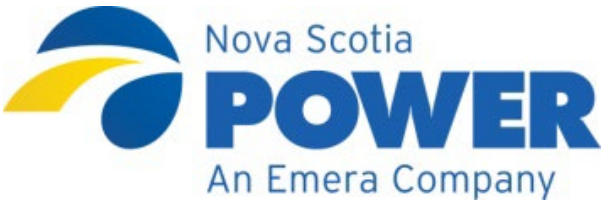

Interconnection Feasibility Study Report
GIP-IR760-FEAS-R0 (ERIS)

Generator Interconnection Request #760
171 MW Synchronous Generator Facility
Pictou, NS

2024-07-16

Control Centre Operations
Nova Scotia Power Inc.

Executive Summary

This Feasibility Study report (FEAS) is based on the Feasibility Study Agreement, signed by the Interconnection Customer (IC) and Nova Scotia Power Inc. (NSPI) dated April 19, 2024 for connection of a 171 MW wind power generating facility at Hopewell, Pictou Country in Nova Scotia (NS).

The agreement states three Siemens SGT-800 generators with each generator rated 57 MW. It is noted that the IC had also submitted the "Appendix 1 to GIP" which states three GE LM6000 generators. This feasibility study is based on the Feasibility Study Agreement and not the "Appendix 1 to GIP". NSPI has informed the IC of the discrepancy. The proposed Commercial Operation Date for IR760 is 2027/09/30.

The facility will be studied as Energy Resource Interconnection Service (ERIS) as per the signed Feasibility Study Agreement. The Point of Interconnection (POI) will be on L-8003, an existing 345 kV line between 79N-Hopewell substation and 67N-Onslow substation.

There are a total of 22 transmission and distribution projects across NS identified in the Combined T/D Advanced Stage Interconnection Request Queue with higher queue positions than IR760.

The power system base cases for the feasibility study include all transmission connected IRs in the GIP queue up to and including IR742 with the exception of IR686, as the IR686 SIS was not completed when IR760 was initiated.

In this feasibility study, IR760 is assessed with the premise that it will displace thermal generation in Nova Scotia, with the order of units in Cape Breton to Central to Halifax, for the clean power initiative. In this context, Cape Breton Export and Onslow Import arming levels and limits will be reduced accordingly by IR760 and higher queued IRs in the transmission corridor from Cape Breton to Onslow.

The Transmission Service Reservation TSR-411 for 550 MW from New Brunswick to Nova Scotia is not included as per the attached notice on NSPI's OASIS site.

Since L-8003 is a Bulk Power System element, connection to this line will require a three ring bus breaker substation at the POI on the line as per NSPI's requirements.

The assessment shows that addition of IR760 does not require any replacement of transmission circuit breakers due to increased short circuit levels contributed by IR760.

With reference to Inertia Response, section 7.5.4 of TSIR (Transmission System Interconnection Requirements) requires for synchronous generators: "The impact on system stability of the combined prime mover plus generator unit inertia (H) will be assessed during the System Impact Studies and unless otherwise specified shall be no less than 3.0 MW-s / MVA. Interconnection Customers shall demonstrate, through study and

monitored operation, the ability of the generator to maintain synchronization for typical fault clearing times at the Point of Interconnection."

The information for voltage flicker and harmonics is not sufficient to determine if IR760 can meet IEEE-519 standard at this time.

In addition to the three ring breaker bus network upgrade at the POI, the thermal and voltage assessment identifies the modification for NSPI's existing Remedial Action Schemes (RASs) that reject Lingan or Point Aconi generation under contingencies.

As IR760 is dispatchable generation that will replace Lingan or Point Aconi generation, any RAS that rejects this generation will require modification to reject IR760 generation (i.e. adding IR760 to the selection of generation rejection for the RASs). Changes to RAS are subject to NPCC's submission, presentation, review and approval.

The nameplates of IR760 generators show that they can meet TSIR's power factor requirements for synchronous generators. TSIR requires, for synchronous generators between 10 MW and 75 MW: "shall have a reactive power at the generator terminals with a range of 0.90 per unit lagging to 0.95 per unit leading". Each of IR760's generators, rated for 57 MW, has power factor of 0.85 lag and 0.95 lead.

The high level non-binding cost estimate for the Network Upgrades (NU), which include the three breaker ring bus at the POI substation, protection and control changes at the remote terminals of L-8003, and the RAS changes plus 25% contingency is $17.5 million CAD.

The high level non-binding cost estimate for the Transmission Provider's Interconnection Facilities (TPIF) upgrades plus 25% contingency is $1.95 million CAD. That includes the cost of installing 203 meters of 345 kV transmission line from POI substation to IC substation, protection & control relaying equipment on the 345 kV side, NSPI supplied Remote Terminal Unit, Tele-protection & SCADA communication.

Thus, the high level non-binding cost estimate for both NU and TPIF is $19.45 million CAD in 2024 dollars, excluding taxes. This estimate is subject to changes to be determined in the SIS and Facility (FAC) studies.

The cost of the Interconnection Customer's Interconnection Facilities (ICIF) is separate, is at the IC's own cost and is not included in this study. Its design must meet NSPI's Transmission System Interconnection Requirements (TSIR) and NERC's BES and NPCC's BPS requirements.

The IC will obtain Right Of Way (ROW) for the transmission line from the IC's substation to the POI and fund its construction costs and maintenance costs in perpetuity, but NSPI will own and operate it. The IC will also obtain the ROW for the POI substation. The estimated time to construct the NU and TPIF is 24-36 months after the receipt of funds. The time frame will be further determined by the FAC study.

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1.0 Introduction

This Feasibility Study report (FEAS) is for Interconnection Request #760 (referred to as IR760), a 171 MW generating facility at Hopewell, Pictou County in Nova Scotia (NS), to be connected to NSPI power system as an Energy Resource Interconnection Service (ERIS).

The Point of Interconnection (POI) will be on L-8003, an existing 345 kV line between 79N-Hopewell substation and 67N-Onslow substation.

The POI will be at a line length of 49 km from 67N-Onslow substation. The generating facility will comprise of three Siemens SGT-800 generators, each rated 57 MW. It is noted that the IC had also submitted the "Appendix 1 to GIP" which states three GE LM6000 generators. This feasibility study is based on the Feasibility Study Agreement and not the "Appendix 1 to GIP". NSPI has informed the IC of the discrepancy.

The proposed Commercial Operation Date for IR760 is 2027/09/30.

There are a total of 22 transmission and distribution projects across NS identified in the Combined T/D Advanced Stage Interconnection Request Queue with higher queue positions than IR760.

The power system base cases for the feasibility study include all transmission connected IRs in the GIP queue up to and including IR742 with the exception of IR686, as IR686 SIS was not completed when IR760 was initiated.

Figure 1 shows IR760 POI connection to L-8003.

Figure 2 shows the approximate POI location on NSPI's electrical transmission one-line.

Figure 1: IR760 POI to L-8003.

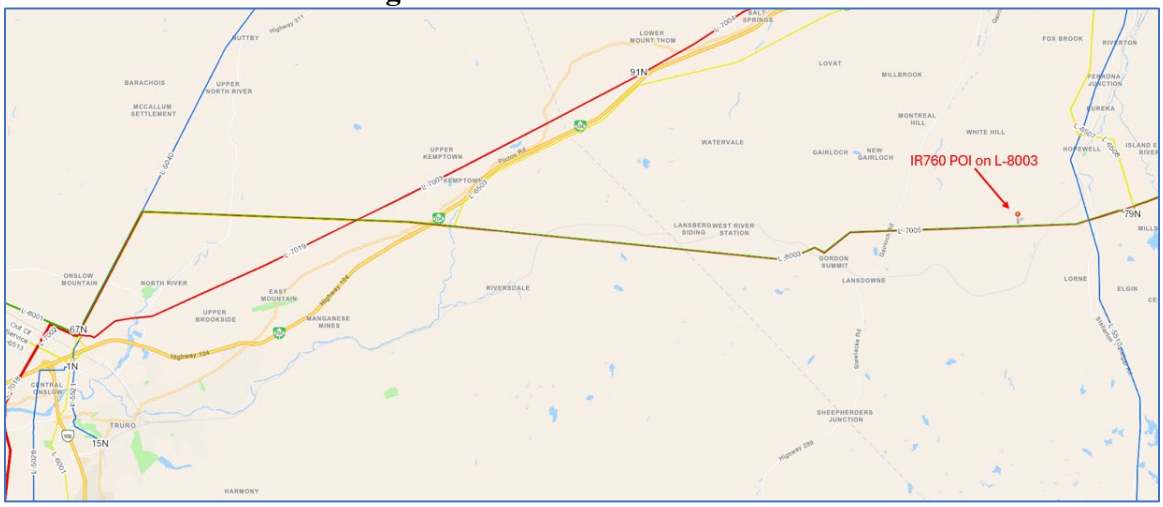
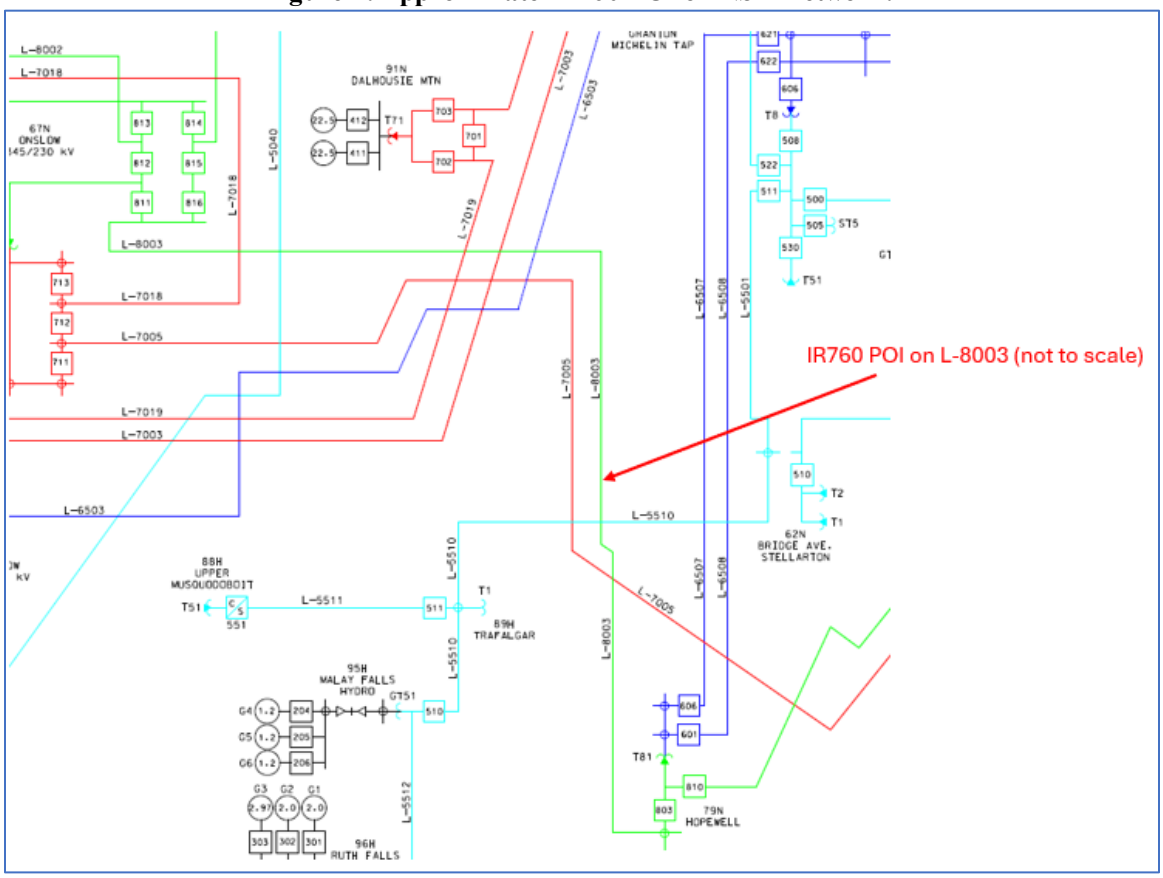


Figure 2: Approximate IR760 POI on NSPI network.



2.0 Scope

This Interconnection Feasibility Study's (FEAS) objective is to provide a preliminary evaluation of system impact and a high-level non-binding cost estimate of interconnecting the new generation facility to the NSPI Transmission System at the designated location based on single contingency criteria.

This assessment will identify potential impacts on transmission element loading above their thermal limits and potential voltage criteria violations.

Circuit breakers must be upgraded if the proposed facility increases the short-circuit duty of any circuit breakers beyond their rated capacity.

The scope of the FEAS includes modelling the power system in normal state, with all transmission elements in service, under anticipated load and generation dispatch. A power flow and short circuit analysis will be performed to provide the following preliminary information:

- Identification of any circuit breaker short circuit capability limits exceeded because of the interconnection and any network upgrades necessary to address the short circuit issues associated with the IR.
- Identification of any thermal overload or voltage limit violations resulting from the interconnection and identify the necessary network upgrades.
- Description and high-level non-binding estimated cost of and time to construct the facilities required to interconnect the generating facility to the transmission system.

This FEAS does not include a complete determination of facility changes/additions required to increase the system transfer capabilities that may be required to the transmission system to meet the design and operating criteria established by NSPI, the Northeast Power Coordinating Council (NPCC), and the North American Electric Reliability Corporation (NERC). These requirements will be determined by a more detailed analysis in the subsequent interconnection System Impact Study (SIS). An Interconnection Facilities Study (FAC) follows the SIS to ascertain the final cost estimate to the interconnect the generating facility.

3.0 Assumptions

This FEAS is based on the following information:

1. As per the Feasibility Study Agreement, signed by NPSI and IC dated April 19, 2024:
   1.1. Energy Resource Interconnection Service (ERIS).
   1.2. POI on L-8003.
   1.3. The maximum facility output is 171 MW, comprising of three Siemens SGT-800 generators with each generator rated at 57 MW.
2. The IC provided an electrical one-line that shows:
   2.1. Connection of three generator step up transformers to a 345 kV switch yard.
   2.2. The three transformers are identically rated at 60/80 MVA 345 kV to 13.8 kV, Grounded Y HV/ Delta LV. Z+=12% on 73 MVA base. The one-line does not indicate X/R, however, the IC confirmed that X/R=50.
3. The transmission line ratings are already in the power system cases using NSPI's latest "Transmission Line Ratings Summary", dated December 29, 2023.
4. In this feasibility study, IR760 is assessed with the premise that it will displace thermal generation in Nova Scotia, with the order of units in Cape Breton to Central to Halifax, for the clean power initiative. In this context, Cape Breton Export and Onslow Import arming levels and limits will be reduced accordingly by IR760 and higher queued IRs in the transmission corridor from Cape Breton to Onslow. The order of generation in NS to be displaced as defined by NSPI below:
   - Trenton 5
   - Lingan
   - Pt Aconi

- Pt Tupper
- Trenton 6
- Tufts Cove

While maintaining a minimum of three thermal units on-line to provide short circuit level for NSPI's system operation and system stability: Trenton 6, Tufts Cove 3, and Point Tupper 2. As all three generators in IR760 are synchronous, it is envisioned that they can serve as part of the minimum generation required to maintain system strength and system stability.

In this feasibility study, it assumes that Lingan 2 is retired as per NSPI's generation plan.

4.0 Project Queue Position

All in-service generation is included in this FEAS; except Lingan Unit 2, which is assumed to be retired.

As of 2024/02/15, the following projects are higher queued in the Advanced Stage Interconnection Request Queue and are committed to the study base cases:

- IR426: GIA Executed
- IR516: GIA Executed
- IR540: GIA Executed
- IR542: GIA Executed
- IR517: GIA in Progress
- IR574: GIA Executed
- IR598: GIA Executed
- IR597: GIA Executed
- IR647: GIA in Progress
- IR664: FAC Complete
- IR662: FAC Complete
- IR670: FAC Complete
- IR671: FAC in Progress
- IR669: FAC Complete
- IR668: FAC Complete
- IR618: FAC Complete
- IR673: FAC Complete
- IR675: FAC Complete
- IR677: SIS in Progress
- IR697: SIS in Progress
- IR739: SIS in Progress
- IR742: SIS in Progress

The power system base cases for the feasibility study includes all transmission connected IRs in the GIP queue up to and including IR742 with the exception of IR686, as the IR686 SIS was not completed when IR760 was initiated.

In addition, TSR-411 is included in the queue, which reflects the study of long-term firm Transmission Service Reservation (TSR) from New Brunswick to Nova Scotia. If approved by the NSUARB, the TSR is expected to be in service in 2028 and a system study is currently underway to determine the required updates to the Nova Scotia transmission system. This has not been included in the feasibility study and the following notice is posted to the OASIS site (at https://www.nspower.ca/oasis/generation-interconnection-procedures):

> ***Due to ongoing development discussions and engineering studies, the Transmission System Network Upgrades identified as part of Transmission Service Request #411 will not be included in the System Impact Study (SIS) Analysis for Generator Interconnection Procedures (GIP) Study Groups #32 to 35. GIP Study Group #32 to #35 analysis will be limited to the 2022 Transmission System configuration plus any material Network Upgrades identified in higher queued projects.***

As for the Transmission Service Request (TSR) Queue, it is shown on Table 1.

Table 1: TSR queue

OATT Transmission Service
Queued System Impact Studies
Active December 11, 2023

Item	Project	Date & Time of Service Request	Project Type	Project Location	Requested In-Service Date	Project Size (MW)	Status
1	TSR 400	July 22, 2011	Point-to-point	NS-NB*	May 2019	330	System Upgrades in Progress
2	TSR 411	January 19, 2021	Point-to-point	NS-NB*	January 1, 2028	550	Facilities Study in Process

* Indicates project as being located near provincial border.

5.0 Short Circuit

The short circuit analysis was performed using PSS/e 34.8.2 with classical fault option, flat voltage profile at 1.0 per unit voltage, and three phase to ground faults.

The short circuit model for IR760 is based the technical bulletin for Siemens Energy AB, SGT-800 generator.

IR760 short circuit model was incorporated into NSPI short circuit system case and was simulated with IR760 off-line and with IR760 on-line and the results for relevant buses are shown in Table 2. Please note that this analysis is for NSPI to determine the impact of

IR760 on NSPI's existing breaker fault interrupting ratings and not for IR760 generating facility design or operation. IR760 is required to do its own detailed design to ensure its operational viability.

Table 2:Three Phase Short Circuit Levels

Location	IR760 Off	IR760 On
Maximum Generation System Normal (Magnitude in MVA / Angle in Degree)		
67N-Onslow 345 kV	4995/ -86.26	5457/ -86.47
79N-Hopewell 345 kV	3925 / -84.47	4637 / -86.92
IR760 POI 345 kV	3962 / -86.45	4741 / -86.94
IR760 HV Bus 345 kV	3829 / -86.31	4614 / -86.85
Minimum Generation (TC3,TR6,PT2 on) System Normal		
67N-Onslow 345 kV	2124 / -87.19	2734 / -87.54
79N-Hopewell 345 kV	1858 / -87.20	2598 / -87.82
IR760 POI 345 kV	1873 / -87.20	2653 / -87.86
IR760 HV Bus 345 kV	1845 / -87.13	2630 / -87.83
Minimum Generation + L-8003a (IR760-67N) Out		
67N-Onslow 345 kV	1938 / -86.82	2088/ -86.61
79N-Hopewell 345 kV	1066 / -86.61	1835 / -87.77
IR760 POI 345 kV	1048 / -86.60	1827 / -87.81
IR760 HV Bus 345 kV	1038 / -86.56	1824 / -87.82
Minimum Generation + L-8003b (IR760-79N) Out		
67N-Onslow 345 kV	1938 / -86.82	2630 / -87.41
79N-Hopewell 345 kV	1066 / -86.61	1106 / -86.45
IR760 POI 345 kV	1510 / -86.71	2289 / -87.64
IR760 HV Bus 345 kV	1491 / -86.66	2276 / -87.64

All the 345 kV breakers in the vicinity of IR760 exceed the short circuit interrupting capability of 15, 000 MVA and the three phase short circuit levels shown in Table 2 do not exceed 15, 000 MVA criteria, hence IR760 does not incur any change out of the 345 kV breakers.

6.0 Voltage Flicker & Harmonics

The information provided is not sufficient to evaluate the voltage flickers or harmonics at this time. The IC will provide more detailed information for assessment in the SIS stage.

7.0 Thermal Limit and Voltage Limit Assessment

For the steady state thermal and voltage assessment, a total of 30 power flow cases and 495 transmission contingencies were simulated for each case.

Half of the cases (with suffix a) have IR760 off-line and the other half (with suffix b) have IR760 on-line for determining any new system issues and upgrades that can be attributed to IR760.

The cases reflect a number of system dispatches:

- Maritime Link HVDC at maximum and minimum.
- NS wind at capacity value of 17% and at 100% when the power system can allow.
- High levels of Cape Breton Export (CBX) and Onslow Import (ONI).
- NB delivers 10 minute operating reserve to NS for loss of 1 pole of Maritime Link HVDC.
- NS delivers 10 minute operating reserve to NB for loss of Point Lepreau nuclear power plant.
- Seasons: winter peak (WIN), summer peak (SUM), summer minimum load (SML), summer shoulder (SSH).

In non system peak cases, with the Maritime Link HVDC at zero and depending upon NS to be able to export to NB, the non system peak cases may not be dispatched at 100% NS wind. Nonpeak cases, C23a, C23b, C63a, C63b have IR739 off-line to avoid local system issues that are not yet resolved by IR739 as its SIS is not yet completed. This will not affect the results of IR760 study as IR739 is electrically remote from IR760.

The contingencies in NS and some in NB include:

- Loss of a single transmission system element.
- Breaker failure to operate (BBU).
- Loss of double circuit towers (DCT).
- Loss of load (LOL).
- Loss of source (LOS).

The criteria for assessment are as follows:

- Under system normal, all elements in service, system voltages are no less than 0.95 per unit and element loading must be within nominal rating (Rate A).
- Post contingency steady state, system voltages are no less than 0.9 per unit and element loading is within short time rating (Rate B). For NS, the element loading must also be within rate D (short time rating for the element auxiliary equipment).

There are some existing system conditions observed in the power system cases used in this feasibility study that are not attributed to IR760:

- VJ gas turbines are on-line in winter peak to avoid local overload (NSPI Operations to operate VJ gas turbine as needed)
- 22W remote 69 kV bus slightly below 0.95 per unit in system normal (NSPI to mitigate).
- Transformers at 58H, 137H, 75W have loading above rating in system normal (NSPI to mitigate).

Table 5 and Table 6 of Section 13 show the detailed dispatch of the power flow cases and Table 7 and Table 8 of Section 14 show the contingencies in NS and NB that were simulated in steady state power flow.

As IR760 is a dispatchable generation to replace thermal generation at Lingan and at Point Aconi and IR760 will be connected to L-8003, a BPS line which forms part of the RASs; therefore, these RASs will require modifications including adding IR760 to the existing RAS generation selection. Modifications to RASs require performing, submitting, and presenting RAS system studies and reports to NPCC for review and approval.

Apart from the network upgrades required for the three breaker ring bus at the POI and the modifications of the RASs (including adding IR760 to the generation selection), the power flow analysis does not identify any additional network upgrades that are attributed to IR760.

8.0 Reactive Power & Voltage Control

The nameplates of IR760 generators show that they can meet TSIR's power factor requirements for synchronous generators. TSIR requires, for synchronous generators between 10 MW and 75 MW: "shall have a reactive power at the generator terminals with a range of 0.90 per unit lagging to 0.95 per unit leading". Each of IR760's generators, rated for 57 MW, has power factor of 0.85 lag and 0.95 lead.

A centralized controller will be required, which continuously adjusts the individual generator reactive power output within the plant capability limits. Voltage regulation and transformer tap changer option will be determined by the SIS. The voltage controls must be responsive to voltage deviations, be equipped with a voltage setpoint control, and have facilities that will slowly adjust the setpoint over several (5-10) minutes to maintain reactive power within the generator's capabilities. Details of the specific control features, control strategy, and settings will be reviewed and addressed in the SIS.

The NSPI System Operator must have manual and remote control of the voltage setpoint and the reactive setpoint of this facility to coordinate reactive power dispatch requirements.

This facility must have voltage ride-through capability as detailed in the NS Power Transmission System Interconnection Requirements (TSIR)[1]. The SIS will examine the plant capabilities and controls in detail to specify options, controls, and additional facilities that are required to achieve low voltage ride through.

9.0 NPCC and NERC Requirements

In NS, certain transmission system elements are required to meet NPCC[2] BPS (Bulk Power System) or NERC[3] BES (Bulk Electric System) requirements or both.

Since the POI for IR760 will be on the 345 kV line (L-8003) which is classified as both NPCC BPS and NERC BES, therefore the 345 kV POI substation, the 345 kV line extension to the IC substation will be BPS. As IR760 generation will be higher than 75 MVA, IR760 generating facilities will be BES.

The SIS will determine the correct classification of the IC substation and the IC generating facility with regard to them being BPS or not.

10.0 Expected Facilities Required for Interconnection

The following facilities are required to interconnect IR760 to the NSPI system via the POI on L-8003 as ERIS:

1) **Network Upgrades (NU):**
   a) Three breaker ring bus at POI substation complete with P&C and connection to L-8003. This substation must be designed to meet NPCC's BPS requirements and NERC's BES requirements, including P&C modifications at 67N-Onslow substation and 79N-Hopewell of L-8003.
   b) Modifications to all RASs that presently target Lingan or Point Aconi generation including adding IR760 to the RAS generation selection.
2) **Transmission Provider's Interconnection Facilities (TPIF):**
   a) 203 meters of wood poles, Dove 556 ACSR, 100 deg C, 345 kV line from POI substation to IC substation. This new 345 kV line must be designed to meet NPCC BPS requirements and NERC's BES requirements.
   b) Protection and control for relaying equipment.
   c) NSPI supplied Remote Terminal Unit (RTU).
   d) Tele-protection and SCADA communications.

[1] NS Power Transmission System Interconnection Requirements; https://www.nspower.ca/oasis/generation-interconnection-procedures
[2] Northeastern Power Coordination Council.
[3] North American Electric Reliability Corporation.

3) Interconnection Customer's Interconnection Facilities (ICIF*)*:

a) Facilities must meet the power factor requirements in the TSIR.

b) Centralized controls for voltage setpoint control. Voltage regulation bus and transformer tap changer option will be determined by the SIS. As synchronous generators, they are required to have AGC (Automatic Generation Control) to be connected to and operational with NSPI's SCADA.

c) NSPI to have supervisory and control of this facility, via the centralized controller. This will permit the NSPI System Operator to raise/lower the voltage setpoint, change the status of reactive power controls, change the real/reactive power remotely. NSPI will also have remote manual control of the load curtailment scheme.

d) When curtailed, the facility shall offer over-frequency and under-frequency control with ±0.2 Hz dead band and 4% droop characteristic. The active power controls shall also react to continuous control signals from the NSPI SCADA system's Automatic Generation Control (AGC) system to control tie-line fluctuations as required.

e) Real-time telemetry will include MW, MVAR, bus voltages, and curtailment state.

f) Meet all the requirements detailed in the NS Power Transmission System Interconnection Requirements (TSIR)[4]. Among them is section 7.5.4 of TSIR (Transmission System Interconnection Requirements), which requires for synchronous generators: "The impact on system stability of the combined prime mover plus generator unit inertia (H) will be assessed during the System Impact Studies and unless otherwise specified shall be no less than 3.0 MW-s / MVA. Interconnection Customers shall demonstrate, through study and monitored operation, the ability of the generator to maintain synchronization for typical fault clearing times at the Point of Interconnection."

g) Facilities for NSPI to execute high speed rejection of generation (transfer trip). The plant will be incorporated in generation rejection RAS.

h) The facility must use equipment capable of closing a circuit breaker with minimal transient impact on synchronizing system voltage and frequency (matching voltage within ±0.05 PU and a phase angle within ±15°).

a) Ambient temperature for outdoor equipment shall be -35deg C to +40deg C and for indoor equipment shall be -5deg C to +40 deg C.

[4] NS Power Transmission System Interconnection Requirements; https://www.nspower.ca/oasis/generation-interconnection-procedures

11.0 NU and TPIF Cost Estimates

The high level, non-binding, cost estimate, excluding HST, for IR760's Energy Resource Interconnection Service is shown in Table 3.

Table 3: Cost Estimate

Item	Network Upgrades (NU)	Estimate ($M CAN)
1	Three breaker ring bus at POI substation complete with P&C and connection to L-8003. This substation must be designed to meet NPCC's BPS requirements and NERC's BES requirements. This cost estimate includes P&C modifications at 67N-Onslow substation and 79N-Hopewell of L-8003	13.00
2	Modifications to all RASs that presently target Lingan or Point Aconi generation including adding IR760 to the RAS generation selection	1.00
	Contingency (25%)	3.50
	Network Upgrade Sub-total	17.50
Item	**Transmission Provider's Interconnection Facilities (TPIF)**	**Estimate ($M CAN)**
1	Install 203 meters of wood poles, Dove 556 ACSR, 100 deg C, 345 kV line from POI substation to IC substation. This new 345 kV line must be designed to meet NPCC BPS requirements and NERC's BES requirements.	0.41
2	P&C relaying equipment	0.30
3	NSPI supplied RTU	0.10
4	Tele-protection and SCADA communications	0.75
	Contingency (25%)	0.39
	TPIF Upgrade Sub-total	1.95
	Total Network Upgrades and new TPIF, excluding HST	**19.45**

This cost estimate is subject to change as will be determined by the SIS and FAC study.

The estimated time to construct the Network Upgrades and Transmission Provider's Interconnection Facilities is 24-36 months after receipt of funds. This time frame will be determined and confirmed in the Facility Study.

12.0 Loss Factor

Loss factor is calculated by running the winter peak load flow case with and without the new facility in service, while keeping 91H-Tufts Cove as the NS Area Interchange bus. This methodology reflects the load centre in and around 91H-Tufts Cove and how effectively the new facility can displace generation at Tufts Cove.

Table 4: IR760 Loss Factor

Component	at IR760 Terminal	at POI
IR760 on at 171 MW	171.00	170.60
TC plant total MW with IR760 on	230.90	230.90
TC plant total MW with IR760 off	389.40	389.40
IR760 Loss Factor	7.3%	7.1%

The loss factor at POI is lower because it does not include the losses from POI to IR760 facility.

13.0 Power Flow Cases

Table 5: Steady State Power Flow Cases Part 1

Case	IR760	NB to NS	NB to PEI	NB to NE	NB to HQ	NL to NS	CBX	ONI	ONS	NS Trans Wind
C02a_WIN	0	0	289	0	-960	475	1008	1037	851	261
C02b_WIN	171	0	289	0	-960	475	829	1037	851	261
C03a_WIN	0	0	288	0	-960	86	210	593	552	1389
C03b_WIN	171	0	289	0	-960	86	183	704	664	1389
C04a_WIN	0	142	259	0	-960	237	791	819	776	261
C04b_WIN	171	142	258	1	-960	237	615	819	776	261
C05a_WIN	0	-370	289	0	-960	475	998	1134	607	528
C05b_WIN	171	-370	289	0	-960	475	818	1134	607	528
C22a_SUM	0	-150	228	800	-845	330	549	650	401	236
C22b_SUM	171	-150	228	800	-845	330	374	650	401	236
C23a_SUM	0	-150	228	801	-845	0	-157	334	230	1299
C23b_SUM	171	-152	228	803	-845	0	-239	342	235	1299
C24a_SUM	0	142	228	800	-845	237	467	571	615	236
C24b_SUM	171	142	227	800	-845	237	294	571	615	236
C25a_SUM	0	-500	228	800	-845	340	911	995	389	236
C25b_SUM	169	-500	229	799	-845	340	734	994	389	236

Case	IR760	NB to NS	NB to PEI	NB to NE	NB to HQ	NL to NS	CBX	ONI	ONS	NS Trans Wind
C42a_SML	0	-150	55	450	-460	170	39	210	47	236
C42b_SML	171	-151	55	451	-460	170	12	278	114	236
C43a_SML	0	-330	55	448	-460	0	-143	134	-141	776
C43b_SML	171	-490	55	602	-460	0	-143	303	-135	776
C44a_SML	0	142	55	444	-460	85	-104	-9	121	236
C44b_SML	171	-27	55	615	-460	85	-104	161	121	236
C45a_SML	0	-500	55	440	-460	0	-83	194	-255	776
C45b_SML	7	-500	55	439	-460	0	-83	200	-249	776
C46a_SML	0	-66	55	466	-460	0	-199	219	141	574
C46b_SML	171	-234	55	632	-460	0	-199	389	141	574
C62a_SSH	0	-151	162	801	-813	330	291	369	163	236
C62b_SSH	171	-152	162	802	-813	330	180	408	201	236
C63a_SSH	0	-418	162	812	-813	0	-181	259	-73	1299
C63b_SSH	171	-456	162	848	-813	0	-183	427	55	1299

Table 6: Steady State Power Flow Cases Part 2

Case	NS Load	Mot Load	TC	TR	PT2	LG	PA	BS	VJ	TUS	WC	Pt Lepre.
C02a_WIN	2340	0	389	165	155	250	184	0	66	30	190	715
C02b_WIN	2322	0	389	165	155	63	170	0	66	30	190	715
C03a_WIN	2297	0	213	110	100	0	0	0	66	30	190	715
C03b_WIN	2293	0	102	78	73	0	0	0	66	30	190	715
C04a_WIN	2331	0	389	151	156	258	184	72	66	30	190	715
C04b_WIN	2322	0	389	151	156	69	184	72	66	30	190	715
C05a_WIN	2340	0	390	165	155	245	184	100	66	30	176	0
C05b_WIN	2322	0	390	165	155	63	165	100	66	30	176	0
C22a_SUM	1545	135	386	160	150	110	174	0	0	0	80	715
C22b_SUM	1536	135	386	160	122	0	126	0	0	0	80	715
C23a_SUM	1587	197	73	160	83	80	0	0	0	10	0	715
C23b_SUM	1578	197	68	78	73	0	0	0	0	10	0	715
C24a_SUM	1541	135	168	160	150	110	184	0	0	0	80	715
C24b_SUM	1532	135	168	160	133	0	126	0	0	0	80	715
C25a_SUM	1563	135	314	160	150	480	184	80	0	0	80	0
C25b_SUM	1554	135	314	160	150	288	184	80	0	0	80	0
C42a_SML	743	165	141	154	100	0	0	0	0	0	0	600
C42b_SML	743	165	75	78	73	0	0	0	0	0	0	600
C43a_SML	743	165	74	79	73	0	0	0	0	0	0	419
C43b_SML	743	165	68	78	73	0	0	0	0	0	0	419
C44a_SML	775	197	68	78	73	0	0	0	0	0	0	715
C44b_SML	775	197	68	78	73	0	0	0	0	0	0	715

Case	NS Load	Mot Load	TC	TR	PT2	LG	PA	BS	VJ	TUS	WC	Pt Lepre.
C45a_SML	743	165	74	79	73	0	0	100	60	16	0	0
C45b_SML	743	165	68	78	73	0	0	100	60	16	0	0
C46a_SML	775	197	68	78	73	0	0	0	0	0	0	600
C46b_SML	775	197	68	78	73	0	0	0	0	0	0	600
C62a_SSH	1172	135	366	100	75	0	126	0	0	0	0	715
C62b_SSH	1156	135	327	78	73	0	0	0	0	0	0	715
C63a_SSH	1218	197	200	78	75	0	0	0	0	10	0	600
C63b_SSH	1214	197	68	78	73	0	0	0	0	10	0	600

14.0 Contingencies

Table 7: Steady State Contingencies Part 1				
101S_701	17V_B63	50N_G6	90H_606	L2101*
101S_702	17V_T1	50N_T12	90H_608	L2102
101S_703	17V_T2	50N_T8	90H_609	L2102*
101S_704	17V_T63	50NB61G6	90H_611	L2103
101S_705	1C_689	50NB62G5	90H_612	L2130
101S_706	1C_B61	50W_501**	90H_T1	L2130-BF-K2-9
101S_711	1C_B62	50W_600SEP	91H_511	L2131-2111
101S_712	1C_G2	50W_B2	91H_513	L2131-2111-BF-B2103-2131
101S_713	1N_600	50W_B3**	91H_516	L2145
101S_811	1N_601	50W_B4	91H_521	L2145-BF-K2-6
101S_812*	1N_613	51V_500**	91H_523	L2145-BF-K2-7
101S_813*	1N_B51	51V_601	91H_603	L3001
101S_814	1N_B52	51V_602	91H_604	L3001-BF-K3-7*
101S_816	1N_B61	51V_603	91H_605	L3001-BF-K3-8*
101S_T81	1N_B62	51V_B51**	91H_606	L3001*
101S_T82	1N_C61	51V_B52	91H_607	L3002
101V_601	1N_T1	51V_T61**	91H_608	L3002-BF-CO3-6
101V_602	1N_T4	51V_T62	91H_609	L3002-BF-K3-1
101V_603	1V_B51	67N_701	91H_611	L3002-BF-K3-2
103H_600	20V_B51	67N_702	91H_613	L3003
103H_608	2CB61*	67N_703	91H_621	L3003-BF-K3-4
103H_681	2CB62*	67N_704	91H_T11	L3003-BF-P3-4
103H_881	2S_600	67N_705	91H_T62	L3004
103H_B61	2S_B64	67N_706	91H_TC3	L3004-BF-CO3-11*
103H_B62	2S_B65	67N_710	91N_701	L3004-BF-CO3-7
103H_T81	2S_T1	67N_713	91N_Dal_WF	L3004-BF-CO3-7*

Table 7: Steady State Contingencies Part 1				
108H_600	2S_T2	67N_811*	91N_Dal_WF	L3004-BF-NO3-01
108H_B1	30N_B61	67N_812	92V_B51	L3006
108H_B3	30NT61	67N_813	99W_501	L3006-BF-ME3-1*
110W	30W_B51	67N_814*	99W_600SEP	L3006-BF-ME3-2*
113H_600	30W_B61	67N_T71	99W_B51	L3006-BF-SA3-3
11V_B51**	3C_711	67N_T81	99W_B61	L3008
120H_621	3C_712*	67N_T82	99W_B62	L3008-BF-BE3-1*
120H_622	3C_713	67N711*	99W_T61	L3008-BF-BE3-2*
120H_623	3C_714	67N712F*	99W_T71	L3009
120H_624	3C_715*	7003a_4*	99W_T72	L3009-BF-CO3-5
120H_626	3C_716	7003c_4*	9W_500	L3010
120H_627	3C_T71	70087009sep	9W_B52	L3010-BF-AN3-2*
120H_628	3C_T72	74N_B61	9W_B53	L3010-BF-AN3-3*
120H_629	3C710*	74NT61	CT-L1104-L1116	L3010-BF-E2104-TC3*
120H_710	3C720*	79N-T81*	CT-L1147-L1165	L3010-BF-E3-1*
120H_711	3S_T1	82V_B61	CT-L1148-L1151*	L3010-SPS
120H_712	3W_B53	85S_B61	CT-L1149-L1212	L3011-BF-AN3-1*
120H_713	43V_503	85S_G1	CT-L1190-L1215	L3011-BF-AN3-6*
120H_714	43V_562	88S_710	CT-L2145-L1199	L3011-BF-K3-5*
120H_715	43V_B51	88S_711	IR618	L3011*
120H_716	43V_B61**	88S_712	IR618_BBU	L3012-3114
120H_720	43V_B62	88S_713	IR668	L3013
120H_SVC	43V_T61**	88S_714	IR668_BBU	L3013-BF-NO3-2*
120H_T71	43V_T62**	88S_715	IR670	L3013-BF-SA3-4
120H_T72	47C_T63	88S_720	IR670_BBU	L3016-BF-P3-10*
132H_602	47C_T64	88S_721	IR760	L3016-BF-SA3-6
132H_603	47C_T65	88S_722	IR760BBU	L3016*
132H_605	47C_T67	88S_723*	L1147	L3017-3019
132H_606	49N_600	88S_G4	L1149	L3017-3019-BF-BA3-2*
13V_B51	4C_620BBU	88S_T71	L1157	L3017-3019-BF-SA3-1*
15V_B51	4C_621BBU	88S_T72	L1159	L3017-3019-BF-SA3-2*
17V_512	4C_622BBU	89S_G1	L1160	L3018
17V_563	4C_623BBU	90H_503	L1165	L3018-BF-BA3-1
17V_611	4C_T2	90H_602	L1193*	L3018-BF-BA3-1*
17V_B1	4C_T63	90H_603	L1199	L3018-BF-BA3-3*
17V_B2	50N_604	90H_605	L2101	L3018-BF-BE3-3*

Table 8: Steady State Contingencies Part 2		
L-5011	L-5571	L6516
L5012	L-5573L5575	L6517
L-5014	L-5580	L6518
L-5015	L6001	L6523
L-5016	L6002_90H	L6531
L-5017	L6002_99W	L6535
L5019_L5035	L6003	L6536
L-5020	L60036007	L6537*
L-5021	L60036009	L6538
L-5022	L6004	L6539
L-5024	L6004a	L6551
L-5025**	L6004b	L6552
L-5026**	L6005	L6613
L-5027	L60056010	L7001
L-5028	L60056016	L7002
L-5029L5030	L6006	L7003a
L-5032L5004	L6007	L7003b
L-5033	L6008	L7003c
L-5036	L6009	L7004a_IR760_91N
L-5037L3031	L6010	L7004b_IR760_3C
L-5039	L60106011	L7005Has*
L-5040	L6011	L7005Ons*
L5041	L6012	L7008
L-5042	L6013	L7009
L5049	L6014	L7011
L-5053	L6015	L7012
L-5054	L6016	L7014
L-5058	L6020	L7015
L-5060	L6021	L7019
L-5500	L6024	L7021
L-5501	L6025_50W-IR739	L70216534
L-5502	L6025_IR725-99W	L7022
L-5505	L6025_IR739-IR725	L8001*
L-5506	L6033	L8002
L-5507L5508	L60335039	L80027009
L-5511	L60336035	L8003 *
L-5512	L6035	L8004 *
L-5521	L6038	ML_2Poles
L-5524	L6040	ML_Pole1
L-5530	L60406042	ML_Pole2
L-5531	L6042	Lepreau

Table 8: Steady State Contingencies Part 2		
L-5532	L6043	104H600
L-5533L5581	L6044	1H
L-5534	L6047	2S_513
L-5535	L6048	47C_602
L-5536	L6051	47C_603
L-5537	L6051a	47C_674
L-5538	L6051b	PHP
L-5539	L6052	T-BA-T7
L-5540	L6053	T-CC-T1-UV
L-5541	L6054	T-CC-T2
L-5545	L6054a	T-ME-T3
L-5546	L6054b	T-NO-T1
L-5547L5551	L6055	T-SA-T2
L-5548	L6503	T-SA-T3
L-5549	L6507	

Note: Contingencies with * are equipped with Remedial Action Scheme (RAS) or Special Protection Scheme (SPS) and ** are Automatic Action Scheme (AAS).

15.0 Preliminary Scope of Subsequent SIS

The following provides a preliminary scope of work for the subsequent SIS for IR#760.

The SIS will include a more comprehensive assessment of the technical issues and requirements to interconnect generation as requested. It will include contingency analysis, system stability, transient stability, ride through capability, and operation following a contingency (N-1 operation). The SIS must determine the facilities required to operate this facility at full capacity, withstand any contingencies (as defined by the criteria appropriate to the location) and identify any restrictions that must be placed on the system following a first contingency loss.

The SIS will confirm the options and ancillary equipment that the customer must install to control flicker, voltage response, frequency response, control interactions with other IBR facilities, active power and ensure that the facility has the required ride-through capability. The SIS will be conducted in accordance with the GIP with the assumption that all appropriate higher-queued projects proceed, and the facilities associated with those projects are installed.

The following notice on OASIS provides additional clarification on the SIS model requirements:

NSPI-TPR-015-2: PSSE and PSCAD Model Requirements and NSPI-TPR-014-1: Model Quality Testing will undergo revision as the grid evolves and performance criteria changes. The most up to date version will be provided as they become available.
To be eligible for inclusion in the Interconnection System Impact Study stage, and thereby advance the Interconnection Request's initial Queue Position, the Interconnection Customer must meet the progression milestone requirements of Section 7.2 of the GIP at least ten (10) Business Days prior to the Interconnection System Impact Study commencement date. For clarity, item 7.2 (i) – provision of a detailed stability model for the generator(s) shall mean:

- ***Provision of PSSE and PSCAD models in compliance with documents NSPI-TPR-015-2: PSSE and PSCAD Model Requirements, and***
- ***Provision of test data demonstrating model testing in compliance with NERC, NPCC and NSPI criteria. NSPI-TPR-014-1: Model Quality Testing lists the minimum requirements that will be performed by NSPI. Additional testing may be performed to assess compliance with all applicable criteria. Any test not meeting the minimum NSPI requirements will be documented in the MQT report to the IC.***

The following outline provides the minimum scope that must be complete to assess the impacts. It is recognized the actual scope may deviate, to achieve the primary objectives.

The assessment will consider but not be limited to the following.

- Facilities that the customer must install to meet the requirements of the GIP and the TSIR.
- The minimum transmission additions/upgrades that are necessary to permit operation of this Generating Facility, under all dispatch conditions, catering to the first contingencies listed.
- Guidelines and restrictions applicable to first contingency operation (curtailments etc.).
- Under-frequency load shedding impacts.

The SIS will assess system contingencies such that the system performance will meet the following criteria:

- Table 1 "Planning Design Criteria" of NPCC Directory 1.
- Table 1 "Steady State & Stability Performance Planning Events" of NERC TPL001-4.
- NSPI System Design Criteria, report number NSPI-TPR-003-4.

Any changes to RAS schemes required for operation of this generating facility, in addition to existing generation and facilities that can proceed before this project, will be determined by the SIS as well as any required additional transmission facilities. The determination will

be based on NPCC[5] and NERC[6] criteria as well as NSPI guidelines and good utility practice. The SIS will also determine the contingencies for which this facility must be curtailed.

_____//_____

[5] NPCC criteria are set forth in its Reliability Reference Directory #1 *Design and Operation of the Bulk Power System*

[6] NERC transmission criteria are set forth in *NERC Reliability Standard TPL-001-4*