NSPI Bulk Power Facilities

Connection Guide

NSPI–TPR-002-4

August 25, 2025

Transmission Planning

Nova Scotia Power Inc.

Revision Record

Date	Version Number	Author	Comments
1999/04/01	Original	R. Creighton	Initial Draft
2010/07/07	Version 1	J. Brake	Updated to better align with NSPI Generation Interconnection Procedures and Terminology. This included using the term Connection instead of Interconnection in many instances. The terms have specific meaning in the context of the GIP.
2010/07/26	Version 2	J. Brake	Updated to add more detail to the SIS and FAC sections. Added Document Approval page.
2025/03/18	Version 3	J. Brake	Updated aspects related to the 3.1 Primary Point and 3.4 Contact and System Impact Study.
2025/08/25	Version 4	J. Brake	Updated for NSEB role and new model requirements and testing. Updating language to accommodate changes in use BPS/BES and interconnection terminology.

Document Approval

Date	Version Number	Name	Signature
2025/08/25	Version 4	C. Milligan	Chris Milligan

Table of Contents

1 Introduction

Nova Scotia Power Inc. (NSPI) is providing this guide to identify the process and general technical requirements for connecting to the NSPI transmission system.

All facilities involved in the generation, transmission, storage and use of electricity must be properly connected to the interconnected power systems to avoid degrading the reliability of the electric systems to which they are connected. To avoid adverse impacts on reliability, all users of the interconnected power system must meet facility interconnection and performance requirements specified by those responsible for the reliability of the interconnected transmission systems.

NSPI is a member of the Northeast Power Coordinating Council (NPCC), itself a member of the North American Electric Reliability Council (NERC). NERC's mission is to promote the reliability of the electricity supply and maintain a set of Reliability Standards as a statement of the fundamental requirements for planning reliable interconnected electric power systems. NPCC, one of the six NERC Regional Entities, develops and maintains regional criteria documented within Directories that organize the criteria along with functionally relevant supporting guidelines and procedures.

NERC provides industry-wide perspective and oversight and NPCC, as a Regional Entity, has unique features and activities that serve the needs of NPCC regional constituents while ensuring that industry follows NERC Reliability Standards. NSPI maintains Nova Scotia specific criteria ensuring that the NSPI electric power system is designed and operated to established standards of reliability for the current and planned system load and dispatch conditions.

As a public utility, NSPI is regulated under the Public Utilities Act and the Nova Scotia Energy Board (NSEB), previously the Nova Scotia Utility and Review Board (NSUARB). The NSEB has supervisory powers over NSPI operations and expenditures.

The NSEB regulates most of the Nova Scotia's energy sector and exercises general supervision over Nova Scotia mandatory standards for enforcement. As NERC and NPCC criteria, or some portion thereof, is approved by the NSEB for enforcement in Nova Scotia, electric industry participants must accept the responsibility to observe and comply with the criteria.

The primary objectives of the NERC, NPCC and NSPI reliability criteria are:

- Safety of personnel, including utility workers, customers and their agents, and the public
- Continuation of electricity supply within the interconnected electric power system
- Power quality within accepted limits
- Prevention of damage to elements of the electric power system
- Prevention of a cascading power system failure affecting neighbouring utilities

The primary purpose of this document is to ensure that Nova Scotia facilities connected to the interconnected grid, regardless of ownership, are planned, designed, and operated to criteria set forth by NERC, NPCC and NSPI.

2 Application of this Guide

2.1 Generation and Energy Storage Facilities

Generation and Energy Storage Interconnection, including facilities proposed by NSPI or its Affiliates, is managed within NSPI's Generator Interconnection Procedures (GIP). The progression and content of the associated Interconnection studies align with Section 3 of this document.

The Generator Interconnection and Operating Agreement (GIA) established with each connected generating or energy storage facility ensures ongoing compliance with NPCC and NERC reliability standards, and NSPI's Interconnection requirements.

The contact information, procedures, agreements and forms required to initiate the various generator Interconnection studies and processes required by NSPI's Generation Interconnection Procedures (GIP) are available on the Open Access Same-time Information System (OASIS) website:

http://oasis.nspower.ca

2.2 Transmission Facilities

Nova Scotia Wholesale Electricity Market Rules (Section 1.1.4, page 1-2) state that there can be no merchant transmission, and all Interconnection requirements are internalized as NSPI is an integrated utility.

NSPI has an NSUARB (now NSEB) approved, Open Access Transmission Tariff (OATT) that establishes various connection requirements for Network Integration Transmission Service and Network Resources. As a component of the OATT, the Standard Generator Interconnection Procedures govern the connection of generation to the NSPI transmission system.

2.3 End-user Facilities

The End-user Interconnection Customer will be guided through the processes, assessments and requirements outlined in Sections 3, 4 and 5 of this document.

2.4 Limitation of this Guide

This Guide is not intended or provided as a design specification for the customer or their agents. Persons using information included in the Guide do so at no risk to NSPI, and they rely

solely upon themselves to ensure that their use of all or part of this guide is appropriate in the particular circumstances.

The customer or their agents recognize that they are, always, solely responsible for the customer-owned plant design, construction, and operation. NSPI or its agents shall not be or become an agent of the customer in any manner howsoever arising.

The advice of NSPI or its agents that the customer-owned plant design or equipment meets certain limited requirements of NSPI does not mean, expressly or by implication, that all or any of the requirements of the law or other good engineering practices have been met by the customer in their plant.

The use of this guide does not supersede or exclude any requirements for interconnection described by the document Nova Scotia Power Tariffs and Regulations, or orders of the NSEB.

In some cases, due to the nature of the connected facility, or its operating characteristics, an Operating Agreement between the facility operator and NSPI may be required.

The Interconnection requirements provided herein are intended to protect NSPI facilities and are not to be relied upon to protect the Interconnection Customer facility. It is the responsibility of the Interconnection Customer to ensure that their facilities are adequately designed and operated.

3 INTERCONNECTION CUSTOMER PROCESS

The following process provides a general overview of the sequential steps taken by a Interconnection Customer to connect to the NSPI system. To expedite the process, the following may be considered:

- The preliminary review can be as little as a meeting with the Interconnection Customer where it may be agreed upon by both parties to move directly to a System Impact Study (SIS)
- The SIS and the Facilities Study may be combined or performed concurrently. NSPI will provide non-binding, good faith estimated cost of facilities required to connect to the Transmission System and to address the identified short circuit, instability, and power flow issues. The Transmission Provider shall charge, and the Interconnection Customer shall pay the actual costs of all studies and assessments performed.

The contact information, procedures, agreements and forms required to initiate the various generator and energy storage Interconnection studies and processes required by NSPI's Generation Interconnection Procedures (GIP) are available on the OASIS website:

https://www.nspower.ca/oasis

NSPI will provide notification of new or modified facilities to those parties responsible for the reliability of the interconnected transmission systems as soon as feasible.

3.1 Primary Point of Contact

The Primary Point of Contact for Interconnection Customers is the Interconnection Engineer. The Interconnection Engineer oversees the legal representatives and financial processes associated with the Interconnection request.

For rate and service options available, the End-user Interconnection Customer information will be handed over to the NSPI Regulatory work group for follow-up.

For technical interconnection information and assistance, the End-user Interconnection Customer information will be forwarded to the Interconnection Engineer for assessment. The Interconnection Engineer will assess the load and determine if the Interconnection Customer will require a Distribution or Transmission connection. If the Interconnection Engineer determines that a Distribution level connection is required, the project will be managed at the Territory level with support from Distribution Planning as required. If a Transmission level connection is required, the Interconnection Customer information will be handed over to Transmission Planning.

3.2 Information Required

The request for Interconnection and/or system studies shall include sufficient information to permit evaluation of the project, but it is recognized that additional relevant information may be requested at any time during the review of the project.

The following constitutes the minimum information required:

- Name, address, phone number, and e-mail address of the Applicant
- Contact information for technical information (consultant, project engineer, etc.)
- Expected in-service date
- Location of facility, including a site plan or area map
- Electrical one-line diagram of facility
- General description of connection (new load, expansion of existing facility, new generation)
- Load characteristics:
    1. Size of load (rated electrical power)
    2. Rated voltage, rated power factor
    3. Load pattern (e.g. cyclic, seasonal, ramping, oscillatory)
    4. Motor starting characteristics (motors over 500 hp)
    5. Type of load (e.g. DC motor, arc furnace, electrolytic, variable speed drive)

For generation and storage Interconnections, the Appendix 1 of the GIP defines information requirements required to initiate a request for an Interconnection generating facility.

3.3 Preliminary Transmission Review

Based on the information provided in the request for information/application for Interconnection, NSPI will conduct an initial review of the potential for the proposed facility to have an impact on the reliability of the Interconnected Power System.

The initial review will be determined by the scope of the project. For End-user connection, the preliminary review may consist of a scope meeting with the Interconnection Customer and a decision to move directly to a detailed SIS as per Section 3.4. If a more detailed initial assessment is required to determine the viability of the project, a preliminary review (referred to as a Feasibility Study in the GIP) with a formal report of the expected technical requirements and high-level cost estimates can be provided.

The preliminary report/feasibility study would include the following:

- Preliminary identification of any circuit breaker short circuit capability limits exceeded as a result of the connection
- Preliminary identification of any thermal overload or voltage limit violations resulting from the connection
- Preliminary description and non-bonding estimated cost of facilities required to connect the Load Facility to the Transmission System and to address the identified short circuit and power flow issues

For generation Interconnections, the Section 6 of the GIP, Interconnection Feasibility Study, provides study detail.

3.4 System Impact Study

For Interconnection Customers, the Interconnection SIS will consist of power flow, short circuit, stability, and electromagnetic transients (EMT) analysis. The SIS will state the assumptions upon which it is based; state the results of the analyses; and provide the requirements or potential impediments to providing the requested connection service, including a preliminary indication of the cost and length of time that would be necessary to correct any problems identified in those analyses. The SIS will provide a list of facilities that are required as a result of the Interconnection Request and a non-binding estimate of cost responsibility and a non-binding estimated time to construct.

Interconnection facilities that have the potential for impact on neighbouring systems will require coordinated joint studies with the affected parties.

To initiate an SIS, models are to be provided by the customer that are an accurate representation of the overall plant as well as specific components. The models must include site specific settings and be accurate to study system level transients where the frequency range can be in the order of few Hz to potentially kHz range. The most recent version of document *NSPI-TPR-015, PSS®E and PSCAD™ Model Requirements* provides detail on the plant and control system data required. The most recent version of *NSPI-TPR-014 Model Quality Test Criteria* outlines the basic tests that will be performed on the models received to determine if the models are adequate for SIS assessment.

The scope of the SIS will include, but will not be limited to:

- Assessment of the impact of the proposed project on the Maritime Area regional Power System and its component systems as well as neighbouring and remote systems
- Estimation of the transmission facility additions and modifications necessary to avoid adverse impact on the reliability or operating characteristics of the transmission system identified to be caused by the proposed project
- Determination of the protective relay and other protection and control additions and modifications
- Determination of metering and communication additions and modifications
- Estimate costs within budget-estimate accuracy the costs of all facilities required to connect the proposed facility

The SIS will, at a minimum, address the following:

- Steady state load flow analyses (including post-contingency) to determine the impact of the proposed plant on transmission element loading (lines and transformers), as well as system voltage, reactive power performance and power factor control
- Short-term (angle) stability and Electromagnetic Transients (EMT) analyses, including post-transient damping analysis to determine that the facility meets the stability performance requirements of NERC and NPCC criteria
- Stability and EMT analyses to determine the impact of transient events and control interactions on the interconnected system
- Short circuit analysis to determine the impact of the plant on the transmission protective equipment, including relay settings and circuit breaker interrupting capability
- Transfer limit impact analysis to ensure that the facility does not degrade the transfer limit of existing System Operating Limits.
- Power quality analyses, to determine the incremental impact on power quality issues
- System Operational Impact analysis, which will review the flexibility and maintainability of the power system with the proposed facility

- Connection Design Analysis, which will review the options for station layout and transmission connection – this will be conducted jointly with the Facility Owner
- Environmental Impact Analysis, if required, from the perspective of the proposed transmission modifications and additions

These studies provide the framework for the assessments, estimates and design determinations to be completed in the Facilities Study.

3.5 Facilities Study

The Facilities Study for Interconnection Customers shall specify and estimate the cost of the equipment, engineering, procurement and construction work needed to implement the conclusions of the Interconnection SIS in accordance with Good Utility Practice to physically and electrically connect the Interconnection Facility to the Transmission System. The Interconnection Facilities Study shall identify the electrical switching configuration of the connection equipment, including, without limitation: the transformer, switchgear, meters, and other station equipment; the nature and estimated cost of any Transmission Provider's Connection Facilities and Network Upgrades necessary to accomplish the Connection; and an estimate of the time required to complete the construction and installation of such facilities.

The Facilities Study will provide the design specifications for the physical plant to be constructed in order to connect the facility, at a minimum, the study will address the following:

- Transmission line: structure type, conductor, overhead ground wire, hardware grounding and minimum insulation
- Substation Layout
- Station Service
- Surge protection
- System protection and coordination design
- Metering and telecommunications
- Grounding and safety issues
- Insulation and insulation coordination
- Equipment Ratings
- Estimated Schedule for Construction and Commissioning
- Scope of work and ownership by the various parties

3.6 Construction and Commissioning

The Facilities Study design would be implemented by the NSPI.

The Transmission Provider and the Interconnection Customer shall negotiate in good faith concerning a schedule for the construction of the Transmission Provider's connection. In general, the In-Service Date of a Interconnection Customer seeking connection to the Transmission System will determine the sequence of construction.

3.7 Operation and Maintenance

NSPI reserves the right to have a separate service agreement if, in the opinion of the Company, there are issues to be addressed for the ongoing benefit of the Company and its customers.

Operating and Maintenance requirements may include, but will not be limited to:

- Synchronizing of facilities
- Maintenance coordination
- Operational issues (abnormal frequency and voltages)
- Communications and procedures during normal and emergency operating conditions

For generation facilities, a standard-form GIA is established and executed prior to connection.

3.8 Inspections and Permitting

NSPI reserves the right to inspect the Facility prior to connection to ensure that the Facility design and construction will not adversely affect the Power System.

Customers' electrical installations are required to comply with the Canadian Electrical Code. NSPI's Inspection Authority Bulletin B-36 defines the electrical code and inspection requirement for Customer Owned High Voltage Installations.

4 RELIABILITY PRINCIPLES

Chapter 3, Reliability Planning Requirements, of Nova Scotia Wholesale Electricity Market Rules sets out the reliability related obligations of all parties in the planning timeframe. These rules apply to the Nova Scotia Power System Operator (NSPSO), to NSPI transmission, and to Market Participants who are responsible for Facilities registered in the market, and to Connection Applicants. The Wholesale Market Documents are available at http://oasis.nspower.ca.

4.1 Design and Operating Criteria

It is the goal of NSPI to ensure that facilities that have the potential to create an adverse impact on the reliability of the Interconnected Power System are designed and operated to the same approved criteria regardless of their ownership.

NSPI is compliant with the planning and operating reliability criteria of NPCC. That body, which itself is compliant with the requirements of NERC, sets out criteria, guidelines, and procedures for reliable operation of the connected power system which can be retrieved on-line at http://www.npcc.org.

NSPI has developed Nova Scotia System Design Criteria, documented in *NSPI TPR-003 System Design Criteria* and approved by the NSUARB (now NSEB).

4.2 NERC Planning and Operating Standards

NERC has established Planning Standards and Operating Standards that extend the traditional approach to ensuring consistent and relevant criteria, particularly during the restructuring of the North American electric power industry. These standards require extensive and timely reporting of relevant data, as well as equipment testing, computer modeling, and establishment of procedures. NSPI Control Centre Operations acts as the coordinator for all facilities within Nova Scotia to which these Standards apply, regardless of ownership. As these Standards are phased-in and refined, the compliance process will be monitored and enforced via the NSPI Control Centre.

NPCC, one of the six NERC Regional Entities, develops and maintains regional specific ,and in some cases more stringent, criteria documented within Directories that organize the criteria along with functionally relevant supporting guidelines and procedures.

5 FACILITY INTERCONNECTION REQUIREMENTS

The technical requirements determined by the SIS, as described in Section 3.4, or in the GIA for Generation Interconnection, will provide the specific requirements for individual projects.

Nova Scotia Power Tariffs and Regulations apply the special conditions that “customers will make all necessary arrangements to ensure that its load does not unduly deteriorate the integrity of the power supply system”. This requirement includes Power Quality issues. In general, limits on voltage flicker (due to motor starting or fluctuating load), voltage and current harmonics, and phase unbalance govern the Facility.

The minimum requirements to connect to the Nova Scotia electric system are documented in the most recent version of the Nova Scotia *Transmission System Interconnection Requirements.*