



# *Powering up for change*

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

April 2022



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## Abbreviations and Acronyms

<b>AMI</b>	Advanced metering infrastructure	<b>ICP</b>	Installation control point
<b>AMP</b>	Asset management plan of an electricity distribution business	<b>IMO</b>	Independent market operator
<b>ComCom</b>	Commerce Commission	<b>IPAG</b>	Innovation and Participation Advisory Group, an Electricity Authority advisory group
<b>DER</b>	Distributed energy resource (such as solar PV, distributed generation, electric vehicles, batteries, home energy management systems, and includes demand response)	<b>LRMC</b>	Long run marginal cost
<b>DG</b>	Distributed generation	<b>LV</b>	Low voltage (any voltage below 1,000 Volts, and in New Zealand electricity distribution refers to 400 Volt three phase / 230 Volt single phase electricity distribution network)
<b>DPWG</b>	Distribution Pricing Working Group, an ENA working group	<b>MV</b>	Medium voltage (in New Zealand this refers to electricity distribution above 1,000 Volts, and is typically 11 kV and 33kV, but may also include 22 kV and sub-transmission owned by EDBs of 66 kV)
<b>DR</b>	Demand response	<b>NTR</b>	Network Transformation Roadmap
<b>DSO</b>	Distribution system operator	<b>PV</b>	Photovoltaic solar, in particular rooftop systems
<b>Dx</b>	Distribution	<b>SCADA</b>	Supervisory control and data acquisition (system)
<b>EA</b>	Electricity Authority	<b>SG</b>	Steering Group for the NTR project
<b>EDB</b>	Electricity distribution business	<b>STWG</b>	Smart Tech Working Group, an ENA working group
<b>EEA</b>	Electricity Engineers' Association	<b>SWOT</b>	Strength, weakness, opportunity, threat
<b>EIPC</b>	Electricity Industry Participation Code	<b>RAPS</b>	Remote area power supply
<b>ENA</b>	Electricity Networks Association (of New Zealand)	<b>RWG</b>	Regulatory Working Group, an ENA working group
<b>EV</b>	Electric vehicle	<b>TOU</b>	Time of use
<b>HEMS</b>	Home energy management system		
<b>HILP</b>	High impact low probability, usually used to refer to an event that affects electricity distribution networks		

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# Executive Summary

The Network Transformation Roadmap (NTR) was launched in April 2019 by the Electricity Networks Association (ENA). It was created in anticipation of the role electricity distribution businesses (EDBs) will 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 preparing 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 implementation to date.

In early 2021 the ENA engaged Dr Allan Miller to conduct an independent review of progress against actions in the NTR across the electricity networks sector. In conducting the progress review Dr Miller interviewed 21 out of 27 network companies and the ENA. The review sought to answer two key questions,

- Is the NTR in its current form still relevant?
- How are networks progressing in implementing roadmap actions?

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

The ENA's Smart Technology Working Group (STWG) has considered the findings of Dr Miller's review and has also critically re-examined the NTR. It concluded that there was no need to change the existing NTR actions or timeframes. With New Zealand's commitment to net-zero by 2050, the NTR remains more important than ever and the group recognised the need to present the NTR in a way that is clearer and more compelling.

The result is this document – the 2022 NTR update.

The NTR update addresses the findings from Dr Miller's review. It 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 among EDBs.

The key changes to the NTR are as follows:

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

The STWG also felt it was important to show how the NTR actions fitted with wider industry developments to support increased levels of electrification.

Since the publication of the NTR, discussion has begun to emerge around the future need for a distribution system operator (DSO). The DSO role is still to be defined in a New Zealand context. It is feasible that multiple parties will be involved in carrying out the activities of a DSO. They will be dependent upon the readiness of EDBs.

The NTR actions enable a DSO function. The NTR is essentially a plan for DSO readiness. It does not presume how the DSO might be structured, nor who might carry out the DSO function. Instead it ensures EDBs are prepared for when the DSO function is required by,

- Improving the visibility, and knowledge, of the capability of the low voltage network,
- Carrying out DER hosting capacity analysis,
- Forecasting of demand, generations and DER capability at a more granular level,

- Ensuring standards are in place to connect DER and ensure future interoperability of these devices, and
- Developing the capability for procurement of non-network alternatives

The NTR is only one aspect of a suite of activities underway by electricity networks to enable a low carbon future. Implementing the NTR cannot be achieved without the support of industry stakeholders. The ENA will continue to work closely and constructively with these parties to support the transition to a low-carbon future.

## Acknowledgements

This report has been prepared with the input and contribution of the Electricity Network Association's Smart Technology Working Group.

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# 1

# Background

## History

The Network Transformation Roadmap (NTR) was formally launched in April 2019 by the Electricity Networks Association (ENA). This followed eighteen months development by the ENA's Smart Technology Working Group (STWG) including several rounds of consultation with key stakeholders.

[www.ena.org.nz/resources/publications/document/483](http://www.ena.org.nz/resources/publications/document/483)

The NTR was created in anticipation of the role electricity distribution businesses (EDBs) will 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. Much of this change will take place at the grid edge where there will be large numbers of electric vehicles (EVs) and solar PV systems, some with batteries, connected to networks creating a new and more dynamic demand side. These devices are collectively called distributed energy resources (DERs)

The problem the NTR seeks to address is not unique to NZ. Globally, energy systems are undergoing unprecedented change to support a low carbon future. The NTR set out the pathway EDBs need to follow within the context of the New Zealand energy system.

There was (and still is) considerable uncertainty as to how and when this transition might occur, but it was clear networks could not wait to begin preparing for it. To overcome this a range of future scenarios was created. Each was predicated on New Zealand meeting its decarbonisation targets<sup>1</sup>. These scenarios represented plausible but deliberately challenging futures and were used to determine the capabilities and tools electricity networks would need even under extreme scenarios. From this a common set of 'least regrets' actions were developed.

The NTR is comprised of nineteen least regrets actions based around seven workstreams. These were designed to assist New Zealand electricity networks to build readiness for the new energy future. These actions are to be implemented over a ten-year period to 2030.

The NTR was solely focused on the core function of electricity networks – to deliver a safe and economic supply of electricity to consumers. It did not seek to promote the commercial activities of EDBs. Its aim was to ensure electricity networks continue to provide a resilient, safe, reliable, and efficient electricity distribution service that allows consumers to connect and operate whatever devices they choose.

It is clear that in the future this will be different from today. This will require electricity networks to develop new capability to sit alongside current competencies. The NTR is about building new capability and enhancing existing capability within EDBs.

## What has happened since the NTR launch?

In the three years since the launch of the NTR, there has been a major shift in attitude and commitment towards New Zealand's decarbonisation goals. The sixth Labour government was elected with a strong mandate to tackle climate change. New Zealand has committed to becoming net-zero by 2050, and to codify this the Climate Change Response (Zero Carbon) Amendment Act 2019 was enacted in November 2019. The Climate Change Commission has subsequently been established and issued its first Emissions Reduction Plan.

All this lays the foundations for the transition to a low-carbon future.

This work is now influencing the electricity distribution industry with the Electricity Authority's recent consultation document Updating the Regulatory Settings for Distribution Networks.

Despite the political appetite for a move to net-zero in the last two years, growth in DERs (solar PV and electric vehicles) has been slower than anticipated and from a low base.

Solar PV installations have grown from 23,601 ICPs (April 2019) to 34,600 ICPs (September 2021). Overall penetration is currently at 1.6% and is growing at 0.2% p.a. There have been recent signs of connection growth accelerating with new annual connections passing 5,000 ICPs for the first time, but this recent growth has only recently surpassed the previous peak in 2018. There are also signs of a shift towards more commercial installations which is driving solar PV capacity growth. If this trend continues it will result in fewer installations (less DERs) but with higher capacity per installation.

Graph one shows 12 months of new solar connections by different groups normalised to August 2014.

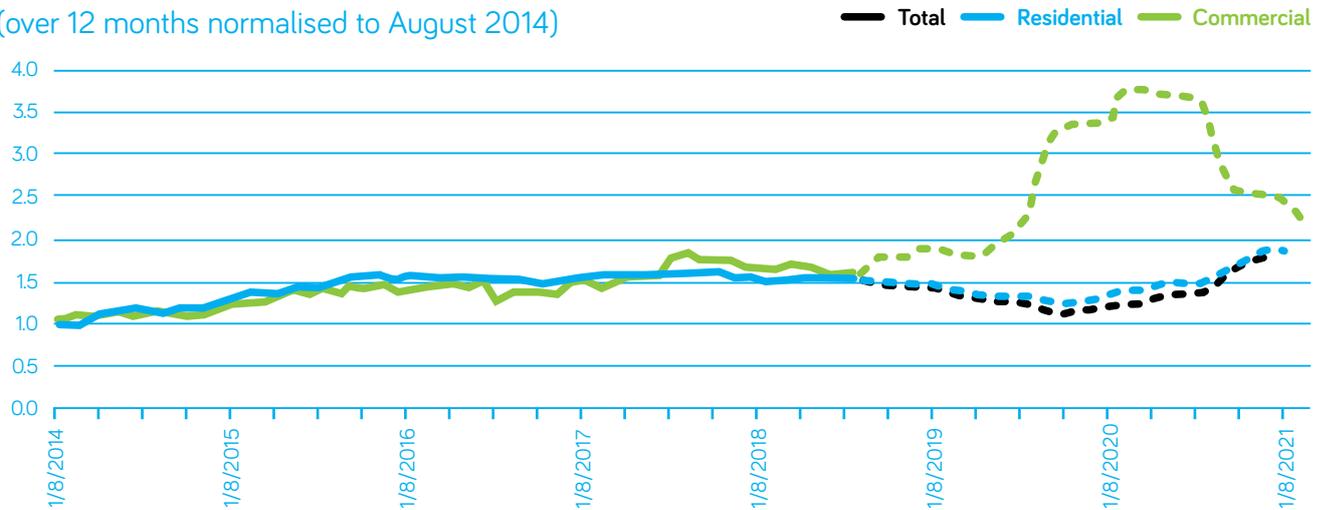
EVs have grown from 13,679 (April 2019) to 32,780 (September 2021). This represents just under 1 percent of the total light passenger fleet. Sales of EVs were 2 percent of total sales for the second quarter of 2021. Quarterly EV sales have ranged between 1.9% and 3.4% of total sales for the last two and a half years.

While EV sales have picked up with the introduction of the clean car discount in July 2021, it is too early to assess the long-term impact.

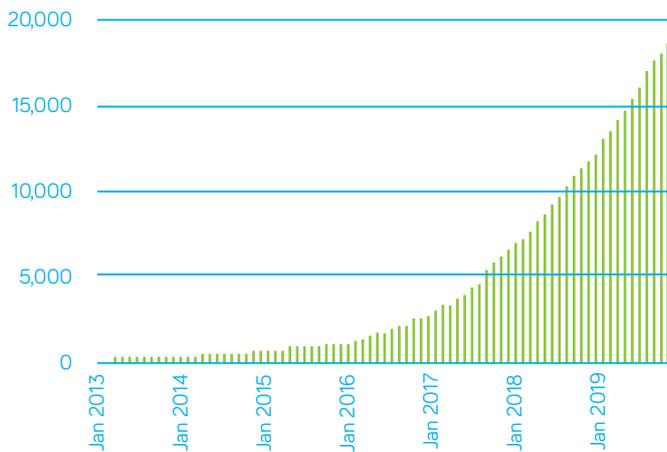
<sup>1</sup> Notably its Nationally Determined Contribution by 2030 under the Paris Agreement and net-zero emissions by 2050.

**GRAPH ONE**  
**NZ Solar PV – new connections**

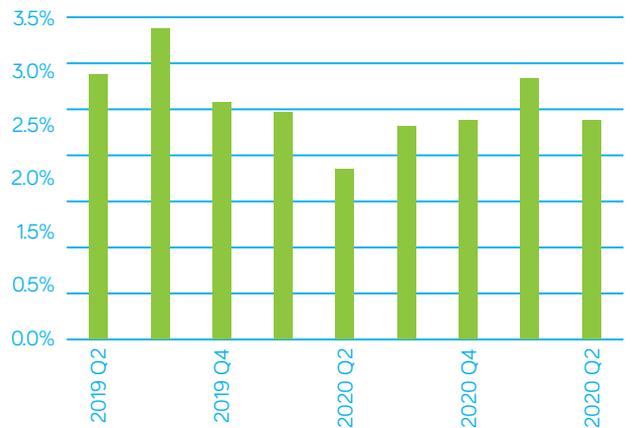
(over 12 months normalised to August 2014)



**GRAPH TWO**  
**NZ EV fleet**



**GRAPH THREE**  
**NZ EV registrations**  
 (as % total registrations)



## Distribution System Operator Readiness

Since the publication of the NTR, discussion has begun to emerge around the future need for a distribution system operator (DSO) in a future where there are large numbers of DERs connected to networks creating a new and more dynamic demandside. The DSO role is still to be defined in a New Zealand context.

Regardless of form and structure, for a DSO to be able to operate effectively certain enabling actions must be implemented. The NTR actions are deliberately designed to enable a DSO function. The NTR is essentially a plan for DSO readiness. It does not presume how the DSO might be structured, nor who might carry out the DSO function. Instead it ensures EDBs are prepared for when the DSO function is required by:

- Improving the visibility, and knowledge of the capability, of the low voltage network,
- Ensuring standards are in place to connect DER and ensure future interoperability of these devices, and
- Developing the capability for procurement of non-network alternatives.

## Independent progress review

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

In early 2021 the ENA engaged Dr Allan Miller to conduct an independent review of progress against actions in the NTR across the electricity networks sector. The review sought to answer two key questions:

- Is the NTR in its current form still relevant?
- How are networks progressing in implementing roadmap actions?

In conducting his progress review Dr Miller interviewed 21 out of 27 network companies, and the ENA.

A full copy of the review can be found on the ENA website:

[www.ena.org.nz/resources/publications/document/947](http://www.ena.org.nz/resources/publications/document/947)

Pleasingly, Dr Miller found all networks interviewed understood clearly their future role in enabling decarbonisation.

He also found that:

- The NTR continues to remain relevant, particularly given New Zealand's commitment to achieving net-zero by 2050.
- As expected there have been shifts in some of the megashifts and uncertainties that form inputs into the NTR but there was no need for fundamental changes to the NTR as a result.
- The ten-year NTR milestones were still appropriate. Expected growth in DERs since the launch of the NTR had been slower than expected.
- Good progress had been made in some areas, notably low voltage network monitoring, although further work was needed in getting access to smart metering data for all EDBs.
- There has been a lack of progress in other areas, particularly in those where EDBs are dependent upon actions from regulators.
- There were some areas where individual companies had made substantial progress on key actions. Sharing learnings from these activities will help all other EDBs build capability faster.
- The progress review found good evidence of collaboration across networks but acknowledged more was required if the NTR actions were to be realised across the sector.
- There is a need for greater awareness and communication around the NTR at executive level and boards of EDBs.
- The biggest challenge cited by all networks interviewed was access to skills and resources. This has implications for how actions will be implemented.

The findings of the progress review were given careful consideration by the STWG. Their response is outlined in the following section.



# 2

## Response to Progress Report

### STWG response to progress report

The ENA's Smart Technology Working Group (STWG) has reviewed the NTR Progress Report and largely agreed with Dr Miller's findings. The current state of progress was in line with expectations given the initial stages of implementation.

While the group accepted the findings of the progress review, they noted the following:

- In areas where single companies have made progress on a key action, e.g. Aurora's procurement of a non-network solution, this actually represents significant progress.

Having a small number of EDBs develop capability before sharing their learnings across the sector is a pragmatic means of collectively developing capability in a resource constrained sector. Such an approach requires collaboration and the STWG recognises the need to develop more formal processes to ensure the sector has full awareness of activities being undertaken by all EDBs.

- A number of actions relating to the development of new standards had shown little or no progress. These actions are all dependent on regulators initiating new regulations and endorsing new standards before EDBs can adopt these.

Work by the STWG has shown a high degree of conformance to the code (and related standards) for distributed generation connection. This provides a high degree of confidence that new standards will be operationalised once ratified.

- Measuring progress against each of the 19 actions presents a view of progress across the entire suite of actions but does not highlight the criticality of some actions or the dependency of some actions on others.

The STWG recognises the need to present NTR actions in a way that highlights more clearly their criticality and interdependency.

In addition to considering the progress review, the STWG critically re-examined the NTR. Since publication of the NTR the STWG has expanded its membership, now representing 16 EDBs and with participation from Transpower (Asset Owner and System Operator). Many current members were not involved in the development of the NTR and so were able to bring a fresh perspective to this exercise.

In reviewing the NTR the group asked itself:

- Are all the actions in the NTR still relevant?
- Are there any new actions to add to the NTR?
- Is the current pace of change still appropriate and do progress outcomes need restating?

The group has decided all actions remain relevant and that no new actions are needed.

The group also agreed with Dr Miller's assessment that the ten-year milestones remained appropriate and there was no need to move these forward.

While there was no substantive change to the NTR in terms of actions or timing, the STWG recognised a need to more clearly outline implementation priorities and dependencies. The group also saw a need to highlight where the NTR fitted with other industry developments.

The group noted the 'Enable Distribution Network Trading' action was broad and had elements outside the scope of the NTR. Recent work by the Electricity Authority's Innovation and Participation Advisory Group had highlighted the significant amount of work and number of parties involved to enable full peer to peer trading. Given this, the STWG proposes to restate this action to ensuring trading on the distribution network is enabled without compromising network stability. The group considered that implementing all other actions in the NTR would address this action (i.e. it is an outcome of the NTR).

The proposed changes which collectively have led to the NTR Update are summarised on the next page.

## Summary of key changes

The changes to the NTR are as follows:

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

Each of the above is outlined in more detail in the remainder of this section.

## Prioritisation

While all actions within the NTR need to be implemented there are a core set of actions that are fundamental. These centre around information, standardisation, and procurement.

Fifteen of the 19 NTR actions sit across these three areas. To highlight the importance of these actions they have been regrouped into these areas. Previously they had been spread

across all seven workstreams. These actions all relate to the building of new capability.

There is a fourth area deemed core to the NTR – Cost-Reflective Pricing. This supports the NTR through creating the right incentives. There were no prescribed actions under the NTR for this area. Instead it was recognised that work done by the ENAs Distribution Pricing Working Group would support the NTR. This remains the case.

The remaining actions fall into the following two areas:

- **Consumer driven** – ‘Understanding New Loads’ is driven by consumer activity as they look to decarbonise their energy use.
- **Asset management** – ‘More Consistent Network Engineering’ and ‘Improved Asset Management Practices’ are about improving asset management capability to support the adaptation of networks to enable a low carbon future.

EDBs already have developed capability in these areas. The actions relate to the future enhancement of this capability.

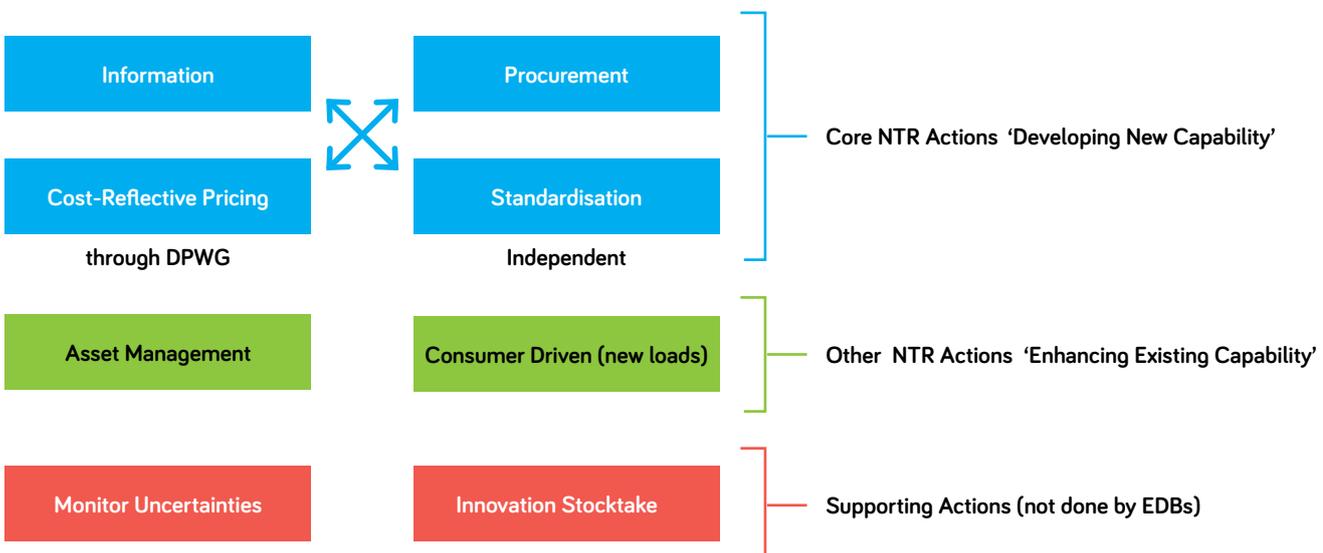
There are two further actions that support the NTR, namely:

- **Monitor Uncertainties and Adjust Roadmap** – this is to ensure the NTR (and subsequent updates) remain relevant given changes in the external environment. This action was recently completed as part of the recent progress review.
- **Annual Innovation Stocktake** – this is to socialise innovation activities undertaken by EDBs to their peers as a means of fostering greater collaboration. This action is described in more detail in Section 4.

These actions are not to be carried out by individual EDBs. Instead they will be undertaken by the ENA.

The regrouping of NTR actions is shown in the diagram below.

### Regrouping of NTR actions



## Dependencies

A number of NTR actions are dependent on other actions. This is particularly the case for actions relating to the use of data and modelling.

Actions have now been grouped into three categories:

- **Foundational** – these are actions which are critical (high priority), and which support downstream actions.
- **Dependent** – these are actions which are dependent on another action, or actions, being completed first.
- **Independent** – these are standalone actions. They are not required to enable downstream actions, nor are they dependent on other actions being completed first. They may however be dependent on other parties, e.g. regulators, enabling them through other actions. There is no prescribed order for completing these. In some cases a collaborative or centralised approach may be the most appropriate way to deliver them.

Actions within the NTR Update have been organised according to dependency to assist EDBs with prioritisation.

Actions with details of underlying dependencies can be found in Appendix A.

## Regulatory reliance

Four of the NTR actions are dependent on precursor actions from regulators. These are:

- Understand new DG
- DER connection codes
- Appliance and DER equipment standards
- Cybersecurity and autonomous DERs.

These will be re-presented as part of a single action – Standardisation. Progress by EDBs under this action will be dependent upon regulators taking the initial actions to enable EDBs to adopt and enforce standards.

## Collaboration and sharing

The NTR was silent on implementation, leaving this for individual networks. What has become clear since the launch of the NTR is the importance of collaboration in delivering the NTR across the sector. The progress review noted evidence of good collaboration between EDBs. The STWG felt a more formalised means of raising the awareness of innovation undertaken by individual EDBs would support greater collaboration. The proposed approach is outlined in Section 4.

## Deliverables

The NTR outlined two, five and ten year deliverables for each action. The two year deliverables were used in the progress review to assess progress against each action.

The granular set of measures was not the optimal guide for EDBs implementing the NTR. They did not reflect the importance of actions or the interdependency of some actions. While this has been addressed through greater prioritisation and highlighting of dependencies (refer above) the group thought it was more useful to present targets in the form of outcomes at specific stages of implementation.

The five stages towards fully implementing the NTR are:

- Initial
- Emergent
- Developing
- Mature
- Leading.

These are described in more detail in the table on the following page.

Stage	Description	
<b>Initial</b>	<p>Networks will:</p> <ul style="list-style-type: none"> <li>• Have limited visibility of their networks and a lack of awareness of what is happening at the network edge.</li> <li>• Be continuing to invest in traditional ‘poles and wires’ solutions.</li> <li>• Be developing asset management practices with limited references to their peers.</li> </ul>	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> <li>• Very low penetration of solar PV (and battery) systems, with linear growth.</li> <li>• Very low penetration of EVs, with linear growth.</li> </ul>
<b>Emergent</b>	<p>Networks will:</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• Be actively collaborating with some of their peers in a structured manner around aligning engineering practices and improving asset management practices.</li> </ul>	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> <li>• Low penetration of solar PV (and battery) systems, but with signs of accelerating growth.</li> <li>• Low penetration of EVs, but with signs of accelerating growth.</li> </ul>
<b>Developing</b>	<p>Networks will:</p> <ul style="list-style-type: none"> <li>• 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 are developing capability to manage stability of the network over the medium- to long-term.</li> <li>• Have trialled competitive procurement of non-network solutions for defined projects.</li> <li>• Be implementing new DER codes based on new standards introduced by regulators.</li> <li>• Be connecting new customer loads (where applicable) and sharing the learnings with their peers.</li> <li>• Have aligned some current engineering practices with their peers and started to develop asset management practice consistent with ISO55001.<sup>2</sup></li> </ul>	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> <li>• Medium levels of penetration of solar PV (and battery) systems, but not at levels creating issues requiring investment or intervention.</li> <li>• Medium levels of penetration of EVs, but not at levels creating issues requiring investment or intervention.</li> <li>• Some new loads connecting to their networks as customers shift away from fossil fuels towards electricity.</li> </ul>

<b>Mature</b>	<p>Networks will:</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Have mature procurement processes that actively test network solutions against those offered by external providers (where it is appropriate to do so).</li> <li>• Continue to implement and adapt new DER codes based on new standards introduced by regulators.</li> <li>• Be developing processes to connect new load types resulting from decarbonisation.</li> <li>• Have aligned key engineering practices with their peers and developed asset management consistent with ISO55001.</li> </ul>	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> <li>• Medium to high levels of penetration of solar PV (and battery) systems at levels creating issues requiring investment or intervention.</li> <li>• Medium to high levels of penetration of EVs at levels creating issues requiring investment or intervention.</li> <li>• New loads connecting to their networks as customers shift away from fossil fuels towards electricity.</li> </ul>
<b>Leading</b>	<p>Networks will:</p> <ul style="list-style-type: none"> <li>• Be actively managing their LV networks enabling customers to use DER without limitation.</li> <li>• Be working collaboratively with DER owners and aggregators to optimise network performance for least overall cost.</li> <li>• Be actively engaging with regulators to adapt and enhance DER connection and management standards.</li> <li>• Have well-developed processes to connect new load types (being driven by decarbonisation).</li> <li>• Be leading their peers in further developing asset management practices.</li> </ul>	<p>Networks will be experiencing:</p> <ul style="list-style-type: none"> <li>• Medium to high levels of penetration of solar PV (and battery) systems at levels creating issues requiring investment or intervention.</li> <li>• Medium to high levels of penetration of EVs at levels creating issues requiring investment or intervention.</li> <li>• New loads connecting to their networks as customers shift away from fossil fuels towards electricity (now being seen as BAU).</li> </ul>



# 3

## NTR Update

### Goal

A pathway to a framework that underpins:  
**(A)** sustainable connection of new technology to the distribution network;  
**(B)** trading energy and capacity between consumers and market participants; with  
**(C)** distribution well informed on planning, investment, and operational requirements.

### Understanding

Consumer Insights

Monitor uncertainties  
and adjust roadmap

### Open Network Framework

Network operation,  
monitoring and stability

Standardise technical  
arrangements

Cost-Reflective Pricing  
and Regulation

### Enabling

Build and adapt EDB capability

The original NTR consisted of 19 actions arranged across seven workstreams as shown in the diagram above.

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

The NTR Update is shown on the following pages. A reconciliation between actions from the NTR to the NTR Update can be found in Appendix B.

The 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.

## Core focus areas

*'Building New Capability'*

Information	Standardisation	Procurement	Cost-Reflective Pricing
<b>Foundational</b> <ul style="list-style-type: none"> <li>• Access to smart meter data</li> <li>• Low voltage (LV) monitoring (or access AMI operational data)</li> </ul>	<b>Foundational</b> <p>None but regulators need to undertake actions to enact new standards.</p>	<b>Foundational</b> <ul style="list-style-type: none"> <li>• Demand response (DR) framework</li> <li>• Develop contracting for network support</li> </ul>	<p>Actions to be undertaken by the ENA's Distribution Pricing Working Group.</p>
<b>Dependent</b> <ul style="list-style-type: none"> <li>• Understand DER deployment</li> <li>• Network stability</li> <li>• Provision of network information</li> <li>• Network understanding</li> </ul>	<b>Dependent</b> <p>None</p>	<b>Dependent</b> <ul style="list-style-type: none"> <li>• Third party DER/DR for network support</li> <li>• Enable distribution network trading</li> </ul>	
<b>Independent</b> <p>None</p>	<b>Independent</b> <ul style="list-style-type: none"> <li>• New distributed generation (DG)</li> <li>• DER connection codes</li> <li>• Appliance/DER equipment standards</li> <li>• Cybersecurity for DERs</li> </ul>	<b>Independent</b> <ul style="list-style-type: none"> <li>• Off grid power supplies</li> </ul>	

## Non-core focus areas

*'Enhancing Existing Capability'*

Consumer Driven	Asset Management	Innovation Stocktake	Progress Review
<b>Foundational</b> <p>None</p>	<b>Foundational</b> <p>None</p>	<ul style="list-style-type: none"> <li>• Collate and disseminate sector innovation activities</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor uncertainties and adjust roadmap</li> <li>• Monitor implementation progress across sector</li> </ul>
<b>Dependent</b> <p>None</p>	<b>Dependent</b> <p>None</p>	<p>To be carried out annually</p>	<p>To be carried out as required</p>
<b>Independent</b> <ul style="list-style-type: none"> <li>• New loads</li> </ul>	<b>Independent</b> <ul style="list-style-type: none"> <li>• Network Engineering</li> <li>• Asset management practice</li> </ul>		

## Supporting Actions

- Foundational** – high priority/do first
- Dependent** – need foundational actions done first
- Independent** – can be done at any stage (some collaboratively)



# 4

## Further Work to Support the NTR

The NTR actions are clear and unchanged. The bulk of these need to be implemented by individual EDBs. However a number are dependent on actions by other parties, namely regulators. Some can be progressed through collective action, as has happened previously via working groups set up by the STWG. Some can be advanced by letting an individual EDB take the lead before sharing learnings. The STWG recognised that there are also additional actions outside of the NTR that support its adoption and implementation. These are outlined further in this section.

### Annual innovation stocktake

The progress review provided insight into what activities EDBs are currently undertaking. It highlighted the value of having small groups of EDBs focus on a particular action, rather than the entire sector collectively concentrating their efforts on that action. The review also noted that those companies that had focused on particular actions were driven by genuine business needs which increased the likelihood of a successful outcome. Sharing the learnings and intellectual property from those networks allows others to implement NTR actions more quickly and is an effective means for the sector to collectively grow capability.

For such an approach to work requires collaboration between networks. The review found evidence of good collaboration across the sector. It acknowledged that collaboration was a key success factor in implementing the NTR.

Collaboration requires awareness. EDBs need to be aware of activities that their peers are undertaking. While there are many forums for sharing, the STWG saw a need to support collaboration through a formal process of an annual innovation stocktake.

It is proposed that the ENA, through the STWG, conduct the stocktake. In its current form the STWG represents a majority of EDBs providing a solid base of coverage. Non-STWG members would be contacted and results for the overall sector compiled and disseminated to all EDBs. The stocktake is not designed to be exhaustive but to highlight key activities and make other EDBs aware of them. The stocktake also offers the opportunity to assess general progress across the sector in implementing the NTR.

The stocktake will not form a specific action under the original NTR but is a key mechanism to disseminate information and foster further collaboration.

### Ongoing Progress Reviews

Networks are committed to enabling a low carbon future. The NTR is the primary mechanism for building readiness over the remainder of the current decade.

Progress needs to be made by **all** networks towards implementing the NTR. The ENA will continue to monitor progress across the sector through the STWG. The NTR itself needs regular review to ensure it remains relevant in the face of expected change. Future progress reviews will continue to examine both aspects.

To maintain objectivity, progress reviews will continue to be independent, providing assurance that a full and accurate picture is presented. An appropriate timeframe for the next review would be early 2024, at the five-year point of the NTR. This timing is not fixed, and may vary depending on other changes. In the interim it is expected that the annual innovation stocktake will provide regular feedback to EDBs on how they are progressing relative to their peers.

### Stakeholder Engagement

When developing the NTR, the STWG undertook several rounds of consultation with key stakeholders, most notably the sector regulators.

The NTR represents a key set of actions for networks to prepare for their role as enablers of increased electrification that will drive the transition to a low carbon future. The NTR update highlights a number of these actions are dependent on regulators adopting standards.

Implementing the NTR cannot be achieved without the support of industry stakeholders. The ENA will continue to work closely and constructively with these parties to support the transition to a low-carbon future.

## Appendix A

# NTR actions – dependencies and linkages

### Foundation Actions

NTR Action	Dependency
1. Access to smart meter data	N/A
8. Demand response framework	N/A
13. Low voltage (LV) network monitoring and visibility	N/A
17. Contracting for network support	N/A

### Dependent Actions

NTR Action	Dependency
2. Understand DER deployment	Dependent upon: 1. Access to smart meter data
6. Enable distribution network trading	Dependent upon: 1. Access to smart meter data 7. Third party DER and DR for network support 13. Low voltage (LV) network monitoring and visibility Also needs to be informed by cost-reflective pricing
7. Third party DER and DR for network support	Dependent upon: 8. Demand response framework 17. Contracting for network support
14. Network stability	Dependent upon: 1. Access to smart meter data 2. Understand DER deployment 14. Low voltage (LV) network monitoring and visibility 16. Network understanding Also needs to be informed by cost-reflective pricing
15. Provision of network information	Dependent upon: 1. Access to smart meter data 2. Understand DER deployment 13. Low voltage (LV) network monitoring and visibility
16. Network understanding	Dependent upon: 1. Access to smart meter data 13. Low voltage (LV) network monitoring and visibility

NTR Action	Dependency
3. New loads	N/A
4. New distributed generation (DG)	Action is dependent upon regulators taking initial actions to enable this.
9. DER connection codes	Action is dependent upon regulators taking initial actions to enable this.
10. Appliance and DER equipment standards	Action is dependent upon regulators taking initial actions to enable this.
11. Network engineering	N/A
12. Cyber security and autonomous DERs	Action is dependent upon regulators taking initial actions to enable this.
18. Asset management practice	N/A
19. Off grid power supplies	N/A

### Support Actions

NTR Action	Dependency
5. Monitor Uncertainties	N/A
NEW Innovation Stocktake	N/A

## Appendix B

### NTR actions

NTR Action		NTR Workstream	NTR Update Focus Area	
1. Access to smart meter data	Progressively over time address barriers to half-hourly consumption data to understand emerging behaviours and ultimately be able to access sub half-hourly and power quality data.	Consumer Insights	Information	Foundation
2. Understand DER deployment	Data on DER deployment (such as location, type and size) available, moving to consumer understanding and scenario modelling to understand DER deployment possibilities.	Consumer Insights	Information	Dependent
3. New loads	Start by understanding connection requirements (such as location, type and size) of new loads, move to actively planning for and delivering network services to new loads.	Consumer Insights	Consumer Driven	Independent
4. New distributed generation (DG)	Understand new DG connection requirements. Develop and trial new DG connection standards (for both small- and large-scale DG) and implement consistently across all EDBs.	Consumer Insights	Standardisation	Independent
5. Monitor uncertainties	Monitor uncertainties, megashifts and consumer behaviours and periodically feed into roadmap programmes where necessary.	Monitor Uncertainties and Adjust Roadmap	Support	As required
6. Enable distribution network trading	Understand access requirements for DERs, open up access, and move to full and equal access to the distribution network as a vital platform for delivery of energy and capacity to and by consumers.	Open Network Framework	Procurement	Dependent
7. Third party DER and DR for network support	Start by trialling DER and DR support to putting in place processes and systems for acquiring and using it, to DER and DR being an important contributor to network operation and support.	Open Network Framework	Procurement	Foundation
8. Demand response framework	Work with regulators on the challenges of multiple users of DR – trial and move to full scale of third party supplied DR to manage the distribution network.	Open Network Framework	Procurement	Foundation
9. DER connection codes	EDBs jointly develop and implement new agreed connection frameworks/codes moving to regular and consistent use by all EDBs, with consistency maintained across all EDBs.	Standardise Technical Arrangements	Standardisation	Independent

NTR Action		NTR Workstream	NTR Update Focus Area	
10. Appliance and DER equipment standards	EDBs collectively assess and contribute to international standards to ensure they are appropriate for NZ and adapt equipment standards appropriate to NZ. Test houses to approve equipment as compliant before being allowed on the network. All equipment connecting to the network is compliant to approved standards and codes, with consistency across all EDBs.	Standardise Technical Arrangements	Standardisation	Independent
11. Network engineering	Investigate how best to achieve consistent network and move to consistent practice across all EDBs.	Standardise Technical Arrangements	Asset Management	Independent
12. Cyber security and autonomous DERs	Research appropriate cyber security standards and standards for autonomous DERs. Trial and implement standards to ensure stability of autonomous DERs.	Standardise Technical Arrangements	Standardisation	Independent
13. Low voltage (LV) network monitoring and visibility	Roll out of LV monitoring systems with data management systems and provision of advanced metering infrastructure (AMI) data to assist with network management. Improve quality and type of monitored data over time. Lead to extensive knowledge of each LV network.	Network Operation, Monitoring and Stability	Information	Foundation
14. Network stability	Research the implications of numerous autonomous DERs and methods of control. Trial control systems and implement control systems across EDBs.	Network Operation, Monitoring and Stability	Information	Dependent
15. Provision of network information	Investigate and trial provision of network information to operators, moving to regularly providing network information to operators, and extensive provision to information.	Network Operation, Monitoring and Stability	Information	Dependent
16. Network understanding	Understand congestion in LV networks (which may include medium voltage networks). Understand the ability of the LV network to host DERs, and opportunities for DERs to mitigate congestion.	Build and Adapt EDB Capability	Information	Dependent
17. Contracting for network support	Trial framing of EDB's requirements for network support and introduce contestable procurement to discover a range of solutions. Develop the necessary processes to support contestable procurement of network support from trial experience. Move to regular practice, practiced consistently across all EDBs.	Build and Adapt EDB Capability	Procurement	Foundation
18. Asset management practice	EDBs collectively explore, trial, and implement improved asset management practices and consistent frameworks across all EDBs.	Build and Adapt EDB Capability	Asset Management	Independent
19. Off grid power supplies	Move from trialling remote area power supplies to best practice between EDBs and industry, practiced where it is more economic than traditional networks.	Build and Adapt EDB Capability	Procurement	Independent



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