



Powering up for change

New Zealand Electricity Distributor
Network Transformation Roadmap:
A three-year update

OVERVIEW

April 2022





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A Snapshot

The world is at the start of an energy revolution as low-carbon electricity replaces climate-change causing oil and gas.

New Zealand is part of this energy transformation, which will require much greater volumes of reliable and sustainable electricity for homes and businesses.

Lines companies are busy planning to ensure local networks are prepared for this dramatic change in electricity generation and use, all the while keeping the power system stable.

Change includes new local and consumer-based generation and storage technologies which supplement electricity transmitted over the national grid.

New options for generating and delivering power to consumers will also be offered by innovators who will have access to local distribution networks.

Future networks will be much more complex, bringing challenges that include:

Two-way flows of power rather than just one-way, creating new safety and technical demands.

Greater complexities in balancing supply with demand every second to ensure quality of supply and reliability.

Greater peaks and troughs in demand – for example, from the mass uptake of electric vehicles or small-scale solar generation.

New technologies which will give consumer more choices in how they generate and consume power.

While the technical challenges and risks should not be underestimated, the electrification of New Zealand's energy needs is eagerly embraced by lines companies and promises significant rewards for both the climate and consumers.

The Network Transformation Roadmap

Traditional production and use of electricity is changing. Newly affordable technologies are disrupting generation, use, and consumer behaviour, driving unprecedented change and unpredictability in the electricity sector as well as creating opportunities.

These fundamental changes, and the consumer preferences and technology they give rise to, will have a profound impact on the electricity industry in the next 30 years.

These changes, or megashifts, include:

1. the requirement to meet climate change objectives, which can be achieved largely by switching energy use to renewable electricity;
2. new consumer technology, which is increasing the options for consumers to produce and store electricity, as well as use electricity in new ways; and
3. the rise of prosumers who actively engage with their electricity supply.

Given the difficult-to-predict nature of future technology development and consumer behaviour, New Zealand electricity distribution businesses (EDBs) must plan in an environment of considerable uncertainty.

The Network Transformation Roadmap was developed with EDBs by the Electricity Networks Association. Its purpose is to provide information, insights and recommended actions for EDBs to navigate the changes in the way electricity distribution networks will be used in the future.

It aims to best position EDBs to effectively and efficiently meet the future distribution service needs of consumers by guiding EDBs to plan and develop their networks and operations in a way that maintains flexibility in a period of disruptive change.

It also provides stakeholders with a coherent vision of the future role of electricity distribution networks in New Zealand.



Interacting drivers of change

The need for nations to reduce greenhouse gas emissions has given rise to clean energy technologies such as wind power, photovoltaic solar (PV), electric vehicles (EVs) and storage batteries, which in turn enable greater consumer choice and active engagement with electricity supply and/or electricity as a product.

At one extreme is a potential increase in large-scale, centralised renewable generation with the required capacity of the transmission and distribution infrastructure to transport greater volumes of electrical energy to the consumer. Renewable energy will provide a more efficient and emissions-free substitute for existing fossil fuelled processes such as industrial heating and transport.

At the other extreme is the growth of distributed generation (e.g. solar), storage and micro-grids. Such technology might be supplemented by energy-dense renewable fuels such as hydrogen or biofuels. Some energy end use might change to electricity (such as transport), while other uses continue with combustion, but with renewable fuels.

The reality is likely to be somewhere between these extremes, just as consumer behaviour will range between passive and active extremes, as identified in the scenarios that underpin this roadmap.

At the centre of the changes are consumers, who have increasing options for using electricity. They will exercise those options depending on the economics, ease of use, environmental attractiveness, and their circumstances, thereby exhibiting more individual behaviour than in the past.

However, no one knows exactly how consumer behaviour will evolve, nor what new technology will be available in the future and how consumers will use it.

Network adaptation

Also at the centre of these changes is electricity distribution, delivering renewable energy to almost every consumer, and increasingly providing them with the network services to sell their electricity.

It is the role of EDBs to support consumers in adopting new technology in the future, thereby facilitating innovation, and aiding the transition to renewable energy in order to meet climate change objectives.

Ultimately, consumers should be free to connect any new electrical technology they wish to the network, provided the cost of connecting that technology is communicated appropriately and the technology meets appropriate standards to ensure safety and reliability for all connected consumers.

The roadmap updated (2022)

The Network Transformation Roadmap (NTR) was first launched in April 2019 by the Electricity Networks Association. It was created in anticipation of the role electricity distribution businesses would play as key enablers of the transition to a low carbon future.

This future will see increased generation of electricity from renewable sources being used to electrify other sectors such as transport and high temperature industrial processes. There was (and still is) considerable uncertainty as to how and when this transition might occur, but networks could not delay beginning to prepare for it.

The adoption of the NTR was left to individual companies to execute in a way that best fitted their context. Two years on from the launch of the NTR, it was timely to review progress towards implementation to date.

In 2021 the ENA conducted an independent review of progress against actions in the NTR across the electricity networks sector seeking to answer two key questions:

Is the NTR in its current form still relevant?

How are networks progressing in implementing roadmap actions?

The review found the networks sector to be committed to its role in enabling New Zealand's decarbonisation goals. It concluded the NTR remained relevant and there was no need for substantial change. The review found implementation progress to be mixed. In some areas progress had been good while in others it had been slower. However, in mitigation, since the launch of the NTR, growth in solar PV and electric vehicles has continued to be slow and off a low base.

The 2022 NTR update seeks to make the NTR clearer in terms of implementation priorities, stakeholder dependencies, and outcomes. It also recognises and highlights the ongoing importance of collaboration between EDBs and the future steps the sector will take to ensure learnings are shared amongst EDBs.

The key changes to the NTR are as follows:

Prioritisation	Greater clarity has been provided to highlight the key actions in the NTR to ensure these are given sufficient focus.
Dependencies	The 2022 NTR update has identified dependencies between actions to aid implementation.
Regulatory reliance	Actions that are reliant on regulators to initiate have been clearly identified and need to be communicated to the appropriate regulatory body.
Collaboration and sharing	Formalising the process of making EDBs aware of other activity in the sector as a means of fostering collaboration.
Targets	The current 2, 5 and 10-year targets have been refined to define outcomes more clearly at set points of implementation.

The update also shows how the NTR actions fit with wider industry developments to support increased levels of electrification.

Deliverables

The five stages towards fully implementing the NTR are described in more detail in the table below.

Stage	Description	
Initial	<p>Networks will:</p> <ul style="list-style-type: none">• Have limited visibility of their networks and a lack of awareness of what is happening at the network edge.• Be continuing to invest in traditional 'poles and wires' solutions.• Be developing asset management practices with limited references to their peers.	<p>Networks will be experiencing:</p> <ul style="list-style-type: none">• Very low penetration of solar PV (and battery) systems, with linear growth.• Very low penetration of EVs, with linear growth.
Emergent	<p>Networks will:</p> <ul style="list-style-type: none">• Have started to explore ways of accessing data that provides more visibility of their entire network – from engaging with providers of smart meter data and by trialling, testing and implementing their own monitoring systems.• Be evaluating opportunities for non-network solutions as an alternative to traditional investment and have developed an understanding of where opportunities are viable and the challenges in procuring these.• Be actively collaborating with some of their peers in a structured manner around aligning engineering practices and improving asset management practices.	<p>Networks will be experiencing:</p> <ul style="list-style-type: none">• Low penetration of solar PV (and battery) systems, but with signs of accelerating growth.• Low penetration of EVs, but with signs of accelerating growth.



Stage	Description	
Developing	<p>Networks will:</p> <ul style="list-style-type: none"> • Have gained access to LV network information and be using this information to identify DERs on the network, improved understanding of the LV network, and will be developing capability to manage stability of the network over the medium-to long-term. • Have trialled competitive procurement of non-network solutions for defined projects. • Be implementing new DER codes based on new standards introduced by regulators. • Be connecting new customer loads (where applicable) and sharing the learnings with their peers. • Have aligned some current engineering practices with their peers and started to develop asset management practice consistent with ISO55001. 	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> • Medium levels of penetration of solar PV (and battery) systems, but not at levels creating issues requiring investment or intervention. • Medium levels of penetration of EVs, but not at levels creating issues requiring investment or intervention. • Some new loads connecting to their networks as customers shift away from fossil fuels towards electricity.
Mature	<p>Networks will:</p> <ul style="list-style-type: none"> • Have well-developed data management systems and be using these to actively manage their LV networks, enabling customers to connect and use DER without limitation. • Have mature procurement processes that actively test network solutions against those offered by external providers (where it is appropriate to do so). • Continue to implement and adapt new DER codes based on new standards introduced by regulators. • Be developing processes to connect new load types resulting from decarbonisation. • Have aligned key engineering practices with their peers and developed asset management consistent with ISO5500. 	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> • Medium to high levels of penetration of solar PV (and battery) systems at levels creating issues requiring investment or intervention. • Medium to high levels of penetration of EVs at levels creating issues requiring investment or intervention. • New loads connecting to their networks as customers shift away from fossil fuels towards electricity.

Stage	Description	
Leading	<p>Networks will:</p> <ul style="list-style-type: none"> • Be actively managing their LV networks enabling customers to use DER without limitation. • Be working collaboratively with DER owners and aggregators to optimise network performance for least overall cost. • Be actively engaging with regulators to adapt and enhance DER connection and management standards. • Have well-developed processes to connect new load types (being driven by decarbonisation). • Be leading their peers in further developing asset management practices. 	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> • Medium to high levels of penetration of solar PV (and battery) systems at levels creating issues requiring investment or intervention. • Medium to high levels of penetration of EVs at levels creating issues requiring investment or intervention. • New loads connecting to their networks as customers shift away from fossil fuels towards electricity (now being seen as BAU).

Required Network Transformation Roadmap actions

The 2022 NTR update is a rearrangement of the NTR actions to better highlight priorities and dependencies. The NTR actions are split across:

Core focus areas requiring the development of new EDB capability

Non-core focus areas requiring the enhancement of existing EDB capability, and

Support actions to be undertaken by the ENA on behalf of EDBs.

The 2022 NTR update also outlines the various stages of maturity of implementation and describes the expected state for each stage.

While the bulk of the actions need to be implemented by all EDBs, not all actions under the NTR fit every EDB's context. For example the use of off-grid power supplies as an alternative means of supplying customers will not be applicable to all EDBs.

Priority core focus areas to build EDB capability include:

- Access to information including smart meter data and low voltage network data
- Development of procurement processes for demand response and flexibility services
- Standardisation, including DER connection specifications, appliance/DER equipment standards and cybersecurity standards for EDBs.

Supporting actions include:

- An annual innovation stocktake across EDBs
- Monitoring progress and refinement of actions as required in the implementation of the roadmap.







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Electricity Networks Association

The Electricity Networks Association represents the 29 distribution networks that provide and maintain the power lines that deliver electricity to individual homes or business.

The association supports its members in terms of developing policy, regulatory matters, compliance and government relations.