Interconnection Guideline

(Applicable to Generating Facilities ≥ 101kW

Connected to Distribution Systems Rated ≤ 26,400 V)

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Nova Scotia Power Inc.
P.O. Box 910
Halifax,
Nova Scotia
B3J 2W5
Phone 902 428 6230
www.nspower.ca

1. Purpose

This document states the minimum requirements for safe and effective operation of customer-owned generation interconnected (or paralleled) with the Nova Scotia Power Inc. (NS Power) Distribution System. This document describes NS Power's interconnection requirements as well as the minimum design and performance standards the Interconnection Customer must satisfy, and a range of normal, abnormal and emergency system conditions the Generating Facility and the Interconnection Customer's Interconnection Facilities could encounter while connected to the Distribution System.

This guideline is based on the following assumptions and principles:

(a) The Generating Facility and the Interconnection Customer's Interconnection Facilities meet the installation requirements of the Canadian Electrical Code Part 1 and equipment is certified to relevant Part 2 product standards. Other local and provincial construction and installation regulations may apply to the Interconnection Customer's facilities.

(b) Safety of personnel, the public and equipment is of primary concern in the design of the interconnected systems.

(c) Interconnection Customers should discuss project plans with NS Power before purchasing or installing equipment, as requirements will vary depending on capacity, type, location and existing NS Power Distribution System configuration.

1.1. Interconnection of Distribution Generation

An Interconnection Customer may be permitted to operate three phase, 60 Hertz generating equipment interconnected with the Distribution System, provided the Interconnection Customer and their facilities meet or exceed the requirements of NS Power's interconnection documents and supporting interconnection and operating agreements. Implementing the requirements of this document will help ensure that the Interconnection Customer's facilities do not operate in a manner that would compromise the safe operation, reliability or power quality of the Distribution System.

The Interconnection Customer is required to install, operate and maintain its facilities in good order and repair at all times (in conformity with good industry practice) to ensure safe and reliable parallel operation with the Distribution System. Agreement to and execution of the "Standard Small Generator Interconnection Agreement (SSGIA)"[1] between the Interconnection Customer and Nova Scotia Power is required before the Generating Facility and the Interconnection Customer's Interconnection Facilities can be interconnected to the Distribution System.

1.2. Limitations

The criteria and requirements of this document are applicable to all three phase Generating Facilities with aggregate capacity greater than or equal to 101 kW that are interconnected with NS Power's radial Distribution Systems, at distribution primary voltages (rated less than 26,400 V phase to phase).

This document does not define the maximum aggregate capacity that may be interconnected to a given Distribution System circuit or feeder.

The requirements of this document do not apply to back-up generation systems utilizing automatic transfer schemes in which load is transferred between the generator and the Distribution System in a momentary "break-before-make" operation.

The requirements in this document are not intended to provide protection of the Interconnection Customer's facilities. The Interconnection Customer is fully responsible for protecting their facilities in such a manner that faults or other disturbances on the Distribution System do not cause damage to their equipment.

This document is not intended or provided as a design specification or as an instruction manual for the Interconnection Customer or their agents. Persons using information included in the document do so at their own risk and at no risk to Nova Scotia Power, and they rely solely upon themselves to ensure that their use of all or part of this document is appropriate in the particular circumstances.

The Interconnection Customer or their agents recognize that they are, at all times, solely responsible for design, construction, and operation of the Interconnection Customer's facilities, unless alternative operating arrangements have been established in the SSGIA. Nova Scotia Power, its servants or agents shall not be or become an agent of the Interconnection Customer in any manner howsoever arising.

The advice of Nova Scotia Power, its servants or agents, that the customer-owned plant design or equipment meets certain limited requirements of Nova Scotia Power does not mean, expressly or by implication, that all or any of the requirements of the law or other Good Utility Practices have been met by the Interconnection Customer in their facilities.

The use of this document does not supersede or exclude any requirements for interconnection required in the SSGIA, the document "Nova Scotia Power Rates, Regulations and Procedures", or orders of the Nova Scotia Utility and Review Board.

All technical requirements mandated by the latest revisions of this document, Distribution System Impact Studies, or any associated documents must be complied with.

2. Definitions

Advanced Inverter: A Generating Facility's Inverter that performs functions which, when activated, can autonomously contribute to grid support during excursions from normal system operating voltage and frequency conditions by providing: dynamic reactive/real power support, voltage and frequency ride though, ramp rate controls, and other functions.

Applicable Laws and Regulations: All duly promulgated applicable federal, provincial and local laws, regulations, rules, ordinances, codes, decrees, judgments, directives, or judicial or administrative orders, permits and other duly authorized actions of any Governmental Authority.

Cease to Energize: In response to an abnormal excursion, the inverter-based Generating Facility shall, without intentional delay, cease to provide real and reactive current. Note: Cease to Energize does not necessitate physical isolation or a trip of the Generating Facility.

CSA: Canadian Standards Association, an accredited standards development organization within Canada.

DFIG: Double Fed Induction Generator, which employs a system in which rotor currents are controlled using a power interface to enable variable rotor speed for improved energy capture as well as extended reactive power capabilities.

Distribution System: NS Power's facilities operated at a nominal voltage of 24,940 V or less which are used to distribute electric power between substations and customer loads.

Distribution System Impact Study (DSIS): A fee-based technical study performed by NS Power to identify impacts of interconnecting a proposed Generating Facility with the Distribution System. The DSIS typically includes technical requirements and associated costs for changes/upgrades required to the Distribution System to accommodate the addition of the Generating Facility.

Generating Facility: The Interconnection Customer's electricity production device to be interconnected with the Distribution System.

Good Utility Practice: Those practices, methods or acts (including but not limited to the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry in North America) that at a particular time, in the exercise of reasonable judgment, would have been expected to accomplish the desired reliability, safety, environmental protection, economy and expedition as applied and practiced in the utility industry with respect to power generation, delivery, purchase and sale.

Hertz (Hz): A measure of the number of times or cycles that a periodic signal repeats in a second, also denoted as cycles per second.

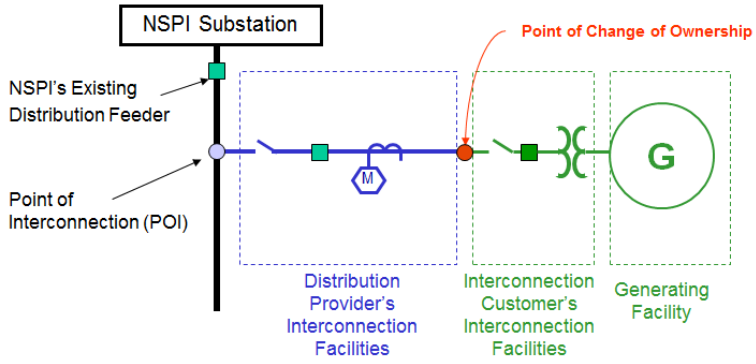
IEEE: The Institute of Electrical and Electronics Engineers, Inc., an organization that develops voluntary standards relating to electrical safety and product performance.

Interconnection: The addition of a Generating Facility to the Distribution System.

Interconnection Customer: The owner/operator of the Generating Facility and the Interconnection Customer's Interconnection Facilities.

Interconnection Customer's Interconnection Facilities: All facilities and equipment located between the Generating Facility and the Point of Change of Ownership necessary to interconnect the Generating Facility to the Distribution System.

Interconnection Facilities: These facilities include both the NS Power's Interconnection Facilities and the Interconnection Customer's Interconnection Facilities. Collectively, Interconnection Facilities include all facilities and equipment between the Generating Facility and the Point of Interconnection necessary to interconnect the Generating Facility to the Distribution System, as shown below for clarity.



Inverter: An electronic device that converts direct current (DC) to alternating current (AC).The input voltage, output voltage and frequency, and overall power handling depend on the design of the specific device or circuitry. The inverter does not produce any power; the power is provided by a DC source, such as photovoltaic panels.

Islanding: A condition in which a portion of the Distribution System is energized solely by a Generating Facility.

Isolation: Physically disconnected or separated from all sources of dynamic energy by approved devices or procedures.

Metering Equipment: All metering equipment installed or to be installed at the Generating Facility pursuant to the Standard Small Generator Interconnection and Operating Agreement (SSGIA) at the metering points, including but not limited to instrument transformers, MWh-meters, data acquisition equipment, transducers, remote terminal unit, communications equipment, phone lines, cellular modems and fiber optics.

NS Power's Interconnection Facilities: All facilities and equipment owned, controlled, or operated by NS Power located between the Point of Interconnection and the Point of Change of Ownership.

Paralleled: A condition in which the Interconnection Customer's Generating Facility is connected a bus common with the Distribution System, with the intent to transfer power between the two systems.

Point of Change of Ownership: The point where the Interconnection Customer's Interconnection Facilities connect to the NS Power's Interconnection Facilities.

Point of Interconnection: The point where the Interconnection Facilities are connected to NS Power`s Distribution System.

Smart Inverter: See Advanced Inverter

Stabilized: A condition where the Distribution System has returned to normal voltage (110% ≥ Voltage ≥ 88%) and frequency (60.7 Hz ≥ f ≥ 59 Hz) for 5 minutes or an alternate time determined by NS Power, following a system disturbance which has resulted in a disconnection of the Generating Facility.

Standard Protection Code: NS Power's set of safe work practices for work on the Distribution System designed to ensure the safety of workers and security of the Distribution System.

Standard Small Generator Interconnection Agreement (SSGIA): A document which defines the responsibilities of the Interconnection Customer and NS Power, identifies key contacts, electrical characteristics of the Interconnection Customer equipment and requirements for the safe and orderly operation and of the Interconnection Customer's facilities with NS Power's Distribution System.

3. Safety Requirements

3.1. NS Power Safety Requirements - Standard Protection Code

Safe work procedures described in NS Power's Standard Protection Code[2] document will be followed when NS Power is performing any applicable work on the interconnected power system, including providing isolation. Interconnection Facility owners are responsible to follow applicable Nova Scotia Department of Labour and Advanced Education Regulations for carrying out work on their system.

3.2. Electrical Inspection Act[3] & Canadian Electrical Code Part I & II (CEC)[4]

The Interconnection Customer's installation must meet all applicable national, provincial and municipal electrical construction and safety codes, including, without limitation, the Electrical Installation and Inspection Act. Except as expressly permitted by law, all electrical equipment must have CSA or equivalent approval.

Information Bulletins regarding Nova Scotia Power Electrical Permits (B-B1-002), and Customer Owned High Voltage Equipment (B-36-000), along with other bulletins can be found at: www.nspower.ca under "For My Home" and "For Your Business", "Electrical Inspections".

3.3. Permission to Operate

Under no circumstances shall the Interconnection Customer begin parallel operation of the Generating Facility until final written approval in the form of a signed "Standard Small Generator Interconnection Agreement (SSGIA)" has been given by NS Power.

3.4. Islanded Operation

Under no circumstances shall a Generating Facility be permitted to operate in an islanded condition (i.e., the portion of distribution line to which the generator is connected becomes isolated from the Distribution System).

4. Distribution System – Characteristics & Requirements

The Distribution System in Nova Scotia is of common North American design. These systems were designed to take power from a single source (substation connected to the transmission system) and distribute it to consumers. The design, operating and maintenance practices used by utilities for such systems are based on this single source concept.

The interconnection of parallel generation with these systems presents several technical and safety related issues that must be dealt with before permitting the Generating Facility to interconnect with the system. Some of the issues can be dealt with in the design of the

Generation Facilities and the interconnection equipment. Other issues must be addressed through the establishment of the SSGIA governing the operation of the Generating Facility.

The specific technical issues and solutions are dependent on the characteristics of the Distribution System and type of generation employed.

4.1. Configuration and Grounding

NS Power's primary Distribution System is a 3-phase, 4-wire multi-grounded common neutral system ("effectively grounded-wye") operated at three typical voltage levels:

- 4,160 Volts line to line (4 kV)
- 12,470 Volts line to line (12 kV)
- 24,940 Volts line to line (25 kV)

Distribution transformers, which step the primary voltage down to utilization voltages, are mainly single-phase units with primaries connected phase to ground. Three phase distribution transformers are normally configured grounded wye - grounded wye. This generally provides a single intentional ground path for short-circuit currents (one zero-sequence path) and has been utilized in the design of short-circuit protection applied to distribution feeder systems. NS Power's standard secondary voltages are:

- 120/240 Volts 1-Phase
- 120/208 Volts Solidly Grounded Wye 3-Phase, 4-Wire
- 347/600 Volts Solidly Grounded Wye 3-Phase, 4-Wire

4.2. Voltage Standards

NS Power maintains voltage levels at all points on the Distribution Systems in compliance with "CSA CAN-3-C235-1983 (R2015) Preferred Voltage Levels for AC Systems, 0 to 50,000 Volts, Electric Power Transmission and Distribution"[5].

4.3. Phasing

Phasing is not standardized across Distribution Systems. Where necessary, the phase sequence and the direction of rotation must be coordinated with NS Power's Distribution System.

4.4. Voltage Flicker, Dips and Unbalance

Voltage flicker and voltage dips refer to transient or periodic variations of voltage which cause objectionable lamp flicker and/or disturbances to connected equipment. Inrush current during starting of motors or generators typically causes a voltage dip whereas voltage flicker is a quasi-continuous variation of voltage that could be caused by arc-welder, arc-furnaces or variations in the output of a generator.

NS Power has established guidelines for the power system regarding voltage dips and voltage flicker. These are provided in Section 5.13.

Although the Distribution System is a three-phase system, loads are connected phase to ground and much of the load is supplied from single-phase laterals. As a result, the load on the three-phase system is not perfectly balanced. The unbalanced load in turn causes a degree of voltage unbalance along the distribution feeder.

Voltage unbalance is defined as the maximum deviation from average phase-to-phase voltage divided by the average phase-to-phase voltage. Unbalanced voltages may result in tripping of generators and reduced generator capabilities. During normal operation, NS Power's primary Distribution System has a phase-to-phase voltage unbalance which is normally less than 3%. In some rural locations the voltage unbalance can be higher. The Interconnection Customer should obtain an estimate from the generator manufacturer of the generator's capabilities when subjected to negative sequence voltages of 3% or more.

The addition of any Generating Facility should not increase the voltage unbalance to more than 3% at any point on the Distribution System. If the generator is unable to tolerate this inherent voltage unbalance, the Interconnection Customer may request that NS Power make system modifications to lower voltage unbalance (to the extent that is achievable by NS Power) at the Interconnection Customer's expense.

4.5. Voltage and Current Distortion

NS Power has adopted "IEEE 519 – 2014 IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems"[6]. This establishes harmonic distortion limits for the Distribution System. It provides the harmonic voltage distortion levels that can be expected on Distribution Systems and the current distortion limits that the Generating Facility must operate within.

4.6. Frequency

The power system in Nova Scotia is connected to the North American grid. As a result of this tie, the Nova Scotia system has tight frequency control which rarely varies more than 0.2 Hz from its 60 Hz nominal value.

On occasion, Nova Scotia and New Brunswick may become separated from this system and operate independently as an electrical island. The islanded condition may be very brief in duration or may last several weeks as maintenance to lines and substations are carried out. When NS Power's systems operate in an islanded state, the frequency may vary from 59.5 to 60.5 Hertz (Hz) during normal (uneventful) operation. Consequently, NS Power may require that distribution-connected generators disconnect whenever the NS Power system is operating in an islanded condition.

There are also conditions that may result in relatively brief frequency excursions down to 57Hz or to above 61Hz.

4.7. Fault Levels, Fault Clearing and Restoration

The maximum design fault level of the 12.5 kV system is 9000 A. The maximum design fault level of the 25 kV system is 8000 A. Actual fault levels will vary from substation to substation and will decrease with distance from the substation.

Short-circuits on distribution feeders are detected and cleared by the operation of protective devices such as reclosers and circuit breakers. These protective devices detect and interrupt the fault current and then reclose the circuit to restore service. If the short circuit remains (permanent fault) then the protective device again interrupts the circuit and again recloses. Reclosing is a common utility practice. This cycle may be repeated multiple times before the protective device opens and must be manually reclosed.

Reclosing can pose a risk to interconnected generation. If the feeder is reclosed with the generator still connected and operating (islanded operation), the machine can be subjected to high torque.

Short-circuit clearing times (fault initiation to interruption) typical of NS Power's Distribution Systems are less than 1.0 second, in some instances clearing times can be longer.

Single phase "Type T" cutout fuses are also utilized on the distribution system to operate under downline fault conditions.

4.8. Reliability

The Distribution System feeder circuits typically experience several outages per year due to exposure to human and natural factors. These outages may be brief or may extend to many hours. In addition to these forced outages, planned maintenance of the NS Power Distribution System require that supply feeders be removed from service for periods of time.

4.9. Resonance and Self-Excitation

The interconnection of generating facilities to Distribution Systems can lead to resonant voltage conditions on the Distribution Systems. Resonance can occur as a result of the interaction between the connected generating facilities and capacitor banks located on the Distribution System and/or near the terminals of the generator. There are several conditions that may result in resonance, such as self-excitation of the generator or resonant grounds. Harmonic resonance can also occur in both normal operation and if islanding occurs.

If these conditions occur, damage to connected customer's equipment and/or primary connected equipment may result.

NS Power requires under and over frequency, and over and under voltage protection at the Interconnection Customer's Generation facilities to address this situation.

5. Interconnection Customer's Generating and Interconnection Facilities – Requirements

This section addresses the technical requirements for the interconnection of generation with the Distribution System.

In addition to the requirements of this Section 5, all Inverter-based Generating Facilities with a valid interconnection request on or after the effective date of this document shall also comply with the Advanced Inverter Requirements set forth in Appendix B of this document.

In general, the Generating Facility and its associated Interconnection Facilities shall be designed and equipped to:

- Prevent the Generating Facility from being connected to the Distribution System upon loss of the supply to the Distribution System (islanding);
- Prevent sustained voltage regeneration caused by the Interconnection Facility step up transformers and/or grounding transformers during loss of one phase of the Distribution System supply;
- Prevent connection or parallel operation of the Generating Facility with the Distribution System unless the voltage and frequency are of normal magnitude; and

- Interrupt the maximum available fault current at the point of connection with the Distribution System. Detect and promptly disconnect from the Distribution System for over-current fault conditions.

In addition, Interconnection Facilities must remain effectively grounded at all times, including when disconnected from the Distribution System in accordance with Section 5.3 of this document.

5.1. Adverse Effects on Other Customers

The Generating Facility must not adversely affect the Distribution System or service to any other connected customers or facilities.

To limit the potential for adverse effects on other customers, NS Power requires that Generating Facilities interconnect with the Distribution System via dedicated step-up transformers.

5.2. Isolating Device

A manual disconnecting device between the Generating Facility and the Distribution System with a visible break for isolation purposes must be provided. The form of this device will vary with the service voltage and capacity but in all cases must be:

- accessible to NS Power,
- capable of providing a visible break, breaking load, opening all phases simultaneously (Gang-operated), and
- capable of being locked in the open position.

The location and form of the device is subject to approval by NS Power. This isolating device is owned by the Interconnection Customer and is therefore subject to the requirements of the Canadian Electrical Code - specifically (but not limited to) Sections 36-204, 36-214, 64-406, 84-024.

Additional disconnection devices may be required for Generating Facilities with more than one generator.

5.3. Grounding Requirements

Following the addition of any Generating Facility to the Distribution System, the system must remain effectively grounded at all locations, in all sustained, temporary, and transient conditions. Operating temporarily ungrounded at any time is unacceptable.

To be considered effectively grounded by NS Power, the grounding of the Generating Facility, as seen from the generator high voltage terminals with the NS Power system disconnected and the generator on-line, shall be:

The grounding at the High Voltage bus of the facility immediately following the disconnection of NSPI system and with generator(s) running shall be such that:

$$\mathbf{2.7 < X_0/X_1 < 3.3}^{a}$$

[a] where X_0 is the zero-sequence reactance and X_1 is the positive-sequence reactance of the system as described above. These values can be verified by calculations and test reports provided by the Interconnection Customer.

in all conditions using the transient reactances of the Generating Facility including all apparatus that may be connected to the HV and LV system. The required values can be achieved by one or more of the following methods: selecting the impedance of a grounding transformer; installation of a neutral grounding reactor on the neutral of a step up transformer; or grounding the generator through a neutral reactor. The choice of the method used will depend on the configuration and specifications of the Generating Facility.

The ratings of the Interconnection Customer's grounding facilities must be able to withstand the continuous zero-sequence currents resulting from normal levels of steady state and transient phase current unbalance occurring in the Distribution System. High voltage grounding transformer banks must be able to withstand faults on the NS Power Distribution System without being disconnected or compromised. Grounding banks should not be protected by fuses.

Note: The connection configuration of a Low voltage grounding transformer would have to be located such that when the generator is disconnected, the grounding transformer is also disconnected from the Distribution System.

5.4. Synchronizing Facilities

Synchronous generators and self-commutated inverters connected to Distribution Systems must be equipped with synchronizing facilities to permit connection only when both the frequency and voltage are within the limits shown in Table 1. The settings must be submitted to NS Power for approval prior to finalizing the SSGIA. The Interconnection Customer is responsible for synchronizing the generators to NS Power's system and ensuring that these systems are in good working order at all times.

Aggregate Ratings of Generation (kVA)	Frequency Difference (ΔHz)	Voltage Difference (ΔV, %)	Phase Angle Difference (degrees)
0 to 500	0.3	10	20
>500 to 1,500	0.2	5	15
>1,500	0.1	3	10

Table 5.13.1-1: Synchronization Limits *(from IEEE 1547 – Table 5)*[7]

All Generating Facilities must have protection employed which prevents any generator from being started, and synchronizing attempted, until the NS Power distribution feeder has voltages and frequencies that have Stabilized within normal range for a period of time. The delay period must be settable in the range of 5-60 minutes. The actual setting will be specified by NS Power and indicated in the SSGIA.

5.5. Voltage Regulation and Power Factor Control

Synchronous generators interconnected to the Distribution System must be equipped with excitation controllers capable of controlling voltage. The controller's voltage set-point shall be adjustable throughout the range of 95-105% of rated terminal voltage. The actual setting will be specified by NS Power, and indicated in the SSGIA. Other generator types will be required to have voltage control capabilities consistent with the above

Induction generators must provide reactive compensation to correct their power factor to 98% measured at the output terminals of the generator unless other terms are determined by NS Power, as established in the SSGIA.

DFIG and Inverter-based wind-powered generators interconnected to the Distribution System must be capable of controlling voltage. The controller's voltage set-point shall be adjustable throughout the range of 95-105% of rated terminal voltage. The actual setting will be specified by NS Power, and indicated in the SSGIA. The generator must have the capability of operating with a range of 95% lagging to 95% leading power factor when generating its real power rated capability.

All other generators must have the capability of operating with a range of 95% lagging to 95% leading power factor when generating its real power rated capability.

Refer to Appendix B for additional voltage regulation and power factor control requirements specific to the interconnection of smart/advanced inverter-based generation.

5.6. Off-Nominal Frequency Operation

In conformance with NPCC Regional Reliability Reference Directory #12 Under Frequency Load Shedding Program Requirements, July 9, 2013 (Figure #1)[8]; NERC Standard PRC 024-1 Generator Frequency and Voltage Protective Relay Settings Version 1 (Attachment 1 – Off Nominal Frequency Capability Curve)[9] and IEEE 1547a-2014 IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems Amendment 1 (Table 2)[7], the following settings are required for generator over and under frequency tripping:

Function	Frequency (Hz)	Clearing Time
UF1	<57	0.16 sec
UF2	<59	300 sec
OF1	>60.7	300 sec
OF2	>62	0.16 sec

Table 2: Required over and under frequency tripping settings

Refer to Appendix B for frequency protection and frequency ride-through requirements specific to the interconnection of Inverter-based generation with capacity greater than 10 kW.

5.7. Off-Nominal Voltage Operation

The Generating Facility shall have protective devices installed to detect abnormal voltages and to disconnect the generator from the system.

The equipment and protective settings required to accomplish this will depend on the type of generation, the configuration of the step-up transformer and the specifics of the interconnected system. In general this will require detection of the fundamental frequency voltage on three individual phases (in some cases phase-to-phase voltages). The voltage sensing equipment may be installed at the Point of Interconnection or on the low-voltage terminals of the step-up transformer.

The Generating Facility Over/Under voltage protection will be set, unless otherwise specified by NS Power, as shown in Table #3 default settings.

Refer to Appendix B for voltage protection and voltage ride-through requirements specific to the interconnection of Inverter-based generation with capacity greater than 10 kW.

Default settings[a]		
Voltage range (% of base voltage[b])	**Clearing time (s)**	**Clearing time: adjustable up to and including (s)**
V < 45	0.16	0.16
45 ≤ V < 60	1	11
60 ≤ V < 88	2	21
110 < V < 120	1	13
V ≥ 120	0.16	0.16

[a] Under mutual agreement between the EPS and DR operators, other static or dynamic voltage and clearing time trip settings shall be permitted
[b] Base voltages are the nominal system voltages stated in ANSI C84.1-2011, Table 1.

Table 3: Voltage Limits – from IEEE P1547a[7]

5.8. Islanding

Islanding is not permitted, i.e. a Generating Facility shall not energize the Distribution System when the Distribution System is de-energized. The Generating Facility shall not remain energized after the portion of the Distribution System to which it is connected has become electrically separated from the rest of the Distribution System.

Unintentional islanding can result in poor power quality, unsafe work environments, equipment damage and a lack of adequate short-circuit protection. For these units every effort must be made to ensure that islanding conditions are detected and the generator isolated from the system.

Specialized protection devices or schemes using communication channels between the NS Power supply point and the generator (transfer trip) are required to ensure that islanding does not occur when generators are capable of doing so.

For interconnected generation less than or equal to 1 MW where the generator has anti-islanding protection, NS Power will permit the installation of an NS Power recloser[b] (owned by NS Power, paid by Interconnection Customer) complete with the protections listed below as an alternative to installing a transfer trip from the substation recloser (and from any downline reclosers between the substation and Generating Facility) to the Generating Facility main breaker, where the aggregate nameplate capacity of existing, committed[c] and the proposed Generating Facility is less than 50% of :

a. the minimum feeder load of the feeder supplying the Generating Facility,
b. the minimum feeder section load of the feeder section supplying the Generating Facility (i.e., downstream recloser supplying Generation Facility), or **[NTD OR or AND?]**
c. the minimum feeder load of the feeder supplying the Generating Facility and of any downstream section of the feeder supplying the existing, committed and the proposed Generating Facility.

[b] The Recloser Protection would include: Over/Under Frequency, Under/Over Voltage, Overcurrent, Voltage Restrained Overcurrent, Phase Unbalance.
[c] Committed generation refers to generation projects which are queued higher in the Advanced Distribution Interconnection Request Queue, on the same feeder/section as the proposed Generating Facility.

It should be noted that generator operation will not be permitted at Generating Facilities utilizing a transfer trip when protection devices from which the transfer trip is being sent, are out of service.

5.9. Thermal Limits

Thermal limits of NS Power equipment shall not be exceeded as the result of the addition of the Generating Facility.

5.10. Protection of Equipment & Fault Detection

The proper detection and isolation of all types of faults, whether they occur on the Distribution System, or within the Interconnection Customer's facilities, is essential to ensure safe operation and limit damage to equipment.

The Interconnection Customer must ensure that their protection devices detect abnormal system conditions and isolate their facilities from the Distribution System, including but not limited to: over and under frequency (per Section 5.6), over/under voltage (per Section 5.7) and anti-islanding (per Section 5.8).

NS Power will normally have backup protection at the Point of Interconnection in the form of a distribution class recloser equipped with an electronic recloser controller, as specified and supplied by NS Power at the Interconnection Customer's cost. This device is intended to provide backup protection only, and is to protect NS Power's system from adverse conditions at the interconnection site. This device is not intended to protect the Interconnection Customer's equipment. The settings for the recloser protective functions will be established by NS Power on a site-specific basis and typically include phase and ground trips, over and under voltage protection, and over and under frequency protection. Other protection may be required dependent on the facility.

The following protection functions may also be available or required:

- Reclose Blocking to ensure that the generator is not on-line when the Distribution System auto-recloses (re-energizes circuit automatically following a fault detection)
- Use of transfer-tripping to ensure that the generator disconnects whenever the supply distribution circuit recloser or downline device has tripped open.

5.11. Automatic Start/Restart of Generation Facilities

Individual generators are typically permitted to automatically start or restart after tripping from the Distribution System. This automatic restart may occur only after the Distribution System voltages and frequencies have Stabilized and the 5-60 minute delay has expired. This time delay is necessary to preclude islanding, reduce stress on the generators resulting from repetitive faults and to stagger the starting of units following a fault or disturbance.

NS Power will specify the time delay to be applied to the individual generators in the SSGIA or DSIS??. **[NTD: How is this setting provided to the IC?]**

5.12. Protection Coordination

The protection systems installed by the Interconnection Customer shall coordinate with NS Power's protection facilities. The Interconnection Customer shall submit details of the protection facilities and proposed settings to NS Power for review and acceptance prior to

finalization of the SSGIA. Any revisions to settings must also be submitted to NS Power for review and acceptance in accordance with the terms of the SSGIA.

5.13. Voltage Variations

5.13.1. Voltage Flicker

The Interconnection Customer is to ensure that the operation of the Generating Facility does not cause voltage variations on the Distribution System that result in objectionable lamp flicker to other connected customers.

The voltage variations will be measured at the Point of Interconnection (POI). These variations can be caused by the start-up and shut-down sequences of the generator (capacitor switching, inrush, resister by-pass etc.), referred to as "voltage dips", or may be caused by the quasi-continuous variation of the prime mover (typically wind) which is referred to as "flicker".

The acceptable limits of flicker emissions from any Generation Facility on NS Power's Distribution System, measured at the designated Point of interconnection in accordance with the IEC Standard IEC 61000-4-15 Ed. 1.1 b:200310 are:

$$\mathbf{P_{st}99\% \leq 0.35}$$
$$\mathbf{P_{lt}99\% \leq 0.35}$$

In computing the flicker emission levels, only periods in which the Generating Facility is in operation shall be included. These limits apply to all consecutive periods.

5.13.2. Voltage Dips

The acceptable limits for voltage deviation are listed in Table 4 below. Operation of the Generating Facility from full generation to no generation, or from no generation to full generation shall cause no more than a 2.5% step change in system voltage measured at the Point of Interconnection. Similarly, disconnection of the generator at full output shall cause no more than a 2.5% step change in system voltage measured at the Point of Interconnection.

ΔV / V (%)	Occurances
2.5%	≤ 1 time / hr
2.0%	≤ 5 times / hr
1.0%	≤ 50 times / hr
0.5%	≤ 500 times / hr
Dynamic voltage changes must be ≤ 2.5%.	

Table 4: Emission Limits for Rapid Voltage Changes

5.14. Voltage & Current Distortion

The harmonic current injection from the Generating facility to the Distribution System measured at the Point of Interconnection shall not cause the limits established by IEEE 519-2014[6] to be exceeded.

The Generating Facility must be tolerant of harmonic voltage distortion levels that are indicated in IEEE 519-2014[6] for Distribution Systems. These distortion levels may be present in the absence of any harmonics generated by the Interconnecting Customer's facility.

5.15. Voltage Regeneration

Sustained voltage regeneration from the Interconnection Customer's Interconnection Facilities following the loss of a supply phase on the Distribution System is not permitted. The Interconnection Customer is required to identify the capability for their site and mitigate the risk of occurrence of regenerated voltages in the design of the Interconnection Customer's Interconnection Facilities.

Regenerated voltages may not be well regulated and can be well below or well above acceptable levels, or may be present at or near nominal voltage. Short-circuit protection on the regenerated phase may be inadequate.

All generator step-up transformer configurations are capable of regenerating voltage, to some extent, for a lost Distribution System supply phase. Only some configurations are capable of reproducing the phase voltage at or near a nominal level. The Generating Facility's interconnection protection must be capable of detecting the loss of any phase to which the DG Facility is connected.

Over/under voltage high voltage protection alone is not an acceptable solution to protect against the regenerated phase conditions in the case where the interconnection configuration is capable of reproducing nominal or near nominal voltage. In such situations, detection of phase regeneration is possible with protection which measures zero-sequence current and voltage and negative sequence current (phase unbalance) on the high voltage (HV) and low voltage (LV) systems. The protection requirements are set out in Appendix A - Table A1.

In general, the zero-sequence quantities should be used for relaying at the HV terminals and included on the LV system if grounding facilities are provided at that voltage (grounding bank or neutral grounding of generators). Negative sequence current should also be used at the HV bus and at the generator terminals. Unless system grounding is provided in the LV system, the negative sequence current at the generator terminals will be the best means of detection of the condition. In the absence of load on the regenerated phase, as the generator loads the negative sequence current will become significant at the generator terminals. The best protective relay measured quantities will depend on the step-up transformer configuration and how system grounding is achieved. See Appendix A Table A1 – "Open Phase Protection Requirements" for additional protection details.

In order to protect against the regenerated voltage in all situations, disconnection of the Interconnection Customer's Generation Facility (at the High Voltage terminals of the step up transformer) when the generator is not running may be necessary.

It should also be considered that facilities utilized to achieve effective grounding as per the requirements of Section 5.3 could be capable of voltage re-generation. In this case, the grounding facilities would be subject to the same protection and disconnection requirements as the step-up transformer.

NS Power may request a demonstration of these protection and disconnection facilities. NS Power may also request engineering analysis of the Interconnection Customer's facilities to determine if voltage regeneration is possible upon loss of a distribution phase.

6. Metering

6.1. Revenue Metering

Revenue-class Metering Equipment will be supplied, installed and maintained in accordance with Section 2.5 of the SSGIA.

Power flows to and from the Generating Facility shall be measured at, or at NS Power's option, compensated to, the Point of Interconnection to ensure that all required billing quantities are recorded as necessary for application of NS Powers' tariffs or power purchase agreements. Unless otherwise agreed by the Parties, NS Power will install Metering Equipment at the Point of Interconnection prior to any operation of the Generating Facility and shall own, operate, test and maintain such Metering Equipment.

The Interconnection Customer shall be responsible for all costs associated with the purchase, installation, operation, testing and maintenance of the Metering Equipment.

All revenue Metering Equipment installations shall at all times meet the requirements of Good Utility Practice and all Applicable Laws and Regulations.

6.2. SCADA – Supervisory Control and Data Acquisition

All Generating Facilities with aggregate capacity greater than or equal to 5 MW shall be equipped with real time Remote Terminal Unit (RTU) or recloser control and communications facilities to enable connection to NS Power's SCADA system for telemetering of the generation output (kW and KVAR), indication of device status, and real time device control.

Generating Facilities less than 5MW in total generating capacity shall be equipped with 'near real time' telecommunications to NS Power's SCADA system via a cellular modem system (or other telecommunications system acceptable to NS Power), to provide the Generating Facility's operational data and status, for each time interval of 10 minutes.

7. General Operating Requirements

NS Power requires operational control over any Interconnection Facilities it deems necessary to ensure reliability or serviceability of the Distribution System.

An Interconnection and Operating Agreement in the form of the SSGIA shall be established between the Interconnection Customer and NS Power to identify responsibilities, key contacts, desired operating characteristics, and other relevant operating considerations.

7.1. Testing

All protective devices or functions supplied to satisfy the requirements in Section 5 and Appendix B shall be routinely tested by qualified personnel at the Interconnection Customer's expense. Each routine check shall include both a calibration check and an actual trip of the circuit breaker or contactor from the device being tested. A test report shall be prepared listing the tests made and the "as found" and "as left" calibration values. Copies of all test reports will be made available to NS Power.

Special tests may also be requested by NS Power to investigate apparent mis-operations that have had an adverse effect on the NS Power system. Costs of such tests will be at the Interconnection Customer's expense.

8. Provision for Future Changes

The Interconnection Customer is responsible for making required changes to the Interconnection Customer's Interconnection Facilities to meet new or revised standards and documents judged applicable by NS Power. The generation owner shall make all required changes in a timely manner. The Interconnection Customer is responsible for all costs associated with such changes.

Appendix A – Open Phase Protection Requirements[11]

Table A1 - Open Phase Protection Requirements (Refer to Section 5.15)

HV-LV Core	Grounding	Required Switchgear (1)	HV (2) Protection	LV (2) Protection	Gen (2) Protection	Notes
YgYg 4/5-leg	Gen Reactor	Either 52HV + (52Gen or 52LV) OR 52LV+52Gen	50/51 59N 46	50/51 59N 47	81 27/59 50/51G 51V 46 47	Backup provided by trips to HVand LV breakers
	LV Gnd Tfr	Either 52HV + (52Gen or 52LV)	50/51N 59N 46	50/51N, 59N 46 47	81 27/59 50/51N 51V 46 47	Backup provided by trips to HV and LV breakers
		OR 52LV+52Gen	_____	50/51N, 59N 46 47	81 27/59 50/51N 51V 46 47	
	HV Gnd Tfr	52HV + (52Gen or 52LV)	50/51N 59N 46	_____	81 27/59 50/51N 51V 46 47	No backup for Gen off (regen)
YgYg 3-Leg	HV neutral reactor and/or Gen reactor and/or LV Gnd Tfr	52HV + (52Gen or 52LV)	50/51N 59N 46	50/51N 59N 46 47	81 27/59 50/51N 51V 46 47	No backup for Gen off (regen)
YgD	HV neutral reactor	52HV + (52Gen or 52LV)	50/51N 59N 46 47	46	81 27/59 50/51N 51V 46 47	No backup for Gen off (regen)
DYg	HV Gnd Tfr	52HV + (52Gen or 52LV)	50/51N 59N 46 47	46	81 27/59 50/51N 51V 46 47	No backup for Gen off (regen)

(1) Minimum requirements to provide protection and backup

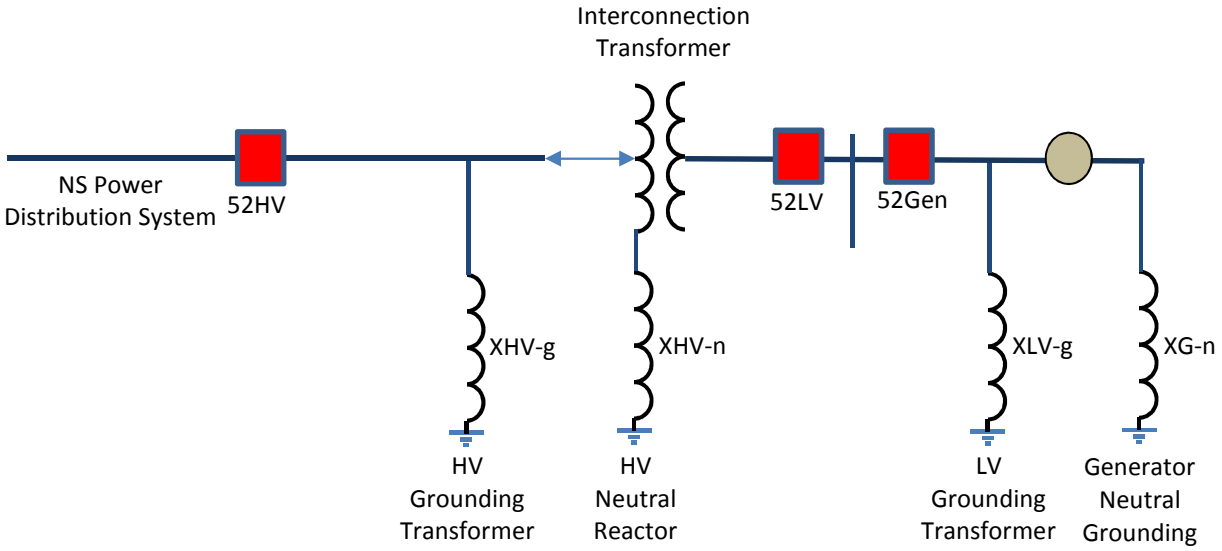
(2) HV and LV protection are the protections required for the interconnection. Generator protection may be adequate in place of the LV protection where an HV circuit breaker and protections are provided.

(3) Preferred solution highlighted

(4) Protection Nomenclature:

81	Over/Under Frequency
27/59	Over/Under Voltage
50/51N	Phase Instantaneous Overcurrent/Neutral Time Overcurrent
51V	Voltage Restrained Time Overcurrent
46	Reverse-Phase or Phase Balance Current Relay or Stator Current Unbalance
47	Phase-Sequence or Phase Balance Voltage

General Interconnection Grounding Arrangement



Appendix B - Advanced Inverter Functions and Operating Requirements

In addition to the requirements listed in Section 5 of this Guideline, the Advanced Inverter Functions and Operating Requirements of this Appendix B shall apply for interconnection of all advanced inverter-based Generating Facilities with a valid interconnection request dated on or after the effective date of this document and with capacity greater than 10 kW.

All such inverter equipment shall be CSA certified and meet the requirements of UL-1741 Supplement SA Standard for Grid Support Utility Interactive Inverters and Converters and/or the equivalent CSA standard in place at the time of the Interconnection Application.

Advanced Inverter Protection Functions Required:

(a) Over and under voltage trip functions which i) cause the inverter to cease to energize the Distribution System whenever the Distribution System voltage at the Point of Interconnection deviates from the normal voltage limits and timeframes set out in Table B1 - Advanced Inverter Voltage Ride-Through Function Settings and ii) prevent the Advanced Inverter from restarting and re-energizing the Distribution System unless the system voltage has Stabilized; and

(b) Over and under frequency trip functions which i) cause the inverter to cease to energize the Distribution System whenever the Distribution System frequency at the Point of Interconnection deviates from the nominal 60 Hz frequency and timeframes set out in Table B2 - Advanced Inverter Frequency Ride-Through Function Settings and ii) prevent the Advanced Inverter from restarting and re-energizing the Distribution System unless the frequency has Stabilized.

(c) Anti-Islanding protection to prevent the inverter from being connected to any portion of the Distribution System that is not energized by the utility supply, in accordance with Section 5.8 of the guideline.

1. Response to Abnormal Voltage Conditions - Voltage Trip and Ride Through Settings

Table B1 defines the voltage ranges and protective trip limits. Generating Facilities shall cease to energize the Distribution System within the prescribed trip time whenever the voltage at the Point of Interconnection deviates from the allowable voltage operating range. Unless provided alternate settings by NS Power, all inverter-based Generating Facilities must comply with the standard voltage ride-through and trip settings specified in Table B1.

Whenever the Distribution System voltage at the Point of Interconnection is outside Normal Voltage Range for the parameters set forth in Table B1, the Advanced Inverter's protective functions shall cause the Advanced Inverter(s) to cease to energize the NS Power's Distribution System, as follows:

(a) The Advanced Inverter shall stay connected to the Distribution System while the system remains within the "Ride-Through Duration" voltage-time range and must function in the corresponding "Operating Mode" for each Voltage Condition listed in Table B1.

(b) In the Normal Voltage – High (NVH) region, the Advanced Inverter may be required to reduce power output as a function of voltage (per 3.1 Volt-Watt mode). The activation state and settings of this mode will be determined by NS Power in the SSGIA.

c) If the Distribution System voltage recovers to normal prior to the expiration of the Ride-Through time, the Advanced Inverter shall restore continuous operation within 2 sec.

d) If the Distribution System voltage does not exit the ride-through region and returns from the

Under Voltage UV3 region to the UV2 or UV1 region, the Advanced Inverter shall restore available current within 2 sec.

e) Post Ride-Through Start/Restart Conditions: For restarting the inverter output after a ride through event, the system voltage shall be Stabilized (i.e. between 110% to 88% of nominal system voltage for 5 minutes or another time as established by NS Power in the SSGIA).

f) Different settings than specified and operating modes than those in Table B1 may be specified by NS Power in the SSGIA.

Voltage Condition	Voltage at POI (% of Nominal)	Ride-Through Duration Default Setting (Sec)	Inverter Operating Mode[1]	Clearing time: Adjustable up to and including (sec)	Post Ride-Through Start/Restart Conditions	
					Voltage Criteria (V) (% of Nominal)	Time Delay (min)[2]
Level 2 Over Voltage (OV2)	V ≥120%	No Ride Through	Cease to Energize	0.16	110% ≥ V ≥ 88%	5 - 60
Level 1 Over Voltage (OV1)	110% < V < 120%	1	Mandatory Operation	13	110% ≥ V ≥ 88%	5 - 60
Normal Voltage Range - High (NVH)	100% < V ≤ 110%	Indefinite	Continuous Operation (Permissive Volt-Watt)[3]	Not Applicable Within Normal Voltage Range		
Normal Voltage Range - Low (NVL)	88% ≤ V < 100%	Indefinite	Continuous Operation			
Level 1 Under Voltage (UV1)	60% ≤ V < 88%	2	Mandatory Operation	21	110% ≥ V ≥ 88%	5 - 60
Level 2 Under Voltage (UV2)	45% ≤ V < 60%	11	Mandatory Operation	11	110% ≥ V ≥ 88%	5 - 60
Level 3 Under Voltage (UV3)	V < 45%	No Ride Through	Cease to Energize	0.16	110% ≥ V ≥ 88%	5 - 60

Table B1 - Advanced Inverter Voltage Ride-Through Function Settings

Table B1 Notes:

1 Operating modes:
Mandatory Operation: the inverter continues to output power during the Ride-Through Duration time and then starts the shutdown process.
Cease to Energize: the inverter reduces its output power to zero and then starts the shutdown process.
"Continuous Operation": the inverter continues to output power as available.

2, 3 Actual settings will be specified by NS Power and indicated in the SSGIA.

2. Response to Abnormal Frequency Conditions - Frequency Trip and Ride Through Settings

Table B2 defines the frequency ranges and protective trip limits. Generating Facilities shall cease to energize the Distribution System within the prescribed trip time whenever the frequency at the Point of Interconnection deviates from the allowable frequency operating range. Unless provided alternate settings by NS Power all inverter-based Generating Facilities must comply with the standard frequency ride-through and trip settings specified in Table B2.

Whenever the Distribution System frequency at the Point of Interconnection is outside Nominal Operation Range for the parameters set forth in Table B2, the Advanced Inverter's protective functions shall cause the Advanced Inverter(s) to cease to energize the NS Power's Distribution System, as follows:

a) The Advanced Inverter shall stay connected to the Distribution System while the system remains within the "Ride-Through Duration" frequency-time range and must function in the corresponding "Operating Mode" for each Frequency Condition listed in Table B2.

b) In the OF1 region, the Advanced Inverter shall have the capability to reduce power output as a function of frequency (per 3.2 Frequency-Watt mode). The activation state and settings of this mode will be determined by NS Power in the SSGIA.

c) If the Distribution System frequency recovers to a normal range before to the expiration of the Ride-Through time, the Advanced Inverter shall restore continuous operation within 2 sec.

d) If the Distribution System voltage does not exit the ride-through region and returns from either Level 2 (Over/Under) region to the corresponding Level 1 (Over/Under) region, the Advanced Inverter shall restore available current within 2 sec.

e) Post Ride-Through Start/Restart Conditions: For restarting inverter output after a ride through event, the system voltage shall be Stabilized (i.e. between 110% and 88% of nominal system voltage for 5 minutes or another time as established by NS Power). When the system voltage is in range of 60.7 Hz and 59 Hz, the Advanced Inverter can operate according to its available power output and is not required to increase or decrease power as a function of system frequency.

f) Different settings than specified and operating modes than those in Table B2 may be specified by NS Power in the SSGIA.

Frequency Condition	Distribution System Frequency	Ride-Through Duration	Inverter Operating Mode[1]	Clearing time: adjustable up to and including (sec)[2]
Level 2 Over Frequency (OF2)	f > 62	No Ride Through	Cease to Energize	0.16
Level 1 Over Frequency (OF1)	62 ≥ f > 60.7	299	Mandatory Operation (f-W)[3]	300
Normal Frequency Range	60.7 ≥ f ≥ 59	Normal Range	Continuous Operation	Not Applicable
Level 1 Under Frequency (UF1)	59 > f ≥ 57	299	Mandatory Operation	300
Level 2 Under Frequency (UF2)	f < 57	No Ride Through	Cease to Energize	0.16

Table B2 - Advanced Inverter Frequency Ride-Through Function Settings

Table B2 Notes:

1 Operating modes:
Mandatory Operation: the inverter continues to output power during the Ride-Through Duration time and then starts the shutdown process.
Cease to Energize: the inverter reduces its output power to zero and then starts the shutdown process.
"Continuous Operation": the inverter continues to output power as available.

2, 3 The actual settings will be specified by NS Power and indicated in the Interconnection Agreement.

3. Additional Advanced Inverter Operational Functions Required

3.1. Volt-Watt Mode

The Advanced Inverter shall be capable of altering its actual real power output when the system voltage at the Point of Interconnection exceeds the defined "volt-watt start set point (%V_{nom})". The real power output of the inverter shall be reduced according to the "gradient setting (%P_{nom}/%V_{nom})".

Volt-Watt Default Settings		
V-W Setting Parameter	**Default setting**	**Range**
Start Voltage (% of V_{nom})	106	105 to 120
Gradient (%P_{nom}/%V_{nom})	0	0 to 100%

a) When the system voltage reaches or exceeds 106% of nominal, the active power output produced by the Advanced Inverter shall be reduced by X% of real power nameplate rating per %Vnom.
b) The voltage default dead-band shall be +10%/+6% (132 V to 127 V).
c) Start Voltage and Gradient Settings to be provided by NS Power in the SSGIA.

3.2. Frequency-Watt Mode

The Advanced Inverter shall be capable of altering its actual real power output whenever the system frequency at the Point of Interconnection exceeds the defined "frequency-watt start set point (Hz)". The real power output of the inverter shall be reduced according to the "gradient setting (%P_{nom}/Hz)".

Frequency-Watt Default Settings		
f-W Setting Parameter	**Default setting**	**Range**
Start Frequency (Hz)	60.7	60.1 to 65
Gradient (%Pnom/Hz)	0	0 to 100%

a) When the system frequency exceeds 60.7 Hz, the active power output produced by the Advanced Inverter shall be reduced by X% of real power nameplate rating per hertz.
b) Start Frequency and Gradient Settings to be provided by NS Power in the SSGIA.
c) The frequency default dead-band shall be +0.7/-1.0 Hz (60.7 Hz to 59 Hz). When the system frequency is in range of 60.7 Hz and 59 Hz, the Advanced Inverter can operate according to its available power output and is not required to increase or decrease power as a function of system frequency.

3.3. Power Factor Control

Advanced inverters must be capable of controlling voltage and operating at a fixed, preset power factor. The controller's voltage set-point shall be adjustable throughout the range of 95-105% of rated terminal voltage. The generator must have the capability of operating with a range of 95% lagging to 95% leading power factor when generating its real power rated capability. The actual settings will be specified by NSPI, and indicated in the SSGIA.

3.4. Dynamic Volt/VAr Operations

Advanced Inverters shall be capable of providing dynamic reactive power compensation (dynamic Volt/Var operation) within the following constraints:

a) The Advanced Inverter shall be able to consume reactive power in response to an increase in line voltage, and produce reactive power in response to a decrease in line voltage.

b) The reactive power provided shall be based on available reactive power, but the maximum reactive power provided to the system shall be as directed by NS Power.
c) The voltage thresholds and reactive power set points are provided by NS Power.
d) This Volt/VAR capability shall be able to be activated or deactivated in accordance with NS Power requirements, as set out in the SSGIA.

3.5. Ramp Rate Requirements

The Advanced Inverter shall have the following ramp capabilities. Ramp rates are reliant on sufficient energy being available from the Advanced Inverter.

a) Continuous Operation ramp rate: For power output level changes during normal operation. The default value is 100% of maximum rated current output per second with a range of adjustment from 1% to 100%, with specific setting as provided by NS Power in the SSGIA.

b) Connect/Reconnect ramp rate: Upon starting to inject power on styart up or a disconnection, the inverter shall be able to control its rate of increase of power from 1 to 100% maximum current per second. The default value is 2% of maximum current output per second with specific settings as provided by NS Power in the SSGIA.

3.6. Summary:

Default Advanced Inverter Functions	**Default Activation State**
a) Anti-Islanding	Activated
b) Voltage Ride Through	Activated
c) Frequency Ride Through	Activated
d) Volt-Watt Mode	Per SSGIA
e) Frequency-Watt Mode	Per SSGIA
f) Fixed Power Factor	Per SSGIA
g) Dynamic Volt-VAr Mode	Per SSGIA
h) Ramp Rates – Normal Operation	Activated
i) Ramp Rate – Reconnect Operation	Activated

Appendix C – References

[1] NS Power "Standard Small Generator Interconnection Agreement (SSGIA)" – Current version: SSGIA
[2] NS Power's Standard Protection Code – Latest version
[3] Province of Nova Scotia "Electrical Installation and Inspection Act" R.S.N.S. 1989, c. 141
[4] CSA Canadian Electrical Code Part 1, C22.1-02, Safety Standards for Electrical Installations (CE Code)
[5] NS Power Regulation 2.7 "Electric Service Availability and Standard Voltages"
[6] CSA Standard CAN3 C235-83 (R2010)– "Preferred Voltage Levels for AC Systems 0 to 50,000V"
[7] IEEE 519 – 2014: Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
[8] NPCC Regional Reliability Reference Directory #12 Under Frequency Load Shedding Program Requirements, July 9, 2013
[9] NERC Standard PRC 024-1 Generator Frequency and Voltage Relay Settings Version 1 (Attachment 1 – Off Nominal Frequency Capability Curve)
[10] IEC Standard IEC 61000-4-15 Ed. 1.1 b:2003
[11] Report: NSPI Distributed Generation, Open-Phase Voltage Regeneration & System Grounding -Stephen D. Boutilier, P.Eng