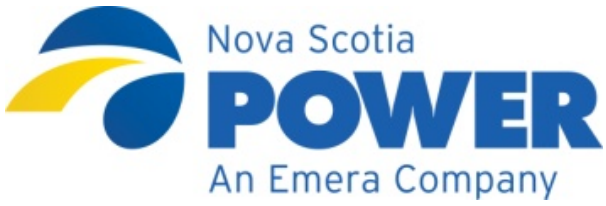


# Interconnection Feasibility Study Report
# GIP-IR597-FEAS-R1

## Generator Interconnection Request 597
## 33.6 MW Wind Facility
## Queens County, NS

2021-08-31

Control Centre Operations
Nova Scotia Power Inc.

# Executive summary

This Feasibility Study report (FEAS) presents the results of a Feasibility Study Agreement for the connection of a 33.6 MW wind generation facility interconnected to the NSPI system as Network Resource Interconnection Service (NRIS).

This project is designated as Interconnection Request #597 in the NSPI Interconnection Request Queue and will be referred to as IR597 throughout this report. The proposed Commercial Operation Date is 2023/08/31.

The Interconnection Customer (IC) identified a 138 kV bus at 50W-Milton as the Point Of Interconnection (POI). This wind generation facility will be interconnected to the POI via an approximately 5.3km long 138 kV transmission line from the Point of Change of Ownership (PCO).

There are two relevant long-term firm Transmission Service Reservations (TSR) in the System Impact Study (SIS) stage in the Transmission Service Queue, with requested in-service 2025/01/01 dates. These are TSR411 (800 MW from NB to NS) and TSR412 (500 MW from NFLD to NS) and are expected to alter the configuration of the Transmission System in Nova Scotia. As a result, the following notice has been posted to the OASIS site[1]:

> *Effective January 19th, 2021, please be advised that the completion of advanced-stage Interconnection Studies under the Standard Generator Interconnection Procedures (GIP) may be delayed pending the outcome of the Transmission Service Request (TSR) 411 and 412 System Impact Studies, which are expected to identify significant changes to the NSPI transmission system. The expected completion date for these studies is December 31, 2021. Feasibility Studies initiated prior to the completion of these TSR System Impact Studies will be performed based on the current system configuration.*

There are no concerns regarding increased short circuit levels. The increase in short circuit level is still within the capability of associated breakers. The minimum short circuit level at the Interconnection Facility's (IF) high side bus is 587 MVA. However, the Short Circuit Ratio (SCR) in minimal generation conditions is approaching the Vestas V150's minimum levels. Refined analysis will be performed in the System Impact Study (SIS) when more detailed transformer specs and collector circuit design is supplied.

[1] OASIS Generation Interconnection Procedures; https://www.nspower.ca/oasis/generation-interconnection-procedures

Voltage flicker will be examined when data is made available for the SIS, however Type 4 wind turbines, like the Vestas V150 used in this IR, are not expected to introduce significant voltage flicker.

The project design must meet NSPI requirements for voltage ride-through, frequency ride-through, reactive power range, and voltage control. Harmonics must meet the Total Harmonic Distortion requirements in IEEE 519.

Power factor correction for IR597 is required to meet NSPI's ±0.95 net power requirements at the IF 138 kV bus. This is in situations when the wind facility is operating at max output and full reactive power is required.

The 50W-Milton POI for IR597 is not classified as NPCC BPS or NERC BES. Complete NPCC BPS status will be determined in the SIS.

The preliminary loss factor is calculated as 1.96% with IR597 modelled in the winter peak case.

This study's power flow analysis did not identify any transmission contingencies inside Nova Scotia which would violate thermal loading criteria. This study determined there are no necessary Network Upgrades for NRIS operation.

The present day preliminary non-binding cost estimate for interconnecting IR597 to the 50W-Milton 138 kV bus as NRIS is $4,565,000. The entirety is TPIF costs, which includes a 10% contingency. This estimate will be further refined in the SIS and Facility (FAC) studies.

The estimated time to construct the Network Upgrades and TPIF for NRIS operation is 18-24 months after the receipt of funds.

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# 1.0 Introduction

This Feasibility Study report (FEAS) presents the results of a Feasibility Study Agreement for the connection of a 33.6 MW wind generation facility interconnected to the NSPI system as Network Resource Interconnection Service (NRIS).

This project is listed as Interconnection Request #597 in the NSPI Interconnection Request Queue and will be referred to as IR597 throughout this report. The proposed Commercial Operation Date is 2023/08/31.

The Interconnection Customer (IC) identified a 138 kV bus at 50W-Milton as the Point Of Interconnection (POI). This wind generation facility will be interconnected to the POI via a 5.3 km long 138 kV transmission line from the Point of Change of Ownership (PCO). Figure 1 shows the approximate location of the proposed IR597 site.

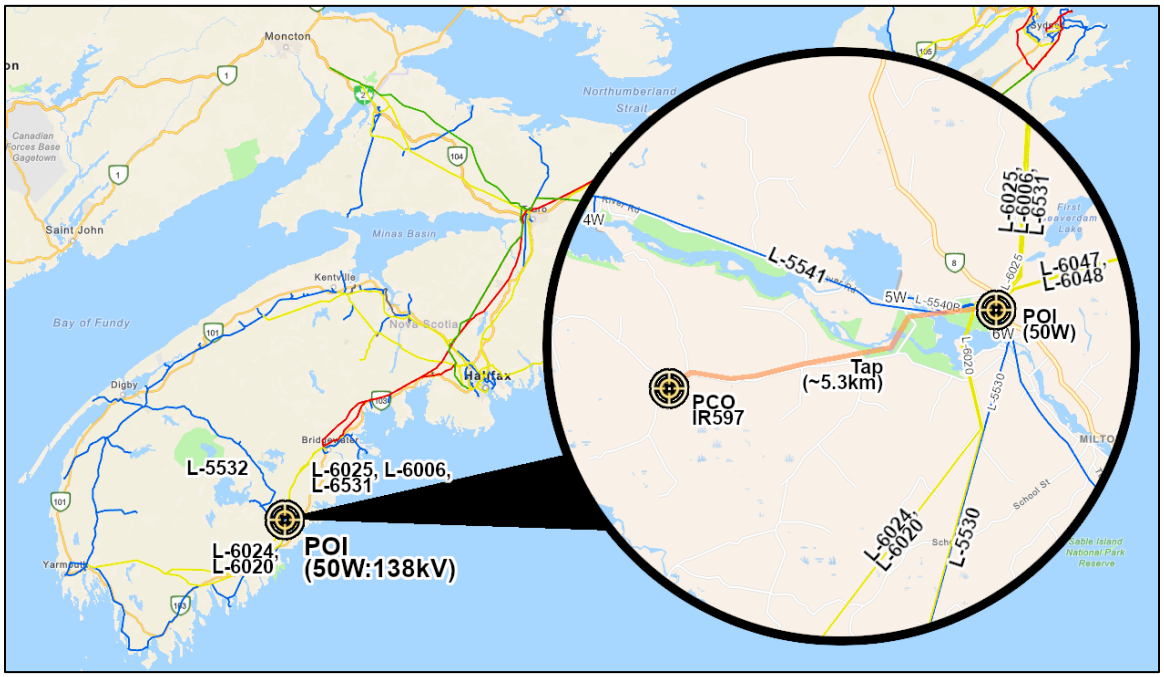



**Figure 1: IR597 approximate geographic location**

# 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 wind 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, which must remain with their thermal limits. Any potential voltage criteria violations will be identified and addressed. 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 as a result 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 to allow full output of the proposed facility.
- 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 in order to ascertain the final cost estimate to the interconnect the generating facility.

## 3.0 Assumptions

This FEAS is based on technical information provided by the IC. The Point Of Interconnection (POI) and configuration is studied as follows:

1. Network Resource Interconnection Service (NRIS) per section 3.2 of the Generation Interconnection Procedures (GIP).
2. Commercial Operation date: 2023/08/31.
3. The Interconnection Facility consists of 8 Vestas V150-4.2 MW wind energy converters, totalling 33.6 MW. These are modelled as Type 4 inverter based generators, evenly split between two collector circuits.
4. The IC identified the POI at one of the 50W-Milton substation's 138 kV buses.
5. The proposed 138 kV transmission line from the POI (50W) to the PCO is 5.3 km of 556 ACSR Dove conductor.
6. Preliminary data was provided by the IC for the substation step-up transformer and generator step-up transformers.

6.1. The substation step-up transformer was modelled as 1x (one) 138 kV (wye) - 34.5 kV (delta) transformer rated at 30/40/50 MVA, with a positive sequence impedance of 8.5% and 20.0 X/R ratio.

6.2. The generator step-up transformers were modelled as an equivalent transformer based off 8x (eight) 34.5 kV (delta) - 0.289 kV (grounded wye) 5.15 MVA transformers, with a 9.9% positive sequence impedance and an assumed 12.14 X/R ratio.

7. A generic collector circuit layout is assumed since a collector circuit design was not provided. Note the plant's net real and reactive power will be impacted by losses through the transformers and collector circuits.
8. The FEAS analysis is based on the assumption that IRs higher in the Generation Interconnection Queue and OATT Transmission Service Queue that have a completed System Impact Study, or have a System Impact Study in progress, will proceed as listed in Section 4.0: Project queue position.
9. Transmission line ratings used in this study are listed in Appendix A: Transmission line ratings.

## 4.0 Project queue position

All in-service generation is included in this FEAS.

As of 2021/05/18, the following projects are higher queued in the Advanced Stage Interconnection Request Queue and are included in this study's base cases:

- IR426: GIA executed
- IR516: GIA executed
- IR540: GIA executed
- IR542: GIA executed
- IR557: SIS complete
- IR569: GIA executed
- IR568: GIA executed
- IR566: GIA executed
- IR574: SIS complete

The following projects have been submitted to the Transmission Service Request (TSR) Queue:

- TSR 411: Accepted application
- TSR 412: Accepted application
- TSR 413: Accepted application

TSRs 411 and 412 have an expected 2025 in service date and system studies to determine required upgrades to the NS transmission system are currently in progress. As a result, the following notice has been posted to the OASIS site[2]:

> *Effective January 19th, 2021, please be advised that the completion of advanced-stage Interconnection Studies under the Standard Generator Interconnection Procedures (GIP) may be delayed pending the outcome of the Transmission Service Request (TSR) 411 and 412 System Impact Studies, which are expected to identify significant changes to the NSPI transmission system. The expected completion date for these studies is December 31, 2021. Feasibility Studies initiated prior to the completion of these TSR System Impact Studies will be performed based on the current system configuration.*

## 5.0 Short circuit

IR597 will not impact 50W-Milton and neighbouring breaker's interrupting capability based on this study's short circuit analysis. Analysis was performed using PSS/e 34.8, classical fault study, flat voltage profile at 1.0 PU voltage, and 3LG faults.

The maximum (design) interrupting capability of the neighbouring 138 kV circuit breakers are at least 5,000 MVA. The Vestas V150 technical bulletin supplied the short circuit characteristics in Table 1: *Vestas V150 operational characteristics*. The short circuit levels in the area before and after this development are provided in Table 2: *Short circuit levels, 3-ph, in MVA*.

The minimum SCR *(Short Circuit Ratio)* specified in the IR documentations for IR597 is 5.0 at the turbine's HV terminals. Minimum fault levels occur when L6025 (50W-Milton/99W-Bridgewater) is out of service. In this scenario, the SCR at the low side of IR597's substation step down transformer is 6.6. This information should be provided to Vestas for design specification as the collector circuit length and generator step-up transformers will further reduce the SCR measured at the wind turbines' HV terminals.

**Table 1: Vestas V150 operational characteristics**

| Characteristic | Value |
|---|---|
| Minimum required Short Circuit Ratio at turbine HV connection | 5.0 (contact Vestas for lower SCR levels) |
| Maximum short circuit contribution | 1.05 PU (continuous)<br>1.45 PU (peak) |

[2] OASIS Generation Interconnection Procedures; https://www.nspower.ca/oasis/generation-interconnection-procedures

**Table 2: Short circuit levels, 3-ph, in MVA**

| Location | IR578 not in service | IR578 in service | Post % increase |
|---|---|---|---|
| **2022, max generation, all facilities in service** | | | |
| 50W-Milton POI:138 | 1,305 | 1,334 | 2% |
| IR597-IC tap PCO:138 | 1,112 | 1,141 | 3% |
| IR597-LV:34.5 | 268 | 300 | 12% |
| **2022, min generation, all facilities in service** | | | |
| 50W-Milton POI:138 | 711 | 740 | 4% |
| IR597-IC tap PCO:138 | 650 | 679 | 5% |
| IR597-LV:34.5 | 229 | 261 | 14% |
| **2022, min generation, L6025 OOS** | | | |
| 50W-Milton POI:138 | 637 | 667 | 5% |
| IR597-IC tap PCO:138 | 587 | 617 | 5% |
| IR597-LV:34.5 | 221 | 253 | 15% |

# 6.0 Voltage flicker & harmonics

Voltage flicker will be examined when data is made available for the SIS. However, Type 4 wind turbines, like the Vestas V150 used in IR597, are not expected to introduce significant voltage flicker.

NS Power's voltage flicker requirements are:

- $P_{st} \leq 0.25$
- $P_{lt} \leq 0.35$

The generator must meet IEEE Standard 519-2014 limiting voltage Total Harmonic Distortion *(all frequencies)* to no higher than 1.5% with no individual harmonic exceeding 1.5% on 138 kV.

# 7.0 Thermal limits

The steady state contingencies evaluated in this study demonstrate IR597 does not require Network Upgrades beyond the POI to operate at its full capacity of 33.6 MW under NRIS.

Base cases used in this study are listed in Table 3: *Base case dispatch*. They were selected to reflect conditions under varying amounts of low/high area load vs historic area generation. This approach was chosen because portions of the Western/Valley transmission system would presently experience overloads if the entire area hydro and wind plants were simultaneously operated at maximum capacity under system light load.

Area transmission line ratings are listed in Appendix A: *Transmission line ratings*.

**Table 3: Base case dispatch**

| Case | NS load | IR587 status | Wind | West/ valley hydro | NS/NB | ML | CBX | ONI | ONS | Valley imp | West imp | Valley exp | West/ Valley imp | West/ valley load |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WP01-1 | 2,145 | - | 486 | 126 | 150 | (320) | 826 | 1,029 | 765 | 103 | 114 | 7 | 59 | 504 |
| WP01-2 | 2,192 | 34 | 520 | 126 | 150 | (320) | 880 | 995 | 730 | 101 | 83 | 7 | 59 | 504 |
| FL01-1 | 1,356 | - | 486 | 104 | 330 | (475) | 585 | 714 | 346 | (4) | 36 | 41 | 1 | 312 |
| FL01-2 | 1,356 | 34 | 520 | 104 | 330 | (475) | 585 | 714 | 346 | (6) | 5 | 41 | 1 | 312 |
| FL02-1 | 1,356 | - | 466 | 23 | 330 | (475) | 610 | 738 | 370 | 61 | 70 | (30) | 72 | 312 |
| FL02-2 | 1,356 | 34 | 500 | 23 | 330 | (475) | 610 | 738 | 370 | 59 | 39 | (30) | 72 | 312 |
| LL01-1 | 721 | - | 367 | 6 | 330 | (475) | 413 | 416 | 82 | (0) | 21 | 9 | 17 | 164 |
| LL01-2 | 721 | 34 | 401 | 6 | 330 | (475) | 413 | 416 | 82 | (3) | (10) | 9 | 17 | 164 |
| SP01-1 | 1,546 | - | 486 | 126 | 330 | (475) | 704 | 819 | 431 | 21 | 42 | 32 | 16 | 353 |
| SP01-2 | 1,546 | 34 | 520 | 126 | 330 | (475) | 669 | 786 | 398 | 19 | 11 | 32 | 16 | 353 |

Note 1: All values are in MW.
Note 2: CBX (Cape Breton Export) and ONI (Onslow Import) are Interconnection Reliability Operating Limit (IROL) defined interfaces.
Note 3: Wind refers to only transmission connected wind.

The following contingencies around the 50W-Milton substation resulted in pre-existing undervoltage conditions in the 69 kV system between 9W-Tusket and 30W-Souriquois, however, the presence of IR597 did not worsen their severity:

- 30W, 30W-B61
- 50W, 50W-B2
- 50W, 50W-B4
- 50W, L6024
- 9W, 9W-B53

# 8.0 Voltage control

IR597 requires power factor correction to meet NS Power's ±0.95 net power factor requirement at the HV terminals of the ICIF substation. IR597 is also required to produce/ absorb reactive power at all production levels up to its full rated output.

Using the Vestas reactive power capability, shown in Figure 2: *Vestas V150 4.2 MW reactive power capability*, various levels were calculated and are displayed in Table 4: *Power factor analysis results*.

**Table 4: Power factor analysis results**

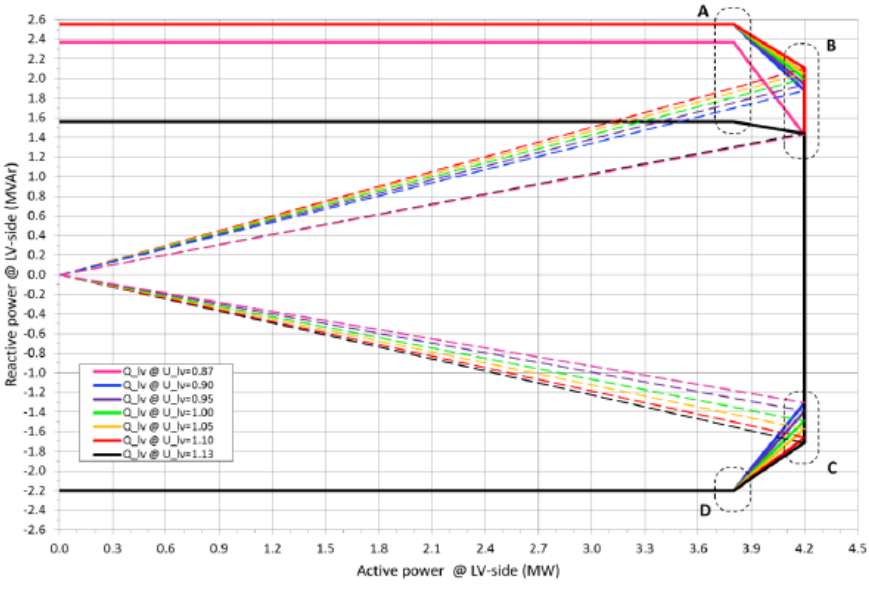
| IR597 output | | | | Measurements at the HV terminals of the ICIF substation | | | |
|---|---|---|---|---|---|---|---|
| MW | MVAR | MVA | pf | MW | MVAR | MVA | pf |
| 30.40 | 20.40 | 36.61 | 0.830 | 29.91 | 14.26 | 33.13 | 0.903 |
| 31.20 | 19.30 | 36.68 | 0.850 | 30.71 | 13.06 | 33.37 | 0.920 |
| 32.00 | 18.19 | 36.81 | 0.869 | 31.50 | 11.83 | 33.65 | 0.936 |
| 32.80 | 17.09 | 36.98 | 0.887 | 32.29 | 10.60 | 33.98 | 0.950 |
| 33.60 | 15.98 | 37.21 | 0.903 | 33.08 | 9.33 | 34.36 | 0.962 |

The only section on the reactive power capability curve that IR597 does not meet NS Power's ±0.95 net power factor requirement is when the wind farm is operating at its max nameplate capacity. The Vestas technical bulletin's reactive power capability, shown in Figure 2, shows that the reactive power capability is slightly reduced at full output (regions A-B, and C-D).

The net power factor will be re-evaluated when the detailed information on the transformers and collector circuit are available in the SIS stage, to determine if and how much supplemental reactive power support is required.

## 10.7 Operational Envelope – Reactive Power Capability in 4.2 MW Power Optimized Mode (PO1)

The reactive power capability for the 4.2 MW Power Optimized Mode (PO1) is as illustrated in Figure 10-5:




| | Coordinates | | | | | | | | Power factor | |
|---|---|---|---|---|---|---|---|---|---|---|
| Point: | A | | B | | C | | D | | | |
| Coordinate: | x (P) | y (Q) | x (P) | y (Q) | x (P) | y (Q) | x (P) | y (Q) | B (Capacitive) | C (Inductive) |
| Reactive power [kVAr] @ LV side @ U_lv = 0.87 p.u. voltage | 3.800 | 2.370 | 4.200 | 1.425 | 4.200 | -1.304 | 3.800 | -2.200 | 0.947 | 0.955 |
| Reactive power [kVAr] @ LV side @ U_lv = 0.90 p.u. voltage | 3.800 | 2.550 | 4.200 | 1.877 | 4.200 | -1.304 | 3.800 | -2.200 | 0.913 | 0.955 |
| Reactive power [kVAr] @ LV side @ U_lv = 0.95 p.u. voltage | 3.800 | 2.550 | 4.200 | 1.938 | 4.200 | -1.302 | 3.800 | -2.200 | 0.908 | 0.949 |
| Reactive power [kVAr] @ LV side @ U_lv = 1.00 p.u. voltage | 3.800 | 2.550 | 4.200 | 1.998 | 4.200 | -1.490 | 3.800 | -2.200 | 0.903 | 0.942 |
| Reactive power [kVAr] @ LV side @ U_lv = 1.05 p.u. voltage | 3.800 | 2.550 | 4.200 | 2.052 | 4.200 | -1.570 | 3.800 | -2.200 | 0.898 | 0.937 |
| Reactive power [kVAr] @ LV side @ U_lv = 1.10 p.u. voltage | 3.800 | 2.550 | 4.200 | 2.105 | 4.200 | -1.660 | 3.800 | -2.200 | 0.894 | 0.930 |
| Reactive power [kVAr] @ LV side @ U_lv = 1.13 p.u. voltage | 3.800 | 1.560 | 4.200 | 1.439 | 4.200 | -1.712 | 3.800 | -2.200 | 0.946 | 0.926 |

*Figure 10-5: Reactive power capability for 4.2 MW Power Optimized Mode (PO1).*

**Figure 2: Vestas V150 4.2 MW reactive power capability[3]**

A centralized controller will be required, which continuously adjusts the individual generator reactive power output within the plant capability limits and regulates the voltage at the low voltage terminal of the ICIF transformer. 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 individual generators' capabilities. Details of the specific control features, control strategy, and settings will be reviewed and addressed in the SIS.

[3] Vestas General Description 4MW platform, document no: 0067-7060 V07, 2021-03-16.

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 described in the NS Power TSIR *(Transmission System Interconnection Requirements)*. 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 ridethrough.

## 9.0 System security

At the time of this study, the proposed POI at 50W-Milton is neither categorized as NPCC[4] BPS *(Bulk Power System)* or NERC[5] BES *(Bulk Electric System)*.

Further, IR597 is not categorized as NERC BES, since it does not meet any of the four inclusion criteria.

The SIS will complete NPCC BPS analysis[6], which requires additional steady-state and transient state-analysis to determine if there is any of the following:

- System instability that cannot be demonstrably contained within NS.
- Cascading that cannot be demonstrably contained within NS.
- Net loss of source or loss of load greater than NS' thresholds, if applicable.

## 10.0 Expected facilities required for interconnection

The following facilities are required to interconnect IR597 to the NSPI system via the 138 kV bus at 50W-Milton as NRIS:

**1) Network upgrades:**

a) No required network upgrades.

**2) Transmission Provider's Interconnection Facilities (TPIF):**

a) A 138 kV breaker and associated switches, substation modifications, and P&C modifications for the 50W-Milton 138 kV bus.

b) Construct a 138 kV transmission line, with OHGW *(OverHead Ground Wire)* & OPGW *(Optical Ground Wire)*, approximately 5.3 km long, built to NSPI standards from the 50W-Milton 138 kV bus to the IR597 substation.

[4] Northeastern Power Coordination Council.
[5] North American Electric Reliability Corporation.
[6] Regional Reliability Reference Criteria A-10: *Classification of Bulk Power System Elements*; NPCC.

c) Control and communications between the ICIF and the NSPI SCADA and protection system.

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

a) Facilities to provide ±0.95 power factor when delivering rated output (33.6 MW) at the 138 kV bus when voltage is operating between ±5% of nominal. Rated reactive power shall be available through the full range of real power output, from zero to full power.

b) Centralized controls for voltage setpoint control for the low side of the ICIF transformer. Fast acting control is required and will include a curtailment scheme, which will limit/reduce total output from the facility, upon receipt of a telemetered signal from NSPI's SCADA system.

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.

d) When curtailed, the facility shall offer over-frequency and under-frequency control with ±0.2 Hz deadband 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) The facility shall support short-duration frequency deviations by providing inertia response equivalent to a Synchronous Generator with an inertia factor (H) of at least 3.0 MW-s/MVA for a period of at least 10 seconds.

f) Voltage ridethrough capability as described in the NS Power TSIR.

g) Frequency ridethrough capability in accordance with the NS Power TSIR. The facility shall have the capability of riding through a rate of change of frequency of 4 Hz/s.

h) Facilities for NSPI to execute high speed generation rejection (transfer trip), if determined in the SIS. The plant may be incorporated in SPS runback or load reject schemes.

i) Operation at ambient temperatures as low as -30ºC. The IC shall also provide icing models and conduct icing studies for their facility.

# 11.0 NSPI Interconnection Facilities and Network Upgrades cost estimate

The high level, non-binding, present day cost estimate, excluding HST, for the IR597's Network Resource Interconnection Service is shown in Table 5: *NRIS cost estimate*. This estimate assumes there is adequate space for new equipment and modifications. This does not include any to-be-determined costs to address any stability issues identified at the SIS stage, based on dynamic analysis.

**Table 5: NRIS cost estimate**

| Item | Network Upgrades | Estimate |
|---|---|---|
| I | None | $ - |
| | Sub-total | **$ -** |

| | TPIF | Estimate |
|---|---|---|
| I | Substation primary equipment, P&C, at 50W-Milton (including breaker, 2 switches). | $ 1,000,000 |
| II | Transmission line, with OHSW & OPGW, from 50W-Milton to the PCO. | $ 2,650,000 |
| III | Teleprotection and SCADA communications via OPGW from 50W-Milton. | $ 500,000 |
| | Sub-total | **$ 4,150,000** |

| Determined costs | |
|---|---|
| Subtotal | $ 4,150,000 |
| Contingency (10%) | $ 415,000 |
| Total of determined cost items | $ 4,565,000 |

The estimated time to construct the Network Upgrades and Transmission Provider's Interconnection Facilities is 18-24 months after receipt of funds.

## 12.0 Loss factor

With IR597 in service, the loss factor is calculated as 1.96%. The data and calculation is detailed in Table 6: *IR597 loss factor data* and Equation 1: *IR597 loss factor calculation*, respectively.

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. A negative loss factor reflects a reduction in system losses.

**Table 6: IR597 loss factor data**

| | Value |
|---|---|
| IR597 nameplate | 33.60 |
| TC3 w/ IR597 | 88.74 |
| TC3 w/o IR597 | 121.68 |
| Delta | 0.66 |
| 2023 loss factor | 1.96% |

**Equation 1: IR597 loss factor calculation**

$$loss\ factor = \frac{(IR597_{nameplate} + TC3_{w/\ IR597}) - TC3_{w/o\ IR597}}{IR597_{nameplate}} = 1.96\%$$

## 13.0 Preliminary scope of subsequent SIS

The SIS will be conducted in accordance with the GIP with the assumption that all appropriate higher-queued projects will proceed, and the facilities associated with those projects are installed. It will provide a more comprehensive assessment, based on NSPI, NPCC, and NERC criteria, of the technical issues and requirements to interconnect the proposed facility as requested.

Parameters for a generic model must be supplied for transient analysis in PSS/e.

Nova Scotia Power
Transmission System Operations
2021/08/31