

## 1 Distributed Generation

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Aurora Energy's network is primarily designed to transfer electricity from Transpower's Grid Exit Points to our customers. The network is designed to maintain voltages in accordance with the Electricity (Safety) Regulations 2010, to ensure that all equipment is operated within maximum operating capacities and thermal limits, and that protection systems operate dependably.

The addition of new load or Distributed Generation (DG) alters loading patterns on the network and may require changes to load and generation management and/or the provision of additional network capacity. This is particularly true for high penetration levels of DG which can introduce reverse power flows (potentially compromising protection), currents higher than design ratings, and cause voltages to deviate from regulations.

We manage the integration of Distributed Generation by:

- Using our Distributed Generation connection process (<https://www.auroraenergy.co.nz/get-connected/solar-and-other-distributed-generation/>),
- Administering our DG Standard,
- Ensuring DG voltage control functions are enabled,
- Ensuring DG power output does not cause network components to malfunction or exceed ratings,
- Ensuring the network has the capacity to accommodate the installed DG.

## 2 Congestion Management Policy

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When developing our Congestion Management Policy, we set out to provide customers with reasonable access to a share of available capacity. In absence of this approach there is potential for a single large DG connection to utilise all available capacity, leaving no provision for other customers in the area to connect unless network upgrades or DG export restrictions are implemented.

Our policy is to:

- Give due consideration to likely DG uptake rates in the medium term.
- Set DG capacity limits across the network.
- Use a 'traffic light' system to ensure appropriate inverter voltage management settings for real and reactive power are applied.
- Implement real-time export limitation rules, arranged on a case-by-case basis as required to manage export capacity limits,
- Use commercial arrangements with customers to ensure that customers can make informed commercial decisions, and network upgrades can be implemented when required to increase DG hosting capacity.

Our commercial arrangements to manage network congestion are under development and must take account of regulatory obligations. They must also be compatible with our overall strategy to providing cost-reflective and service-based pricing. Where possible we will assess the incremental cost to relieve constraints and allocate a pro-rata share of the network reinforcement cost consistent with our capital contribution policy or, alternatively, recover those costs through charges on exported energy. In some cases, we may agree to make a payment toward DG capacity and operation that alleviates network congestion.

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The acceptable network congestion limit depends upon the extent of congestion, technical and operational characteristics, and connection terms and conditions. In some cases, DG may add to existing network congestion that requires network reinforcement in the near future. In other circumstances DG may be used to alleviate congestion.

### 3 Setting our DG Hosting Capacity Limits

The DG Hosting Capacity Limit relates to the per connection maximum permissible export and is dependent on:

- The assumed penetration level of DG - how many connections within a distribution transformer network are reasonably forecast to require a DG connection in the medium term,
- extent of congestion, the technical and operational characteristics of the network
- the DG technical settings associated with power and reactive power production (e.g. Volt-Var and Volt-Watt settings),
- and the connection terms and conditions.

Our starting assumption for DG penetration is 25% and we will monitor actual DG uptake across each network area (distribution transformer area) and adjust this upward as required to ensure that our DG Hosting Capacity Limits reflects the changing limits over time.

To reflect the impact that DG technical functionality and/or settings can have on Hosting Capacity we have developed the following table (traffic light approach) to assess a proposed DG connection against network DG Hosting Capacity.

**Table 1 Traffic Light system**

Light	Consequence
Green	If the proposed DG export is less than the lowest threshold (orange) then the distributed generator can be installed without an engineering review. We do not anticipate that DG export within this threshold will cause any network over loading or voltage excursions.
Orange	If the proposed DG export is greater than the lowest threshold (orange) but less than the highest threshold (red) then the distributed generator can be installed without specific engineering review so long as Volt-VAR control is enabled to manage the risk of over voltage.
Red	If the proposed DG export is greater than the highest threshold (red) then an engineering review will be needed to ensure that export limitations are acceptable, that the transformer, conductors and other components will not exceed thermal ratings or be overloaded, and that voltages will comply with regulations. For approval to be given in this case the network may require upgrades and the customer may be asked for a contribution or face a DG export charge.

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