Congestion and Interruption Management Policy

Document Register

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1. Purpose

This policy has been prepared to explain the principles and policy for the congestion and interruption management for distributed generation (DG) connected to the Wellington Electricity (WELL) distribution network (the network).

2. Policy

The Wellington Electricity Distribution Network was originally built to deliver power in one direction – from the grid to homes and businesses. But as more customers install their own DG systems, like solar panels, electricity can now flow back into the network. This can put extra pressure on the system and, in some cases, cause problems for safety and reliability.

To keep the network safe and reliable while providing fair access to all customers, Wellington Electricity will continue to optimise the use of the network by demand and DGs at the time of congestion and constraints. Wellington Electricity will issue a price signal in the form of an operating envelope through the ICP retailer.

In the instance of safety risk, WELL may require DGs export to be interrupted or disconnected from the network.

3. Scope

This policy applies to Distributed Generation (DG) systems connected WELL networks at all voltage levels, and all types of DG Systems.

4. Definitions

Table 1: Definitions

Terms	Definitions
Alternating Current (AC)	A type of electric current that periodically reverses direction, causing the voltage polarity to switch back and forth over time, such as a residential power plug.
Active Power	The real, usable energy in an AC electrical system that performs work (e.g., heats a resistor, spins a motor) and is consumed by loads. It is measured in Watt (W) or kilowatt (kW)
Apparent Power	The total power in an AC electrical system, combining: Active power (P, kW): real usable energy, and Reactive power (Q, kVAR): "Invisible" power for voltage support. It is measured in Voltage Ampere (VA) or kilo VA (kVA)
Anti-islanding protection	It is a safety mechanism that prevents Distributed Generation (DG) sources (e.g., solar PV, wind turbines) from continuing to power a section of the grid when the main utility supply is disconnected.
Congestion	A condition in electricity networks where the power flow exceeds the thermal or stability limits of the network components.
Curtailment	Dispatching below maximum output. It is a reduction in the output of a generator from what it could otherwise produce given available resources (e.g., wind or sunlight), usually on an involuntary basis.
Direct Current (DC)	A type of electrical current where the flow of electric charge moves in a single, constant direction, such as a battery or, photovoltaic.
Distributed Generation	Electric generation facilities connected to the Utility network at the Point of Connection (PCC).
Distribution network	It is a part of an electrical power system that delivers electricity from the national grid to the customer.

Fault Level	A number shows when physical condition that causes a device, a component, or an element to fail to perform in a required manner, for example, a short-circuit, a broken wire, or an intermittent connection.
Generator	It is a device that converts mechanical energy (from turbines, engines, or renewable sources) into electrical energy through electromagnetic induction.
Grid Injection Point	Refers to where electricity is fed into the high-voltage transmission network (220kV, 110kV, and 66kV).
Harmonics	Continuous distortion of the normal sine wave; typically caused by nonlinear loads or by inverters, measured in total harmonic distortion (THD).
High Voltage (HV)	Wellington Electricity refers to an AC voltage of 11,000 volts
Hosting Capacity	The estimated remaining capacity of the network to accept additional distributed generation. The hosting capacity data in this map is calculated with a high-level of assumptions and simplifications and therefore should not be relied upon for the completion feasibility or viability studies.
Interruption	It is a loss of electrical power supply to a load or system, either planned or unplanned.
Low Voltage (LV)	AC voltages exceeding 50 V but not exceeding 1000 V RMS
Maximum Export Power	It is the aggregate nameplate capacity of the generating equipment, minus the minimum load at the point of connection or the active power export limit imposed by an active power export control device.
Minimum Load	It is the minimal power consumed by a consumer or distributed generation applicant. It is measured in kilowatt (kW) or kilo Volt-Amperes (kVA).
Nameplate Capacity	It is the maximum theoretical output or generating of a generator. It is measured in kilowatt (kW) or kilo Volt-Amperes (kVA).
Non-rotating generation	The generation that produces electricity without relying on electromechanical rotation. Instead, generating power through direct energy conversion methods, such as inverter-based solar generation and battery storage.
Operating Envelope	A Flexible Export Limits published on Wellington Electricity Website along with export congestion charges.
Power Flow	Refers to the distribution of active (P) and reactive (Q) power in an electrical grid, ensuring stable voltage levels and minimal losses.
Power Quality	It is the stability, reliability, and cleanliness of electrical power in a system.
Reactive Power (VAR / kVAR)	It is the portion of electricity that does not perform real work (like powering lights or motors) but is essential for maintaining voltage stability in AC power systems.
Rotating generation	The generation that produces electricity through electromechanical means, typically involving a rotating turbine or machine, such as a wind turbine, or micro hydro.
Synchronisation	It is the process of matching the voltage, frequency, and phase angle of an electrical power source (e.g., a generator or inverter) with an existing grid or another source before connecting them.

5. References

Table 2: References

Reference Standards	Title
Industry Standards and Regulations	
AS/NZS 4777.1:2024	Grid Connection of Energy Systems via inverters, Part 1: Installation requirements
AS/NZS 4777.2:2020	Grid Connection of energy systems via inverters, Part 2: Inverter requirements
AS/NZS 1768:2007	Lightning protection
AS/NZS 3000:2018	Electrical installations - Known as the Australian/New Zealand Wiring Rules

AS/NZS 3010:2017	Electrical installations - Generating sets
IEEE 519-2022	IEEE Standard for Harmonic Control in Electric Power Systems
Safety Regulation	Electricity (Safety) Regulations 2010
The Code	Electricity Industry Participation Code 2010
Wellington Electricity Policies and Standards	
ENP-116	Wellington Electricity Distribution Code and Network Connection Standard
ENG-100	Technical Requirements for Connection of Distributed Generation (DG)
ENP-119	Network Connection Policy for Distributed Generation
CFP-011	Customer Contribution Policy
End Of References	

6.Congestion, Interruption, and Disconnection

6.1. Congestion

Congestion occurs when exported electricity is being injected into the network beyond its capacity, or when voltage or thermal limits are reached at certain times of the day. This can be a cumulative effect from multiple DG units. This can affect parts of the network.

Such congestion can result in overvoltage on the network and may damage equipment if the power flowing through it exceeds its design voltage and thermal limits.

Part 6 of the Electricity Industry Participation Code 2010 (the Code) governs the connection to distribution networks, both distributed generation and load, to ensure that the operation of New Zealand's electricity grid remains stable and reliable. The Code aims to encourage cost-effective generation, particularly using renewable fuel sources such as solar photovoltaic panels. Wellington Electricity welcomes the connection of distributed generation to its network, provided that technical and regulatory requirements are met so there is no impact to other customers, and the ability to operate our network safely and sustainably is not compromised.

Schedule 6, Clause 6.3A enables WELL to issue an operating envelope (Flexible Export Limits) for congestion management following a network study. The concept and application of the operating envelope is specified in Section 7 for congestion management.

6.2. Interruptions and Disconnections

Clause 10 *"General obligation relating to interruptions"* of Schedule 6.2 of the Code requires Wellington Electricity to make reasonable endeavours to ensure that the connection of the DG is not interrupted, but Clause 11 *"Circumstances allowing distributor to temporarily electrically disconnect distributed generation"* permits such interruption or disconnection of the DG in a number of cases, including the need to comply with the requirements listed in WELL Network Connection Policy for Distributed Generation policies.

The DG's protection systems are required to disconnect the DG from the network whenever the supply from the network is disrupted or when the grid operates outside the specified voltage and frequency parameters. Passive and active anti-islanding protection is required for customers installing and operating DG connected to the network. The following specifies the conditions under which distributed generation electrical output may need to be interrupted or disconnected from the network:

1. Operation of the DG presents a danger to personnel working on the network or a risk to property.
2. Output from the DG exceeds the rating of connected equipment (i.e., the capacity of the network components to which it is connected).

3. Operation of the DG causes a disruption in the supply to other customers (e.g., power quality issues under certain operational conditions, e.g., excessive voltage (limits set by the Electricity (Safety) Regulations 2010, clause 28), fluctuations or harmonics).
4. Operation of the DG poses risks to network security or reliability.
5. If necessary for planned maintenance, construction, and repairs on the distribution network.

7. Congestion Management Policy & Procedure

Wellington Electricity will manage network congestion to remain compliant to the regulatory standards and code requirements. This will be achieved through operating envelopes or network upgrade.

All applications made under Part 1 of Schedule 6 will be accepted for connection if they meet the regulatory, code and WELL Electricity Policies and Standards on published on the website. All the DG system owner must agree to the congestion management and interruption policy and the use of the operating envelope for congestion management. If application does not meet any of the stipulated requirements or provide sufficient information further information may be requested to enable Wellington Electricity to process the application. If the DG system owner is unable to provide necessary information, the application will be declined.

Where the application is declined, the applicant can still resubmit a revised application that addresses the reasons for declining the original application.

All applications made under Part 2 of Schedule 6 may require a network assessment on an individual basis, and no hosting capacity reservation will be given. Congestion issues arising from DG systems can be mitigated by reinforcing the network to which they are connected. In such circumstances, the costs and timing of such reinforcement would need to be factored into the DG installation planning and must be in compliance with the WELL Customer Contribution Policy (CFP 011).

7.1. Operating Envelopes

Reduce/manage the congestion through the published Operating Envelope (Flexible Export Limit) through ICP retailers to signal congestion expects DG owners to alter export levels. Following the network study, operating envelopes schedules will be published on Wellington Electricity website from time to time for congested areas of the network with flexible export limit (operating envelope).

ICP retailer will be notified in advance when those envelopes would apply to ICPs in the congested areas of the network. The congestion charge will be passed to ICP retailers for all the DGs exporting higher than the threshold.

Customers can avoid the congestion charge by making one of the following choices at the time of the congestion:

1- Consume additional generation through additional local behind the meter demand.
2- Install local battery systems to store the additional generation at the time of network congestion and export when network is not congested.
3- Reduce the output/export from the DG to remain within the export limit for the congestion duration.

7.2. Network Upgrade

Wellington Electricity will choose to remove the congestion by network upgrade when Operating Envelope mechanism is no longer the most effective means of managing congestion to maintain regulatory and code compliance.

The recovered congestion charge from DGs will contribute towards permanent network upgrade.

8. Additional Information & Scenarios

Wellington Electricity has published the distributed generation congestion heat map on its website, offering an overview of the distributed generation (DG) penetration on LV distribution networks as guidance for the DG system applicants.

For Part 1 applicants, this will enable them to identify areas where an Operating Envelope/Flexible Export Limit is likely to apply through their ICP retailer. Higher default export limit is subject to customer and/or ICP retailer acceptance of being responsible for paying posted operating envelope charges for injection as published from time to time on WELL website.

For Part 2 applicants, it will enable them to size the DG system accordingly or request network upgrades as per the WELL Customer Contribution Policy (CFP 011).

In the instance of Multiple Trading Relationships (MTRs), the operating envelope congestion charges would only be applied to the ICP/meter associated to the DG based on the gross DG export value.

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