



**System Impact Study Report
Report GIP-IR225-SIS-R2**

**Generator Interconnection Request #225
59.8 MW Generating Facility
Loganville, NS**

Principal Investigator
Hung Van Huynh, P.Eng.

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Transmission Planning
Nova Scotia Power Inc.

Executive Summary

This System Impact Study (SIS) is for Interconnection Request #225 (IR225) for a proposed 59.8 MW wind generating facility in Loganville, Nova Scotia.

The facility will comprise of 26 Enercon E-82 E2 FT wind turbines, each rated 2.3 MW. The individual wind turbine voltage will be transformed to 34.5 kV at the collector circuits, which will be further transformed to 138 kV in order to connect to the transmission system. A new spur 138 kV line (~11.7 km), will be constructed from the generating facility to the Point-Of-Interconnection (POI) at a line tap on L-6503. The POI substation will be located about 25 km from the 1N-Onslow substation and will have a three breaker ring bus configuration.

The service request is Energy Resource Interconnection Service (ERIS), meaning that the generation will be dispatched using transfer capacity available in the existing transmission system. The SIS is conducted with IR225 replacing either Lingan or Trenton generation when the constrained interfaces are at limits. Since replacing Trenton generation represents a more stressed case, the SIS is conducted mostly with IR225 replacing Trenton generation.

Based on the information provided by the Interconnection Customer (IC), the SIS finds that the short circuit level increase provided by IR225 does not exceed the fault interrupting capabilities of existing circuit breakers in the system.

The new 138 kV POI substation is non-Bulk Power System (non-BPS). Stability analysis shows IR225 remains on line as required when the Nova Scotia system is islanded.

IR225 wind turbines meet the requirement of Low-Voltage-Ride-Through. The calculation shows that voltage flicker should be a non-issue. IR225 wind turbines have the capability to meet North East Power Coordinating Council's under-frequency operation curve.

IR225 generating facility is required to meet IEEE Standard 519 Total Harmonic Distortion but there is not sufficient information provided to determine if the facility will meet the requirement.

The system loss factor for IR225 is calculated at 6.9%. When generating at full output, IR225 would displace 65.7 MW of generation at Lingan plant or 58.8 MW of generation at Trenton plant.

Stability analysis shows that the system is stable and well damped for all the contingencies and base cases studied.

The generating facility using Enercon E82 E2 FT model wind turbines does not meet the power factor requirement. The SIS recommends that the FTQ wind turbines should be used instead of FT models. The FTQ models provide more expanded reactive power capability. The IC may

determine an optimum mix of FTs and FTQs to provide reactive power necessary to meet the power factor requirement.

The load flow shows that the 138 kV breakers 1N-623 and 50N-607 on L-6503 overload above name plate ratings under contingencies. The Facility Study will determine if these breakers are capable of carrying the temporary overload, otherwise either the breakers will be upgraded or the ONI arming level will be reduced.

The SIS recommends seasonal values for special protection schemes associated with CBX. The details of this recommendation are in section 2.4.2 and section 4.0 of this report.

The variability of wind generation and the fast generation required to control its impact on the system is not in the scope of this SIS.

A new three breaker ring bus substation will be required at the POI substation. The breakers and associated switches shall have 2,000 amperes continuous ratings.

A new 11.7 km transmission line from the POI substation to IR225 will be required. The line design will allow 100 °C conductor operating temperature. The conductors could be 556 ACSR (Dove) or 795 ACSR (Drake) and the voltage level for the line and the POI substation could be 138 kV or 230 kV. The 230 kV option would match the existing 230 kV design for L-6503.

All associated protection, control, and communication needed for the interconnection of IR225 to the system will be required.

The preliminary non-binding cost estimate, in 2010 Canadian dollars, for the connection of IR225 to L-6503 ranges from \$10,241,825 to \$17,369,251 depending upon the options. The section 3 and 4 of the report provide more information.

Depending upon the IC's final choice of Interconnection Facilities configuration for the connection of IR225 to the system, the Facility Study will provide the detailed cost estimate.

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