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Review of Electricity Distribution Businesses' 2021 Asset Management Plans in relation to decarbonisation

Summary paper

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Contents

Executive summary

Purpose of this paper

X1 This paper presents a summary of Electricity Distribution Businesses' (EDBs) Asset Management Plan (AMP) reporting related to their readiness for the impact on network services of decarbonisation.

X2 EDBs are expected to play a key role in enabling decarbonisation. In order to do so, EDBs' networks and the systems that support their networks will need to evolve in response to changing consumer demand and the opportunities presented by new technology and services. Consumers and other stakeholders will be increasingly interested in understanding how EDBs are operating and investing in their networks to address these issues.

X3 Our review has identified a number of actions by EDBs. This does not necessarily mean that enough is being done. We would expect to see initiatives increasing over time.

Scope of review

X4 AMPs are planning documents which report on how EDBs intend to operate and invest in providing a network service over the next 10+ years. We set the requirements for the content and disclosure of the public version of AMPs through our information disclosure determination.[1]

X5 Under the Commerce Act, we have the power and function to monitor and analyse all information disclosed, including the EDBs' AMPs to assess the performance of EDBs. We must further publish a summary and analysis of the information disclosed to promote an understanding of how EDBs are delivering services at a price and quality that promotes the long-term benefit of their consumers consistent with outcomes in competitive markets.[2],[3]

X6 Given the importance of decarbonisation to the sector and to consumers in general, we reviewed all 29 EDBs' 2021 AMPs with a view to answering the following questions:[4]

[1] Commerce Commission, Electricity Distribution Information Disclosure Determination 2012 (consolidated April 2018).

[2] See section 53B "Effect of being subject to information disclosure regulation".

[3] See section 52A "Purpose of Part" which describes the purpose of that part of the Commerce Act which regulates EDBs prices and quality of service.

[4] Aurora was exempt from publishing an AMP in 2021 because it was progressing through a Customised Price Path application. Accordingly, we reviewed its 2020 AMP.

X6.1 Does the EDB's AMP recognise and discuss the potential impacts decarbonisation-driven electrification will have on that EDB?

X6.2 Does the EDB's AMP outline policies that demonstrate it is planning for decarbonisation-driven electrification?

X6.3 Does the EDB's AMP describe actions planned or taken in relation to decarbonisation-driven electrification?

X7 We recognise that this review of EDBs' AMPs does not provide a complete picture of EDBs' preparedness for electrification and decarbonisation because:

X7.1 EDBs may report on their preparedness for increased electrification in other documents separate to AMPs;

X7.2 EDBs may be undertaking planning and preparation for increased electrification that they are not reporting on; and

X7.3 Some relevant developments, such as the release of the final advice from He Pou a Rangi (the Climate Change Commission), have occurred since EDBs' 2021 AMPs were published.

Key findings

X8 Overall, our AMP review showed that EDBs were engaged with issues stemming from decarbonisation. We note that preparation for decarbonisation is a continuous process, for which the requirements will evolve where different solutions will be available, and expectations of EDBs will increase over time. We also recognise that there will naturally be leaders and followers in this space, and that not all EDBs will address decarbonisation at the same pace or by using the same actions. There is also inherent uncertainty about the timing and extent of decarbonisation and its impact on electrification, and some challenges exist outside EDBs' control, such as evolving consumer preferences which are difficult to predict. However, we expect EDBs to plan for different scenarios and it is likely that all EDBs will need to address decarbonisation to a degree. We anticipate seeing increased maturity of approaches in subsequent disclosures.

X9 We found that all EDBs recognised that decarbonisation would impact their business. EDBs acknowledged that consumer sentiment and government policy on decarbonisation will likely lead to increased electrification and a corresponding increase in demand for electricity and a change in the way electricity is produced and transported around networks (i.e., two-way power flows). New technologies such as electric vehicles (EVs) and distributed energy resources (DERs)[5] are also expected to become more cost effective and widely adopted over time. EDBs appeared to consider this a matter of "when, not if" but varied in their assumptions about how quickly they will feel the impacts.

X10 EDBs have made a number of policy decisions to address decarbonisation trends.[6] Examples include: adjusting forecasts to account for increasing electrification, conducting surveys to understand consumer preferences regarding EVs and DERs, engaging with industrial consumers regarding their plans for electrifying process heat (for example, electrifying coal-powered boilers used in food processing) and introducing more cost-reflective pricing to encourage consumers to efficiently manage their energy consumption. A few EDBs have embedded decarbonisation into their overriding AMP strategic objectives, resulting in a more comprehensive and consistent suite of policies regarding decarbonisation in their AMPs.

X11 Nearly all EDBs' AMPs reported at least one action the EDB had undertaken or was planning to undertake in preparation for decarbonisation. The most common actions reported were in relation to increasing and improving EDBs' monitoring of the low voltage (LV) parts of their networks, which is that part of the network conveying electricity at less than 400V. EDBs were increasing their monitoring of the LV parts of their networks in light of the expectation that increased uptake of EVs and DER could lead to capacity constraints on the LV parts of the network that may require intervention (for example, if a number of households on the same street were to purchase EVs and charge simultaneously). Other actions include undertaking trials of new technologies, actively seeking third party DER solutions, embedding a focus on understanding emerging technologies and identifying future network capacity constraints.

[5] DER are small-scale, distribution connected assets that either reduce load or export more power (eg, solar panels, storage (like batteries) or load management devices).

[6] In this review we have defined the term 'policy' broadly. Policies include guiding principles or processes adopted by EDBs in relation to decarbonisation, in addition to formal policy documents.

Additional observation

X12 Although the focus of our review was on EDBs' preparedness for decarbonisation-driven electrification, we notice that most EDBs had also reported on actions they were taking to reduce their own emissions. For several EDBs this was limited to monitoring and / or reducing emissions of sulphur hexafluoride (SF_6) used in electrical switchgear, which is a very intensive greenhouse gas. Some EDBs embedded sustainability into their strategic objectives, and had a range of environmental policies in place that aimed to reduce their carbon footprint.

Information Disclosure

X13 This review was undertaken as part of our ongoing summary and analysis of EDBs' disclosed information. We are aware not all initiatives EDBs are undertaking in relation to decarbonisation have been documented in the AMPs. This review has provided a number of observations about EDBs' preparedness for decarbonisation and has provided insights into potential changes to information disclosure (ID), to help reveal the extent of EDBs' ongoing preparedness.

X14 A planned project of targeted amendments to the ID regime is due to commence early next calendar year (targeted ID review).

X15 We would welcome any feedback on this paper. Please send any feedback to Jo Perry, Manager, Performance Analysis, Economic Regulation Branch, Commerce Commission - jo.perry@comcom.govt.nz.

Chapter 1 Introduction

Decarbonisation of the energy sector

1.1 In 2015, the New Zealand government signed the Paris Agreement which committed it to significant carbon reduction targets. To meet its commitments under the terms of this agreement the government passed the Climate Change Response (Zero Carbon) Act in 2019 which made a number of changes to the Climate Change Response Act (CCRA).

1.2 In particular, the amendments to the CCRA legislated a target of achieving net zero emissions of long-lived greenhouse gases (other than biogenic methane) by 2050 and provided that this emissions reduction target is a permissive consideration for public decision-makers. The amendments further provided for the establishment of He Pou a Rangi whose role is to advise government on how to reach its climate goals. This included recommending emission reduction plans to enable New Zealand to achieve net zero emissions (other than biogenic methane) by 2050.[7]

1.3 He Pou a Rangi has recommended targets for 50% of all energy consumed in New Zealand to come from renewable sources by 31 December 2035, and 95-98% of electricity generation to be renewable by 2030.[8] Two key factors necessary to achieve these goals are:

1.3.1 **Increased electrification of transport and process heat:** This involves the substitution of renewable electricity for fossil fuels as the power source for transport and industrial heating processes**.** This will mean a greater flow of electricity across distribution networks, including potentially more peak flow on distributors' networks. Transpower is forecasting electricity demand to increase significantly by 2050, with its base case scenario ('accelerated electrification') modelling an increase in demand of approximately 50% by 2050.[9]

[7] The Government has received He Pou a Rangi's advice on how New Zealand can reach net zero emissions gases by 2050 and has to decide whether to accept the recommendations in the advice.
[8] Ināia tonu nei: a low emissions future for Aotearoa, page 286, https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa.pdf
[9] Whakama I Te Mauri Hiko: Monitoring Report March 2021, page 4 https://www.transpower.co.nz/sites/default/files/uncontrolled_docs/WiTMH%20Monitoring%20Report%20-%20March%202021.pdf

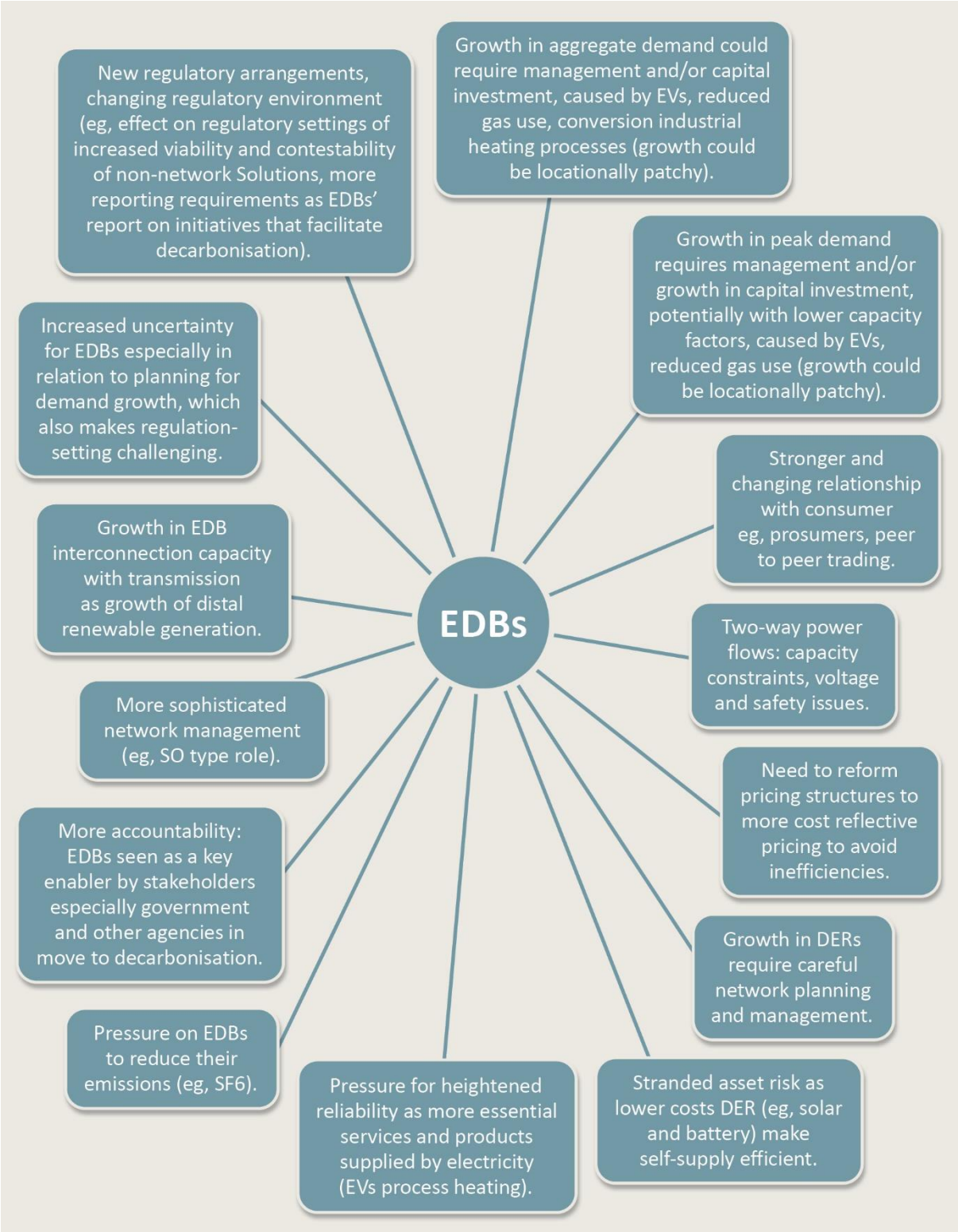
1.3.2 **Increased penetration of renewable energy generation and storage in the electricity system:** New renewable generation being introduced into the electricity system may range from large scale generation directly connected to the transmission or high voltage distribution networks such as windfarms and geothermal power stations, to small scale generation connected directly to EDBs' LV networks such as photovoltaic (PV) generation (solar panels) on residential consumers' premises. The latter is a type of distributed energy resource (DER).

A more complex operational environment for EDBs associated with greater electrification

1.4 EDBs will be expected to play a key role in enabling decarbonisation, particularly as it is on the distribution network where large amounts of the new generation and loads will need to be connected. In order to do so, EDBs' networks and the systems that support their networks will need to change. The changes will take many forms and will require a significant shift in the way EDBs invest in and operate their businesses.

1.5 Decarbonisation and increased electrification will also lead to a more complex distributed system with two-way power flows requiring granular and real time data in order for distributors to be able to manage and also operate their networks efficiently and effectively. Consumers will have greater choice around when and from where they source electricity to power their homes and businesses. Below is a diagram illustrating some of the key effects that greater increased electrification and decarbonisation will have on EDBs.

Figure 1:Our general observations of potential impacts of increased electrification and decarbonisation on EDBs



1.6 Besides decarbonisation there are several other drivers of change including:

1.6.1 lower cost technologies (for example, electric vehicles, DERs);

1.6.2 the internet of things (IoT);

1.6.3 the cost of energy; and

1.6.4 consumers' desire to be more energy independent.

1.7 These factors are moving the distribution sector in broadly the same direction as decarbonisation in terms of contributing to various changes within the electricity system. These changes include:

1.7.1 greater flows of electricity on the distribution system (including greater peak flows);

1.7.2 more complex electricity flows given the more distributed system that is emerging;

1.7.3 more consumer services relying on electricity, like transport; and

1.7.4 greater consumer engagement across all elements of delivered electricity.

EDBs' role in supporting decarbonisation

1.8 The final advice from He Pou a Rangi contains emissions targets and recommendations for the energy sector, some of which relate more specifically to EDBs (lines companies).[10]

1.9 The energy sector emissions targets recommend that:

1.9.1 50% of all energy consumed to come from renewable sources by 31 December 2035; and

1.9.2 consideration be given to replacing the target for 100% renewable electricity with achieving 95% - 98% renewable electricity by 2030.

1.10 The energy sector recommendations are aimed at enabling a low-emissions, reliable and affordable electricity system to support electrifying transport and industry. The recommendations that relate most specifically to the electricity distribution sector, include the following:

[10] Ināia tonu nei: a low emissions future for Aotearoa, page 286-287, https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa.pdf

1.10.1 supporting the evolution to a low-emissions electricity system fit for technology evolution. This should include work to increase the participation of distributed energy resources including demand response, and determining whether lines companies can integrate new technologies, platforms and business models by:

1.10.1.1 assessing whether they have the necessary capacity and capabilities to support climate resilience and the transition.

1.10.1.2 evaluating whether the current regulatory environment and ownership structures of lines companies are fit for future needs.

1.10.2 designing regulatory settings that meet the needs of diverse communities, ensuring that they enable independent and distributed generation, especially for remote, rural and Māori communities.

1.10.3 enabling a fast-paced and sustained build of low-emissions electricity generation and infrastructure by ensuring resource management processes, other national and local government instruments, and settings for transmission and distribution investment decisions are aligned to the required pace for build.

Our role

1.11 As noted earlier, the emissions reduction target under the CCRA is a permissive consideration for public decision-makers. We may therefore consider the impact of decarbonisation in relation to our work, and its relevance to our work programme.

1.12 In our open letter of April 2021,[11] we noted that we are interested in emerging issues that relate to New Zealand's decarbonisation and use of new energy sector technologies and business models (the "energy transition"). Submissions received in response to our open letter generally recognised that EDBs face significant changes that they need to be prepared for.

[11] Commerce Commission: Open letter—ensuring our energy and airports regulation is fit for purpose, page 1 https://comcom.govt.nz/__data/assets/pdf_file/0022/253561/Open-letter-Ensuring-our-energy-and-airports-regulation-is-fit-for-purpose-29-April-2021.pdf.

Chapter 2 Purpose and scope of the review

2.1 The purpose of this review is to present a summary of EDBs' Asset Management Plan (AMP) reporting related to their readiness for increased electrification due to decarbonisation.

Context and scope of review

2.2 All 29 EDBs, as suppliers of electricity distribution services, are subject to information disclosure (ID) regulation under Part 4 of the Commerce Act ('the Act') because they operate as natural monopolies (i.e., there is little or no competition in the markets for the electricity distribution services they offer).

2.3 The relevant ID determination that sets out the current ID requirements that apply to all EDBs is the Electricity Distribution Information Disclosure Determination 2012 [2012] NZCC 22.[12]

2.4 The purpose of ID regulation is to ensure that sufficient information is readily available to interested persons to assess whether the purpose of Part 4 of the Act is being met.[13] Section 52A of the Act sets out the purpose of Part 4:

> (1) The purpose of this Part is to promote the long-term benefit of consumers in markets referred to in section 52 by promoting outcomes that are consistent with outcomes produced in competitive markets such that suppliers of regulated goods or services—
>
> a) have incentives to innovate and to invest, including in replacement, upgraded, and new assets; and
>
> b) have incentives to improve efficiency and provide services at a quality that reflects consumer demands; and
>
> c) share with consumers the benefits of efficiency gains in the supply of the regulated goods or services, including through lower prices; and
>
> d) are limited in their ability to extract excessive profits.

2.5 To understand whether the relevant outcomes consistent with workably competitive markets are occurring, interested persons should have sufficient information to assess the performance of EDBs in relation to the matters listed in s 52A(1).

[12] Commerce Commission Electricity Distribution Information Disclosure Determination 2012 (consolidated 2018), https://comcom.govt.nz/__data/assets/pdf_file/0025/78703/Electricity-distribution-information-disclosure-determination-2012-consolidated-3-April-2018.pdf

[13] Section 53A of the Act.

2.6 To achieve these purposes, the Act provides the Commission with the power to monitor and analyse all information disclosed in accordance with the ID requirements and requires it to publish a summary and analysis of that information for the purpose of promoting greater understanding of the performance of regulated suppliers.[14]

2.7 EDBs' preparedness for changes affecting the service they provide and the prospect of greater electrification due to decarbonisation is relevant to their performance. As is the case with businesses in workably competitive markets, we expect EDBs to plan for and react appropriately to changing market conditions to ensure that the long-term benefits of consumers are promoted.

ID and Asset Management Plans

2.8 As is the case with other businesses, EDBs need to plan so that they can continue to meet the needs of consumers in an ever-changing environment. They need to plan on the demand-side so they can be prepared for the effect that changes in future demand could have on their business and they need to plan on the supply-side to ensure that their assets are maintained and replaced as appropriate, that they explore use of lower cost alternative solutions, and that their ongoing operations enable them to deliver the service demanded by consumers.

2.9 EDBs are required to publish a public version of their plans called Asset Management Plans (AMPs) under the ID requirements. AMPs are an important source of information for understanding and assessing EDBs' performance and asset management practices for a wide range of stakeholders. They provide information to consumers, and other stakeholders, including the Commission, to help determine whether the purpose of Part 4 and the interests of consumers are being met.

2.10 The Commission has had a focus on encouraging improvements to asset management reporting by EDBs in their AMPs and the asset management practices that underpin this reporting. This focus is evidenced by our reviews relating to aspects of EDBs' asset management and our recent open letters to industry on asset management.

2.11 Fundamentally, the AMP is a planning document that reports on how the EDB is planning to operate and invest in its network over at least the next ten years. AMPs therefore should cover an EDB's consideration of the potential effect increased electrification will have on its network and the actions it is considering or already undertaking to prepare for increased electrification.

[14] Section 53B(2).

2.12 As well as the inherent connection between AMP reporting and EDBs' preparedness for increased electrification, there are some more specific requirements contained in the ID determination for AMPs which demonstrate an even stronger nexus. For example, AMPs are required to contain:

2.12.1 **Details of demand forecasts**: This is relevant if demand is projected to increase because electricity will be substituted for fossil fuels to power transport and meet the heating requirements of residential and industrial customers;

2.12.2 **A discussion of the impact of the load forecasts on any anticipated levels of distributed generation in a network:** Distributed generation is a type of DER, the development and operation of which will promote electrification and decarbonisation; and

2.12.3 **A description of the EDB's policies on distributed generation**.

2.13 We recognise that the review and analysis of EDBs' AMPs will not provide a full insight into EDBs' preparedness for increased electrification and decarbonisation because:

2.13.1 EDBs report on their preparedness for increased electrification in other documents as well (i.e., annual reports, statements of corporate intent, pricing disclosures);

2.13.2 EDBs will be undertaking planning and other actions preparing for increased electrification that they are not reporting on. This is especially the case in a fast-changing environment with significant uncertainty; and

2.13.3 Some relevant developments related to increased electrification and decarbonisation have occurred since EDBs' 2021 AMPs were published. It is perhaps therefore understandable why some of the potential effects on asset management, and associated actions are not addressed to the extent they could be in 2021 AMPs. The key development was the He Pou a Rangi final report which was released after the 2021 AMPS were published. Only the draft was published before AMPs were published. A number of EDBs recognised this situation in their AMP discussions on increased electrification and decarbonisation.

2.14 The following summary table details the scope of the review including what is not in scope.

In scope	Out of scope

Information in EDBs' 2021 AMPs related to EDBs' readiness and preparedness for increased electrification brought about by decarbonisation.	Information in EDBs' 2021 AMPs related to the effect on EDBs' assets and reliability from the expected increase in the severity and frequency of adverse weather events brought about by climate change.
Information in EDBs' 2021 AMPs where the aim to decarbonise is not the sole driver for increased electrification, ie, there are other influencing factors apart from decarbonising the economy. For example, consumer sovereignty of energy resources, price competitiveness of new technologies, and consumer demand for more reliable power supply.	Information including disclosed information that is outside of EDBs' 2021 AMPs.
Information in EDBs 2021 AMPs detailing the actions that EDB's are taking to reduce their own emissions. (while this is not a focus area of our review we have covered it briefly).	Information in EDBs' previous AMPs prior to the 2021 AMPs

2.15 The scope was kept narrow to ensure that the analysis was manageable and well constrained. In particular, as identified in the table above we did not cover information in EDBs' AMPs related to the effect on EDBs' assets and reliability from the expected increase in the severity and frequency of adverse weather events brought about by climate change.

Chapter 3 Review methodology

3.1 We reviewed all 29 EDBs' 2021 AMPs[15] with a view to answering the following questions. Further explanatory material is provided after the questions.

3.1.1 **Does the EDB's AMP discuss and recognise the potential impacts of increased electrification due to decarbonisation will have on that EDB in the future?** For example, does the EDB recognise the effects that trends related to decarbonisation could have on their network in terms of future demand growth and associated capital investment (for example, increased electrification of transport, decline of fossil fuel heat, growth of EVs).

3.1.2 **Does the EDB's AMP contain policies that show it is planning for increased electrification due to decarbonisation?** Beyond recognition, is the EDB planning for increased electrification and has it developed a course or principle of action (for example, including in their forecasting process consideration of the effect of greater electrification/decarbonisation and related matters).

3.1.3 **Does the EDB's AMP have actions (such as, processes and practices in place) to address specific parts of the network, or individual assets, or classes of assets, that will potentially be most affected by greater electrification due to decarbonisation?** There is great uncertainty about the path increased electrification will take and its effect on EDBs. However, there are some plausible high-level possibilities that EDBs could be preparing for (for example, through monitoring) so that they can adapt particular parts of their planning and operations to meet the challenges.

3.2 We recognise that EDBs' AMPs reporting on matters covered by the questions varies and reflects EDBs' different circumstances and the way they have structured their AMPs.

[15] Aurora was exempt from publishing an AMP in 2021 because it was progressing through a Customised Price Path application. Accordingly, we reviewed is 2020 AMP.

Chapter 4 Findings

Recognition of decarbonisation in EDBs' AMPs

4.1 We found that all EDBs recognised that decarbonisation would impact their business. EDBs acknowledged that consumer sentiment and government policy regarding decarbonisation will likely lead to increased electrification and a corresponding increase in demand for electricity. New technologies such as EVs and DER are also expected to become more cost effective and widely adopted over time. EDBs appeared to consider this a matter of "when, not if" but varied in their assumptions as to how quickly impacts will be felt by them. The government policy direction was generally accepted as being clear, but EDBs noted that it remains uncertain which exact policies will be implemented and when.[16]

4.2 EDBs recognise that decarbonisation will impact their businesses in different ways. Technological change will be accelerated alongside changing consumer sentiment, driving a shift in business practices. Orion noted the impact of evolving consumer preferences on the complexity of the network:[17]

> An increasing number of customers are thinking about installing solar PV, putting excess solar generation or power stored within a charged battery back into the grid, and considering a move to electric vehicles that are cleaner and cheaper to run. This energy transformation means our customers' usage patterns are becoming more complicated as energy sources become embedded across our distribution network.

4.3 While some EDBs addressed decarbonisation more narrowly in the context of particular issues (eg, climate change resilience, EV uptake), others viewed decarbonisation as a key factor impacting future planning of the entire network. For example, EA Networks summarised the outlook as follows:[18]

> Carbon emission reduction is the next frontier that the electricity network will have to assist in tackling. This will take the form of additional solar photovoltaic generation, more battery storage, more electric vehicle charging, and conversion of some coal-fuelled heating to electrically powered heating. These technologies will change the demands placed upon the network and the way it is operated. There is also an ongoing interest in reducing electrical losses which can provide an improvement in network electrical energy efficiency.

The main decarbonisation impacts identified were growth in EV usage and DER

4.4 The decarbonisation trends EDBs identified as being of most impact to their businesses were the accelerating adoption of EVs (and associated EV charging electricity demand) and the growth in DER on their networks. Powerco states:[19]

[16] Note that the AMPs reviewed were published prior to the He Pou a Rangi's final advice and the announcement of the Clean Car Programme.
[17] Orion Asset Management Plan 2021, page 12.
[18] EA Networks Asset Management Plan 2021-2031, page 30.
[19] PowerCo Electricity Asset Management Plan 2021, page 1.

> The rate at which our network will transform will, ultimately, be dictated by our customers and their uptake of distributed energy generation or new devices connected to the network.

4.5 An increase in the number of EVs being driven within New Zealand was recognised as being likely to have a direct impact on peak demand, assuming EV owners will tend to charge their vehicles during existing peak demand hours such as the early evening. The geographic impact of EV uptake due to socio-economic disparities was noted by several EDBs. An example from Counties Power that typifies EDB thinking in this area is:[20]

> While the arrival of an EV at a single property is very unlikely to be an issue on the network, the arrival of several in a street with owners arriving home and plugging in at the same time could lead to local overloading and the need to install additional distribution transformers and low voltage cables. This is considered highly probable as the customers likely to purchase new EVs are most probably in a high socio-economic area and an effect called "clustering" is likely to occur with one initial purchase triggering neighbours to follow…However, with the substantially improved monitoring of the network offered by the smart meter data, we will be able to identify any problem areas and proactively upgrade as necessary.

4.6 Wider scale introduction of DER was also recognised as a key outcome of decarbonisation. An increased number of PV connections were noted by many EDBs, as well as growth in other distributed generation (DG) and flexibility services which, while offering opportunities to better manage the network, also pose risks that need to be managed. Many EDBs did not foresee significant short-term growth in PV but were monitoring uptake closely. For example, Aurora states:[21]

> Due to the size of PV connections, we do not expect continuing growth to have a material network impact, but we will continue to consider the cumulative impacts over time, particularly if evidence of generation clusters emerges.

4.7 Several EDBs noted that the cost of emerging technologies to consumers relative to traditional supply will impact uptake. From The Power Company Limited [TPLC]: [22]

> Line charges in the Southland region reflect TPCL's high cost of transporting energy over large distances to limited numbers of customers. These costs make alternative technologies such as solar and photovoltaic more attractive to customers. While these alternative technologies are not yet competitive with traditional supply, their gradually declining costs may make them more competitive toward the end of the planning period.

[20] Counties Power Asset Management Plan 2021, page 111.
[21] Aurora Asset Management Plan April 2020 – March 2030, page 29.
[22] The Power Company Asset Management Plan 2021-2031, page 102.

4.8 DER, especially batteries, or DER with a battery component, were recognised by many EDBs as presenting a potential alternative to network capex, particularly in remote locations or to reduce network demand when needed. EDBs generally noted that investment in batteries are currently not cost-effective in most circumstances, but identified that this may change as the price of this technology decreases over time. Aurora Energy states:[23]

> The use of energy storage technologies such as batteries could enable us to defer or avoid expenditure on network development….Battery storage is relatively expensive and its uptake in New Zealand is in its infancy. In some situations, mainly in remote rural areas, installing combined generation and battery storage units could provide an economic alternative to long service lines. In the longer term, battery storage systems will have valuable applications for both lines companies and residential customers. They offer significant potential for increased reliability and resilience of supply, potential for deferring network reinforcements and lifting network utilisation, improving network stability, and maximising the value from DER sources. The cost of this technology is linked to the mass production of EVs and is projected to be an economic alternative to meeting growth or at the least offering a deferral of network upgrade solutions.

4.9 EDBs also recognised there are risks associated with DER that need to be managed including voltage issues and risks posed by two-way power flows. The potential that DER could cause the network or parts of the network to operate outside statutory voltage requirements (especially on the LV network) was recognised. A general increase in the complexity of network design, brought about by more DER was also expected. From EA Networks:[24]

> …the complexity of power flow through the distribution network is going to increase over time and there will be a need to manage that complexity with additional assets and resources… EA Networks is investigating options for providing data capture and control options for charging, monitoring, and controlling the capacity required by each connection. This would be one piece of the wider puzzle to allow the distribution network to facilitate bi-directional power flow and localised energy trading. It is still not clear how it will be possible to properly coordinate the myriad appliances that generate into, store energy from, and load the network (an AC battery does all three). As the way becomes clearer, EA Networks will look to provide the necessary infrastructure to remove barriers to economic and efficient use of the distribution network.

4.10 Vector noted the need to manage the increased complexity associated with DER uptake which was not foreseen when the LV network was originally designed:[25]

[23] Aurora Asset Management Plan 2020, page 114.
[24] EA Networks Asset Management Plan 2021, page 31.
[25] Vector Asset Management Plan 2021, page 253.

> …there is capability growth associated with meeting the changing customer expectations for electricity, including increased EV and smart device penetration and how customers can play a more active role in the electricity value chain. The increased introduction of disruptive technology (eg Solar PV, V2G) enables the injection of energy into the LV network from non-traditional sources and establishes two-way power flows, a situation that was not envisaged when the LV network was designed. The challenge is to encourage the connection of these devices without writing off value in existing network assets, and to deliver economic solutions to the problems raised.

EDBs identified several other decarbonisation impacts

4.11 The increased electrification of process heat was recognised as a trend to varying degrees by EDBs, although not as widely as EV uptake. This was particularly the case for those EDBs with large industrial loads on their networks (particularly food processing). Some EDBs mentioned being approached by industrial consumers who were considering electricity conversions of fossil fuel boilers. We would expect to see further discussion of process heat electrification in future AMPs given the focus on this issue in He Pou a Rangi's final advice. Process heat conversions will more likely result in large 'lumpy' demand increases, rather than the steadier demand increase expected from rising EV usage.

4.12 It was noted that grid upgrades to accommodate these conversions would require signification capital expenditure and time to implement. Network Waitaki noted that grid upgrades to accommodate process heat conversion may take five years, meaning demand response and/or load transfer may be required temporarily to manage the new load if the conversion is completed earlier.

4.13 Other issues noted by EDBs as areas to watch included the likelihood of more wood burners being replaced by heat pumps, energy efficiency measures acting to reduce demand, and the potential impact of increased electrification of other forms of transport apart from light vehicles including ferries, trains, and trucks. A few EDBs considered increasing electrification due to consumers moving from piped gas to electric for heating and cooking purposes in their AMPs. Powerco noted that:[26]

> We are seeing some smaller scale electrification transition, largely in the government sector, such as education and health. We are aiming to obtain an increasing amount of information from customers regarding plant renewals and load sizing to keep our planning teams as informed as possible and alerted to potential system constraints.

EDBs recognise uncertainty resulting from government policy as being a key risk for their businesses

[26] Powerco Asset Management Plan 2021, page 385.

4.14 Many EDBs recognise uncertainty surrounding climate change policy as a key risk for their business planning. While the AMPs reviewed were published prior to the release of the He Pou a Rangi's final advice, many noted that they expected to see policy changes coming as a result of the He Pou a Rangi's work and indicated they were paying close attention to its conclusions. For example, Eastland Network:[27]

> The direction outlined in the Climate Change Commission's draft report is more aggressive than what has been factored into our demand and consumption forecasts included in this AMP, and we will need to review our forecasts in the next iteration of this plan.

4.15 Waipa Networks:[28]

> A watching brief is maintained on future government policy related to transportation electrification which could increase EV update.

4.16 Vector:[29]

> We are facing uncertainty at unprecedented levels around future electricity demand, the impact of climate change and associated policy response, and the extent of regulatory change required to support new technology investment to avoid over investment in traditional assets in our network. If the Climate Change Commission's draft advice is implemented by Government it will have a potentially material impact on electricity distribution networks, both in terms of EVs and the potential transition from gas to electricity. As such, the degree of any certainty within our forecasts is significantly lower given we do not know, particularly in these changing times, what may happen.

EDBs no longer viewing mass network stranding as a concern

4.17 The potential for network stranding, caused by mass customer disconnection was raised as a material issue by EDBs during the last input methodologies review undertaken by the Commerce Commission in 2016. Most EDBs appear to no longer view this as a concern, despite most of the drivers that were expected to lead to this largely remaining present. Some EDBs recognised that individual assets or groups of assets could become stranded or underutilised in the future (over the long 30-50 year life of some network assets) as a result of developments in technology. For example, Top Energy, considered the risk of asset stranding may lead to investing in lower cost and /or shorter life assets:[30]

> While we know that our industry will be significantly affected by the introduction of emerging technologies, the timing and nature of these impacts is far from clear. In this environment, the risk of asset stranding, where an asset becomes redundant part way through its life, can be reduced through the installation of lower-cost alternatives with a relatively short life, on the basis that by the end of their life, the future of the industry should be clearer. We can then replace these assets with solutions that better meet our stakeholders' long-term requirements.

[27] Eastland Network Asset Management Plan 2021, page 7.
[28] Waipa Networks Asset Management Plan 2021, page 139.
[29] Vector Asset Management Plan 2021, page 7.
[30] Top Energy 2021 Asset Management Plan, page 35.

4.18 Some EDBs noted decarbonisation as creating opportunities for their business:[31]

> Our risk context...also has significant upside opportunities – especially related to long-term customer demand growth for our electricity delivery service, as our community increasingly shifts from carbon fuels to renewable electricity.

Policies EDBs have introduced in relation to decarbonisation

4.19 EDBs have adopted a range of policies to address decarbonisation trends. In this review we have defined the term 'policy' broadly. Policies include guiding principles or processes adopted by EDBs in relation to decarbonisation, in addition to formal policy documents. An example of such a process is adjusting forecasts to account for decarbonisation trends.

4.20 Subsequent sections of this report address actions and monitoring undertaken in preparation for decarbonisation. We acknowledge there will be some overlap between policies, actions, and monitoring as defined in this paper.

EDBs' approaches to decarbonisation policy

4.21 A few EDBs have embedded decarbonisation into their overriding strategic objectives. For example, Vector clearly links its Project Symphony strategy to decarbonisation trends and climate change policy:[32]

> We understand the significant role that the electricity industry has in achieving the transition to a low carbon future. Our Symphony strategy calls for a system which reduces peak loads, helps manage demand profiles, and provides customers with choice and control, while maintaining service.

4.22 The majority of EDBs have not linked their consideration of decarbonisation to their strategic objectives as explicitly. However, decarbonisation trends are influencing policy decisions in relation to EV, PV, and DER, forecasting and other areas. Some EDBs have developed interim roadmaps demonstrating their expected network transformation, often based on the Electricity Network Association's (ENA) network transformation roadmap.[33]

4.23 Some EDBs considered decarbonisation resources in their funding plans:[34]

> Funds have been made available for extra staff members or external consultants when required to support the Network Division in its endeavour for developing strategies and plans for the upcoming decarbonisation and electrification of transport and large industrial loads.

[31] Orion Asset Management Plan 2021, page 44.
[32] Vector Asset Management Plan 2021, page 7.
[33] New Zealand Electricity Distributor, Network Transformation Roadmap, April 2019 (https://www.ena.org.nz/resources/publications/document/483)
[34] Scanpower Asset Management Plan 2021, page 78.

Policies regarding EVs and DER

4.24 Many EDBs discussed the expected uptake of EVs and increase in DER and the need to prepare for this growth. However, most EDBs felt that uptake in their region would not be significant enough to pose issues within the 10-year planning period, the period covered by AMPs. EDBs generally caveated this with the recognition that government policy could result in a faster than expected uptake, and that cluster effects could create strain on certain parts of the network. We found that a majority of EDBs had conducted some analysis into expected trends for EDBs in their region, with consideration of geographic and socio-economic factors.

4.25 Several EDBs had conducted customer surveys including questions on if/when customers envisaged purchasing EVs or PV generation. Mainpower conducted a survey finding 60% of customers were willing to pay to ensure the network is ready for new technologies. Scanpower considered rooftop PV generation for dairy sheds as an area to encourage investment in:[35]

> The addition of solar energy to dairy sheds – either as direct hot water or PV– is also a more economical solution and something Scanpower will encourage investment in. The peaky nature of their load and their winter off season is a good match for PV. Every dairy shed could carry and use at least 10kW of PV. There are approx. 270 dairy sheds on Scanpower's network, so this is minimum 2.7MW development opportunity.

4.26 Network Tasman is piloting a system to reward customers with PV generation and battery storage who provide generation during in peak demand periods, as well as investigating a control mechanism to signal to PV owners when is best to provide energy to the network.

Policies for process heat electrification

4.27 Some EDBs, generally those with more food processing plants on their networks had policies in place for process heat electrification. These consist mainly of engagement plans with owners of large fossil fuel fired plants to obtain the owners' views of conversion possibilities/timings. For example, Network Waitaki has included large process heat conversion loads in its high load growth forecast scenario. It is working with large coal process heat users to evaluate electricity as an energy source, and is engaging with other South Island EDBs to compile a database of South Island coal boilers that could be switched out for electrical boilers.

[35] Scanpower Asset Management Plan 2021, page 136.

Consideration of decarbonisation in forecasting

4.28 Nearly all EDBs had considered how decarbonisation could impact their forecasting. Many EDBs had updated their forecasts of EV and PV growth to be consistent with Transpower's Whakamana i Te Mauri Hiko forecasts,[36] and some such as Alpine and Powerco had conducted scenario analysis to assess the impact of varying uptake profiles on network constraints. Aurora also recognised in their risk profiling that growth of PV could cause overloading issues on LV cables, particularly if PV generation is clustered in neighbourhoods.[37]

4.29 Many EDBs noted that their forecasts did not account for significant increases in EV, PV or process heat electrification within the next five years, as they did not see material growth occurring in this period. From Powerco:[38]

> At current uptake rates, material impacts from edge technology will only happen well beyond our CPP period, possibly even after this AMP planning period. Accordingly, while our AMP expenditure profiles make some provision for trialling technology and starting to improve the visibility and performance of our LV networks, we have omitted any major expenditure on transitioning to an open-access network.

4.30 EA Networks planned for increased demand from approximately 2022 for increased electrification of process heat:[39]

> EA Networks are taking a cautious approach to the future summer system maximum demand with the inclusion of all known electrical process heat conversion. It will possibly exceed 200+MW by 2031, and that is the presumed system maximum demand.

4.31 Some EDBs' capital expenditure planning factored in decarbonisation considerations, noting the long-life of EDB assets. Powerco states that:[40]

> While the timing for the uptake of material volumes of edge devices is uncertain, even if we allow, for example, a 10 years lag, we have to consider the long lifecycle of an electricity network when we invest. This means that investment decisions we make today have to consider the potential energy use scenarios 20 to 40 years from now. It is therefore essential we understand and prepare for the eventuality of material changes in electricity use, to ensure our networks can accommodate the impact.

4.32 Some EDBs were seeking to develop their analytical capabilities to better inform capital and operating expenditure investment in their network. Alpine Energy states:[41]

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[36] Transpower, Whakamana i Te Mauri Hiko - Empowering our Energy Future, March 2020. (https://www.transpower.co.nz/resources/whakamana-i-te-mauri-hiko-empowering-our-energy-future.
[37] Aurora Asset Management Plan 2021, page 237.
[38] PowerCo Asset Management Plan 2021, page 5.
[39] EA Networks Asset Management Plan 2021, page 17.
[40] PowerCo Asset Management Plan 2021, page 53.
[41] Alpine Energy Asset Management Plan 2021, page 8.

> Our approach to these challenges is to stay abreast of development in the international as well as the national arena through collaboration with our peers and industry players. As far as our distribution network is concerned we are putting systems and tools in place that will allow us to model and simulate realistic scenarios with respect to EV uptake, charging of batteries ,and behavioural patterns. We have to be aware of premature investment that could result in stranded assets or 'gold-plating' of our network, while still being able to respond in accommodating the connection of distributed generation and increased supply requirements for the charging of EVs and other batteries.

4.33 Unison believes that uptake of DERs, EVs and ongoing improvements in energy efficiency will render traditional constraint forecasting approaches incomplete. Future demand forecasting will need to forecast not only the quantity of consumers, but also energy use intensity by segment, degree of DER uptake and be able to provide information down to the level of low voltage (400V) reticulation. [42]

> Based upon analysis of the industry environment, Unison believes that it is unlikely for there to be an economic driver for New Zealand EDBs outside major urban centres to provide DSO type services in the short to medium term. However, Unison is aware that under the right conditions, such as major regulatory change, the landscape could shift quickly...Under certain scenarios the landscape could look considerably different by 2030. This means that doing nothing is not an option.

Policies to encourage uptake of low emission technology

4.34 Many EDBs had policies in place to encourage uptake of low emissions technologies on their network such as supporting DER connections. Some EDBs linked their objectives to the government's drive toward more renewable generation.

4.35 In accordance with Part 6 of the Electricity Industry Participation Code, EDBs had developed guidelines for DG connecting to their networks and this was generally noted in the AMPs. Orion contributed to the development of a DG Connection Guideline requiring distributors to establish a DG hosting capacity for each LV network feeder. This hosting capacity will be based on an expected medium-term uptake / penetration level.

Other policies

4.36 Many EDBs recognised the need to transition their pricing system to be more cost reflective and respond to emerging technologies. Northpower states:[43]

> Our pricing strategy is to transition to more cost reflective network pricing that is responsive to the evolving market and the changing way consumers are using electricity. Emerging technology, such as electric vehicles, solar panels and batteries are changing how we consume, generate, and manage our electricity. We think it is important that pricing evolves to encourage efficient use of the network to minimise the cost of capacity increases, to reduce prices for consumers in the long term and ensure fair outcomes for all consumers on our network.

[42] Unison Asset Management Plan 2021, page 1-18.
[43] Northpower Asset Management Plan 2021, page 4.

4.37 Many EDBs mentioned the importance of participating in industry forums (for example, ENA) to share information about industry developments and learn through collaboration.

Actions EDBs are undertaking in relation to decarbonisation

4.38 Nearly all EDBs' AMPs reported at least one action the EDB had undertaken or was planning to undertake in preparation for decarbonisation.

Low voltage monitoring

4.39 The most common actions reported were in relation to increasing and improving EDBs' monitoring of their LV networks. The two main actions proposed or undertaken were utilising smart meter data or installing LV monitoring devices on LV feeders, particularly transformers. Some of these initiatives were funded by expenditure approved for network evolution type capex. Aurora states:[44]

> Our initial focus will be on general power quality monitoring at strategic locations across the network to get a base line understanding of network power quality performance. In addition, we will undertake LV network monitoring in areas where analysis has identified potential constraints and / or DER congestion.

4.40 And Westpower:[45]

> The development of a Low-Voltage Management System device will allow Westpower to properly monitor and manage its LV infrastructure and enable the new energy future (which will see an increased reliance on renewable electricity). It has been developed in-house over the last five years and the first 500 PowerPilot devices are currently being rolled out on Westpower's network.

4.41 Some EDBs are also undertaking analysis to understand levels of spare capacity on their LV networks in order to inform investment and operational decisions. For example, Orion, which has completed 100 LV monitor installations over FY20, has also commissioned a study to forecast the impact of EVs on the LV network:[46]

> In FY20, we commissioned a high-level study, in collaboration with EPE Centre at the University of Canterbury, to forecast the potential impact of electric vehicles and residential batteries on the low voltage network...The results from this work have enabled us to identify LV networks which will be most vulnerable to load changes arising from the adoption of new technologies...These results clearly illustrate the benefits of diversified charging behaviour in the long-term.

4.42 Vector is also conducting analysis to better understand the LV network to identify constraints and inform investment and enable DER connections:[47]

[44] Aurora Asset Management Plan 2020, page 121.
[45] Westpower Asset Management Plan 2021, page 11.
[46] Orion Asset Management Plan 2021, page 109.
[47] Vector Asset Management Plan 2021, page 253.

> …we need to improve our understanding of LV network performance (LV visibility), including anticipating issues so we can proactively address them. Vector will put a focus on…
>
> - Increased network monitoring to enable real-time modelling….
> - Improvements and simplification of the method to calculate the spare capacity on the distribution network to enable more efficient use of the network distribution assets and ultimately capex investment…
> - Development of self-service congestion maps. These would enable relevant and selected customers to calculate spare capacity on the network for the connection of new load or new generation (eg additional solar/PV)

Use of Advanced Distribution Management System (ADMS)

4.43 ADMS is the software platform that supports the full suite of distribution management and optimisation, including functions that automate outage restoration and optimise the performance of the distribution grid. Using an ADMS provides EDBs with enhanced visibility of their asset utilisation. Some EDBs were using ADMS to model scenarios of potential EV and PV uptake to assess the effect on certain locations and individual assets (for example, substations) or classes of assets (for example, LV) on their networks, as well as voltage flow monitoring. Those EDBs who have direct access to smart meter data appeared to be more advanced in this area, likely due to having the necessary information regarding their LV networks readily available. Others like Northpower were planning further phases of ADMS which will provide the platform on which LV monitoring can be integrated.

Technology trials

4.44 Several EDBs reported trialling new technologies to monitor their effect on the network. For example, Network Tasman piloted a system to reward customers with PV generation and batteries who generate in peak load periods, and is now investigating introducing a control mechanism to signal to PV owners when to provide energy to the network.[48]

> Network Tasman has been undertaking a trial with domestic scale battery systems, whereby the battery system is controlled by the company to charge during the night and early morning and discharge into the network at times of peak loading the following day. A trial battery storage system has been installed at the company's Hope office for set up and testing. Trials of remote control of the battery have been successful, and the company is now in a position to consider offering battery system owners a consumer tariff option where line charge reduction rewards are made available in return for temporary use of the battery system.

[48] Network Tasman Asset Management Plan 2021, page 60.

EV technology trials

4.45 Vector trialled retailing vehicle-to-home technology that utilises battery systems to support homes during outages, enabling customers to power home appliances from their EVs.

4.46 The EV Connect program, funded by Wellington Electricity (WELL) and the Energy Efficiency & Conservation Authority, developed an industry roadmap which will be combined with WELL's network level programs to develop a business case for the accommodation of EVs and other DER on the WELL network. The business case will include a 30-year work program and funding requirement, a customer cost benefit analysis, legislative and policy changes needed to support implementation, and a view on regulatory funding model requirements.[49]

Funding for new technology trials that will help plan WELL's long-term investment requirements are included in this AMP, with an initial $0.4m per annum over the first five years and rising to around $3 million at the end of the planning period. The results of these trials will be used to develop and refine the business case for further investment. Progress on the business case will be provided in future iterations of the AMP. Work has already started on developing a long term 30-year funding model so that future investment needed to meet the increase in energy demand from decarbonisation can be optimised and integrated with the fleet replacement programmes.

4.47 A few EDBs, including Alpine, Counties Power, Electra and Vector, reported on their installation of fast EV chargers on their networks to accommodate or facilitate the uptake of EVs in their area: Vector states;[50]

Starting in 2019, Vector has installed 200 controllable 7 kW EV charging stations in customer premises over the wider Auckland region including Waiheke island. These are being trialled to understand the peak demands caused by EV chargers, the impact on peak demand by controlling chargers and the customer experience if chargers are controlled as well as gain information for EV charger customer habits and patterns in general.

Other actions

4.48 Powerco has set up a dedicated team to cover emerging technologies.[51]

A dedicated Network Evolution team, with the support of Powerco's other teams, has been set up to monitor energy trends, research and test new technology and the customer impact of these and to develop new solutions to network requirements. Current and recent activities include:

- Monitoring and analysing trends on our network, as well as nationally and internationally, of customers' technology changes, focusing on EVs, PV panels and domestic batteries. Providing insights to the rest of the business, based on this analysis. This activity is further supported by projects to work with customers to install new edge devices on parts of our network and use the information gained to better inform our strategy.

[49] Wellington Electricity Asset Management Plan, page 284.
[50] Vector Asset Management Plan 2021, page 210.
[51] Powerco Asset Management Plan 2021, page 56.

- Installation of our first grid scale Battery Energy Storage System (BESS) in Whangamata (a 2MW, 2MWh unit that automatically islands the central distribution network following a bulk supply outage).

- Deploying various types of monitoring and communication devices across our network to ascertain performance and ease of integration, there by laying the foundations for more automation and asset utilisation optimisation.

- Testing various forms of LV network monitoring devices, to inform our future investment in this important area.

- Enabling new entrants to develop new services on our network.

4.49 One of the most significant actions by an EDB is Aurora's renewable Upper Clutha project, which involved soliciting a third-party DER solution that enabled the deferral of network investment[52]:

> The Upper Clutha DER solution offers a medium-term solution to the capacity and voltage constraints on our Upper Clutha 66 kV network. It involves procuring the services of a DER solution provider to provide peak load demand reduction on an ongoing and as required basis (such as during exceptional peak demand or when one of the two Upper Clutha lines is out of service). The solution involves the DER provider working with consumers in conjunction with a time-of-use pricing structure in the Upper Clutha area – this may require an adjustment to our existing pricing. We will pay the solution provider an agreed amount for each consumer in their scheme, with targets of number of consumers and non-network capacity support gained. The scheme will provide everyday demand management, in response to cost reflective pricing. It will also provide targeted demand response during network contingencies. Such demand response will attract a per event fee. This project is planned as a trial in RY22 and RY23 before delivering a reliable alternative to network capacity in RY24 and beyond.

4.50 Buller conducted analysis to understand potential capacity constraints from future EV uptake:[53]

> Due to the future predicted uptake in EVs BEL has completed some preliminary analysis of the 11kV distribution network and substations based on various international and New Zealand reports and scenarios…[which]identifies the distribution substations with transformers above 30kVA as being capacity constrained if the uptake of electric vehicles and their associated EV charging technologies increase the after diversity maximum demand by 0.8kw per ICP.

4.51 As discussed above at para 4.41 some EDBs had identified potential future constraints on their networks that they were considering addressing with DER options. For example, Alpine stated an intention to go to market for proposals for non-network solutions for certain constraints. Many EDBs were monitoring and reporting on solar connections across their various customer classes and geographic locations and obtaining data on new EV registrations and their location. This data will facilitate the further identification of potential future constraints.

[52] Aurora Asset Management Plan, page 113.
[53] Buller Asset Management Plan 2021, page 6-16.

4.52 A number of EDBs reported on their transition to more cost reflective pricing to promote the efficient adoption of new technologies, particularly EVs and PVs. For example, WELL introduced Time of Use prices which encourage EV users to charge their vehicles during less congested periods.

We also noted EDBs have taken actions to reduce their own net emissions

4.53 Although the focus of our review was on EDBs' preparedness for decarbonisation-driven electrification, we noticed that most EDBs had also reported on actions they were taking to reduce their own emissions. Below we have identified the main areas in which EDBs reported taking action, and also highlighted some examples of actions that certain EDBs are undertaking. It is important to note, however, that this review does not draw conclusions or provide an assessment of EDBs' performance in this area (or for that matter in the other areas covered by this report). The inclusion of a particular example therefore does not imply that EDB demonstrates a good approach, nor does the absence of an example from a particular EDB imply a poor approach.

4.54 Most EDBs reported on at least one action they were undertaking. Some EDBs had gone as far as to embed sustainability into their objectives or corporate strategies. These EDBs often had in place environmental policies that looked to reduce their carbon footprint across a number of areas.

4.55 The areas that EDBs said where they were taking action to reduce their emissions included:

- 4.55.1 reducing emissions from sulphur hexafluoride (SF_6);
- 4.55.2 reducing emissions from travel; and
- 4.55.3 other initiatives related to:
  - 4.55.3.1 greenhouse gas measurement and reduction;
  - 4.55.3.2 reducing the EDB's own electricity use through improved efficiency; and
  - 4.55.3.3 sustainable sourcing of materials used in an EDB's networks.

Reducing emissions from SF_6

4.56 The most common emissions reduction actions reported related to sulphur hexafluoride (SF_6).[54] In some cases, EDBs were looking to reduce the release of SF_6 recognising its potent GHG effect whilst others, which were in a minority were also looking to phase out its use in some or all of its applications on their network. Examples of EDBs in this latter category included:

4.56.1 Aurora Energy has recently signed supply agreement for indoor zone substation switchgear that does not contain SF_6 gas.

4.56.2 Horizon Energy has a policy of not purchasing more primary switch gear with SF_6.

4.56.3 Counties Power is investigating alternative overhead switchgear solutions to minimise its SF_6 quantities.

4.56.4 Network Tasman has adopted a policy of avoiding the deployment of SF_6 as an insulating gas within its network. It deploys encapsulated vacuum or dry air insulated technology-based switchgear for new and replacement equipment rather than SF_6.

Reducing emissions associated with travel

4.57 A small number of EDBs reported on initiatives to reduce the emissions associated with travel. The initiatives included:

4.57.1 **Reducing the amount of travel required:** Powerco sought to reduce travel by increasing:

4.57.1.1 the use of remote meeting facilities; and

4.57.1.2 automation and remote fault indication on its network (thereby reducing the travel required for switching, fault-finding and repairs).

4.57.2 **Electrifying the vehicle fleet:** WEL Networks intended to convert its vehicle fleet to electric vehicles (EV) or hybrids. This included operating and evaluating a fully electric powered elevated work platform truck, and a hybrid technology battery powered hydraulics/diesel truck.

Other initiatives

4.58 EDBs also reported undertaking the following measures:

[54] Sulphur hexafluoride (SF_6) is a potent greenhouse gas commonly used as an interruption medium in switchgear. EDBs report SF_6 usage as part of their Emissions Trading Scheme obligations.

4.58.1 **GHG measurement and reduction:** A number of EDBs such as WEL Networks, Network Tasman, Northpower, Powerco and Vector had already or were planning to undertake an assessment of their greenhouse gas emissions footprint with a view to implementing a plan to reduce emissions over time. For example:

4.58.1.1 Vector had made a commitment to net zero emissions by 2030; and

4.58.1.2 Powerco was seeking to improve its understanding of the embedded carbon in its network embedded in the materials used to build (for example concrete versus wood poles) and operate (for example ester versus mineral oils) the network.

4.58.2 **Reduction in electricity use through improved efficiency:** EDBs also sought to reduce emissions through improving the efficiency of their network operations. For example, Powerco reported it was seeking to reduce electricity use at its substations and office facilities, and also to reduce line losses (particularly in its LV network).

Chapter 5 Key observations and possible next steps

5.1 This review has provided a number of observations about EDBs' preparedness for increased electrification brought about by decarbonisation. It has shown that overall, and to different extents, EDBs recognise the potential impacts that greater electrification due to decarbonisation will have on their networks.

5.2 The review has also identified that EDBs are, to different extents, planning for greater decarbonisation and taking initial actions such as enhanced monitoring to enable them to take further action, such as operational and capital investment to ensure that they can meet the challenge that the transformation brings.

5.3 EDBs' AMP reporting also shows that most EDBs realise that being prepared for greater electrification is not just about using new technologies in new ways. It is also about performing the traditional role better, particularly in terms of understanding and forecasting the growth in electricity demand. This in turn relies heavily on good data collection practices and management.

5.4 The review has also highlighted to the Commission that it can be difficult for an interested party to understand in a quick and easy manner the approach and actions that EDBs are taking to prepare for increased electrification due to decarbonisation. Relevant material is presented differently across EDBs' AMPs and it can be hard to access and use because it is difficult to find amongst other material in EDBs' AMPs. Further, there are no specific requirements currently in ID, including with respect to AMP reporting, on many matters related to decarbonisation (although there are some that are related, for example, requirements for EDBs to report on distributed generation).

5.5 Given the important role EDBs will play in the transition to a decarbonised energy sector there is a case for considering changed or additional ID requirements related to decarbonisation that could apply to EDBs.

5.6 We recognise that the pathway for EDBs to transform to meet the challenges in this area is uncertain, because changes can occur rapidly, are hard to predict accurately and can be outside EDBs' control. These features mean that any amendments to ID requirements would be best provided for in a non- -prescriptive form. This would allow EDBs the freedom to experiment and trial in the face of the fast pace of change. Also, we realise that there will be an aspect of learning from doing, which is also consistent with non-prescriptive changes to ID. The most important aspect is continuous improvement in reporting so that interested parties can see what EDBs are doing, look for opportunities, and have the necessary confidence that EDBs are doing the right things.

5.7 With these principles in mind, we could consider introducing ID requirements relating to the following types of information.

5.7.1 Information about network needs (ie, current and forecast network capacity constraints, which can be presented in the form of “heat maps”).

5.7.2 Information on EDBs network power quality metrics such as voltage. This could initially be confined to the higher voltages, the sub-transmission level of the network, but overtime could be extended to the LV network too.

5.7.3 Information about the effect on the network, and the plans to address, of the electrification of large fossil fuelled loads in their network area (ie, dairy factories, hospital boilers, electric bus fleet or electric ferry charging).

5.8 We intend to consult with the sector on proposed changes to ID early next calendar year.