

# A FLEXIBILITY PLAN 1.0:

what we need to do and how  
we can do it

The FlexForum is a cross industry group formed to identify a set of actions to integrate distributed energy resources (DER) into the electricity system and markets to maximise the benefits for Aotearoa New Zealand. The FlexForum is a coordination point for exploring and understanding the role of flexibility. The group is focussed on gathering and sharing knowledge and facilitating collaboration on real-world trials to ensure that our energy transition can learn from and avoid some of the challenges seen internationally.

The FlexForum purpose is to:

Deliver 3 objectives:

1.

Identify the minimum specifications of the services that DER can provide, to who, when, where, how and for how much

2.

Identify the practical, scalable, and no regrets steps to use the services that DER can provide

3.

Support ongoing learning and collaboration across the electricity sector on real world deployment of solutions to realise the benefits of DER, including identifying and resolving barriers

**Build a broad consensus across the electricity sector and others interests for the set of actions to integrate DER**

**Build capacity and capability to implement the set of actions to integrate DER**

This Flexibility Plan represents a synthesis of the ideas and opinions expressed during the fortnightly FlexForum meetings, public webinars and interviews conducted from February 2022 – August 2022. Part of the challenge of bringing together information from international research and the wide range of FlexForum members and guests means that there are aspects of this plan that may not align with individual members' views.

The purpose of the Flexibility Plan is to provide a framework for leading the transition required by the whole electricity system, including consumers with and without DER, to maximise the value of flexible resources. Delivering the entire Flexibility Plan will take many years and requires support and resources at every level from communities, to the electricity sector, to government and regulators. We invite you to be more involved with the FlexForum and shape the Flexibility Plan during the next phase. In the next phase we will identify which steps deserve immediate attention and bring together industry-led groups to identify the scope, deliverables and pathway for real-world trials with the goal of facilitating mutual learning and advancing the role of flexibility in Aotearoa NZ.

More information on the FlexForum and its members can be found at [New Zealand's FlexForum](#)

To have a conversation or to send your thoughts and views, please contact us at [info@flexforum.nz](mailto:info@flexforum.nz).



Flex Forum  
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25 August 2022

To the Flex Forum participants,

MBIE is pleased to provide a written endorsement of the process the Flex Forum is undertaking to plan and implement a Flexibility Plan.

Flexibility services from distributed energy resources (DER) can provide a range of benefits across the electricity system that support the Governments objectives for a highly renewable electricity system that is secure and affordable. Enabling consumers to make choices about providing flexibility services from DER can support New Zealanders to more actively manage energy demand, so that they have more control over their energy use and costs.

A multi-year effort will be needed across the electricity value chain to deliver the investments, the changes to planning and operational practices, the changes to regulatory settings and the engagement with consumers required to leverage the capability of DER. Planning and co-ordination will be important to deliver this required action.

MBIE endorses the process that the Flex Forum is undertaking to develop and implement a Flexibility Plan that will identify practical, scalable, and least-regrets steps needed to use DER and transact flexibility. Diverse representation from across the sector and the collaborative approach the Flex Forum is undertaking, including facilitating engagement with interested parties in the sector, is important. The Flex Forum provides a platform to make progress, supporting necessary action, through a co-ordinated, collaborative and practical approach.

Your sincerely,

Phillippa Fox  
General Manager, Energy and Resource Markets  
Ministry of Business, Innovation and Employment



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# A plan for unlocking the value of distributed energy resources and flexibility

This plan sets out initial practical, scalable and least-regrets steps that will unlock the value of distributed energy resources (DER) and flexibility for households, businesses, communities, the power system and Aotearoa New Zealand.

## Flexibility is central to electrification and decarbonisation

Households, communities and businesses are starting on an electrification journey which will result in the proliferation of electric vehicle (EV) chargers, solar generation, battery storage, electric space and water heating, electric motors and smart devices.

All of these are DER and can be flexible by responding to signals and events.

Flexible DER can – with the right frameworks and relevant capability in place – provide a range of benefits to households, businesses, communities, distribution and transmission networks and the electricity market.

The opportunity is twofold: enable households, communities and businesses to make choices which maximise the value of flexibility and to integrate flexible DER efficiently and equitably into both the physical and market systems that deliver electricity.

## The Flexibility Plan provides a starting point for coordinated, collaborative action

The Plan identifies 39 steps across five areas to provide a starting point for the electricity sector – suppliers, policymakers and regulators – to provide a focus for coordinated and collaborative action.

The five areas are: coordination and collaboration, data and information, technical requirements, processes and regulatory settings.

The Plan is intended to assist Aotearoa New Zealand to join the energy transition occurring globally and develop an electricity market and power system which makes it as easy as possible for households, businesses and communities to unlock the value of flexibility as they electrify and decarbonise.

Delivering the steps of the Plan requires input and effort from across the electricity ecosystem including distributors, Transpower, the System Operator, electricity retailers, equipment manufacturers and suppliers, industry associations, regulators and policymakers as well as households, communities and businesses.

Success depends on practical learning-by-doing and experience to inform what, when, where, and how flexibility will play a role in the electricity market and power system.

The Plan's delivery model is expected to evolve over time. The starting point is an industry-led body to coordinate delivery of the steps in the Flexibility Plan and provide transparency about progress.

Giving visibility of progress against clear milestones will provide households, businesses, communities, the electricity sector, regulators and government with confidence that the process and outcomes reflect the long-term interests of consumers in general, the electricity system and market and Aotearoa New Zealand.

# DER and flexibility are central to electrification and decarbonisation

Households, communities and businesses are beginning an electrification journey resulting in the proliferation of electric vehicle (EV) chargers, solar generation, battery storage, electric space and water heating, electric motors and smart devices.

All of these are **distributed energy resources** or DER.

**Distributed** – located with or near homes and businesses and connected to distribution networks.

**Energy** – electricity, stored heat such as hot water, or energy sources such as hydrogen.

**Resources** – devices and equipment which generate and consume electricity, including electric vehicles, solar PV, battery storage, hot water cylinders, air-conditioning and refrigeration units.

The future imagined by the Climate Change Commission includes a major expansion of the electricity system to displace fossil fuels by electrifying transport, electrifying industrial process heat, and electrifying space heating.

*The use of low emissions electricity allows other sectors to reduce emissions. Electrifying transport and process heat will require significant expansion in electricity generation capacity. Demand for electricity will also increase as buildings and process heat switch away from fossil fuels. Increased generation and demand will need to be accompanied by expanding infrastructure for transmission and distribution.*<sup>1</sup>

Electrification is happening and will only get faster, supported by a range of Government policies and targets.<sup>2</sup> This increased pace drives a need for using all of the resources available to support an organised transition.

- By 2030, Transpower forecasts nearly 180,000 solar installations; without any specific Government policy support.<sup>3</sup>
- The Government has set a target that 30% of light vehicles will be zero emissions by 2035. Based on the current light passenger fleet size of about 3.5 million vehicles, this means we could be well on our way to 1 million EV chargers by 2035.<sup>4</sup>
- Transpower expects forecast gross energy demand to increase by 68% by 2050, with 16% of the increase from electrification of industrial process heat.<sup>5</sup>

<sup>1</sup> Climate Change Commission, 31 May 2021, **Ināia tonu nei: a low emissions future for Aotearoa**, page 112. Emphasis added.

<sup>2</sup> Ministry for the Environment, Emissions reduction plan, see <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-reduction-plan/>. Key actions in the energy and industry sectors are outlined here: <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/low-emissions-economy/emissions-reduction-plan/>

<sup>3</sup> Whakamana i Te Mauri Hiko (figure 20) forecasts 178,065 solar systems by 2030 (refer **Whakamana i Te Mauri Hiko data report figures** see data report figures' (bottom of the page), up from 41,360 solar systems (1.84% of connections) at 31 July 2022 (see <https://www.emi.ea.govt.nz/r/2I50n>). The Transpower forecast is equivalent to 8% of current connections (see [www.emi.ea.govt.nz/r/ta4pj](http://www.emi.ea.govt.nz/r/ta4pj)).

<sup>4</sup> Refer **Fleet statistics | Ministry of Transport**. Monthly fleet size by motor technology reports 3,534,292 light passenger vehicle registrations on 30 June 2022. Target is 30% light vehicles are zero emissions by 2035. Taking account of efforts to reduce the size of the car fleet and assuming a less than 1:1 charger to vehicle ratio, it is plausible to expect charger numbers will be moving towards the 1 million mark.

<sup>5</sup> Transpower, March 2020, Whakamana i Te Mauri Hiko, Figure 3. A further resource is the Transpower, February 2021, **A Roadmap for Electrification**.

# DER can be flexible – this provides an opportunity

DER can be **flexible** – taking the steps to make this flexibility accessible and available to more parties provides an opportunity to realise a more affordable, more reliable, and more sustainable electricity supply.

DER – solar and other distributed generation (DG)<sup>6</sup>, EV chargers, battery storage, solar inverters, and smart devices – all have the potential to be ‘flexible’.

Flexible DER can – with the right frameworks and relevant capability in place – provide a range of benefits to households, businesses, communities, distribution and transmission networks and the electricity market.

The defining feature of flexible DER is it can modify how it produces or uses electricity in response to an external signal. These signals could be used to support electricity system security and provide the owner with additional options to optimise their electricity use.<sup>7</sup>

Practically speaking, flexibility is available in some devices already:

- solar systems with smart inverters can lower generation output
- battery storage systems, including those in electric vehicles, can either charge or discharge electricity
- devices and equipment – electric vehicle charge points, space and water heating, ventilation and air-conditioning, machinery – can turn down, on or off.

The opportunity is twofold: enable households, communities and businesses to make choices which maximise the value of flexibility and to integrate flexible DER efficiently and equitably into both the physical and market systems that deliver electricity.

**Flexibility** is the modification of generation injection and/or consumption patterns, on an individual or aggregated level, often in reaction to an external signal, to provide a service within the energy system.

This definition of flexibility was developed in the European Union and United Kingdom and is being adapted for use in Aotearoa New Zealand.

## Action must start now to ensure flexibility is accessible and available when it is needed

Action must start now to ensure flexibility is accessible and available when needed to support affordable and reliable operation of the electricity market and power system, and, as importantly, to enable accelerated electrification by households and businesses as part of the transition to a zero emissions economy.

*Having the option to use flexibility relies on the electricity sector and households, businesses and communities having the capability, practices or processes needed to fully realise the opportunity of DER and flexibility.*

<sup>6</sup> Distributed generation is connected to distribution networks. It ranges from kilowatt-sized household solar generators to megawatt-sized solar farms and hydro generators.

<sup>7</sup> Terminology is important. DER is often characterised as being controllable or uncontrollable. This perhaps reflects an electricity sector perspective. However, access by the electricity sector to flexibility fundamentally relies on the owners of DER choosing to respond to signals and incentives. As such, DER is flexible or not flexible, with the flexibility resulting from its ability to respond to signals or instructions due to its connectivity, programming etc.

# Acting now is about being prepared

The Government has signalled a decarbonised future for Aotearoa New Zealand and while we don't necessarily know how quickly this future will arrive, acting now allows us to take advantage of the opportunities, rather than react to the circumstances that arise in the future.

Developing the capability, practices and processes cannot occur overnight. Electricity distributors in the United Kingdom have made considerable progress since announcing a flexibility commitment<sup>8</sup> in December 2018, going from 116MW of flexibility contracted in 2018 to 1.6GW contracted in the first half of 2021.<sup>9</sup> However, the UK's journey to use flexibility began in 2011.<sup>10</sup>

Preparation is needed for three reasons.

1.

**The pace at which households and businesses choose to electrify and decarbonise is increasing** and these are significant and long-lived investment decisions. More can be done to enable households and businesses to make informed and least-regrets decisions about their energy priorities.

Once DERs are more common across NZ, DER and flexibility can be used to build a fairer and more equitable power system, to avoid vulnerable households paying more than their fair share for the transition and avoid inefficient investments by all households and businesses. This requires learning-by-doing in the short-term to identify the market design and policy settings that support this outcome of an organised and equitable transition to a low carbon future.

2.

**The electricity sector needs time to develop the new capabilities, practices and processes** to ensure flexibility is ready when it is needed in the future to help avoid inefficient investments. The Flexibility Plan anticipates a multi-year effort by industry, policymakers and regulators.

Electricity networks will play an essential role and should be supported to do so. This is recognised by Transpower in its Electrification Roadmap<sup>11</sup> which says "Transpower and distribution lines companies must directly support and enable rapid electrification. If one part of the supply chain is not prepared with either the equipment, expertise or planning, the electrification of our economy will stumble at the start."

3.

**Electrification and uptake of DER by consumers will be difficult to predict.**

For distribution networks, electrification will cause a step-change increase in the need for network capacity as electrification of transport, water and space heating, and agricultural, commercial and industrial processes result in greater electricity consumption and potentially higher maximum demand.

Distribution networks, including the low voltage layer that directly serves most consumers, are long life physical systems that were designed before widespread use of DER by households became possible.

Further, electrification of communities will likely not occur in an orderly and predictable way. The leading edge of electrification is resulting in unpredictable, large and lumpy requests for extra network capacity from the electrification of industrial processes, development of large renewable generation projects, or clustering of EV chargers or rooftop solar PV.

<sup>8</sup> Energy Networks Association, December 2018, Flexibility Commitment, <https://www.energynetworks.org/industry-hub/resource-library/open-networks-flexibility-commitment-2018.pdf>

<sup>9</sup> Energy Networks Association, <https://www.energynetworks.org/newsroom/britain-breaks-network-flexibility-record-with-45-percent-more-contracted-this-year-than-all-of-2020>

<sup>10</sup> See [FlexForum Session 10\\_Notes](#)

<sup>11</sup> Transpower, February 2021, [A Roadmap for Electrification, Decarbonising transport and process heat](#), page 67.

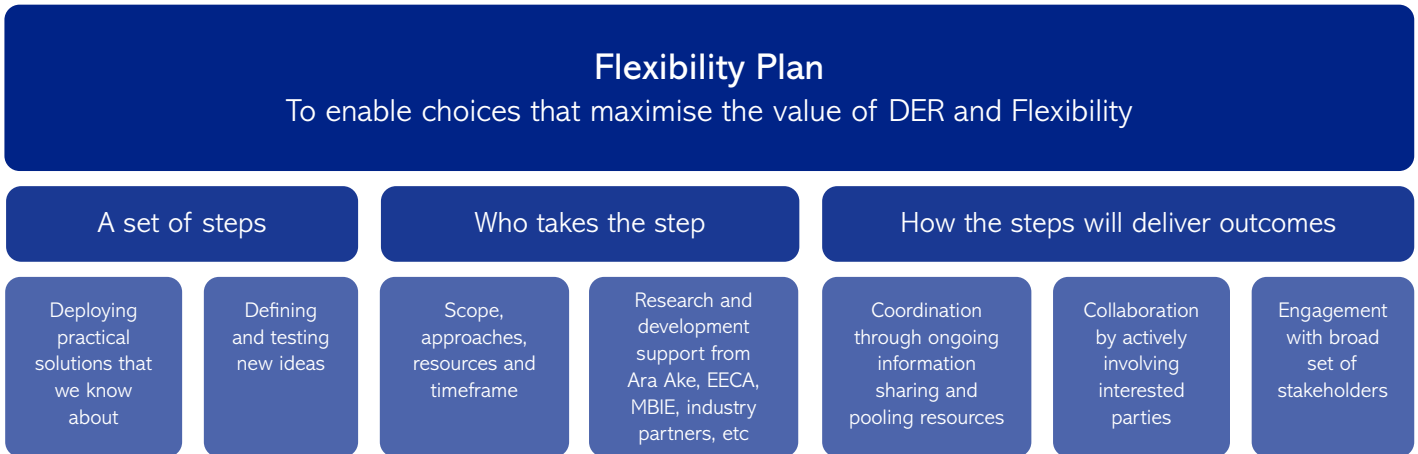


# A starting point for action

The Flexibility Plan identifies practical, scalable and least-regrets steps needed to enable households, businesses and communities to make choices which maximise the value of DER and flexibility.

The Plan provides a starting point, setting out initial steps, who will take the steps, and highlighting expectations for a coordinated and collaborative approach to delivering each step.

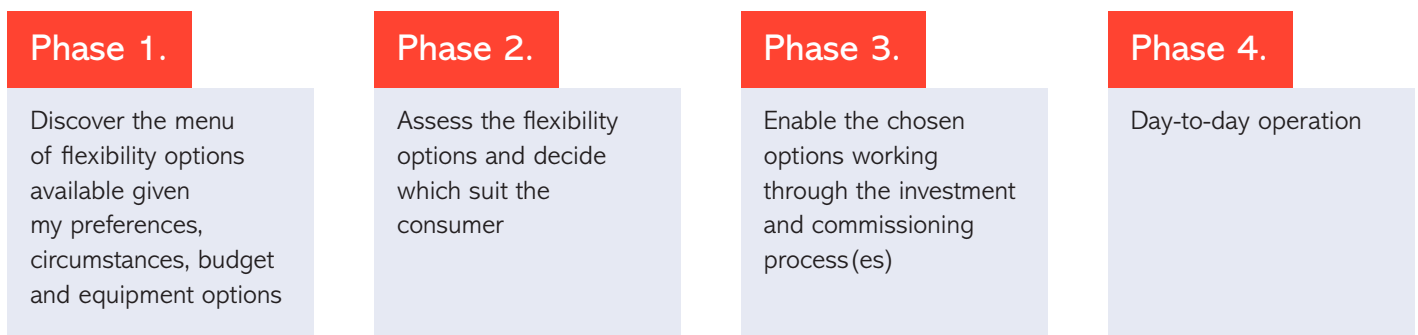
**Figure 1** Overview of the approach taken in this Flexibility Plan



The initial steps are listed in detail in Appendix A along with who is expected to be involved, and the industry activities underway or planned which could support an action.

The steps have been identified by mapping the journey a consumer might take to make decisions about flexibility. The journey is divided into four steps: Discover, Assess, Enable and Operate.

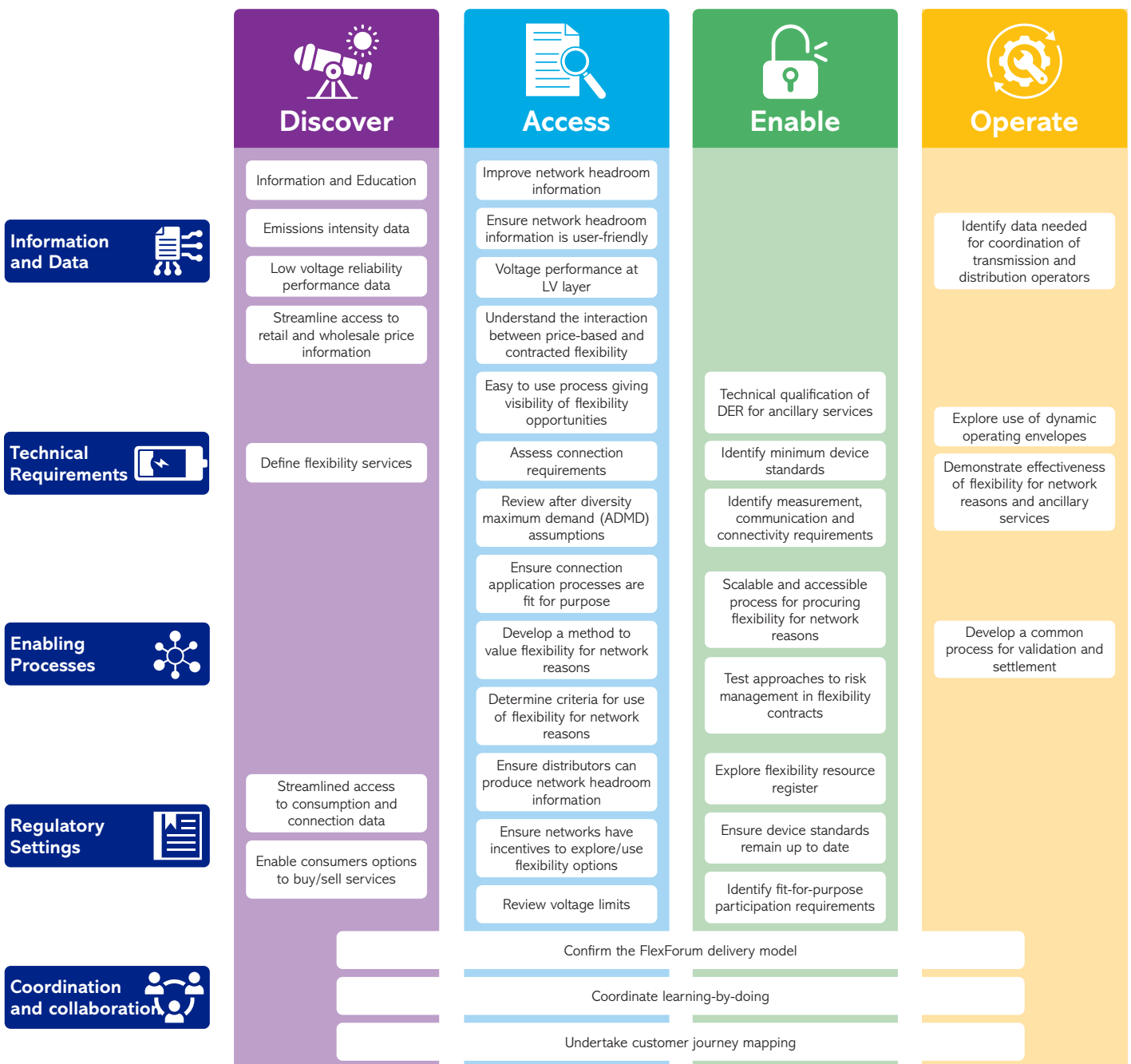
**Figure 2** An indicative customer decision-making journey



The steps identified through the four-phase journey are grouped into five categories.

1. Overarching steps to facilitate the collaboration and coordination needed for delivering the Flexibility Plan
2. Technical steps to ensure safe, reliable and efficient operation of the power system, including flexibility resources
3. Data and information steps to ensure electricity sector participants and consumers are enabled to access and share appropriate data and information
4. Process steps to ensure electricity sector participants and flexibility suppliers (individuals and aggregators) have easy to access pathways to value and use flexibility
5. Regulatory steps that remove or avoid barriers to enabling consumers to make choices about flexibility and provide clarity to industry participants as to resources, roles, and responsibilities with regards to flexibility.

**Figure 3** Overview of initial steps by category and phase in the customer journey (see Appendix A for detailed descriptions)



Each step involves either:

- delivering a capability, practice or process that is already well understood and is required for a household or business to achieve a specific outcome
- exploring new options through coordinated and collaborative research projects designed to uncover the path to achieve a desired outcome or helps identify if there are more preferred outcomes to pursue.

*The Flexibility Plan does not strive to identify priorities or timelines at this stage given that the range of internal priorities, resources and capabilities of the parties involved varies so significantly.*

## Steps reflect the perspective of a household, business or community making choices about flexibility

The steps reflect the perspective of a household, business or community – who may have flexible resources either now or in the future – making choices about flexibility and wanting to maximise the value of their DER for themselves, their community and for the wider economy.

The starting point is the **outcome sought by the household, business or community**. There is a range of outcomes sought by consumers. Seven representative outcomes have been used to frame **the types of inputs needed from electricity sector participants**, and the **specific capability, practice or process** required to deliver those inputs and realise the desired outcomes.

Households, businesses and communities might not express their preferences in this way, however focusing on achieving outcomes for consumers is intended to ensure the underlying capabilities, practices or processes used will reflect a whole-of-system value and not necessarily the preferences of individual electricity sector participants. It is likely that some of these consumer outcomes may be in conflict at certain times, and real-world trials that consider the whole electricity system will support learning which solutions best resolve those conflicts. The seven representative outcomes are as follows:

1. Reduce energy-related capital costs *'I want the most affordable upfront investment to meet my specific energy needs'*
2. Reduce energy-related ongoing costs *'I want the most affordable ongoing costs to meet my energy needs (sell my surplus power for the best price or ensure my consumption occurs when prices are cheap)'*
3. Improve reliability and resilience *'I want a specific level of reliability and resilience'*
4. Reduce emissions *'I want to reduce my effect on emissions'*
5. Supply energy market services *'I want to modify my generation or consumption to support the energy needs of others including the wholesale markets'*
6. Supply network services *'I want to provide local network support that benefits my community and maximises the value of my DER...'*
7. Supply ancillary services *'I want to provide ancillary services to support the national electricity system and maximise the value of my DER...'*

Customer journey mapping is identified as a requirement (Step #C) to test this characterisation of consumer preferences and inform future iterations of the Flexibility Plan.

# Approach – a starting point for coordinated and collaborative effort

The Flexibility Plan identifies a set of practical, scalable and least-regrets steps required to enable households, communities or businesses (or someone working on their behalf) to discover, assess, implement and operate flexible DER suited to their preferences and circumstances.

The immediate purpose is to provide a starting point for coordinated and collaborative action to identify and unlock the full value of flexibility for households, businesses, communities, the power system and Aotearoa New Zealand.

## The approach rests on coordinated effort, collaboration and accountability

The core principles and approach of this Flexibility Plan are coordinated action, collaboration and accountability.

**Figure 4** The Flexibility Plan is based on three principles





## A commitment to coordination

The Flexibility Plan relies on industry-led effort to deliver the practical, scalable and least-regrets steps that enable households, businesses and communities to make the choices which maximise the benefits of flexibility.

In the short term, coordinated and collaborative learning-by-doing will provide experience and insights into the capability, practices and processes required to maximise the value of flexibility.

The experience from learning-by-doing will inform a parallel second track of effort to implement the capability, practices and processes, including changes to regulatory settings.

A critical aspect of learning-by-doing is a supportive research and development system which unlocks resources and funding to enable and encourage collaborative efforts to answer both specific and systemic concerns.

Step #B is intended to support the coordination of learning-by-doing across the range of agencies and bodies engaged in this space in Aotearoa New Zealand.

## A commitment to collaboration

The Flexibility Plan facilitates collaboration, with regular information sharing, the opportunity for active involvement of interested parties in the thinking and design, and to assist with testing and implementation. No single party acting alone can maximise the benefits of flexibility, and this requires an increased focus on engaging widely across the electricity sector and beyond.

A whole-of-system approach involving collaboration across policy, regulatory, industry and consumer interests is needed to maximise the benefits of flexibility.

Each Step has leads and key stakeholders identified that will play a role in delivering the step.

The Flexibility Plan is a shared endeavour relying on collaboration and ongoing involvement in some cases that may mean contributing to activities that are less critical to an individual organisation but very critical to the overall success. Talking and listening to stakeholders and sharing experiences are as important as practical action to ensure that everyone is brought along the journey.

### Earning a social licence is essential.

Households, businesses and communities will be choosing to engage their DER and provide flexibility, meaning that the social license to set expectations, signals and incentives must exist.

A critical part of delivering each step must be exploring consumer and customer preferences. Involving and educating consumers during the learning-by-doing process will help inform the development of future arrangements so that they reflect consumer preferences and expectations and build trust and confidence in the electricity sector.

## A commitment to accountability

The Flexibility Plan provides a basis for coordinating the delivery of a complex and inter-related set of steps involving input from the electricity sector, regulators, government and consumers.

Once a group has come together to address a step in the plan, they will have a delivery lead, a scope reflecting the expected outcome or hypotheses, and a delivery timeframe reflecting where the step sits on the critical path and any dependencies.

Visibility of progress against clear milestones will provide households, businesses, communities, the electricity sector, regulators and government with confidence that the process and outcomes reflect the long-term interests of customers, consumers in general, the electricity system and market and Aotearoa New Zealand.

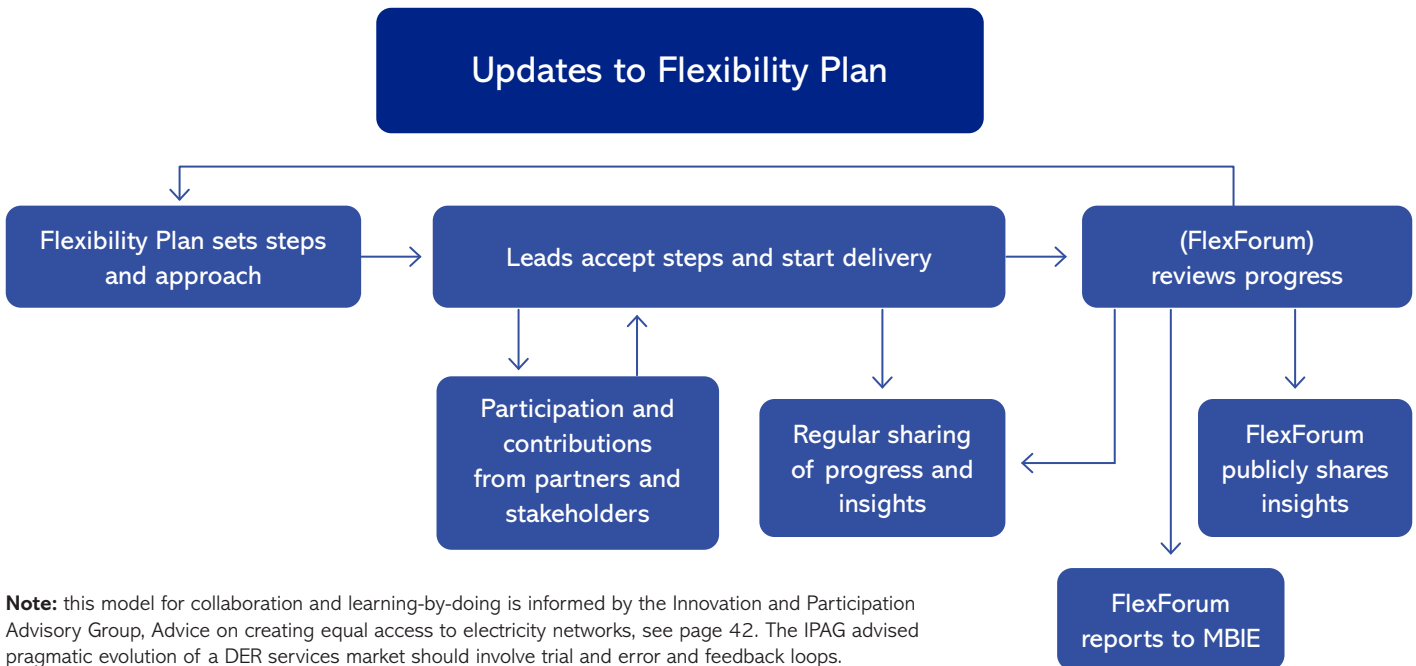
# Delivery model should ensure coordinated action, collaboration and accountability

The delivery model for the Flexibility Plan is expected to evolve over time, particularly to account for arrangements established to implement the government's Energy Strategy<sup>12</sup> and Emissions Reduction Plans<sup>13</sup>. However, the delivery model should continue to ensure coordinated action, collaboration and accountability.

*The starting point is an industry-led body that provides coordination for the delivery of the steps in the Flexibility Plan, which includes transparency about progress and feedback of the learnings to all parties.*

Delivery of each step will be led by a specific organisation, group, industry association or a regulatory body with the commitment, capability and interest in completing a step.

**Figure 5** A model for collaboration and learning-by-doing



**Note:** this model for collaboration and learning-by-doing is informed by the Innovation and Participation Advisory Group, Advice on creating equal access to electricity networks, see page 42. The IPAG advised pragmatic evolution of a DER services market should involve trial and error and feedback loops.

Ensuring that practical experience from testing hypotheses is shared through feedback loops will inform the development of capability, practices and processes, and the development of appropriate regulatory settings. It is important to note that “failures” provide important learnings and should be embraced as a critical part of advancing the Flexibility Plan.

- hypotheses – identified in specific steps – may be tested via real-world or desktop-based projects and trials. Ongoing sharing of results will be important as valuable insights can be obtained during each phase of a project, providing opportunities to test thinking at the scoping stage as well as the delivery stage
- projects take time to scope and start, however existing or completed activities and projects could provide a basis for assessing how the Flexibility Plan can be improved
- a collaborative and near enough approach should be the target to provide options for low-cost experimentation and learning. Projects do not need to be commercial scale.

Step #A is to identify the specific functions and form of an enduring delivery-model for the Flexibility Plan. An ongoing role for the FlexForum is not assumed, but it could provide the overarching coordination that has been challenging to achieve across industry bodies to date.

<sup>12</sup> Ministry of Business, Innovation and Employment, Aotearoa New Zealand Energy Strategy, see <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-strategies-for-new-zealand/aotearoa-new-zealand-energy-strategy/>

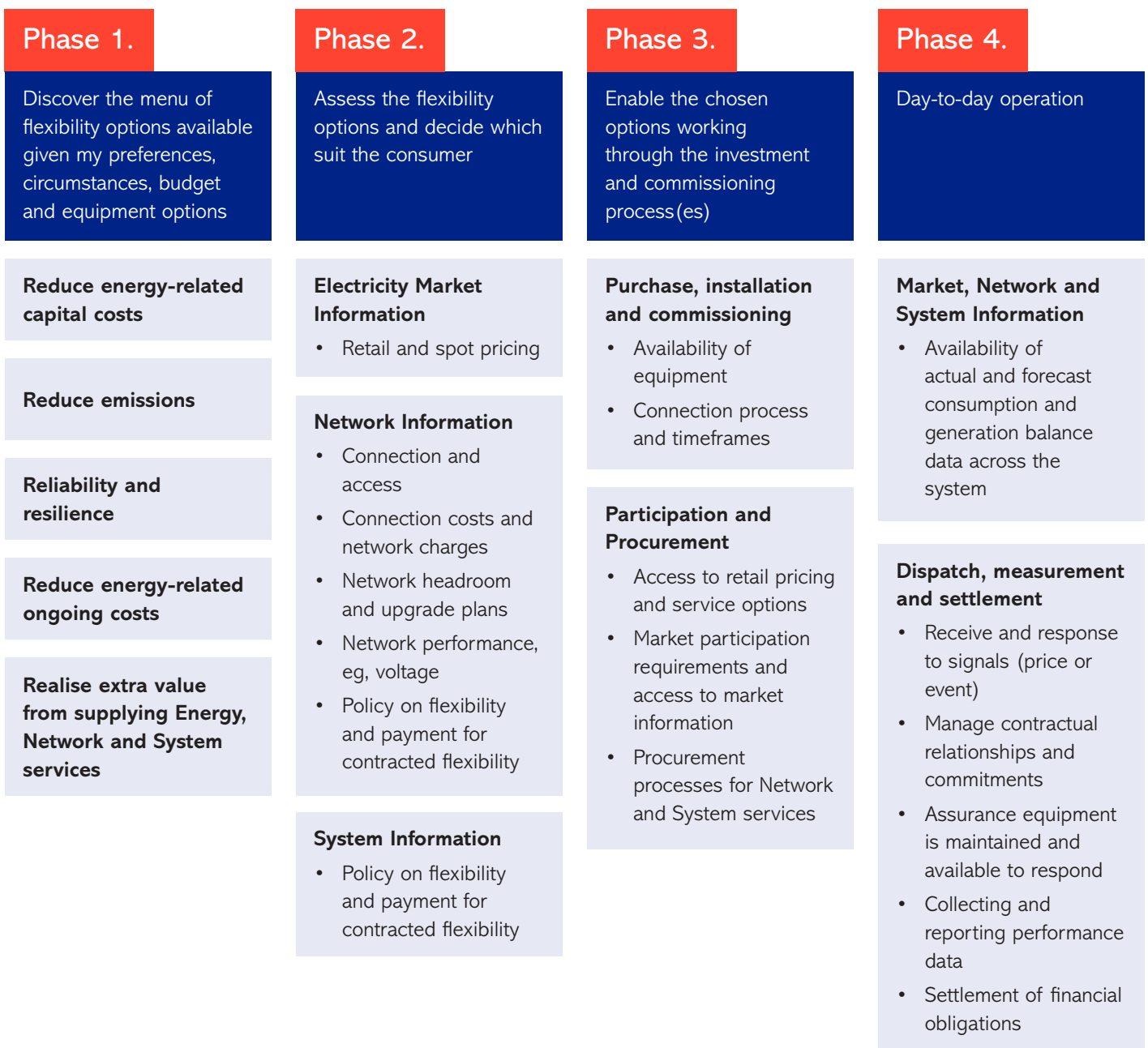
<sup>13</sup> Ministry for the Environment, Emissions reduction plan, see <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-reduction-plan/>. Key actions in the energy and industry sectors are outlined here: <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/low-emissions-economy/emissions-reduction-plan/>

# Appendix A: Steps, description, who would be involved and related workstreams

This Appendix sets out the initial steps to enable a household, business, community (or their agent) to make choices which maximise the value of flexibility. These steps will not be undertaken by the FlexForum directly, they will be (or are already) led by relevant parties and FlexForum will support the coordination, collaboration and sharing of knowledge as we progress.

The steps in the Flexibility Plan have been identified by mapping the journey a consumer might take to make decisions about flexibility. The customer journey is divided into four phases.

**Figure 6** Overview of the four phases in a customer's flexibility decision-making journey



## Phase 1.

**Discover** the menu of options available, which could include pursuing options without flexibility, given the consumer's preferences and circumstances. The household or business is expected to rely on one or more experts to assist with the discovery process, including: architects and building services firms, distributors, DER equipment suppliers (eg, solar installers), and electricity services providers, such as retailers or EV charging suppliers.

## Phase 2.

**Assess** the options and decide. Phase 2 involves a household or business assessing and deciding on the flexibility options given their preferences and circumstances.

## Phase 3.

**Enable** the selected options. Phase 3 involves enabling the selected options by completing the investment, procurement, commissioning and participation processes required to enable the option and achieve the desired outcomes by completing the relevant investment, procurement, commissioning and participation processes.

## Phase 4.

**Operate** the selected options. Phase 4 involves day-to-day operation of the preferred options to maximise the value of the DER and flexibility for the household or business.

The components identified through the four-phase journey have been grouped into five categories.

1. Overarching steps for delivering the Flexibility Plan
2. Technical steps to ensure safe, reliable and efficient operation of the power system, including flexibility resources
3. Data and information steps to ensure electricity sector participants and consumers have the data and information they need
4. Process steps to ensure electricity sector participants and flexibility suppliers, whether individuals and aggregators, have clear and simple pathways to use flexibility
5. Regulatory steps to remove or avoid barriers to enabling consumers to make choices about flexibility.

The numbering of the steps in each category of the Flexibility Plan reflects the place in the four-phase customer journey.



# Coordination and collaboration steps

**Table 1** Steps relating to delivery of the Flexibility Plan

#	Component	Description	Who would be involved	Related workstreams
A	Scope and confirm a Delivery Model for the Flexibility Plan	The delivery model for the Flexibility Plan is expected to evolve over time, particularly to account for arrangements established to implement the Energy Strategy and Emissions Reduction Plans. However, the delivery model should ensure there is coordinated action, collaboration and accountability for delivering the Flexibility Plan	<b>FlexForum, the wider electricity sector, regulators, policymakers and consumer groups</b>	A range of workstreams are underway, including: ENA Network Transformation Roadmap (NTR); Commerce Commission Input methodology (IM) and Information Disclosure (ID) reviews; and Electricity Authority Future Security and Resilience Review; and Energy Strategy
B	Ensure coordination between agencies and bodies with a role in supporting learning-by-doing.	Learning-by-doing will provide experience and insights into the capability, practices and processes required to maximise the value of flexibility. A supportive research, development and commercialisation ecosystem is critical and there is currently no organisation or government agency tracking and supporting this in NZ. Learning-by-doing is made more difficult if innovators are required to cobble together support they need.	<b>MBIE, Ara Ake, EECA, Commerce Commission, Electricity Authority, Participants, Consumers</b>	
C	Complete a customer journey mapping exercise to inform further iterations of the Flexibility Plan	User and customer journey mapping should be used to identify how households and businesses make choices and decisions	<b>FlexForum</b> , with support from Partners Individual tasks are likely to require customer journey mapping as well	

# Technical steps

**Table 2** Steps relating to technical requirements

#	Component	Description	Who would be involved	Related workstreams
6	Develop a common definition for network services which could be supplied using flexibility, including minimum communication and technical requirements [Discover step]	<p>A common specification for network services which can be supplied via flexibility should assist:</p> <ul style="list-style-type: none"> <li>households and businesses know what opportunities are on the table wherever they are in the country</li> <li>equipment suppliers and manufacturers identify what minimum capability they should include as standard when supplying or designing products.</li> </ul> <p>Several distributors have issued RFPs describing the need case and service to be performed using flexibility. RFP templates have been shared amongst distributors, but there is no common service definition or minimum technical and communication requirements.</p> <p>A common specification for network services which can be supplied via flexibility will provide visibility about technical questions:</p> <ul style="list-style-type: none"> <li>What is the minimum size of flexibility capacity which can participate?</li> <li>What is the minimum duration of response?</li> <li>What is the minimum delivery period?</li> <li>How quickly is the response required?</li> <li>What type of response is required?</li> <li>How often might the response be activated?</li> <li>What are the testing requirements?</li> </ul> <p>Developing the specification is expected to assist in building a shared understanding across distributors, and the rest of the sector, on the services that can be provided by flexible resources.</p>	<p><b>Distributors and Transpower</b> for information on service specifications</p> <p><b>Flexibility suppliers and equipment suppliers</b></p>	<p>NTR Actions</p> <p>#17 Contracting for network support</p>
9	Review whether connection requirements, including associated network design and planning practices enable rapid uptake of DER, including accounting for the flexibility of DER without adversely impacting network security and equity [Assess]	<p>The import and export limits (voltage and capacity) for network connections are specified in each distributor's Connection Standard (policy).</p> <p>Connection requirements reflect network design and planning practices based on expectations for how the network is used, eg, household consumption.</p> <p>DER and electrification will change how networks are used, potentially having flow-on effect for network design and planning practices.</p> <p>Flexible DER can vary its operation to reflect network conditions, ie, voltage and capacity constraints. This flexibility provides scope for network design and planning practices to include dynamic network management options.</p> <p>Connection requirements which do not recognise this capability of DER may create a barrier to electrification, for example by increasing application costs and timeframes, or by discouraging electrification by unnecessarily raising connection costs.</p>	<p><b>Distributors</b> are responsible for Connection standards, subject to a range of legislative requirements and permissions</p> <p><b>Flexibility suppliers, equipment suppliers</b></p>	<p>NTR Actions:</p> <p>#4 New distributed generation connection requirements</p> <p>#6 enable distribution network trading</p> <p>#9 DER Connection Codes</p>

**Table 2** Steps relating to technical requirements continued...

#	Component	Description	Who would be involved	Related workstreams
10	Review after diversity maximum demand (ADMD) assumptions under the status quo and under an accelerated electrification scenario to ensure network design and planning practices accommodate rapid uptake of DER, including by accounting for the flexibility of DER [Assess]	ADMD assumptions influence how much network capacity is available to consumers, and potential network access. Historical design choices remain embedded in the network design and evaluating those impacts on a network's ability to integrate new DER must also be considered. DER and electrification will change how networks are used. A key impact on future network investments will be to the ADMD assumptions which underpin network planning decisions. <sup>14</sup>	<b>Distributors, building services engineers</b>	NTR Actions #11 Network engineering EECA Green paper on EV chargers
25	Identify minimum technical standards for devices such as EV chargers to make flexibility accessible and available [Enable]	Households and businesses will be faced with a wide variety of brands and models of EV charger, solar panels, inverters etc, each potentially with varying capability to provide flexibility. Minimum technical standards for DER will assist households, businesses and communities to avoid purchasing DER which does not meet their needs or is unable to meet foreseeable future needs. There are a range of mandatory standards (eg, ASNZ4777 for inverters <sup>15</sup> ) and voluntary guidelines (eg, PAS SNZ PAS 6011:2021 for residential charging infrastructure for EVs) relating to DER. Part 6 of the Code requires distributors to publish a list of the makes and models of inverters that the distributor has approved for connection to its network. Part 6 also requires the registration of any DG connected to the network.	<b>Equipment suppliers</b> write standards <b>Distributors</b> can specify technical standards <b>EECA</b> the Electricity Authority and Worksafe have a role in mandating standards Flexibility suppliers	NTR Actions #9 DER Connection Codes #10 Appliance and DER equipment standards
31	Identify the measurement, communication and connectivity requirements for devices using flexibility either by the consumer to reduce costs etc, or to provide an electricity system security or market service [Enable]	Consumer's flexible resources need the ability to receive and respond to messages (signals) providing information for when and how to use flexibility, eg, a signal to reduce load because spot price is high or there is network congestion or emergencies. Distributors and Flexibility suppliers need the ability to send and receive messages to enable dispatch of flexibility and report on performance. The ability to send and receive messages requires decisions about measurement, communication and connectivity requirements. Key decisions are: <ul style="list-style-type: none"> <li>• Messaging protocol, eg, Automated or manual, standardised and open, or user dictated and proprietary</li> <li>• Messaging content – this will depend on the purpose of the message</li> </ul> These requirements should be standardised to minimise costs and barriers to participation, eg, arising from there being multiple non-compatible messaging protocols and formats.	<b>Distributors and Flexibility suppliers, Equipment suppliers</b>	EEA and EECA are exploring communication protocols

<sup>14</sup> The amount of network built is less than the sum of the physical capacity of each connection due to a thing called diversity. Long experience shows that consumers do not all use the network at the same time, allowing network infrastructure to be right-sized based on planning assumptions about after-diversity-maximum-demand (ADMD). The ADMD is an estimate of the capacity required to reliably deliver electricity to each connection based on expected 'worst case' scenario conditions, not possible use. Particularly for households, the ADMD is significantly less than the physical capacity. ADMD assumptions for household connections used in Aotearoa NZ range from 5kVA to 1.5kVA (not the 15kVA of the physical connection). Electrification of transport, heating and cooling and commercial processes will result in significant increase in demand for capacity on low voltage networks, potentially causing over-loading of lower-voltage feeders because demand for capacity on a connection-by-connection basis exceeds the traditional ADMD assumption.

<sup>15</sup> Refer AS/NZS 4777.2:2020 Grid connection of energy systems via inverters, Part 2: Inverter requirements at <https://www.standards.govt.nz/shop/ASNZS-4777-22020>

# Information and data steps

**Table 3** Steps relating to information and data

#	Component	Description	Who would be involved	Related activities
1	Identify what information and education can be provided to consumers and to their advisers to assist decisions about DER and flexibility [Discover]	<p>Consumers are expected to rely heavily on expert advisers, eg, architects, building and process engineers, and equipment suppliers, eg, solar installers for information and advice about flexibility, including the options and accompanying obligations associated with installing DER. Providing these advisers with up to date and trustworthy information about the menu of flexibility options available given circumstances and preferences will enable more informed choices.</p> <p>A range of general information sources are available, eg, <a href="#">Gen Less</a>. These provide guidance but not actionable information for decision-making.</p> <p>Electrification decisions will involve material investment, with long-term consequences (more material than switching retailer). Choices to lock in or lock out flexibility will last many years. Access to authoritative and useable information about obligations and options associated with using DER and flexibility, costs and prices should support decision-making.</p>	<p><b>Electricity sector</b> for information on circumstances</p> <p><b>Equipment suppliers</b> for information on equipment options</p> <p><b>Building services engineers</b> and related advisers</p> <p>Standards bodies</p>	
3	Provide consumers with information on reliability and resilience performance relevant to their point of connection [Discover]	<p>Some consumers will want to explore using DER to achieve a specific level of reliability and resilience.</p> <p>Because reliability is currently reported on a network-wide basis households, businesses and communities may not have access to information about the historical reliability performance of the specific parts of distribution networks to which they are connected.</p> <p>This makes it difficult for a consumer or their agent to identify the potential reliability at a location, and consequently difficult to make informed decisions about whether the desired reliability outcome is cost-effectively achieved by investing in DER or using the network.</p> <p>Regulations currently limit the resources available for networks to gather and report this level of information for low voltage areas of the network (see Component 13)</p>	<p><b>Distributor</b> and <b>Transpower</b> for information about reliability and resilience</p> <p>Flexibility suppliers, Building services engineers</p>	NTR Actions #13 Low voltage network monitoring and visibility
4	Provide consumers with emissions intensity data for energy sources [Discover]	Emissions intensity data for energy source options is available from the Ministry for the Environment, Transpower's EM6 API, MBIE <sup>16</sup> and EECA.	<b>Government agencies</b>	
7	Assess whether consumers making choices about DER have streamlined access to sufficient information about retail pricing and power purchase options [Assess]	<p>Consumers (or their agents) thinking about using flexibility to reduce their energy-related costs or sell surplus power may need information on the range prices on offer for purchase and sale of power to enable assessment of the costs and risks of DER, including regarding system size and capability.</p> <p>Retail pricing information for people desiring non-traditional electricity pricing is not always easy to access.</p>	<p><b>Retailers</b> and <b>Distributors</b></p> <p>Price comparison tool providers, eg Powerswitch</p> <p>Flexibility providers</p>	

<sup>16</sup> See <https://environment.govt.nz/publications/measuring-emissions-a-guide-for-organisations-2022-summary-of-emission-factors/> and <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/new-zealand-energy-sector-greenhouse-gas-emissions/>



**Table 3** Steps relating to information and data continued...

#	Component	Description	Who would be involved	Related activities
8	Assess whether consumers making choices about DER have streamlined access to sufficient wholesale market information [Assess]	Consumers (or their agents) thinking about using flexibility to reduce their energy-related costs or sell surplus power may need information wholesale market pricing and wholesale market conditions to enable assessment of the costs and risks of DER, including regarding system size and capability.  Wholesale market information includes: <ul style="list-style-type: none"> <li>NZ Generation Balance<sup>17</sup> and other market information produced by the System Operator</li> <li>indicative spot prices and quantities<sup>18</sup></li> </ul> Processes and systems for access to wholesale market information were designed assuming the users were well-resourced and sophisticated firms. These arrangements may not be suited for smaller parties, including households and businesses.	<b>Electricity Authority</b> , System Operator, NZX (Clearing Manager), and ASX (energy derivatives)	
12	Improve the availability to consumers of information about current and forecast network capacity and constraints, over time moving to provide visibility of conditions for the specific part of the network to which they are connected, which could include whether there is a short term opportunity to defer an upcoming investment or a long-term avoidance strategy in their region. [Assess]	Consumers (or their agents) thinking about using flexibility across the range of possible use cases will want access to information about network headroom.  Distributors have a good understanding of network headroom (ie, the available network capacity given forecast demand for network capacity) for the high voltage and medium voltage network layers due to: <ul style="list-style-type: none"> <li>historical consumption data is available, with some caveats,<sup>19</sup> from retailers for network planning purposes. This data is a key input to network planning by enabling forecasting of demand for network capacity based on well-understood network use patterns</li> <li>existing operational visibility of the HV and MV layers enabled by real-time monitoring capability provides inputs for assessing current (real-time) network headroom.</li> </ul> To improve the availability of information about network headroom for the LV layer, distributors need to <ul style="list-style-type: none"> <li>obtain monitoring capability to provide operational visibility of the LV layer</li> <li>develop forecasting capability to estimate demand for network capacity at LV layer. This requires historical consumption and power quality data and operational (real-time) consumption and power quality data.</li> </ul> Distributors need the ability, incentive and funding to invest in LV layer monitoring and forecasting capability, and to make this information accessible to consumers.	<b>Distributors</b> are responsible for producing information on network headroom  Flexibility suppliers, Equipment suppliers	NTR Actions #2 Understand DER deployment #3 New loads #16 Network understanding

<sup>17</sup> The New Zealand Generation Balance website provides information to help predict, isolate and prevent situations where available generation is insufficient to meet projected load in the next 200 days. See <https://nzgb.redspider.co.nz/>.

<sup>18</sup> Indicative wholesale prices and quantities for energy and reserve are made publicly available on the Wholesale Information Trading System (see <https://18.www1.electricityinfo.co.nz/>) for the week ahead. The information is refreshed once daily until 36hrs ahead of real-time, then every 2hrs until 4hrs ahead of real time, then every 30mins. With real-time pricing from 1 November 2022 the dispatch schedule will be published in real-time and averaged (time-weighted) at the end of each trading period to form final prices.

<sup>19</sup> Distributors have the ability to obtain historical consumption data from retailers via the default agreement – provision of consumption data in Part 12A.1 Appendix C of the Code. However, the default agreement has functionality issues which require minor amendments, including to remove clause 5(1)(e) which requires permission from the trader for the distributor to combine consumption data with other data.

**Table 3** Steps relating to information and data continued...

#	Component	Description	Who would be involved	Related activities
14	Provide consumers with reference information and education about historical voltage performance for the LV layer of the network [Assess]	Power quality, particularly voltage performance, is an input to consumer decisions to invest in PV as it indicates the potential for curtailment due to poor voltage in that part of the network. This historical data will not represent the future state of voltage performance due to factors such as new connections, equipment usage, network configurations, etc.  Curtailment of generation could significantly reduce the yield of the system and impact on the value of the investment. Network voltages from 235V will derate inverter as operating power factor will be affected. Network voltages from 244V will reduce kW rating of inverter.  Distributors measure voltage at the HV and MV layers. This capability needs to be extended to the LV layer, either through specific monitoring equipment or purchase of network operational data from smart meters. Again, distributors need the incentive and funding to obtain this capability and data.	<b>Distributors</b> are responsible for monitoring network performance and power quality  Flexibility suppliers, metering equipment providers, Equipment suppliers	Information Disclosure review draft decision  NTR Actions #2 Understand DER deployment #13 Low voltage network monitoring and visibility
16	Make sure information about current and forecast network capacity and constraints is presented in an easy-to-access and understand way [Assess]	Consumers (or their agents) thinking about using flexibility across the range of possible use cases will need to be able to understand and use the information network headroom. Distributors provide considerable information on network headroom and planning responses in Asset Management Plans (AMP). However, the AMPs are updated annually and can be difficult to interpret and use.  Publication of easy-to-access information on current and forecast network headroom and any planning response for the HV, MV and LV layers would enable more informed decisions about flexibility. Examples to consider include: <ul style="list-style-type: none"> <li>• <a href="https://www.nationalmap.gov.au/">https://www.nationalmap.gov.au/</a> which provides access to information including available network capacity (firm substation capacity minus the forecast peak demand)</li> <li>• <b>Map — UK Power Networks (opendatasoft.com)</b> which provides access to detailed information about the UKPN network including DG and flexibility resources (&gt; 1MW), network headroom, load forecasts and planning responses. This approach is a possible future state</li> </ul>	<b>Distributors</b> are responsible for presenting information on network headroom and planning responses  Flexibility suppliers, Building services engineers and other advisers	NTR Actions #15 Provision of network information
20	Understand the interaction between price-based flexibility and contracted flexibility [Assess]	Consumers can provide flexibility in two ways: <ul style="list-style-type: none"> <li>• price-based flexibility is provided indirectly by the consumer via their response to price signals created by the structure and level of network charges or the retail and spot prices.</li> <li>• contracted flexibility is provided directly via contract with the consumer. This could be a contract for delivering a flexibility response as part of specific connection terms between the customer and the distributor.</li> </ul> Consumers thinking about investing in flexibility would benefit from more clarity about when distributors, retailers, or flexibility suppliers would use price-based flexibility versus contracted flexibility or both. This clarity will enable forward looking decisions about DER capability, including the ability to shift or shed load, and operational choices about electrification.	<b>Distributors, Retailers and Flexibility suppliers</b>	

**Table 3** Steps relating to information and data continued...

#	Component	Description	Who would be involved	Related activities
32	Identify an easy-to-use method and process for providing visibility of and access to opportunities to supply flexibility for network reasons [Assess]	<p>Consumers able to supply flexibility for network reasons will be more likely to do so if the procurement journey is transparent, simple, and repeatable. The dynamic and localized nature of many constraints seen on distribution networks may mean meeting this objective creates limits on the types of opportunities available through these procurement processes.</p> <p>The procurement journey requires publication (visibility) of flexibility opportunities based on network constraints analysis and the ability to participate.</p> <p>Making it easy to participate lowers participation costs and increases access to resources and increases the volume of assets able to participate.</p> <p>Platforms like the Western Power Distribution <a href="https://www.westernpower.co.uk/network-flexibility-map">https://www.westernpower.co.uk/network-flexibility-map</a> or Piclo (<a href="https://www.piclo.energy/">https://www.piclo.energy/</a>) provide information about opportunities to supply flexibility for network reasons. The success of platforms like these require that DER resources are available and accessible.</p> <p>Providing long-term visibility of opportunities to use flexibility allows assets to be recruited and ready when required, including via repeat procurements. Flexibility providers can start the journey at their own pace.</p>	<b>Distributors and Transpower and Flexibility suppliers</b>	
35	Identify the coordination capability, roles and functions required for distributors and the System Operator to optimise network and power system operation, including data sharing required for more accurate network and system forecasting [Operate]	<p>Increasing uptake and use of flexibility will require more coordinated operation of transmission and distribution networks and the wholesale market, particularly relating to:</p> <ul style="list-style-type: none"> <li>forecasting supply and demand for electricity and network</li> <li>physical operation, including maintaining voltage and availability of flexible resources, eg, for AUFLS.</li> </ul> <p>More coordination between distributors and the System Operator will include more data sharing and feedback loops to assist load forecasts to be as accurate as possible and to enable optimal network and power system operation.</p> <p>The coordination will influence the ability of households and businesses to realise value from their DER and flexibility.</p>	<b>Distributors, Transpower and System Operator, Retailers, Flexibility suppliers</b>	NTR Actions #15 Provision of network information

# Process steps

**Table 4** Steps relating to processes

#	Component	Description	Who would be involved	Related activities
11	Explore the use of dynamic operating envelopes for managing access to the network for consumers' DER [Assess]	<p>Dynamic operating envelopes (DOE) are a method for varying the network access available to a connection, and/or to an individual resource, by time and by location based on the available capacity of the local network or power system.<sup>20</sup></p> <p>Dynamic rather than fixed limits are expected to enable more efficient use of available network capacity.</p> <p>DOEs are a more sophisticated and principled allocation of the available network capacity to individual or aggregate DER or connection points. DOEs are not meant to be used for set-point control, but instead place bounds around potential set points that reflect available capacity.</p> <p>Applying DOEs requires developing the capability and process to:</p> <ul style="list-style-type: none"> <li>• Determine the initial or uncontrollable powerflow and available hosting capacity</li> <li>• Identify the location of DER or connections which will be allocated the available (spare) hosting capacity</li> <li>• Calculate and allocate the available (spare) hosting capacity</li> <li>• Publish and communicate the operating envelopes to those with control of flexible resources</li> <li>• Allow aggregation if possible.</li> </ul> <p>DOEs may impact consumers' use of DER for both import and export of electricity. Given the potential for consumer impact extensive consumer engagement will be required to build trust and earn the social license to use DOEs.</p>	<p><b>Distributors</b> are responsible for assigning network access</p> <p><b>The Electricity Authority</b> regulates network access for DG under Part 6 of the Code</p> <p><b>Retailers, Flexibility suppliers</b></p>	<p>NTR Actions</p> <p>#6 enable distribution network trading</p>
17	Provide clarity around the intent and criteria for using flexibility by network operators [Assess]	<p>Consumers and Flexibility suppliers will inform their decisions to invest in flexibility, including location and type of DER, based on the expectation that network operator may use flexibility for network reasons.</p> <p>Key to the growth in the use of flexibility by distributors in the United Kingdom was the flexibility first commitment, with all distributors committing to trying to first use flexibility to manage network conditions.<sup>21</sup></p>	<p><b>Transpower</b> and <b>distributors</b> are responsible for network planning, Flexibility suppliers</p>	
19	Demonstrate the effectiveness of using flexibility for network reasons to build knowledge around the economic business case, resource availability, use cases, performance characteristics and associated risks, and the processes and platforms necessary for procuring and dispatching that flexibility [Assess]	<p>Transpower and some distributors have, or are, testing the use of modern DER based flexibility to provide network services, eg, capacity support.</p> <p>More experience through learning-by-doing is required to prove when it is appropriate, what risks are associated with its use, where and how flexibility can be used to provide networks services, eg, capacity support.</p> <p>Building the knowledge around the economic business case, resource availability, and performance characteristics associated with these use cases would inform (Component #18).</p>	<p><b>Transpower, Distributors</b> and <b>Flexibility suppliers</b></p>	<p>NTR Actions</p> <p>#7 Third party DER and DR for network support</p> <p>#14 Network stability</p> <p>#17 Contracting for network support</p>

<sup>20</sup> For more information on DOEs, see the work of the Australian Distributed Energy Integration Program DOE workstream at <https://arena.gov.au/knowledge-innovation/distributed-energy-integration-program/dynamic-operating-envelopes-workstream/>

<sup>21</sup> Energy Networks Association Flexibility Commitment, December 2018, at <https://www.energynetworks.org/industry-hub/resource-library/open-networks-flexibility-commitment-2018.pdf>

**Table 4** Steps relating to processes continued...

#	Component	Description	Who would be involved	Related activities
21	Develop a common method for valuing flexibility used for network services and making associated investment decisions [Assess]	Potential suppliers of flexibility will make decisions based on potential value available. Providing information about the method for valuing flexibility and the price range will enable more informed decisions about investing in flexibility and help to build liquidity.  Experience in the UK indicates that publishing a price range attracts suppliers. Competition and transparency between suppliers means that distributors should receive the best price.	<b>Distributors, Retailers and Flexibility suppliers</b>	
23	Demonstrate the effectiveness of using flexibility for ancillary services [Assess]	There is some use of distributed flexibility by the System Operator for ancillary services.  More experience through learning-by-doing is required to prove when, where and how flexibility can be used to provide ancillary services, and how that use might impact distribution network operations.  An approach for routine use of distributed flexibility at scale can be identified with the benefit of experience.	<b>System Operator</b> procures ancillary services, <b>Distributors</b> and <b>Flexibility suppliers</b>	
24	Develop a method for providing technical qualification of DER (at scale) to provide ancillary services [Assess]	The System Operator procures ancillary services. The Procurement Plan <sup>22</sup> gives details of the procurement process and requirements for each service. Testing and technical qualification processes are based on obtaining ancillary services from large suppliers. Using these same qualification processes for large numbers of small-scale flexibility resources might be onerous and costly, thus creating a barrier to participation.	<b>System Operator and Flexibility suppliers</b>	
27	Review whether connection application processes and connection standards enable rapid uptake of DER [Enable]	Electrification and uptake of DER are expected to create more frequent touchpoints between households and businesses and distributors as more requests for new or upgraded connections are received.  Using connection processes based on traditional network connections for DER-related requests may absorb more resources and take longer, particularly if detailed technical studies are needed.  Having access to streamlined connection processes should support DER and flexibility investments and avoid resourcing issues for distributors and avoid delays and unsatisfactory experiences for consumers.  Part 6 of the Code sets out the connection process for distributed generation, offering 3 different processes depending on circumstances, each with different timeframes. Part 6 only applies to DG, not load managing DER.	<b>Distributors</b> are responsible for Connection standards/policy, including the process, subject to a range of legislative requirements and limitations  <b>Retailers, Flexibility suppliers</b>	

<sup>22</sup> Ancillary services procurement plan, 22 March 2022, available at <https://www.ea.govt.nz/assets/dms-assets/30/Certified-Copy-Ancillary-Services-Procurement-Plan-Effective-3-May-2022.pdf>

**Table 4** Steps relating to processes continued...

#	Component	Description	Who would be involved	Related activities
29	Identify a common approach to risk management in consumer contracts for services relating to flexibility which ensures a fair and reasonable allocation of risk [Enable]	<p>Common and fair terms of trade, particularly relating to risk management</p> <p>Retail contracts are expected to align with regulatory expectations in the minimum terms and conditions for domestic contracts and consumer care guidelines.<sup>23</sup></p> <p>Services offered by retailers of flexibility suppliers relying on flexibility may include new or different provisions beyond existing regulatory expectations.</p> <p>Standardisation of contracting arrangements will occur over time. Standardising too soon creates a risk of locking in conservative arrangements which reflect current understanding and risk appetites, rather than more mature arrangements based on experience. In the early stages of deployment a proactive response strategy for addressing failures would benefit consumers.</p> <p>However, a common approach to contracting will be needed for new provisions dealing with allocation of risk and cost to ensure these are fair and reasonable. A common approach to risk management will enable households and businesses to be more confident about what they are buying given the small number of reference points for negotiations between consumers and retailers/suppliers, the potential for variation based on the maturity of those negotiating, relative risk appetites and capability to deal with mitigations. [refer FF session 13]</p>	<b>Retailers and Flexibility suppliers</b>	
33	Develop a scalable and accessible process for procuring flexibility for network reasons [Enable]	<p>Experience from the UK is to make the procurement journey transparent, simple, and consistent as possible so it is repeatable and minimises barriers to participation. This will particularly assist participation of smaller flexibility resources, as the traditional procurement methods for distributors are not designed with smaller resource providers in mind.</p> <p>Traditional procurement platforms may not be fit-for-purpose for procuring small scale flexibility, potentially being labour intensive and unfriendly for the user/provider friendly given the scale of resources/contracts.</p>	<b>Distributors, Transpower and Flexibility suppliers</b>	<p>NTR Actions</p> <p>#7 Third party DER and DR for network support</p> <p>#17 Contracting for network support</p>
34	Identify a common approach to options for risk management in contracts to supply flexibility for network reasons [enable]	<p>A common approach for the terms of trade for supplying flexibility for network reasons will reduce transaction costs.</p> <p>Standardisation of contracting arrangements will occur over time. Standardising too soon creates a risk of locking in conservative arrangements which reflect current understanding and risk appetites, rather than more mature arrangements based on experience.</p> <p>A common approach to risk management will enable households and businesses to be more confident about what they are buying given the small number of reference points for negotiations between counterparties, the potential for variation based on the maturity of those negotiating, relative risk appetites and capability to deal with mitigations. [refer FF session 13].</p> <p>The approach to risk management is expected to evolve over time as use of flexibility for network reasons moves from pre-commercial to mature product after gaining experience with learning-by-doing.</p>	<b>Distributors, Transpower and Flexibility Suppliers</b>	

<sup>23</sup> Regulatory expectations set by the Electricity Authority relating to retailer contracts are available here: <https://www.ea.govt.nz/operations/retail/retailers/retailer-obligations/>. Contracting arrangements must also meet other legislative requirements, such as the Fair Trading Act.



**Table 4** Steps relating to processes continued...

#	Component	Description	Who would be involved	Related activities
36	Identify a common process for validation and settlement of services using flexibility to supply network services and ancillary services [Operate]	A common process for measuring delivery of flexibility is required to underpin payment for service provision. A common process for settlement of financial for electricity, network and ancillary services should be included as part of the terms of trade. The process should reflect a common approach to measurement and reporting.	<b>Distributors, System Operator and Flexibility Suppliers</b>	

Appendix A: Process steps

## Regulatory steps

**Table 5** Steps relating to regulatory settings

#	Component	Description	Who would be involved	Related activities
2	Ensure consumers and their agents have streamlined (automated) access to historical consumption information, plus other connection-related information [Discover]	Historical consumption information is a critical input to a consumers' decisions about flexibility. Households and businesses can access historical consumption data from their retailer. However, this access is not always streamlined, particularly when an agent is requesting the information on behalf of the consumer. <sup>24</sup> The Registry administered by the Electricity Authority holds information relating to all connection points to the electricity system, including physical location, distributor, trader, meter type and generation. <sup>25</sup> The Registry is populated by retailers and distributors.	<b>Retailers</b> and the <b>Electricity Authority</b> for historical consumption information <b>Electricity Authority</b> for connection-related information <b>Flexibility suppliers and customer agents, Metering equipment providers</b>	ENA Network Transformation Roadmap (NTR) Actions #1: Access to smart meter data
5	Provide consumers with the ability to choose across the range of options for buying and selling electricity services with separate providers [Discover]	Households and businesses are currently functionally limited to buying and selling power from a single trader at a time, which may prevent them optimising the value of their flexibility by contracting with one trader to buy power and contracting with another trader to sell power. Market systems will need to adapt to enable customers to choose to contract with one or more traders or flexibility suppliers.	<b>Electricity Authority</b> is responsible for the functionality of market systems	Ara Ake is leading a pilot to test practical options and benefits
13	Ensure distributors have the ability and incentive to invest in capability to obtain and produce network information to enable consumer decisions [Assess]	Because low-voltage visibility has not been a core business requirement, the associated capital and operating costs have not been reflected in the revenue (costs) allowed by the Commerce Commission price-quality regime. As the regime uses historical costs to determine the revenue allowance, non-exempt distributors do not have funds to invest in obtaining greater network visibility and a richer set of operational information (without risking the negative impacts of under-investing elsewhere).	The <b>Commerce Commission</b> is responsible regulatory settings	Input methodology review

<sup>24</sup> Consumer access to historical consumption data is enabled through the Electricity Industry Participation Code 2021, Part 11, clauses 11.32A-11.32F. See <https://www.ea.govt.nz/assets/TheCodeParts/Code-Part-11-Registry-information-management-1-March-2022.pdf>.

<sup>25</sup> Go to <https://www.ea.govt.nz/operations/market-operation-service-providers/registry-manager/>. Customers and service providers can access most of this connection-related information, see <https://www.ea.govt.nz/consumers/your-power-data-in-your-hands/my-meter/>.

Appendix A: Regulatory steps

**Table 5** Steps relating to regulatory settings continued...

#	Component	Description	Who would be involved	Related activities
15	Review voltage limits to ensure they do not create a barrier to uptake of DER [Assess]	<p>Power quality, particularly voltage performance, is an input to consumer decisions to invest in PV as it indicates the potential for curtailment due to poor voltage in that part of the network.</p> <p>The <b>Electricity (Safety) Regulations 2010</b> require a supply of electricity to installations to be within 6% of a range from 200V and 250V AC.</p> <p>This voltage range was set assuming little to no DER, particularly solar.</p> <p>The voltage limits need to be updated to remove a barrier to uptake of DER, particularly PV. The most straight-forward solution is to adopt the voltage limits being introduced in Australia and allow voltage to be 10% above and 6% below the 200-250V range.</p>	<p>Distributors are responsible for meeting voltage limits.</p> <p><b>MBIE</b> is responsible for the Electricity (Safety) Regulations 2010</p> <p>Equipment suppliers</p>	
18	Ensure regulatory settings provide Transpower and distributors with sufficient resources, incentives, and permission to explore and use flexibility options [Assess]	<p>Transpower and some distributors have, or are, testing use of modern flexibility to provide network services, eg, capacity support. All distributors have experience with flexibility through use of ripple control.</p> <p>Modern flexibility resources will not be like ripple control because they allow dispatch of individual resources, and households and businesses will control how and when the resources are available. This difference means Transpower and distributors do not have experience with or confidence in the reliability of modern flexibility – this experience needs to be developed.</p> <p>Developing this experience is complicated because distributors do not have adequate incentives to make the forward-looking investments required to develop confidence in the capability of flexibility, particularly when they risk being penalised for breaching reliability thresholds due to directing limited resources towards testing flexibility, and risk facing shareholder, community and political repercussions.</p> <p>Similarly, flexibility suppliers do not have incentives to invest in demonstrating flexibility for distribution because there is no obvious path to market. Other revenue streams are apparently not sufficient to warrant the investment in commercialisation.</p> <p>The commercialisation of flexibility elsewhere has been explicitly supported by availability of funding for distributors to build experience, alongside an expectation that distributors actively commit to building that experience, including through collaboration with flexibility suppliers. Current regulations in NZ limit distribution expenditures to the provision of the electricity distribution service, which would not include market making in potential adjacent markets.</p> <p>Key to the growth in the use of flexibility by distributors in the United Kingdom was the flexibility first commitment, with all distributors committing to trying to first use flexibility to manage network conditions.<sup>26</sup></p> <p>Transpower and distributors will also need to be (1) funded to purchase flexibility services (2) and/or the regulatory mechanisms allow capex and opex substitution (which it currently does within a regulatory period, but not across regulatory periods).</p>	<p><b>Commerce Commission,</b> Transpower, Distributors, Flexibility suppliers</p>	<p>Input methodology review ID review</p>

<sup>26</sup> Energy Networks Association Flexibility Commitment, December 2018, at <https://www.energynetworks.org/industry-hub/resource-library/open-networks-flexibility-commitment-2018.pdf>

**Table 5** Steps relating to regulatory settings continued...

#	Component	Description	Who would be involved	Related activities
22	Ensure regulatory settings enable System Operator to use flexibility options [Assess]	Ancillary services are delivered according to the Code, Procurement Plan and contractual requirements. These arrangements were developed for an environment without much distributed flexibility. As such, it is worth checking the arrangements are fit-for-purpose and do not create barriers to the System Operator using flexibility for ancillary services.	<b>System Operator</b> procures ancillary services, <b>Flexibility suppliers</b>	FSR workstream
26	Ensure technical standards for devices remain up to date and interlinked with international standards [Enable]	Technical standards should always remain up to date. This is not always the case. For example, the Electricity (Safety) Regulations 2021 directly reference 4777.1:2005, which is an obsolete standard but applies until the Regulations are amended. Refer <a href="https://www.worksafe.govt.nz/laws-and-regulations/regulations/electrical-regulations/regulatory-guidance-notes/regulatory-application-of-asnz-4777/">https://www.worksafe.govt.nz/laws-and-regulations/regulations/electrical-regulations/regulatory-guidance-notes/regulatory-application-of-asnz-4777/</a>	<b>MBIE</b> is responsible where standards are referenced in legislation	
28	Explore how to deliver a flexibility resource register (including DER other than distributed generation) [Enable]	<p>Distributors obtain information about distributed generation (DG) through the connection process. Some of this information is recorded in the Registry and is generally accessible.</p> <p>Distributors have expressed a desire to have equivalent visibility of EV chargers. This requires a change to legislation to require households and businesses to advise distributors about installation of EV chargers.</p> <p>The main reason for wanting this visibility is to aid forecasting of network use and planning.</p> <p>Experience with mandatory registration of EV chargers from the UK suggests mandatory approaches can be difficult to enforce and may draw consumer ire.</p> <p>Registration of the DER and flexibility at a connection would enable things like: marketing of products and services, streamlined switching of retailers/suppliers, and help avoid allocating the same capability twice.</p> <p>Options should be explored and tested to ensure the most reasonable approach is selected to balance the trade-offs between the costs and intrusion into consumer affairs and benefits of enhanced data for simplifying forecasting of network use to assist safe and reliable network management.</p> <p>The decision to impose obligations on consumers relating to the devices they install in their homes and businesses should follow extensive consumer engagement to build trust and earn the social license to do so.</p>	<b>Distributors</b> record DG (DER) information, Electricity Authority, Retailers and Flexibility suppliers, Equipment suppliers	
30	Establish fit-for-purpose participation requirements for flexibility suppliers that enable participation by small entities with DER and flexibility [Enable]	<p>The Electricity Industry Act defines a range of Participants based on the activities they engage in.<sup>27</sup> Households and businesses engaging in activities of a participant must register as a participant, and ensure they meet all the relevant obligations.</p> <p>The participation requirements, and obligations on participants, reflect a traditional electricity supply chain, and may not be fit-for-purpose to enable 'participation' by large numbers of small entities with DER and flexibility.</p>	<p><b>MBIE</b> is responsible for the Act</p> <p>The <b>Electricity Authority</b> is responsible for administering the Code</p> <p><b>Participants – distributors, retailers, flexibility suppliers</b></p>	

<sup>27</sup> The list of Participants is available here: <https://www.ea.govt.nz/operations/industry-participants/participant-register/>.

# Appendix B: Glossary

This Glossary describes terms and concepts relevant to ‘flexibility’ and distributed energy resources. This Glossary is provided as a starting point. It is not comprehensive.

Term	Definition
<b>Active DER</b>	DER that can be externally controlled by a third party to provide a response, often coordinated with other DER as part of a Virtual Power Plant (VPP).
<b>Active Managed Charging</b>	This form of managed charging, also known as direct load control, supersedes customer charging behaviour and imposes utility preferences on charger functionality. Charging is controlled by communication signals sent from a utility or aggregator to a vehicle or charger. Active managed charging can be event based, where load is controlled during a limited number of events in a given time period. Active managed charging can also be continuous, which enables more constant control that is responsive to grid conditions on a more granular scale.
<b>Active Network Management</b>	the use of distributed control systems to continually monitor network limits, along with systems that provide signals to Flexibility suppliers to modify outputs in line with these limits.
<b>Aggregator</b>	A commercial entity that combines disparate Flexible Resources and offers it as larger units. The means of aggregation could be commercial or technical. An Aggregator is an entity who acts as an intermediary between active parties such as distributed energy resources and active customers who can offer flexibility See Flexibility Supplier
<b>Advanced Metering</b>	Advanced Metering typically includes ‘smart meters’ (that measure bi-directional energy flows at a higher level of granularity than conventional meters), upgraded communications networks (to transmit large volumes of data), and requisite data management systems.
<b>Charger</b>	The on-board or off-board device that interconnects the EV battery with the electricity grid and manages the flow of electrons to recharge the battery. Also known as Electric Vehicle Supply Equipment (EVSE).
<b>Charging Session:</b>	A charging session is the amount of time that transpires beginning when an EV driver plugs a charger into their vehicle and ending when they unplug the charger from the vehicle. In the context of managed charging, a charging session serves as the opportunity for throttling to take place.
<b>Charging Station:</b>	The physical site where the Electric Vehicle Supply Equipment (EVSE) (also known as the charger) or inductive charging equipment is located. A charging station typically includes parking, one or more chargers, and any necessary “make-ready equipment” (i.e., conduit, wiring to the electrical panel, etc.) to connect the chargers to the electricity grid, and can include ancillary equipment such as a payment kiosk, battery storage, or onsite generation.
<b>Continuous Managed Charging</b>	This managed charging method, also known as dynamic managed charging, adjusts the EV load according to real-time or near real-time grid conditions. Continuous managed charging adjusts EV charging schedules in response to wholesale energy prices, renewable generation, grid constraints, and other utility signals while adhering to driver preferences
<b>Demand Response (DR)</b>	Demand response is a load management method that is used during periods of peak demand to relieve grid stress. As part of a demand response effort that occurs during a charging session, the charger could be throttled to reduce energy consumption temporarily and return to full charging capacity once grid stress is relieved.
<b>Distributed energy resources</b>	Technologies used to generate, store, or manage energy are referred to as distributed energy resources (DER). DER are smaller-scale devices that can either use, generate, or store electricity and form a part of the local distribution system, which primarily serve homes and businesses. DER can include renewable generation, energy storage, electric vehicles (EVs), and technology to flexibly manage loads (such as water heaters or pool pumps) at the premises. Generation or storage DER operate for the purpose of supplying all or a portion of the customer’s electrical load and may also be capable of supplying power into the system or alternatively providing a load management service for customers. DER can also include front-of-meter small generation or storage located in lower-voltage parts of the network

Term	Definition
<b>Electric Vehicle Supply Equipment (EVSE)</b>	The equipment that interconnects the AC electricity grid at a site to the EV. It can be Level 1, Level 2, or Direct Current Fast Chargers (DCFC) charging. Also known as a charger.
<b>Flexibility</b>	The modification of generation and/or consumption patterns in response to an external signal, to provide a service within the energy system.
<b>Flexibility Platform</b>	An IT platform where the coordination, trading, dispatch and support services for Flexibility to be transacted
<b>Flexible Resources</b>	Typically distributed generation, storage or demand response, are connected to the electricity network, and are flexible in how they operate and impact the network
<b>Flexibility Supplier</b>	An entity providing Flexibility to perform a service for an electricity participant A Flexibility Supplier is an owner of, or responsible for, managing DER to perform services for Flexibility buyers Importantly, flexibility suppliers can maximise the value of DERs by allocating them to their highest value use ("value stacking").
<b>Flexibility Buyer</b>	An entity buying Flexibility to perform a service
<b>Hosting Capacity</b>	Hosting capacity is a calculation of the maximum amount of load or generation that can be connected to a distribution network (and the electricity system as a whole) without breaching technical limits.
<b>Interoperability:</b>	The ability of devices, systems, or software provided by one vendor or service provider to exchange and make use of information, including payment information, between devices, systems, or software provided by a different vendor or service provider.
<b>Market</b>	A regular gathering of people/parties for the purchase and sale of a good or service, for example electricity
<b>Network headroom</b>	The available network capacity given forecast demand for network capacity See Hosting Capacity
<b>Passive DER</b>	Any DER that is not an Active DER (ie, cannot be externally controlled by a third-party to provide a response). Passive DER may still change its behaviour autonomously in response to network conditions (such as a change in electrical frequency).
<b>Platform Market</b>	A Market where user interactions are mediated by an intermediary, the platform provider, and are subject to network effects. As opposed to a marketplace or trading exchange, a platform intermediary must offer inherent value beyond the simple mediation process for the two sides of the Market. This added-value usually comes from ICT and the associated complementary innovation that increases utility and attractiveness of the Flexibility Platform to all user groups.
<b>Smart Grid</b>	An electrical grid which includes a variety of operational and energy measures including smart meters, smart appliances, renewable energy resources, and energy efficient resources. Electronic power conditioning and control of the production and distribution of electricity are important aspects of the Smart Grid.
<b>Virtual Power Plant (VPP)</b>	VPPs are notional entities comprised of aggregated and managed DER components, which can provide generation, managed load (up or down), and system support functions and can participate in energy markets (like traditional generators).
<b>Volt-Watt response</b>	Volt-Watt response mode reduces inverter power output when voltage levels rise above 250V.
<b>Volt-Var response</b>	Volt-Var response mode smooths grid voltages by using the customer's inverter to absorb reactive power from the grid when voltage levels rise above 235V. When voltages fall below 220V, the Volt-Var mode will cause the customer's inverter to produce reactive power to support the grid voltage.

The list has been developed from a range of sources, including:

- ENA, Open Networks Project, Flexibility Market Principles, July 2019
- ENA, Open Networks Project, Terms and definitions, September 2019
- IPAG, Review of the Transpower demand response programme, September 2021
- SEPA: The State of Managed Charging in 2021