Impact Assessment Generator Form

This connection impact assessment form provides information for the Connection Assessment and Connection Cost Estimate.

Date: _____ (dd/mm/yyyy) Consultant/Developer Name: _____

Project Name:

1. **Applicant Contact Information** (whom will be contractually obligated for this generating facility)

   Name:
   Service Address:

   Telephone: Cell:
   E-mail: Fax:

2. **Single Line Diagram ("SLD"):**

Provide an updated SLD of the Generating Facility, signed by a Professional Engineer, which includes the Interface Point/Point of Common Coupling ("PCC") to Toronto Hydro's distribution system. The SLD shall contain details on the following:

- Electrical equipment at the embedded generation facility, principal ratings, impedances, winding configurations, neutral grounding methods, etc.
- Protective relaying, synchronizing and revenue metering arrangements. The device numbers should be in accordance with IEEE Standard Electrical Power System Device Function Numbers (ANSI/IEEE C37.2).

The SLD shall include the following details, as applicable:

- Disconnecting device at the interface (PCC) point with Toronto Hydro 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 (length, type, impedance)
- Surge arresters
- Any other relevant electrical equipment.

SLD Drawing Number: _____ Rev. _____

☐ Attached
☐ Mailed Separately

3. **Location and Site Plan**

Provide a site plan outlining existing facilities and proposed embedded generator location. The site plan will to include approximate line route for connection to Toronto Hydro, as well as roads, lot numbers, and nearby power lines.

Drawing Number: _____ Rev. _____

4. Protection Philosophy

Provide a document describing the protection philosophy for detecting and clearing:

- Internal faults within the EG facility;
- External phase and ground faults (in Toronto Hydro's distribution system);
- Certain abnormal system conditions such as over / under voltage, over / under frequency, open phase(s);
- Islanding
- tripping matrix

Document Number: , Rev.

5. Embedded Generator Fault Contributions at the Interface Point/PCC

All values to be at the nominal connection voltage to Toronto 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, or MVA
- Phase-to-phase fault _____ kA, or MVA
- Single Phase to ground fault _____ kA, or MVA

X1 /R1 X0 / R0

6. Generator Facility Characteristics:

a. Number of generating unit(s): _____

b. Manufacturer / Type or Model No. _____ / _____

c. Rated capacity of each unit:
Gross: _____ kW _____ kVA
Net: _____ kW _____ kVA
If unit outputs are different, please fill in additional sheets to provide the information.

d. Type of generating unit: ☐ Synchronous ☐ Induction ☐ Static Power Converters (SPC)
☐ Other (Please Specify) _____

e. Rated frequency: _____ Hz

f. Number of phases: ☐ One ☐ Three

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

Direct axis transient reactance, Xd' pu
Direct axis subtransient reactance, Xd'' pu
Negative sequence reactance, X2 pu
Zero sequence reactance, X0 pu

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

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

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

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

7. 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:

(a) The term "High Voltage", used above, refers to the connection voltage to Toronto Hydro's distribution system, and "Low Voltage", used above, refers to the generation or any other intermediate voltage.

8. Intermediate Transformer Characteristics (if applicable):

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

Note:

The term "High Voltage", 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.

9. 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 Toronto Hydro's system will be prevented. _____

10. Operation Information:

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

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

Expected:	**Total Generation (a)**		**Total Internal Consumption (b)**		**Total Output (To Toronto 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.

12. Invoice Contact Information:

Company/Person – _____
Contact Person – _____
Mailing Address - _____
P/O. # - _____

13. Feeder Information *(Utility Use Only)*:

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

Feeder Name:

TS 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….. (Provide details below) ☐ No

Total number of Generator customers on the feeder (other than the proposed generator)

Number of units Total Capacity : kW kVA