



Final Report prepared for

Nova Scotia Power Inc.

**System Impact Study
for the
IR137 & IR150, Statia 23 MW Wind Generation Facility in
Richmond County, Nova Scotia**

H-331658

March 13, 2009

Executive Summary

This report presents the results of a System Impact Study (SIS) for the 23 MW Statia Phase 1 & 2 wind generation facility (IR137 & IR150) that is proposed to be connected to the 25 kV bus of the existing Tupper 1C substation of the Nova Scotia Power Inc. (NSPI) transmission system. The objective of this study was to investigate the potential impacts of the proposed wind generation facility on the NSPI power system.

Accordingly, system studies were carried out employing load flow, short circuit, transient stability and voltage flicker analyses. NSPI's GIP procedures and system planning criteria document were followed in compiling the results for this SIS.

Based on the study results, it is concluded that the incorporation of the proposed wind generation facility into the NSPI transmission system at the specified location has no serious negative impacts on reliability of the NSPI system provided the recommendations given in this report are implemented.

The following is a summary of findings and recommendations:

- The proposed Statia (IR137 and IR150) wind generation facility may cause a marginal increase in thermal overloading of the L-7004 230 kV line section between Onslow and the IR084 tap point under certain contingency conditions. This overloading pre-exists in the base operating scenarios and is not expected to exceed the summer line rating by more than 7%, for the operating scenarios analyzed in this study. However, it is recommended to implement appropriate measures to monitor power flow on this 230 kV line section to avoid any unacceptable loading level under any other operating scenario not investigated in this study.
- It is expected that the proposed wind generation facility will meet the reactive power requirements of 0.95 power factor (leading and lagging) at the Point of Interconnection (POI) and no additional compensation will be required at the Point Tupper 25 kV Bus. However, during the detailed design stage of the project, the reactive power losses in the collector system should be calculated to confirm that the wind generating facility does not pose any reactive burden on the Point Tupper 25 kV Bus.
- 20 MVAR of incremental reactive power support is needed in the Metro or Onslow area to compensate for the reactive power deficit resulting from Statia (IR137 & IR150) wind generation facility. This amount of reactive power compensation should be considered a part of large centrally located reactive power support facility that might ultimately be required in the NSPI system due to other wind generation projects. The reactive power support facility size recommended in this study should be used to determine the portion of the cost for the large centrally located reactive power support facility that should be borne by the IR137 and IR150 wind generation facility developer.
- The metering at both ends of the L-6523 line should be updated to allow full capability of the line to be used.
- An operating study should be carried out to determine the new setting of the Cape Breton Export transfer arming level to eliminate the possibility of overloading of the lines L-7004A and L-6511, under certain operating conditions.
- The 47C motors will trip on close-in faults (pre-existing condition).
- NSPI should contact Enercon to resolve the issue of frequency spike at the generator terminal for close by faults.

- The short circuit contribution of the IR137 and IR150 wind generation facility does not call for any upgrade at 138 kV and 25 kV voltage levels.
- The system is transiently stable for all the simulated disturbance conditions.
- The proposed wind generation facility meets the Low Voltage Ride-Through (LVRT) requirements for faults in the NSPI system.
- The proposed wind generation facility does not instigate any voltage flicker beyond NSPI's power quality requirements.
- The recommendations and requirements established in this SIS report are in addition to the requirements given in the Distribution System Impact Study report prepared by NSPI (Appendix D).

The preliminary cost estimate for the generation interconnection facilities is about \$4,100,000, including the cost of distribution modifications identified in the Distribution System Impact Study.



Addendum to the Final Report prepared for

Nova Scotia Power Inc.

**System Impact Study
for the
IR137 & IR150, Statia 23 MW Wind Generation
Facility in Richmond County, Nova Scotia
IR137**

H-331658

May 07, 2009

1. Introduction

The System Impact Study (SIS) for the proposed IR137 wind generation facility concluded that the maximum 23 MW output from this generating facility negatively impacts the Metro DRR and the overall voltage profile of the NSPI system under different contingencies, especially in the case of most stringent operating scenario. Accordingly, 20 Mvar of reactive power support is needed to account for the reactive power deficit resulting from this generation integration. It was recommended that this reactive power support facility should be in the form of an increase in the rating of the reactive power support facility in the Metro area or its vicinity.

Subsequent to the completion of the SIS, the interconnection customer advised NSPI to change its interconnection request from Network Resource Interconnection Service (NRIS) to Energy Resource Interconnection Service (ERIS), which means that the generation may be dispatched up to the point where transmission reinforcement is not required. This also means that the interconnection customer agrees to curtail generation output of the wind generation facility if the transmission service is not available for the maximum capacity output. Accordingly, the requirement for an additional 20 Mvar reactive support facility will no longer be valid should the interconnection customer applies for ERIS.

The additional reactive power support facility requirement is directly related to the high Onslow Import and high Onslow South flows. This requirement can be obviated under ERIS if the power transfer across these interfaces is reduced by increasing metro gas/oil generation and decreasing coal generation at Lingan or Trenton. This would result in “out-of-merit” dispatch costs but these costs may be less than adding 20 Mvar reactive power support facility under NRIS. Alternatively, the IR137 wind generating facility output will have to be curtailed during high power transfer periods.

This addendum presents the results of an analysis that was carried out to investigate the option of ‘out-of-merit’ dispatch of the NSPI generating units to facilitate the operation of the IR137 wind generation facility at its full capacity output. No further study is deemed necessary to implement the second option, i.e., curtailing the output of the IR137 wind generation facility.

In view of the results of the main SIS, the scope of this analysis was limited to the load flow and transient stability simulations for selected contingencies in the most stressed operating scenario only. The relevant data and methodology was the same as described in the SIS report. It is expected that the cost associated with ‘out-of-merit’ generation will be determined by NSPI.

2. Data

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