated	($X2_v$ %)	Negative sequence reactance - unsaturated	($X2_i$ %)

For induction generators (per unit rated KVA base):

Locked rotor current	(amps)	Stator leakage resistance	(R_S %)
Rotor resistance	(R_r %)	Rotor leakage resistance	(R_l %)

For generators greater than 1 MW:

M1 (momentum constant)		M2 (momentum constant)	
Field Current		Field Voltage	
Rotor reactance	(X_r %)	Stator reactance	(X_s %)
Short circuit reactance	(X_d "%)	Magnetizing reactance	(X_m %)

Note: If there are more than 2 generators, attach an additional sheet describing each.

14. Interface Information

Generator Synchronizer		Inverter for DC Generator	
Manufacturer		Manufacturer	
Rating		Rating	
Model Number		Model Number	
Automatic or Manual Synchronizer		Line or Self Commutated Inverter	

15. Protective Equipment

Protective Device 1		Protective Device 2	
Range of Available Settings		Range of Available Settings	
Trip Time		Trip Time	
Manufacturer		Manufacturer	
Trip Set Point		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 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)		Describe operation for disconnecting the generator or inverter in the event of a distribution system short circuit (three phase and single phase to ground)	

Complete all applicable items. Add separate sheets if necessary for more devices.

16. Short Circuit Current Contribution of the Proposed Generating Facility

Distributed Generator Short Circuit Current (filled out by applicant)			**Assumption of Distribution System Short Circuit Current (filled out by LDC)**		
Single Phase to Ground		amps	Single Phase to Ground		amps
Three-Phase Symmetrical		amps	Three-Phase Symmetrical		amps
Three-Phase Asymmetrical		amps	Three-Phase Asymmetrical		amps

17. Short Circuit Interrupting Rating of Interconnection Disconnection Device

_____ amps (asymmetrical) _____ amps (symmetrical)

18. Does the Proposed Generating Facility start with the aid of grid power?

☐ Yes ☐ No If yes, what is the inrush current _____ amps (inrush current)

19. Will the Proposed Generating Facility have a dedicated transformer?

☐ Yes ☐ No If yes, please describe:

Rating KVA _____
Primary Volts _____
Secondary Volts _____
Impedance _____
Type of transformer connection _____
Available fixed taps _____

20. Metering Configuration and Connection

☐ Series ☐ Parallel ☐ Direct

21. Liability Insurance

Carrier _____
Limits _____
Agent Name _____
Phone Number _____

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

_____
_____
_____
_____

23. 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 (yyyy/mm/dd)

_____

Project Design / Engineering Date (yyyy/mm/dd)

_____

24. Release of Personal Project Related Information (check applicable)

☐ I hereby grant Halton Hills Hydro Inc. permission to correspond with, meet, and release project related information to the installer of my project.

☐ I hereby request that once prepared, Halton Hills Hydro Inc. sends the Connection Cost Agreement, Offer to Connect, and Connection Agreement to my installer rather than myself.

Applicant Signature Date (yyyy/mm/dd)

_____

This form and all other technical documents made with this submission (single line diagram, site plan, load details, etc...) must by signed and sealed by a Professional Engineer licensed by the Professional Engineers of Ontario.

Please complete and return this form to Halton Hills Hydro Inc., Engineering Department.

Appendix 5

ESA Electrical Guidelines for Inverter-Based Micro Generating Facilities 10kW and Smaller

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

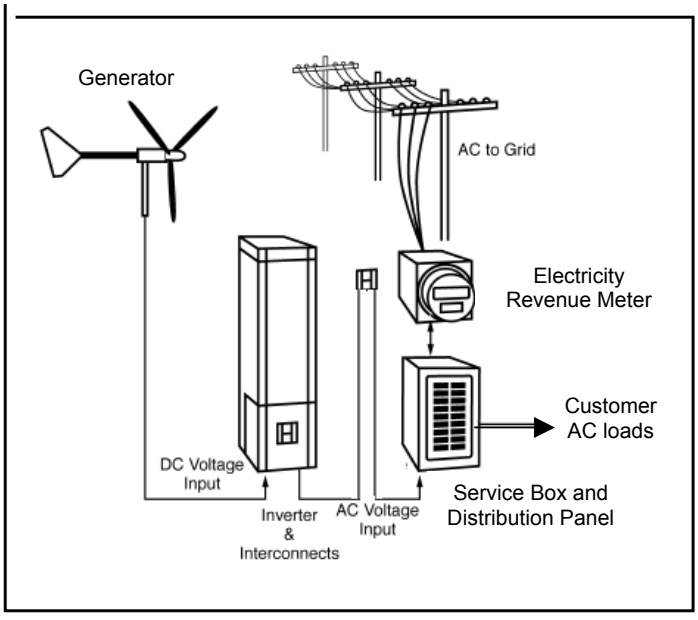


FIGURE 1. Diagram of a grid-tied wind electric system with "DG system disconnect"
(*Source: Phantom Electron Corp*.)

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.

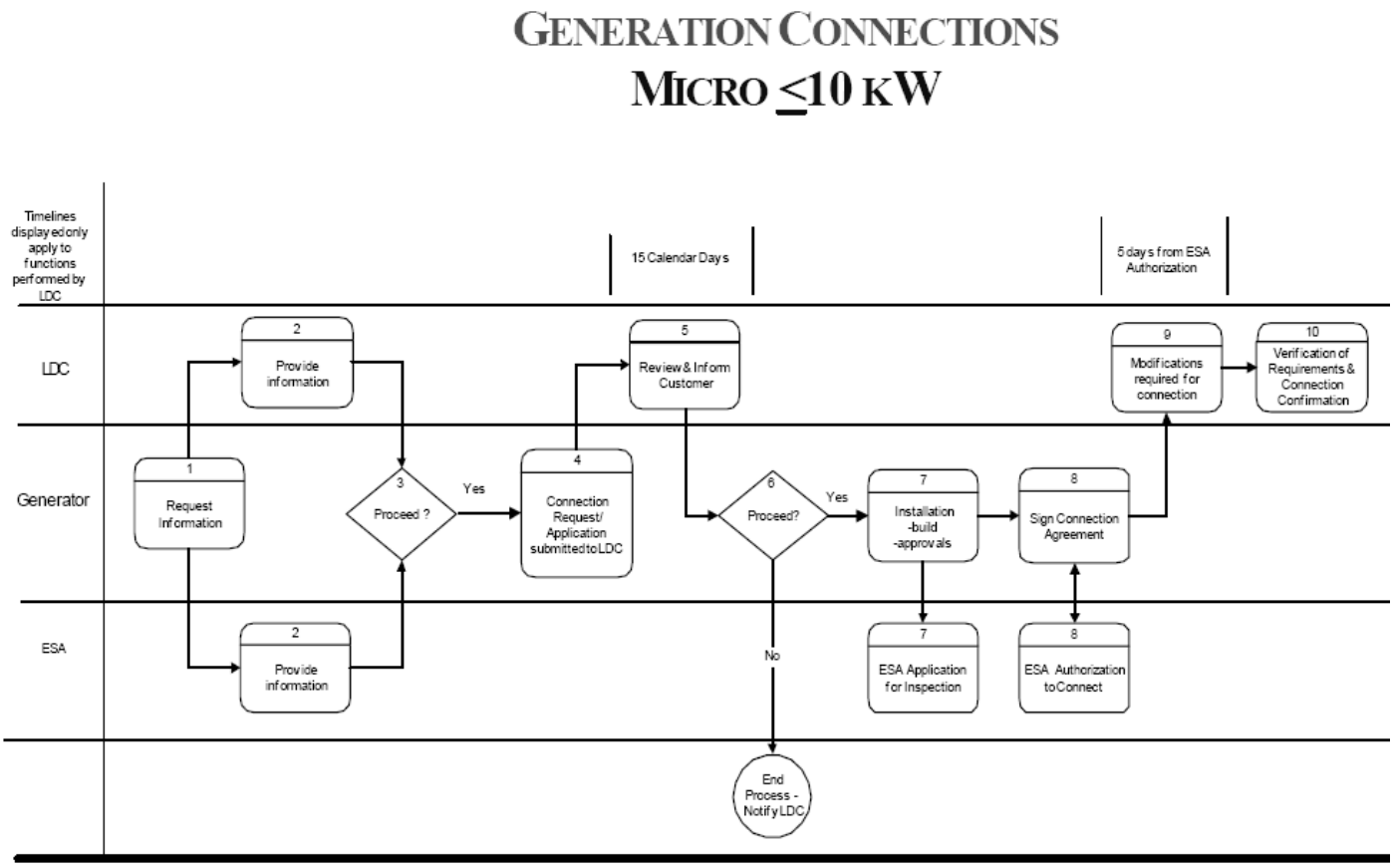
Ontario Electrical Safety Code (OESC): provides the standards for the safe installation of all temporary and permanent electrical wiring and equipment. The OESC applies to all homes, businesses, farms and industry in Ontario.

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**

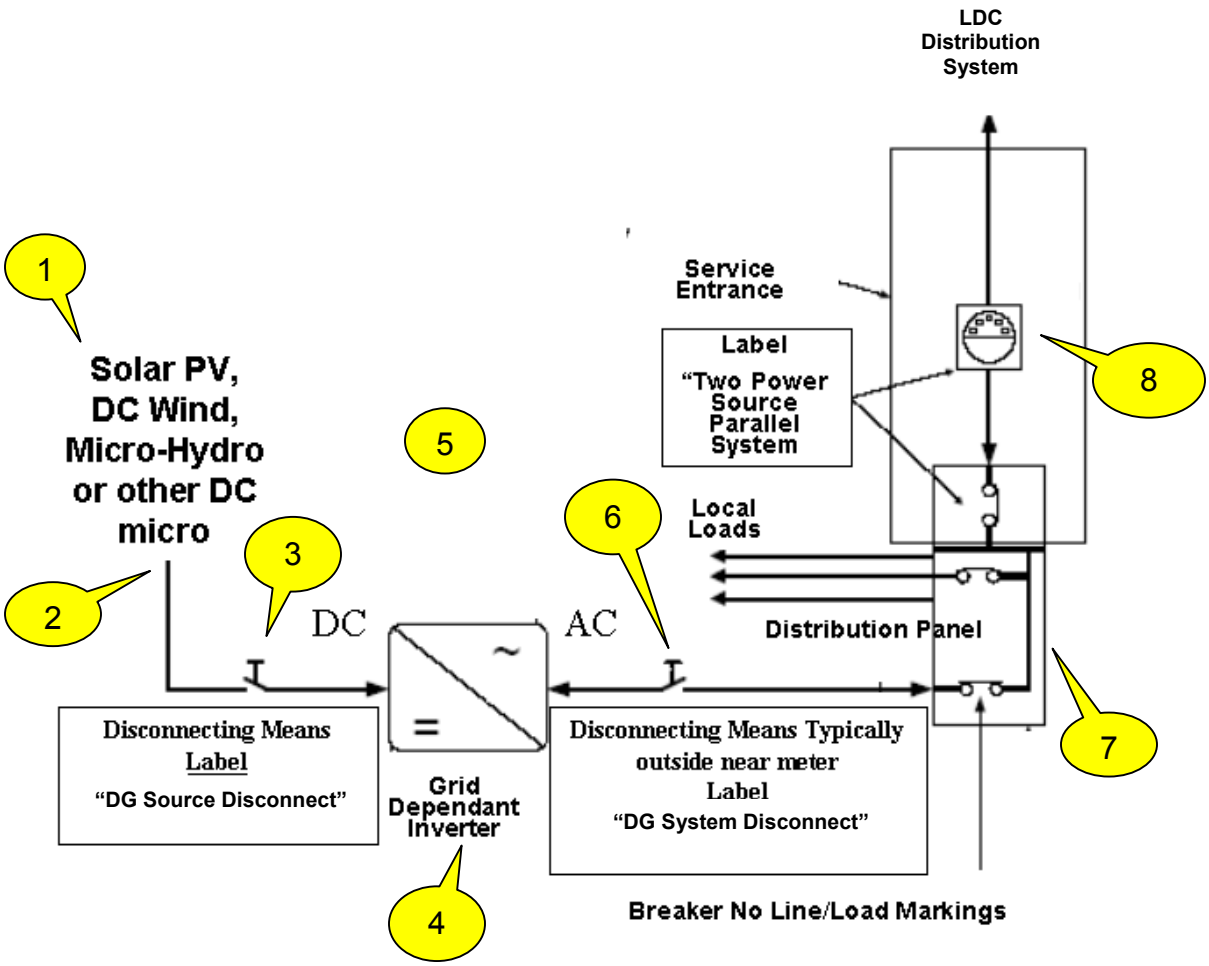
   Following completion of the inspection(s) by the Electrical Safety Authority and the issuance of a certificate of inspection contact the local electric utility. Finalise the connection agreement and provide the LDC a copy the ESA certificate of inspection.

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

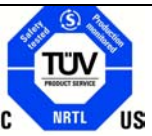
.

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)	

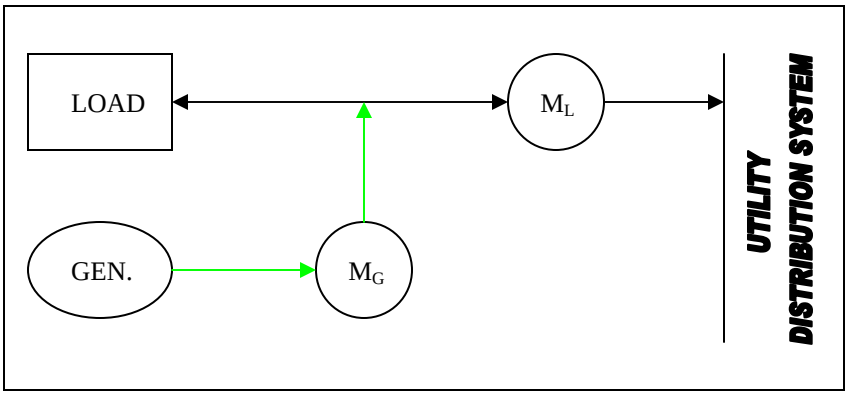
Appendix 6

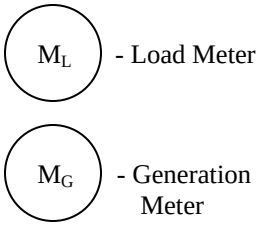
Metering Configurations

METERING CONFIGURATIONS

Indirectly Connected in Series

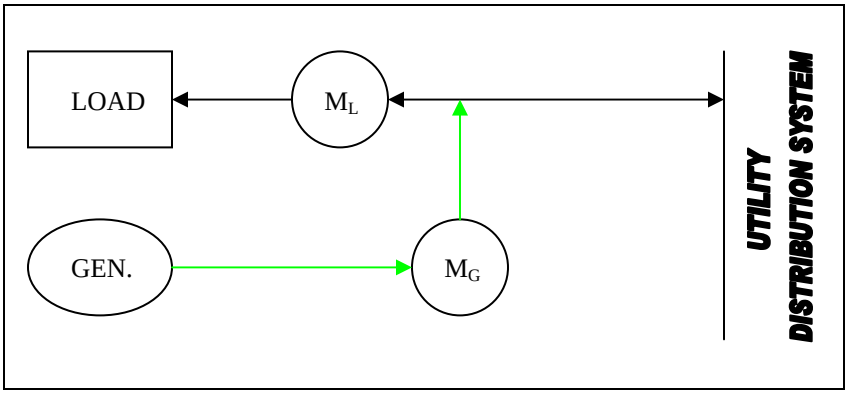
Connection occurs before the customers load meter.





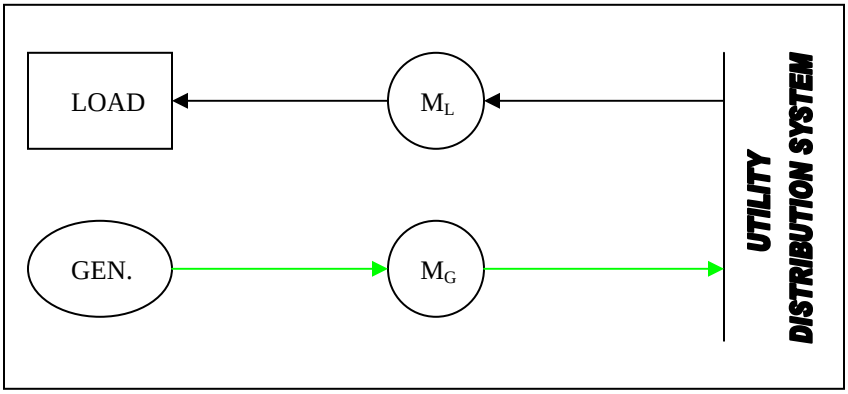
Indirectly Connected in Parallel

Connection occurs after the customers load meter.



Directly Connected

Connection is made directly to the utilities distribution system.



For advantages and disadvantages of each type of connection please visit the Ontario Power Authorities FIT program website at http://fit.powerauthority.on.ca/.

Appendix 7

Commissioning and Equipment Verification Report

HALTON HILLS HYDRO INC.
Commissioning and Equipment Verification Report

Prior to an applicants distributed generation project being connected to Halton Hills Hydro's (HHH's) distribution system, the applicant in working with HHH must complete Commissioning and Equipment Verification Report (Report) verifying the equipment is approved, tested, and suitable for connection.

The Applicant should submit their Commissioning Plan to HHH at least 5 business days prior to the commissioning test date. The applicant should note that HHH requires this Report to be signed and sealed by a Professional Engineer registered with the Professional Engineers of Ontario on the applicant's behalf.

In addition to testing required on the part of the Applicant to satisfy other regulatory agencies, HHH requires Commissioning and Verification tests shall be performed per CSA C22.3 No. 9-08 "Interconnection of Distributed Resources and Electricity Supply Systems", IEEE 1547 "Standard for Interconnecting of Distributed Resources with Electric Supply Systems" and The OEB Distribution System Code Appendix F.2 "Technical Requirements".

This Report applies to distributed generation projects greater than 10kW.

Instructions for Completing this Report:

- The applicant shall contact HHH's Engineering Tech and present their Commissioning Plan at which time HHH's Engineering Tech shall fill in the grey areas of Section 1 "General Site Information" and Section 2 "Contact Information" as send this Report to the Applicant.

- The Applicant shall complete Section 1 "General Information" and Section 2 "Contact Information".

- During commissioning the Applicant will complete their portions of this Report after which HHH will complete their portions of the same Report.

- In Section 3 "Equipment Verification and Testing" the Applicant shall indicate a result of Pass, Fail, or N/A. Where a result of Fail or N/A is applied the Applicant shall provide notes as to the reason.
  - White area's are to be completed by the Applicant.
  - Grey area's are to be completed by HHH's Engineering Tech or an HHH representative.

- The Applicant shall record any deficiencies and resolutions of those deficiencies in Section 4 "Deficiencies and Resolutions". Where no deficiencies are found the Applicant shall check the box at the bottom of Section 4.

- HHH's Engineering Tech shall complete Section 5 "Electrical Safety, Site Access, and Agreements".

- The Applicants and their representative (P.Eng.) shall sign where indicated in Section 6 of this Report.

- HHH's Engineering Tech shall review the Report and once satisfied sign the Engineering Tech portion of Section 6 of this Report.

A copy of the completed Report shall be provided to the Applicant as well as filed in HHH's project file.

1	General Site Information
Name of Applicant	
Name of Facility	
Proposed Energization Date	
HHH D.G. Designation	
Transformer/ Distribution Station	
Feeder Name	

2	Contact Information
Applicant Contact	HHH Engineering Tech Contact
Name:	Name:
Title:	Title:
Tel. #:	Tel. #:
Fax #:	Fax #:
Email:	Email:

3	Equipment Verification and Testing (Applicant)		
Results: P = Pass, F = Fail, N/A = Not Applicable			
	Item to be Verified	Result	Notes
	Confirm output voltage of generator is no less than 7% below and no greater than 4% above nominal voltage (CSA C235-83, table 3) with clearing times per CSA C22.3 No 9-08		
	Check Phase Rotation (Generator)		
	Under Voltage Protection (IEEE 27) working		
	Over Voltage Protection (IEEE 59) working		
	Confirm frequency is operating in the range of 59.4Hz to 60.6Hz (CSA C22.3 No 9-08)		
	Under Frequency Protection (IEEE 81/O) working with clearing times per CSA C22.3 No 9-08		
	Over Frequency Protection (IEEE 81/U) working with clearing times per CSA C22.3 No 9-08		
	Maximum Harmonic Current Distortion is per CSA C22.3 No 9-08		
	Power Factor per OEB DSC Appendix F.2, item 4		
	All grounding is in accordance with the Ontario Electrical Safety Code at CSA C22.3 No 9-08		
	Instrument Transformers are functioning within manufacturer tolerance (CT's/ PT's)		
	Confirm Protective Relays/ Circuit Breakers are calibrated and functioning correctly.		
	All Protective Schemes and interconnecting devices relating to loss of utility power function correctly		
	Field installed power and control wiring compliant with specifications		
	Confirm Islanding Detection (ID, Anti-Islanding) functions and removes generation from grid upon simulated utility power outage.		
	Monitoring Equipment that HHH has remote access to functions correctly (where applicable)		
	Confirm Transfer Trip (where applicable): a) Ceases to energize the distribution system upon receiving a transfer trip signal, b) Ceases to energize the distribution system upon transfer trip communication loss.		
	Inverter and related equipment is Certified to UL1741, IEEE 1547, and CSA Standards		

3	Equipment Verification and Testing (HHH)		
Results: P = Pass, F = Fail, N/A = Not Applicable			
	Item to be Verified	Result	Notes
	Check Phase Rotation on Distribution System		
	DG AC Disconnect is CSA/ ULC Approved, lockable, and accessible to HHH staff		
	Meter base/ cabinet specified was installed		
	ESA warning label “DG SYSTEM DISCONNECT” affixed to AC Disconnect		
	ESA warning label “WARNING TWO POWER PARALLEL SYSTEM” affix to meter base/ cabinet.		
	Inverter bares Certification Organizations emblem.		
	Confirm that communication to HHH meter is working (may require office/ ODS assistance) Note: This check may occur following connection		
	Check dial-in/ Ethernet connection to meter (if applicable) Note: This check may occur following connection		

3	Equipment Verification and Testing (Equipment Data)			
HHH	CT and PT Ratios for meter (400A and up):	CT Ratio:_____ PT Ratio: _____		
	Meter Reading after Commissioning Complete (if applicable):	_____kWh		
Applicant	Customer Step-up Transformer Size (kVA):		Transformer Impendence:	
	Transformer Manufacturer:		Manufactured Date:	
	Transformer Serial Number:			
	Power Factor (>30kW, PF = ± 0.9):	☐ Leading_____	☐ Lagging_____	
	Phase Rotation (from 0°):	R_____	W_____	B_____

4	Deficiencies and Resolutions	
	Deficiency	Resolution
1		
2		
3		
4		
5		
6		
7		
8		
	No Deficiencies were found at time of commissioning ☐ (check)	

5	Electrical Safety, Site Access, and Agreements		
Item		Received (check)	Date (yyyy/mm/dd)
If required for commissioning tests, ESA Temporary Connection Authorization per OESC 2-014			
HHH has received keys to access meter (where applicable)			
Letter from a Professional Engineer that is signed and sealed stating that the equipment and installation meets CSA, ESA, and all other applicable industry Standards.			
HHH has received copies of Applicants own commissioning and testing reports			

6	Completion of Report and Acceptance Sign-off's
By signing this Report the Applicant and their Representative acknowledges that all required verifications on their part have been completed and that the Applicants generation facility meets or exceeds the minimum industry design Standards, Regulations, and Laws for such a facility connected to a distribution system in Ontario. The applicant has submitted to HHH copies of their own commissioning and testing reports that may be included with this or separate from this Report.	_____ Signature of Applicants Representative (must be a P.Eng.) Name (Print): _____ Date (yyyy/mm/dd): _____ _____ Applicant's Signature Date (yyyy/mm/dd): _____
HHH's Engineering Tech has reviewed the above Report and found the results and information provided to be acceptable to HHH. The project may move forward towards connection subject to all approvals/ documentation being in order prior to connection.	_____ Signature of HHH Engineering Tech Name (Print): _____ Title: _____ Date (yyyy/mm/dd): _____

Appendix 8

Connection Agreements

1. Net Metering (RET)

2. 10kW or Less

3. Above 10kW (Small and Mid-Sized)

Halton Hills Hydro Inc. – Net Meter Connection Agreement

In consideration of Halton Hills Hydro Inc. (HHH) agreeing to allow you to connect your 500 kW name-plate rated capacity or smaller generation facility to HHH's distribution system, you hereby agree to the following terms and conditions:

1.0 Eligibility

1.1 Your generation facility must employ a renewable energy technology (RET) as defined by the Ontario Ministry of Energy.

1.2 You agree that your generation connection shall be subject to all applicable laws and bound by the terms and conditions of HHH's Conditions of Service as amended from time-to-time, which have been filed with the Ontario Energy Board (OEB) and are available on request and at www.haltonhillshydro.com.

1.3 You agree that the power produced by this generation facility shall be only for your own use.

2.0 Technical Requirements

2.1 You represent and warrant that you have installed or will install prior to the connection of your generation facility to HHH's distribution system, an isolation device satisfying Section 84 of the Ontario Electrical Safety Code and agree to allow HHH's staff access to and operation of this as required for the maintenance and repair of the distribution system.

2.2 You agree to perform regular scheduled maintenance to your generation facility as outlined by the manufacturer in order to assure that connection devices, protection systems, and control systems are maintained in good working order and in compliance with all applicable laws.

2.3 You agree that during a power outage on HHH's system your generation facility will shut down, unless you have installed special transfer and isolating capabilities on your generation facility. You agree to the automatic disconnection of your generation facility from HHH's distribution system, as per the generator protective relay settings set out in this Agreement, in the event of a power outage on HHH's distribution system or any abnormal operation of HHH's distribution system.

2.4 You covenant and agree that the design, installation, maintenance, and operation of your generation facility are conducted in a manner that ensures the safety and security of both the generation facility and HHH's distribution system.

2.5 Due to HHH's obligation to maintain the safety and reliability of its distribution system, you acknowledge and agree that in the event HHH determines that your generation facility (i) causes damage to; and/or (ii) is producing adverse effects affecting other distribution system customers or HHH's assets, you will disconnect your generation facility immediately from the distribution system upon direction from HHH and correct the problem at your own expense prior to reconnection.

3.0 Liabilities

3.1 You and HHH will indemnify and save each other harmless for all damages and/or adverse effects resulting from either party's negligence or willful misconduct in the connection and operation of your generation facility or HHH's distribution system.

3.2 HHH and you shall not be liable to each other under any circumstances whatsoever for any loss of profits or revenues, business interruptions losses, loss of contract or loss of goodwill, or for any indirect, consequential, incidental or special damages, including but not limited to punitive or exemplary damages, whether any of the said liability, loss or damages arise in contract, tort or otherwise.

3.3 You understand that HHH reserves the right to disconnect your generation facility at any time if HHH becomes aware of any unsafe condition(s) to persons/ live stock or property and that your generation will remain unconnected until safe conditions for operation of the generation and related equipment have been re-established. HHH will notify ESA in writing of the unsafe conditions.

4.0 Compensation and Billing

4.1 Subject to any applicable law, you agree that HHH will not pay you for any excess generation that results in a net delivery of energy to HHH between meter reads.

4.2 Subject to any applicable law, you acknowledge and agree that there will be no carryover of excess generation from one billing period to the next unless you are, at the relevant time, a net metered generator.

5.0 Future Charges

5.1 You agree to pay, if required, any current or future charges or tariffs with respect to your connection to HHH's distribution system, as approved by the OEB.

6.0 Termination

6.1 You understand that you have the right to terminate this agreement at any time, and that by doing so you are required to disconnect your generation facility and notify HHH of such action.

6.2 You understand that HHH reserves the right to terminate this agreement and disconnect your generation facility at any time if HHH discontinues its Net Metering Program.

6.3 You understand that HHH reserves the right to terminate this agreement and disconnect your generation facility at any time if HHH becomes aware of any unsafe condition(s) to persons/ live stock or property that you do not correct in a timely fashion. HHH will notify ESA in writing of the unsafe conditions.

7.0 Assignment

7.1 You may assign your rights and obligations under this Agreement with the consent of HHH, which shall not withhold its consent unreasonably. HHH shall have the right to assign its rights and obligations under this Agreement without your consent.

I understand, accept and agree to comply with and be bound by the above terms and conditions governing the connection of my generation facility to HHH's distribution system.

Customer Signature: _____ Date: _____

Print name and HHH account number: _____

I confirm that the following information is true and accurate:

Nameplate rating of Generator: _____KW Total installed generation _____KW

Type: □ Wind Turbine □ Photovoltaic (Solar) □ Hydraulic Turbine □ Biomass

□ Other (Specify) _____

Inverter Utilized: □Yes □No

Inverter Certification: □ C22.2 #107.1 □ UL 1741 □ Site Certified by the ESA

For office use only:

Station Name:_____ Feeder No.:_____ Date Connected:_____

HHH Generator Account Number:_____

Generator Protective Relay Settings

Table 1 B Inverter Based Generation
The following relay settings shall be used for inverters built to the CSA standard:
Source: CSA C22.2 No. 107.1-01 Table 16

System Voltage Vn = V nominal **V (Volts)**	Frequency **F (Hertz)**	Maximum number of cycles to disconnect	
		Seconds	Cycle
V < 0.5 Vn	60	0.1	6
0.5 Vn # **V** < 0.88 Vn	60	2	120
1.10 Vn # **V** <1.37 Vn	60	2	120
V > 1.37 Vn	60	0.033	2
Vn	**F** < 59.5*	0.1	6
Vn	**F** > 60.5	0.1	6

* The UL1741 & IEEE P1547 Standards use F < rated-0.7 i.e. 59.3 Hz. To update if CSA C22.2 No. 107.1-01 is changed.

Table 2 B Non B Inverter Generation
HHH's minimum requirements, for other generation are as follows:

System Voltage Vn =V nominal **V (Volts)**	Frequency **F (Hertz)**	Maximum clearing time*	
		Seconds	Cycles
V < 0.5 Vn	60	0.16	9.6
0.5 Vn # **V** < 0.88 Vn	60	2	120
1.10 Vn # **V** <1.20 Vn	60	1	60
V $ 1.20 Vn	60	0.16	9.6
Vn	**F** < 59.3	0.16	9.6
Vn	**F** > 60.5	0.16	9.6

* Clearing time is the time between the start of the abnormal condition and the generation ceasing to energize HHH's distribution system

- If you are uncertain about your generation equipment's protective relay settings, please check with your generating equipment supplier.
- Automatic reconnect setting time for your generator is after 5 minutes of normal voltage and frequency on HHH's distribution system.
- The above technical specifications are intended primarily for micro installations. For three phase applications, technical requirements will be reviewed on a case by case basis, however the criteria will be as much as possible based upon applicable regulations, standards, codes, and possibly Hydro One requirements for Connecting Generators.

Halton Hills Hydro Inc. – Connection Agreement, 10kW or less

In consideration of Halton Hills Hydro Inc. (HHH) agreeing to allow you to connect your 10 kW name-plate rated capacity or smaller generation facility to HHH's distribution system, you hereby agree to the following terms and conditions:

1.0 Eligibility

1.1 You agree that your generation connection shall be subject to all applicable laws and bound by the terms and conditions of HHH's Conditions of Service as amended from time-to-time, which have been filed with the Ontario Energy Board (OEB) and are available on request and at www.haltonhillshydro.com.

1.2 You agree that the power produced by this generation facility shall be only for your own use and which may be distributed into Halton Hills Hydro's distribution system.

2.0 Technical Requirements

2.1 You represent and warrant that you have installed or will install prior to the connection of your generation facility to HHH's distribution system, an isolation device satisfying Section 84 of the Ontario Electrical Safety Code and agree to allow HHH's staff access to and operation of this as required for the maintenance and repair of the distribution system.

2.2 You agree to perform regular scheduled maintenance to your generation facility as outlined by the manufacturer in order to assure that connection devices, protection systems, and control systems are maintained in good working order and in compliance with all applicable laws.

2.3 You agree that during a power outage on HHH's system your generation facility will shut down, unless you have installed special transfer and isolating capabilities on your generation facility. You agree to the automatic disconnection of your generation facility from HHH's distribution system, as per the generator protective relay settings set out in this Agreement, in the event of a power outage on HHH's distribution system or any abnormal operation of HHH's distribution system.

2.4 You covenant and agree that the design, installation, maintenance, and operation of your generation facility are conducted in a manner that ensures the safety and security of both the generation facility and HHH's distribution system.

2.5 Due to HHH's obligation to maintain the safety and reliability of its distribution system, you acknowledge and agree that in the event HHH determines that your generation facility (i) causes damage to; and/or (ii) is producing adverse effects affecting other distribution system customers or HHH's assets, you will disconnect your generation facility immediately from the distribution system upon direction from HHH and correct the problem at your own expense prior to reconnection.

3.0 Liabilities

3.1 You and HHH will indemnify and save each other harmless for all damages and/or adverse effects resulting from either party's negligence or willful misconduct in the connection and operation of your generation facility or HHH's distribution system.

3.2 HHH and you shall not be liable to each other under any circumstances whatsoever for any loss of profits or revenues, business interruptions losses, loss of contract or loss of goodwill, or for any indirect, consequential, incidental or special damages, including but not limited to punitive or exemplary damages, whether any of the said liability, loss or damages arise in contract, tort or otherwise.

3.3 You understand that HHH reserves the right to disconnect your generation facility at any time if HHH becomes aware of any unsafe condition(s) to persons/ live stock or property and that your generation will remain unconnected until safe conditions for operation of the generation and related equipment have been re-established. HHH will notify ESA in writing of the unsafe conditions.

4.0 Compensation and Billing

4.1 Subject to any applicable law, HHH will pay you the approved compensation amount as set forth by the Ontario Power Authority in respect to their Feed in Tariff programs.

4.2 Subject to any applicable law, HHH reserves the right to determine the payment frequency unless a specific schedule is mutually agreed upon by both parties.

4.3 Subject to any applicable law, HHH will bill you/ the generation facility account for any energy consumed by the generation facility.

5.0 Future Charges

5.1 You agree to pay, if required, any current or future charges or tariffs with respect to your connection to HHH's distribution system, as approved by the OEB.

6.0 Termination

6.1 You understand that you have the right to terminate this agreement at any time, and that by doing so you are required to disconnect your generation facility and notify HHH of such action.

6.2 You understand that in terminating this agreement there may be implications in respect to any Ontario Power Authority programs the generation facility may be enrolled in (where applicable). You further understand that it is your responsibility to contact the Ontario Power Authority regarding any of their contracts you affect by termination of this agreement.

6.3 You understand that HHH reserves the right to terminate this agreement and disconnect your generation facility at any time if HHH becomes aware of any unsafe condition(s) to persons/ live stock or property that you do not correct in a timely fashion. HHH will notify ESA in writing of the unsafe conditions.

7.0 Assignment

7.1 You may assign your rights and obligations under this Agreement with the consent of HHH, which shall not withhold its consent unreasonably. HHH shall have the right to assign its rights and obligations under this Agreement without your consent.

I understand, accept and agree to comply with and be bound by the above terms and conditions governing the connection of my generation facility to HHH's distribution system.

Customer Signature: _____ Date: _____

Print name and HHH account number: _____

I confirm that the following information is true and accurate:

Nameplate rating of Generator: _____KW Total installed generation _____KW

Type: □ Wind Turbine □ Photovoltaic (Solar) □ Hydraulic Turbine □ Fuel Cell

□ Other (Specify) _____

□ OPA microFIT/ FIT Contract No.: _____ □N/A

Inverter Utilized: □Yes □No

Inverter Certification: □ C22.2 #107.1 □ UL 1741 □ Site Certified by the ESA

For office use only:

Station Name:_____ Feeder No.:_____ Date Connected:_____

HHH Generator Account Number:_____

Halton Hills Hydro Inc. – Connection Agreement, 10kW or less

Generator Protective Relay Settings

Table 1 B Inverter Based Generation
The following relay settings shall be used for inverters built to the CSA standard:
Source: CSA C22.2 No. 107.1-01 Table 16

System Voltage Vn = V nominal **V (Volts)**	Frequency **F (Hertz)**	Maximum number of cycles to disconnect	
		Seconds	Cycle
V < 0.5 Vn	60	0.1	6
0.5 Vn # **V** < 0.88 Vn	60	2	120
1.10 Vn # **V** <1.37 Vn	60	2	120
V > 1.37 Vn	60	0.033	2
Vn	**F** < 59.5*	0.1	6
Vn	**F** > 60.5	0.1	6

* The UL1741 & IEEE P1547 Standards use F < rated-0.7 i.e. 59.3 Hz. To update if CSA C22.2 No. 107.1-01 is changed.

Table 2 B Non B Inverter Generation
HHH's minimum requirements, for other generation are as follows:

System Voltage Vn =V nominal **V (Volts)**	Frequency **F (Hertz)**	Maximum clearing time*	
		Seconds	Cycles
V < 0.5 Vn	60	0.16	9.6
0.5 Vn # **V** < 0.88 Vn	60	2	120
1.10 Vn # **V** <1.20 Vn	60	1	60
V $ 1.20 Vn	60	0.16	9.6
Vn	**F** < 59.3	0.16	9.6
Vn	**F** > 60.5	0.16	9.6

* Clearing time is the time between the start of the abnormal condition and the generation ceasing to energize HHH's distribution system.

- If you are uncertain about your generation equipment's protective relay settings, please check with your generating equipment supplier.
- Automatic reconnect setting time for your generator is after 5 minutes of normal voltage and frequency on HHH's distribution system.
- The above technical specifications are intended primarily for micro installations. For three phase applications, technical requirements will be reviewed on a case by case basis, however the criteria will be as much as possible based upon applicable regulations, standards, codes, and possibly Hydro One requirements for Connecting Generators.

Appendix 9

Connection Impact Assessment Study Agreement

{Name of Project} Generating Station

{Name of Customer} (the "Customer") has requested and Halton Hills Hydro Inc. ("HHH") has agreed to perform the Work described below to determine the feasibility and impact of the Proposed Project defined below and to undertake the Work (as defined in the Scope of Work attached hereto as Schedule "A"), and under the Standard Terms and Conditions of Halton Hills Hydro's Guidelines for Applicants Connecting Distributed Generation and as stated below all forming a part hereof (the "Agreement") dated_____.

Proposed Project

The Proposed Project is the connection of {**Name of Project**} (the "Generation Facility") to HHH's distribution system at {Station Name} DS on {Feeder Name} and/ or which is connected to Hydro One's transmission system at {Station Name} TS.

Information Requirements

The Customer shall provide HHH with the following:

1. site location map(s) with suitable details of the **Generation Facility,** line routing and the proposed connection to HHH's facilities;

2. four sets of single line diagrams showing the line conductor sizes and distances from HHH's {Station Name} DS (the "Distribution Station) or TS (the "Transmission Station") to the Generation Facility interface transformer;

3. four sets of technical descriptions of the operating philosophy of the electrical equipment, and the protection and control philosophy of the Customer's Facilities that could affect HHH's distribution system;

4. A completed Generator Connection Assessment Review Form.

Submitted information must be signed and sealed by a Professional Engineer registered with the Professional Engineers of Ontario.

Completion Date:

Subject to OEB DSC 6.2.12 as applying to an applicant proposing to connect a small embedded generation facility HHH shall complete the Work, by no later than 60 days (where no system expansion is required) or 90 days (where system expansion is required) after the latter of:

(a) the Customer executing this Agreement;

(b) the Customer paying HHH the amount specified below in (b) under the heading "Costs";

(c) the Customer providing the information described above under the heading "Information Requirements".

Subject to OEB DSC 6.2.13 HHH shall complete the Work within 60 days of the receipt of the application in the case of a proposal to connect a mid-sized embedded generation facility or 90 days of the receipt of the application in the case of a proposal to connect a large embedded generation facility after the latter of:

(a) the Customer executing this Agreement;

(b) the Customer paying HHH the amount specified below in (b) under the heading "Costs";

(c) the Customer providing the information described above under the heading "Information Requirements".

If at any time after the latter of the above HHH is unable to complete the Work within the applicable timeframe, HHH will inform the customer in writing that an extension is required to complete the Work and provide an estimated timeframe for completion of the Work.

HHH requires that the information requested from the applicant to complete the CIA be submitted as soon as possible. Delays in receiving information from the applicant may result in the CIA completion date not being met for which HHH is not liable.

Where a Connection Impact Assessment is required to be performed by another distributor in addition to that performed by HHH, HHH shall apply to that distributor for a Connection Impact Assessment. The applicant shall be responsible for any costs incurred by HHH in applying to that distributor for a Connection Impact Assessment. Such costs may or may not be included in the estimate provided by HHH for its Connection Impact Assessment as detailed in "Costs (a)" of this Agreement. If such is the case, completion and return of the Connection Impact Assessment may be dependant on the other distributors timing.

Impact of Subsequent Changes to the Information Provided by Customer

Should the Customer make any changes to the information provided by the Customer as described above under the heading "Information Requirements" after HHH has commenced the Work and those changes:

(i) result in an increase in the cost of HHH performing the Work above the payment contemplated below under the heading "Costs", the Customer shall make such further payment as may be required by HHH in the time specified by HHH; and

(ii) otherwise affect any other provision of this Agreement, such as the time required for completion of the Work, the parties shall negotiate and agree upon the required amendments to this Agreement and HHH shall be under no obligation to resume performance of the Work until such time as the parties agree on such amendments.

Costs:

(a) The Customer shall pay HHH's Actual Cost of performing the Work which amount is estimated to be $ ____.__ (plus applicable Taxes).

(b) The Customer agrees to pay HHH $____.__ (plus applicable Taxes) by no later than 30 days after the date first written above towards the Actual Cost of the Work.

(c) Within 90 days after the completion of the Work, HHH shall provide the Customer with a final invoice or credit memorandum which shall indicate whether the amounts already paid by the Customer exceed or are less than the Actual Cost of the Work. Any difference between the Actual Cost (plus applicable Taxes) and the amount already paid by the Customer shall be paid within 30 days after the rendering of the said final invoice or credit memorandum, by HHH to the Customer, if the amount already paid by the Customer exceeds the Actual Cost (plus applicable Taxes), or by the Customer to HHH, if the amount already paid by the Customer is less than the Actual Cost (plus applicable Taxes).

Costs of Connection Impact Assessment by Halton Hills Hydro Inc.

Project type	Project Size**	Cost*
Net Metered	>10 kW and ≤500 kW	$3,000
Small Projects (not Net Metered)	a) ≤250 kW connected on distribution system voltage <15 kV b) ≤500 kW connected on distribution system voltage ≥15 kV	$3,000
Mid-Size Projects	>500 kW but ≤10 MW connected on distribution system voltage ≥15 kV	$5,000
Large Projects	>10 MW	$6,000

* The above costs do not include taxes or fees applicable if another distributor must conduct a Connection Impact Assessment. HHH and the Generator must consider additional costs in the total cost of the CIA. Costs are subject to change without notice.

** Project size as defined by the Ontario Energy Board's Distribution System Code.

GST Registration Information

The GST registration number for HHH is {_____} and the GST registration number for the Customer is [Insert Number].

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by the signatures of their proper officers, as of the day and year first written above.

HALTON HILLS HYDRO INC.,

Arthur Skidmore

Title: President & C.E.O.

I have the authority to bind the corporation

{Name of Customer}

Print: _____

Signature: _____

Title:

I have the authority to bind the corporation

SCHEDULE "A": Scope of Work - Connection Impact Assessment

HHH will perform and provide the Customer with a Connection Impact Assessment to determine the feasibility of the Proposed Project by reviewing the impact of the Proposed Project on HHH's distribution system.

HHH will advise the Customer of specific requirements, for each of the alternative connections that are identified by the Connection Impact Assessment.

HHH will describe the necessary modifications to HHH's distribution system facilities based on HHH's review of the Proposed Project in order to permit the connection of the Proposed Project.

Appendix 10

Regulatory and Industry Contacts

Appendix 10

Regulatory and Industry Contacts

Halton Hills Hydro Inc.
43 Alice Street
Acton, Ontario
L7J 2A9
Phone: (519) 853-3700
(905) 453-2222
Fax: (519) 853-5168
Website: **www.haltonhillshydro.com**

Hydro One (Corporate)
483 Bay Street
15th Floor Reception
Toronto, Ontario
M5G 2P5
Website: **www.hydroone.com**

Ministry of Energy
900 Bay Street, 4th Floor
Hearst Block
Toronto, Ontario
M7A 2E1
Phone: 1-877-818-2900
Website: **www.energy.gov.on.ca**

Electrical Safety Authority
155A Matheson Blvd. West
Suite 200
Mississauga, Ontario
L5R 3L5
Phone: 1-877-421-2228
Website: **www.esainspection.net**

Ontario Power Authority
Suite 1600
1200 Adelaide Street West
Toronto, Ontario
M5H 1T1
Phone: 416-967-7474
Fax: 416-967-1947
Website: **www.powerauthority.on.ca**
http://www.powerauthority.on.ca/FIT/

Ontario Energy Board
P.O. Box 2319
2300 Yonge Street
Toronto, Ontario, Canada
M4P 1E4
Phone: 1-877-632-2727
Website: **www.oeb.gov.on.ca**

Canadian Standards Association
5060 Spectrum Way
Mississauga, Ontario
L4W 5N6
CANADA
Phone: 1-800-463-6727
Website: **www.csa.ca**

Canadian Wind Energy Association
Suite 320, 220 Laurier Avenue West
Ottawa, Ontario
Canada K1P 5Z9
Phone: 613-234-8716 or 1-800-922-6932
Website: **www.canwea.ca**

Canadian Solar Industries Association
CanSIA, 208 - 2378 Holly Lane,
Ottawa, ON,
K1V 7P1
Website: **www.cansia.ca**

Alternative Energies
5800 Explorer Dr., Suite 200
Mississauga, Ontario L4W 5K9
(905) 602-8877 ext. 232
Website: **www.micropower-connect.org**