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The Electricity Authority's

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Dear Dr Crauford

Updating the Regulatory Settings for Distribution Networks

Thank you for the opportunity to help inform the regulatory settings for distribution networks so that the regulatory framework supports competition in a low emissions economy. Fit for purpose regulatory settings are also an essential enabler for the industry to meet its climate change obligations.

Wellington Electricity Lines Limited (**WELL**) has been developing how it will accommodate electric vehicles (**EVs**) and other Distributed Energy Resources (**DER**) on the Wellington distribution network since 2017 with the support of EECA funding and other technology partners. We have recently expanded our development programme to incorporate the wider climate change actions released early this year in the Climate Change Commission (**CCC**) 2021 Draft Advice for Consultation (**Draft Advice**).

The climate change actions require regulatory change. We believe that rather than facilitating the changes needed in the electricity sector, regulation is hampering the development of the new capability and capacity needed to accommodate the climate change driven increase in electricity demand and to connect new customer devices to distribution networks while maintaining network stability and security. Our own EV Connect programme (which has been developed in consultation with the industry) has highlighted regulatory support and leadership as being an essential enabler for the industry. The strong progress made in other jurisdictions, like the United Kingdom and Australia, has been made with the help of regulators providing distribution networks with the funding and incentives needed to develop new innovation, tools and services that will assist in accommodating new demand and new customer devises. We welcome the opportunity to participate in updating the regulatory settings and we support the Electricity Authority's view that change is quickly needed.

We agree with the Authorities vision for distribution networks and with the themes presented in the '*Updating the Regulatory Settings for Distribution Networks'* consultation document (**Consultation Document**). The Authorities vision aligns closely with our own EV Connect work programme. The EV Connect work programme considers similar topics as those outlined in the Consultation Document with the additional advantage of being developed using the latest industry views gathered from a recent industry consultation. We are in the process of finalising the EV Connect Roadmap of actions that the industry believe are needed to accommodate EVs onto the electricity network. While we won't have completed the final roadmap in time for this submission of this response, we have appended the draft roadmap and we will circulate the final roadmap to the Authority once its finish in October.

However, we are concerned that parts of the discussion included in the Consultation Document are based on are old industry feedback that was provided before climate change actions and targets were presented. The CCC Draft Advice has accelerated the pace of change and the development of new ideas and concepts. We hope our own EV Connect Roadmap which we have provided with this response will provide an update of the industry's views and alternative options to consider. Many of the options presented are also for future versions of flexibility service that are still in their infancy and may not develop into the form expected. We believe that care is needed to avoid a regulatory framework that is too prescriptive. Regulatory flexibility is needed to allow stakeholders to test and develop the new services without barriers restricting or slowing progress. More restrictive regulation can always be applied later once services mature.

This response provides details of our EV Connect programme which we hope the Authority will find useful as a consolidated view of the actions needed to accommodate EV's and other DERs on to the electricity network. The EV Connect programme is an industry wide programme which recognises that actions required go beyond just those needed by distribution networks. The electrification of transportation and the increasing use of DER has been expected by distribution networks and the wider industry for some time now and good progress has been made in understanding the challenges and what's needed to meet the increase in electricity demand and co-ordinate the industries response.

Before detailing the EV Connect programme, this response will also provide an overview of the impact the climate change actions will have on the Wellington network, an overview of the wider work programmes we are implementing in response (EV Connect is only one of the programmes) and a summary of useful advice from our sister distribution companies in United Kingdom, Australia and

Hong Kong. The overview will provide context to support our direct responses to the consultation questions and the options being considered.

1. The impact of the climate change actions

The fast-paced development of technology and its adoption will result in some customers having more choices for energy generation, storage and management within their homes. The new technology also allows two-way power flows and new business models trading in energy from DER, turning the traditional distribution network into an active system. This will require additional monitoring and coordination than the current price-quality system considers.

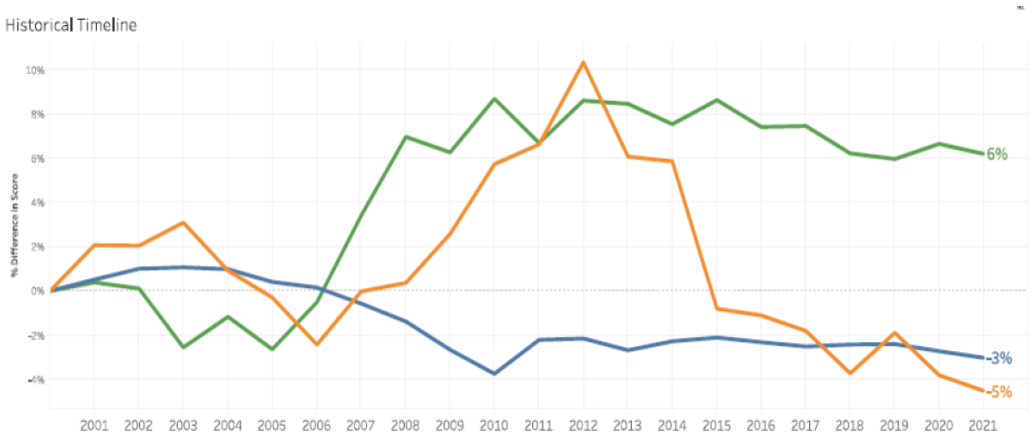
Where new demand is higher than the current network capacity, the increase in demand is traditionally met by building a larger network – bigger cables, larger transformers and higher capacity sub-transmission equipment to deliver more energy. New factors mean that traditional delivery methods (and the current regulatory framework) alone may not meet expectations of an affordable and secure delivery system:

- **The size of the increase in demand:** An initial calculation of the change in electricity demand needed to meet the CCC Draft Advice actions shows an 80% increase. This represents an unprecedented increase in demand outside of what the industry regulatory settings is currently structured to deliver. This is in addition to recent demand increases from new housing developments in response to the Wellington housing shortage.
- **Rapid uptake of electric vehicles:** The uptake of electric vehicles (EVs) is a cornerstone of the climate change actions to reduce carbon emissions. EV charging significantly increases household energy use and the CCC's promotion of EVs above fossil fuel driven transportation is likely to cause a rapid increase in electricity demand - an increase that maybe difficult for traditional network re-enforcement to keep pace with.
- **New technology:** New consumer products will allow homes to generate, store and export energy from behind the meter, effectively turning the supply system on its head. This will require standards and guidelines to ensure the low voltage network remains stable and within its operating limits, so all consumers receive an acceptable quality of supply. There will be different value streams which will be reconciled across the distribution network as new and innovative services are developed. This will be supported by digitisation of many of the new devices allowing them to be aggregated and managed by a variety of vendors. This will require new rules and standards to ensure the distribution network receives access to data on real time network performance to manage capacity, hosting and identify constraints. The new

technology will provide consumers with the opportunity to participate in flexibility services to support network security and reliability.

- **Cost impact:** Building a larger network is expensive. Our early calculations show that if energy from EV's charging is not managed, it could increase peak demand by 80% which will cost hundreds of millions of dollars and lead to increased prices by 80% (nominal) over 30 years. A price increase of this magnitude could be unaffordable for a large number of consumers and therefore we need to consider more dynamic pricing to avoid cross subsidisation.
- **Time and resources needed to double the capacity of the network:** The significant increase in network investment will come at a time when other distribution networks, the transmission grid and other industries like water and transportation will also replacing, developing and growing their infrastructure in response to the climate change targets. A finite pool of skilled resource in New Zealand (and potentially globally as other countries reduce carbon emissions) could make this level of growth unrealistic.
- **Changing risk landscape for investment.** The uncertainty of future investments will have a dampened effect on longer term investment, like what has been seen with directives on gas exploration and bringing forward the replacement of gas with electricity rather than gas remaining a transition fuel. Without an adequate change in regulation to support investors making a return on investment, there is likely to be less capital available at an affordability level than what is needed to deliver the climate change actions. Already, decarbonising process heat is realising the need to retain coal boilers as electrification may not be affordable at peak demand periods (wholesale market pricing) and hence it may be more effective to retain coal for process heat. This underlines that base load generation other than coal or gas or water, will leave the system at risk to intermittent sources of generation and scarcity pricing. This creates expensive energy on top of higher costs for increasing infrastructure investment. It will be important to strike the correct balance between sustainability, security and affordability. However there currently isn't a government agency assigned the responsibility for this overview. While NZ remains within the top ten internationally for the energy trilemma index (shown in Figure 1 below), the index shows that improved sustainability (green line) has come at the expense of security (orange line) and affordability (blue line).

Figure 1: Energy trilemma index, Business NZ Energy Council – Sept 2021



The need for alternative delivery solutions is more than providing lower long term distribution prices. We are concerned than just using traditional delivery methods won't allow distribution networks to meet the climate change actions.

In our submission to the Draft Advice, we outlined why new solutions are needed to better utilise the existing network to meet the Climate Change energy demands while delivering distribution services that are affordable and secure. Figure 1 shows that if the new demand is not well managed then higher investment will be required to increase demand capacity. Conversely, if the new demand can be managed and existing capacity headroom utilised during the less congested day and night periods, then further network investment could be deferred, helping to keep long term prices low prices for customers.

Figure 2: Our approach to delivering the Climate Change emissions targets

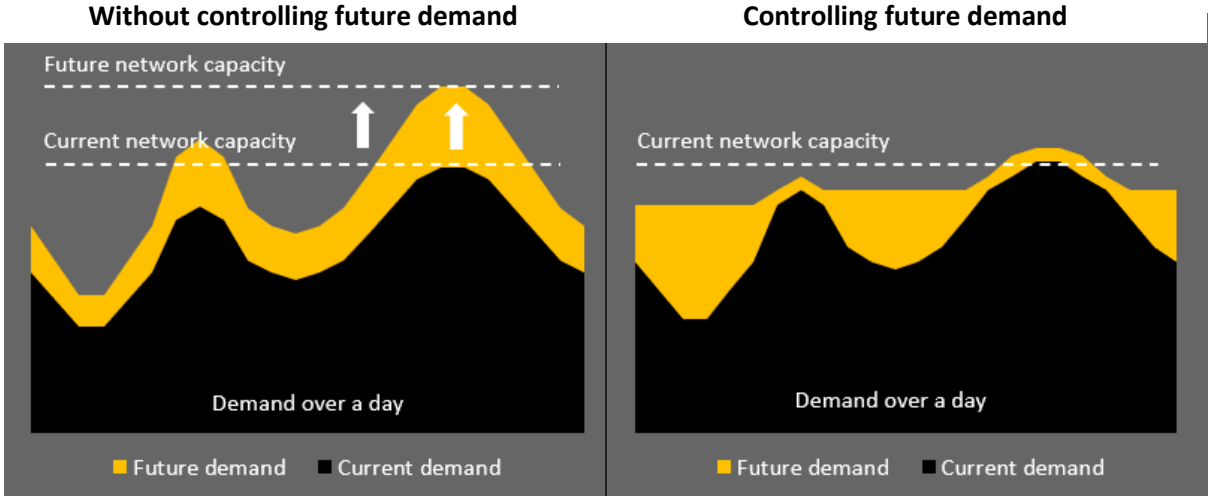


Figure 2 represents a theoretical view of optimising network utilisation to meet the proposed climate change actions. In reality we would expect that additional network investment is required to:

- Provide capacity for consumers who want to use electricity during peak demand periods and are willing to pay the cost reflective price to do so.
- Assist in maintaining a high level of network security. The Wellington network has a high customer density, so this allows a degree of interconnectivity to provide a secure system, particularly in underground areas. However, flattening the demand curve may require additional asset investment or services investment to maintain security levels during planned maintenance. There also needs to be some spare capacity to manage unplanned events, allowing enough capacity to reconfigure the network and shift demand.
- Re-enforce sections of the network that do not have enough capacity headroom to meet the expected increase in demand. Figure 1 does not represent every section of the Wellington network and some sections will need re-enforcing for existing demand growth ahead of climate change initiatives of EV adoption and reticulated gas curtailment.
- Provide headroom for sections of the network where we are forecasting rapid growth and where demographic forecasts show existing capacity will be used up by new or emissions reduction growth.

We are in the process of modelling investment scenarios reflecting different levels of demand management. Our Initial calculations indicate an investment of between $0.5b and $1b is needed to meet the proposed climate change actions, depending on the how much of the new demand we can move to less congested periods. This supports the Authority's general view that the value of efficiently managing peak demand is significant.

Our approach to meeting the climate change targets is to increase our community engagement and educate consumers on the sustainability benefits of demand side management particularly for energy storage. This has been summarised in the short animation video:
https://www.welectricity.co.nz/insights/show/climate-change-response/

2. Focus on shifting EV and hot water demand

Our early estimates indicate that controlling the load to move electricity consumption to less congested periods on the network means that peak demand could be up to 60% less than if energy use during peak demand wasn't controlled (this is the maximum amount – in reality is likely to be

much less as not all load can be shifted). This means that the investment in the network would also be less – the increase in demand can be delivered by a smaller network with managed demand.

We are part of Concept Consulting EV Study work programme. A key deliverable of the programme is to establish what load can be shifted to a less congested period. This will allow us to focus on the development of flexibility services for customer DER that can be practically moved. The study found that management of EV chargers and hot water provides the best opportunity for shifting peak residential demand. Of new demand, management of EV chargers has the largest influence of peak demand – which is why our work programme has focused on EV chargers. Our work programme in the future will consider hot water and how we can maintain and expand our current hot water control capability, particularly as gas hot water heating systems are electrified.

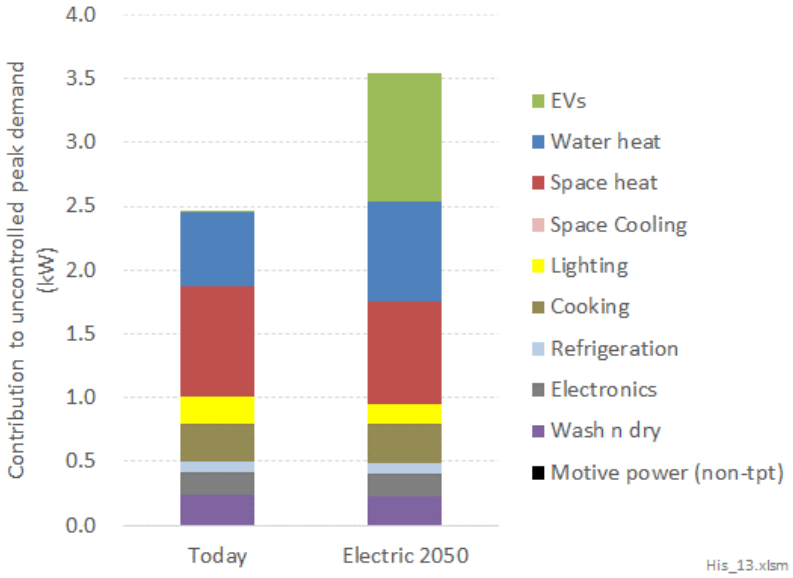
The Concept Consulting EV study analysed two points in time[1]:

- 'Today', being a breakdown of electricity consumption between end-uses as per EECA's Energy End-Use Database[2]
- 'Electric 2050', being the increase in average per household electricity consumption by 2050 assuming the degree of electrification proposed by the Climate Change Commission in its draft advice.

Figure 3 shows the estimated breakdown of average per household contribution to peak demand without any demand management – i.e., prior to any appliance control or action by consumers to change when they use an appliance. Prior to any demand management, the biggest driver of today's average uncontrolled household contribution to system peak is space heating, followed by water heating, then cooking, with other appliances driving the remaining 30% of peak demand. By 2050, if households have no incentives to manage when they charge their EVs, un-managed peak per household demand will increase by 45% - largely from EVs, with some increased contribution from water heating (gas being removed) and small offsets from other uses. In total, EVs would represent 30% of un-managed peak demand per household.

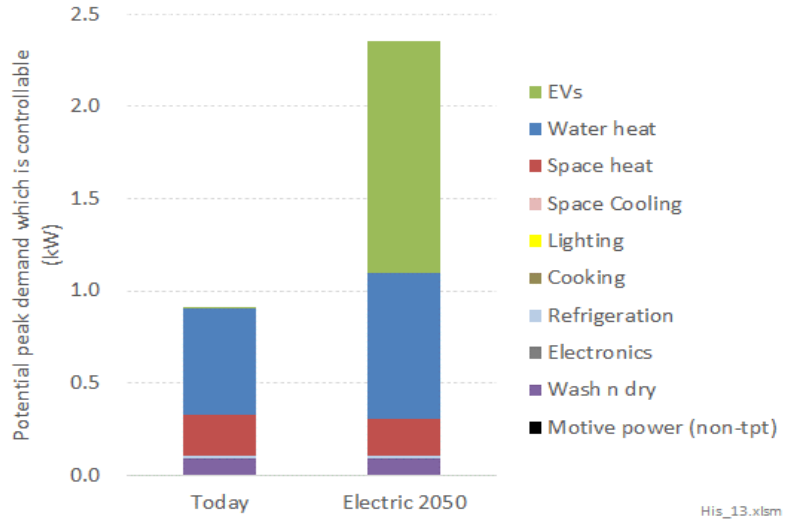
[1] The key assumptions are natural gas and LPG space heaters all switch to heat pump electric, water heating all switches to electric, with 15% using heat pump cylinders (and the balance using resistive heating), household vehicles are all fully electric, and 20% of journeys shift to active or public transport, cooking is all switched to electric, and there are energy efficiency improvements across lighting (25%), space heating (15%), water heating (5%) and appliances (2.5%).
[2] https://tools.eeca.govt.nz/energy-end-use-database/

Figure 3 - Breakdown of average per household contribution to peak demand prior to any appliance demand management



The study looked at what appliances have the most potential for demand management. Figure 4 shows an estimated breakdown of the potential for demand management[3]. The key takeaway is that EV charging and water heating have, by far, has the most potential for load management.

Figure 4 - Breakdown of average household potential for appliance demand management during peak demand



[3] The scope for easing capacity investment pressures depends on the size of the contribution to peak demand, and the extent to which the demand is time critical (1) some uses are inherently less time critical – for example, clothes and dishwashing are more delayable than lighting or cooking, and (2) other uses are non-time critical because the appliance has built-in storage that act as a buffer between supply and consumption.

The study is on a national basis. The Wellington network has the highest proportion of gas space heating in NZ and its urban environment is better suited to EVs than other networks. The potential for controlling peak demand is even higher in Wellington. This may also mean that some areas on Wellington's network may require investment earlier than expected in areas already seeing demand growth.

3. WELL's programme to deliver climate change demand increase

We are aware of the impact that a rapid uptake of DER could have on distribution networks. We are particularly cognisant of the potential rapid growth in EV's because:

- The technology has developed to the point it will soon provide a realistic option for meeting the majority of New Zealand's light transport needs and meeting the emissions targets. Other options, like biofuels and hydrogen, still need developing to the point they could be considered a viable alternative energy source for light transport;
- EVs offer lower running costs than traditional internal combustion engines due to the higher cost of fossil fuels and the higher efficiency of energy conversion from battery storage;
- New Zealand's high level of renewable energy generation (over 80%) being an ideal match for EVs which are seen as an appealing option for environmentally and cost-conscious consumers;
- Constantly evolving energy storage systems, electric drives and charging technologies that will improve the efficiency and range of EVs; and
- Wellington is particularly well suited to EV's due to its short commuting distances and dense urban environment making it well suited for a fast roll out of charging infrastructure.
- EV's provide an opportunity for rechanging outside congested periods to manage peak demand. In the future there will be opportunities from EV batteries to provide support for network demand management, improving the utilisation of the distribution network, and deferring expensive network development.

To support the swift adoption of EV's, WELL has a number of EV and DER work streams. These work streams centre around developing the ability to use flexibility services to manage peak demand. A brief description of each work streams follows.

3.1. EV Connect roadmap

We have developed a roadmap of the industry changes needed to support the introduction of EV's. Changes include ensuring regulation and policy supports the action needed to connect EVs, networks operators are appropriately funded, and the Electricity Code provides rules to ensure consumers can

safely connect EVs in their homes. Changes are also needed to ensure all stakeholders have the data and information to develop the tools and products needed to manage EV demand away from congested periods on the network.

The EV Connect roadmap provides the steps to introduce flexibility services and what is needed to allow consumers to recognise the full value of their investment in an EV battery and the ability to use the stored energy as part of a flexibility service.

EV Connect is a co-funded EECA LEVCF project which has engaged the industry, through workshops and supporting consultation, to develop how EV's can be used to allow more energy to be delivered through existing network infrastructure. The purpose of doing this is to support EV adoption while maintaining network safety, security and affordability. We have been working collaboratively with stakeholders and the technology developers at GreenSync to articulate the technology steps required to support EV adoption. A key deliverable of the EV Connect project is a roadmap of actions needed to accommodate EVs, including the development of flexibility services which are needed to manage the additional demand. The workstreams align closely with the themes identified in this Consultation Document.

The EV Connect Draft Roadmap used stakeholder feedback to draft the actions and steps needed to accommodate EVs onto the electricity network. 50 stakeholders provided input via workshops and consultations – stakeholders ranged from Policy makers at MBIE, other distribution networks, Transpower the national grid operator, regulators including the Commerce Commission and the Electricity Authority, electricity retailers, consumer advocates and EV user groups.

We are now using feedback from a second workshop and a further consultation to refine and finalise the roadmap. Industry participants generally support the steps and actions outlined in the draft roadmap. Key workshop topics and areas of refinements for the final roadmap include:

1. Industry leadership to ensure the roadmap actions are implemented. The actions are beyond the scope of distribution networks and regulatory and industry leadership is needed.
2. Better definition of the role of the DSO and clarification of when each of those roles will be needed. Many of the roles and functions won't be needed until the market for flexibility services is mature.
3. Start trailing, using and testing flexibility services now – the services won't be developed until this happens.
4. The benefits of incentivising (or mandating) communicating smart chargers.

5. The use of dynamic connection agreements with consumers to allow EV charging flexibility services that maintain the security of the network.

The final roadmap will provide a robust set of actions that the industry can then use to accommodate the EVs onto the electricity system. The EV Connect Draft Roadmap and the full set of consultation and workshop documents can be found at: https://www.welectricity.co.nz/about-us/major-projects/ev-connect/. A draft copy of the EV Connect Roadmap is attached as Appendix B.

3.2. EV Trial

A trial to understand the impact that EVs and EV charging behaviours will have on electricity demand on the Wellington network. The trial allowed WELL to study charging behaviours of 100 early EV adopters in Wellington to see what the additional demand will mean for network capacity. Findings from the trial have been used to inform the development of our EV Time of Use tariff introduced in 2018 and the design of our follow-up EV Connect programme. Figure 5 provides a summary of the findings of the trial.

Figure 5: Findings from our EV Trail

Finding	Impact on meeting emissions budget
EV charging will increase average residential demand by approximately 2,500kWh, equal to 1/4 - 1/3 of annual household electricity consumption.	The electrification of transportation will have a material impact on electricity use. A larger network will need to be built to meet this demand if the demand cannot be shifted to off-peak periods.
70% Drivers were comfortable with an EDB managing their EV charging.	Consumers are likely to be receptive to flexibility services at the right price point.
80% of EV owners charge their vehicles after 9pm.	Charging during off-peak, night time periods appear to suit customer preferences – most consumers don't need to charge their vehicles during peak periods.
66% of EV owner's use a timer on their EV charges that lets them chooses when to charge.	Most vehicles have a timer that could be used to respond to ToU price signals. Communicating smart meters were less common. Communicating smart meters will be an important feature for participating in flexibility services.
EV's provide a 45% reduction in household energy costs.	Household costs should reduce with the transition to an EV. This should help to encourage a faster transition to EVs by bringing forward the point that it will be economic to change from the current petrol or diesel vehicle.

3.3. Testing and trialling technology to directly manage DER devises

Developing the tools and processes to manage electricity demand away from congested periods on the network. This workstream has included technology trials that have tested the technology needed (including digital platforms and smart EV chargers) to manage EV charging on behalf of EV owners or

for owners to receive this as a market service. We are now considering trials to test the technology to provide specific flexibility services. Any future trials will depend on funding availability.

3.4. Cost reflective prices

Accurate cost reflective prices for distribution services and flexibility services in the future will be essential to ensure the full value of deferring or avoiding network investment is signalled to consumers. We initially trailed demand-based prices and Time of Use prices before settling on Time of Use prices. We have now rolled out Time of Use prices to all residential customers. We will continue to develop our prices so that they reflect the cost of using energy during peak periods. Our pricing programme includes the development of prices to support flexibility services.

3.5. Long term network planning

While shifting network demand to less congested periods provide the most efficient and affordable outcome for accommodating EV, there will still be an increase in energy use which will require network re-enforcement at some locations. We are developing a long-term investment programme, beyond the 10 year regulatory planning period. The investment programme tests different network designs for a variety of loadings and service delivery solutions.

4. Observations from our sister companies

WELL is part of a global group of electricity distribution networks including United Kingdom Power Networks (the London, East London and South London networks), South Australia Power Network, Hong Kong Electric and Powercor City Power and United Energy (Melbourne networks). Our sister networks and the industries they operate in are more advanced in developing the capability and capacity needed to electrify transport and accommodate DER. There feedback and experience provides important context for the options presented in the Consultation Document.

- The development of flexibility services has taken time and funding. The United Kingdom (UK) adopting their initial Climate Change initiatives 15 years ago and has been funded trials and pilots for flexibility services for five years. Flexibility services are only now being introduced as a standard offering. Trails and pilots have been an important step to refine flexibility services into services that customers can easily participate in and are an effective non-wire alternative solution. A strong focus of the trials has been on trying different market mechanisms and promotional methods to increase uptake.
- Flexibility services in the UK focus on demand management rather than two way power flows. The development of two-way power flow flexibility services has been slow because the

application process is based on the solar connection process which isn't suited to customers who want to use batteries as part of a flexibility service. It is essential to have fit for purpose connection standards.

- After developing the market and promotional tools, the UK trials were able to attract 50% consumer participation in flexibility services for the select trial area. Further trials are now underway for new technology that will make it easier for customers to participate.
- Overseas regulatory frameworks have adopted uncertainty mechanisms which set an agreed change threshold for additional regulatory allowances. Capex and opex allowances have been equalised (using totex mechanisms) to remove preferences for capital expenditure or for purchasing flexibility services. Allowances also now have direct budgets for purchasing flexibility services. Where flexibility services cannot be obtained, allowances are still provided for traditional network investment needed to meet new demand.
- Visibility of where DER are located and access to consumption data is still an issue in the UK. Agreements are in place between aggregators and EDBs to provide data but smart charging data tends to be aggregated in some countries. More reliance is placed on LV monitoring because of the lack of available consumption data as smart meters have not been fully rolled out.
- Smart chargers have been subsidised by the government to provide flexibility services capability. Incentivising smart chargers' area also an important finding from our own EV Connect Roadmap.
- An accurate price signal is important so that participants can make clear choices about when and whether to participate.
- Charging infrastructure is a strong focus in urban centres because of the high proportion of on street parking. The United Kingdom is currently looking at chargers that operate off streetlight circuits. The provision of low-cost charging points is an industry focus.

5. Q.1 Have you experienced issues relating to a lack of information or uneven access to information?

Yes, we have experienced issues relating to a lack of information or uneven access to information. The recent consultation on our EV Connect Roadmap also highlighted areas where industry participants were having issues with accessing data. Examples include:

1. **No visibility of the location of DER being installed**: While networks have visibility of solar and other distributed generation installations, we do not have visibility of other large DERs like EV

chargers. Without knowing where large customer devices are being installed, Electricity Distribution Businesses (**EDB**s) are not able to plan or prepare for the additional demand caused by these devices. For privacy reasons, the New Zealand Transport Authority will not provide when or where new EVs are registered.

On 29 August 2021, Wellington experienced a very cold evening which resulted in unusually high energy consumption. The high levels of electricity usage included areas of the network where new peaks were unexpected. We expect this maybe because of the installation of DER devices like EV chargers or customers preference to keep warm was more important than the higher costs price signal. Without knowing where large DER are installed, networks will have difficulty in matching capacity and demand on specific parts of their networks. It also highlights that consumer may opt for comfort and convenience ahead of congestion pricing.

2. **Sourcing consumption data**: We have had difficulty sourcing historic consumption data. We have had to enter into time consuming confidentiality agreements with each retailer for a set of 30-minute consumption data. While the new Data Template will streamline this, EDBs will still have to negotiate with each retailer. Feedback from other EDBs (via the ENA) is that negotiations are taking time and often include a parallel agreement with the meter provider. Some EDBs also commented that the cost charged for the data can also be unaffordable, noting that EDBs will not have allowances for new costs like this. At the time this submission was drafted, no agreement had been concluded for individual negotiations using the new agreement- the industry is still unsure whether the new mechanism will provide the data needed.

3. **Availability of real time consumption data**: Access to real time consumption data is needed to improve the timeliness of demand management responses. Retailers and MEPs cannot provide real time consumption data or customer power quality information. Discussions with meter providers suggest that more granular five-minute consumption data may be available in the future, but real time data is still a long way off.

4. **Congestion information**: The Consultation Documents suggested that networks were not making congestion data available. Networks generally do not have visibility of their LV networks and do not collect a detailed record of congestion data, apart from a coarse maximum demand (20-minute averaging) indication on some distribution transformers.

Significant investment is needed to allow networks to monitor the LV network. Our EV Connect Roadmap has identified this as an important step in accommodating EV's onto distribution networks.

The use of communicating (via the cloud) smart EV charging devices needed to participate in flexibility services, could provide valuable network performance information in real time.

6. **Q.2 What information do you need to make more informed investment and operation decisions?**

The EV Connect roadmap through its industry consultation highlighted the information needed to make informed investment and operational decisions. This includes the information needed for EDBs to call for flexibility services.

1. **LV network congestion data**: This is needed for EDBs to:
    a. Monitor "voltage out of limits" events which indicate need to reassess hosting capacity (solar injection) or demand-side management services
    b. Forecast capacity constraints on their networks and to facilitate any demand management response that is needed.
    c. Calculate and plan for network re-enforcement to meet any residual capacity shortfalls.
    d. To calculate price signals that reflect network capacity constraints and the cost of using congestion during peak periods. Accurate price signals will be used by EDBs to call on flexibility services.
2. **Power quality data**: Voltage performance of the LV network is a mandatory requirement under the Electricity Code to maintain supply within prescribed limits. Maintaining power quality will become more important as the network is used for two-way power flows. Power quality information like voltage will also be needed for EDBs to provide a secure electricity supply.
3. **Customer consumption data** – the types of data will depend on what types of flexibility services are being offered and purchased. Consumption data is needed for:
    a. Verification of network modelling so dynamic connection agreements can provide some initial demand side flexibility.
    b. Identify network investment timing based on change in consumption patterns.
    c. Setting hosting capacity limits
    d. Identifying when flexibility services are required or timing of new network investment

e. Designing and setting prices and price signals
f. Forecasting the customer impact of new prices or price changes
g. Observing customer responses to price signals and purchased flexibility services

Current pricing methods can be managed using historic data provided at 30-minute intervals. As flexibility services develop, real time data and smaller time increments may be needed.

4. **Location and details of new customer devices**: To provide EDBs with visibility of where large new loads are being connected. This will assist an EDBs network re-enforcement planning and demand management response.
5. **Accurate demand forecasting**: EDB's will need the capability to accurately forecast demand on their networks. This will inform the investment programme and when flexibility services will need to be called.

7. Q.3 What options do you think should be considered to help improve access to information?

We agree that congestion data being collected from smart chargers or grid intertie inverters should be accessible to network companies as a means of monitoring performance of the LV network. We question the assumption that congestion data would need to be made public and that flexibility providers would need this to provide services. What is needed is effective price signals that reflect congestion **and** the value that moving demand to less congested times has. As highlighted above, EDBs will need congestion information and the ability to forecast future congestion periods. However, this information would not need to be made public as the default Distribution Agreement should encourage Traders to make sure network performance details are shared in the best long-term interest of their customer. If Traders subscribe a cost to this, then as long as this is passed through as part of the lines function service, then this is neutral, except for the customer paying twice. A better approach is Traders providing information from their data to the Distributor of constraints or abnormal network conditions (conditions outside expected levels of standard supply quality). Providing detailed congestion data would only provide a small portion of the information needed for a flexibility service provider to offer services - the congestion data by itself is also of little value without:

- Forecast information to show when the network will be congested in the future, rather than at the current moment.
- The impact of other demand management tools available to a network operator. A network operator may be using hot water control, back feeding from other parts of the network or

have network re-enforcement underway. Network re-enforcement may be needed even with demand management tools due to the size of the extra capacity needed.

- A price point which shows the value of shifting congestion away from peaks and accounts for other demand management tools already in place and network re-enforcement in progress that will shortly provide additional capacity.

EDBs are responsible for managing network capacity and quality of supply, however the DDA does define responsibility for the Retailer to manage behaviour of their customer when network limits are exceeded, or connection requirements not complied with. An EDB will assess what flexibility services are needed as part of their overall network management plans and will calculate the price at which those services can be offered, a price which reflects the network investment that can be deferred. An EDB already discloses how it will manage its network and any related investment in detail as part of its Asset Management Plan.

Flexibility traders would only face an uneven trading playing field if they don't have access to congestion data or a distributors price signal was not cost reflective. A more appropriate solution is for distributors to continue to develop accurate cost reflective prices and continue with the detailed disclosures provided in their Asset Management Plans which in time will identify cost deferral options for flexibility services support.

We do agree that heat maps of network congestion could provide useful tools to help promote flexibility services and provide guidance to where networks might call on flexibility services.

We support the options to make consumer information available and the need for a common communication language (API) so that data can be passed from consumer DER to flexibility service providers and EDBs. A centralised repository of consumption data would be useful, but we agree that this would be expensive unless MSP's were able to provide this so data could be efficiently shared among those participating in flexibility services.

Our EV Connect project and the subsequent workshops have highlighted the actions needed to improve access to information:

i. Establish a national registry with the location and size of large DER. Small DER can be managed by EDB's within network capacity constraints providing connection approvals make this visible to the network owner. Large DER have the potential to significantly impact the security of supply and power quality.

ii. EDBs to develop business cases for the investment into LV monitoring and demand forecasting. Unless networks can fit the investment into the current capex allowances, additional capex will need to be included in allowances for the next regulatory period.

iii. Continue to develop and refine cost reflective prices. Future pricing could become locational and provide potential providers of flexibility services the indicated value signal for implementing their flexibility service.

iv. Access to consumption data for all participants and the consideration to how real time consumption data might be provided in the future from dynamic devices through agreed API's.

v. Consideration of who is best placed to store, process and analysis consumption data. The size of consumption data sets will increase significantly as data is recorded at 5-minute increments. The storage and analysis of large data sets is expensive, and it is inefficient for multiple parties to duplicate the development of this capability. Consideration should be given to who is best placed to provide this service.

vi. Common communication protocols – central storage of data would be very useful, but we agree with the Authority's suggestion that it would be expensive to maintain. We believe that using APIs that use a common communication language would provide similar levels of data access at a lower cost.

vii. Streamline rules and processes to protect privacy – we agree this is essential. EDBs will need to develop and improve their data privacy capability as they are given access to customer data like electricity consumption, or the location and details of new devices being installed. We support MBIEs work programmes to develop a data privacy and protection framework.

Figure 6 summarises our views on the direct options proposed

Option	Support (y/n)	Reasons
Inform and educate consumers on how to request their consumption data	N	We question the value of this. Like retailers, flexibility traders will engage in sales and promotion to attract consumers to use their services. We believe flexibility providers will direct and instruct consumers about what they will need to do to participate in the service. If there are barriers to the process of sharing consumer data, then we would support improvements that make access to the data easier. This will help promote new services and competition.
Encourage distributors to collaborate in finding the most efficient way of capturing and publishing utilisation data	partly	We support EDBs working together to develop the best tools for monitoring the LV network. However, as outlined above we believe that price should signal network congestion and the value of shifting demand to less

Option	Support (y/n)	Reasons
		congested periods. We do not see the value in investing in making congestion data public.
Assess options to implement shared data arrangements	Y	A robust data sharing framework and efficient data sharing tools will be important for enabling data to be efficiency shared. This should also include common communication protocols to allow technical solutions to efficiently communicate.
Publish guidance for distributors to report on export congestion and network investment needs	N	Part 4 Information Disclosures already require networks to report on network congestion and to disclosure the investment that is planned in response. This is a significant component of the existing Asset Management Plans
Shared data through API	Y	We believe this is a more efficient solution to sharing consumptions data than a centralised data store. Common APIs should also be used for other data exchanges.
Central meter data store	N	We support a central data store as access to consumption data would provide competition and encourage the development of new products and services. However, we believe the using common APIs that's allows data to be efficiently shared would be a more cost-effective solution.

8. Connection standards - general

It is important to consider the purpose of the standards when considering whether options to refine the connections standards, especially market-based options that rely on a market to act sensibly to maintain minimum levels of safety and supply quality. Connection standards are often the minimum standards that the electricity networks must meet for users to be confident that they will get a continuous supply. When considering different options, it is important to consider whether options which give users the choice of how they will connect, will achieve these minimum settings. Like road rules, there is a minimum set of rules that road users must adhere too - after which they can use the road how they want to. We agree that over standardisation can reduce competition, however, there are important minima's that must be meet and we believe operating to the minima should not be left to chance.

9. Q.4 Have networks experienced issues from the connection or operation of DER?

We have not experienced network issues that are directly caused by the DER connection / operation. Currently, DER penetration level in general is low on the Wellington distribution network. However, we are expecting to experience greater impacts on our LV network in the immediate future due to the large number of recent distributed generation applications.

Some parties have experienced delays in DER connection as they have not followed the DG process and have to do significant rework to make their installation compliant. Some smaller operators also

struggle with DER settings which need to be applied so that the network is not negatively impacted through the expected operating range.

We are also experiencing network capacity challenges for the electrification of public transport. The large new connections are creating network planning challenges due to the large new loads requiring network re-enforcement and customer expectation of being able to connect quickly. The size of the new connections are also creating funding challenges as the regulatory allowance mechanisms aren't suited to investment steps that are too large for the Default Price Path and too small for a Customised Price Path. In some cases, dynamic agreements are being sought where a lower Price-Quality trade-off is agreed in order to reduce capacity investment in exchange for a reduction in operating capacity during contingent events.

10. **Q.5 Do the Electrical (Safety) Regulations require review? If so, what changes do you think are needed (a) in the near term and (b) in the longer term?**

The Climate Change actions are likely to drive the rapid increase in DER. It is important that the Electrical (Safety) Regulations are reviewed before hosting capacity of the network is exceeded. Currently the standard voltage specified in the ESR is +/- 6%. It would be beneficial to follow what Australia have revised the voltage requirements. We support a voltage range of +/- 6% to +10%/-6% which aligned with the value set out in AS 60038 (refer to Electricity (Voltage Limits) Amendment Regulation 2017 (Australia)). This change will increase the hosting capacity for the DERs by 15% on some of the networks. This change in Australia provided $256M in benefits over ten years in Queensland.

The current ESR is referring to the outdated AS/NZS 4777 2015 standard. The ESR should refer to the latest AS/NZS 4777 2021.

Currently, ESR requires the Parliament to approve any changes in standards. This regimented process will refrain the rate of changes needed in the standard environment in order to keep up with the technology and innovation development in the DER space. This clause should be relaxed to allow standards to develop organically in a more rapid rate to suit the changing environment.

11. **Q.6 Does Part 6 remain fit for purpose? If not, what changes do you think are needed (a) in the near term and (b) in the longer term?**

Part 6 needs immediate change and is no longer appropriate due to the large numbers of distributed generation requests. The current 10-day timeframe set out for the Notice of final approval for IES under 5kVA in specific circumstances (Part 1A) is too short to assess more complex applications. The

tight 10-day timeframe is followed with an unconditional approval clause where if the approval takes longer than the prescribed time, the application is deemed as approved (Clause 9F). This is only reasonable if the volume of applications is low, the request is not complex and the hosting capacity of the network is abundant. The time frames are now too short given the number and complexity of applications. The applications process requires immediate review.

WELL is also concerned about the high cost of assessing and designing connections for DER. The costs greatly exceed what can be recovered by the EDB and other customers will be subsidising the new connection.

The maximum application fees in Schedule 6.5 were set many years ago. New fees need to be introduced to reflect the current market.

12. **Q.7 Is there a case to be made for minimum mandatory equipment standards for DER equipment, specifically inverter connected DER?**

We would support a minimum mandatory equipment standard for IES DERs. Minimum requirements should be set to ensure the DERs can be connected safety and so they don't impact network security. For example, the manufacturer will need to make sure that the equipment will have anti-islanding functionality. AS/NZS 4777 currently provides a good set of rules for the IES.

Already the standard for inverters is much lower than that adopted by Australia which will result in network performance problems as the inverters are not equipped to lower injection levels when voltage exceed maximum limits.

We note that the standards should be the minimum requirement to connected safety and securely and it should not be overly prescriptive. Standards that are overly prescriptive will not be able to keep up with new technology.

13. **Q.8 What standards should be considered to help address reliability and connectivity issues?**

Communication protocol for monitoring and controlling the IES can be standardised. AS/NZS 4777 provides requirements of the demand response modes (DRMs), but it doesn't address communication protocols.

Figure 7 summarises our views on the direct options proposed

Option	Support (y/n)	Reasons
Voluntary guidelines	partly	We believe a combination of mandatory minimum standards and voluntary standards supported by education and templates. The minimum mandatory standards should cover aspects that are essential for safety and network reliability.
Develop templates	Y	
Education and awareness	Y	
Recommend standards templates	Y	
Threat of regulation	N	Not required
DER registry	Y	Visibility of DER is essential for effective network planning and management
Lay foundations for standards	Y	Useful if its to assist the development of standards.
Mandatory uniform standards	partly	We believe a combination of mandatory minimum standards and voluntary standards supported by education and templates. The minimum mandatory standards should cover aspects that are essential for safety and network reliability.

14. Q.9 Is there a case to look at connection and operation standards under Part 6 with a view to mandating aspects of these standards?

WELL believes that guidance would be useful to encourage conformity across networks. We would support mandating standards which ensure the network is able to operate securely and reliably, ahead of the DER remaining connected. We believe standards should help prevent DERs remaining connected when they could cause damage to other connected consumers. The standards adopted in other countries allow the DER to have IP connections for future management. The operation of DER should be able to be adjusted to maintain the network in a steady operational state. EDB will need to be able to quickly adapt their connection standards to their own network operating requirements.

15. Q.10 What flexibility services are you pursuing?

We agree and support the Authority's objective of developing flexibility services. Flexibility services will provide an important tool to help EDBs manage climate change driven network demand and to keep long term distribution prices low. We also support flexibility services being provided by entities other than EDBs. Independent flexibility service providers will be able to sell to other parties and will provide the end consumer with the best return for participating. Our EV Connect project and the experience from our sister companies have highlighted some important assumptions that must be addressed as solutions are developed:

- Flexibility services should focus on demand that can be practically shifted. We believe the focus of trials and pilots for one-way power flows should be on managing demand from EV chargers and hot water as this demand that customers would be comfortable shifting to off peak periods. Other types of residential demand are less discretionary and any investment made to create a related flexibility service may be wasted.
- Trails and pilots should also include household battery's and solar as rather than shifting non-discretionary energy use (like heating and cooking), they store energy from less congested period to be used during peak periods. These services allow customers to still use appliances during peak periods while not contributing to network peak demand.
- Security of supply must be maintained which may require alternative safety guard to also be developed as a backup if competitive flexibility services do not shift demand as expected or needed. While non-wire solutions may provide services at a lower price, they may not be able to meet a networks quality expectations by themselves.
- Flexibility services will be one of the tools a network uses to manage demand. EDBs are responsibility to manage congestion and reliability on the network and must met the quality expectations and targets set by the Commission as part of their price/quality responsibilities. A network's demand management response will include many different tools include re-enforcing the network, existing hot water control, balancing demand across the wider network and cost reflective price signals. EDBs will need the ability to call on flexibility services when they are needed and as part of a wider demand management response.
- Flexibility services take time to trial, develop and offer. The United Kingdom has been funding trials for 5 years and is only now funding networks to call on flexibility services as part of their core demand management capability. Networks in New Zealand have not had similar funding and have not been able to trial and develop flexibility services and the processes and technology needed to offer them.
- Changes to the regulatory funding model is needed. While the IRIS rates for opex and capex have been equalised which theatrically means that EDBs are incentivised to use non-wire solutions, the complexity of the opex IRIS and the cashflow volatility created by large funding movements between capex and opex reduces the effectiveness of the incentives[4].

[4] We do not believe that IPAGs finding that EDBs do not understand the IRIS incentive scheme is correct (para 6.7 of the Consultation Document) - rather the practical application of the IRIS mechanism is complex and a network can have to wait for years to receive any incentive for an efficient investment.

Our EV Connect programme is considering a number of different flexibility services. We expect the form of the service will evolve as they are trailed and refined:

- The use of solar/batteries to provide additional security of supply and capacity support for parts of the networks that aren't part of a ring supply. This option is being considered as an alternative to building traditional infrastructure. This is a similar premise to Aurora's Frankton agreement with solar city.
- Directly managing large devices that are connected to parts of the network with capacity or security restrictions. We are seeing requests to connect very large vehicle chargers (usually public transport) that have very high demand requirements. We are considering whether we need to directly control these devises so they can be safely and securely managed to connect to the network. In some instances, these connections may have restrictions on times when that can be used at full capacity - the restrictions would apply to provide additional time to reenforce the wider network.
- Purchasing flexibility services from flexibility service providers. This option is being considered to manage the increased demand from the uptake of EVs on the wider network. The market for these services is immature and we expect this to be a longer-term option.

16. Q.11 Are flexibility services being pursued through a competitive process?

We believe the majority of flexibility services will be purchased through either a competitive process or through offering a price to a market of available providers. However, we also expect there may be some large connections where demand must be carefully and directly managed so that that connection can operate initially without impacting the safety and reliability of the network until additional reinforcement is undertaken.

17. Q.12 What options should be considered to incentivise non-network solutions?

Other judications, like the UK, have been funding EDBs to develop, trial and test flexibility services for the last five years. They are now at the point they are offering alternatives to building traditional infrastructure – the flexibility service offerings have reached the scale required. New Zealand has not provided the same level of funding and flexibility services have not been developed to the point that EDBs can use them as an alternative to traditional network re-enforcement. Careful trailing and testing is still needed to understand how reliable flexibility services could be used and to understand the level of confidence that EDBs can rely on them to meet the regulatory quality standards. EDBs will still be responsible for providing a secure supply of electricity and will face fines of up to $5m if they don't meet the regulatory targets.

The regulatory focus should therefore be on incentives to develop and test flexibility services and any 'no regret' decisions that need to be made now so that customer with DER can participate in flexibility services in the future (an example of this would be ensuring smart chargers are able to communicate and be controlled by third parties). Our EV Connect Roadmap highlighted a number of other changes needed to incentivise non-network solutions. Actions include 'no regret' changes that are needed now to allow DER owners to participate in future services.

Fund trials/innovation: EDBs and the industry first need funding to test and develop flexibility services and the processes to incorporate them into demand management functions. The Commerce Commission set the allowances that networks have to build and operate their networks and the quality standards they must deliver. Currently, these allowances only provide a small allowance for innovation - for up to 50% of the total cost of approved innovative projects in the assessment period, but not exceeding 0.1% of the total allowance in the regulatory period. The fund is too small to support the level of investment needed to trial and introduce new demand management technology and the flexibility services needed to improve the utilisation of existing electricity networks and to keep electricity prices affordable. As part of the recent reset of the price/quality path for distribution networks, the Commerce Commission presented evidence that the innovation allowance is small:

- Only 7% of energy sector businesses are conducting research and development, which is much less than other sectors;
- Energy sector expenditure on research and development decreased between 2007 and 2016;
- For the 2018 regulatory year, distributors reported a total of less than $10m expenditure on research and development (compared to total lines charges of around $2.5b);

The United Kingdom previously followed a similar approach of providing no research and development (R&D) allowances for regulated lines companies when it operated a low-cost regulatory regime for electricity distribution services, like New Zealand does now. The United Kingdom has since moved away from this approach due to the lack of investment in non-wire services. The regulatory regime has now incentivised investment into R&D, offering large contestable funds requiring the results on successful projects to be shared across the industry.

Regulatory changes are needed to allow a forward looking rather than "business as usual" approach to encompass the level of R&D needed to support climate change initiatives. Other international regulatory regimes provide workable models and approaches that have already been shown to be successful for our sister utility companies in both Australia and the UK. WELL supports the scheme developed by the United Kingdom's electricity which is managing an increase in innovation

expenditure through a contestable innovation fund where EDBs bid and share successful ideas. Asset management plans could be extended to include progress updates on developing flexibility services.

Refining the regulatory funding model

The opex and capex IRIS incentives have been equalised so theoretically reductions in capex can be used to fund increases in opex and a network will have a financial benefit for any net cost reductions. However, practically the IRIS mechanisms (and the opex IRIS in particular) is complex and creates medium term cashflow volatility. Investors in regulatory assets invest for the stable and low risk returns, while receiving a lower overall return (when compared to higher risk investments) as a trade-off for the low risk. The cashflow volatility introduced by the IRIS impacts the stability of the regulatory returns – the volatility created by the IRIS mechanism therefore has an unintended consequence of creating a disincentive to invest in non-wire solutions.

The IRIS mechanism incentivises investments in non-wire solutions if the expected reduction in capex is in the same regulatory period as the investment in the alternative solution is made. However, it could be that the cost saving benefits from deferred or avoided capex will be across multiple DPP periods after the investment in the new capability. The expected future capex savings are likely to already been included in an EDBs AMP capital forecasts. EDBs would therefore not be fully rewarded for avoiding capex.

Incentivising non-wire solution is complex and the solutions used in other judications have significant strengths and weaknesses. While we don't have a preferred solution, we do believe that this will be an important workstream for the upcoming Input Methodology review. Feedback from distributions networks to the Commissions 'Open Letter" highlighted this as a key issue and suggested the industry should make an early start to investigating of possible solutions due to the complexity of the subject. Our response to The Open Letter outlines the key Part 4 regulatory changes that are needed to deliver the climate change actions, including the electrification of transportation. A copy of our response has been provided in Appendix A.

Promote benefits and consumer participation

We agree with the Authority's option to educate consumers about the benefits of participating in flexibility services and what they need to do so that they can include their DER as part of a flexibility service. Experience in the UK was that the viability of a flexibility service is very dependent on having enough DER participating.

Develop tools to assist customer participation

EV Connect feedback suggested that technology could be used to make it easy for consumers to join and participate in flexibility services. Later trials in the UK focused on customer applications and other customer tools designed to make it easy for customers to join a flexibility service and to encourage more participants.

Encourage or mandating communicating smart chargers

Customers will not be able to participate in flexibility services if their DERs are not smart and they cannot communicate with a flexibility provider. We believe that it should be mandated that all EV chargers should be smart and able to communicate so that customers can participate in the future.

Remove low fixed user pricing restrictions

Flexibility services will depend on EDBs and other purchases of flexibility services being able to signal the value and timing of flexibility service using an accurate price signal. The current low fixed user restrictions limit the residential pricing options available to EDB's and retailers. More complex and cost reflective pricing methods like demand and capacity pricing are difficult to apply sensibly under the restrictions to the fixed price components of retailer and EDB prices. The removal of the lower user fixed charge will allow EDBs to more effectively signal congestion and the higher cost of operating during peak demand periods.

Continue to develop cost reflective prices

Accurate prices which reflect network congestion and the value of shifting demand will be important tools for signalling the value of flexibility services to flexibility providers. Accurate prices will allow flexibility service providers to develop services that correspond to the value and periods of congestion indicated by the price.

Figure 8 summarises our views on the direct options proposed

Option	Support (y/n)	Reasons
Education on flexibility services	Y	This would help make potential future providers aware of the potential new business opportunity. It would also make consumers aware of the potential new service they could offer back to EDBs, Transpower and retailers.
Require distributors to disclose progress	Y	This would facilitate networks sharing their experience and learnings.

Option	Support (y/n)	Reasons
Publish a comparative report	N	Flexibility services are in their infancy and it's too soon to consider this. The final form of flexibility services may not suit this mechanism.
Fund trials	Y	This is the essential next step – other judications that now have flexibility services to the point they can be used as a non-wire alternative to traditional networks solutions, first funded trials to develop the capability.
Distributors required to prove that they have fully explored flexibility	N	Flexibility services are in their infancy and it's too soon to consider this. The final form of flexibility services may not suit this mechanism. Flexibility services have also not been developed to the point that they can provide a meaningful 'wire' alternative that meets quality expectations – at this early stage there would be little value in requiring this.
Link distributors' regulated revenue to their progress in developing the use of flexibility services	N	Flexibility services are in their infancy and it's too soon to consider this. The final form of flexibility services may not suit this mechanism. Flexibility services have also not been developed to the point that they can provide a meaningful 'wire' alternative that meet quality expectations – at this early stage there would be little value in linking revenue to these services.

18. Q.13 What options would encourage competitive procurement processes for flexibility services?

It is to early to start deciding on regulatory rules to increase competition for flexibility services – the services first need to be developed, providers established and EDBs need to develop how they will use the services within their own demand management framework. Following the timelines of other judications, we are years away from having to decide on whether to restrict EDBs from owning or operating DER. Developing regulatory restrictions to early increases the risk of regulation inadvertently creating barriers to future services. For example, there may be some situations where it is sensible for EDBs to directly manage some customer devices – especially where devices are large, and restrictions are needed on how they are used so they can be safely and securely connected to the network.

Similarly, we believe it's too early to be considering reviewing the Part 4 cost allocation rules and related party rules. It is also important to note that the Commission already apply tight regulatory restrictions on related parties and the allocation of shared costs. Focus should be on the regulatory support needed to develop flexibility services first.

Figure 9 summarises our views on the direct options proposed

Option	Support (y/n)	Reasons
Education on competitive procurement and coordination & procurement guidelines	Y	Developing procurement guidelines may be useful for some networks. However, EDBs will already have procurement processes and expertise as providers of essential infrastructure – we wonder how useful this option would be.
Enable multiple trading relationships	Y	Enabling multiple trading relationships will be important going forward and we agree this would be a sensible workstream to implement. The example provided in the consultation documents suggests that this capability will be needed before mass market flexibility services are developed.
Assess cost allocation rules & assess related party transaction rules	N	Flexibility services are in their infancy and it's too soon to consider this. Making Part 4 regulatory changes to soon could result in relegation that doesn't suit the final form of flexibility services and having an inadvertent negative impact on the provision of those future services.
Encourage distributors to make available 'standing offer' price information for DER	Y	Continuing the cost reflective pricing work programme will be important. This would include the development of prices for flexibility services that reflect congestion on networks and the cost of that congestion. This will allow flexibility providers to develop the commercial models needed to provide and sell future services.
Competitive tenders for flexibility services	N	Flexibility services are in their infancy and it's too soon to consider this. The final form of flexibility services may not suit this mechanism. Flexibility services have also not been developed to the point that they can provide a meaningful 'wire' alternative that meet quality expectations – at this early stage there would be little value in forcing procurement mechanisms on the service.
Restrictions on distributors owning or operating DER	N	Flexibility services are in their infancy and it's too soon to consider this. The final form of future services may mean that it is more efficient for EDBs to operate flexibility services directly. For example, some large connections may only be able to operate on a network with a restricted operating environment if EDBs had the ability to control demand to maintain security of supply.

19. Q.14 Have you experienced difficulties with negotiating operating agreements for flexibility services?

Flexibility services are in their infancy in New Zealand. Networks have not been funded to develop flexibility services and are not funded to purchase those services if they were currently available as a meaningful way of deferring or delaying network investment. Negotiations to date have been ad hoc

and have focused on supporting our EECA funded trial. As the services are developed and offered as part of business-as-usual operations, we will be in a better position to respond to this question.

We do see the benefit of having standard agreements to streamline the negotiation process and we have started to draft what this agreement might contain as part of our EV Connect programme. Our EV Connect programme refers to these agreements as Dynamic Connection Agreements and has based our early templates on what is currently being used in Australia.

20. Q.15 Are the transaction costs of developing contracts a barrier to entering the market for flexibility services?

The Consultation Document assumes that the cost of developing and negotiating flexibility agreements will be high. The Consultation Documents also assumes that EDBs will be in a stronger negotiating position. Care must be taking in creating perceived issues– regulation should be designed on evidence and not conjecture otherwise the resulting regulatory changes are likely to be unsuited to future services. Regulatory barriers could be created before the services have been developed.

Its is not in an EDBs interests to create bespoke agreements for each potential provider – this adds additional costs to the EDBs which they are not funded for. A similar example are retailer agreements. We have used a single template for all retailers since we have owned and operated the network in Wellington and have had very few complaints from retailers. In our experience, the cost of negotiating retailer agreements is at the very lower end of the range provided in the paper - an amount which is not material given the services being purchased.

EDBs may also not be in a position of negotiation strength if other parties (like Transpower and Retailers) are also purchasing flexibility services. Accurate cost reflective prices will signal the value of services and the IRIS incentive and revenue cap will incentives EDBs not to over price the services. Competition with other buyers will incentives EDBs not to under-price the service.

We do agree that the transitional costs may be higher initially as the trials and pilot services are tested and refined. Like any new service, costs are initially high, as the services are developed.

We do not believe that the transactional costs will create a barrier to entry as participants will all be incentives to streamline the transaction process.

One area that will need consideration is how quality of supply obligations are treated. EDBs will only purchase flexibility services if they are confident that they will meet their security of supply expectations. Consideration needs to be given to whether quality expectations are also passed

through to flexibility service providers. A similar example is when EDBs purchase field services for the secure operation of network services. Those contractual terms include quality expectations and incentives and penalties like those received by the EDB for over and under performance of the quality targets.

21. Q.16 Would an operating agreement help lower transaction costs and level negotiating positions?

As discussed above, we do not believe, and operating agreement is needed to level negotiating positions.

We do agree that guidance on what an agreement should consider would be very useful. We also agree that a template may be useful once services mature and enough is known to develop a robust set of terms. Flexibility services are too immature to do this yet. We note that the time and resource needed to develop a template is significant (from observing the DDA development process) and at this stage we are unsure whether the benefits of a template could outweigh the cost. A defined set of principles maybe a more efficient options for these types of services.

Figure 10 summarises our views on the direct options proposed

Option	Support (y/n)	Reasons
Develop guidance for operating agreements	Y	We agree this would provide useful guidance and still provide the flexibility for contract terms to be refined and the services are developed.
Establish a 'DDA style' agreement which parties can opt in to	Maybe	Once the flexibility services are established a template agreement could be useful. However, we note the high cost of developing template (from observing the DDA development process).
Establish a mandatory set of terms that parties must use	N	Flexibility services are in their infancy and it's too soon to consider mandatory terms. The final form of future services may mean any terms developed now create inadvertent barriers to the efficient application of future services. As discussed above, we also question the benefits of mandatory terms as there may not be an uneven negotiating potion for EDBs as there will be other buyers of flexibility services.

22. Q.17 What kind of operating agreement would address the issues described in this chapter?

Bespoke agreements will be appropriate initially as the new services are trailed and tested. Contractual terms will need to be flexible to reflect the changing nature of the services being developed.

As the services mature then streamline agreements could be considered. We believe that guiding principles to help the development of agreements will be useful. At this later stage, industry bodies like the ENA and ERANZ could help co-ordinate the development of a template agreement.

23. Q.18 What are distributors doing to ensure their network can efficiently and effectively manage the transformation of networks?

As outlined in the introduction of this response, networks have been aware of the likely rapid increase in DER for some time now and WELL has a number of programmes to accommodate the new DER on the Wellington network.

We believe we are making good progress on defining what capability and capacity we need to deliver the climate change driven increase in demand. However, we now need the funding and regulatory support the deliver that capability. We believe that EDBs and the wider industry will need to progress rapidly with building the new capability – if we don't, climate change driven demand could rapidly, exceed the capacity of the electricity network.

In terms of the capability of the distribution industry, we do think there are opportunities to improve the efficiency of the industry as a whole. Sharing what we learn from our trials and pilots of how we are working with DER and flexibility services will be essential to avoid cost duplication. The ENA will provide an important conduit for the sharing this information.

Figure 11 summarises our views on the direct options proposed

Option	Support (y/n)	Reasons
Encourage collaboration	Y	Encouraging collaboration is a low cost, low risk options. It is important to note that there are already incentives in place to encourage collaboration that could result in cost savings. There is also already a high level of collaboration between the networks that are price/quality regulated.
Improve transparency of investment decisions	N	There is already a high-level scrutiny and disclosure around investment decisions for those price/quality regulated. There are

Option	Support (y/n)	Reasons
		also incentives to encourage good investment decisions. This is not needed.
Develop a reporting framework for distributors and DER suppliers to report results of trials	Y	This would help ensure that develop costs are not duplicated. We support the innovation scheme developed by the United Kingdom's electricity sector which provides innovation expenditure through a contestable innovation fund where EDBs bid and share successful ideas. If a reporting framework was developed, then it would be sensible to include it under Part for disclosures so that the reporting is considered alongside the funding to implement the trials.
Impose price quality regulation on all distributors	unsure	The costs and benefits would need to be established before considering whether to expand price/quality regulation to all entities. We think that the price/quality cost saving incentive mechanisms would help encourage networks to co-ordinate their activities and provide efficiency. We are unsure whether this would offset the regulatory cost imposed by price/quality regulation.
Clarifying the roles of a distribution network operator (DNO) and a distribution system operator (DSO)	Y	Flexibility services and the associated demand management capability are in their infancy. An important next step is to define how these functions will evolve and what the function and role each party will have in their operation. We support a workstream to define this – while noting The DSO/DNO functions will need to evolve with new services and capability.
Create industry body to body would promote coordination of DSOs	N	Flexibility services and the associated demand management capability are in their infancy. It is too early to create a centralised DSO capability.
Encourage joint venture arrangements	Y	We believe that improving the price/quality cost saving incentive schedule (i., e. removing the complexity and cashflow volatility) would encourage collaboration. We do note that this would assume all networks are subject to price/quality regulation.
Adopt a single DSO model	N	Flexibility services and the associated demand management capability are in their infancy. It is too early to create a centralised DSO capability.

24. Q.19 How are distributors currently working together to achieve better outcomes for consumers?

Our EV Connect Roadmap has been developed with stakeholder feedback, include feedback from other distributors. We hope the final roadmap will provide a useful guide for other networks about what's needed to accommodate DER, and EVs in particular, onto their networks.

The wider electricity industry has also been preparing for the transition from fossil fuels to electricity and the accommodation of DERs for some time. WELL has been participating or observing progress in other work streams. Other work programmes include:

- Concept Consulting's EV Study is identifying a set of coordinated actions to accelerate the transition to clean vehicles in a way that maximises economic and environmental benefits, and minimises adverse social impacts.
- The Innovation and Participation Advisory Group (IPAG) is focused on issues specifically related to new technologies and business models, and consumer participation.
- ENA's Smart Technology working group which is developing connection standards for distributed energy resources, a framework for monitoring new devices on the low voltage electricity distribution network and exploring what data is needed to manage network demand in the future.
- Vector is developing the tools to communicate with consumers with DER and to provide flexibility services in the future.
- As part of a global group of regulated infrastructure business, WELL has access to the research and development of new technology solutions that could assist in developing the tools and processes for managing network demand. Current trials include:
    - **Victoria EV Grid**: Enabling Electric Vehicle Friendly Networks and Neighbourhoods trial will see more than 170 electric vehicle owners across Victoria, the ACT, and Tasmania receive a 'smart wall charger' that will be up to three times faster than the regular charger commonly supplied with a new electric vehicle and will allow electricity networks to dynamically manage when charging occurs.
    - **Melbourne "SOLAR SPONGE" community battery network**: creating a network of batteries, or "solar sponges", located on the low-voltage electricity network across inner-Melbourne operated by CitiPower. The battery network works as a solar sponge, absorbing power from solar during the day and releasing it during peak times and at night.
    - **London Energy Exchange**: In the transition to Distribution System Operator, the London network operator (UKPN) is increasingly connecting distributed generation customers. Distributed Generators – mainly renewables like wind and solar – are pivotal in facilitating the UK's low-carbon transition. Some of these generators operate on 'flexible' connection agreements. Energy Exchange, or 'Market-Based Curtailment Management' will evaluate market-based solutions that could make it easier and more profitable for customers with a flexible connection. In doing so it will allow us maximise the incentives for flexible connections and continue to drive the low-carbon revolution.

As highlighted in the EV Connect programme, leadership is now needed to co-ordinate all of the different work programmes and to increase the pace and momentum of the changes needed. A key theme of the EV Connect stakeholder feedback was the need for joint government/industry leadership with all stakeholders represented. This will ensure the decarbonisation programmes make best use of new technology available, stay technology agnostic to not slow future development, ensures the electricity network delivers services that customers wanted and has the capability and capacity to deliver the emissions budget.

25. Q.20 Could more coordination between distributors improve the efficiency of distribution?

Yes, we believe that more co-ordination between distributions could provide efficiency improvements. As discussed, an important step in encouraging more co-ordination is to improve the incentive mechanisms for those that are price/quality regulated. Other tools like a facility for sharing the results of trials and pilots and the continued invitation to participate in each other's development programmes will also provide efficiency savings.

The ENA provide an important forum for sharing experience and knowledge and to form formal working groups to solve on-going issues. The ENA already have a new technology working group that is helping to co-ordinate the development of a roadmap to accommodate DER and the tools to implement the changes needed.

26. Closing

Thank you for the opportunity to outline the Climate Change related implications for the regulation of electricity distribution. Meeting the increase in electricity demand is a complex challenge and represents a significant change in the industry. Ensuring EDBs have the allowances, tools, and investor confidence to develop their networks and demand management capability will be an essential step in delivering New Zealand proposed Climate Change targets.

The issues are complex, and the final form of the services customers want and what they will offer back to the electricity sector are unlikely to be in the form which we are currently imagining. We encourage the Authority to base any changes to the regulatory settings on strong evidence and to wait until any new flexibility services have matured a little further before considering regulatory solutions. Other judications have taken years to trial and develop the new services and now have more mature services to base more certain regulation on. We also believe that flexible regulation will be required due to the changing nature of industry – regulation that is too prescriptive will be at risk of becoming out of date and potentially creating barriers to progress.

Lastly, our EV Connect programme has identified industry leadership as a key driver for the accommodation of DER resources onto the electricity network. Many of the EV Connect Roadmap items are outside of the scope of distribution networks and required co-ordinated action from the industry. We believe the Authority are well placed to partner with the industry to ensure the actions identified in this Consultation Document and in other EV Connect Roadmap are completed. We look forward to working with the Authority to update the regulatory settings. A draft copy of the EV Connect Roadmap is attached as Appendix B.

If you have any questions or there are aspects you would like to discuss, please don't hesitate to contact Scott Scrimgeour, Commercial and Regulatory Manager, at scott.scrimgeour@welectricity.co.nz. We appreciated the opportunity to talk through some aspects of the consultation with you earlier in the month and we would like to continue discussing the proposed framework as it evolves.

Yours sincerely

Greg Skelton

Chief Executive Officer

Wellington Electricity Lines Limited

Appendix A: WELL's response to the Commerce Commissions "Fit for purpose regulation" consultation

28 May 2021

Wellington Electricity
Lines Limited

85 The Esplanade
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New Zealand

Andy Burgess,

Head of Energy, Airports, and Dairy Regulation Deputy Chair

Commerce Commission

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Dear Andy

Feedback on fit for purpose regulation

Wellington Electricity Lines Limited (**WELL**) thanks the Commerce Commission (**Commission**) for the opportunity to provide feedback on the 'Open letter—ensuring our energy and airports regulation is fit for purpose' (**Open Letter**). The actions proposed in the Climate Change Commission '2021 Draft Advice for Consultation' (**Draft Advice**) will result in a significant increase in electricity demand (Transpower Te Mauri Hiko & relevant updates). Like electricity generation and transmission, Electricity Distribution Networks (**EDB**) (and the supporting legislation, policy and regulation) will need to grow and develop to ensure that the increase in demand and reliance on electricity as a primary energy source can be met.

Before we consider impacts on regulation from pending legislative changes proposed by the Climate Change Commission advice to Government, the question of Fit for Purpose regulation should consider the outcomes of the current legislation to ensure there are no unintended consequences already requiring amendment ahead of considering Climate Change legislation impacts. It is important that a review of current performance is understood ahead of managing future performance objectives, to ensure there are no current systemic outcomes which need to be addressed. Some of these items are currently being discussed with the Commission.

While the climate changes actions haven't been confirmed, The New Zealand Government has committed to being carbon neutral and the most viable and likely solutions involve replacing fossil fuels with renewable electricity.

The fast-paced development of technology and its adoption will result in customers having more affordable choices for energy generation, storage and management within their homes, allowing new business models and power flows that turn the traditional distribution network into an active system which will require additional monitoring and coordination than the current price-quality system considers.

Where new demand is higher than the current network capacity, the increase in demand is traditionally met by building a larger network – bigger cables, larger transformers and higher capacity equipment to deliver more energy. New factors mean that traditional delivery methods (and the current regulatory framework) alone may not meet expectations of an affordable and secure delivery system:

- **The size of the increase in demand**: An initial calculation of the change in electricity demand needed to meet the Draft Advice actions shows an 80% increase. This represents an unprecedented increase in demand outside of what the industry is currently structured to deliver. This is in addition to demand increases from the new housing developments in response to the Wellington housing shortage.
- **Rapid uptake of electric vehicles:** The uptake of electric vehicles (EVs) is expected to be a cornerstone of carbon emission reduction. Construction of a larger network within an established urban environment takes a long time and it may be difficult to increase capacity of the network without managing this additional demand carefully.
- **New technology:** New technology allows consumers to generate, store and export energy from their home systems, effectively turning the supply system on its head. This will establish different value streams which will be reconciled across the distribution network as new and innovative services are developed. This will be supported by digitisation of many of the new devices allowing them to be aggregated and managed by a variety of vendors. This will require new rules and standards to ensure the distribution network remains stable, operates within expected limits and not deteriorate in either security or reliability.
- **Cost impact:** Building a larger network is expensive. Our early calculations show that if energy from EV's charging is not managed, it could increase peak demand by 80% which will cost hundreds of millions of dollars and could increase prices by 80% (nominal) over 30 years. A price increase of this magnitude could be unaffordable for a large number of consumers.
- **Time and resources needed to double the capacity of the network**: The significant increase in network investment will come at a time when other distribution networks, the transmission grid and other industries like water and transportation will also replacing, developing and growing their infrastructure in response to the climate change targets. A finite pool of skilled resource in New Zealand (and potentially globally as other countries reduce carbon emissions) could make this level of growth unrealistic.

In our submission to the Draft Advice, we outlined why new solutions are needed to better utilise the existing network to meet the Climate Change energy demands while delivering distribution services that are affordable and secure. Figures 1 show that if the new demand is not well managed then higher investment will be required to increase demand capacity. Conversely, if the new demand can be managed and capacity headroom utilised during the less congested day and night periods, then further network investment would become optimal and provide a longer-term benefit to customers.

Figure 1: Our approach to delivering the Climate Change emissions targets

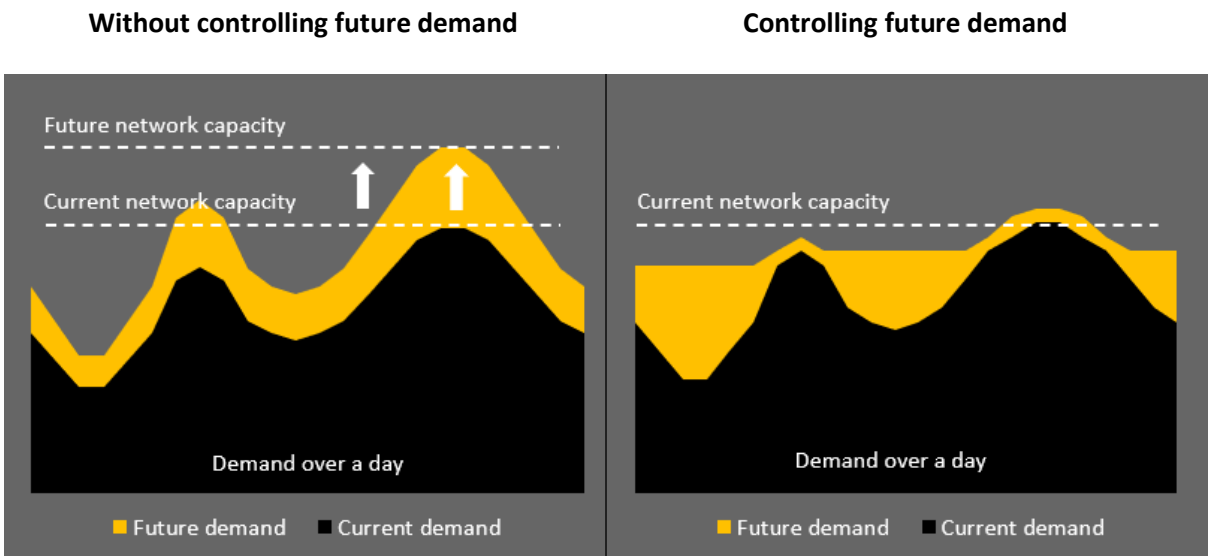


Figure 1 represents a theoretical view of optimising network utilisation to meet the proposed climate change actions. In reality we would expect that additional network investment is required to:

- Provide capacity for consumers who want to use electricity during peak demand periods and are willing to pay the cost reflective price to do so.
- Assist in maintaining a high level of network security. The Wellington network has a high customer density, so this allows a degree of interconnectivity to provide a secure system, particularly in underground areas. However, flattening the demand curve may require additional asset investment or services investment to maintain security levels.
- Re-enforce sections of the network that do not have enough capacity headroom to meet the expected increase in demand. Figure 1 does not represent every section of the Wellington network and some sections will need re-enforcing for existing demand growth ahead of climate change initiatives of EV adoption and reticulated gas curtailment.
- Provide extra headroom for sections of the network where we expect rapid growth and where demographic forecasts show existing capacity will be used up by new or emissions reduction growth.

We are in the process of modelling investment scenarios reflecting different levels of demand management. Our Initial calculations indicate an investment of between $0.5b and $1b is needed to meet the proposed climate change actions, depending on the how much of the new demand we can move to less congested periods.

Our approach to meeting the climate change targets is to increase our community engagement and educate consumers on the sustainability benefits of demand side management particularly for energy storage. This has been summarised in the short animation video: https://www.welectricity.co.nz/insights/show/climate-change-response/.

Regulatory changes will be needed to support EDBs to make the additional investment in their networks and to develop demand management capability needed to utilise the capacity headroom the network provides in off-peak times. The new factors outlined above will also mean that the current regulatory model will need to be adapted to meet changing resource requirements and consumer expectations. This response to the Open Letter draws and builds on WELL's response to the Draft Advice which included changes that we believe are needed to the regulatory framework. Our response is structured to address:

1. Changes to the regulatory framework to build/repair investor confidence.
2. Changes to the regulatory framework to allow EDBs greater flexibility to deliver the proposed climate change actions.

Our response highlights the issues that we believe need addressing as part of the upcoming input methodology (**IM**) review or in another similar forum. As such we have focused on the issues to discuss rather than present possible solutions.

27. Changes to build/repair investor confidence

The climate change actions outlined in the Draft Advice will require investment in distribution networks. We estimate that the climate change actions will increase demand on the Wellington network by 80%. This includes the electrification of the transport fleet and the transition from residential and industrial gas to electricity. Our early estimates indicate this would cost between $0.5b to $1.0b and increase prices by 40% to 80% by 2050 depending on how much of this increase falls during the peak network demand periods (in the morning and evening). Additional investment will also be needed to accommodate and manage Distributed Energy Resources (**DER**) like electric vehicles, solar and household batteries. This would include funding a Distribution System Operator (**DSO**) function through the support from further digitalisation of low voltage (**LV**) monitoring and management.

This investment is in addition to the investment needed to meet increases in in demand from housing growth, commercial development and large asset replacement programmes. The Wellington

network's underground cable and power transformer fleet replacements will fall at the same time as we are developing the capacity to meet the proposed climate change actions.

There are issues with the current regulatory framework which means that EDBs may not have incentives to invest as they will not be earning a real return consistent with the regulated cost of capital. A reasonable investor would not invest if they could not expect to earn a real return. Investors may not be willing to make the additional investment needed to deliver the Climate Change actions.

27.1. Inflation forecast errors leading to the under recovery of return on equity capital

The Commission targets a 'real return' for EDBs – the purchasing power of the return is maintained and is not eroded by inflation. However, the current treatment of inflation is resulting in EDBs under recovering the efficient return on equity capital and the allowances needed to cover debt funding costs. Specifically:

a. **The inflation forecasting problem.** The Commission's estimate of expected inflation has (on average) been materially higher than actual inflation over the past decade. If the Commission's estimate of expected inflation exceeds investors' true expectation of inflation—which is plausible in the low-inflation environment that has prevailed over the last 10 years or so—then, EDBs will not receive the efficient real return on equity required in order to attract equity capital. This is because an over-estimate of investors' true inflation expectations results in too high a forecast of the inflationary gain in the RAB being deducted when the Commission sets EDBs' return on capital allowances.
b. **The debt compensation problem.** EDBs issue nominal debt and are contractually required to pay nominal interest costs, but the regulatory framework delivers only a real return on debt capital in each regulatory period. If EDBs have no effective way of aligning their actual cost of debt to the real return on debt allowance provided by the regulatory framework, then equity investors are forced to make up any shortfall if actual inflation turns out to be less than forecast by the Commission or gain if actual inflation turns out higher than forecast by the Commission.

A more detailed explanation of these issues was presented to the Commission in April 2021 by Aurora, Orion, Powerco, Unison, Vector and Wellington Electricity.

27.2. Under funding of operating costs

New operating costs or above inflationary cost increases are not captured by the Default Price Path (**DPP**) allowance calculation. As part of the DPP3 consultation, the Commission identified $59m in unexplained cost increases that were not captured by the DPP2 operating cost forecast mechanisms (Figure A1 and section A16 of the Draft Decision). As part of the Electricity Networks Association's (**ENA**) submission to the DPP3 Draft Decision, a report from NERA was submitted supporting a positive partial productivity factor to capture genuine cost increases not captured in the allowance calculation. The report highlighted that cost growth is limited to changes in the size of the traditional network (line length and number of ICPs) and no allowances are included for other drivers that might change

operating costs over time (like aging networks, changing reporting and quality monitoring requirements, regulatory compliance etc.).

WELL's submissions to the DPP3 Draft Decision highlighted that the mechanism to capture specific new costs or above inflationary cost increases, the 'step' in the step and trend approach, is too rigid and known cost increases rarely pass the step change assessment criteria (the new costs must be significant, verifiable, not be captured in other mechanisms, outside of the distributors control and applicable to most EDBs). DPP3 submissions from EDBs requested step changes for a large list of cost increases, (e.g. increases in insurance levies, LV network monitoring, cyber security and tree regulation changes) were all turned down because they did not pass assessment. These cost increases are real and networks either have to forego other expenditure or overspend, receive an IRIS penalty and forgo earning a real return (all other profit inputs being equal). Networks do try to find efficiencies to fund new costs, however, as shown by the Commissions analysis of the effectiveness of the IRIS mechanism presented as part of the DPP3 consultation, EDBs have not been able to make savings even with a 34% incentive to do so. Any potential productivity savings has been offset and exceeded (as highlighted by figure A1 and section A16 of the Draft Decision) by cost increases not allowed for in the DPP2 allowances.

New network investment driven by the proposed climate change actions will also require an increase in supporting operating costs (i.e., to maintain and manage the new assets and to purchase demand management services to manage the new demand). Under the current DPP regime, network operators cannot be confident that they will receive the opex allowances to do so effectively, further increasing the risk of earning returns less than regulatory WACC.

27.3. Customised price path framework

The Customised Price Path (**CPP**) intentionally provides the Commission with a high degree of flexibility when setting prices and transitioning onto a new price path at the end of the CPP regulatory period. CPP applications are for unique, non-business as usual investment programmes that by nature require regulatory flexibility. However, this flexibility can lead to uncertainty in what allowances may be set for a CPP and how the supporting mechanics of the determination may be applied. Some costs are also unrecoverable. This uncertainty can result in EDBs earning less than a real return. Specific examples are:

- The unrecoverable CPP application costs (that are usually in the millions) means that an EDB is unlikely to be made whole for their investment in medium size investment programmes.
- New CPP approved reoccurring operating costs that fall for the first time in the last year of a CPP regulatory period are not necessarily captured and included in the next price period. For example, DPP operating costs are based on the second to last period of the previously

regulatory period which would miss any new costs that fall in the last year. Inclusion of these costs relies on the judgement of the Commission and is not certain.

- The method for transitioning to the next price period is made at the discretion of the Commission and is made towards the end of the CPP regulatory period. The transition method can result in very different allowances for the following price period – a building blocks approach could provide a different level of funding compared to extrapolating the CPP allowances. Certainty around the transition method would provide EDBs with the ability to implement the due diligence needed to avoid committing to a price-quality path that may not provide the ability to achieve a real return.

28. Changes to allow the delivery of proposed climate change actions

It is important that a responsive regulatory system is evolved to allow EDBs the flexibility to make the investment needed to deliver their decarbonisation targets. If EDBs cannot fund the development and implementation of tools to accommodate an electrified transport fleet, the transition from gas to electricity and the electrification of manufacturing process heat, the electricity supply is likely to be disrupted by an unmanaged increase in load, leading to lower network security and delays in reaching the emission reduction targets. Without adequate regulatory support, New Zealand will not achieve its 2050 carbon neutral targets.

For a successful renewable energy solution to emissions reduction, then all three elements of sustainability, affordability and security need to be managed as a tripartite approach which needs to be supported by regulation which is flexible to meet this objective.

The current regulatory framework of providing a DPP for business-as-usual levels of investment and a CPP for a step change in business activities, works well for the operation of a traditional network with modest increases in demand. The funding for network growth and regular fleet replacements can be carefully and precisely managed to meet forecast growth rates and well understood asset performance profiles. The traditional and predictable investment profiles can be forecast well in advance of actual expenditure and can be generally managed within five yearly regulatory periods.

The significant increase in demand from the decarbonisation programmes and the change from the traditional response of building a larger network to using new technology to better utilise the existing network capacity means that the future environment of climate change adaption does not have the predictability and certainty of the past which the existing regulatory framework relies on. Specifically:

- The rate of the increase in demand is uncertain and networks will need to flex their investment programmes to meet that demand within a five-year regulatory window. For example, the size of government subsidies for purchasing EV's, timing on restrictions on petrol and diesel engines, the speed of transition from gas and the development of an EV charging network will all influence the speed of change in electricity demand.

- The types of services that consumers want will change rapidly – how and when consumers choose to charge their cars, whether they install solar and how they discharge household batteries are likely to change the networks demand characteristic. Investment in demand management and network re-enforcement will have to quickly adjust.
- The technology to improve the utilisation of the existing networks is new and is developing rapidly. The technology may also be offered as a service and purchased as operating expenditure rather than the traditional approach of capital expenditure. EDBs will not be able to accurately predict cost, cost type and capabilities five years in the future – EDBs will need the ability to adapt their allowances to reflect quickly changing demand management solutions and this will require greater flexibility than that provided by current regulation.

The current regulatory model is a barrier to EDB's delivering their decarbonisation initiatives. The DPP framework may not provide the funding capacity needed and the CPP is cumbersome and expensive to apply, and its application is too uncertain for an EDB to be confident that they will be made whole for their investment. Specific concerns about the regulatory framework include:

- The DPP framework is backwards looking for the calculation of its operating cost allowances and relies on a "business-as-usual" approach continuing into the next regulatory period. New types of costs, like the purchase of demand management services, will not be captured.
- The increase in energy demand from EVs will be nation-wide and is likely to impact urban EDB's more so than rural EDBs. The speed of EV uptake will also differ between EDBs, with urban networks likely to see faster EV growth than rural networks. New Zealand's decarbonisation initiatives will mean there is no 'business-as-usual' scenarios that suits the DPP, and the higher levels of funding are likely to become the norm, rather than the one-off exceptional circumstance a CPP regime was designed for.
- The unrecoverable CPP application costs (that are usually in the millions) means that an EDB is unlikely to be made whole for their investment in medium size investment programmes.
- For many networks the investment to meet the decarbonisation targets may be modest but too large to be captured by the business-as-usual DPP framework and are not large enough to represent an operational change or investment to require a full CPP application. Applying for a CPP is an expensive, complex, whole of business process.

We support refining the current regulatory framework to provide EDBs with a price path which has the flexibility to meet changing demand, changing customer services and new delivery solutions. Options to provide regulatory flexibility could include:

- An individual price path using consistent and repeatable review processes. It is likely that networks will need to invest over multiple regulatory periods. An individual price path with consistent and repeatable review process will allow an EDB to adjust their expenditure levels at a lower administration cost than a CPP.
- Refine the DPP framework to keep regulatory compliance costs as low as possible and allow one-off projects outside of the capex gating with additional scrutiny.
- Allow a 'streamline' CPP like WELL's earthquake readiness programme. A network would remain on a DPP for its business-as-usual operations and the higher level of CPP scrutiny would apply to a specific investment programme.

Some flexibility was added during the last DPP reset – the re-opener for new customer growth provides EDBs with an important ability to re-open the price path for unexpected growth. The upcoming IM review provides another opportunity to add further flexibility.

In addition to adding flexibility to the mechanisms used to calculate allowances, a change is also needed to the strategic treatment of investment risk – specifically the risk of overbuilding networks. Traditionally, investment into distribution networks could be precisely managed using well understood and predictable investment profiles and asset lives. Predicable changes in growth and asset replacement programmes means the Commission can be confident that networks aren't over or under investing. However, as previously discussed, the rate of the increase in climate change driven demand is uncertain and new technology is changing the services that consumers want from their distribution networks. New network capacity and capability takes time to develop, and networks may no longer be able to match network capacity with new growth as well as it has in the past. Additional capacity may have to be built earlier than necessary to provide a buffer against faster than expected growth. Conversely, demand management tools may be required where networks can't be built fast enough to meet rapid demand increases. The industry (including regulators) will have to consider how to balance investment and uncertain demand – how to measure and trade-off the risk of overinvesting with the risk of networks not meeting future demand expectations and being unable to deliver the proposed climate change targets.

The consequence of the network capacity not keeping pace with changes in consumer demand has been seen in overseas jurisdictions. In Australia, government incentive schemes contributed to the rapid uptake of customer DER, specifically solar. Networks were not able to accommodate the rapid increase in new devises and had to curtail solar exporting electricity back into the network so they could maintain a secure and stable network service. Consumers and the Government were not able to realise the full benefits from their investment in household solar devises.

28.1. Understanding and adapting to changing consumer preferences

New consumer devices are changing how consumers use electricity. For example, EV's are significantly increasing household demand. Our EV trail showed that a small charger will increase household energy use by 35%. Large chargers use significantly more energy, reduce demand diversity and may cause electricity use to exceed the safe capacity of the standard household connection. Household batteries and solar devices introduce two-way power flows that can cause network voltage and stability issues that current networks haven't been designed to cope with.

In the future there are likely to be new devices that will have further unexpected impacts on distribution networks. EDBs will need to understand what distribution services consumers want and

what services customers can offer EDB's to orchestrate the stability of the network. EDB's will need to continue to educate consumers that sustainable outcomes also need to consider balancing security and affordability dimensions so that trade-offs are properly considered especially if this results in cost cross-subsidisation or equity issues. Consumers will need to make informed price/quality decisions about what future services they would support. This will require a level of investment in retailer/customer communication that EDBs are not funded or structured to provide currently.

Consumers will also need to make a decision about what network reliability they want when networks develop the tools and methods to deliver the proposed climate change actions. Our proposed approach of shifting demand to less congested periods will help keep prices low, however, it could reduce supply security levels and has reliability implications. The current capacity headroom on the Wellington underground network is used to provide a high level of network reliability. The Wellington network is designed to allow electricity to be redirected across the network if a section of the interconnected urban network is short of capacity. If the capacity headroom is used up, WELL will have less ability to re-direct electricity and the electricity supply will be less reliable and consumers will see more outrages.

Some headroom is needed to provide a buffer to allow us to manage demand and maintain a secure supply. Consumers will need to decide what level of reliability they want. Do they want to use a large portion of the network capacity and reduce the size of the network build needed to deliver the climate change actions? This approach keeps prices as low as possible but decreases network reliability. Or do they want to build a larger network that has more spare headroom for a higher price but better reliability?

EDBs will need the ability to have direct and more informed communication with end consumers so consumers can decide what distribution services they want to use or services they can provide back to the utility and are willing to pay for or be paid for – like two-way power flow, the network of the future will likely have two-way economic flows. Better communication is also needed so consumers can decide what approach they want to take to deliver the climate change actions – do they want to pay more and have a better reliability or do they want to pay less and have a less reliable network.

28.2. Innovation

DDP3 included the introduction of an innovation project allowance for up to 50% of the total cost of approved innovative projects in the assessment period, but not exceeding 0.1% of the total allowance in the regulatory period. While this innovative fund is in line with Part 4 of the Commerce Act to promote the long-term benefit of consumers, the actual allowance amount is insufficient for EBDs to deliver the innovation projects that are needed to deliver the zero carbon targets. Specifically, the

fund is too small to support the level of investment needed to trial and introduce new demand management services or LV monitoring alternatives. As outlined earlier, new technology and changing expectations around how consumers will use their DER will mean that traditional network solutions may not be appropriate. EDBs will need to develop new solutions quicker than they have done in the past. Allowances should be adjusted to cater to the higher research and development requirements – the consequence of under investing in innovation will be solutions that don't meet consumer expectations, do not deliver the climate change actions or are not the most efficient solution for consumers.

As part of the DPP3 re-set process the Commission provided evidence that the industry is underinvesting in innovation when compared to other sectors (section 4.54 of the DPP3 Draft Decision). This was a similar result to what Ofgem found in the UK until they established an innovation incentive scheme. We encourage regulators to consider Ofgem's approach of managing an increase in innovation expenditure through a contestable innovation fund where EDBs bid and share successful ideas. The upcoming IM review provides an important opportunity to align the innovation incentives with the size of the upcoming development programmes.

29. Addressing these issues

As highlighted earlier, external factors (like changing technology and customer expectations) will mean than traditional business processes may not deliver the increase in electricity demand resulting from the proposed climate change actions. Significant changes may be needed to the regulatory frameworks to provide greater flexibility to support the delivery of distribution services. The current regulatory consultation process is good for making minor refinements under a business-as-usual environment, but we believe more time is needed for more complex issues.

Sufficient time will be needed to identify and understand more complex issues, develop least regrets solutions and debate the most appropriate response. This consultation will highlight what the complex issues will be. We believe that solutions to these issues should be developed in advance of the IM review process. A draft solution could then be refined using the standard consultation process of issues paper, draft decision and final decision.

30. Workshops

To develop draft decisions in advance of the IM review, WELL suggests using industry working groups to develop options and then workshops with the Commission to refine those options. We commend the Commission for the two workshops it did hold for the DPP3 but believes they were too large to allow the co-ordinated development of solutions and to then debate the pros and cons. The DPP3 workshops were useful to answer stakeholder questions and to clarify the draft decisions but were

the wrong format for more in-depth discussions. Workshops with representatives from each stakeholder group would provide an effective forum. A smaller number of participates will allow a more interactive discussion.

31. Closing

Thank you for the opportunity to outline the Climate Change related implications for the regulation of electricity distribution. Meeting the increase in electricity demand is a complex challenge and represents a significant change in the industry. Ensuring EDBs have the allowances, tools, and investor confidence to develop their networks and demand management capability will be an essential step in delivering New Zealand proposed Climate Change targets.

The issues are complex, and we believe significant change is needed to move from a business-as-usual regulation to a more flexible set of regulatory tools. We encourage the Commissions to consider the extra time and resources that may be needed to deliver a fit for purpose framework. Networks will soon need to start investing in new capacity and capability so small incremental changes to the existing regulatory model may hamper a network businesses ability to meet the proposed climate change targets. We look forward to working with the Commission to develop and refine the regulatory model. If you have any questions or there are aspects you would like to discuss, please don't hesitate to contact Scott Scrimgeour, Commercial and Regulatory Manager, at sscrimgeour@welectricity.co.nz

Yours sincerely

Greg Skelton

Chief Executive Officer

Wellington Electricity Lines Limited

wellington electricity

CO-FUNDED BY EECA

Appendix B: EV CONNECT CONSULTATION

DRAFT ROADMAP

Consultation close date: 15 July 2021

Released May 2021

CONTENTS

Acknowledgements

We acknowledge the input and engagement from our stakeholders through 2020-21 which have contributed to the scope and direction outlined in the roadmap and key actions within it. We also acknowledge the support of GreenSync – particularly Bridget Ryan - in helping us to write and refine this Draft Roadmap. Finally, we acknowledge the funding, support and engagement of EECA on the EV Connect project.

1. Introduction

As electric vehicle (EV) uptake increases, electricity networks will be required to manage the associated increase in demand for electricity. The increase will be significant – our studies show that a small EV will increase household electricity use by 35%. This can be supported most of the time but becomes challenging during peak demand periods (in the evenings) when the network is already busy.

Our job – as a utility – is to enable consumers to choose the vehicles they want and support the way they want to use them. To ensure our service remains affordable and the network remains reliable, customers may need support to target charging their EVs at lower demand times. Changes are required to provide this support.

There is a view that EV uptake will be gradual as people replace their current vehicles as they come to the end of their useful lives. This should provide sufficient time for the industry to develop the capability to manage EV demand and develop networks to accommodate EVs through the steps outlined in this document.

However, as underscored by the New Zealand Climate Change Commission's new targets for emissions reduction in light transport and recommendations for government incentives, the uptake of EV's could be faster than anticipated. We will therefore need to be prepared to respond more quickly. Consequently, we need to begin to take iterative steps now and be prepared to accelerate the programme if needed.

In New Zealand, electricity distribution is regulated. The Commerce Commission sets how much money an Electricity Distribution Business (EDB) has to build and operate their network, the services provided and the level of quality delivered. The Electricity Authority defines how EDBs interact with other industry participants and customers.

As such, there is a vital need for prompting government leadership to co-ordinate the industry wide changes need to accommodate EVs and provide supporting legislation, regulation and policy. Equally, the role and participation of EDBs and EV stakeholders including EV owners, electricity retailers, consumer advocates and technology / product manufacturers is critical in making the changes that are needed.

1.1. About EV Connect

To make headway in understanding the changes required and options available to drive those changes, Wellington Electricity Lines Ltd (WELL) started a conversation with stakeholders on EVs and energy demand. This discussion has focussed on how we could move energy use to less-congested times on the network. The purpose of doing this is to support EV adoption while maintaining network supply security, reliability and providing new benefits to consumers and across the electricity supply chain.

With funding from the Energy Efficiency & Conservation Authority (EECA), through the Low Emission Vehicle Contestable Fund, we have been working on the EV Connect project. The project has helped us to identify the steps and methods needed to allow consumers to connect their EVs.

EV Connect has enabled us to garner insights, test technologies and identify options to continue to equitably support EV-owning and non-EV-owning customers in our network alike.

This project has also allowed us to progress the conversation and to engage with consumers and the wider industry about how together, we can support EV adoption and unlock value while also maintaining network security.

Accelerated emissions reduction ambitions

There is even more reason now to address changes that support EVs with the release of the New Zealand Climate Change Commission (CCC) '2021 Draft Advice for Consultation'. The Draft Advice identifies priority areas of action needed to meet climate change targets including the electrification of light transport and transition from gas to electricity. This Advice if adopted into Government policy, provides increased impetus to accelerate the adoption of EVs to realise our emissions reduction ambitions.

Delivering on the emissions outcomes in the context of accelerated EV uptake, while also ensuring an affordable, reliable system is maintained, will require the actions outlined in this roadmap to be fast-tracked.

WELL's analysis of the new CCC targets indicates that:

1. Accommodating more EVs will have the largest impact on electricity demand while the change from gas to electric hot water heating will have a compounding impact on peak demand.
2. If demand is not shifted away from peak periods, networks will have to be rapidly upgraded to accommodate an estimated 80-100% increase in energy consumption[1].
3. If demand from EV charging and the shift from gas to electric hot water heating can be shifted to less congested times, this would allow an ordered planning approach, reduce the additional network capacity needed, and keep prices low.
4. There may be trade-offs between price and quality as the network's headroom (off-peak capacity) used for managing network security is squeezed. However, this is expected to balance out as the benefits of battery storage elements from EV's become realised.

1.2. About this document

This Draft Roadmap document is the penultimate output from the EV Connect project and builds on our 2020 stakeholder engagement activities. The Roadmap aims to articulate the steps required to support EV adoption and unlock value and utility while maintaining network security and equity to all consumers.

This Draft Roadmap is focussed on identifying and encouraging opportunities to minimise congestion by moving demand from EV charging to less congested times.

[1] For the Wellington network this increased build could cost NZ $1 billion. Source: WELL analysis (2021)

We outline the connected steps that need to be taken to deliver changes at least cost and with most benefit, and that ensure our community is brought along with us.

A number of the steps require government and policymakers to move towards allowing flexibility in the regulatory framework so that we can enable and support new services from and for EVs in New Zealand.

There is a vital role for government and industry leadership to work together to ensure a more efficient and effective network that supports and benefits EV stakeholders including EV owners, electricity retailers, consumer advocates and technology / product manufacturers.

For our part, WELL will look to support increasing demand, customer choice and a secure energy supply. Our focus is to ensure that we continue to support the uptake of EVs. Our approach is to progress new customer-oriented EV charging services, tariff arrangements and connection settings that will ensure our services remain affordable and reliable.

The Roadmap is summarised in Figure 1. This outlines the objectives and actions to be taken in collaboration with key stakeholders over the next five years to support the ongoing uptake and charging of EVs.

The Roadmap detail is articulated through the sections that follow Figure 1 on context, objectives, actions, work programme, leveraging progress to date through EV Connect and 'getting to the starting line'.

Appendices cover relevant case studies on hot water 'ripple control', South Australia's solar PV control requirements, a new standard for residential EV charging and network tariff approaches to EV charging management.

Next steps

Following the release of this Draft Roadmap, we will hold a stakeholder consultation session on 9 June 2021. We invite stakeholders to provide feedback on the Draft Roadmap at this session or via EV_Connect@welectricity.co.nz. Stakeholder feedback will contribute to the finalisation of the Roadmap.

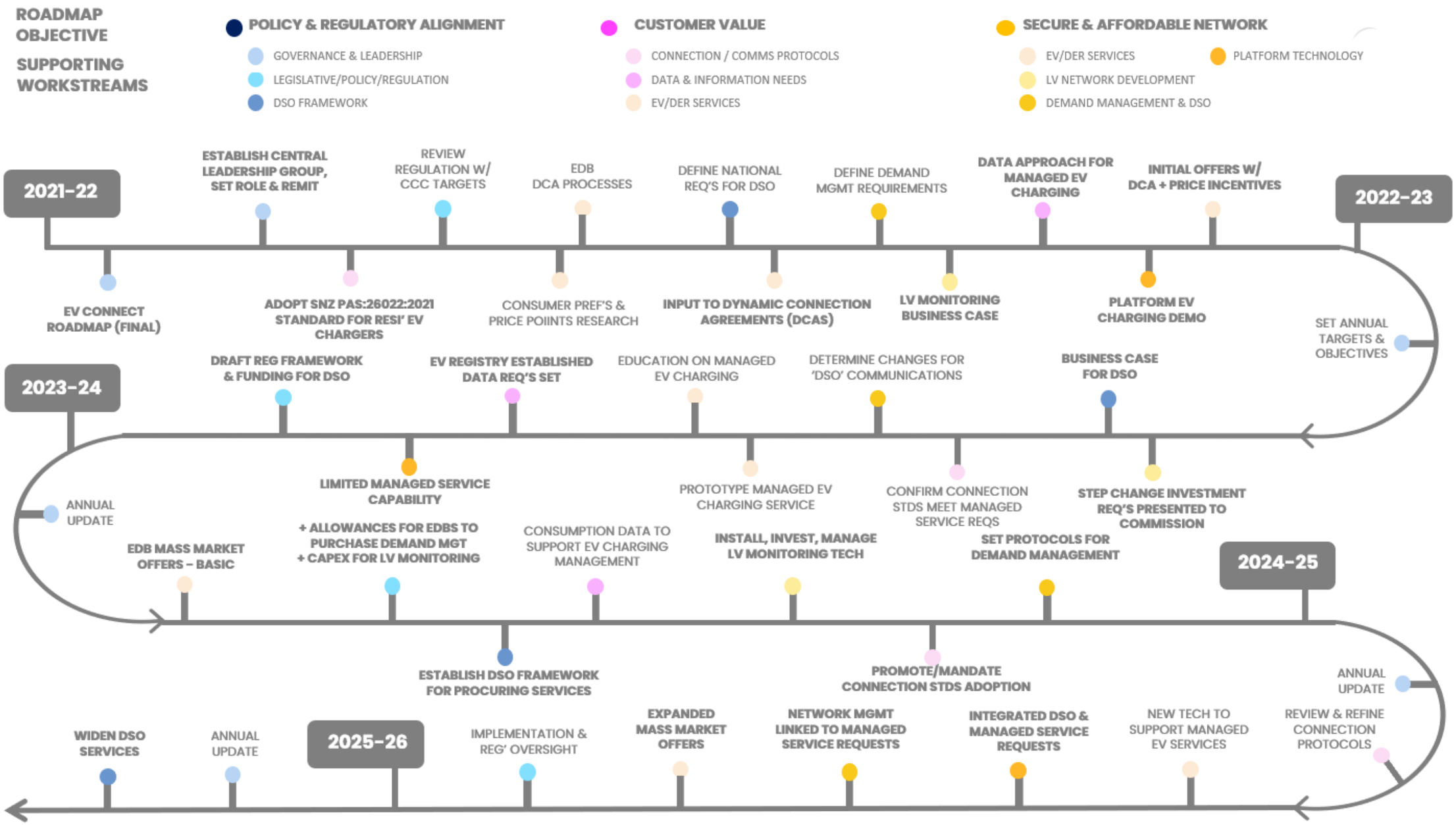
The closing date for feedback on this draft Roadmap is 15 July 2021.

We propose a work programme with elements led by key stakeholder groups.

We look forward to collaborating with stakeholders to drive this forward over the latter half of 2021 and beyond.

We aim to finalise and publish the Roadmap in the second half of 2021.

Figure 1: EV Connect Draft Roadmap – Summary



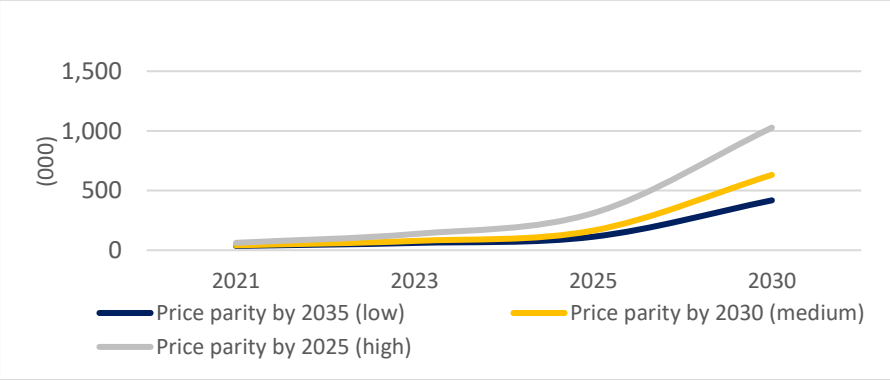
2. Context

The world's energy systems are changing at a rapid pace as consumer owned devices and distributed energy resources (DER) play an increasingly significant role in energy markets and general life. In particular, the electrification of transport fleets is occurring around the world and locally. EVs are being purchased by New Zealanders in growing numbers.

Key drivers

The numbers of EVs in New Zealand are increasing and forecast to grow significantly. The scenarios shown in Figure 2 (below) vary based on how fast the price of EVs reach price parity with internal combustion engine (ICE) vehicles. The speed at which this occurs will be influenced by factors like production/technology costs, government subsidies and incentives.[2]

Figure 2: Forecast EV uptake (New Zealand, national estimate)



[2] Energy Efficiency and Conservation Authority by KPMG, https://www.eeca.govt.nz/assets/EECA-Resources/Research-papers-guides/EV-Charging-NZ.pdf

The recently released CCC emissions targets for transport and energy will likely further accelerate the uptake of EVs and reduce reliance on fossil fuels.

BOX 1: Practicalities of building a larger network

If demand for EV charging is not controlled, we will have to build a larger network to deliver an 80% increase in energy use. This could cost $1b. Practically, building a network this large in the climate change timeframes may not be possible. For example, the Wellington distribution network has 3,000 residential transformers (each servicing about 50 homes). Each transformer takes about 6 weeks to upgrade. A single team of eight skilled workers would need 375 years to upgrade all 3,000 transformers. It would take 20 teams to complete the work in 20 years. This represents a doubling of WELL's current overall field work force and oversight functions. Furthermore, the replacement of residential transformers represents about 20% of the work programme needed to increase the network's overall capacity.

Question 1: Submissions from the first EV Connect consultation thought EV uptake would be slow and the industry would have time to develop the ability to accommodate new demand from EVs. Since then, the Climate Change Draft Advice has been released. What visibility of EV penetration onto networks or through fleet purchases & home charging is required to monitor network uptake rates?

Key risks

The 20th Century centrally oriented frameworks in which the electricity system was designed will be seriously challenged by the pace of change required and the types of interactions across systems.
There are key risks in terms of supply reliability and cost impacts:

- Infrastructure that is unable to support the rate of connections required and the charging demand, particularly at peak times, will affect supply reliability
- Investment in the network that is inefficient and/or unreasonably increases costs for consumers and industry would be unacceptable to the community and government.

2.1. Wellington Electricity perspectives

Wellington Electricity is concerned about the increased network load that the expected increase in EVs will have on network reliability and affordability.

As EV uptake accelerates, electricity networks will be required to manage the increase in demand. Without a planned approach, networks will not be able to absorb this increase in demand.

However, with planning, fit-for-purpose regulation, new technologies and collaboration, it is possible that adverse effects can be minimised or avoided altogether.

Indeed, we also believe such collaboration can enable a system that allows consumers and the wider industry to unlock the additional value that EV batteries and charging technology can provide which may ultimately be the best long-term solution to manage the increase in EVs.

Question 2: Are our observations about the Wellington network consistent with other regions or do they relate to urban rather than rural areas?

Discussion and actions under EV Connect

To build understanding and stakeholder interest we engaged in consultations under EV Connect. A key finding of the recent stakeholder engagement was that leadership is needed to coordinate the required work programmes and to increase the pace and momentum of the changes needed.

Stakeholder discussions also reinforced our view that the key to minimising the impact of EVs on the network is via reducing congestion or moving demand to less congested times and/or locations. To support this at a practical level and in a cost-effective way will require changes to the regulatory framework and adoption of new technology.

As part of EV Connect, we also tested GreenSync's deX platform and supporting solutions to assess if and how current technology can efficiently allow us to connect, see and manage EV charging. This solution delivers key tools for us to be able to use spare network capacity (see Figure 3).

Figure 3: EV Connect Technology Demonstration Structure

2.2. Added imperative – emissions reduction targets

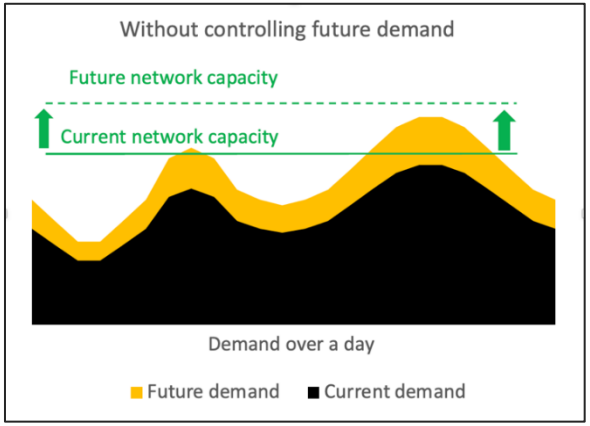
The New Zealand Climate Change Commission recently released emissions reduction targets for the transport and energy sectors which have added further impetus for the issues and actions we have addressed and progressed through EV Connect.

The size of an accelerated EV uptake challenge

We estimate the electrification of the transport fleet and the transition away from gas will increase energy consumption on the Wellington network by around 80% per annum by 2050.[3] If we cannot move this increased demand away from congested periods, the estimated additional network capacity required would cost around $1 billion to build, increasing prices to consumers by 80%.

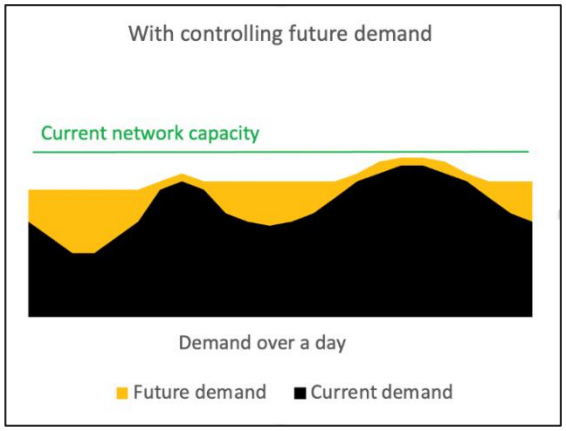
Figures 4 and 5 show that if the new demand from EVs is not controlled, more investment will be needed to build a larger network with more capacity. Conversely, if the new demand can be managed and shifted to less congested periods on the network (during low usage day and night periods), much of the new demand can be readily accommodated, delaying the need for new network investment.

Figure 4: Network capacity without ability to control demand



[3] Wellington Electricity submission to New Zealand Climate Change Commission's Draft Advice for Consultation (2021). Page 5 of our submission.

Figure 5: Network capacity with ability to control demand



Question 3: What do you think will be other key drivers for managing peak demand apart from price signals and shifting EV charging to off peak periods?

2.3. Including the wider industry

Accommodating EV growth while maintaining a reliable and affordable network is not something that EDBs can do in isolation. We need others to collaborate with us in order to have, or be able to access:

- Technology that can communicate with our systems – directly or via platform technologies
- Consistent protocols and product standards
- Retailer & Customer engagement and buy-in
- Dynamic Connection Agreements
- Regulatory support

The electricity industry has been preparing for the transition from fossil fuels to electricity for some time. It is also important that we incorporate learnings and experience from other work programmes including:

- Concept Consulting's EV Study which identifies a set of coordinated actions to accelerate the transition to clean vehicles in a way that maximises economic and environmental benefits and minimises adverse social impacts.
- The Innovation and Participation Advisory Group (IPAG) which is focused on issues specifically related to new technologies and business models, and consumer participation.
- ENA's Smart Technology working group, which is developing connection standards for DER, a framework for monitoring new devices on the low voltage electricity distribution network and exploring what data is needed to manage network demand in the future.
- The ENA Network Transformation Roadmap which provides information, insights and recommended actions for EDBs to navigate the changes in the way electricity distribution networks will be used in the future.

Question 4: Could the proposed actions be combined with other industry programmes or should the EV programme remain independent?

Question 5: What is the best model and implementation plan for ensuring the actions are delivered?

3. Roadmap objectives

This EV Connect Roadmap is focussed on identifying and encouraging opportunities to enable increasing connection and charging of EVs on our network and across the country in the most efficient way possible.

The Roadmap has clear objectives to deliver (1) customer value, (2) a safe, resilient and affordable network and (3) policy/regulatory alignment to support the changes needed.

3.1. Customer value

For customers to benefit from their assets (EVs) at least cost requires:

- Smart charging technology
- Network incentives for managed charging
- Customer offers from retailers that support shared value
- Clear product requirements
- Streamlined (digital) processes for connection
- Incentives to catalyse uptake (government led or other entity)

3.2. A safe, resilient and affordable network

Arrangements for safe, efficient, flexible network infrastructure to support EV uptake, at an affordable price, requires:

- Smart technology and infrastructure (e.g. deX, LV asset monitors, advanced distribution management system software etc)
- Standards and processes for a safe and smart connection
- Data and information approaches to support stable LV operations, forecasting and (future) services
- EV / DER services and supporting processes
- A regulatory framework that provides the flexibility to allow EDBs to invest in LV monitoring and contract for services (demand management & DSO)

3.3. Policy and regulatory alignment

Ensuring that the above two objectives can be met requires the regulatory framework to be updated to enable flexibility, to allow stakeholders and industry participants to make the changes necessary and to keep regulatory costs low. We see this requiring:

- Leadership and targets to drive overall delivery
- Legislative/policy change to allow service procurement by EDBs and investment in LV monitoring
- Enablement of the Distribution System Operator (DSO) model, adding flexibility into how EDBs manage operating costs and future investments
- EV / DER services and supporting processes
- Demand management capabilities and development of the DSO business model.

Question 6: Have we captured the correct objectives within the roadmap?

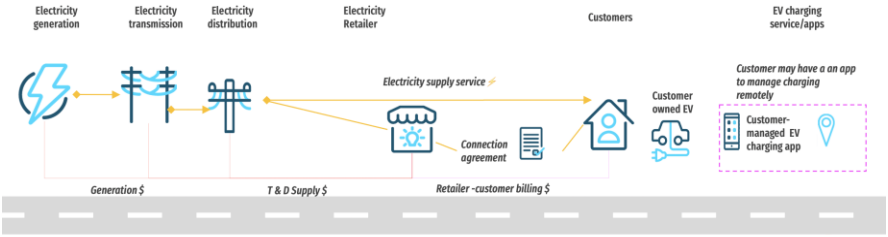
Question 7: Are there other deliverables we have missed or which need amending?

4. Roadmap approach and actions

This draft Roadmap provides a first-best plan to deliver on the objectives of customer value, network resilience at an affordable price and policy/regulatory alignment.

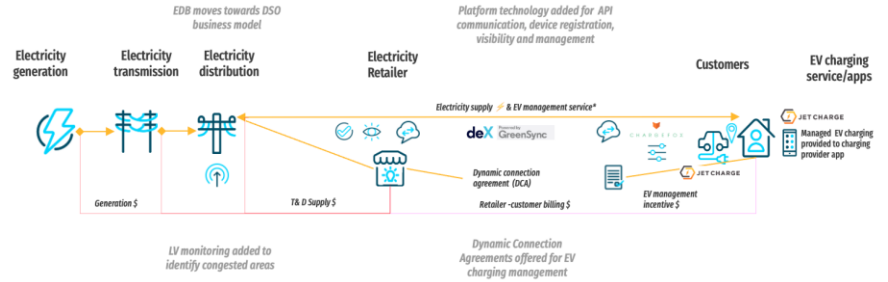
We see this roadmap driving change from where we are today:

Figure 6: How things work today



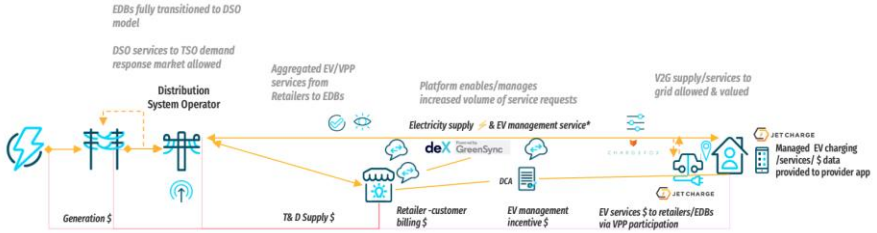
To an interim structure beginning in 2021/22, fully operating by 2023:

Figure 7: How things can work soon



And – potentially – to a modified operational model by 2025/26:

Figure 8: How things might work in the future



The ability to encourage EVs to charge during off-peak periods is essential. The more this is done, the easier and cheaper it will be for consumers. To accelerate and deliver this in the most efficient way requires stakeholders to work together on standards, procedures, network investments and demand management.

We have proposed a series of workstreams and actions under each objective and identified who is best placed among our stakeholders to lead and who is needed to support. The work streams and actions are summarised at Figure 9.

We organised this plan with policy and regulatory alignment at the top as our stakeholders emphasised the critical nature of direction and coordination of all other steps.

Timeframes are indicative, but each step is iterative and connected, building up to the objectives we outlined in Section 3.

4.1. Policy and regulatory alignment

Lead: Government, policymakers & regulators
Support needed from: EV stakeholders, Electricity Distribution Businesses

These actions are focused on accelerating alignment in the policy and regulatory area to deliver customer value and network resilience.

4.1.1. Leadership & targets

- Establish a central leadership group to drive objectives, set outcomes and report (annually) on progress
  - EDBs and EV stakeholders to co-lead and collaborate on directions to
    - Enable ongoing connection and support of EVs
    - Deliver affordable electricity supply, and
    - Reduce emissions.

Question 8: Feedback suggested a government lead or/co-lead work programme. What steps are needed to make sure this structure is effective?

Question 9: Do we need to get a government mandate to support/resource?

Question 10: If not, what path needs to be adopted?

4.1.2. Legislative/Policy/Regulation

- Review legislation, policy and considering the new CCC targets and initiatives
- Provide EDBs with the allowances they need to reliably and efficiently connect EVs and other DER
- Apply standards for safety connecting EVs to the electricity system
- Allow EDBs to invest in LV monitoring and to purchase demand management services
- Set the funding framework for the DSO model

4.1.3. DSO Framework

- Drive DSO Framework policy/regulatory changes including:
  - Definition of DSO requirements
  - DSO Funding framework (changes)
  - Set capabilities for service procurement for demand management/other network support services
  - Expand/extend capabilities for DSO services

4.2. Customer value

Lead: EV stakeholders – OEMs, Customers, Retailers, Consumer Advocates, EV dealers, EV charging tech
Support needed from: Government, policymakers & regulators; EDBs

These actions are focused on accelerating value and services to EV-owning customers and ensuring equity for customers who do not own EVs.

Question 11: We are cognisant that the roadmap has been assembled from an industry perspective. We also expect services offered to consumers with DER will evolve with time and consumer benefits will growth as new services are offered. Do you think the proposed actions will lead to consumers receiving the most value for their DER?

4.2.1. EV/DER services and technology

- Research consumer preferences and price points
- Provide input to EDB Dynamic Connection Agreement (DCA) developments

- Encourage evolution of offers for managed EV charging services
- Undertake education/awareness/promotion of new services
- Provide/sell/enable new technology to support customers with managed EV services

BOX 3: What's a DER?

Distributed Energy Resources (DER) commonly refers to all residential-scale assets that can generate, store or manage energy and interact with the low-voltage (LV) electricity system. DER include solar PV systems, battery storage systems, EVs and EV chargers.

DER may also be used to refer to larger assets at commercial/industrial sites that provide demand management, energy generation or energy storage services. A defining factor is that these assets are modular and geographically distributed.

Question 12: Digitalisation will allow just about any party, in future, to move demand. Are there situations or circumstances where a grid or network emergency requires one party to establish demand reduction rights over another?

4.2.2. Connection protocols

- Adopting the SNZ PAS 6011:2021 standard for residential EV chargers
- Confirm that connection standards will meet managed EV charging service requirements for customers and EDBs
- Promoting/mandating adoption of additional standards/protocols identified over time.

Question 13: The SNZ PAS 6011:2021 standard for residential EV chargers provides great advice and guidance for connecting EVs. How can we ensure consumers read and use the guidance?

BOX 4: What's a DCA?

A Dynamic Connection Agreement (DCA) is an innovation on the present approach to connection agreements for generation or storage assets that are connected to the electricity grid. A DCA is designed to provide flexibility for the owner of the asset and security for the network. This agreement adds in a **dynamic** ability for the network to manage an asset, with owner permissions, during times of network congestion. In exchange the owner receives a benefit of some form – tariff or incentive – to allow the network to manage this asset to maintain network availability.

4.2.3. Data and information needs

- Co-develop a data approach for managed EV charging
- Establish a national EV Registry and set related data requirements
- Secure source of real-time consumption data to support managed EV charging.

Question 14: We have been thinking about who should provide demand management services (flexibility services) – Is there a clear and obvious party to provide demand response services?

Question 15: Should this initially default to the EDB to ensure security of the LV network pending further market development?

Question 16: Who would provide the most value to consumers?

Question 17: As demand can only be shifted once, does there need to be an understanding of a hierarchy to prioritise demand response management so value is assigned correctly across the supply chain?

4.3. Network resilience

BOX 5: What's an OEM?

Original equipment manufacturers (OEMs) are the brands behind consumer-purchased products. In the case of EVs – Tesla, Volvo, GM, Nissan are all OEMs. In the case of EV chargers, these include Jetcharge, EV Box, Tesla.

Lead: EDBs
Support needed from: Government, policymakers & regulators; EV stakeholders – OEMs, Customers, Retailers, Consumer Advocates, EV dealers, EV charging management tech

The included actions are intended to drive alignment on delivering customer value and on improving network resilience

4.3.1. EV/DER services and technology

- Research on consumer preferences and price points to inform managed EV charging tariffs and other services
- Development of Dynamic Connection Agreement settings and supporting processes
- Engaging in the prototyping and evolution of offers for managed EV charging services
- Education and awareness programs for new services
- Developing the capability to observe and manage customer demand and to support the demand management function, including through LV network monitoring
- Development of demand management functions & DSO operating structures.
- Implementation of platform technology to support initial and future capabilities - EV charging management, customer DCAs, data to inform network operations, service contracting and demand management.

Question 18: We envisage that an EDBs demand management and DSO capability will evolve with time. What do you think are the core responsibilities of the DSO function?

Question 19: When will each of the core DSO responsibilities identified above be needed (i.e. what drivers/causes will require their delivery)?

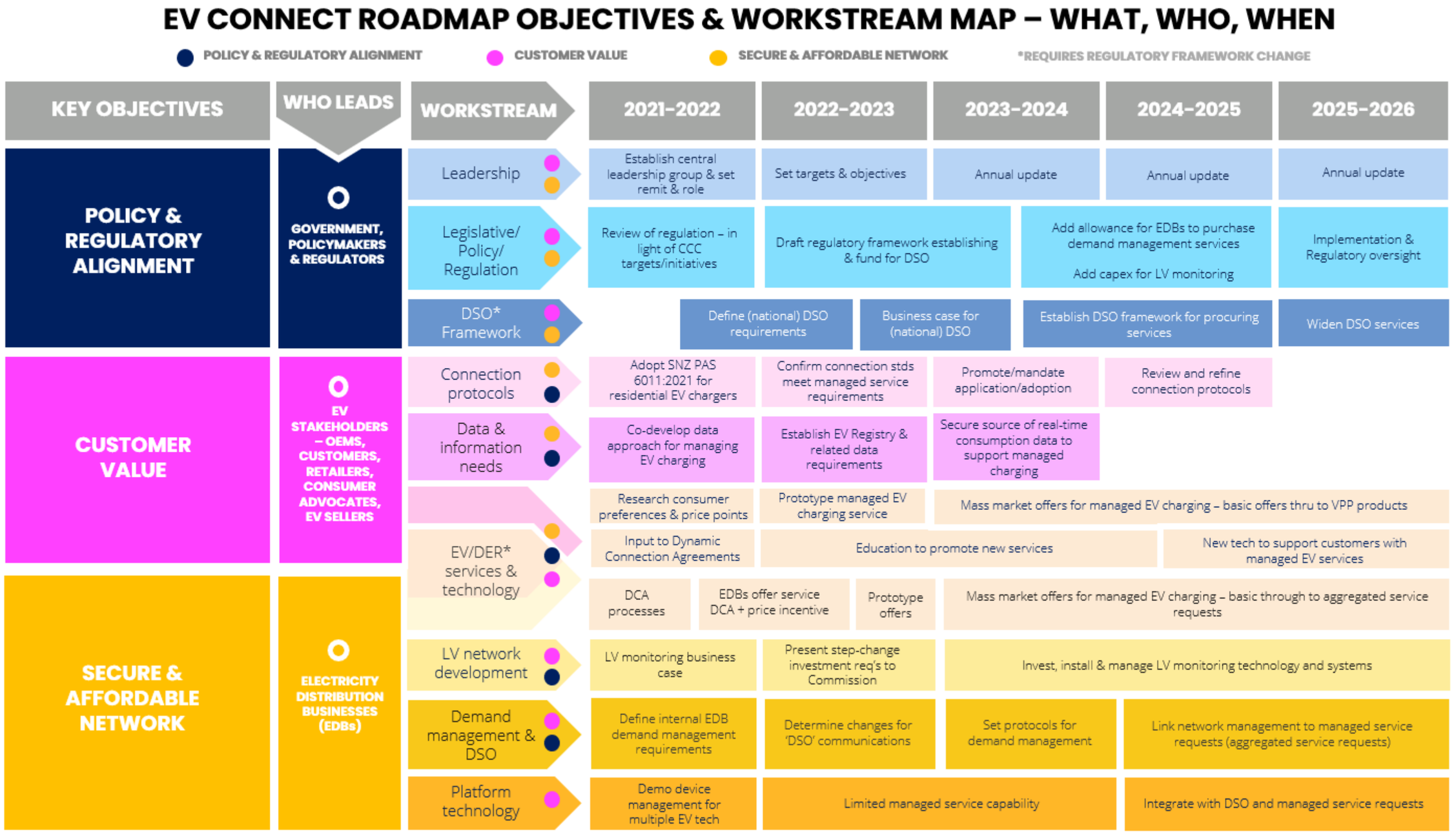
Question 20: Who is best placed to deliver the DSO function?

BOX 6: An evolution towards energy services and contracting

We believe a natural transition is underway towards EV charging management services being aggregated by third parties. This will enable EDBs to contract for those services at a price point which reflects the savings gained from avoiding long-term capital investment in infrastructure. Such contracting could occur at the same time as services are being provided to parties (e.g. retailers or aggregators) to support wholesale or demand response market opportunities.

The above is founded on our experience in managing demand from storage devices (electric hot water) for over 60 years. That capability has delivered cheap hot water to customers for decades

Figure 9: Draft Roadmap Workstreams & Actions



5. Building on EV Connect progress

With funding assistance from the Energy Efficiency & Conservation Authority (EECA), through the Low Emission Vehicle Contestable Fund, we have been working on the EV Connect project.

The EV Connect Project built on our earlier EV management research and pilots and enabled us to garner further insights, test technologies and identify options to equitably support both EV-owning and non-EV-owning customers on our network.

The project also allowed us to progress comprehensive stakeholder consultation and public policy engagement.

What we have most recently learnt has reinforced the findings from our earlier projects. However, to leverage this work to its best effect will require engagement beyond our corporate boundaries.

5.1. Stakeholder engagement

To ensure our roadmap captured all the aspects needed to accommodate EVs on the electricity network, we incorporated consultation phases into the EV Connect Project, releasing a consultation paper [4]in September 2020.

Feedback was gathered from key organisations[5] via a half day workshop with 50 stakeholders on 20 October 2020 and from 13 written submissions received following the workshop. This input was summarised[6] and shared with stakeholders in early 2021.

This stakeholder feedback provided us with the foundation components of this Roadmap and gave us a clear incentive for proposing further collaboration to foster alignment and buy-in.

Through the EV Connect Project we also tested technologies that could provide options to equitably support EV-owning customers and non-EV-owning customers in our network.

5.2. EV Connect technology demonstration

Our EV Connect Project technology demonstration was developed with the input, participation, technology expertise and products from GreenSync, Chargefox, Jetcharge and GoodMeasure.

[4] EV Connect – Stakeholder Consultation Document: https://www.welectricity.co.nz/about-us/major-projects/ev-connect/document/230

[5] Stakeholders providing input to the EV Connect Consultations in 2020: Aurora Energy, Drive Electric, Orion, Our Energy, Vector, Unison Networks, Electra, Powerco, Network Tasman, Meridian, Flick, Independent Electrical Generators Association, Major Users Group, Transpower, Electricity Authority, Electricity Engineers Association, Electricity Networks Association, Commerce Commission, New Zealand Transport Authority, Energy Safety, Energy Efficiency & Conservation Authority

[6] EV Connect – Stakeholder Consultation Response Document - https://www.welectricity.co.nz/about-us/major-projects/ev-connect/document/229

Figure 10: EV Connect - Technology demonstration overview

As shown in Figure 10, WELL trialled GreenSync's deX platform to support EV charging management by:

- Using the deX software platform to communicate (via API integrations) to EV charging devices, feed information to us so that we can monitor network capacity and performance and be able to manage charging in line with the limits of the network.
- Working with smart EV charging technology providers – GoodMeasure, and Chargefox who completed API integrations to deX.
- Using the deX platform to:
  - See and manage the charging of our EV fleet via the deX platform communicating with GoodMeasure and/or Chargefox.
  - Develop a model for customers to utilise DCAs to allow charging management by us
  - Allow Retailer visibility of the active management of EVs.

What we demonstrated

- There are solutions available, today, to support EV charging being managed during peak demand periods by EDBs.
- The deX technology allows WELL to offer a new service-based arrangement for EV owners which will:
  - Ensure EV owners' vehicles are charged at least-cost
  - Allow us to manage charging within the network's capacity
  - Be provided for a lower price than standard distribution prices.
  - Enable WELL to stabilise the low voltage (LV) network by modulating the charge rate across many devices based on network capacity and supply quality at that point in time.

What we learnt

- Platform technology can underpin communication between different vendors and the network, ensuring consumer product choices are supported.
- Technology can be demonstrated even when things are changing.
- Customers will participate if the incentives and services work in with their lives.
- Managing EV charging is a key option that will deliver demand management, reduce emissions and mitigate network build costs.

What happens next

- Industry input and collaboration (encouraged via the Roadmap) is key to taking the learnings from this project and ensuring they provide benefit and value
- Engaging consumers directly and via partnerships with retailers and EV vendors
- Facilitating or supporting market research and trials to prototype managed EV connections and DCAs with retailer/EV vendor partners.

6. Getting to the starting line

This Draft Roadmap proposed the steps to deliver New Zealand's ambition to electrify its transportation. The Roadmap will only be effective if the implementation is by the collaboration of the industry stakeholders.

We invite stakeholders to engage with us to refine the approach we have put forward in this Draft Roadmap document.

6.1. Stakeholder consultations and input

Stakeholder engagement is important to us. We will hold a workshop and consultation for invited stakeholders on 9 June 2021. We invite any interested stakeholders to attend that session, and/or provide feedback in relation to the draft Roadmap via EV_Connect@welectricity.co.nz.

6.2. Roadmap finalisation

We aim to finalise the Roadmap in the second half of 2021. Finalisation of the document will be influenced by the upcoming stakeholder road map consultation and feedback.

6.3. Pursuing the (proposed) work programme

We hope that the Roadmap drives positive, progressive action. We look forward to collaborating with stakeholders to drive this forward over the latter half of 2021 and beyond.

We, as a leading EDB, have a role to play in educating, facilitating and putting words into action. We plan to leverage the EV Connect project via:

- Developing and refining DCAs
- Potentially including managed EV charging in our next tariff proposal to the Commerce Commission
- Advocating for government action to be taken on the elements included in this Draft Roadmap.

APPENDIX A: CASE STUDIES & INSIGHTS

1: RIPPLE CONTROL & OFF-PEAK HOT WATER SERVICE	
What is it?	• Ripple control is a technology solution from the 1960s which is still used, today, to move water heating to less congested periods of the day. • The electricity distribution company is able to manage 'load' via sending a signal to electric hot water systems to shift hot water heating into the over-night period, storing hot water for use the next day. • Consumers may know this as 'off-peak tariffs' for hot water heating.
Why is it relevant?	• Ripple control has allowed the electricity distribution network to be better utilised rather than trying to size the infrastructure to meet household demand all at once. ○ For example, ripple control provides WELL the ability to defer 45 MW of demand at peak periods and is used to support Transpower, New Zealand grid operator, provide grid level demand management • It has enabled consumers to take advantage of 'cheaper rates' without taking any manual action themselves.
What are the insights?	• Load management of customer-owned devices is already a part of the electricity distribution system. • The ability to manage hot water heating via ripple control shows that spreading load across the network to reduce congestion or demand peaks allows more capacity and improves security of supply for customers.
	• Cheaper rates and limited/no manual action • Easy for customers to understand and adopt.

APPENDIX A: CASE STUDIES & INSIGHTS

2: SOUTH AUSTRALIA – SOLAR PV REQUIREMENTS	
What is it?	• Over 30% of South Australian homes have solar PV systems installed. On some days, rooftop solar PV supplies most of the demand in the state. This creates serious challenge for the grid operator around minimum demand. • New regulations, applying from September 2020, require all newly installed solar PV systems to be capable of being remotely disconnected and reconnected. This capability can be called on by the market operator when minimum demand risks occur. ○ In 2021, this new requirement has already been used to respond to a system risk. • From 2022 systems must be additionally capable of responding to dynamic export limits that allow the distribution network to manage local constraints. • This will allow customers to join VPPs to maximise the use of their solar PV/battery within the physical limits of the system and pave the way to also provide local grid services as regulation and technology allows.

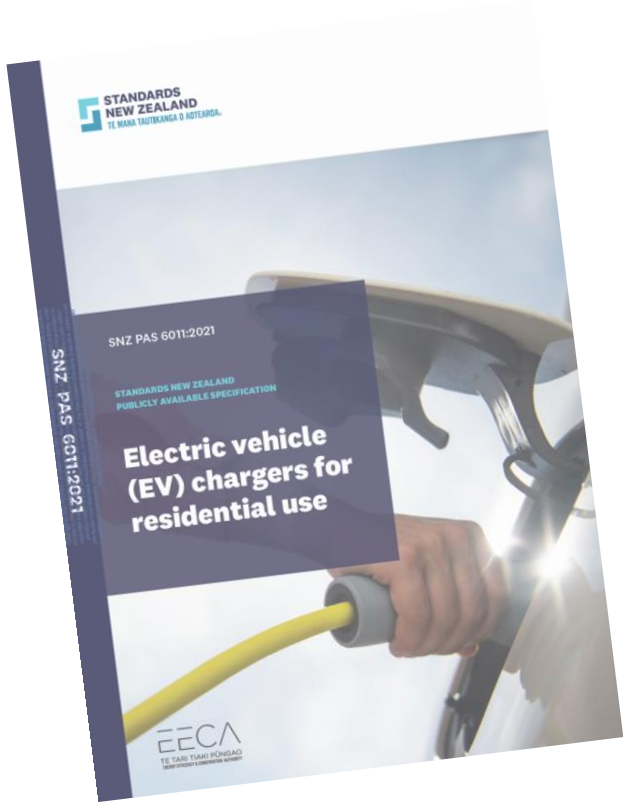
Why is it relevant?	• The uptake of EVs in New Zealand are forecast to be similar to the solar PV experience in Australia.
	• The Regulations show that there are technology and system solutions available to support:
	  ○ remote disconnect/reconnect requirements
	  ○ dynamic limit functions
	  ○ customer consent and device registration processes using digital systems.
	• However, the pace of the changes in South Australia placed significant pressure on technology and supply chains to meet the requirements.

• **What are the insights?**	• South Australia demonstrates that as DER installation hits a threshold risk, action needs to be taken – rapidly. • Establishing clear policy early on allows industry to respond in a measured way and ensures customer benefits can be maximised. • Technology is rapidly evolving to meet the challenges. These capabilities are largely transferable to EV grid integration

APPENDIX A: CASE STUDIES & INSIGHTS

3: EV CHARGER CONNECTION STANDARDS	
What is it?	• New Zealand will likely face a rapid increase in EVs in the near future. Standards New Zealand have released Publicly Available Specification "SNZ PAS" 6011:2021 Electric Vehicle (EV) chargers for residential use. • It is designed to provide consumers with clear and simple guidance on how to safely and cost efficiently charge an EV at home. • The Standard provides advice on how chargers can be safely installed and used. • Importantly, the Standard outlines the ideal size of charger for residential dwellings.
Why is it relevant?	• Most distribution networks can continue to operate securely as small, residential chargers are installed and used. • However, the installation of moderate to larger chargers could exceed the tolerance of the network and lead to failure of the network. • Network operators have no visibility of where chargers are installed and has no ability to protect other users for outrages caused by chargers being installed or used inappropriately.

What are the insights?	• The Standard provides a great foundation for managing the connection of EV chargers.
	• It should be possible to build on this standard to:
	  ○ ensure chargers – at all sizes – can be installed without impacting network reliability
	  ○ provide EDBs visibility and ability to approve the installation of large chargers (as is the case for large solar generation systems)
	• As EV chargers become more common and the size of the chargers increase with new models of EVs there may come a point at which the standards are mandated.



APPENDIX A: CASE STUDIES & INSIGHTS

4: EV AND DEMAND MANAGEMENT TARIFFS	

What is it?	• Tariffs are an important component of any demand management service offered to consumers
	• The incentives and savings provided by tariffs can encourage consumers to choose to use a specific service
	  ○ Peak demand tariffs encourage consumers to shift their energy use away from congested periods on the network
	  ○ Managed service tariffs (like controlling how an EV charges) provide savings if consumers let EDBs control their EV chargers in response to network demand approaching the networks capacity.

Why is it relevant?	• Research, stakeholder feedback and our own experience tells us that prices alone do not result in strong customer participation.
	  ○ The ENA's pricing guidance paper[7] shows that price combined with technology to help consumers use energy efficiently are 4x more effective at shifting consumer demand away from peak periods
	  ○ Feedback at the EV Connect Workshop from retailers and EDBs said that consumers response to pricing signals improved when combined with education and awareness programmes
	  ○ WELL's EV trial showed that most consumers are happy for their devices to be managed

What are the insights?	• Consumers prefer demand management products that are easy to use and don't require constant monitoring and awareness. • Managed EV charging using a DCA agreement which ensures consumers can still use their EVs as they want appears to be a good solution. • Including a technology and education workstream to encourage consumer uptake of services is critical to successful uptake.

[7] Guidance Paper for Electricity Distribution on new pricing options (www.ena.org.nz/resources/publications)