



B.29 [17i]

Managing the assets that distribute electricity



Photo acknowledgement:
mychillybin © Thysje Arthur

Managing the assets that distribute electricity

Presented to the House of
Representatives under section 20 of
the Public Audit Act 2001.

June 2017

ISBN 978-0-478-44267-0

Contents

Overview	3
Part 1 – Introduction	5
The structure of this report	7
Part 2 – The financial health of electricity distribution businesses	8
Our summary of the financial health of electricity distribution businesses	8
Our approach to reviewing the financial health of electricity distribution businesses	9
The income of electricity distribution businesses is increasing	12
What levels of profits and returns are electricity distribution businesses achieving?	13
Net debt levels are low	14
Electricity distribution businesses are reinvesting in their core business	14
Part 3 – Asset management capability	17
Governance of asset management	17
Resourcing of asset management	18
Risk management	19
Part 4 – Asset knowledge, maintenance strategies, and resilience	21
What the three companies know about their assets	21
Maintenance and replacement work programmes	23
Resilience of networks	27
Part 5 – Network adaptability	29
Planning to accommodate technology changes	29
Appendix – Background information on the three companies we considered	31
Figures	
1 – Location and overview of Alpine Energy Limited, Unison Networks Limited, and Waipa Networks Limited	6
2 – Main consolidated financial information for 26 electricity distribution businesses, 2011/12 to 2015/16	11
3 – Electricity distribution businesses' regulatory results, 2011/12 to 2015/16	12
4 – Electricity distribution businesses' reported returns on income, and dividends and discounts as a proportion of income, 2011/12 to 2015/16	13
5 – Reported returns on income, and dividends and discounts as a proportion of income, by ownership type, 2011/12 to 2015/16	14
6 – Capital expenditure as a percentage of the regulatory asset base, 2012/13 to 2015/16	15
7 – Forecast maintenance and replacement expenditure in constant dollars	25

Overview

Electricity distribution businesses own networks that distribute electricity throughout New Zealand. It is important that they manage their networks well to ensure a safe and reliable supply of electricity to their consumers, now and in the future.

Electricity distribution businesses face a challenging future. It is important that they:

- recruit the right staff, or have in place the right resources, to manage assets effectively and improve asset management techniques;
- maintain resilient networks that can withstand extreme events and natural disasters; and
- respond to emerging technologies that are beginning to affect the networks.

My Office looked at how electricity distribution businesses were managing, maintaining, and investing in their networks to ensure that they could provide services to consumers for the long term.

We considered this in two ways. First, we analysed publicly available financial information of all electricity distribution businesses. Our analysis shows that electricity distribution businesses, as a whole, are generating a commercial return and enabling dividends to their owners. The businesses as a whole also maintain low levels of debt.

Secondly, we reviewed the asset management practices of three electricity distribution businesses. We chose Alpine Energy Limited, Unison Networks Limited, and Waipa Networks Limited (the three companies) because they are different sizes, have different ownership structures, and are located in different parts of New Zealand. Although we reviewed the practices of three companies, we encourage all electricity distribution businesses to consider whether our findings also apply to them.

Examining the asset management practices of the three companies, we found some effective practices that are well described in their asset management plans. In particular, the three companies have adequate base asset knowledge, and there are appropriate initiatives to improve network resilience and ensure continuity of supply.

However, there is room for improvement. Electricity distribution businesses own assets with long useful lives, and we expect them to understand the financial effects of maintaining and replacing these assets for a substantial portion of the assets' life. Instead, the three companies' focus was largely on the short term. With a longer-term focus, the three companies can make better-informed decisions about how to manage their networks.

Improving knowledge of asset condition, performance of critical assets, and risk management strategies would complement the asset management practices that we observed. These are fundamental for electricity distribution businesses as their networks continue to expand and new technologies emerge.

I thank staff from Alpine Energy Limited, Unison Networks Limited, and Waipa Networks Limited for their help and co-operation during our audit.

A handwritten signature in black ink, consisting of a large, stylized 'G' followed by a horizontal line with a small flourish at the end.

Greg Schollum
Deputy Controller and Auditor-General

13 June 2017

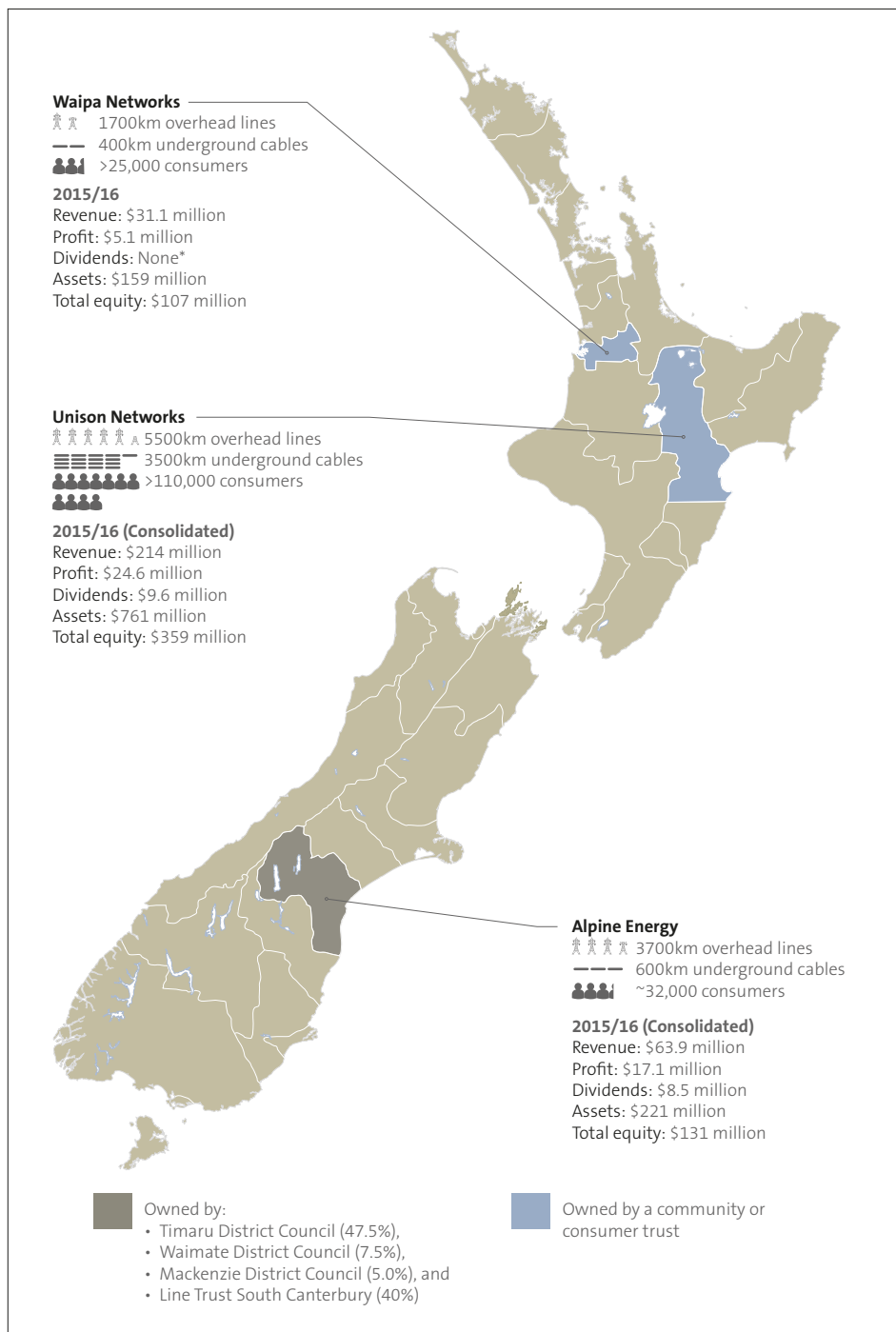
Introduction

- 1.1 The energy sector in New Zealand is diverse and made up of a mixture of public and private entities. Most of the public entities in the energy sector are electricity distribution businesses responsible for distributing electricity to consumers.
- 1.2 In June 2016, we released a report on the results of 2014/15 energy sector audits.¹ The report outlined the trends we saw from the audits of electricity distribution businesses. We emphasised that electricity distribution businesses are asset-intensive entities that must plan and carry out effective asset management. Electricity networks require continuous replacement and upgrading to ensure a safe and reliable supply of power.
- 1.3 In this report, we examine the asset management practices of electricity distribution businesses. Although other organisations² have carried out some analysis of electricity distribution businesses' asset management plans, we have focused on how those plans are put into practice.
- 1.4 We wanted to look at how electricity distribution businesses were managing and maintaining their assets and, in particular, how they were investing in their networks to ensure that they could continue to deliver the services required.
- 1.5 We reviewed the asset management practices of three electricity distribution businesses (the three companies): Alpine Energy Limited (Alpine), Unison Networks Limited (Unison), and Waipa Networks Limited (Waipa). Figure 1 shows the locations and overviews of the three companies. Background information about each company is in the Appendix. We chose these companies after considering the financial information prepared by all electricity distribution businesses. We also looked at other information, such as who owns the businesses and where they are located. Although we reviewed the practices of only three companies, we encourage all electricity distribution businesses to consider whether our findings also apply to them.
- 1.6 We focused on three aspects of asset management:
 - Entity capability:
 - how the three companies govern the management of their network assets;
 - the three companies' resourcing strategies for asset management and their approaches to training and developing staff; and
 - the risk management strategies and formal reporting about risks.
 - Asset knowledge, maintenance strategies, and resilience:
 - how well the three companies understand the distribution assets they own and the condition and performance of these assets;

1 Office of the Auditor-General (2016), *Energy sector: Results of the 2014/15 audits*, Wellington.

2 Most notably, the Commerce Commission carried out reviews of electricity distribution businesses' asset management plans to assess compliance with the Commission's expectations. The most recent review, for the 2011-21 asset management plans, is available on the Commission's website.

Figure 1
Location and overview of Alpine Energy Limited, Unison Networks Limited, and Waipa Networks Limited



* Although Waipa did not pay any dividends to its shareholders in 2015/16, it did provide \$4 million in line revenue discounts to individual customers.

- the approaches the three companies take to maintain and replace assets and the trends we saw from what they forecast in the short and long term; and
- how the three companies ensure that their networks are resilient.
- Network adaptability:
 - what the three companies are doing in response to changing technologies.

1.7 Our findings are based on interviews with staff and a review of documents, such as the three companies' asset management plans.

The structure of this report

1.8 Part 2 sets out our analysis of financial information prepared by electricity distribution businesses for the period 2011/12 to 2015/16. We describe what this tells us about their financial health and investments in their networks.

1.9 Part 3 examines the three companies' asset management capabilities.

1.10 Part 4 examines the three companies' asset knowledge, maintenance strategies, and network resilience.

1.11 Part 5 examines the three companies' network adaptability.

2

The financial health of electricity distribution businesses

- 2.1 In this Part, we outline the financial health of electricity distribution businesses as a whole based on publicly available financial information.³
- 2.2 Electricity distribution businesses vary significantly in size. Vector Limited and Powerco Limited are the largest companies by consumer coverage. In 2015/16, these two companies together earned more than 40% of consolidated sector income and owned more than 40% of consolidated sector assets.
- 2.3 There are 18 electricity distribution businesses that we refer to as trust-owned companies and they are fully owned by community or consumer trusts.⁴ The remaining 11 electricity distribution businesses we refer to as non-trust-owned companies. They have various owners, including a mix of community or consumer trusts that own some but not all shares, local authorities, other electricity distribution businesses, private interests, and the public (through co-operatives or being publicly listed). Non-trust-owned companies include Vector Limited⁵ and Powerco Limited, so they are a bigger group (in regards to revenue and customer numbers) than the trust-owned companies.

Our summary of the financial health of electricity distribution businesses

- 2.4 We have not identified any significant concerns with the financial health of electricity distribution businesses as a whole. The core distribution business is profitable. More widely, electricity distribution businesses have provided double-digit profits and dividends and discounts as a proportion of income in each financial year since 2011/12. Electricity distribution businesses have relatively low levels of debt, which means that they have the financial flexibility to respond to unexpected changes in the short term.
- 2.5 Electricity distribution businesses as a whole continue to invest in their networks throughout the country. The level of investment means that electricity distribution businesses are maintaining the average age of the networks, which should help to provide a reliable supply of electricity to consumers in the future.

³ We audit only 20 of the 29 electricity distribution businesses. However, to adequately discuss the financial health of the sector, our analysis covers public and private electricity distribution businesses.

⁴ These are: Buller Electricity Limited, Centralines Limited, Counties Power Limited, Eastland Network Limited, Electra Limited, MainPower New Zealand Limited, Marlborough Lines Limited, Network Tasman Limited, Network Waitaki Limited, Northpower Limited, Scanpower Limited, The Lines Company Limited, The Power Company Limited, Top Energy Limited, Unison Networks Limited, Waipa Networks Limited, WEL Networks Limited, and Westpower Limited. In July 2015, Eastern Bay Energy Trust became the sole shareholder of Horizon Energy Distribution Limited. We have not included Horizon Energy Distribution Limited in this subcategory because for other years it was not fully trust-owned.

⁵ Entrust, a community trust, owns 75.1% of Vector Limited. Because it is not fully owned by the community trust, we have included Vector Limited in our category of non-trust-owned companies.

- 2.6 However, the networks of four individual electricity distribution businesses appear to be getting older, which could mean additional expenditure in the future to maintain their operations.
- 2.7 Another risk in operating ageing networks include an increased risk of asset failure, which might reduce the likelihood of a reliable power supply. Ageing networks could also pose a health and safety risk to employees and the wider community.
- 2.8 Electricity distribution businesses with ageing networks may need to factor increases for future maintenance and capital expenditure into their budgets (see Part 4).
- 2.9 We encourage all electricity distribution businesses to consider whether they are adequately identifying and managing the risks associated with ageing networks.

Our approach to reviewing the financial health of electricity distribution businesses

- 2.10 To assess the financial health of all electricity distribution businesses, we started with audited annual financial statements. In our analysis, we looked at:
- what the electricity distribution businesses' income and profits are, and whether they are increasing compared with previous years;
 - the amount of dividends and community discounts the electricity distribution businesses made and how they compared with previous years; and
 - how much debt electricity distribution businesses have and whether the debt is becoming difficult to manage.
- 2.11 Because we are looking at asset management, we also wanted to understand how much electricity distribution businesses' main assets (the core distribution network) were worth, and how much was being reinvested in these assets.
- 2.12 It is important to note that financial health is only one measure of an electricity distribution businesses' performance. Many electricity distribution businesses will look beyond traditional measures of profit and return on investments to include safety, environmental, and social aspects. Although these are important, we have not commented on them except for the three companies we look at in Parts 3 to 5.

- 2.13 There were limitations to how we could use the audited financial results in analysing the information from electricity distribution businesses because reporting can vary:
- We used the consolidated results. We would have preferred to analyse the parent-only results because our focus for this report is on the core distribution business. However, parent-only results were not available for every financial year we considered. From 2014/15, companies have had the option to report only consolidated financial statements.⁶ Several electricity distribution businesses took advantage of this option in 2014/15 and 2015/16.
 - Electricity distribution businesses do not have a common balance date so the financial results we analysed cover different time periods. Some companies also changed their balance dates during the period we reviewed, which meant some results were reported for nine months or 15 months.
 - Financial reporting standards allow entities to value an item of property, plant, and equipment at either cost or fair value.⁷ Individual electricity distribution businesses can use either approach, which reduces comparability.
- 2.14 Because of the differences in the audited financial results, we also analysed the information that electricity distribution businesses prepare to comply with the Commerce Commission's *Electricity Distribution Information Disclosure Determination*⁸ (the Determination).
- 2.15 The Determination sets rules for the financial information disclosed by electricity distribution businesses, including setting the end of the financial year as 31 March. The Commerce Commission also requires the information disclosed to be audited and made available to the public. These rules make the information comparable for all electricity distribution businesses.
- 2.16 When we refer to the financial results of the core business, we mean the financial information prepared in accordance with the Determination.

6 Up until the 2014/15 financial year, companies with subsidiaries were required by the Financial Reporting Act 1993 to include both parent and group figures in their financial statements. This Act was repealed from 1 April 2014, and companies with subsidiaries were no longer required to include parent figures in their financial statements.

7 External Reporting Board (2015), *New Zealand Equivalent to International Financial Reporting Standard 16: Property, Plant and Equipment* (NZ IAS 16), Wellington.

8 Commerce Commission (2015) *Electricity Distribution Information Disclosure Determination 2012* (consolidated in 2015).

Consolidated financial results of electricity distribution businesses

2.17 We derived and analysed the consolidated financial information of 26 electricity distribution businesses for the 2011/12 to 2015/16 financial years.⁹ Consolidated financial information includes the wider business, not just the results related to the core network for which electricity distribution businesses' returns are set. There were limitations to how we could extract information (see paragraph 2.13). Additionally, we reviewed regulatory financial information for the same time period (see paragraph 2.20). Figure 2 summarises the main consolidated financial information from our analysis of electricity distribution businesses.

Figure 2
Main consolidated financial information for 26 electricity distribution businesses, 2011/12 to 2015/16

	2011/12 \$m	2012/13 \$m	2013/14 \$m	2014/15 \$m	2015/16 \$m
Total income	3,196	3,588	3,742	4,080	4,193
Profit after tax	415	467	486	463	635
Dividends paid	281	297	296	316	337
Community discounts paid	87	91	94	94	99
<i>Total dividends and discounts</i>	<i>368</i>	<i>388</i>	<i>390</i>	<i>410</i>	<i>436</i>
Property, plant, and equipment	11,006	11,392	11,867	12,324	12,308
Total assets	13,719	14,093	14,692	15,544	15,717
Net debt*	4,392	4,435	4,646	5,315	5,019
Total liabilities	7,137	7,293	7,541	8,245	8,177
Total equity	6,582	6,800	7,151	7,299	7,540

Note: Electricity distribution businesses use either a 31 March or a 30 June year-end for financial reporting purposes. We have made no adjustment for the different financial year-ends in the table above.

* We calculated net debt as all recognised external debt, finance lease liabilities, and bank overdrafts, less financial investment assets such as cash and cash equivalents and term deposits.

Financial results of the core business

2.18 The Determination requires electricity distribution businesses to disclose financial performance and regulatory asset information. Regulatory assets are made up of property, plant, and equipment that are related to the core distribution business. The financial information is prepared under regulatory rules that draw on generally accepted accounting practice. The regulatory rules are set out in the Commerce Commission's *Electricity Distribution Services Input Methodologies Determination 2012*.

⁹ Wellington Electricity Lines Limited's financial statements are not publicly available. Additionally, Nelson Electricity Limited and OtagoNet Joint Venture are owned by other electricity distribution businesses. Because the results of these entities are reported in their owner's financial statements, we did not separately include them.

- 2.19 The regulatory rules set a common revaluation policy for regulatory assets and a common capital structure when calculating the regulatory financial results. The revaluation policy requires all assets to be revalued each year in line with movements in the consumer price index. The regulatory rules assume a level of debt to assets of 44%.¹⁰
- 2.20 Figure 3 sets out the regulatory financial performance of all 29 electricity distribution core businesses from 2011/12 to 2015/16.¹¹ The Determination does not require the disclosure of financial information that includes distributions to owners, liabilities, and equity.

Figure 3
Electricity distribution businesses' regulatory results, 2011/12 to 2015/16

	2011/12 \$m	2012/13 \$m	2013/14 \$m	2014/15 \$m	2015/16 \$m
Regulatory income	2,089	2,252	2,280	2,493	2,488
Regulatory profit after tax	372	373	392	395	411
Regulatory asset base (property, plant, and equipment)	9,390	9,637	9,985	10,253	10,554

- 2.21 Trust-owned companies are a smaller proportion (both in terms of revenue and customer numbers) of all electricity distribution businesses, making up about 33% of total regulatory income in 2015/16.

The income of electricity distribution businesses is increasing

- 2.22 As can be seen in Figure 2, the income of electricity distribution businesses as a whole increased by 31% to just under \$4.2 billion from 2011/12 to 2015/16. In our view, there are two main reasons for this. First, electricity distribution businesses increased prices. This was to reflect price increases from Transpower Limited and to cover the cost of reinvestment in the core business, such as to accommodate growth in customers. When focusing on the core business, regulatory income increased by 19% from 2011/12 to 2015/16. Secondly, electricity distribution businesses as a whole continued to increase their unregulated businesses, such as contracting revenue. Because electricity distribution businesses are not consistent in how they disclose their income, we cannot provide any further analysis of this increase.

¹⁰ Commerce Commission (2015), *Electricity Distribution Services Input Methodologies Determination 2012*, page 61.

¹¹ For consistency purposes, we have analysed only regulatory information prepared in accordance with the Determination.

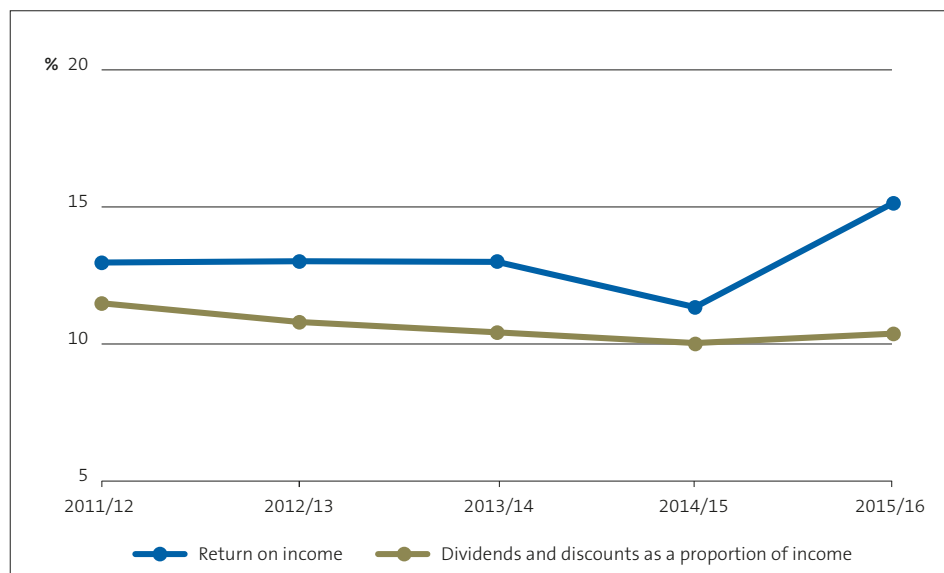
2.23 We considered whether there was a difference in revenue growth between trust-owned and non-trust-owned companies. Trust-owned companies' regulatory income has increased at a faster rate (25%) than that of non-trust-owned companies (16%). One reason for this is because 12 of the 18 trust-owned companies are not subject to regulatory price control and can increase prices at a faster rate than non-trust-owned companies.

What levels of profits and returns are electricity distribution businesses achieving?

2.24 Electricity distribution businesses as a whole recognised \$2.5 billion in profits after tax and distributed \$2.0 billion during the five years (see Figure 2).

2.25 Figure 4 shows profits and dividends and discounts as a proportion of income for electricity distribution businesses as a whole.¹² The increase in 2015/16 followed Vector Limited's sale of some of its gas distribution interests, which resulted in a \$164.1 million gain.

Figure 4
Electricity distribution businesses' reported returns on income, and dividends and discounts as a proportion of income, 2011/12 to 2015/16

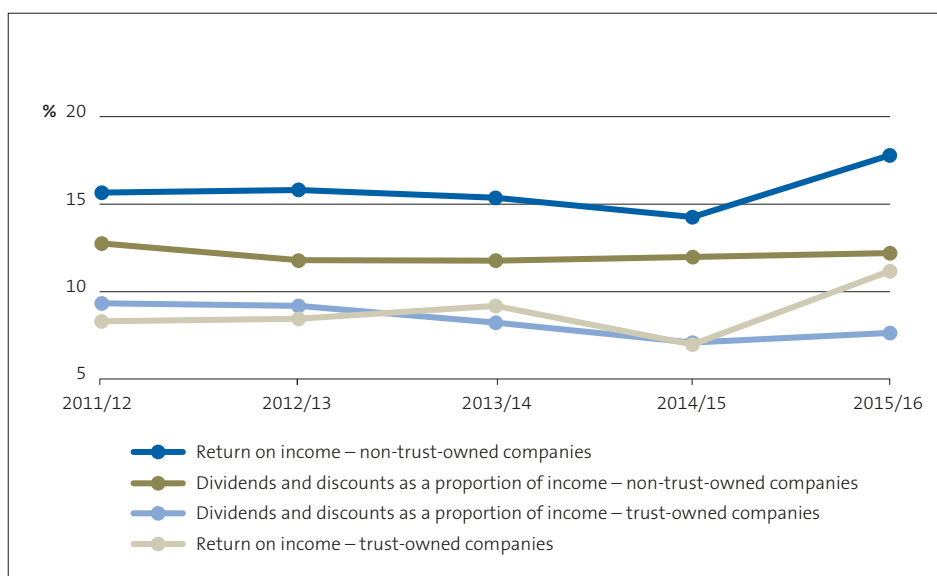


2.26 Figure 5 compares the “return on income” and “dividends and discounts as a proportion of income” of trust-owned companies with other non-trust-owned

¹² We compared profits and distributions to income rather than another metric such as equity, to allow us to do the same analysis when using the regulatory information. The Determination does not require the calculation or disclosure of an equity balance.

companies. During the five-year period, trust-owned companies made lower returns and distributed less compared with non-trust-owned companies.

Figure 5
Reported returns on income, and dividends and discounts as a proportion of income, by ownership type, 2011/12 to 2015/16



Net debt levels are low

- 2.27 As a whole, electricity distribution businesses have relatively low net debt levels, ranging between 32% and 35% of total assets during the period we reviewed. For individual electricity distribution businesses, net debt levels at the end of 2015/16 ranged from -14% (where the electricity distribution business recognised no debt but did have cash and cash equivalents) to 58%.
- 2.28 The amount of debt held by electricity distribution businesses differs by ownership type. Trust-owned companies' net debt was low, about 22% of total assets by 2015/16. In comparison, non-trust-owned companies had net debt of about 39%.

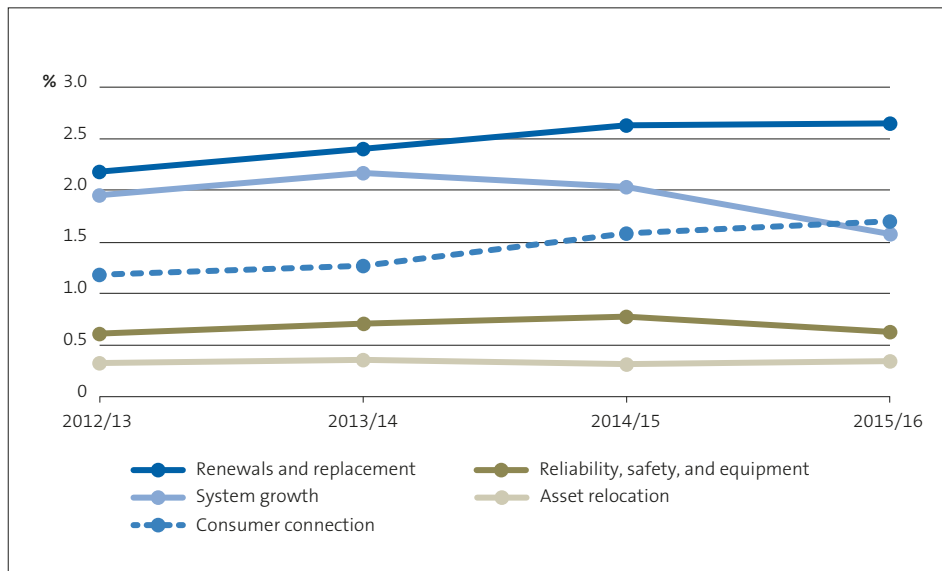
Electricity distribution businesses are reinvesting in their core business

- 2.29 Electricity distribution businesses as a whole continue to invest in their networks (the regulatory asset base). Since 2011/12, the regulatory asset base increased 12% to \$10.6 billion. About 25% of this increase relates to the annual revaluation of assets and the remaining 75% relates to capital expenditure on the networks.

- 2.30 Network investment includes:¹³
- new assets to cater for new connections or system growth;
 - expenditure to relocate assets (for example, putting overhead lines underground);
 - expenditure to improve the reliability and safety of the networks; and
 - the renewal and replacement of assets.

2.31 Figure 6 outlines the capital expenditure as a percentage of the regulatory asset base.¹⁴ Electricity distribution businesses as a whole spent the largest amount on renewing the networks. A significant amount of expenditure was also incurred from connecting new consumers and catering for system growth. When we analysed the results by owner, the network investment made by electricity distribution businesses does not show any other significant trends.

Figure 6
Capital expenditure for all electricity distribution businesses as a percentage of the regulatory asset base, 2012/13 to 2015/16



13 These are categories that the Commerce Commission defines in the *Electricity Distribution Information Disclosure Determination 2012* (consolidated in 2015).

14 We can analyse this information only for the years 2012/13 to 2015/16. Electricity distribution businesses were not required to disclose this information for 2011/12.

- 2.32 We expect electricity distribution businesses to maintain the average age of the overall network. Based on information that electricity distribution businesses have disclosed about the age of their networks, they, as a whole, have maintained the age of the overall network at around one-third of its expected useful life since 2012/13. Maintaining the networks in this way should help to ensure a reliable supply of electricity throughout the country.
- 2.33 However, the age of some networks increased during the four-year period.¹⁵ These electricity distribution businesses will need to ensure that this increase in the average age of their networks does not adversely affect the quality of their service.

¹⁵ Greater than one-year increases included: Aurora Energy Limited (from 17.6 years in 2012/13 to 19 years in 2015/16), Electricity Ashburton Limited (8.1 to 9.8), Wellington Electricity Lines Limited (25.7 to 28.4), and Westpower Limited (16.6 to 18.1).

Asset management capability

3.1 We reviewed the asset management practices of Alpine, Unison, and Waipa. In this Part, we consider the three companies’:

- governance of asset management;
- resourcing of asset management; and
- risk management.

Governance of asset management

3.2 Governance practices are fundamental to the effective operations of any entity. We looked at how the three companies govern how their network assets are managed. We expected:

- the boards of directors of the three companies to be involved in strategic and long-term planning and to receive regular reports about the performance of their networks (directors need to be involved in the planning and monitoring of an electricity distribution businesses’ core business – in this case, operating their networks); and
- the three companies’ investments in subsidiary or associated companies, particularly in emerging technologies, to not affect the “business-as-usual” ongoing management of their networks. We have previously noted that electricity distribution businesses are making more investments that are not central to their operations.¹⁶ Therefore, we looked at how boards of directors were ensuring that:
 - management resources were not diverted or spread too thinly; and
 - investment risk was being managed.

3.3 Governance practices are a focus of our annual audits of financial statements. We have previously reported that our annual audits did not identify any significant governance issues in electricity distribution businesses.¹⁷ However, we encourage all electricity distribution businesses to be vigilant in their standards of governance, especially in applying appropriate levels of scepticism when evaluating information from management.

Governance arrangements

3.4 The boards of directors of the three companies are involved, to different extents, in planning the asset management strategies for their networks. Each board oversees asset management plans early in the strategic-planning process and scrutinises the budgets. We found that the boards regularly reviewed the performance of their respective networks, mainly through monthly reporting.

¹⁶ Office of the Auditor-General (2016), *Energy sector: Results of the 2014/15 audits*, Wellington, pages 19 to 23.

¹⁷ Office of the Auditor-General (2016), *Energy sector: Results of the 2014/15 audits*, Wellington, page 19.

- 3.5 There was a clear separation of management and governance roles in the three companies.

The effect of subsidiary investments on the management of the network

- 3.6 Managing subsidiary investments did not appear to distract from the three companies' governance and management of their networks. The Appendix summarises the corporate structures of the three companies and their company investments.
- 3.7 In some instances, the three companies' investment in subsidiary contracting companies may help to create close and complementary relationships that could improve the overall management of their networks. Unison's investment in ETEL Limited has given it the opportunity to operate better-performing transformers. Alpine's investment in Infratec Limited has provided it access to emerging technologies.
- 3.8 There are risks in non-core investments. Waipa does not expect a significant return on its fibre investment until at least 2020, and Infratec Limited is exposed to risk, particularly with its overseas operations. In our view, the three companies are appropriately recognising and managing these risks.

Resourcing of asset management

- 3.9 Effective asset management can happen only if an entity has the right resources in place. We expected the three companies to:
- appropriately resource their asset management teams and manage any identified staff shortages or skill-set requirements; and
 - provide appropriate training and development of staff.

Resourcing strategies

- 3.10 The three companies have resourcing strategies in place, which are specific to their organisation and tailored to their size. The Appendix summarises the approach that each company takes. The three companies use external contractors to manage any gaps that they identified in their staff levels.
- 3.11 The three companies' resourcing strategies allow them to prepare their asset management plans in-house. Underpinning the asset management plan are various systems and procedures, which have been devised by staff and external contractors.

- 3.12 All electricity distribution businesses recognise a need in the future for more data technicians and business analysts to complement the traditional engineering and electrician roles. Because New Zealand is a relatively small country, we expect that finding more data technicians and business analysts could be a challenge for many electricity distribution businesses. This is something that electricity distribution businesses, possibly collectively, might need to consider and manage.

Staff training and development

- 3.13 The three companies have processes to ensure that their staff are adequately trained. They also work to maintain the number of staff required in a particular area. For example, Unison has an employment programme to train graduates in professional asset management and engineering. Waipa has introduced an internal secondment programme to increase the number of staff in network management.
- 3.14 The three companies have plans in place to manage the training needs that they have identified. For example, Waipa noted that it needed to provide staff training to properly maintain a new type of asset it had recently installed on its distribution network.
- 3.15 We were told that staff employed by contracted businesses might not be familiar with asset management concepts and strategies. Each company needs to consider whether these staff need more training to understand the links between strategic asset management and work in the field. We consider it encouraging that the three companies are aware that they need to address this through training. We encourage the three companies to put in place processes that are designed to ensure that the work of contracting and maintenance personnel is fully in line with each company's asset management direction and strategies.

Risk management

- 3.16 Risk management is an important foundation for effective asset management. The overall purpose of risk management is to understand the cause, effect, and likelihood of adverse events occurring and to mitigate these risks to an acceptable level. There are widely used standards that set out how the entity identifies and assesses asset- and asset-management-related risks.
- 3.17 Identifying risks at an asset level is necessary when deciding whether to intervene in the management of assets. This is important regardless of whether the decision is about maintaining or replacing an asset.

- 3.18 We expected the three companies to have integrated risk management strategies and to report risks and their treatment to relevant levels of management and then to the board of directors.
- 3.19 Alpine and Unison based their approach to risk on the Australian/New Zealand Standard, *Risk Management – Principles and guidelines*.¹⁸ However, the comprehensiveness of their approaches differed:
- Unison had the most sophisticated approach to risk management. Unison has risk streams for operational and corporate matters, including asset management. Unison’s resources in risk management include an experienced risk manager and designated “risk champions” to oversee the risk strategies in each business unit. Risks are reported to specialised committees. These committees report twice-yearly to the Audit and Risk Committee.
 - Alpine improved its approach to risk during 2015 and 2016. In 2015, Alpine approved an updated risk management policy, which focuses on health and safety, network risk matrix, and corporate risks. Critical risks are reported to the chief executive officer and the Audit and Risk Committee.
- 3.20 Waipa’s risk management is in the early stages of development. Its policy currently focuses on health and safety, natural disasters, and supply to critical customers. Risks are reported annually to the board of directors.
- 3.21 The three companies are aware that they need to improve their risk management efforts. We commend each company for recognising this.
- 3.22 Unison’s intended improvements come from a reasonably advanced platform. Unison intends to pursue a granular approach to network risks that may result in thousands of assets being plotted on risk graphs. One of the challenges for Unison in making this improvement will be to ensure that its granular approach does not become so detailed that it loses sight of the bigger picture.
- 3.23 Both Alpine and Waipa acknowledge that they can achieve improvements through appropriate reporting to management and their boards of directors. Alpine and Waipa are currently investigating what these improvements could be. Better reporting of risks will enable more informed decisions about the management of assets. We urge Alpine and Waipa to prioritise investigating and implementing improvements to their reporting regimes.

Asset knowledge, maintenance strategies, and resilience

- 4.1 In this Part, we consider:
- what the three companies know about their assets;
 - what maintenance and replacement work programmes the three companies have in place; and
 - how the three companies are ensuring that their networks are resilient.

What the three companies know about their assets

- 4.2 It is important that electricity distribution businesses have up-to-date knowledge of their assets, especially their condition and performance. This is necessary to make informed decisions about whether to inspect, repair, or replace an asset. We do not expect electricity distribution businesses to have information about every asset they own because this would be too costly. However, they need to have comprehensive information on critical assets in their networks and general information on their other assets.
- 4.3 We expected all electricity distribution businesses to have comprehensive knowledge of:
- information, such as location and age, and detailed descriptions of critical asset components; and
 - the condition and performance of network assets.
- 4.4 Electricity distribution businesses also need to continually monitor the information they have to ensure that it remains current and is used to inform asset management decisions.
- 4.5 We considered the extent of the three companies' information about their network assets. We did not enquire about non-network assets, such as vehicles and office equipment.
- 4.6 Network asset information is usually held in asset databases and geographic information systems.¹⁹ Information about the condition and performance of assets is usually based on inspections.
- 4.7 The three companies had databases and systems that recorded basic attribute information about their network assets. Each company had age profiles of their major asset categories. However, Waipa had to make assumptions about the age of some assets because the source information was not available. Many entities that own infrastructure assets take this approach.

¹⁹ Geographic information systems provide network asset data, location, and connectivity information.

- 4.8 Although the three companies reported on the condition of their assets, there were differences in how this information was collected and the extent of reporting. Unison had the most extensive condition information and had analysed many of its asset classes in detail. In comparison, Waipa last completed an asset condition assessment in 2006. Waipa began a further cycle of condition assessments in 2010/11 and it is expected to take eight years. Although the level of detail varied in each company, this is not unreasonable. We expect companies to take account of their specific circumstances when considering what information they collect and hold about their assets.
- 4.9 Two of the companies told us that they have made changes to improve the accuracy of asset knowledge:
- Alpine had selected a new enterprise-wide asset and financial management system, which should help Alpine meet its advanced asset management needs. Under this system, condition information will be easier to obtain for individual assets. The system was due to be implemented from April 2017, but it will be some time before the benefits are fully realised. Unison was also investigating the benefits of an enterprise-wide information system.
 - Unison was focusing on improving its knowledge of asset condition. A condition-based risk maintenance analysis technique was being put in place, and will be integrated into a tool called Condition Adjusted Survival Time. This assesses asset condition according to a 10-point scale rather than the less-detailed four-point scale.
 - New technologies are available to assist in condition assessments. Unison introduced sensors and real-time monitoring to be used alongside visual inspections of assets. There is also a new tool that can better estimate the remaining life of wooden poles. We commend the use of these new technologies in assessing asset condition.
- 4.10 The three companies need to continue to improve their understanding of the condition of main distribution assets. Unison and Alpine are actively planning improvements – on what information is collected and how information is recorded, respectively – to address where their information is not up to date. Waipa is part-way through a condition re-assessment exercise and will need to prioritise this work.

Maintenance and replacement work programmes

- 4.11 It is important to have maintenance and replacement strategies in place when managing assets. Not replacing assets at the right time might result in an unexpected failure. For an electricity distribution business, this could mean consumers not receiving electricity.
- 4.12 We expected the three companies to:
- have clear and defined maintenance strategies that separate planned and unplanned maintenance.²⁰ Differentiating between planned and unplanned maintenance is important because an increasing incidence of unplanned maintenance might indicate that their networks are deteriorating and becoming unreliable;
 - track, manage, and address any maintenance that has been deferred. Poor maintenance work can also affect how effectively an asset operates;
 - have identified a process or criteria to determine when assets should be replaced; and
 - apply consistent asset life policies.
- 4.13 We also wanted to understand the trends in maintenance and asset replacement expenditure for the three companies and their long- and short-term forecasts for maintenance and asset replacement.

Maintenance and replacement strategies

- 4.14 Each company had, in its asset management plans, a summarised maintenance strategy that differentiated between planned and unplanned maintenance.
- 4.15 However, none of the three companies had a complete list of maintenance task procedures for each type of maintenance job. Maintenance task procedures are an important part of best practice asset management. Task procedures, which usually include pictures and photos, show what is to be done, how it is to be done step by step, any health and safety and other risks, and what is to be documented.
- 4.16 None of the three companies had identified any significant maintenance that has been deferred. Instead, the three companies told us that they have carried over some maintenance projects from scheduled years because of the availability of contracting staff and the need for reassessments.
- 4.17 The three companies have processes and criteria to determine whether an asset should be replaced and to prioritise replacements. Although the sophistication and detail of the criteria varied between the three companies, the core considerations were age, performance, condition, safety, risk, and cost.

²⁰ Planned maintenance is any maintenance work to an asset or item of equipment that is scheduled regularly. Unplanned maintenance is corrective work required in the short term to restore an asset to working condition.

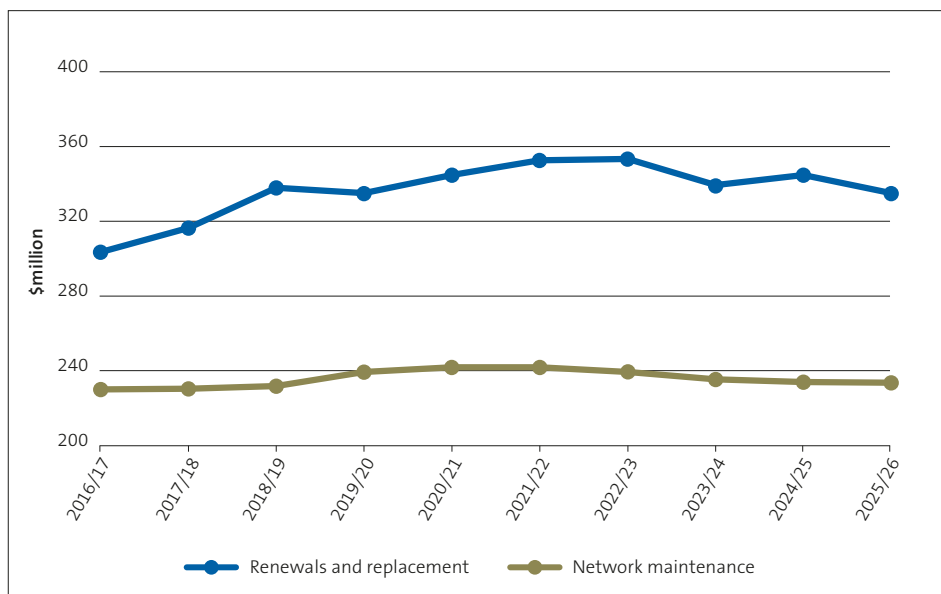
- 4.18 Unison has invested \$28 million over five years into its Smart Grid Initiative. The tools and processes, such as sensors and asset condition monitoring, enable improved monitoring of its network. Unison is also providing evidence to better determine the timing of maintenance and replacements. Unison's 2016-26 *Asset Management Plan* identifies expected benefits of more than \$18 million a year from 2020/21. Much of this comes from a delay in replacing equipment compared to an age-based replacement programme.
- 4.19 Of these considerations, age is becoming less of a factor in decisions about replacements. However, when using other factors to make a decision, some care needs to be taken to accurately estimate the timing of replacements.
- 4.20 Alpine and Waipa told us that robust, detailed, and up-to-date condition monitoring and risk assessments are still under way. Therefore, replacement forecasts based on those factors have a degree of uncertainty.

Maintenance and replacement expenditure trends

- 4.21 The three companies have maintained or decreased their operational and maintenance budgets for the period to 2025. None of the three companies forecast maintenance beyond the 10-year regulatory planning period.
- 4.22 The replacement forecasts to 2025 differed between the three companies. Waipa plans the same level of replacement in real-dollar terms. Alpine and Unison have more variability and have planned for particular replacement projects in certain years. However, none of the three companies have replacement forecasts that extend beyond 10 years.
- 4.23 We were surprised that maintenance and replacement forecasts did not extend beyond a 10-year period. Effective asset management planning includes life-cycle management strategies for all significant assets. Those strategies include maintenance and replacement estimates and general trends. Estimates should extend to the end of the projected lives of assets, which can be 50 years or more. Local authorities are now required to prepare infrastructure strategies that include projections for at least 30 years.
- 4.24 We were also surprised that there are no projected increases for maintenance and replacement in the forecasts. Companies told us that generally assets are lasting longer than the standard useful lives assigned to them. This might be true, but as these assets age they could require more maintenance. Networks are also expanding to accommodate new connections and construction projects. We question whether the maintenance associated with network growth is adequately factored into forecasts, especially without robust, detailed, and up-to-date condition monitoring.

- 4.25 In our view, life-cycle management strategies need to be forecast for more than 10 years. Life-cycle management is an important part of asset management, especially for long-life assets like those owned by electricity distribution businesses. This involves understanding the processes necessary to maintain the assets through their useful life and to dispose of, or replace, the asset at the end of their life.
- 4.26 Once an entity understands the maintenance and replacement needs, and how much they will cost throughout the asset life-cycle, it can make better decisions about managing and funding assets. None of the three companies are expecting a significant increase in maintenance and replacement costs in the 10 years to 2025/26. This is consistent with the expectations of electricity distribution businesses as a whole.
- 4.27 Figure 7 shows the forecast maintenance and replacement expenditure in constant dollars²¹ for the core business of all electricity distribution businesses from 2016/17 to 2025/26. Replacement expenditure is expected to increase, and electricity distribution businesses expect to spend about 10% more in 2025/26 compared with 2016/17. Forecast maintenance costs are generally unchanged.

Figure 7
Forecast maintenance and replacement expenditure in constant dollars



21. By “constant dollars”, we mean that the amounts are not inflation-adjusted.

- 4.28 We do not know whether the three companies, or electricity distribution businesses as a whole, could reach a “peak” of replacing assets after 2025/26.
- 4.29 The three companies need to do more work to understand the potential maintenance and replacement needs and costs for a longer time period. With this information, boards can make more informed decisions about asset management and associated funding.

Asset life policies

- 4.30 Based on the replacement forecasts, we found that, for many asset categories, assets are expected to last longer than the useful lives they are assigned for financial reporting and regulatory purposes. In our view, useful lives in asset management plans, and those assigned for financial reporting and regulatory purposes, need to reflect how long assets are actually being used. They should not differ.
- 4.31 There are also differences between the useful lives used for financial reporting and regulatory purposes.²² For the three companies:
- Alpine disclosed a useful life range of three to 100 years for its distribution system for financial reporting purposes. We estimated the average useful life recognised in 2015/16 was 48 years. This is the same as Alpine’s regulatory weighted average useful life.
 - Unison disclosed a useful life range of 10 to 80 years, and we estimated an average useful life in 2015/16 of 57 years. Unison’s regulatory weighted average useful life was 52 years.
 - Waipa sets its useful life at 40 years for financial reporting purposes, which compares with a regulatory weighted average useful life of 49 years.
- 4.32 We would not expect differences between the useful lives prepared for financial reporting and regulatory purposes. The useful lives recorded in the three companies’ systems also need to match what companies are experiencing in practice.
- 4.33 The three companies need to review their asset life policies and confirm that they are consistent with what they are experiencing in practice. Although asset life information may be becoming less important when making replacement decisions, more reliable performance and condition information is still being developed. As long as the three companies use asset age as a factor when making replacement decisions, accurate asset life information is needed. This will enable the companies to replace assets when they are needed.

²² For financial reporting purposes, useful lives of asset classes are usually expressed as a range (for example, between 50 and 60 years). By further analysing the financial statements, we can estimate the total useful life. The Determination requires electricity distribution businesses to disclose asset life information.

Resilience of networks

- 4.34 The main purpose of electricity distribution businesses is to manage their networks so they are capable of providing a reliable supply of electricity to their consumers. Electricity distribution businesses must ensure that their networks are resilient, so unexpected events and natural disasters do not cause communities to lose electricity supply for an unacceptably long time.
- 4.35 Electricity distribution businesses also need to understand current demand and accurately predict future demand to ensure that their networks can supply the electricity needed.
- 4.36 We looked at how the three companies ensured that their networks were resilient. We expected the three companies to:
- have plans in place to ensure that their networks were resilient; and
 - use systems to ensure that their networks can meet current demand and predict future demand.

Plans to manage network resilience

- 4.37 The three companies have plans to manage network resilience, with a focus on improving their resilience to natural disasters. These include strengthening buildings and holding off-site back-ups of their systems.
- 4.38 When we carried out our fieldwork, the three companies had recently experienced wind damage after storms. Resilience measures were adopted in response to this, including more vegetation control to reduce damage to overhead lines in high winds. Alpine and Waipa have significantly increased their budgets for vegetation control. Alpine also told us that it has put in place a policy that prohibits the use of soft wood poles for any new overhead line construction. Alpine has also started a programme to replace soft wood poles carrying high-voltage lines.
- 4.39 There is a balance between improving resilience and managing costs. A small increase in resilience may incur high costs, leading to increased line charges. The three companies are aware of the balance that is needed between resilience, risk, and cost. They are increasingly using analytical techniques to better manage this balance.

Demand management

- 4.40 Managing existing demands is a core activity for managing line networks. For example, ripple control allows electricity distribution businesses to switch off supply to consumers' hot water cylinders or irrigators to control demand.

- 4.41 The three companies have strategies to manage existing electricity demand and predict future demand. To predict demand, the three companies look to the overall yearly increases in demand as well as predicted peak demand. The three companies have estimated their future demand, but the depth and sophistication of assumptions and analysis varied between them. Of the three companies, Unison carried out the most extensive analysis.
- 4.42 Unison has introduced a load forecast tool that uses historical peak demands and key economic indicators to create a 20-year forecast. Unison also plans to introduce more nuanced approaches to analyse trends, such as segmental analysis of demographic data and more detailed long-term weather predictive data. Unison expects to use these initiatives to better manage asset performance and improve resilience.

Network adaptability

5.1 In this Part, we discuss what plans are in place to accommodate changing technologies.

Planning to accommodate technology changes

5.2 Examples of emerging technologies in the energy sector include:

- solar power and batteries;
- infrastructure for electric cars; and
- standby generators.

5.3 Emerging technologies could have two main effects on how the electricity industry operates in the future. First, new technologies could be disruptive to an established network because they would make managing a network from a centrally managed unified model to a distributed model more complicated.²³ For example, even if there is high solar power uptake by consumers, companies must still provide for peak load demand in their networks. The second effect is on the wider business. If consumers have more choices, then companies will have to consider what non-network tools and services they will provide. We expected the three companies to:

- have adopted strategies to accommodate, manage, or encourage the uptake of emerging technologies; and
- put in place any infrastructure or trial projects to assist in the uptake of emerging technologies.

5.4 The three companies are in locations where consumers are used to a traditional power supply. However, the three companies are aware of the types and nature of emerging technologies that could affect their businesses. The main elements of emerging technologies are the increasing use of solar power and batteries. There is a steady increase in the number of consumers using solar power, although this is from a low base. The companies are predicting that solar power use will not increase greatly in the next 10 years.

5.5 Electricity distribution businesses have been working together to respond to the emergence of new technologies. For example, they sponsor the Smart Grid Forum,²⁴ which has examined the effect of emerging technologies. The Electricity Networks Association has carried out modelling to examine how electricity networks would be affected by new technologies.

²³ In a distributed model, each consumer with solar power could potentially supply electricity to the network. With many more points of supply, the networks become more complex because the electricity distribution businesses cannot easily control all of these points.

²⁴ The Smart Grid Forum is made up of industry representatives, consumers, and other interested stakeholders.

- 5.6 The three companies are monitoring emerging technologies and acknowledge that, at some point, solar power and other technologies will be used more widely. However, they do not believe that solar power is economically viable at present.
- 5.7 Each company has been trialling emerging technologies. Alpine and Unison have installed solar panels and charging stations for electric vehicles. Waipa is planning a pilot project on solar and battery technology for a typical home. Alpine is also considering emerging technologies for a proposed high-power-demand dairy farm at the end of a lesser-strength distribution line. This could avoid or defer a costly investment in a new distribution line.
- 5.8 There are risks with emerging technologies. If the adoption of emerging technologies is faster than expected, the three companies may not have made the changes needed to their networks in time. This could lead to unexpected costs to quickly upgrade their networks. Scenario modelling done previously might need to be regularly reviewed as the pace of technological change continues to increase.
- 5.9 To address this risk, we encourage the three companies to continue working with others in the industry to prepare long-term technology scenarios and prepare responses to each scenario.

Appendix

Background information on the three companies we considered

Alpine Energy Limited

Alpine has a mixed ownership model of trust and local authority shareholdings. LineTrust South Canterbury (LineTrust) owns 40% of Alpine and represents consumers in the district of the former South Canterbury Electric Power Board. The remaining 60% is owned by three local authorities (Timaru District Council, 47.5%; Waimate District Council, 7.5%; and Mackenzie District Council, 5.0%). LineTrust pays 90% of its annual dividend to consumers.

Alpine has a wholly owned subsidiary, NETcon Limited (NETcon), which maintains the Alpine network. NETcon, in turn, owns Infratec Limited (Infratec), which specialises in end-to-end renewable energy. The same board of directors oversees Alpine and NETcon, and the Infratec board is made up of three Alpine board directors. Alpine also has investments in several smaller entities, including On Metering Limited (50% ownership), Rockgas Timaru Limited (50% ownership), and SmartCo Limited (14% ownership).

Alpine has a total workforce of 183 staff, 103 of whom are employed by NETcon. NETcon is the preferred supplier for maintenance and some replacement jobs. Alpine has recently restructured its network department, which specialises in key asset management tasks. Fourteen new staff have been appointed and, when we visited, there were new roles that still needed to be filled. Alpine has selected an enterprise-wide asset and financial management system to replace their current systems.

Unison Networks Limited

Unison is owned by the Hawke's Bay Power Consumers' Trust. The trust organises a return to consumers through yearly distributions and pays this out of the dividend received from Unison.

Unison has four wholly owned subsidiary companies: Unison Contracting Services Limited (UCSL), ETEL Limited (EDEL), Unison Insurance Limited, and Unison Fibre Limited. UCSL provides specialist contracting services, mainly to Unison. ETEL is a company that manufactures transformers. Unison has obtained services from ETEL in purchasing transformers and producing a transformer with higher specifications.

Unison employs 142 staff and UCSL, its wholly owned subsidiary, employs 220 staff. Unison employs a number of asset management specialists and also has business analysts heavily involved in asset management. UCSL carries out all maintenance work. To assist in planning, Unison is supplying UCSL with a three-year rolling maintenance job schedule.

Waipa Networks Limited

Waipa is owned by the Waipa Networks Trust. The company provides a discount to customers through six-monthly distributions. Waipa makes the distribution on behalf of its owner, Waipa Networks Trust.

Waipa does not own any subsidiaries but has recently invested substantially, through Waikato Networks Limited, in Ultrafast Fibre Limited. Waipa's investment was \$30.5 million as at 31 March 2016.

Waipa has 57 staff, who carry out most network asset management activities, network maintenance, and vegetation control. There have been recent changes in the senior management team, with the appointment of a new chief executive and a network manager.

As a smaller network, Waipa makes a greater use of external resources:

- Waipa's call centre is in Blenheim, and it outsources control room operations to WEL Networks Limited in Hamilton.
- Design services and major projects, such as the recently completed \$20 million 110kV transmission line, are outsourced.
- Historically, Waipa has used contractors to collect asset condition data.

About our publications

All available on our website

The Auditor-General's reports are available in HTML and PDF format on our website – www.oag.govt.nz. We also group reports (for example, by sector, by topic, and by year) to make it easier for you to find content of interest to you.

Our staff are also blogging about our work – see blog.oag.govt.nz.

Notification of new reports

We offer facilities on our website for people to be notified when new reports and public statements are added to the website. The home page has links to our RSS feed, Twitter account, Facebook page, and email subscribers service.

Sustainable publishing

The Office of the Auditor-General has a policy of sustainable publishing practices. This report is printed on environmentally responsible paper stocks manufactured under the environmental management system standard AS/NZS ISO 14001:2004 using Elemental Chlorine Free (ECF) pulp sourced from sustainable well-managed forests.

Processes for manufacture include use of vegetable-based inks and water-based sealants, with disposal and/or recycling of waste materials according to best business practices.

Office of the Auditor-General
PO Box 3928, Wellington 6140

Telephone: (04) 917 1500
Facsimile: (04) 917 1549

Email: reports@oag.govt.nz
Website: www.oag.govt.nz