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Quantitative Assessment of Asset Management Performance and Economic Effects

Prepared for EA Networks

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Contents

Definitions

AMP	Asset Management Plan
DPP	Default Price-Quality Path
EDB	Electricity Distribution Business
GDP	Gross Domestic Product
GW	Gigawatt
GWh	Gigawatt hour
ICP	Installation Control Point
IDs	Information Disclosures
kVA	Kilovolt-amperes
kWh	Kilowatt hour
MW	Megawatt
MWh	Megawatt hour
ROI	Return on Investment
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index

Executive Summary

EA Networks engaged Link Economics to assess asset management performance outcomes from an economics perspective. This review is not intended to examine the systems and processes used by EA Networks to manage its assets but is instead focussed on a range of outcome-based performance metrics. We used publicly available data to consider:

- asset condition and whether the company is making sufficient re-investment to replace or renew aged assets,
- investment in capacity to accommodate demand growth and how that relates to economic growth in the region,
- service reliability and how that that has affected the economic costs associated with outages, such as foregone output and lost consumer benefits, and
- the level of operating costs, prices, and financial returns in comparison with other networks.

We find that EA Networks performs well across these factors.

Asset condition compares well with other networks

EA Networks' asset condition grade is at least 4 out of 5 for each asset type (where 5 represents "as new" condition) and is higher than the national average for each type of asset. We also find that in comparison to the average of all NZ networks, EA Networks has a significantly lower proportion of assets that are either unknown or in the lowest asset two condition grades. In other words, EA Networks' assets appear to be in better condition than the average NZ network.

We find that EA Networks has consistently made capital expenditure that exceeds depreciation, indicating that on average it is investing sufficiently to maintain its assets.

Investment has supported economic growth in the region

Real regional GDP in the Ashburton territorial authority area has grown by 95% since 2001 to $2.8 billion in 2023, outstripping the national growth rate over that period of 81%.[1] Over the same period, EA Networks' peak demand and its distribution transformer capacity have both grown by more than 150%.[2]

Electricity is an essential input to production for industrial and commercial economic activity, though it does not on its own drive economic growth. However, the dependence of many sectors on electricity means that electricity usage and economic growth are linked.[3] For example, in the mid-Canterbury region agriculture has been a key driver of economic growth, where the link between growth in output and electricity capacity is particularly evident. Powered pumping equipment for irrigators increases land productivity and provides higher gross farm revenues per hectare than dryland farming.

To consider the extent to which EA Networks' investment has supported growth in the local economy, we have examined how GDP output relates to the electricity network use by drawing on data from the National Accounts Input : Output tables published by Stats NZ. Based on these figures,

[1] MBIE Modelled Territorial Authority GDP
[2] Information disclosures.
[3] For a discussion of the literature on this topic, see Shakouri, Hamed, Shikhar Pandey, Farnoosh Rahmatian, and Esa A. Paaso "Does the increased electricity consumption (provided by capacity expansion and/or reliability improvement) cause economic growth?" Energy Policy Volume 182, November 2023.

we estimate that in the Ashburton area, each $1 million of additional annual GDP requires approximately $99,000 of capital expenditure by EA Networks.[4]

When deciding on investment that is aimed at expanding available capacity, networks face a trade-off between the risks of underinvesting (or investing too slowly) and overinvesting. While overinvestment has the consequence of inefficiently high costs and charges and the potential for stranded assets, underinvestment has the consequence of constraining supply and network use, delaying consumer benefits and economic growth.

The estimates above indicate that if EA Networks had taken a more reactionary approach to network investment and that this had constrained access to distribution network capacity and restricted economic activity, then for each year it delayed spending $1 million, regional GDP would have been held back by around $10 million per year.

Economic benefits of significant service reliability improvements

Changes over time in reliability outcomes also have economic impacts, with outages leading to foregone output and losses of consumer benefit. We find that the average annual minutes of unplanned outages, which is a key driver of inconvenience and output losses, followed a downward trend since 2001, reducing by around 25%. Service improvements over that period translate to half an hour less of outage time per year for the average connection. We estimate that the service improvements that have occurred over the past 20 years currently provide an annual economic benefit of $0.58 million to EA Networks' consumers.

We also compare outages across all networks by comparing the five-year period from 2008 to 2012 with the period from 2019 to 2023 and find that while EA Networks' service quality has been increasing over that period, most networks have experienced reductions in service quality (though we note that adverse weather events in the North Island have been a factor in those outcomes). Focussing in on a smaller sample of networks with the most comparable network characteristics to EA Networks, we find that EA Networks has provided the strongest improvements in service quality of that sample.

The Commerce Commission sets SAIDI and SAIFI limits as part of Default Price-Quality Path (DPP) regulation that applies to EA Networks. EA Networks' quality measures have complied with Commerce Commission SAIDI and SAIFI limits every year since the regime was introduced in 2011. Of the 16 networks that are regulated under the DPP, EA Networks is one of only 5 EDBs to never have breached quality standards.

Efficiency, pricing, and financial sustainability

When comparing operating costs, we find that EA Networks' unit operating network expenditure (expenditure per km of line length) is among the lowest of all EDBs. For non-network operating expenditure, the relative performance of non-network operating costs depends on the choice of metric. When non-network expenditure is unitised by the number of connections (ICPs), EA Networks' ranks among the highest cost networks (along with 2 of the 8 benchmark EDBs). However, rather than implying inefficiency, this seems to reflect the type of connections served by EA Networks – that is, a lower proportion of its connections are residential. When operating

[4] Distribution charges recover the sum of depreciation, a return on capital, and operating expenses. We derived capital expenditure from charges on the assumption that the average asset life is 40 years, a 7% return on capital is required, and that operating expenses at approximately 2% of capital expenditure.

expenditure is instead unitised by the capacity used by customers at peak times (maximum demand), EA Networks' unit cost falls into the lower half of all EDBs.

To consider price outcomes, we draw on data from MBIE's quarterly survey of domestic electricity prices. The survey shows that EA Networks' electricity distribution charges to retailers for residential connections are the second cheapest in the country and lower than all benchmark networks.

As a check on whether EA Networks has been operating its electricity lines business in a manner that is financially sustainable, we have compared its Return on Investment (ROI) with other regulated networks. Over the past 5 years, EA Networks has earned an average ROI of 6.85%, which is almost identical to the average of all EDBs that are regulated under the Commerce Commission's price-quality path regime (typically referred to as "non-exempt" EDBs).

1 Introduction

EA Networks engaged Link Economics to assess asset management performance outcomes from an economics perspective. The review is not intended to examine the systems and processes used by EA Networks to manage its assets but is instead focussed on a range of outcome-based performance metrics.

What are the features of good asset management performance?

To determine a methodology for assessing EA Networks' performance, we first needed to consider what a well-managed community-owned network would look like. We took the approach that such a network would:

- Have well-maintained assets, with the company making sufficient re-investment to replace and renew aged assets,
- Invest in capacity to accommodate demand growth, providing economic benefits to its consumers and community and enabling carbon-reducing electrification initiatives,
- Provide reliable service to minimise the economic costs associated with outages, such as foregone output and lost consumer benefits, and
- Operate efficiently and minimise the cost to consumers while being financially sustainable.

Data and method for assessing against these criteria

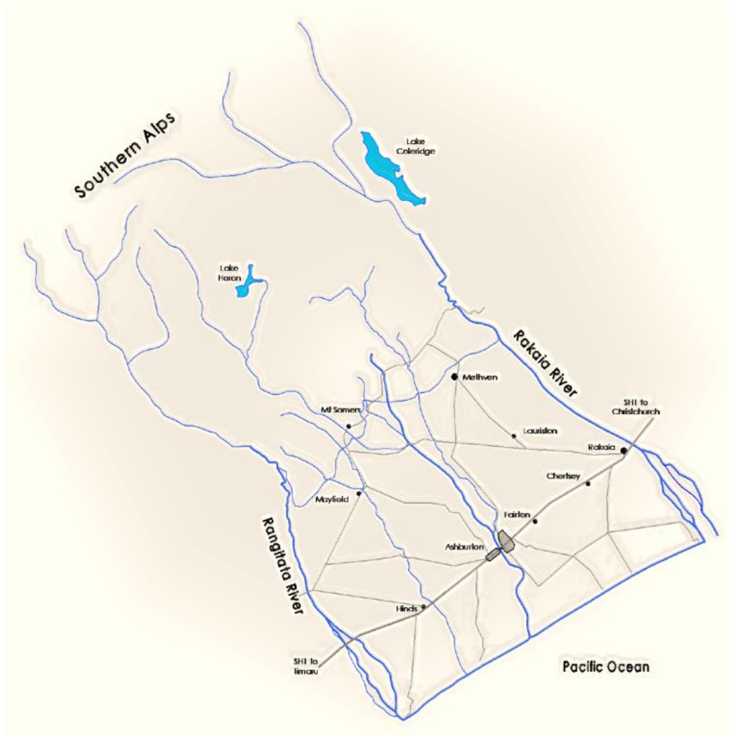
All Electricity Distribution Businesses (EDBs) are required to publish detailed audited and director-certified information disclosures that include measures of asset condition, age and value, service reliability, actual and planned investment, operating costs, billed quantities and revenues, financial performance, and various analytical ratios. The data provides a rich source for examining the performance of individual networks and for comparative analysis across networks. Other relevant sources of information include the quarterly survey of domestic electricity prices that is collected by MBIE.

To assess EA Networks' asset management and the impact that it has had on the local economy we first discuss some relevant context about the network and its customers, and identify a set of comparable benchmark networks (section 2) and then apply the criteria identified above by examining:

- Reported asset condition, how it compares with other electricity distribution businesses (EDBs), and whether the network is reinvesting sufficiently (section 3),
- The extent of investment that had been made to grow network capacity and how it relates to economic growth (section 4),
- Network performance, as measured by quality of service (unplanned and planned outage frequency and duration), and the value to customers of changes in service quality over time (section 5), and
- Efficiency, pricing, and financial sustainability outcomes (section 6).

2 Network context and relevant benchmarks

2.1 *Region and customers*



EA Networks provides electricity distribution services to around 20,500 connections in central Canterbury in the area that is bordered by the Rakaia River to the north and the Rangitata River to the south. Population centres in the region include Ashburton, Methven and Rakaia.

The region's strong agricultural base is reflected in electricity use – approximately one third of the energy delivered over EA Networks electricity assets is for irrigation pumps. A further 28 percent of electricity use is for residential and small commercial connections, and the remainder is used by large commercial and industrial connections, including meat and vegetable processing factories, and a ski field.

Demand for electricity capacity grew most strongly from 2000 to 2016, primarily driven by irrigation pumps. More recently, demand has been reasonably static but is forecast to grow over the next 5 years with decarbonisation being a key driver, including the transition away from coal for process heat and the electrification of transport. Other sources of future growth include new loads from residential housing development and new commercial connections.

2.2 *Identifying benchmark networks*

For some measures such as cost and reliability, comparisons with similar networks can be more informative than comparisons with all of the other 28 EDBs. To identify which networks would be the most informative for the purposes of the cost and reliability comparisons in this report we have considered key factors that will affect each network's costs and reliability. Key drivers of network operating costs include the density of connections and the nature of the terrain that the network must cover. For example, a compact urban network that is primarily underground will have very different operating costs than a network that covers large areas of rugged terrain. Along with weather patterns and events, these factors will also affect service reliability targets - for example, the service reliability of a compact underground urban network would typically be higher than that of a predominantly rural network (such as EA Networks), which will also differ from a network with significant remote and rugged areas of service where service restoration may take longer. As a result, we identify a set of the most comparable networks by using ID data on the profile of terrain covered by each network.

The majority of EA Network's line length is classified as rural (71%), 2% is remote, and the remaining 27% is urban or underground. We have identified a set of networks that have a similar terrain profile, using the criteria that the proportion of urban and underground circuit length is no more than 40%, and that rugged and remote circuit length accounts for no more than 5%. Appendix A contains further information on how these criteria were applied.

The resulting set of benchmark networks are: Alpine Energy, Counties Energy, Network Tasman, Network Waitaki, Northpower, Scanpower, Top Energy, and Waipa Networks. **Table 1** provides further details of these networks.

Table 1 Network characteristics – percent of total km of circuit length, 2023

	EA Networks	Alpine Energy	Counties Energy	Network Tasman	Network Waitaki	Northpower	Scanpower	Top Energy	Waipa Networks
Underground + Urban	27%	27%	40%	33%	29%	28%	14%	26%	32%
Rural	71%	71%	58%	61%	71%	72%	86%	74%	64%
Remote + Rugged	2%	2%	2%	5%	0%	0%	0%	0%	3%
Location	Mid Canterbury	South Canterbury	Southern Auckland region + northern Waikato	Nelson-Tasman	North Otago	Northland	Manawatū	Far North	Waipa/ Waikato

Source: 2023 Information Disclosures

3 State of assets and renewal investment

EA Networks' asset condition grade is at least 4 out of 5 for each asset type (where 5 represents "as new" condition) and is higher than the national average for each type of asset. We also find that in comparison to the average of all NZ networks, EA Networks has a lower proportion of assets that are either unknown or in the lowest asset two condition grades. In other words, EA Networks' assets are in better condition than the average NZ network.

We also find that the EA Networks has consistently made capital expenditure that exceeds depreciation, indicating that on average it is investing sufficiently to maintain its assets.

3.1 Asset condition compares well with other networks

EDBs are required by the Commerce Commission's information disclosure rules to disclose whether they hold information on the condition of each asset type and, if so, what the level of asset condition is, using a scale of 1 to 5. Grade 1 represents the lowest asset grade, representing assets with the most immediate need of replacement and at the other end of the scale are Grade 5 assets, which are "as new" with no need for replacement. (See Table **2** below for definitions of each level of this grade scale).

Table 2: Definition of asset condition grades

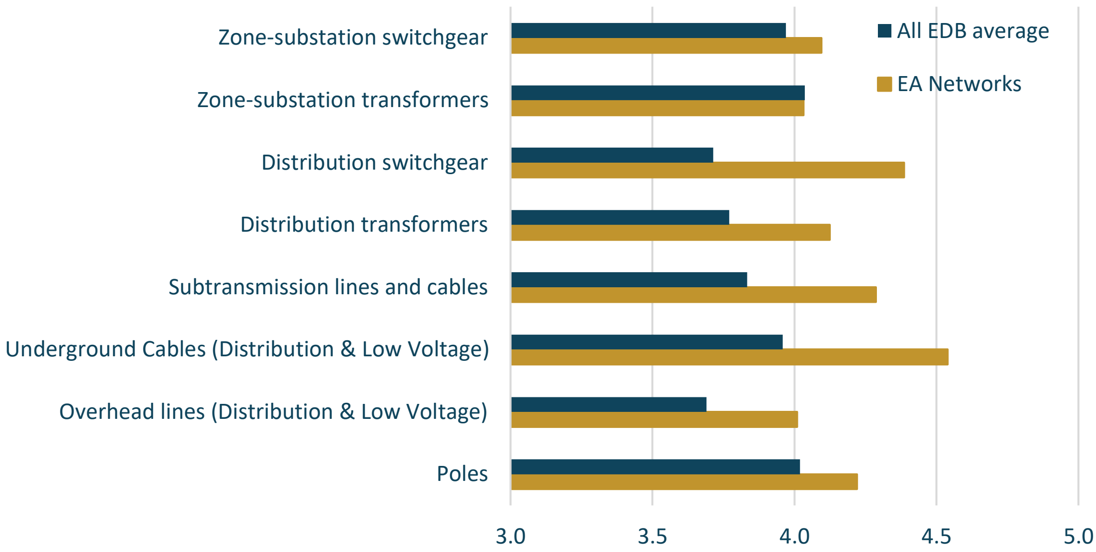
Asset condition grade	Definition
Grade 1	Replacement recommended
Grade 2	End of life drivers for replacement present, high asset related risk
Grade 3	End of life drivers for replacement present, increasing asset related risk
Grade 4	Asset serviceable – no drivers for replacement, normal in-service deterioration
Grade 5	As new condition – no drivers for replacement

Commerce Commission, Electricity Distribution Information Disclosure Determination 2012, pp. 141-142

EA Networks' disclosures show that it holds complete asset condition information for each asset type. While this is true of many networks, some have gaps. For example, for poles, the information disclosures show that on average NZ networks have 1.2% of poles with unknown grade, and for overhead distribution and low voltage (LV) line, this figure is 2.5%, with 5.2% for underground distribution and LV cables.

We have categorised the assets into 8 categories and have calculated the average asset condition for EA Networks and for all networks. As Figure **1** shows, the average asset condition for EA Networks lies between 4 and 4.5 for 7 asset categories, with the remaining asset category (Underground Cables) rating slightly higher at 4.54. EA Network's asset condition rating is higher than the EDB average for 7 of the 8 asset categories, with the remaining category having an average rating that is roughly equal to the EDB average.

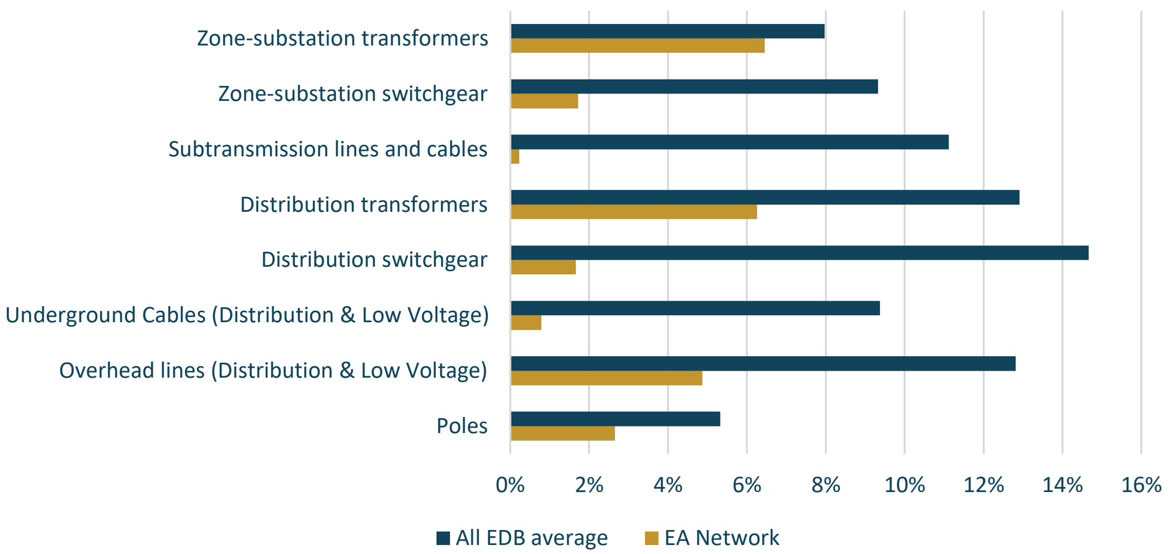
Figure 1: Average grade of asset condition, 2023



Source: 2023 Information Disclosures, Schedule 12a

We have also looked at the proportion of assets that are either in the lowest 2 asset condition grades or have an unknown grade. For each asset type, that proportion is significantly lower for EA Networks than for the average of other EDBs.

Figure 2: Percentage of assets that with unknown, grade 1 or grade 2, 2023

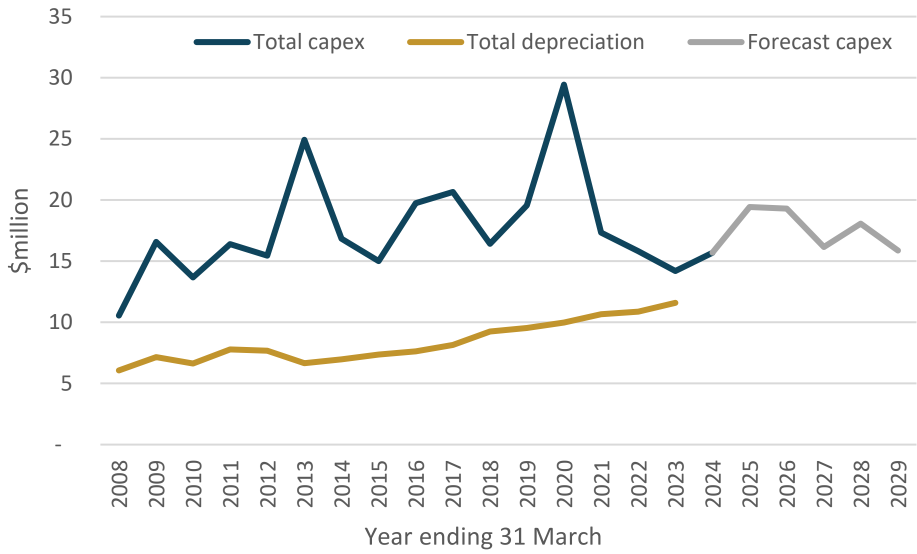


Source: 2023 Information Disclosures, Schedule 12a

3.2 Capital expenditure exceeds depreciation

While asset replacement investments can be lumpy from year-to-year, we would generally expect that for a well-maintained network, on average over time capital expenditure would be at least as high as depreciation. Figure **3** shows that EA Networks annual investment has consistently tracked significantly above depreciation. While the gap has narrowed in recent years, this appears to reflect a reduction in capital expenditure on new capacity as demand has levelled off.

Figure 3: Depreciation compared with capital expenditure



Source: Information Disclosures, Asset Management Plan 2024

Note: The above chart relates to network and non-network assets

4 Expanded capacity and contribution to local economic growth

During the period 2010 to 2016, EA Networks invested around $55 million in electricity infrastructure to support increased demand.[5] That demand growth was particularly driven by irrigation connections, which were an input to improving land productivity and achieving higher gross farm revenues per hectare. We examine how investment in the local electricity network has supported local regional economic growth in the Ashburton area. We estimate that if EA Networks had taken a more reactionary approach to network investment and that this had constrained access to distribution network capacity and restricted economic activity, then for each year it delayed spending $1 million, regional GDP would have been held back by up to $10 million per year (see section 4.3).

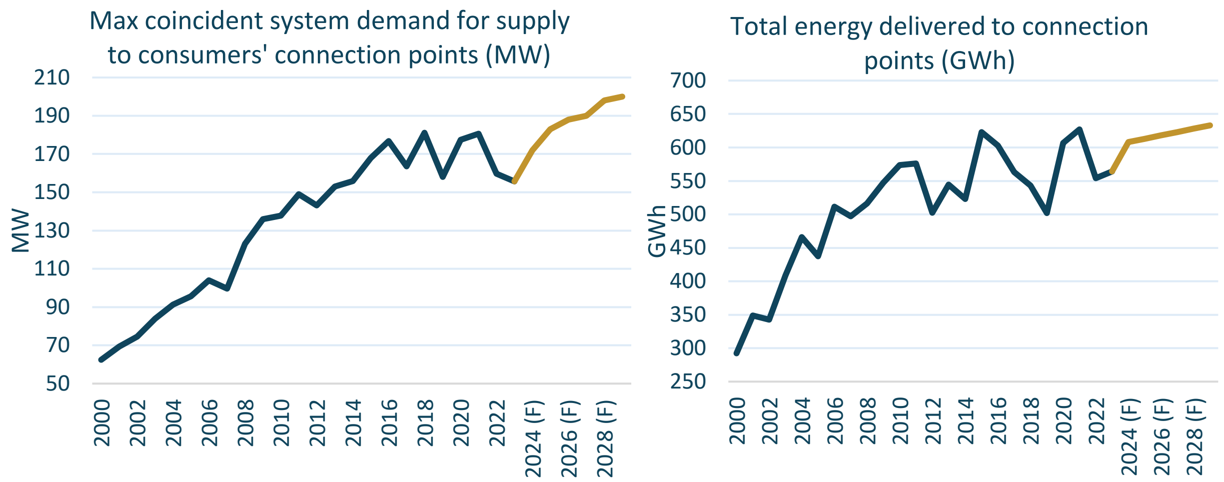
4.1 Demand growth for electricity capacity

In EA Networks' region, demand for electricity capacity (MW) grew steeply from 2000 to 2016, with maximum coincident demand having a compound annual growth rate of approximately 7% over this period. The growth rate has flattened since then but demand is forecast to grow strongly in the future as a result of decarbonisation (see the chart on the left in Figure **4**).

[5] Measured as capital expenditure on system growth and consumer connections, net of capital contributions.

EA Networks' demand growth over the period 2000 to 2016 was predominantly caused by rural irrigation. The network currently has around 1,600 irrigation connections. The average capacity requirement for an irrigation connection is 88 kW, though some pivot irrigation systems can require up to 300 kW. In 2023, irrigation connections purchased 142 MW of capacity from EA Networks, using 182 GWh of electricity (around one third of electricity usage on the network). The volume of energy in a year is highly dependent on weather conditions – a dry spring/summer will increase volume, a wet spring/summer will lower it. Capacity is not affected by annual weather variations.

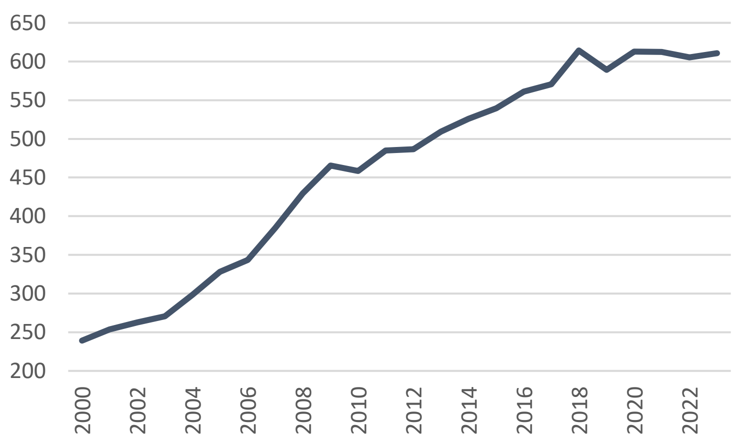
Figure 4: Growth in demand and energy use



Source: Information Disclosures

Total distribution transformer capacity, which could be interpreted to roughly represent the capacity provisioned to meet customer demand, has also grown steadily, flattening off in recent years.

Figure 5: Total distribution transformer capacity (GW), 2000 to 2023

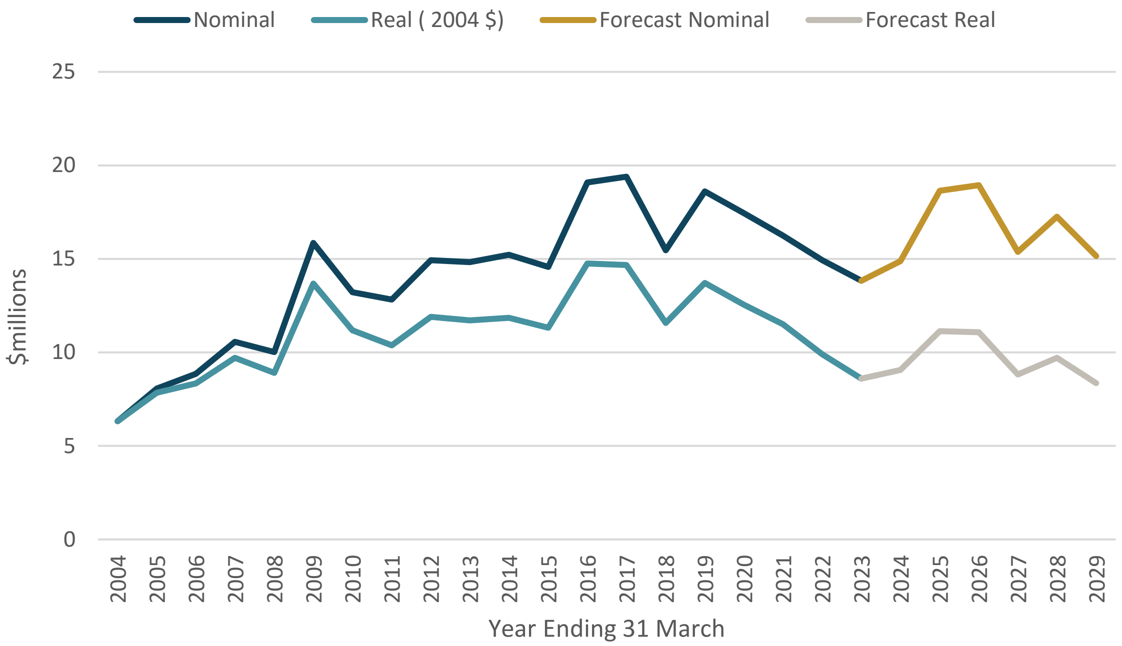


Source: Information Disclosures

4.2 Investment to meet capacity demands

EA Networks considerably increased its network investment from 2009 to provide the capacity needed to meet growing demand (see Figure **6**). From 2010, network investment data can be disaggregated into the type of investment: system growth, consumer connection, asset replacement and renewal, and reliability, safety and environment.

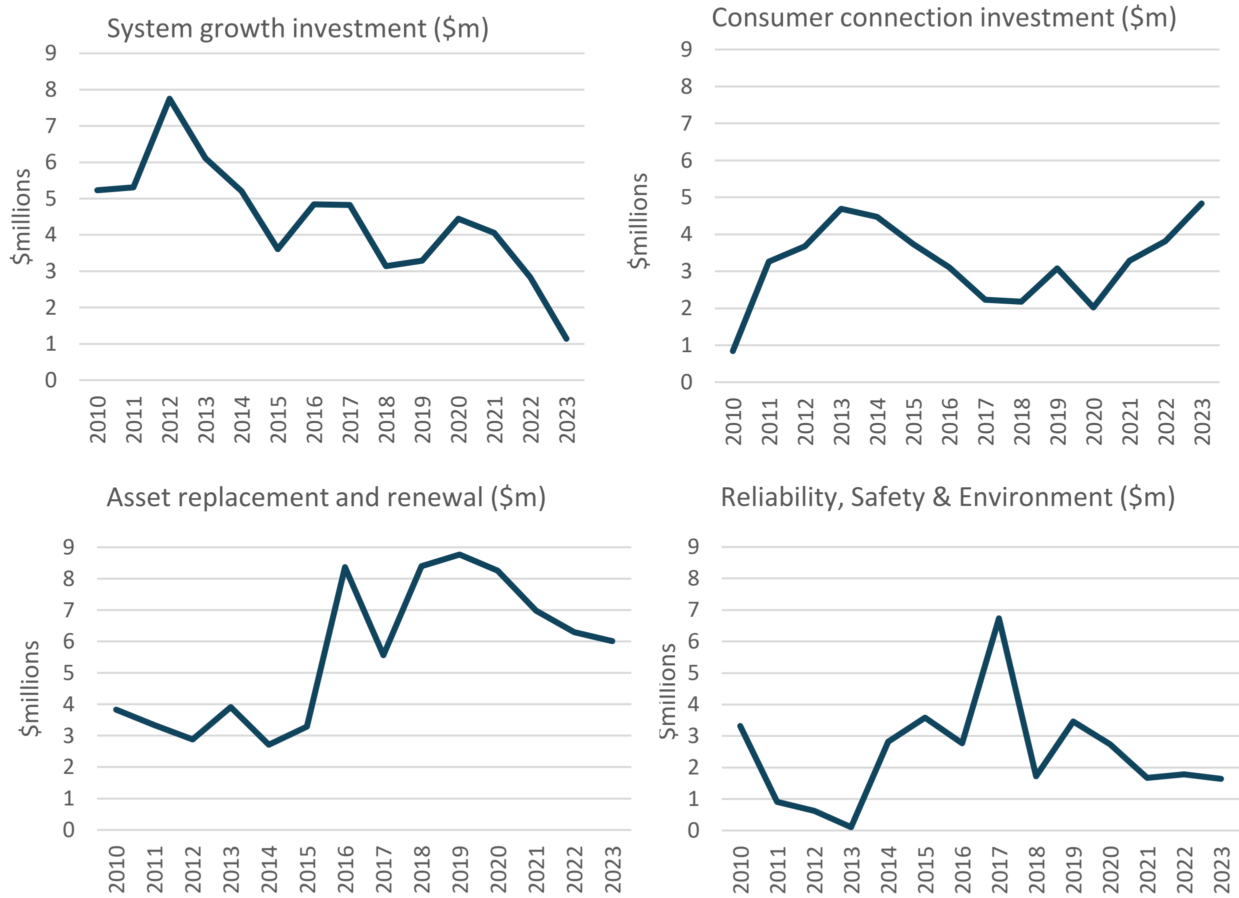
Figure 6: Expenditure on network assets, 2004 to 2023 ($millions)



Source: Information Disclosures

Disaggregated data shows that while investment aimed at accommodating new growth has decreased over time as demand flattened, the focus of EA Networks' investment has turned primarily to asset replacement and renewals. An uptick in consumer connection investment in recent years likely reflects decarbonisation projects.

Figure 7: Network investment, 2010 to 2023 (nominal)

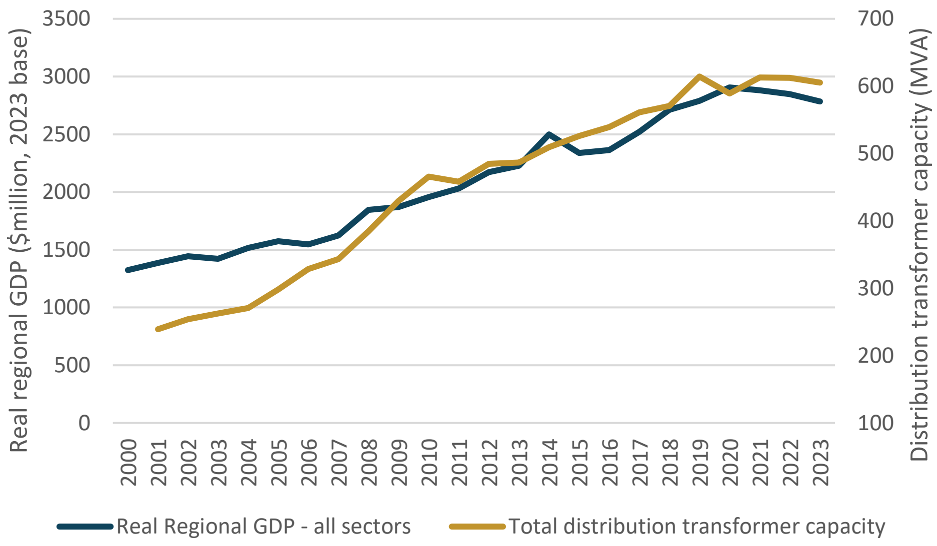


4.3 Network investment as an enabler of regional economic growth

Electricity is an essential input to production for industrial and commercial economic activities, though it does not on its own drive economic growth. Raw materials and resources, technology, land, and labour are required to produce output. However, the dependence of many sectors on electricity, means that electricity usage and economic growth are linked.[6]

Real regional GDP in the Ashburton territorial authority area has grown by 95% since 2001 to $2.8 billion in 2023, outstripping the national growth rate over that period of 81%.[7] Over the same period, EA Networks' peak demand and its distribution transformer capacity have both grown by more than 150% (see **Figure 8**).[8] A key driver of economic growth in the mid-Canterbury region has been agriculture, where the link between growth in output and electricity capacity is particularly evident. Powered pumping equipment for irrigators increases land productivity and provides higher gross farm revenues per hectare than dryland farming.

Figure 8: Real regional GDP and transformer capacity, 2000 to 2023 (2023 dollars)



Source: MBIE Modelled Territorial Authority GDP, Information disclosures

Note: Regional GDP is measured on the left vertical axis, with transformer capacity on the right vertical axis

To consider the effect of EA Networks' investment on the local economy, we have examined how GDP output relates to the use of electricity networks. National accounts Input:Output tables[9] published by Stats NZ provide estimates of how much extra electricity distribution and transmission network output is required for each industry is to produce more of its own output.[10] We have weighted these estimates by the composition of output by industry in the Ashburton region and found that to produce an extra $1 million of annual regional GDP requires $10,600 of electricity

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[6] For a discussion of the literature on this topic, see Shakouri, Hamed, Shikhar Pandey, Farnoosh Rahmatian, and Esa A. Paaso "Does the increased electricity consumption (provided by capacity expansion and/or reliability improvement) cause economic growth?" Energy Policy Volume 182, November 2023.
[7] MBIE Modelled Territorial Authority GDP
[8] Information disclosures.
[9] Also referred to as the Leontief inverse matrix
[10] https://www.stats.govt.nz/information-releases/national-accounts-input-output-tables-year-ended-march-2020#:~:text=Input%2Doutput%20tables%20show%20the,gross%20domestic%20product%20(GDP).

transmission and distribution network services annually. On the assumption that transmission has historically accounted for approximately 25% of EA Networks' charges, this translates to a distribution network service requirement of approximately $8,000 worth of annual distribution services. Based on these figures, we estimate approximately $99,000 of capital expenditure by EA Networks is needed to support $1 million of additional GDP growth per year.[11]

When deciding on investment that is aimed at expanding available capacity, networks face a trade-off between the risks of underinvesting (or investing too slowly) and overinvesting. While overinvestment has the consequence of inefficiently high costs and charges and the potential for stranded assets, underinvestment has the consequence of constraining demand, delaying consumer benefits and economic growth.

The estimates above indicate that if EA Networks had taken a more reactionary approach to network investment and that this had constrained access to distribution network capacity and restricted economic activity, then for each year it delayed spending $1 million, regional GDP would have been held back by up to $10 million per year. Put another way, at the time that electricity demand was growing strongly (especially during the period 2008 to 2016), by investing to cater to that demand EA Networks enabled up to $10 million of additional regional GDP per year for each $1 million that it invested in its network. These estimates are based on simplifying assumptions but provide an indication of the scale of economic growth that has been enabled by distribution network investment.

5 Network service quality and economic implications

Changes over time in reliability outcomes also have economic impacts, with outages leading to foregone output and losses of consumer benefit. We find that the average annual minutes of unplanned outages, which is a key driver of inconvenience and output losses, followed a downward trend since 2001, reducing by around 25%. This translates to approximately half an hour less of outage time per year for the average connection. We estimate that the service improvements that have occurred over the past 20 years provide an annual economic benefit of $0.58 million to EA Networks' consumers (as is explained in section 5.4 below).

We also compare outages across all networks by comparing the five-year period from 2008 to 2012 with the period from 2019 to 2023 and find that while EA Networks' service quality has been increasing over that time, most networks have experienced reductions in service quality, though we note that adverse weather events in the North Island have been a factor in those outcomes. Focussing in on a smaller sample of networks with the most comparable network characteristics to EA Networks we find EA Networks to have provided the strongest improvements in service quality of that sample.

5.1 EA Networks' service quality has improved over time

Service quality for electricity is most commonly measured by the total duration of interruptions and the number of interruptions experience by customers on average. The specific measures are referred

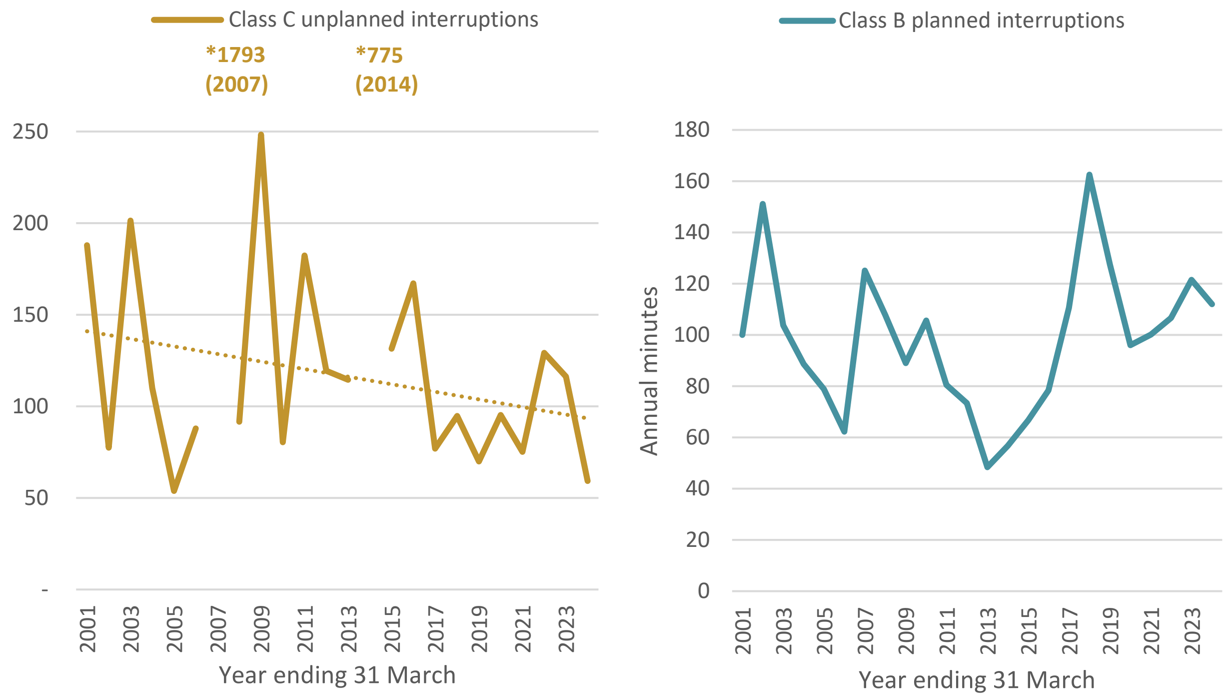
[11] Distribution charges recover the sum of depreciation, a return on capital, and operating expenses. We derived capital expenditure from charges on the assumption that the average asset life is 40 years, a 7% return on capital is required, and that operating expenses at approximately 2% of capital expenditure.

to as SAIDI (System Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index), which can be further disaggregated into planned and unplanned outages.

The average annual minutes of unplanned outages (SAIDI) experienced by EA Networks' consumers has followed a downward trend over the period of available data (2001 to 2024) and has fallen by a quarter over that period.[12] As can be seen from Figure **9**, the downward trend also reflects a reduction in the variability of SAIDI, with lower spikes in recent years.

The average annual minutes of planned outages experienced by EA Networks' consumers has varied over time with no clear trend. The total average annual outage minutes (planned + unplanned) has fallen over time, being 28 minutes lower in the last 5 years of data than in the first 5 years (see Table **3** below).

Figure 9: SAIDI – Average minutes of interruptions on the network per annum, unplanned and planned, 2001 to 2024



Source: Information Disclosures, sourced from the Commerce Commission's online spreadsheet summaries from 2008 onwards, and from the New Zealand Gazette for prior years.

Note: Large spikes occurred in unplanned SAIDI minutes of 1793 in 2006/7 and 775 in 2013/14, which were caused by severe weather events (a snowstorm in 2006 and a windstorm in 2013). We have omitted these data points from the chart as its inclusion would distort the scale of the chart.

[12] Unplanned outage SAIDI minutes vary significantly from year to year. To address this we have used 5 year averages. For example, to calculate the change in unplanned SAIDI minutes over the period 2001 to 2023 we have compared the average during the first 5 years of this period to the average during the last 5 years.

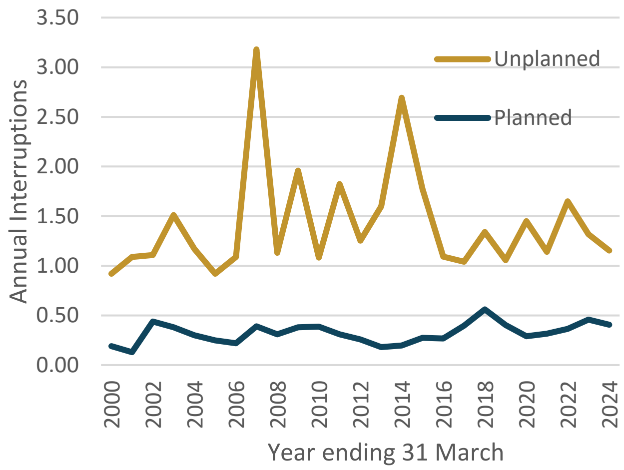
Table 3: Change in average annual minutes of interruptions per connection, 2001 to 2024

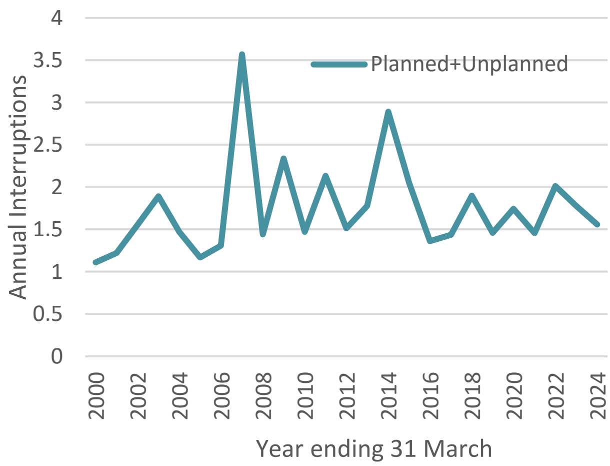
	Planned	Unplanned	Total
First 5 years (2001 to 2005)	104	126	231
Mid 5 years (2009 to 2013)	79	149	228
Last 5 years (2020 to 2024)	107	95	202
Change from first 5 years to last 5 years	+3	-31	-28
Change (%)	+3%	-25%	-12%

Note: Excludes outages that relate to the national grid.

Turning to the frequency of outages, the number of outages in any given year varies and has not followed a clear trend.

Figure 10: EA Networks' SAIFI – Average number of planned and unplanned interruptions



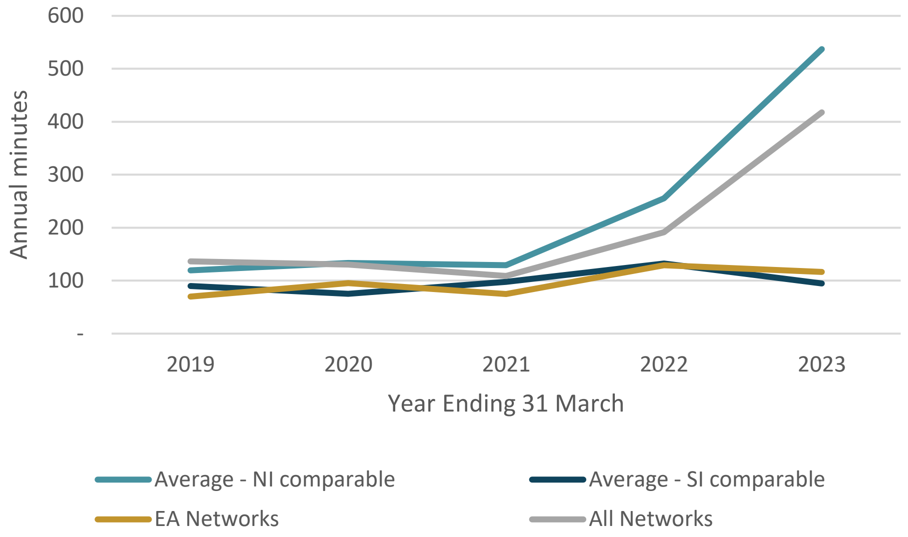


Source: Information Disclosures, sourced from the Commerce Commission's online spreadsheet summaries from 2008 onwards, and from the New Zealand Gazette for prior years.

5.2 Service quality provided by EA Networks compares favourably with other networks

Over the last 5 years, the average minutes of unplanned interruptions for EA Networks' customers (SAIDI) has been lower than the national average across all EDBs. We have split the benchmark networks into North Island and South Island, because severe weather events have significantly affected network reliability measures for numerous North Island distribution networks over the recent years. We found that the average minutes of unplanned interruptions for EA Networks' has been similar to the average of the South Island benchmark EDBs across the 5 years (see **Figure 11**). In the first 3 years of the sample (that is, excluding the two years with the most severe weather events in the North Island), SAIDI was lower for EA Networks' than it was for the average of the North Island benchmark networks.

Figure 11: SAIDI - Unplanned interruptions on the network (minutes) – last 5 years

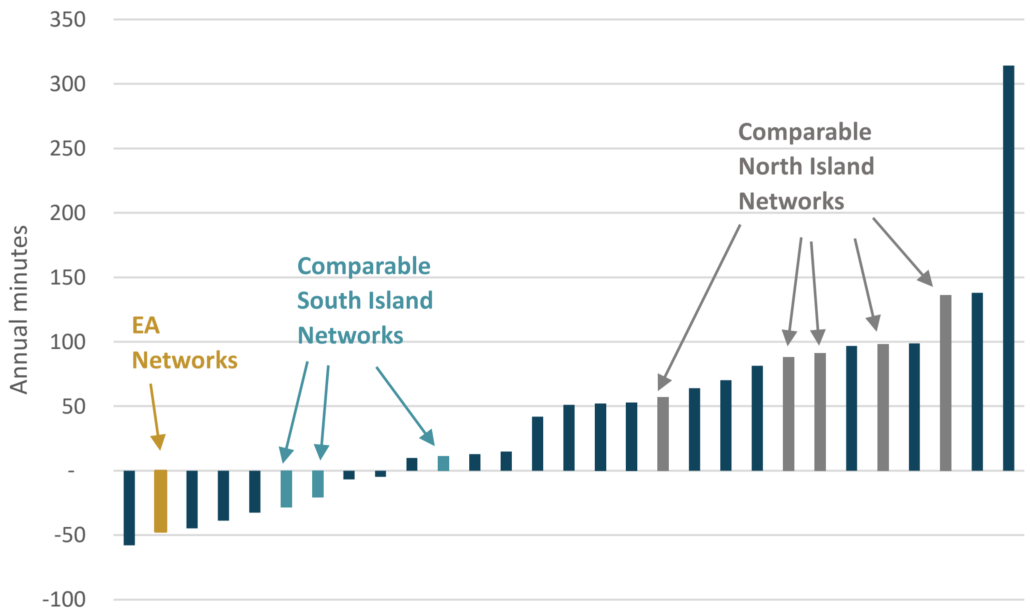


Source: Information Disclosures, sourced from the Commerce Commission's online spreadsheet summary

Note: NI = North Island, SI = South Island

We have also compared the change in the average minutes of unplanned interruptions across networks for the period of readily available data (2008 to 2023). When looking at the difference between the first 5 years in the period and the last 5 years, we found that EA Networks achieved a greater improvement in reliability than all but one other network. We note that severe weather events in recent years affected the results for a number of North Island networks.

Figure 12: Change in SAIDI - Unplanned interruptions on the network (minutes), difference between the average from 2008 to 2012 and the average from 2019 to 2023



Source: Information Disclosures, sourced from the Commerce Commission's online spreadsheet summaries.

5.3 Consistency with service quality standards set by the Commerce Commission

The Commerce Commission sets SAIDI and SAIFI limits as part of Default Price-Quality Path (DPP) regulation that applies to EA Networks. EA Networks' quality measures have complied with Commerce Commission SAIDI and SAIFI limits every year since the regime was introduced in 2011. Of the 16 networks that are regulated under the price-quality regulation, EA Networks is one of only 5 EDBs to never have breached quality standards.

5.4 Value of Lost Load

We have quantified the value to consumers of EA Networks' improvement in service reliability using the Value of Lost Load (VOLL) per kWh. VOLL is the dollar value of measure of the impact of outages on electricity users. EA Networks has estimated the VOLL per kWh for different connection types, which we have applied to the changes in SAIDI to calculate the annual benefit to consumers from reliability improvements.[13] In doing so we have made the assumption, based on international studies, that the VOLL associated with unplanned outages is 50% higher than for planned outages, reflecting that consumers are able to mitigate the effects of service interruptions with the benefit of advance notice.

We find that improvements in service reliability since 2001 mean that EA Networks' consumers are now better off by $0.58 million per year.

Table 4: Benefits of service reliability improvements

Capacity of connection	EA Networks VOLL estimate ($/kWh)	Energy volume (MWh)	ICPs	Average kW per ICP	Annual VOLL - SAIDI improvements (2001 to 2023)
8 kVA	$16.00	661	225	0.34	$571
20 kVA	$14.00	128,780	16291	0.90	$97,280
50 kVA	$18.00	30,120	1778	1.93	$29,253
100 kVA	$20.00	66,502	799	9.50	$71,765
150 kVA	$22.00	47,482	302	17.95	$56,364
Irrigation	$6.00	238,228	1644	16.54	$77,124
Industrial	$23.00	35,949	41	100.09	$44,613
Large users	$25.00	85,491	10	975.92	$115,321
Generation	$13.50	121,289	4	3,461.44	$88,349
Total					**$580,640**

6 Efficiency, pricing, and financial sustainability

When comparing operating costs across EDBs, we find that EA Networks' unit operating network expenditure is among the lowest. The relative performance of non-network operating costs depends on the choice of metric.

[13] VOLL estimates were sourced from EA Networks' Pricing Methodology disclosure.

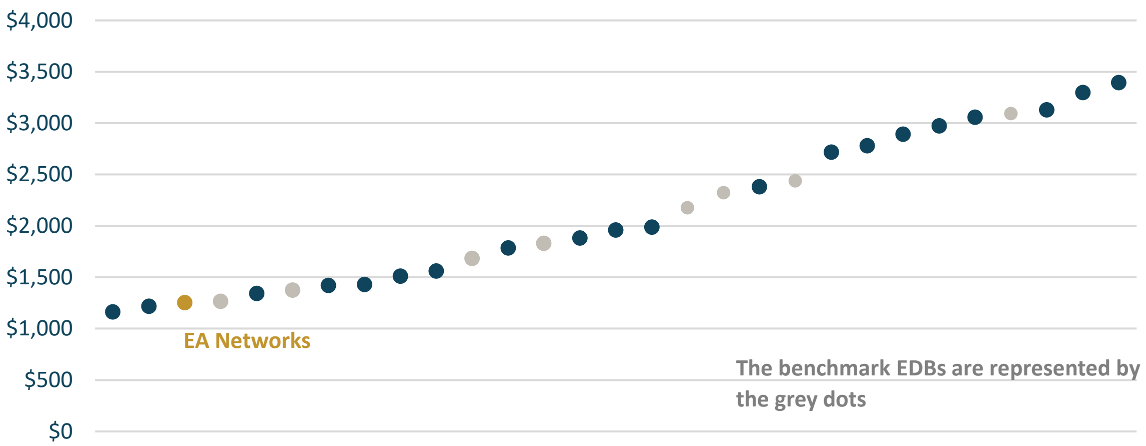
MBIE's price survey finds that charges to retailers for residential connections in Ashburton are the second lowest in the country.

To examine financial sustainability, we consider return on investment and find that over the 5 years from 2019 to 2023 EA Networks earned a return that was on par with other networks that are also subject to price-quality path regulation by the Commerce Commission.

6.1 Operational expenses per unit

To examine operational efficiency, we have examined the unit costs of network and non-network operating costs, in comparison with other EDBs. A common metric for examining network costs is the cost per km of line. When looking at this measure, we find that EA Networks has one of the lowest unit network costs in the country, which is lower than all of the benchmark EDBs.

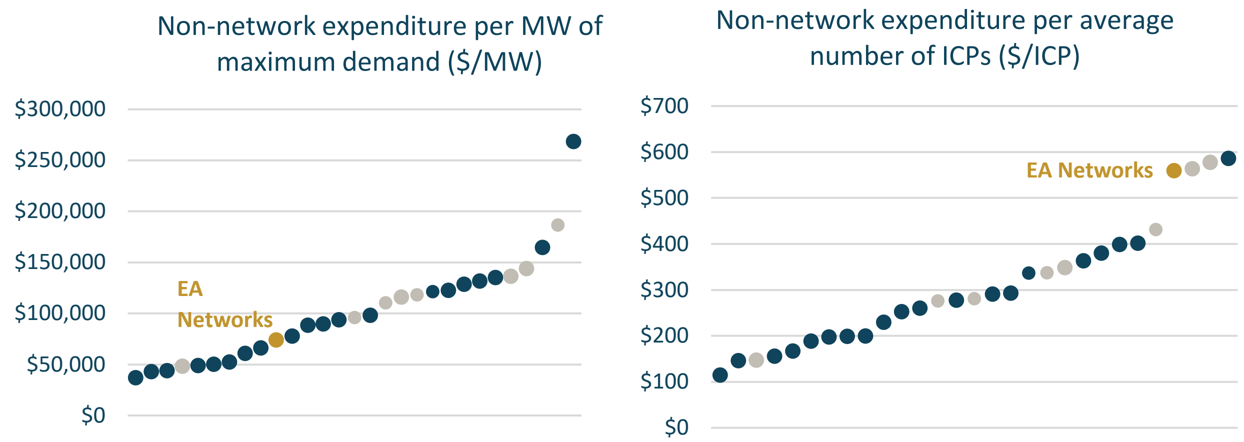
Figure 13: Network operating cost per km of circuit length ($/km), Year ending March 2023



Source: 2023 Information Disclosures

Turning to non-network costs, the results of a comparison vary depending on how the costs are unitised. When the non-network operating expenditure is unitised by the number of connections (ICPs), EA Networks' ranks among the highest cost networks (along with 2 of the 5 benchmark EDBs). However, rather than implying inefficiency, this seems to reflect the type of connections served by EA Networks – that is, a lower proportion of its connections are residential. When operating expenditure is instead unitised by the capacity used by customers at peak times (maximum demand), EA Networks' unit cost falls into the lower half of all EDBs, and is lower than all but one of the benchmark EDBs.

Figure 14: Non-network operating cost, 2023



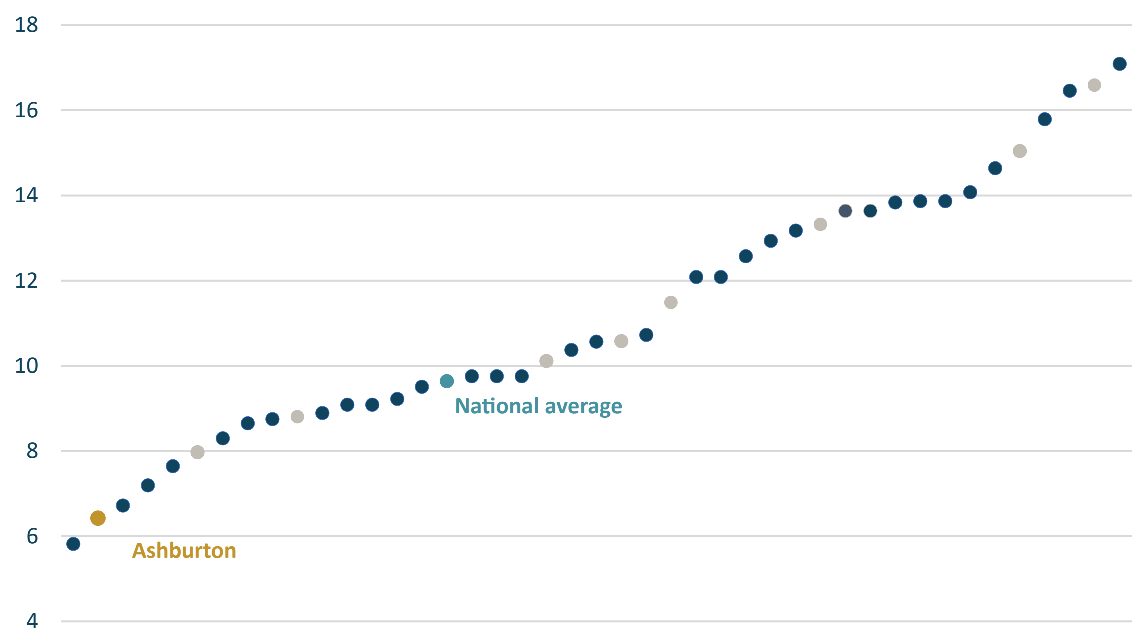
Source: 2023 Information Disclosures

Note: The grey dots in these charts represent the 5 benchmark EDBs.

6.2 Residential electricity distribution prices in Ashburton are the second cheapest in the country

As a check on the price outcomes that EA Networks delivers (that is the prices that EA Networks charged to electricity retailers), we have used data from MBIE's Quarterly Survey of Domestic Electricity Prices for electricity prices faced by residential consumers. The survey looks at the electricity price applicable in 42 towns and cities across the country, looking at the total retail charge and the charge by component (distribution, transmission, energy + other). The survey shows that EA Networks' electricity distribution charges to retailers for residential connections in Ashburton are the second cheapest in the country, and below all of the benchmark networks.

Figure 15: Distribution component of electricity price for residential consumers (15 February 2024), cents per kWh



Source: MBIE Quarterly Survey of Domestic Electricity Prices

6.3 Financial performance measures

As a check on whether EA Networks has been operating its electricity lines business in a manner that is financially sustainable, we have compared its Return on Investment (ROI) with other regulated networks. Over the past 5 years, EA Networks has earned an average ROI of 6.85%, which is almost identical to the average of all EDBs that are regulated under the Commerce Commission's price-quality path regime (typically referred to as "non-exempt" EDBs).

Table 2: ROI (comparable to a post-tax WACC)

	2019	2020	2021	2022	2023	5-year average
Non-exempt EDB average	6.05%	6.82%	4.00%	9.02%	8.33%	6.84%
EA Networks	5.53%	6.47%	4.40%	9.45%	8.40%	6.85%
Lowest of non-exempt EDBs	2.05%	2.23%	1.46%	6.33%	6.95%	
Highest of non-exempt EDBs	8.81%	12.61%	6.50%	10.87%	9.59%	

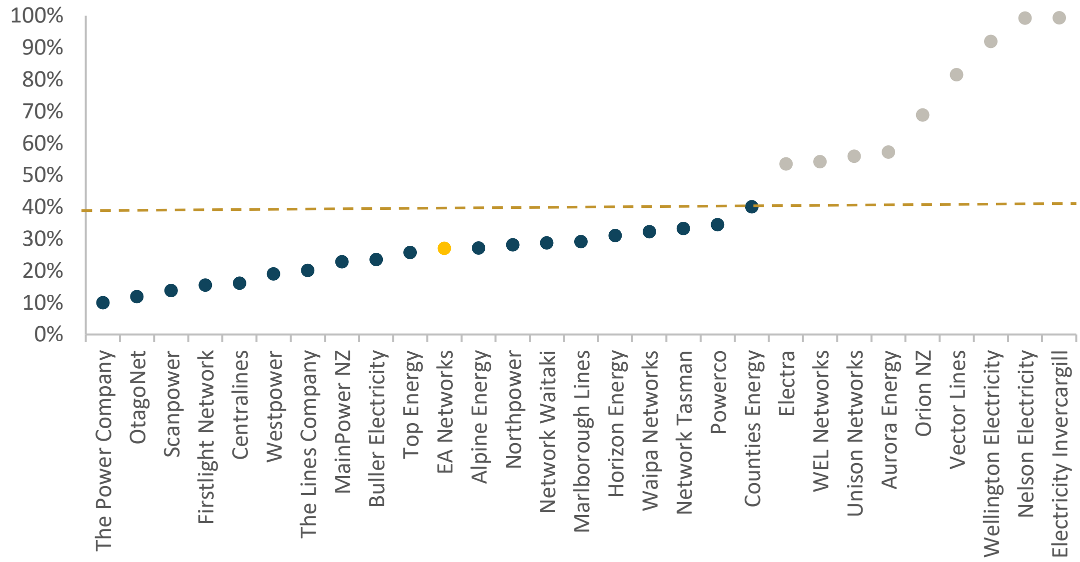
Source: Information Disclosures

Appendix A: Identifying a set of benchmark networks

Further details on selection of benchmark EDBs

As discussed in section 2.2, we used ID data on the terrain covered by each network to identify a set of benchmark networks. We first applied the criterion that the proportion of circuit length that is classified as either underground cable or urban overhead line is no more than 40%, as this appears to be a point where there is a step up in the data – see the dashed yellow line in Figure **16** below. As is evident from the grey dots in the same chart, this criterion eliminated networks that are compact underground networks (such as Electricity Invercargill and Nelson Electricity) as well as those that serve large cities (Aurora, Orion, WEL Networks, Wellington, and Vector) and some others that have significant urban populations (Electra and Unison). For the remaining networks, EA Networks is near the median of the urban and underground circuit length proportion.

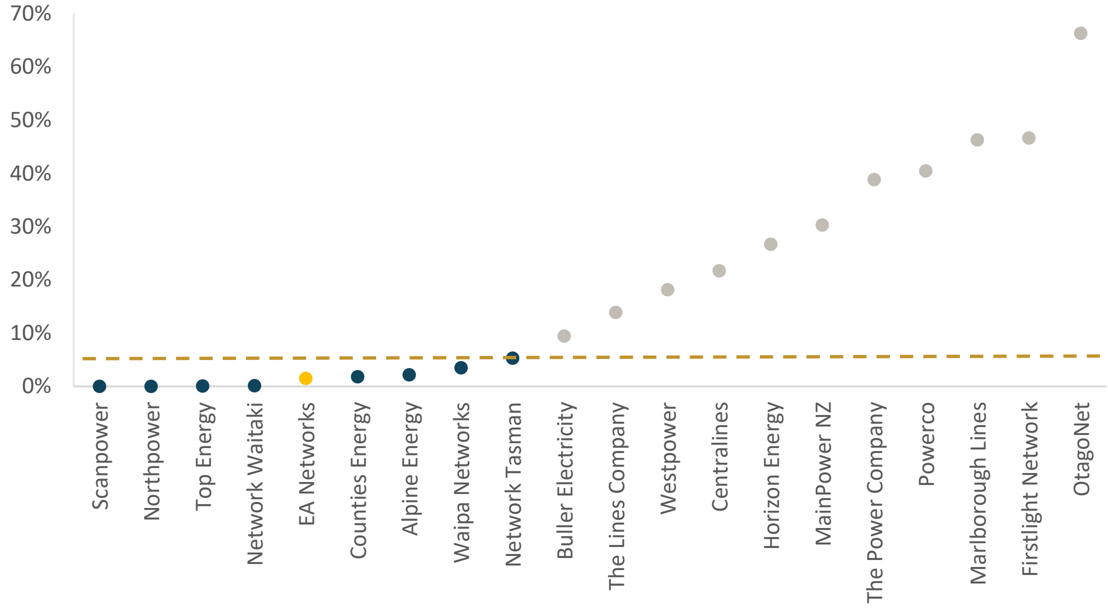
Figure 16: Urban and underground network as a percent of total km of circuit length, 2023



Source: Information Disclosures for the year ending 31 March 2023

The second criterion was that the proportion of network circuit length that is in remote and rugged areas – that is, high cost areas – is no more than 5% (EA Networks has 2%). Figure **17** shows the application of the second criterion, after removing networks already eliminated from the benchmark set. The final benchmark set of 8 networks is represented by the dark blue dots, with EA Networks sitting in the middle of that set. As can be seen from the chart, doubling the threshold from 5% to 10% would have made little difference to the benchmark set.

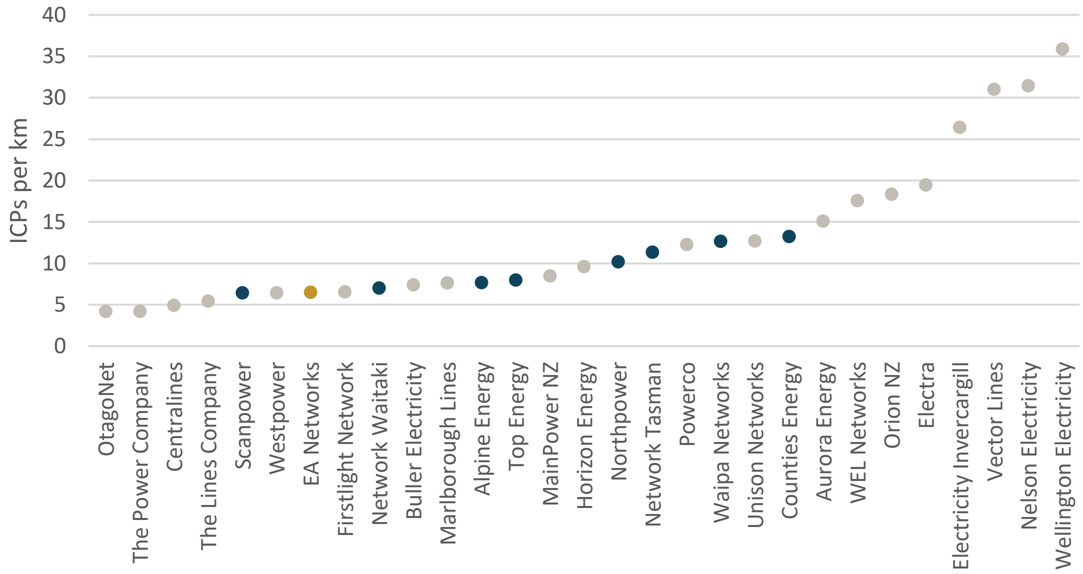
Figure 17: Remote and rugged network as a percent of total km of circuit length, 2023



Source: Information Disclosures for the year ending 31 March 2023

While the two criteria that we used to identify the benchmark set did not explicitly use the ICP density measure, we would expect the networks selected on the basis of network terrain to have a reasonably comparable density (or at least not fall into an extreme end of the range of ICP density). Figure **18** provides a check on the ICP density of the benchmark set in relation to all networks. The ICP density of the benchmark networks fall into the range of 6 to 13 ICPs/km, with EA Networks near the lower end of that range (6.5 connections per km of line).

Figure 18: ICP density (ICPs per km of circuit length), 2023

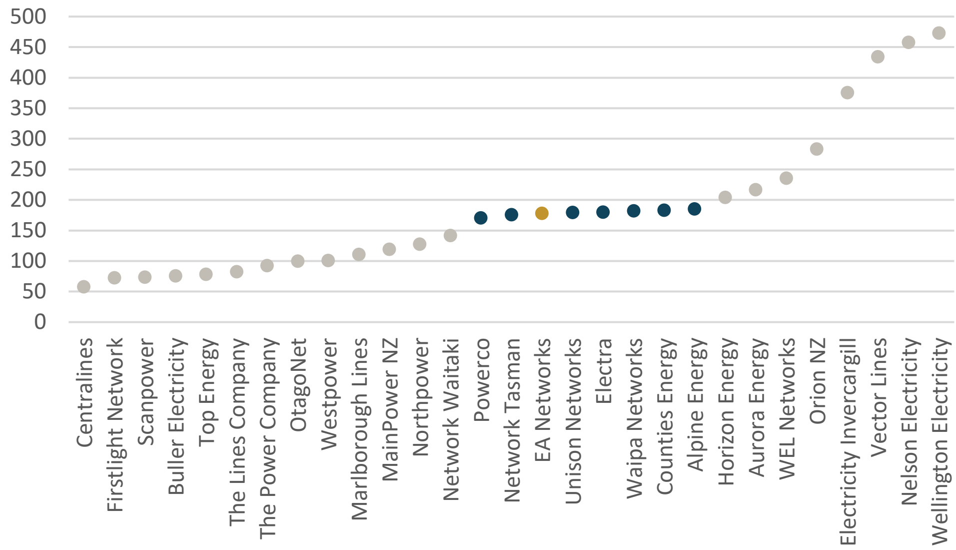


Source: Information Disclosures for the year ending 31 March 2023

Sensitivity analysis using energy density to select benchmark set

Benchmarks can be selected using different criteria and those criteria will depend on what the focus of the benchmarking is. We received feedback from EA Networks that an alternative method for selecting a benchmark set would be to identify EDBs that had a similar energy density, as measured by MWh/km, which may provide an indication of the local economy surrounding and benefiting from the network. Doing so identifies a benchmark set that includes: Alpine Energy, Counties Energy, Electra, Network Tasman, Powerco, Unison Networks, and Waipa Networks. That is, a set which has 4 networks in common with the benchmark set identified in this report, and 3 different.

Figure 19: Volume density (MWh/km), 2023



Source: Information Disclosures for the year ending 31 March 2023

Table 5 Alternative benchmark networks – volume density, 2023

EDB	MWh/km
Powerco	170.5
Network Tasman	175.8
EA Networks	**177.9**
Unison Networks	179.9
Electra	180.3
Waipa Networks	182.3
Counties Energy	183.5
Alpine Energy	185.7

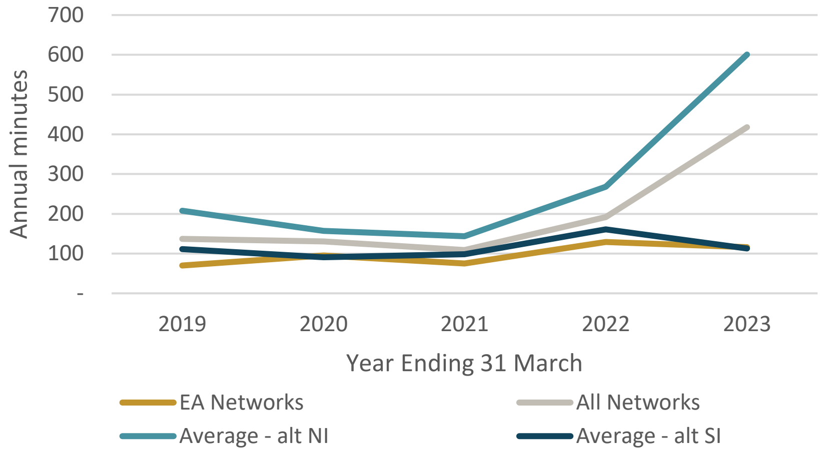
Source: Information Disclosures for the year ending 31 March 2023

We have reproduced the charts from the main body of this report that looked at benchmarks, using this alternative set of benchmark networks. Our overall conclusions from the comparisons of EA Networks performance with the benchmark EDBs remain largely the same.

SAIDI comparisons

Using the alternative benchmark set, we continue to find that over the last 5 years, the average minutes of unplanned interruptions for EA Networks' customers (SAIDI) has been lower than the national average across all EDBs. The average minutes of unplanned interruptions for EA Networks' was either similar to or below the average of the South Island benchmark EDBs in each of the 5 years (see Figure **20**). In the first 3 years of the sample (that is, excluding the two years with the most severe weather events in the North Island), SAIDI was lower for EA Networks' than it was for the average of the North Island benchmark networks, and EA Networks was significantly lower in the most recent two years of the data period.

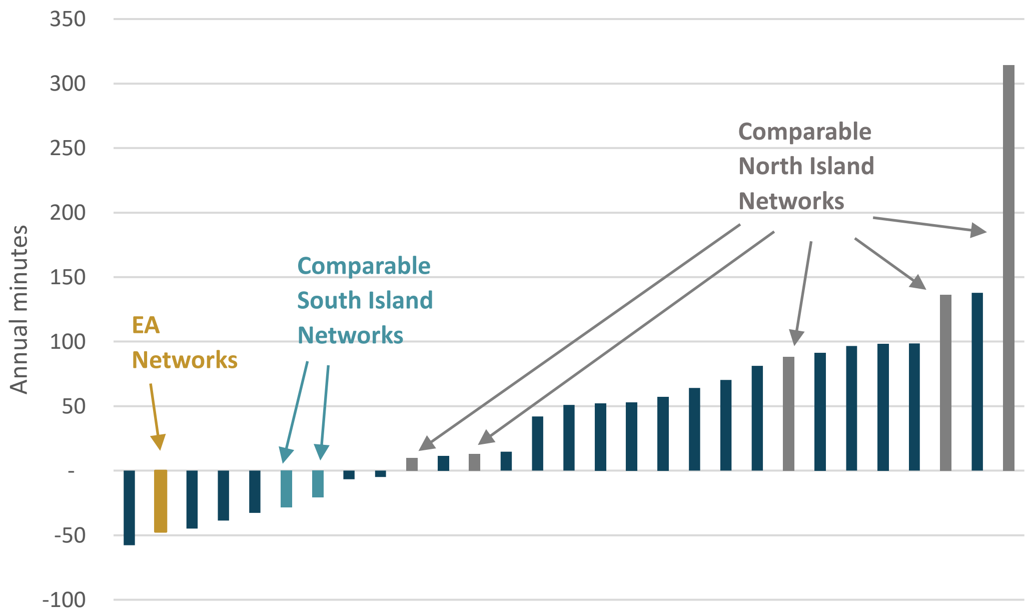
Figure 20: SAIDI - Unplanned interruptions on the network (minutes) – last 5 years, using alternative benchmark set



Source: Information Disclosures, sourced from the Commerce Commission's online spreadsheet summary.
Note: NI = North Island, SI = South Island

We also updated the comparison of the change in the average minutes of unplanned interruptions across networks for the period of readily available data (2008 to 2023). When looking at the difference between the first 5 years in the period and the last 5 years, we continue to find that EA Networks achieved a greater improvement in reliability than all of the benchmark networks.

Figure 21: Change in SAIDI - Unplanned interruptions on the network (minutes), difference between the average from 2008 to 2012 and the average from 2019 to 2023, using alternative benchmark set

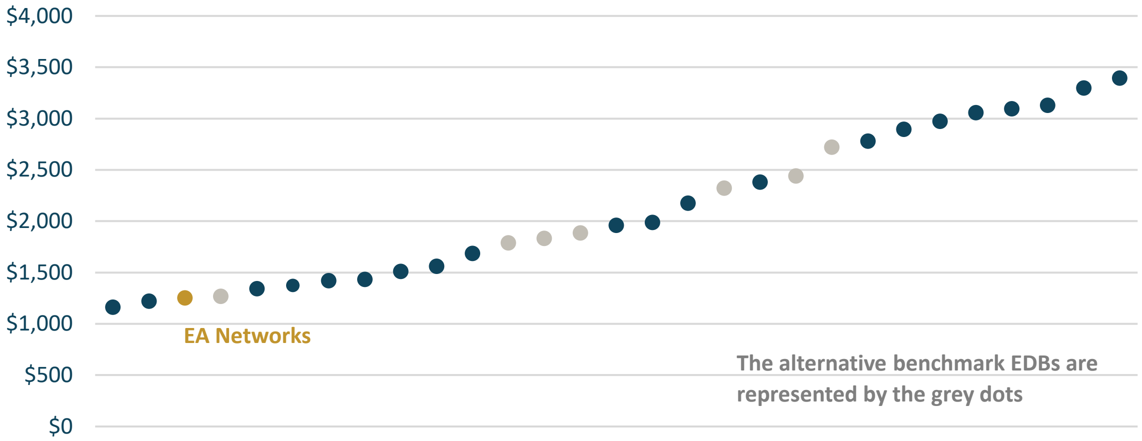


Source: Information Disclosures, sourced from the Commerce Commission's online spreadsheet summaries.

Cost and price comparisons

We next updated the charts that examined the unit costs of network and non-network operating costs. When using the alternative set of benchmark networks, we continue to find that EA Networks' network operating cost per km of circuit length is below the comparator networks.

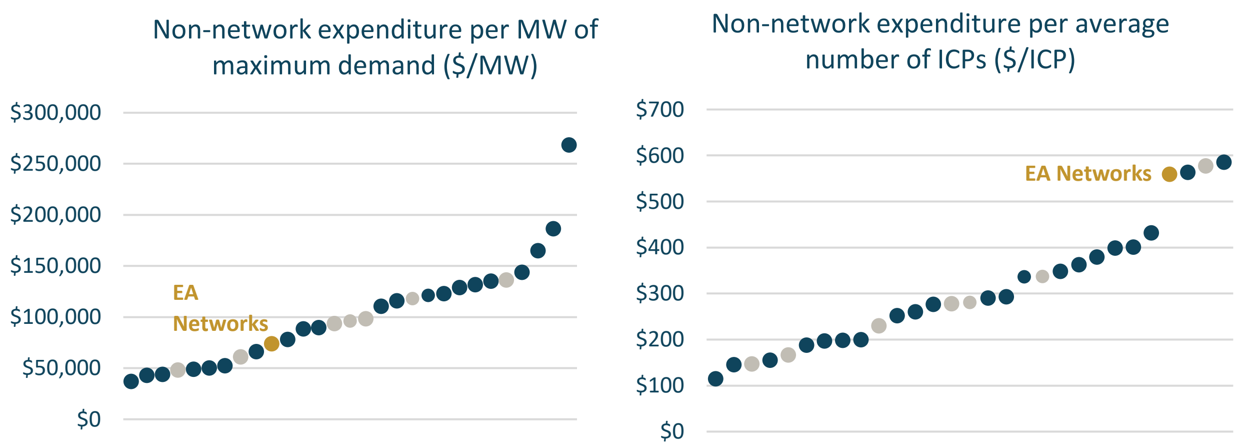
Figure 22: Network operating cost per km of circuit length ($/km), 2023, using alternative benchmark set



Source: 2023 Information Disclosures

Turning to non-network costs, when expressed as dollars per MW of maximum demand, the average unit cost of the alternative benchmark set is lower than that of the benchmark set used in the main body of our report. However, EA Networks continues to compare well, falling in the lower half of the set of alternative benchmark EDBs. When non-network cost is unitised by the number of ICPs, EA Networks continues to be near the upper end of the alternative benchmark networks (though one other benchmark EDBs is at a similar level). However, as noted in the main body of this report, this result appears to reflect the type of connections served by EA Networks, with a lower proportion of its connections being residential than many other networks.

Figure 23: Non-network operating cost, 2023, using alternative benchmark set

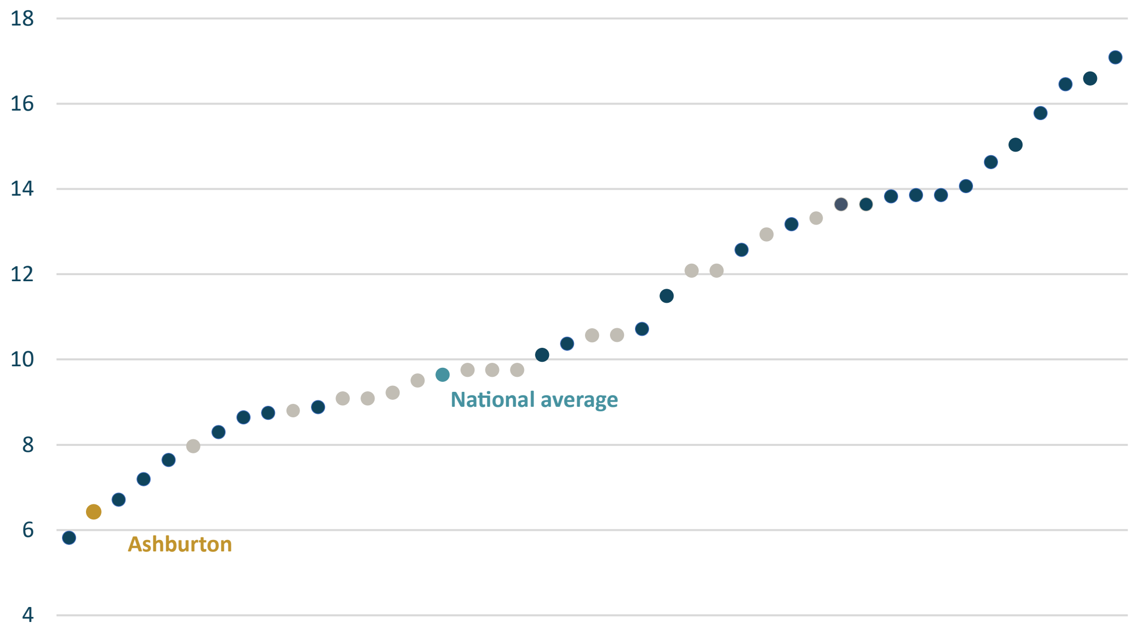


Source: 2023 Information Disclosures

Note: The grey dots in these charts represent the alternative benchmark EDBs.

With regard to distribution pricing for residential connections, the alternative benchmark sample has lower average prices than the benchmark sample used in the main body of this report. However, the average price for Ashburton continues to be cheaper than all benchmark EDBs.

Figure 24: Distribution component of electricity price for residential consumers (15 February 2024), cents per kWh, using alternative benchmark set



Source: MBIE Quarterly Survey of Domestic Electricity Prices

Note: The grey dots in this chart represent the alternative benchmark EDBs.

Disclaimer

Although every effort has been made to ensure the accuracy of the material and the integrity of the analysis presented in this report, Link Economics Ltd accepts no liability for any actions taken based on the report's contents.

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