

Congestion Management Policy

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1. Definitions

Distributed Generation (DG)	Any generation that is connected to the distribution network or that uses the distribution network to facilitate the export of energy. Commonly referred to as DG. This is a subset of DER and is the focus of this policy.
DG Penetration Level	The percentage of ICPs on a Local LV Network that have generating equipment.
DG Penetration Scenario	A defined DG Penetration Level used for the assessment of Hosting Capacity.
Dynamic Export Limit	An export limit that changes in response to real-time network state.
Dynamic Operating Envelope (DOE)	An envelope in which connections may operate consisting of an upper and lower bound. These are used in conjunction with dynamic export limits to allow connections to export at various levels based on real-time network state. Commonly referred to as DOE.
Export Capability	The maximum export power a generating system is capable of delivering to the network.
Export Congestion	The state a local network is in when it can no longer accept any additional export from generating connections.
Fixed Export Limit	An export limit that does not change over time.
Hosting Capacity	The maximum active power (in kW per phase) that each DG customer (at a specified DG Penetration Level) on an LV network can export without causing network constraints. This is the output of the Hosting Capacity Study, for each ICP.
ICP	A customer connected to the Orion network. ICP stands for Installation Control Point.
Inverter	The equipment required to turn DC energy into AC energy for export to the local distribution network.
Low Voltage (LV) Network	Orion's 400V network, commonly referred to as LV.
Local LV Network	A subset of Orion's LV network that is supplied by a single distribution transformer. These are typically the same street or neighbourhood area.
Photovoltaic System (PV)	Refers to a solar panel or array used to generate power. Commonly referred to as PV.
Small-Scale generation	Generation under 69kVA that is eligible for rebates as per Orion's pricing policy.
Static Export Limit	An export limit that is fixed for now while Orion builds dynamic operational capability. This limit may be reviewed over time

2. Overview

2.1 Context

There is an increasing uptake of Distributed Generation (**DG**) by customers connected to the Low Voltage (**LV**) network and a desire for Electricity Distribution Businesses (**EDBs**) to maximise the ability for these customers to export to distribution networks. Historically, the networks have been built to accommodate the flow of electricity in one direction, from source to use. As penetration of DG increases, this flow will more commonly be in both directions. This poses a challenge for EDBs and must be managed to ensure that all connected parties experience a safe and reliable service.

Uptake rates of DG in Australia have shown the risks a network can face when not prepared for a significant amount of generation uptake and the resulting reverse power flow. While Australia is advanced in the uptake of small-scale solar, it is also showing what can be done to minimise the network risk from these installations and ensure EDBs can provide the expected quality of service. One of the methods employed in Australia to manage the risk associated with an increase in distributed generation is Dynamic Operating Envelopes with direct inverter control. This enables the EDB to control an installation's export in response to current network conditions, allowing more export at peak load times and minimising the impact of excess generation at low load times. In most situations, this significantly increases the total energy an installation can export throughout the day.

Orion New Zealand Limited (**Orion** or **we, us, our**) intends to build towards dynamic capability, while ensuring it is cost-effective for customers to do so. The Electricity Authority is also supporting the industry in New Zealand to develop consistent methodologies for the assessment of export limits and improving control capabilities. This is likely to take three to five years for Orion to achieve. Until then, this document sets out the steps Orion will take to actively manage Export Congestion with the tools available to us today.

Please note that this Congestion Management Policy forms part of Orion's Connection and Operation Standards.

2.2 Principles

This policy is underpinned by the following four principles, which guide Orion's decision making as it manages network congestion:

- 1) Orion will seek to maximise export from generation in all instances outside of where a network constraint is present.
- 2) Any advantage or disadvantage to first or last movers within the same LV network will be minimised as much as possible.
- 3) Where a customer wishes to export more than their allocated capacity, they will be able to apply to do so as long as they are prepared to pay for this additional capacity.

- 4) The location of a connection within a Local LV network should not advantage or disadvantage an applicant's Export Limit.

2.3 Scope

This policy applies to all DG on the Orion network unless Orion notifies you of the need for a bespoke congestion management arrangement. DG with a capacity of greater than 30 kW is more likely to require bespoke congestion management arrangements. For the avoidance of doubt, unless we let you know otherwise, this policy applies to all generation connected on the Regulated Terms under Part 6 of the Electricity Industry Participation Code 2010 (**the Code**).

Any application for Export Capability of less than 30 kW will be assessed directly against the Hosting Capacity Study outlined in this policy.

This document focuses solely on Export Congestion.

2.4 Export Congestion Definition

Export Congestion is defined in the Code as a situation where a distribution network cannot accept additional electricity exported from DG because doing so would either:

- 1) Cause one or more network components to operate beyond acceptable limits (including thermal, voltage, fault level, protection, or other operational limits), such that there is a material risk of equipment damage or unsafe operation; or
- 2) Give rise to an unacceptably high voltage at the point of connection.

As a network operator, Orion must operate the network safely, reliably, and in accordance with its power quality and security-of-supply obligations. Avoiding congestion is a fundamental enabler to achieve this. Export Congestion, however it is caused, can compromise both network performance and customer outcomes, making proactive congestion management essential to maintaining safe and reliable operation. This may include a need to constrain generation due to network or grid emergencies. Export Congestion must be avoided or actively managed to prevent equipment overloads, over-voltage, and other adverse electrical effects that could undermine network or power system integrity. This is why Orion requires DG to integrate with the network without causing congestion, and why we deploy both passive and active congestion management tools, including pricing incentives, inverter-based voltage controls, and tailored curtailment or disconnection arrangements. By managing congestion effectively, Orion not only protects its assets and ensures compliance with good electricity industry practice but also maintains fair and safe access for customers connecting to or exporting into the network.

3. Orion's Approach to Congestion Management

Orion does not currently have the capability to operate DG devices in real time. However, we intend to put in place certain measures to ensure we will have the ability to do this in the future. This includes updates to approved equipment, connection agreements, and policies that allow for this type of operation. This ensures we are future-proofing our connection processes and operational capabilities to continue maximising the export capacity of the network now and in the future, while maintaining fair and equitable network access to those wishing to export energy.

In principle, LV network access should not be dominated by first movers and this approach to network access (and congestion management) will allow customers to export equitably regardless of when they choose to connect.

3.1 Embracing a Dynamic Future

To truly maximise export to the real time network capability, export limits need to be dynamically set for each LV network. A Dynamic Export Limit is a cap on how much electricity a generation system can export to Orion's network, which changes based on the network's real time conditions.

As an example, most solar generation happens in the middle of the day when people aren't using much power. That low demand, combined with a high amount of generation, results in a situation where excessive power can flow back through the network and raise local network voltages, creating safety and quality issues. If that happens, Orion would need to temporarily reduce the amount of solar generation that can be exported by each individual connection. In the past, this has been managed using a Fixed Export Limit, set low enough to be safe even in the worst-case DG Penetration Scenarios. In the short term, that approach may be overly conservative at certain times of the day and could prevent customers from exporting more power when the network could allow it. For example, at times of peak demand, Fixed Export Limits restrict the ability for DG owners to provide, and be rewarded for, services that can reduce system peaks. This can help us lower the cost of reinforcing the network and reward those generators for their export.

A Dynamic Export Limit solves this by adjusting to real-time network conditions, allowing higher exports when demand is high, and reducing exports only when needed to keep the network safe or reliable. This is especially beneficial for systems with batteries or Vehicle-to-Grid technology, as they can shift their exports to utilise periods of higher demand on the network.

Orion intends to shift towards Dynamic Export Limits for Small-Scale Generation in the next three to five years. The cost of doing so will be weighed continuously against the benefits of dynamic control and alternative solutions to increasing export limits on the network.

3.2 Managing Congestion Going Forward

Orion will work towards a future that encourages flexibility of customer devices to support the network, and this includes the ability to dynamically manage export to the network. This requires specific equipment and functionality to be available at an installation now to ensure that dynamic management is achievable in the future. To support this, from 1 October 2026, Orion will only approve applications for inverter-based generation on our network that use an inverter capable of dynamic exports. A list of these inverters can be found on the [Clean Energy Council's website](#). The required inverter systems must have communication capabilities, either natively or via a gateway device. This ensures that the system has critical functionality required for the future of network operation, which is beneficial for the owner.

While Orion is on the journey toward Dynamic Export Limits, Static Export Limits will be used to ensure network safety and reliability. To remove conservatism in these limits, we are assuming a fixed DG Penetration Level of uptake across the network. We will continue to review and potentially alter limits as penetration levels approach or cross the DG Penetration Level within each local area.

Subject to Orion's network studies, we intend to approve Static Export Limits up to 10 kW per phase where network studies show it is achievable, but do not guarantee every connection a minimum of a 10 kW export limit.

The network studies will provide Hosting Capacity values for each Local LV network at a specified DG Penetration Level. More information is set out in the following section, with our methodology in Appendix A, but we've summarised some key things to know below.

Several assumptions are required to complete these studies. These assumptions allow us to maximise export capacity as much as possible for each connection on the network, while ensuring we operate within network safety limits and ensuring no first-mover advantage for those parties who may be able to connect ahead of others. In keeping with Principle 2 of this document, Orion may need to reduce the Static Export Limit of certain connections as the local network to which they export experiences congestion due to increasing penetration of DG.

Orion intends to provide conditional approval for those wanting to connect Small-Scale Generation, noting that the Static Export Limit may change over the life of the generation plant, in accordance with this policy, and to ensure the safety, stability, or reliability of our network. For those with existing generation approval on the Regulated Terms under the Code, this policy applies as it is a Connection and Operation Standard. For new and upgrading customers, including those wishing to increase their export limit with existing equipment, an application will need to be made for these changes and any approval will be subject this policy.

For the avoidance of doubt, Orion does not intend to offer a Fixed Export Limit arrangement due to the difficulty caused by locking in capacity for an uncertain future. This means that

there is an increased ability for customers to get greater benefit from their export to the network.

We will base our Static Export Limits on the local network Hosting Capacity where you are connected and wish to export. These limits will be informed by existing DG penetration levels and uptake rates. Once Orion has developed dynamic capability, subject to your generation plant capability, your system will be allowed to export to its maximum potential within safe network operating limits. These Dynamic Export Limits will react to real-time network signals. There may still be network limitations, which may limit the size of the system you wish to install. It is important to note that under this policy, there may be times when Orion limits your export due to the current network conditions. Even with this occurring, it is expected that most customers' export potential will increase. We will keep our customers updated on when we have implemented dynamic capability.

The below sections detail how these values will be used to assess connections and determine relevant export limits.

3.3 Hosting Capacity Study

A Hosting Capacity study assesses a network's ability to support connections. This can be completed for load or generation and requires certain assumptions. This study considers only the generation Hosting Capacity of our Local LV networks to support an uplift in the Export Capability where appropriate.

The key assumption within the generation-based study is:

DG Penetration Level: This assumption concerns the number of generation connections on the assessed network with Export Capability. To ground this figure in real-world DG uptake levels, Orion is using the current DG Penetration Level on each LV network as a baseline and using a DG Penetration Scenario approach to test various penetration levels for each network.

We have assumed penetration levels will increase by 20% for the Hosting Capacity Study and will re-run this study annually. As an example, this means that for a LV network with 100 customers, where 10 ICPs already have DG, the modelled DG Penetration Scenario would have 30 DG connections ($10 + 0.2 \times 100$). A penetration value of 100% will be used in any instance where the 20% increase will push the penetration above 100%. As the DG Penetration Level increases, Orion may need to request that early adopters reduce their Static Export Limits in accordance with this policy. Figure 1 below provides an example of how increasing DG Penetration Levels on a local network impacts the export limits experienced by those connected to that network. This figure also shows how the location of connections can impact this value. Orion has chosen to follow a balanced approach to estimating the location of connections in order to minimise conservatism in the calculations.

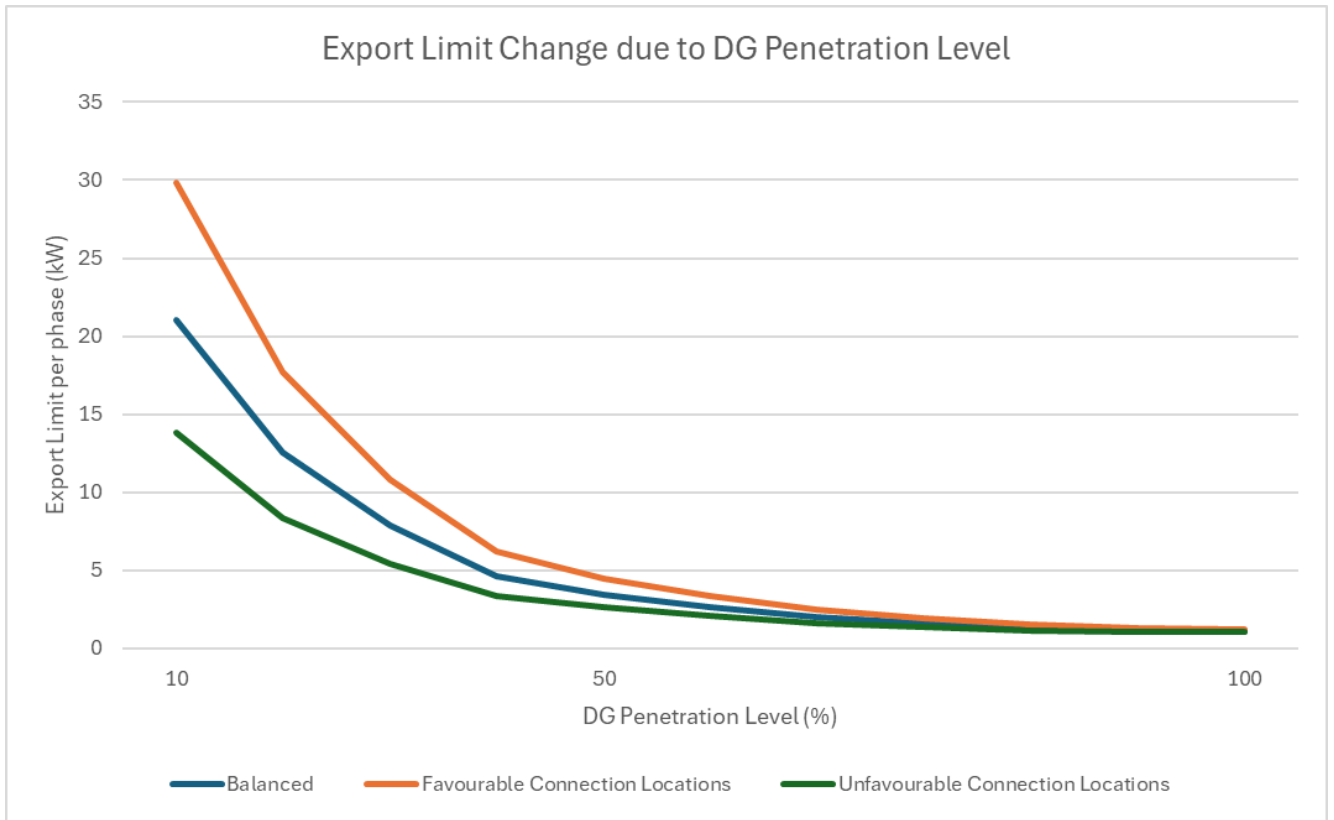
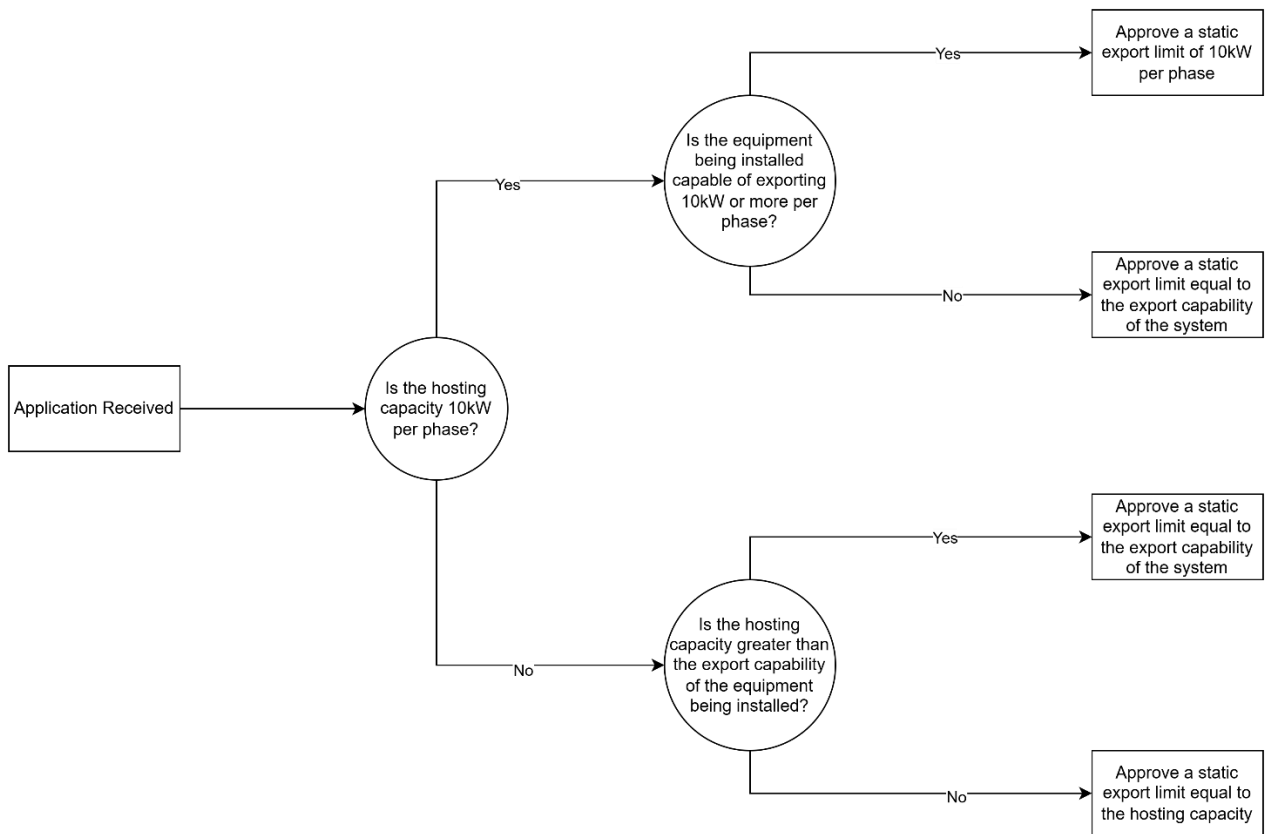


Figure 1: Export Limit change as a result of DG Penetration Level and connection location

4. Connection Level Congestion Management

The flowchart below describes how Orion intends to assess generation applications, supported by the Hosting Capacity values. It illustrates the process followed by the application assessment team, depending on the export capacity applied for.



5. Passive Management

Orion will use passive congestion management options in the first instance where available. Passive management is intended to encourage certain customer behaviours and limit the impact of their activities on the network. Passive congestion management is effective at limiting the impact of constraints caused by generation and generally takes two forms. These are:

Pricing incentives: Orion offers an export rebate to eligible customers with export connections. More information on these can be found on our website (www.oriongroup.co.nz/our-story/pricing). This is intended to encourage generators to shift their export into peak load times and lower Export Congestion when loads are low.

Technology response: Inverter-based generation is equipped with several passive power quality response modes. To connect generation to the Orion LV network, two of these must be enabled: volt/watt and volt/var response modes. These will passively support voltage levels and may reduce Export Capability in response to network voltage conditions. If a connection is found to not have these power quality response modes enabled, Orion may require that the generating equipment is disconnected until it can be proven to be compliant.

The impact of these response modes on a customer's Export Capability will vary depending on the connection location. This is due to the nature of voltage within an electrical network. Historically, without DG, voltages were higher at the point of supply (e.g. the transformer) and lower at the point of connection (e.g. a house). The voltage profile is impacted by the amount of export a network experiences and will therefore depend on where the areas of greatest export are.

These response modes prioritise a reactive power response which has minimal impact on Export Capability, before curtailing real power and impacting Export Capability. Although the effect of this on customer Export Capability is unlikely to be equal across all connections, this passive voltage support enables more generation to connect and export to the network and is therefore seen as a net benefit.

6. Supporting the Future

As outlined in the 'Embracing a Dynamic Future' section above, Orion is developing the capability to send market and control signals either directly to devices or to third party participants to enable flexibility. This will require communication capabilities to exist within the installed devices. This can either be native to the inverter or run through a gateway device. This will enable Orion, or another participant who has a contract with you, to control your device on your behalf. This is essential to maximising the Export Capability of generating devices, as they will only be limited when real-time network information indicates it is required.

7. Managing Congestion in a Dynamic Future

In the event of network congestion, Orion will apply a uniform percentage reduction to the export limits of all installations contributing to that congestion. This approach ensures that curtailment is proportional to each installation's relative impact, with larger systems experiencing a greater absolute reduction in the Dynamic Export Limit than smaller systems. This methodology ensures equitable treatment of all customers throughout the congestion event, consistent with their contribution to the underlying constraint.

This means there is no last on, first off approach or similar. It also means that all DG will be managed collectively regardless of the timing of the connection. This method means that export will be maximised from any DG that is connected at any given time, within safe network operating limits. Where necessary, Orion will curtail generation from connections that are exporting more than the Local Network Static Export Limit before curtailing those within the limit where applicable.

8. Appendix A – Hosting Capacity Study Methodology

8.1 Purpose of the DG Hosting Capacity Study

A DG Hosting Capacity Study is used to understand how much export generation the electricity network can safely support. The study informs the Static Export Limits applied to DG so that the electricity network continues to operate safely within its design limits, while allowing customers to maximise the benefits of their investment.

The outcomes of the study are used to support Orion's Congestion Management Policy and will be completed annually to update the Static Export Limits.

8.2 Overview of the Methodology

Network Modelling

A load-flow model is created for each of Orion's LV networks (approximately 11,000 in total). Load-flow modelling is a standard power system analysis technique used to understand how electricity flows through a network and how voltages and equipment loadings behave under different conditions.

Each LV network is modelled individually to reflect its specific characteristics, such as:

- Network layout and conductor sizes.
- Transformer capacity.
- Number of connected customers.

Customer Demand Modelling

Customer demand at each ICP is modelled using Smart Meter data. To represent realistic operating conditions for DG export (typically PV):

- Demand data is taken at 12:00 midday on a typical summer's day.
- This period reflects high PV generation and relatively low customer demand, conditions under which networks are most likely to be export constrained.

Using measured demand data ensures the study reflects how the network actually operates, rather than relying on estimated demand.

Customer DG Modelling

DG is modelled separately from customer demand:

- Existing DG systems are included at their known locations on the network.
- To represent future uptake, additional DG systems are added to the model based on defined scenarios.

- The modelled scenario assumes existing DG plus a further 20% increase in DG Penetration Level. Where the increase would result in a penetration greater than 100%, the DG Penetration Level will be capped at 100%.
 - For example, in an LV network with 100 ICPs, where 10 ICPs already have DG, the modelled DG count = $10 + (20\% \times 100) = 30$ ICPs.

Future DG Locations

DG Hosting Capacity is sensitive to where DG systems are connected within an LV network. It is not possible to accurately predict which customers will install DG in the future, so instead DG is located using a controlled and repeatable approach that:

- Uses network impedance to select DG locations.
- Minimises phase imbalance.
- Represents an average and fair outcome for all networks.

This approach avoids situations where unfavourable DG placement would result in unnecessarily low Static Export Limits for some customers and ensures consistent treatment across the network.

Determining Hosting Capacity

Once DG locations are set:

- The export for all DG ICPs on an LV network is increased in increments of 1 kW per phase.
- The load-flow analysis is re-run at each step.
- The process continues until a network constraint is observed (either voltage or thermal) or the maximum export limit is reached (10 kW per phase).
- The DG Hosting Capacity is the maximum per-phase export that does not cause any network constraint.
- The DG Hosting Capacity is then used to set the Static Export Limits for all customers connecting DG on that network.
- Since DG Hosting Capacity is calculated per phase, a customer's Static Export Limit depends on the number of phases (i.e. phases \times Hosting Capacity).

Use of the Modelled Scenario

DG Hosting Capacity decreases as penetration increases. To reduce the need for frequent changes to Static Export Limits as DG uptake grows, Orion bases Static Export Limits on the modelled scenario, which assumes 20% additional DG penetration.

This approach:

- Sets Static Export Limits at a level the network can support in the near term.
- Provides operational headroom if actual DG locations result in lower-than-average Hosting Capacity.

- Reduces the likelihood of Static Export Limits needing to be revised frequently.

Orion retains the right to review and update Static Export Limits in the future as DG uptake and network conditions change.

Overall Outcome

This methodology balances:

- Safe and reliable operation of LV networks.
- Fair and consistent treatment of customers.
- The ability for customers to maximise DG export within network limits.