# IESO logoSystem Impact Assessment Application (IESO)/

**Sault Ste. Marie LP**



# Customer Impact Assessment Application

# (Hydro One SSM)

# for Generation Facilities

Submit this form to the **Independent Electricity System Operator** and also to **Hydro One Sault Ste. Marie LP** to inform about your new connection or modification to an existing connection:

|  |  |
| --- | --- |
| **Independent Electricity System Operator**  [connection.assessments@ieso.ca](mailto:connection.assessments@ieso.ca)  To the extent possible, the documents and drawings should be submitted in .pdf format. Signed documents should be scanned in .pdf format. Connection applicants intending to send documents in a different format are encouraged to contact the Connection Assessments in advance.  Hard copies of the application forms and supporting documents are not required. Where the supporting documentation (e.g. single line diagram) is not suitable for email submission, it should be submitted by mail or courier to:  **Independent Electricity System Operator**  2635 Lakeshore Rd. West  Mississauga, ON  L5J 4R9  **Attn: Connection Assessments** | **Hydro One Sault Ste. Marie LP**  483 Bay Street, TCT 6  Toronto, ON  M5G 2P5  **Attn:  Director, Account Management**  Fax number: (416) 345-5957  [LargeAccounts@HydroOne.com](mailto:LargeAccounts@HydroOne.com) Note: This is not an LDC Connection Impact Assessment application form. |

**Subject: System Impact Assessment Application (IESO)/Customer Impact Assessment Application (Hydro One SSM) for Generation Facilities**

All information submitted in this process will be used by the Independent Electricity System Operator (IESO) and Hydro One Sault Ste. Marie LP (Hydro One SSM) solely in support of their obligations under the *Electricity Act, 1998*, the *Ontario Energy Board Act, 1998,* the *Market Rules*, the Transmission System Code and associated policies, codes, standards and procedures and their licences. All information submitted will be treated in accordance with the IESO's and Hydro One SSM confidentiality policies. The undersigned consents to the sharing of all such information between the IESO and Hydro One SSM.

Since specific equipment data may not yet be available for this Project, the accompanying data sheets have been modified to identify those data that are essential for the IESO and Hydro One SSM to be able to undertake both Assessments. The data sheets also identify those data for which the IESO or Hydro One SSM will use suitable typical values should the Applicant not provide them.

Whenever it is necessary for the IESO or Hydro One SSM to use typical (generally conservative) values for the Assessment of the Connection Application, then it will be the responsibility of the Applicant to ensure that the equipment that is eventually installed meets or exceeds these values.

Applicants should use this form for the assessment of spare equipment on site or on order from manufacturers to replace major components (e.g. main power transformers, turbine components, inverters etc.) in case of failure or while undergoing refurbishments.

Applicants are responsible for providing as-built equipment data prior to connection, for the equipment that is constructed and is to be put into service. Timelines for providing as-built data are specified on the Hydro One SSM and IESO websites.

## Part 1 – General Information

|  |
| --- |
| Organization Name (Generator): |
| Organization Short Name: (Maximum 12 keystrokes) |
| Project Name[[1]](#footnote-1): |
| Location of Project: |

|  |  |
| --- | --- |
| **Authorized Representative** | |
| Name: | |
| Position / Title: | |
| Company: | |
| Address: | |
| City/Town: | |
| Province/State: | |
| Postal/Zip Code: | Country: |
| Telephone No.: | Fax No.: |
| Email Address: | |
| IESO Organization ID (if applicable):  (Only for existing customers intending to install generation for load displacement.) | |

|  |  |
| --- | --- |
| Primary Contact | |
| Name: | |
| Position/Title: | |
| Company: | |
| Address: | |
| City/Town: | |
| Province/State: | |
| Postal/Zip Code: | Country: |
| Telephone No.: | Fax No.: |
| E-mail Address: | |

## Part 2 – Payment of Applicable Deposit ($30,000 for Transmission Connected Facility or $20,000 for Embedded Generation Facility) to IESO for System Impact Assessment (SIA)

|  |  |  |
| --- | --- | --- |
| Method of Payment (choose one) | | |
| Certified cheque payable to the IESO | Attached | |
| Deposit to IESO Account | Receipt Attached | |
| Electronic Wire Payment to IESO Account | Receipt Attached | |
| For direct deposit or electronic wire payments, reference the following IESO account: | | |
| **TD Bank, Institution ID # 0004, Transit # 10202, Account # 0690-0429444** | | |
| **Purchase Order (PO) #** (if applicable) | | (The PO # will be referenced on the final invoice and is not a replacement for the deposit) |

## Part 3 – Payment to Hydro One SSM

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| Payment to Hydro One SSM along with the terms and conditions will be outlined in the Hydro One SSM SIA/CIA Agreement, which will be discussed with the Applicant upon receipt of the application form. Cost for the Customer Impact Assessment (CIA) and Hydro One SSM’s costs associated with the IESO SIA will be based on Hydro One SSM’s actual costs in accordance with Hydro One SSM’s approved Customer Connects Process. |

## Part 4 – Certification

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| The undersigned hereby declares that the information contained in and submitted in support of this document is, to the best of the connection applicant’s knowledge, complete and accurate. By signature the connection applicant agrees that information may be provided to the affected transmitter(s) and posted on the *IESO* Web site as stipulated in the applicable Market Manual pertaining to connection assessment and approval. | | |
| Name (Please Print) |  | Title |
| Signature |  | Date |

|  |  |  |
| --- | --- | --- |
| Generic Information | *Bold-Italic* | Essential |
| Bold | Essential for Hydro One SSM - to be provided prior to Connection |
|  | Typical values will be assumed if data not provided |
|  | Only required upon request |

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| --- | --- | --- |
| Facility Type | ***Specify if generation facility will be registered as self-scheduled, intermittent or dispatchable.*** |  |
| Intent of Generation | *Specify if the facility will be used as load displacement or for sale of electricity.* |  |
| Project Dates | *Start of construction* |  |
| ***Electrical backfeed (energized stations)*** |  |
| *In-service dates (first synchronization of each unit)* |  |
| ***Permanent in-service date*** |  |
| **Protection System Description** | ***An overview of the protective relaying schemes to be employed together with an explanation of the manner in which they are to be deployed.***  ***A simplified tripping matrix as per schedule E, exhibit E-2 of the Transmission System Code (TSC), appendix 1 for generator customers.*** | Attach file |
| **Operating Philosophy** | ***An overview explaining how the facility will be operated outlining possible operating modes. Include details on generation facility start-up procedure. Indicate if the generation facility is subject to any common mode of failure (loss of station service or failure of a single element: bus, breaker, transformer, pump, etc. that forces the entire generation facility out of service) that cannot be identified on the facility’s single line diagram.*** | Attach file |
| **Detailed Single-Line Diagram(s)** | ***A detailed single-line diagram showing the equipment and the protection and telemetry points. The locations of the proposed connections on to existing lines, or into existing transformer/switching stations, are also to be included.***  ***Details are to be included of any existing facilities that are to be replaced or removed from service. Out-of-service dates are to be provided whenever these dates do not coincide with the in-service dates for the new facilities.***  ***Provide details of LDCs between the generator and the transmission system.*** | Attach file |
| **Geographic Map including GPS Coordinates** | ***A large-scale map or drawing showing the location of the exact point of the proposed interconnection with Hydro One SSM facilities (or other transmitters including lot number and concession number for the project).***  ***Attachments for wind farm projects must include the configuration and grouping of individual units, including GPS coordinates of each turbine, physical dimensions and turbine nomenclature.*** | Attach file |
| **Control Schemes** | ***Describe any control schemes that are to be used to automatically change the tap positions for any of the transformers, or to automatically switch into-service or out-of-service any reactive compensation devices.*** | Attach file |

All files and diagrams provided as attachments are to be signed and sealed by a Professional Engineer.

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| Generation Facilities | *Bold-Italic* | Essential |
| Bold | Essential for Hydro One SSM - to be provided prior to Connection |
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| **Unit Data**  Complete one table for each different type of generator | ***Number and identifier of identical units (e.g., 3 units - G1, G2, G3)*** | | | | | | | |  | | | |
| Manufacturer | | | | | | | |  | | | |
| ***Type (e.g. salient pole, round rotor, induction, inverter based, e.g. solar)*** | | | | | | | |  | | | |
| ***Frequency (Hz)*** | | | | | | | |  | | | |
| Speed (RPM) | | | | | | | |  | | | |
| ***Machine base (MVA)*** | | | | | | | |  | | | |
| ***Rated voltage (kV)*** | | | | | | | |  | | | |
| ***Power Factor*** | | | | | | | |  | | | |
| ***Maximum Continuous Rating (MCR)*** | | | ***(MW) - summer at 30°C*** | | | | |  | | | |
| ***(MW) - winter at 10°C*** | | | | |  | | | |
| Capability above MCR (MW), sustainability per event (hrs) | | | | | | | |  | |  | |
| NERC Unit type | | | | | Refer to Table below | | |  | | | |
| NERC Status | | | | | | | |  | | | |
| NERC Cooling Water Source | | | | | | | |  | | | |
| NERC Fuel Type (primary, alternate) | | | | | Refer to Table below | | |  | |  | |
| NERC Fuel Transportation (primary, alternate) | | | | | | | |  | |  | |
| NERC primary fuel heat rate at full load (BTU/kWhr) | | | | | | | |  | | | |
| ***Unsaturated reactances in pu based on machine base (Xo required only if unit transformer provides a zero sequence path)*** | | | | | | | | | | | |
| ***Xd*** | ***X’d*** | ***X’’d*** | | ***Xq*** | | ***X’q*** | ***Xl*** | | ***X2*** | | ***Xo*** |
|  |  |  | |  | |  |  | |  | |  |
| ***Open circuit time constants*** | | | | | | | | | | | |
| ***T’do*** | | ***T’’do*** | | | | ***T’qo*** | | | ***T’’qo*** | | |
|  | |  | | | |  | | |  | | |
| ***Station load (MW, Mvar)*** | | | | | | | |  | | | |
| Minimum power (MW) | | | | | | | |  | | | |
| Normal loading and unloading ramp rates (MW/min) | | | | | | | |  | |  | |
| Emergency loading and unloading ramp rates (MW/min) | | | | | | | |  | |  | |
| ***Armature (Ra) and field resistance (Rfd 1) (Ohms)*** | | | | | | | |  | |  | |
| ***Total rotational inertia of generator and turbine(s)*** | | | | | | | |  | | | |
| ***Saturation at rated voltage (S1.0) and 20% above (S1.2)*** | | | | | | | |  | |  | |
| Damping | | | | | | | |  | | | |
| ***Base field current (A)*** | | | | | | | |  | | | |
| ***Base field voltage (volts)*** | | | | | | | |  | | | |
| Losses at 1.0 and 0.9 power factor (MW) | | | | | | | |  | |  | |
| **Characteristics**  (must be provided for each different type of generator) | ***Open circuit saturation curve*** | | | | | | | | Attach file | | | |
| ***Short circuit curve*** | | | | | | | | Attach file | | | |
| V curves | | | | | | | | Attach file | | | |
| ***Capability curve*** | | | | | | | | Attach file | | | |

All files and diagrams provided as attachments are to be signed and sealed by a Professional Engineer.

1 Field resistance should be specified at 75ºC for hydro-electric units and at 100ºC for thermal units.

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| Generation Facilities (continued) | *Bold-Italic* | Essential |
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| **EXCITATION SYSTEM MODEL** |  |
| ***A block diagram\* suitable for stability studies or an IEEE standard model type with all in-service parameter values for the exciter. Models for stabilizers, under-excitation limiters and over-excitation limiters shall be provided where applicable.*** | Generation facility directly connected to the *IESO-controlled grid* |
| **GOVERNOR AND PRIME MOVER SYSTEM MODEL** | |
| ***A block diagram\* suitable for stability studies or an IEEE standard model type with all in service parameters values for the governor and prime mover (turbine). More detailed models would be required if off-nominal frequency or shaft torsional studies are required.*** | Generation facility directly connected to the IESO-*controlled grid*, generation facility  greater than 50 MW, or generation unit greater than 10 MW |

\* The block diagram must be compatible with PSS/E model libraries. Please check with the IESO regarding the software version currently in use.

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| **NERC UNIT TYPE** | | | | | |
| AB | Atmospheric Fluidized Bed Combustion | | IG | Integrated Coal Gasification Combined Cycle | |
| CA | Combined Cycle | Steam Turbine with supplemental firing | JE | Jet Engine | |
| CC | Total Unit (use only for such units that are in planning stages) | NB | Steam Turbine | Boiling Water Nuclear Reactor |
| CD | CANDU | | NG | Graphite Nuclear Reactor |
| CE | Compressed Air Energy Storage | | NH | High-temperature Gas-Cooled Nuclear Reactor |
| CH | Steam Turbine | | NP | Pressurised Water Nuclear Reactor |
| CS | Combined Cycle | Single Shaft (gas turbine & steam turbine share a single generator | OC | Ocean Thermal Turbine | |
| CT | Combustion Turbine Portion | PB | Pressurised Fluidised Bed Combustion | |
| CW | Steam Turbine – Waste Heat Boiler only | PS | Hydraulic Turbine Reversible – Pumped Storage | |
| FB | Fluidised Bed Combustion | | PV | Photovoltaic | |
| FC | Fuel Cell – Electrochemical | | SS | Steam Turbine | Solar |
| GE | Steam Turbine – Geothermal | | ST | Boiler – Non-nuclear |
| GT | Combustion Turbine – Gas Turbine | | VR | Various Types | |
| HL | Hydraulic Turbine | Pipeline | WT | Wind Turbine | |
| HY | Conventional | OT | Other (describe in notes) | |
| IC | Internal Combustion (diesel, piston) | | NA | Unknown at this time | |

Generation Facilities (continued)

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| **NERC FUEL TYPES** | | | |
| ANT | Anthracite | PET | Petroleum - Generic |
| BFG | Blast-Furnace Gas | PC | Petroleum Coke |
| BIO | Biomass - Generic | PL | Plutonium |
| BIT | Bitumous Coal | PRO | Propane |
| COG | Coke-Oven Gas | REF | Refuse, Bagasse, of Other Non-wood Waste |
| COL | Coal – Generic | RG | Refinery Gas |
| COM | Coal-Oil Mixture | RRO | Re-Refined Motor Oil |
| CWM | Coal-Water Mixture | SNG | Synthetic Natural Gas (Coal Gasification) |
| CRU | Crude Oil | STM | Steam |
| FO1 | No. 1 Fuel Oil | SUB | Sub-bituminious Coal |
| FO2 | No. 2 Fuel Oil | SUN | Solar |
| FO3 | No. 3 Fuel Oil | TH | Thorium |
| FO4 | No. 4 Fuel Oil | TOP | Topped Crude Oil |
| FO5 | No. 5 Fuel Oil | UR | Uranium |
| FO6 | No. 6 Fuel Oil | WAT | Water |
| GAS | Gas – Generic | WC | Waste Coal (culm) |
| GST | Geothermal Steam | WD | Wood & Wood Waste |
| JF | Jet Fuel | WH | Waste Heat |
| KER | Kerosene | WND | Wind |
| LIG | Lignite | OT | Other (describe under ‘Notes’) |
| LNG | Liquefied Natural Gas | NA | Not Available |
| LPG | Liquefied Propane Gas | ZZ | Fuel brought to the plant site that is converted before the combustion process, such as for a coal gasification system. To be identified as Type ZZ, and explained in a footnote |
| MF | Multi-fuel (two or more fuels burned simultaneously, not as a mixture) |
| MTE | Methane |
| MTH | Methanol | ZZF | Orimulsion ™ water emulsified bitumen used in New Brunswick Power’s Dalhousie units. |
| NG | Natural Gas |

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| Connection (Transmission) Facilities | *Bold-Italic* | Essential |
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| If the connection from the generator to the transmitter consists of different sections, then the applicant must complete a table for each overhead circuit section and for each underground circuit section.  Provide a detailed single line diagram of the connection facilities. | | | | | | | |
| **Transmission connection** | ***Point of connection to IESO controlled grid:***  ***- circuit operating nomenclature or terminal station name*** |  | | | | | |
| ***- circuit section*** |  | | | | | |
| ***- tower number*** |  | | | | | |
| ***- GPS coordinates*** |  | | | | | |
| **Overhead circuit section**  Complete one table for each overhead circuit section | ***Identifier (to be provided on drawing)*** |  | | | | | |
| ***Voltage (kV)*** |  | | | | | |
| ***Length (km)*** |  | | | | | |
| Phase conductor size (kcmil) |  | | | | | |
| Phase conductor type (ASC, ACSR, ACSS, ACCR, etc.) 1 |  | | | | | |
| Phase conductor stranding (# of Al strands, # of Steel strands) |  | | |  | | |
| Phase conductors per bundle, spacing if more than one (mm) |  | | |  | | |
| Geometry of all phase and sky wires for each tower type (m) |  | | | | | |
| Ground resistivity (ohm-meters) |  | | | | | |
| Skywire size (kcmil) |  | | | | | |
| Skywire type (Alumoweld, EHS, HS)1 |  | | | | | |
| Skywire stranding (# of Al strands, # of Steel strands) |  | | |  | | |
| Skywire number if more than one |  | | | | | |
| ***Positive sequence impedance***  ***R, X in ohms and B in mhos***  ***if in per unit specify bases*** | R in ohms | | X in ohms | | B in mhos | |
|  | |  | |  | |
| R in pu | | X in pu | | B in pu | |
|  | |  | |  | |
| ***Zero sequence impedance***  ***Ro, Xo in ohms and Bo in mhos***  ***if in per unit specify bases*** | Ro in ohms | | Xo in ohms | | Bo in mhos | |
|  | |  | |  | |
| Ro in pu | | Xo in pu | | Bo in pu | |
|  | |  | |  | |
| **Mutual Impedance (only needed for parallel circuit)**  **Rm, Xm in ohms and Bm in mhos**  **if in per unit specify bases** | Rm in ohms | | Xm in ohms | | Bm in mhos | |
|  | |  | |  | |
| Rm in pu | | Xm in pu | | Bm in pu | |
|  | |  | |  | |
| **Base Voltage VB** (Applicable to positive & zero sequences and mutual impedances) |  | | | | | |
| **Base MVA B** (Applicable to positive & zero sequences and mutual impedances) |  | | | | | |
| **Overhead circuit section cont’d**  Complete one table for each overhead circuit section | ***Winter thermal ratings: Continuous, Long-term, Short-term (A)***  ***(see table below for rating assumptions)*** |  |  | | | |  |
| ***Summer thermal ratings: Continuous, Long-term, Short-term (A)***  ***(see table below for rating assumptions)*** |  |  | | | |  |

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| Connection (Transmission) Facilities (continued) | *Bold-Italic* | Essential |
| Bold | Essential for Hydro One SSM - to be provided prior to Connection |
|  | Typical values will be assumed if data not provided |
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| **Overhead Transmission Lines - Rating Assumptions for System Impact Assessment studies** | | | | |
| **Rating** | **Conductor Temperature** | **Pre-load** | **Ambient Temp** | **Wind Speed** |
| **Continuous** | 93°C  (or sag temperature if lower) | N/A | **Summer**  30°C  **Winter**  10°C | 0 to 4 km/hr  15 km/hr  within 50 km of wind farm |
| **Long-Term Emergency**  **(Limited to 50 hr/year on all conductors)** | 127°C  (or sag temperature if lower) | N/A |
| **Short-Term Emergency**  **(15-minute limited-time rating)** | 150°C  (or sag temperature if lower)  (Limited to 127°C for High Aluminum Content (HAC) conductors) | Continuous Rating at 93oC |

1 If the conductor type is new then additional information may be required.

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| Connection (Transmission)  Facilities (continued) | *Bold-Italic* | Essential |
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| **Underground Circuit Section**  Complete one table for each underground circuit section | ***Identifier (to be provided on drawing)*** |  | | |
| ***Voltage (kV)*** |  | | |
| ***Length (km)*** |  | | |
| BIL rating |  | | |
| Phase conductor size (kcmil) |  | | |
| Distance from the “from” terminal (km) |  | | |
| Maximum operating temperature ( ºC) |  | | |
| Phase conductor type 1 |  | | |
| Insulation type |  | | |
| Semiconductor shield type |  | | |
| Shield grounding |  | | |
| Metallic sheath type |  | | |
| External layer type |  | | |
| Geometry of all phases |  | | |
| Ground resistivity (ohms-meters) |  | | |
| Cable construction |  | | |
| ***Installation type (e.g. direct buried, in duct, etc.)*** |  | | |
| ***Positive sequence impedance***  ***R, X in ohms, B in mhos***  ***if in per unit specify bases)*** | R in ohms | X in ohms | B in mhos |
|  |  |  |
| R in pu | X in pu | B in pu |
|  |  |  |
| ***Zero sequence impedance***  ***Ro, Xo in ohms, Bo in mhos***  ***if in per unit specify bases*** | Ro in ohms | Xo in ohms | Bo in mhos |
|  |  |  |
| Ro in pu | Xo in pu | Bo in pu |
|  |  |  |
| **Mutual Impedance (only needed for parallel circuit)**  **Rm, Xm in ohms and Bm in mhos**  **if in per unit specify bases** | Rm in ohms | Xm in ohms | Bm in mhos |
|  |  |  |
| Rm in pu | Xm in pu | Bm in pu |
|  |  |  |
| **Base Voltage VB** (Applicable to positive & zero sequences and mutual impedances) |  | | |
| **Base MVAB** (Applicable to positive & zero sequences and mutual impedances) |  | | |
| ***Winter thermal : Continuous, Long-term, Short-term (A)***  ***(see table below for rating assumptions*** |  |  |  |
| ***Summer thermal ratings: Continuous, Long-term, Short-term (A)***  ***(see table below for rating assumptions*** |  |  |  |
| **Main Buses**  Complete one table for each bus | Identifier (to be provided on drawing) |  | | |
| Station |  | | |
| ***Voltage (kV)*** |  | | |
| ***Summer continuous (A)*** |  | | |
| ***Winter continuous (A)*** |  | | |
| Maximum operating temperature (ºC) |  | | |
| Conductor size (kcmil) |  | | |
| Conductor type (ASC, ASCR, Al tube) |  | | |

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| Connection (Transmission)  Facilities (continued) | *Bold-Italic* | Essential |
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| --- | --- | --- |
| Surge Arresters | Identifier |  |
| Station |  |
| Manufacturer |  |
| Serial number |  |
| Voltage rating (kV) |  |
| Type (e.g. ZnO, SiC) |  |
| Class (e.g. secondary, distribution, intermediate, station) |  |

1 If the conductor type is new then additional information may be required.

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| Connection (Transmission)  Facilities (continued) | *Bold-Italic* | Essential |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Transformers**  Complete one table for each transformer | ***Number and Identifier of identical units (e.g., 3 units - T1, T2, T3)*** | | | | | |  | | | | | | | | | | | |
| ***Station*** | | | | | |  | | | | | | | | | | | |
| **Serial Number**  (must be provided prior to Connection) | | | | | |  | | | | | | | | | | | |
| **Manufacturer** | | | | | |  | | | | | | | | | | | |
| **Configuration (e.g. 3 phase unit or three single phase units)** | | | | | |  | | | | | | | | | | | |
| **Phase Location if single phase (e.g. R, W, B)** | | | | | |  | | | | | | | | | | | |
| ***Cooling types ( e.g. ONAN, ONAF, OFAF)*** | | | | | |  | | | |  | | | | |  | | |
| ***Associated Thermal Rating for each cooling type (MVA)*** | | | | | |  | | | |  | | | | |  | | |
| Winter (10ºC) continuous, 10-DAY and 15-MIN thermal ratings | | | (A) | | |  | | | |  | | | | |  | | |
| (MVA) | | |  | | | |  | | | | |  | | |
| ***Summer (30ºC) continuous, 10-DAY and 15-MIN thermal ratings*** | | | (A) | | |  | | | |  | | | | |  | | |
| (MVA) | | |  | | | |  | | | | |  | | |
| ***Connection for each winding H, X, Y (e.g. wye, delta, zig-zag)*** | | | | | |  | | | |  | | | | |  | | |
| ***Rated voltage for each winding, e.g. HV, LV, tertiary (kV)*** | | | | | |  | | | |  | | | | |  | | |
| **Rated capability for tertiary winding, if applicable (A, MVA)** | | | | | |  | | | | | | |  | | | | |
| **Impedance to ground for each winding H, X, Y (ohms)**  **(U – Ungrounded; R – Resistance; X – Reactance, e.g. 16 R)** | | | | | |  | | | |  | | | | |  | | |
| ***Off–load taps (kV)*** | |  | | |  | | |  | | | |  | | | | |  |
| ***In-service off-load tap position (kV)*** | | | |  | | | | | | | | | | | | | |
| ***Under-load taps: max tap (kV), min tap (kV), number of steps*** | | | |  | | | | |  | | | | |  | | | |
| **Positive Sequence Impedance** | (see IEEE C57.12.90 for measurement techniques) | ***Positive Sequence Impedance (%)*** | | | ***HX*** | | | | | ***HY*** | | | | | ***XY*** | | | |
| ***R*** | | |  | | | | |  | | | | |  | | | |
| ***X*** | | |  | | | | |  | | | | |  | | | |
| ***Base MVA*** | | |  | | | | |  | | | | |  | | | |
| **Zero Sequence Impedance**  (only required for transformers with 1 or 2 external neutrals) | H winding energized  all others open | Closed Tertiary | | | H | | | X | | | | HX | | | | | XH | |
| R | | |  | | |  | | | |  | | | | |  | |
| X | | |  | | |  | | | |  | | | | |  | |
| Base MVA | | |  | | |  | | | |  | | | | |  | |
| H winding energized  X winding shorted | Open Tertiary | | | H | | | X | | | | HX | | | | | XH | |
| R | | |  | | |  | | | |  | | | | |  | |
| X | | |  | | |  | | | |  | | | | |  | |
| Base MVA | | |  | | |  | | | |  | | | | |  | |

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| --- | --- | --- |
| Connection (Transmission) Facilities (cont) | *Bold-Italic* | Essential |
| Bold | Essential for Hydro One SSM - to be provided prior to Connection |
|  | Typical values will be assumed if data not provided |
|  | Only required upon request |

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| **Shunt Capacitors**  Complete one table for each type of shunt capacitor | ***Identifier*** |  |
| ***Station*** |  |
| Manufacturer |  |
| **Serial number** (must be provided prior to Connection) |  |
| ***Rated voltage (kV)*** |  |
| ***Rated capability (Mvar)*** |  |
| ***Discharge time (ms)*** |  |
| Current limiting reactor (mH or Ω) |  |
| Bank arrangement (e.g. delta, wye, double-wye, etc) |  |
| ***Surge capacitor (µF)*** |  |
| Description of automatic switching | Attach file |
| Anticipated switching restrictions | Attach file |
| **Shunt Reactors**  Complete one table for each type of shunt reactor | ***Identifier*** |  |
| ***Station*** |  |
| Manufacturer |  |
| **Serial number** (must be provided prior to Connection) |  |
| ***Rated voltage (kV)*** |  |
| ***Rated capability (Mvar)*** |  |
| Winding configuration (e.g. delta, wye) |  |
| Description of automatic switching | Attach file |
| ***Description of anticipated switching restrictions*** | Attach file |

All files and diagrams provided as attachments are to be signed and sealed by a Professional Engineer.

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| Connection (Transmission)  Facilities (continued) | *Bold-Italic* | Essential |
| Bold | Essential for Hydro One SSM - to be provided prior to Connection |
|  | Typical values will be assumed if data not provided |
|  | Only required upon request |

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| **Circuit Breakers**  Complete one table for each type of circuit breaker | ***Identifier*** |  | | |
| ***Station*** |  | | |
| Manufacturer |  | | |
| **Serial number** (must be provided prior to Connection) |  | | |
| ***Maximum continuous rated voltage (kV)*** |  | | |
| Interrupting time (ms) |  | | |
| ***Interrupting media (e.g. air, oil, SF6)*** |  | | |
| ***Rated continuous current (A)*** |  | | |
| ***Rated symmetrical and asymmetrical short circuit capability (kA)*** |  |  | |
| **Circuit Switchers**  Complete one table for each type of circuit switcher  (typically used for taps only – asymmetrical may not be necessary) | ***Identifier*** |  | | |
| ***Station*** |  | | |
| Manufacturer |  | | |
| **Serial number** (must be provided prior to Connection) |  | | |
| ***Maximum continuous rated voltage (kV)*** |  | | |
| ***Interrupting time (ms)*** |  | | |
| ***Interrupting media (e.g. air, oil, SF6)*** |  | | |
| ***Rated continuous current (A)*** |  | | |
| ***Rated symmetrical and asymmetrical short circuit capability (kA)*** |  | |  |
| **Disconnect Switches/Mid Span Openers**  Complete one table for each disconnect switch/mid span opener with different technical specifications | ***Identifier*** |  | | |
| ***Station*** |  | | |
| Manufacturer |  | | |
| **Serial number** (must be provided prior to Connection) |  | | |
| ***Maximum continuous rated voltage (kV)*** |  | | |
| ***Continuous current rating (amps) (Non-Ground Switches only)*** |  | | |
| ***Rated symmetrical short circuit capability (kA)*** |  | | |
| **Wavetraps** | Identifier |  | | |
| Station |  | | |
| Manufacturer |  | | |
| **Serial number** (must be provided prior to Connection) |  | | |
| Continuous current rating (amps) |  | | |
| **DC Lines** | ***Identifier*** |  | | |
| ***Complete steady state (loadflow) parameters and dynamic parameters*** |  | | |
| **FACTS Devices**  (e.g., dynamic reactive devices, series compensation, etc.) | ***Identifier*** |  | | |
| ***Complete steady state (loadflow) parameters and dynamic parameters*** |  | | |

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| LDC Facilities for Embedded Generation | *Bold-Italic* | Essential |
| Bold | Essential for Hydro One SSM - to be provided prior to Connection |
|  | Typical values will be assumed if data not provided |
|  | Only required upon request |

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| Provide the following information for each LDC existing between the new facility point of connection and the transmitter facilities.  Provide a detailed single line diagram of the connection facilities. | | | | | | | |
| **Transmission connection** | ***Point of connection to Transmitter (circuit operating nomenclature or terminal station name)*** | |  | | | | |
| **Overhead circuit section**  Complete one table for each section | ***Identifier (to be provided on drawing)*** | |  | | | | |
| ***Voltage (kV)*** | |  | | | | |
| ***Length (km)*** | |  | | | | |
| ***Positive sequence impedance***  ***R, X in ohms and B in mhos***  ***if in per unit specify bases*** | | R in ohms | | X in ohms | | B in mhos |
|  | |  | |  |
| R in pu | | X in pu | | B in pu |
|  | |  | |  |
| ***Zero sequence impedance***  ***Ro, Xo in ohms and Bo in mhos***  ***if in per unit specify bases*** | | Ro in ohms | | Xo in ohms | | Bo in mhos |
|  | |  | |  |
| Ro in pu | | Xo in pu | | Bo in pu |
|  | |  | |  |
|  | **Mutual Impedance (only needed for parallel circuit)**  **Rm, Xm in ohms and Bm in mhos**  **if in per unit specify bases** | | Rm in ohms | | Xm in ohms | | Bm in mhos |
|  | |  | |  |
| Rm in pu | | Xm in pu | | Bm in pu |
|  | |  | |  |
|  | **Base Voltage VB** (Applicable to positive & zero sequences and mutual impedances) | |  | | | | |
|  | **Base MVAB** (Applicable to positive & zero sequences and mutual impedances) | |  | | | | |
|  | ***Winter thermal : Continuous, Long-term, Short-term (A)***  ***(see table below for rating assumptions*** | |  | |  | |  |
|  | ***Summer thermal ratings: Continuous, Long-term, Short-term (A)***  ***(see table below for rating assumptions*** | |  | |  | |  |
| **Underground Circuit Section**  Complete one table for each underground circuit section | ***Identifier (to be provided on drawing)*** | |  | | | | | |
| ***Voltage (kV)*** | |  | | | | | |
| ***Length (km)*** | |  | | | | | |
| BIL rating | |  | | | | | |
| Phase conductor size (kcmil) | |  | | | | | |
| Distance from the “from” terminal (km) | |  | | | | | |
| Maximum operating temperature ( ºC) | |  | | | | | |
| Phase conductor type 1 | |  | | | | | |
| Insulation type | |  | | | | | |
| Semiconductor shield type | |  | | | | | |
| Shield grounding | |  | | | | | |
| Metallic sheath type | |  | | | | | |
| External layer type | |  | | | | | |
| Geometry of all phase | |  | | | | | |
| Ground resistivity (ohms) | |  | | | | | |
| Cable construction | |  | | | | | |
| ***Installation type (e.g. direct buried, in duct, etc.)*** | |  | | | | | |
| ***Positive sequence impedance (R, X, B)*** ***(R, X in ohms, B in mhos or if in per unit specify bases)*** | |  |  | |  | | |
| ***Zero sequence impedance (Ro, Xo, Bo) (Ro, Xo in ohms, Bo in mhos or if in per unit specify bases)*** | |  |  | |  | | |
| ***Continuous, 15-Minute and 24-Hour thermal ratings (A)*** | ***Winter*** |  |  | |  | | |
| ***Summer*** |  |  | |  | | |

1 If the conductor type is new then additional information may be required.

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| **Overhead Transmission Lines - Rating Assumptions for System Impact Assessment studies** | | | | |
| **Rating** | **Conductor Temperature** | **Pre-load** | **Ambient Temp** | **Wind Speed** |
| **Continuous** | 93oC  (or sag temperature if lower) | N/A | **Summer**  30oC  **Winter**  10oC | 0 to 4 km/hr  15 km/hr  within 50 km of wind farm |
| **Long-Term Emergency**  **(Limited to 50 hr/year on all conductors)** | 127oC  (or sag temperature if lower) | N/A |
| **Short-Term Emergency**  **(15-minute limited-time rating)** | 150oC  (or sag temperature if lower)  (Limited to 127oC for High Aluminum Content (HAC) conductors) | Continuous Rating at 93oC |

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| LDC Facilities for Embedded Generation | *Bold-Italic* | Essential |
| Bold | Essential for Hydro One SSM - to be provided prior to Connection |
|  | Typical values will be assumed if data not provided |
|  | Only required upon request |

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| **Transformers**  Complete one table for each transformer | ***Number and Identifier of identical units (e.g., 3 units - T1, T2, T3)*** | | | | | |  | | | | | | | | | | | |
| ***Station*** | | | | | |  | | | | | | | | | | | |
| **Serial Number**  (must be provided prior to Connection) | | | | | |  | | | | | | | | | | | |
| **Manufacturer** | | | | | |  | | | | | | | | | | | |
| **Configuration (e.g. 3 phase or three single phase)** | | | | | |  | | | | | | | | | | | |
| **Phase Location if single phase (e.g. R, W, B)** | | | | | |  | | | |  | | | | |  | | |
| ***Cooling types ( e.g. ONAN, ONAF, OFAF)*** | | | | | |  | | | |  | | | | |  | | |
| ***Associated Thermal Rating for each cooling type (MVA)*** | | | | | |  | | | |  | | | | |  | | |
| Winter (10ºC) continuous, 10-Day and 15-Minute thermal ratings | | (A) | | | |  | | | |  | | | | |  | | |
| (MVA) | | | |  | | | |  | | | | |  | | |
| ***Summer (30ºC) continuous, 10-Day and 15-Minute thermal ratings*** | | **(A)** | | | |  | | | |  | | | | |  | | |
| **(MVA)** | | | |  | | | |  | | | | |  | | |
| ***Connection for each winding H, X, Y (e.g. wye, delta, zig-zag)*** | | | | | |  | | | |  | | | | |  | | |
| ***Rated voltage for each winding, e.g. HV, LV, tertiary (kV)*** | | | | | |  | | | |  | | | | |  | | |
| ***Rated capability for tertiary winding, if applicable (A, MVA)*** | | | | | |  | | | |  | | | | | | | |
| **Impedance to ground for each winding H, X, Y (ohms)**  **(U – ungrounded; R – Resistance; X – Reactance, e.g. 16 R)** | | | | | |  | | | |  | | | | |  | | |
| ***Off–load taps (kV)*** | | |  |  | | |  | | | |  | | | | |  | |
| ***In-service off-load tap position (kV)*** | | | | |  | | |  | | | | |  | | | | |
| ***Under-load taps: max tap (kV), min tap (kV), number of steps*** | | | | |  | | | | | | | | | | | | |
| **Positive Sequence Impedance** | (see IEEE C57.12.90 for measurement techniques) | ***Positive Sequence Impedance (%)*** | | | | ***HX*** | | | | ***HY*** | | | | | ***XY*** | | | |
| ***R*** | | | |  | | | |  | | | | |  | | | |
| ***X*** | | | |  | | | |  | | | | |  | | | |
| ***Base MVA*** | | | |  | | | |  | | | | |  | | | |
| **Zero Sequence Impedance**  (only required for transformers with 1 or 2 external neutrals) | H winding energized  all others open | Closed Tertiary | | | | H | | | X | | | | HX | | | | | XH |
| R | | | |  | | |  | | | |  | | | | |  |
| ***X*** | | | |  | | |  | | | |  | | | | |  |
| ***Base MVA*** | | | |  | | |  | | | |  | | | | |  |
| H winding energized  X winding shorted | Open Tertiary | | | | H | | | X | | | | HX | | | | | XH |
| R | | | |  | | |  | | | |  | | | | |  |
| ***X*** | | | |  | | |  | | | |  | | | | |  |
| ***Base MVA*** | | | |  | | |  | | | |  | | | | |  |

1. If your project is a new facility to be connected to the IESO controlled grid, please consult with the transmitter and IESO Market Registration ([market.registration@ieso.ca](mailto:market.registration@ieso.ca)) regarding your proposed facility name prior to submitting this application. [↑](#footnote-ref-1)