**WAIPA NETWORKS LIMITED**

| Distributed Generation Policy | |
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| Date: | 26 July 2018 |
| Approved By: | Adam Fletcher |
| Signature: |  |

## Introduction to Distributed Generation

Distributed generators, also known as 'embedded generators', are generators located at a home or business which are capable of generating electricity for that home or business' own use. They may also be capable of putting surplus electricity back into Waipa Networks' electricity distribution network. These generators can take many forms; diesel generators, wind turbines and photovoltaic (PV) solar panels are the most common.

## The Process to Connect Generation to Our Network:

Before installing any generator capable of exporting energy into the Waipa Networks distribution network, you must meet all relevant statutory and regulatory requirements, the Waipa Networks Distributed Generation Policy, and comply with all applicable safety standards.

Information packs are available on the Waipa Networks website describing how to connect two categories of distributed generation:

- Small distributed generation systems (10kW or less).
- Medium to large distributed generation systems (above 10kW).

The Waipa Networks Distributed Generation Policy follows the regulated terms for connection of distributed generation as per Schedule 6.2 of the Electricity Industry Participation Code 2010 (Connection of Distributed Generation).

## Waipa Networks Connection and Operation Standards

- Generators must complete the application form to start the connection approval process.
- Waipa Networks shall carry out an inspection of all high voltage installations to ensure they are safe, will not interfere with other network customers if they fault, and meet industry accepted practice.
- Any assets, which Waipa Networks is to own can be constructed by contractors of the generators' choice but that contractor must be authorized to work on the network by Waipa Networks. The contractor must submit a proposed design which must comply with the Waipa Networks Design Manual.

- Waipa Networks can provide competitive quotations for work that complies with the Waipa Networks Design Manual. No network related construction will commence until payment to Waipa Networks is received in full unless other arrangements for payment are made to Waipa Networks's satisfaction.

## Consumer's Proposed Distributed Generation

Larger generators (above 1,000kW) may be subject to Transpower's terms and conditions for embedded generators.

Distributed generation must meet all relevant statutory and regulatory requirements and comply with all applicable safety standards, including:

1. The system must conform to AS/NZS 3000:2007, Electrical installations (Wiring Rules).

2. Other Electricity Authority guidelines that the generator must comply with, including the following:

    - Information Sheet Embedded Generation.

    - Connection of small scale generation (equal or less than 10kW) to a local network.

    - Guidelines for connection of DG greater than 10kW.

3. If inverter-connected, the system shall be compliant with AS 4777.1:2013 Grid connection of energy systems via inverters - Installation requirements and AS 4777.2:2015 Grid connection of energy systems via inverters – Part 2: Inverter requirements to ensure correct protection and isolation of the generator.

Copies of these standards are available from the website www.standards.com.au and www.ess.govt.nz. For further information from the Electricity Authority refer to www.ea.govt.nz.

Waipa Networks recognises all inverters approved by the Clean Energy Council. A list of Waipa Networks approved inverters is available from the website:
http://www.solaraccreditation.com.au/products/inverters/approved-inverters.html

Retailer for Site

The distributed generation customer must provide evidence of a retailer or electricity market participation. Normally the retailer will advise Waipa Networks that it is the retailer for the site and connection will take place once this is advised. It is an ongoing responsibility of the customer to ensure it has a retailer for input and export energy.

An Import/Export meter is required to be installed for all distributed generation connections.

## Additional Technical Requirements

Other technical guidelines are as follows:

- Generators above 300kVA shall have the characteristics of synchronous generators.
- Small wind farms above 300kVA shall have a static VAR compensator.
- Variable speed drives with rated current greater than 20kW shall have active mitigation of harmonics.

## Testing and Inspection

Testing completed by the installer of the generator should include:

- Earth mats, earth electrodes, star point earthing including earthing resistors.
- HV cables.
- Transformers.
- Regulators: Operation.
- Circuit breakers: Over current, Earth fault.
- Any RCD devices.
- 400V tests as per AS/NZS 3000.
- Over voltage.
- Under voltage – including the loss of a phase.
- Under frequency.
- Input energy fluctuations and the effects on output voltage and power factor.
- Auto-reclosing.

Waipa Networks will inspect all HV and more complex connections, including the following aspects:

- Safety.
- Protection.
- Over frequency.
- Synchronisation.
- Islanding.
- Single phasing.
- Self-excitation on loss of supply.
- Shut down to allow auto reclosing.
- Variations in input power and reactive power adjustments.
- Operating voltages.
- Speed of shutdown on loss of supply.

## Operation

When operating the generator has an obligation to ensure the generation plant is able to:

- Have the power switched off and turned back on (auto reclosed) without damaging itself, embedded appliances and other customer's equipment.
- Isolate itself and shut down when the supply is removed.
- Not produce voltages outside the regulation limits particularly during light load times at the point of connection.
- Not produce harmonics that exceed harmonic codes.
- Not self-excite if isolated or started without supply.
- Not have magnetising in rush currents that affect other customers or equipment.
- Inhibit parallel operation unless all phases are available and within normal limits.
- Disconnect from the supply in the event of unacceptable deviations of voltage or frequency.
- Not cause interference with network protection or cause circulating currents by the way star points are connected.
- Not cause variations in voltage that cannot be tracked by regulators.
- Not cause network tap changers to operate at an excessive rate.
- Not cause fault current levels which exceed network equipment ratings.
- Not cause any adverse network effects during fault ride through events.

## Protection

To protect against the issues outlined above, the minimum protection to be provided shall include:

- Loss of external supply.
- External system over voltage.
- External system under voltage and phase balance/loss of phase.
- External system over and under frequency.
- Overcurrent.

## Power Factor

To overcome congestion issues caused by low power factor Waipa Networks reserves the right to:

- Pass on, penalty charges from Transpower.
- Restrict connections in certain areas.

The majority of Waipa Networks distribution network comprises long rural overhead distribution lines that are inherently inductive causing a lagging low power factor. It is therefore important that prospective distributed generation installation are designed to have a minimal adverse impact on network power factor.

## Congestion, Curtailment and Interruption of Generation

This Distributed Generation Policy allows for distributed generators to be curtailed or interrupted in order to ensure that the distributor's other connection and operation standards are met.

The electricity network is currently set up for electricity flow in one direction only. Increased distributed generation could introduce bi-directional electricity flow on the network and lead to congestion of its low voltage and high voltage networks. Network congestion will cause a network asset to be operated beyond its rated capacity or give rise to a high voltage at the point of connection to the network.

In order to manage network congestion, Waipa Networks ensures that distributed generation is only connected in unconstrained areas and will upgrade the network where necessary to meet requirements. Waipa Networks may also implement real-time operational curtailment rules and arrangements on an as-needed and case-by-case basis.

The network congestion measure will be depended on the extent of congestion, technical and operational characteristics, and connection terms and conditions. The additional costs will be allocated based on a pro-rata share of reinforcement costs following the Waipa Networks Capital Contribution Policy.

All areas of Waipa Networks are considered to be uncongested at present. However, regular assessments will be carried out to determine what areas on our network will be congested due to the addition of future distributed generation. Any congested area on our network will be updated in this section.

### Technical Standards

Waipa Networks has an obligation to ensure the supply meets all national technical specifications at the point of connection with Waipa Networks' lines. As a consequence, the generator must advise Waipa Networks of changes to the installation as per Waipa Networks connection standards.

Where a customer refuses to respond to requests that are in compliance with industry codes, disconnection may result.

## Faults

### Loss of Supply due to Unplanned Events

In the event of a fault on a distribution feeder, any distribution generator must be automatically disconnected from the network via its own protection. The customer has sole responsibility for the safety of their generation plant and equipment under such conditions.

Waipa Networks shall endeavour to restore supply to generators after an unplanned event such as a storm occurs. During such events priority to restore supply is:

- Sustenance of life
- Essential services
- Minimising significant environmental and property damage

Disconnection in an Emergency Situation

WNL shall disconnect installations in emergency situation to maintain safety or network stability. Typically, events will include:

- Force majeure events, including extensive storms
- Emergency events caused by failure of network or customer equipment
- Situations where safety to life risks need to be minimised
- Situations where damage to equipment risks need to be minimised

## Regulated Terms

Any distributed generation connected to the Waipa Networks distribution network should comply with the Electricity Industry Participation Code 2010 Schedule 6.2. This regulated term can be found here.

In the majority of distributed generation connections (once completed) the Electricity Authority's Regulated Terms from the Code Part 6.2 will apply. However, Waipa Networks and the distributed generator may enter into a connection contract at any time and these contract terms shall take precedence. If contracted terms cannot be negotiated and agreed within 30 days following notice to Waipa Networks of the intent to form a contract, then the Regulated Terms shall apply. Any changes to contracted terms shall be by mutual agreement.

If you have any further questions, please contact:

retailservices@waipanetworks.co.nz