



System Impact Study Report Report GIP-IR360-SIS-R2

**Generator Interconnection Request #360
18 MW Wind Generating Facility
Annapolis County, NS**

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Transmission Planning
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Executive Summary

This report presents the results of a System Impact Study (SIS) for a proposed 18 MW wind turbine generating facility interconnected to the NSPI transmission system. The System Impact Study performed analysis on the impact of the proposed development on the NSPI power grid. The study included short circuit, power factor, voltage flicker, steady state thermal and voltage violations, stability, Bulk Power System analysis, under-frequency operation, low voltage ride through and loss factor. NSPI and NPCC planning criteria were applied.

This wind facility will be interconnected to the 70V-Bridgetown Rural 69 kV substation via a disconnect switch and a new 7 km spur line. A circuit breaker at the high voltage side of Interconnection Customer's (IC) power transformer and protection systems acceptable to NSPI are required at the IC's Interconnection Substation.

This study shows that low system short circuit level could be an issue with L-5025 open at the 11V-Paradise end concurrent with low Valley generation. The short circuit ratio is less than the minimum value recommended by the generator vendor for the proposed model. Similarly, low short circuit conditions result in the voltage flicker P_{st} for continuous operation exceeding NSPI's required limit. Therefore IR#360 will be required to resolve this issue otherwise this wind farm would have to be restricted when the short circuit level is too low under certain system configurations.

The addition of IR#360 to the NSPI system will cause overloads on L-5025, L-5531 and L-5535 under certain system normal conditions and to L-5026, L-5541 and L-5532 under contingencies. Therefore network upgrades will be required on L-5025, L-5026, L-5531 and L-5535 in order to accommodate the full output of IR#360. For L-5025 and L-5026 the metering equipment at 10V-Nictaux, 11V-Paradise and 13V-Gulch substations will need to be upgraded and the switches at 51V-Tremont, 13V-Gulch and 70V-Bridgetown Rural substations will have to be replaced. L-5531 and L-5535 would need to be re-built. An existing SPS will also need to be modified to manage the thermal overloads on L-5541 and L-5532.

If no major transmission reinforcements are applied, then the addition IR#360 to the system would require the establishment of operating restrictions when the generation in the Valley area is high during the period when summer line ratings are in effect. There will also be restrictions required when the generation in the Valley area is high and the load is off-peak during the period when winter line ratings are in effect.

IR#360 was not found to cause issues with the stability of the interconnected system however documentation provided by the generator manufacturer (dated 2010-08-25) indicated that the V100GS-2MW is a new design and the computer models used in this model may be out of date. IR#360 was not classified as part of the Bulk Power System, was found to comply with the Low Voltage Ride Through requirements, and remained on-line through simulated under frequency islanding events.

IR#360 would require significant operating restrictions without network upgrades and the high level estimated cost for Interconnection Costs is \$2,387,000. All costs of associated facilities required at the Interconnection Customer's substation and generating facility have not been included this estimate.

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