Form 6

Part A

Request for a Connection Impact Assessment (CIA) Review/Update, and for Generators with project size larger than 10 kW To Connect Embedded Generation to Oakville Hydro's Electrical Distribution System

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

Section 1: General Connection Information

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

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

Date: _____ (dd/mm/yyyy)

1. **Project Name:** ___________________________

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

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

4. **Project Location:** Address:_________________________________
   ____

5. **Oakville Hydro Account Number (if applicable):**

6. **Project Information:**

Project Developer:

Contact Person:	
Mailing Address:	
Telephone:	
Fax:	
Email	

Form 6

Project Owner (if not same as Project Developer):

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

Engineering Consultant (Electrical)

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

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

9. Mode of Operation:

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

☐ Emergency Backup

Will Emergency Backup generator be synchronized to Oakville Hydro's system at any time

☐ Yes ☐No ☐ Other, please specify_____

10. Intent of Generation:

☐ Sale of Power ☐ Load Displacement

Form 6

11. Location and Site Plan

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

Drawing / Sketch No. _____,

Rev. ______

12. Proposed connection voltage to Oakville Hydro's distribution system (if known) : _____ kV

Form 6

Section 2: Connection Impact Assessment Information

Note:

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

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

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

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

The SLD shall include the following, as applicable:

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

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

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

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

Maximum Symmetrical (all generators online)
- Three phase fault _____ kA
- Phase-to-phase fault _____ kA
- Single Phase to ground fault _____ kA

2. Generator Characteristics:

a. Number of generating unit(s): _____
b Manufacturer / Type or Model No. _____________ / _______

Form 6

c. Rated capacity of each unit

Gross ______________kW ______________ kVA

Net ______________kW ______________ kVA

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

d. Type of generating unit:

☐ Synchronous ☐ Induction ☐ Static Power Converters (SPC)

☐ Other, please specify ____

e. Rated frequency _____________ Hz

f. Number of phases ☐ one ☐ three

g. **For Synchronous Units:**

i) Generation voltage ______________ kV

ii) Rated current ______________ A

iii) Rated power factor of generating unit (s) ______________ p.u

iv) Type and characteristics of exciter

____

____

____

v) Minimum power limit for stable operation ______________ kW

vi) Unsaturated reactances on: __________ kVA base______________kV base

Direct axis synchronous reactance, Xd _____________ pu

Direct axis transient reactance, Xd' ______________ pu

Direct axis subtransient reactance, Xd'' ______________pu

Negative sequence reactance, X2 ______________ pu

Zero sequence reactance, X0 ______________pu

vii) Limits of range of reactive power

Lagging (over-excited) ______________kVAR

Leading (under-excited) ______________kVAR

viii) Provide a plot of generator capability curve (MW output vs MVAR)

Document Number: ____________________, Rev.______

h. **For Induction Units:**

i) Generation voltage ______________kV

ii) Rated design power factor ______________p.u

iii) Rated speed ______________ RPM

iv) Slip regulation interval ______________ %

v) Rated slip ______________%

vi) Actual power factor at delivery point (after p.f. correction):

- Full output ______________ p.u.
- No output ______________ p.u.

vii) Generator reactive power requirements:

- Full output ______________kVAR
- No output ______________ kVAR

viii) Total power factor correction installed ______________ kVAR

- Number of regulating steps ______________
- Power factor correction switched per step ______________ kVAR
- Power factor correction capacitors are automatically switched off when generator breaker opens ☐ Yes ☐No

ix) Starting inrush current limited to (multiple of full load current) ______________p.u.

x) Locked rotor current (at rated voltage) ______________ p.u.

xi) Fault current vs time curves (for various types of faults near the generator) ______________ Dwg No

Form 6

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

3. Interface Step-Up Transformer Characteristics:

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

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

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

4. Intermediate Transformer Characteristics (if applicable):

a. Transformer rating ____________ kVA
b. Manufacturer ____________
c. Nominal voltage of high voltage winding ____________ kV
d. Nominal voltage of low voltage winding ____________kV
e. High voltage winding connection ☐ delta ☐ star
   Grounding method of star connected high voltage winding neutral
   ☐ Solid ☐ Ungrounded ☐ Impedance: R______X__________ ohms
f. Low voltage winding connection ☐ delta ☐ star
   Grounding method of star connected low voltage winding neutral
   ☐ Solid ☐ Ungrounded ☐ Impedance: R_________X________ ohms
g. Impedances on ____________ kVA base ________ kV base
   R: ____________ p.u. X: ____________ p.u.
h. Tapping range, location and type of tap changer ______________________________
i. Expected tap settings HV____________ kV, LV ____________ kV

Form 6

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

Note:

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

5. Generating Facility Load Information

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

b. Maximum start up load: _____ kVA _____ kW

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

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

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

6. Operation Information:

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

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

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

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

∗

8. Protection Design, Philosophy and Logic

- Provide a document describing the protection philosophy for detecting and clearing:
  - Internal faults within the EG facility;
  - External phase and ground faults (in LDC's distribution system);

Form 6

- Certain abnormal system conditions such as over / under voltage, over / under frequency, open phase(s);
- Islanding

Document Number:
___________________, Rev.______

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

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

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

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

Form 6

9. Connection and Operation Information

a. Synchronizing and paralleling scheme / procedure ____________Doc. / Dwg. No.
b. The generator is designed with auto-connection scheme ☐ Yes ☐ No

10. Document List

Item No.	Description	Reference No.	No. of Pages
1			
2			
3			
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Form 6

11. Drawing List

Item No.	Description	Reference No.	No. of Pages
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12. Other Comments, Specifications and Exceptions (attach additional sheets if needed)

____

____

____

____

13. Applicant and Project Design / Engineering Signature

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

Applicant Signature　　　　　　　　　　Date

____

Project Design / Engineering　　　　　　　　　　Date

____

- **Return this form to:**
  Oakville Hydro, P.O Box 1900, 861 Redwood Square Oakville ON L6J 5E3
  Attn: Embedded Generation Contact c/o Engineering Dept.
  E mail: engineering@oakvillehydro.com
  Phone: 905-825-9400 Ext. 2266 Fax: 905-825-5830

Form 6

Part B

LDC Supplemental Information

1. **LDC Name:** Oakville Hydro

Contact Person: Embedded Generation Contact c/0 Engineering Department

Mailing Address: P.O. Box 1900
Oakville ON L6J 5E3

Telephone: 905-825-9400 X 2266
Fax: 905-825-5830
E-mail: engineering@oakvillehydro.com

2. **Feeder Details:**

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

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

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

4. **Load information**

Maximum load of the facility _____________ kVA _____________ kW
Maximum load current (referred to the nominal voltage at the connection point to Hydro One system) _____________ A
Maximum inrush current (referred to the nominal voltage at the connection point to Hydro One system) _____________A

Form 6

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

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

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