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| IESO Logo | Technical Feasibility Study ApplicationGeneration Facilities |

Submit this form by email to 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 IESO 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 the following address:

**Independent Electricity System Operator**2635 Lakeshore Rd. West
Mississauga, ON

L5J 4R9
**Attn: Connection Assessments**

**Subject: *Technical Feasibility Study Application – Generation Facilities***

All information submitted in this process will be used by the *IESO* solely in support of its obligations under the *Electricity Act, 1998*, the *Ontario Energy Board Act, 1998,* the *Market Rules* and associated policies, standards and procedures and its licence. All information submitted will be assigned the appropriate confidentiality level upon receipt.

*Since complete 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 to be able to undertake the Assessment. The data sheets also identify those data for which the IESO will use appropriate values should the Applicant not provide suitable data.*

*Whenever it is necessary for the IESO 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.*

## Part 1 – General Information

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| Organization Name:       |
| Organization Short Name: (Maximum 12 keystrokes)       |
| Project Name:       |
| Location of Project:       |

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| **Authorized Representative** |
| Name:       |
| Position / Tile:       |
| Company:       |
| Address:       |
| City/Town:        |
| Province/State:       |
| Postal/Zip Code:       | Country:       |
| Telephone No.:       | Fax No.:       |
| Email Address:       |

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| **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 $20,000 Deposit

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| 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** |

## Part 3 – 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. The undersigned also declares that the subject project is not being developed in response to an IESO procurement, as stipulated in the applicable Market Manual pertaining to connection assessment and approval. |
| Name (Please Print)       |  | Title       |
| Signature |  | Date       |

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| Generic Information | *Bold-Italic* | Essential |
|  | 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.*** |       |
| In-Service Dates | ***Initial in-service date (start of commissioning):*** |       |
| ***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.*** | Attach file |
| *(This information is to be provided upon request by the IESO)* | A functional description of all protective schemes shall be provided to allow a detailed analysis of all credible contingencies.These descriptions shall include, but are not limited to, the following:* Operating times for protection components

(e.g. primary relaying, auxiliary relaying, communication),* General models for normal and delayed (breaker failure) fault clearing, and
* Exceptions to the general model (e.g. LEO, HIROP).

For all recognized contingencies, the functional description must enable fault clearing times at all terminals to be determined for both normal and delayed clearing. | 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 do not coincide with the in-service dates for the new facilities.*** | 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.******If the Project is to include a load rejection or generation rejection scheme, this should also be described.*** | Attach file |

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| Generation Facilities | *Bold-Italic* | Essential |
|  | Typical values will be assumed if data not provided |
|  | Only required upon request |
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| **Unit Data**  | ***Identifier***  |       |
| Manufacturer |       |
| Serial Number |       |
| ***Type (e.g. salient pole, round rotor, induction)*** |       |
| ***Frequency (Hz)*** |       |
| NERC Unit type  |       |       |
| NERC Status |       |
| NERC Cooling Water Source  |       |
| NERC Fuel Type (primary, alternate) |       |       |       |
| NERC Fuel Transportation (primary, alternate) |       |       |
| ***Maximum Continuous Rating (summer MCR, winter MCR)*** |       |       |
| Capability above MCR (MW), sustainability per event (hrs) |       |       |
| Description of other restriction when operating above MCR (e.g. hours/year) |       |
| NERC primary fuel heat rate at full load (BTU/kWhr) |       |
| ***Rated capability (MVA)*** |       |
| ***Rated voltage (kV)*** |       |
| ***Power Factor*** |       |
| ***Total rotational inertia of generator and turbine(s)*** |       |
| ***Unsaturated reactances in pu 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 (s)*** |
| ***T’do*** | ***T’’do*** | ***T’qo*** | ***T’’qo*** |
|       |       |       |       |
| Speed (RPM) |       |
| ***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\*) (Ohms)*** |       |       |
| ***Saturation at rated voltage (S1.0) and 20% above (S1.2)*** |       |       |
| Rotational inertia for generator without turbine(s) (upon request only) |       |
| Damping |       |
| ***Base field current (A)*** |       |
| ***Base field voltage (volts)*** |       |
| Losses at 1.0 and 0.9 power factor (MW) |       |       |
| **Characteristics** | ***Open circuit saturation curve*** | Attach file |
| ***Short circuit curve*** | Attach file |
| V curves | Attach file |
| ***Capability curve*** | Attach file |

\*Field resistance for hydraulic units should be specified at 75ºC and at 100ºC for thermal units.

Generation Facilities (continued)

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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. | For each unit 10 MVA or larger |
| **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. | For each unit 10 MVA or larger |

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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 |
|  | Typical values will be assumed if data not provided |
|  | Only required upon request |

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| **Overhead Circuits****(For each section)** | ***Identifier*** |  |
| ***Terminal station(s)*** |  |  |  |
| ***Voltage (kV)*** |  |
| ***Length (km)*** |  |
| ***Identifier(s) and length of circuit(s) on common towers*** |  |  |
| ***Positive sequence impedance (R, X, B)*** |  |  |  |
| ***Zero sequence impedance (Ro, Xo, Bo)*** |  |  |  |
| Winter (10ºC) continuous and 15 minute thermal ratings (A) |  |  |
| ***Summer (30ºC) continuous and 15 minute thermal ratings (A)*** |  |  |
| **Overhead Circuits****(For each segment)** | ***Identifier*** |  |
| ***Length (km)*** |  |
| ***Distance from the “from” terminal (km)*** |  |
| ***Maximum operating temperature ( ºC)*** |  |
| ***Phase conductor size (kcmil)*** |  |
| ***Phase conductor type (ASC,ACSR)\**** |  |
| ***Phase conductor stranding (# of Al strands/ # of Steel strands)*** |  |  |
| ***Phase conductors per bundle and spacing (m)*** |  |  |
| Geometry of all phase and sky wires for each tower type |  |
| Ground resistivity (ohms) |  |
| Skywire size (kcmil) |  |
| Skywire type (Alumoweld, EHS, HS)\* |  |
| Skywire stranding (# of Al strands/ # of Steel strands) |  |  |
| Skywire number if more than one |  |
| Identifier and length of circuits sharing the same right of way |  |  |
| Mutual impedance to other circuits (Zzero) |  |  |
| **Underground Circuits** | ***Identifier*** |  |
| ***Complete steady state and dynamic electrical and physical parameters******of conductors, insulators and surrounding material*** |  |
| **Buses** | Identifier |  |
| Station |  |
| Maximum operating temperature (ºC) |  |
| Conductor size (kcmil)  |  |
| Conductor type (ASC,ASCR,Al tube)\* |  |
| **Surge Arresters** | Identifier |  |
| Station |  |
| Manufacturer |  |
| Serial number |  |
| Voltage rating (kV) |  |
| Type (e.g. ZnO, SiC) |  |
| Class (e.g. secondary, distribution, intermediate, station) |  |

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

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| **Transformers**  | ***Identifier*** |       |
| ***Station*** |       |
| Manufacturer |       |
| Serial Number  |       |
| Construction (e.g. shell or core)  |       |
| Configuration (e.g. 3 phase or three single phase) |       |
| Temperature rise (ºC) |       |
| Cooling types ( e.g. ONAN, ONAF, OFAF) |       |       |       |
| ***Associated Thermal Rating for each cooling type (MVA)*** |       |       |       |
| Winter (10ºC) continuous, 15 minute and 10 day thermal ratings (A) |       |       |       |
| ***Summer (30ºC) continuous ,15 minute, and 10 day thermal ratings (A)*** |       |       |       |
| ***Connection for each winding H, X, Y (e.g. wye, delta, zig-zag)*** |       |       |       |
| ***Rated voltage for each winding (kV)*** |       |       |       |
| ***Rated capability for each winding (MVA)*** |       |       |       |
| Impedance to ground for each winding H, X, Y (ohms)Indicate: U – ungrounded or R – Resistance; X – Reactance (e.g. 16 R) |       |       |       |
| **Positive Sequence Impedance** | (see IEEE C57.12.90 for measurement techniques) | Positive Sequence Impedance (%) | HX | HY | XY |
| R |       |       |       |
| ***X*** |       |       |       |
| ***Base MVA*** |       |       |       |
| **Zero Sequence Impedance****(data is required for transformers with 1 or 2 external neutrals)** | H winding energizedall others open | Closed Tertiary  | H | X | HX | XH |
| R |       |       |       |       |
| ***X*** |       |       |       |       |
| ***Base MVA*** |       |       |       |       |
| H winding energizedX winding shorted | Open Tertiary  | H | X | HX | XH |
| R |       |       |       |       |
| ***X*** |       |       |       |       |
| ***Base MVA*** |       |       |       |       |
| In-service off-load tap (kV) |       |
| ***Off –load taps (kV)*** |       |       |       |       |       |
| ***On-load taps (kV) (max tap, min tap, number of steps)*** |       |       |       |
| Core and Excitation Losses (kW, kVAr) |       |       |

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

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| **Shunt Capacitors** | ***Identifier*** |       |
| ***Station*** |       |
| Manufacturer |       |
| Serial Number |       |
| ***Rated voltage (kV)*** |       |
| ***Rated capability (MVAr)*** |       |
| Discharge time (ms) |       |
| Current limiting reactor (ohms) |       |
| Synchronous closing unit |       |
| Bank arrangement (e.g. delta, wye, double-wye, etc) |       |
| Description of protection | Attach file |
| Description of automatic switching | Attach file |
| ***Anticipated switching restrictions*** | Attach file |
| **Circuit Breakers**  | ***Identifier*** |       |
| ***Station*** |       |
| Manufacturer |       |
| Serial Number |       |
| ***Rated voltage (kV)*** |       |
| ***Interrupting time (ms)*** |       |
| Interrupting media (e.g. air, oil, SF6) |       |
| ***Rated continuous current (A)*** |       |
| ***Rated symmetrical short circuit capability (A)*** |       |
| **Shunt Reactors** | ***Identifier*** |       |
| ***Station*** |       |
| Manufacturer |       |
| Serial Number |       |
| ***Rated voltage (kV)*** |       |
| ***Rated capability (Mvar)*** |       |
| Winding configuration (e.g. delta, wye) |       |
| Description of protection | Attach file |
| Description of automatic switching | Attach file |
| ***Description of anticipated switching restrictions*** | Attach file |

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

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| **Switches** | Identifier |       |
| Station |       |
| Manufacturer |       |
| Serial number |       |
| Voltage rating (kV) |       |
| Type (e.g. disconnect, interrupt) |       |
| Continuous current rating (amps) |       |
| **Wavetraps** | Identifier |       |
| Station |       |
| Manufacturer |       |
| Serial number |       |
| Continuous current rating (amps) |       |
| **Current****Transformers** | Identifier |       |
| Station |       |
| Manufacturer |       |
| Serial number |       |
| Continuous current rating (amps) |       |
| **DC Lines** | ***Identifier*** |       |
| ***Complete steady state (loadflow) parameters and dynamic parameters*** |       |
| **FACTS Devices** | ***Identifier*** |       |
| ***Complete steady state (loadflow) parameters and dynamic parameters*** |       |

\*If the conductor type is new then additional information may be requested.