POWERING OUR FUTURE

ASSET MANAGEMENT PLAN 2020 – 2030

Network Waitaki
Powering North Otago

WWW.NETWORKWAITAKI.CO.NZ

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POWERING NORTH OTAGO

01

INTRODUCTION

Welcome to our Asset Management Plan (AMP) for the planning period 1st April 2020 to 31st March 2030. As we provide an essential service to the communities we serve, it is vital that our electricity network meets the evolving needs of our consumers. Our AMP plays a central role in determining the appropriate levels of network planning and investment required to achieve this.

This chapter introduces the AMP and is structured as follows:

Executive summary: Explains our Asset Management approach and summarises the challenges and development ahead for us, including our Capital and Operational Expenditure Forecasts.

Purpose: explains the purpose and objectives of the AMP; the period and assets covered; the date it was approved by our Board of Directors (the Board); and the intended audience.

Key Themes and Initiatives: summarises the key themes and initiatives that have been outlined throughout the AMP.

Document Structure: an illustration of how the AMP is structured.

1.1 EXECUTIVE SUMMARY

1.1.1 Our approach to asset management

We view effective asset management as a continual cycle, with direction, planning, implementation, and review working together to improve our performance.

Our documentation such as the Strategic Plan, Asset Management Policy, Asset Management Strategy, and this AMP are all aligned with our corporate objectives. This alignment flows through to the delivery of the works program.

We have a single shareholder, the Waitaki Power Trust (the Trust), which holds the shares of NWL on behalf of the NWL consumers. The Trust has five elected trustees and appoints directors to the Board to carry out the governance function of the business.

We report monthly to the Board and quarterly to the Trust on our performance, including progress on the delivery of our works program.

Reliability of our network is of high importance to us and to our customers. Our customer surveys have revealed that the service attributes most highly valued are "*keeping the power on"* and *"getting the power back on if it goes off*". Maintaining and improving reliability is a focus whenever we consider asset management strategies. In the next few years we will be investigating measures that will enhance how we understand the reliability of the network and how we can influence it.

We are committed to ensuring that our network remains safe at all times and seek to actively manage risks to the public, public property, and our staff. To facilitate this, we are focused on continuing to foster a positive safety environment for staff and the public.

To manage the risk associated with operating an electricity network we have a robust risk management system, based on *ISO31000 - Risk management*. This has allowed us to incorporate risk management across the entire business from strategic planning through to daily activities such as fault responses. Our treatment of risk includes planning for major events and working with other local authorities through activities such as our involvement in Civil Defence and Emergency Management to align our response planning.

To keep the public safe, we operate a Public Safety Management System (PSMS) which is audited to the national standard, NZS7901:2008 *Electricity and gas industries – Safety management systems for public safety*. This PSMS is audited annually for compliance to the standard by Telarc, with any opportunities for improvement being incorporated into it.

Our Statement of Corporate Intent (SCI) is reviewed regularly along with our corporate objectives to ensure that the business drivers for operating the network are correctly aligned. These documents are key inputs into our asset management process.

Our asset management practice is to actively seek out best practice both from within our industry, and from other industries where it is appropriate. Examples of this are:

- Using fault data from the UK via the National Equipment Defect Reporting System (NEDeRS) database to assist in asset decision making.
- Attendance at training from within the industry e.g. Electricity Engineers Association (EEA) courses.
- Attendance at training from subject matter experts outside the industry e.g. asset management practice training from the Institute of Public Works Manage Engineering Australasia (IPWEA).

- Learning from more advanced users of geographical information systems (GIS) such as District Councils about optimising the use of GIS within our business.

We are currently undertaking an exercise to coordinate asset condition and operational data across several systems, which will enable greater insight into the operation and lifecycle of our assets.

One of the key activities in the early part of the planning period is the implementation of an asset criticality framework. This will inform the development of more focussed maintenance and renewal strategies and improve performance and safety outcomes for the network.

We continue to improve our awareness and implementation of Asset Management practices. Assessment of our asset management using the Commerce Commission asset management maturity assessment tool (AMMAT) shows that our asset management practice is reasonably good, but that there is still scope for improvement, with our scores being 2 or 3 out of 4 across all areas of assessment. Our growing awareness of good practice in asset management helps the continuous development of our business.

1.1.2 Managing our assets

Key features of the network are shown in the table below:

Table 1 - Key features of NWL network

Parameter	Value
Number of Poles	21,702
Length of 33 kV lines and cables	222 km
Length of 11 kV lines and cables	1,329 km
Length of LV lines and cables	343 km
Number of zone substations	18
Number of connected customers	13,070
Coincident max demand	63 MW
Annual energy delivered to customers	262 GWh

These assets are discussed in more detail in Section 5 Renewals and Maintenance.

We have traditionally managed our asset life via condition-based renewals and replacements. We are improving and strengthening these practices, for instance with the introduction of a new framework for field inspections and specialised training for our line inspectors. With the integration of our asset data systems we are working towards utilising better predictive methods for analysing lifecycle of the assets. Examples here include rolling out a remote distribution transformer monitoring system and integrating fault and asset data directly from the field into our asset management systems and GIS.

1.1.3 Developing our network

The development of our network is discussed in detail in Section 6.

The main driver for development in our network has been growth in the irrigation load, which has firmly established us as a summer peaking network. We have also seen modest growth in the industrial and domestic sectors. Most irrigation growth has occurred at our rural zone substations. In some cases, this has had the effect of reducing spare capacity, and the ability to provide back up to neighbouring substations. Projects are underway to investigate and remediate this, and to optimise the spare capacity around the network.

We are forecasting continued growth across the network, as shown below.

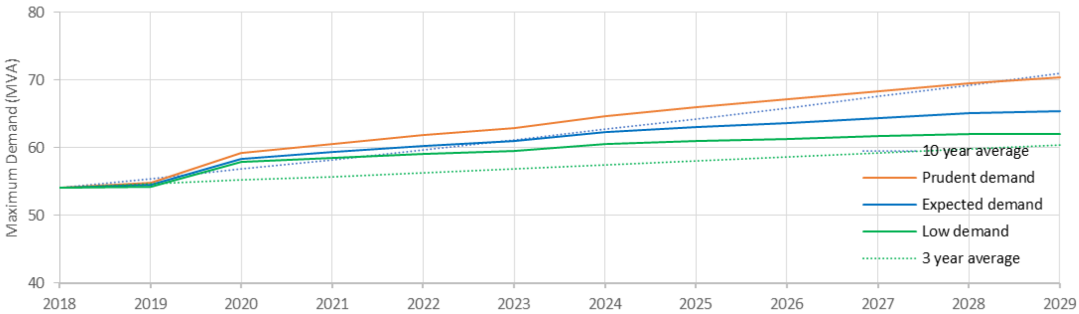

Figure 1- Load growth of all GXPs (excluding Black Point GXP)

There is a capacity constraint on the Transpower 110 kV transmission lines that supply Oamaru GXP. This threatens to restrict the available capacity to connect new load in the lower Waitaki area, as well as affecting the lower South Canterbury area. We are working with Transpower and other stakeholders to address this situation. This is detailed further in Sections 6.3.4 and 6.4.1.

Potential effects from emerging technologies, such as electric vehicles, solar distributed generation, and batteries have been analysed and included in our load forecasting. We acknowledge that there is high uncertainty in both the size and the timing of the effect that these technologies will have on our network.

We plan to increase the monitoring and data gathering on our low voltage networks and will continue working to gain access to customer smart meter data from metering equipment providers.

1.1.4 Our summary of forecast network expenditure

The summary of our forecast expenditure on our network for the planning period is shown in Table 2 below. Note that these figures do not cover non-network expenditure, or expenditure not associated with the lines business.

These estimates are considered to be fairly accurate for the first 5 years of the planning period, and less accurate beyond that point. This is primarily due to many of our investment, maintenance and renewal decisions being very dependent on outcomes of inspections in the first 5 years, customer growth, the impact of emerging technologies, and other issues that are currently out of our control, including Transpower constraints in North Otago and South Canterbury, or asset relocation work that tends to be driven by third party requests.

Table 2 - Summary of forecast network expenditure

	Forecast Expenditure ($)									
Capital Expenditure	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**
Consumer connection	1,084,189	1,060,096	1,036,003	1,011,909	987,816	963,723	939,630	915,537	891,444	867,351
System growth	2,314,161	4,407,669	1,614,531	3,498,150	1,926,673	1,883,619	322,906	269,088	269,088	269,088
Asset replacement and renewal	2,879,764	4,901,053	5,126,853	4,150,569	3,970,584	3,676,063	4,254,197	2,994,300	3,327,000	2,950,668
Asset relocations	131,000	0	0	0	0	0	0	0	0	0
Reliability, safety, and environment: Quality of supply	928,280	1,495,741	633,843	633,843	569,602	462,534	141,330	139,188	109,209	109,209
Reliability, safety, and environment: Legislative and regulatory	697,793	632,375	348,896	348,896	43,612	37,070	37,070	37,070	37,070	37,070
Other reliability, safety, and environment	0	0	0	0	0	0	0	0	0	0
Subtotal Capital Expenditure	**8,035,085**	**12,496,934**	**8,760,126**	**9,643,368**	**7,498,288**	**7,023,010**	**5,695,134**	**4,355,185**	**4,633,813**	**4,233,387**
Operational Expenditure										
Service interruptions & emergencies	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000
Vegetation management	629,000	629,000	629,000	629,000	629,000	629,000	629,000	629,000	629,000	629,000
Routine & corrective maintenance & inspection	939,636	926,636	826,636	826,636	826,636	796,636	796,636	796,636	796,636	796,636
Asset replacement & renewal	310,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000
Subtotal Operational Expenditure:	**2,328,636**	**2,285,636**	**2,185,636**	**2,185,636**	**2,185,636**	**2,155,636**	**2,155,636**	**2,155,636**	**2,155,636**	**2,155,636**
Total Expenditure	**10,363,721**	**14,782,570**	**10,945,762**	**11,829,004**	**9,683,924**	**9,178,646**	**7,850,770**	**6,510,821**	**6,789,449**	**6,389,023**

1.2 PURPOSE

The purpose of this AMP is to align the management of our assets with our corporate objectives and our mission of "Promoting regional growth and wellbeing through the provision of innovative and sustainable energy solutions for our customers".

This AMP is an integral part of our business planning process alongside other key corporate documents, including our Statement of Corporate Intent, annual business plan and budget, Network Development Plan, monthly board reports, and our emergency preparedness documents.

The objectives of this AMP are:

- To link the asset management processes to customer and stakeholder preferences for prices, supply reliability, and safety of our staff and the public.
- To ensure that all asset lifecycle activities, plans and associated costs are systematically planned with a long-term view towards minimising lifecycle costs, which promotes productive efficiency.
- To ensure that physical, commercial, and regulatory risks are correctly managed throughout the life of the asset.

1.2.1 Approval date

The 2020-2030 AMP was approved by the Network Waitaki (NWL) Board of Directors on 30th March 2020. See Appendix B for a copy of the signed Certificate of Approval.

1.2.2 Scope

The scope of this AMP includes all areas of planning that relate to NWL's electrical distribution services as an Electricity Distribution Business (EDB). This does not include business streams outside the core EDB business, such as electrical contracting, metering services, and the fibre optic network.

1.2.3 Intended audience

The AMP is published on our website (www.networkwaitaki.co.nz) and is aimed at the following readership:

- The Commerce Commission
- Our trustees, directors, and management
- Our staff
- Our customers
- Our other stakeholders
- Interested members of the public
- Other Electricity Distribution Businesses (EDBs)

1.3 KEY THEMES

The key themes for the planning period within the Waitaki area are:

- The importance of safety on and around the network, both as a safe workplace for our staff and as a safe utility for the public.
- Meeting customer expectations in terms of quality and reliability of supply.
- Development of our load forecasts out to 2030, including multiple scenarios and different load types (domestic, commercial, dairy shed, irrigation) - continued growth is expected in demand in the rural areas based on further irrigation development in the region.
- The impact of the constraint on the Transpower 110 kV supply to Oamaru GXP.
- Resilience to natural events is becoming a more important issue for our communities.
- In the urban areas, it is expected that load changes will be due to population growth, commercial/industrial growth and the gradual uptake of new technologies (such as electric vehicles).
- Increasing focus on replacement of aging assets to reduce risk.

1.4 USE OF NOMINAL DOLLAR VALUES

Capital and operational expenditure values are expressed in nominal dollar terms. We have not included an adjustment for inflation in order to allow for better comparison of expenditure between years.

1.5 DOCUMENT STRUCTURE

Figure 2 below illustrates the structure of this AMP.

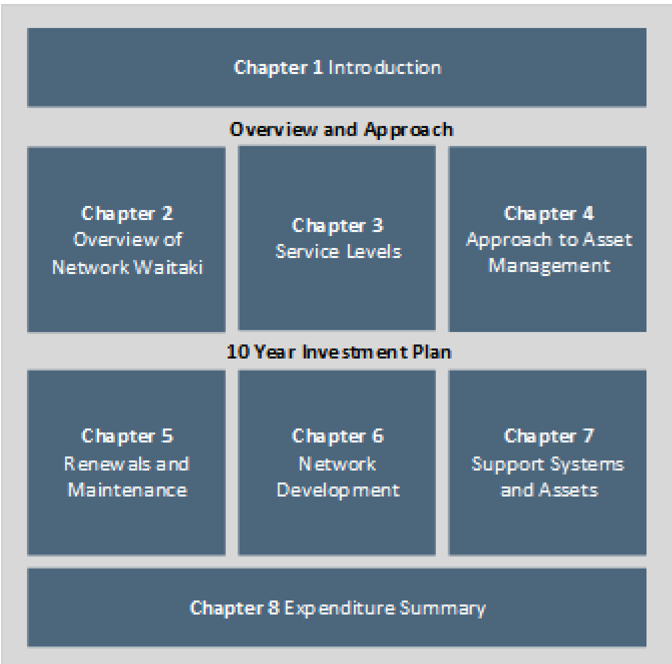

Figure 2 - Structure of Network Waitaki's 2020 AMP

POWERING NORTH OTAGO

02

NETWORK WAITAKI OVERVIEW

This chapter describes who we are, what we want to achieve and is structured as follows:

- **Our company:** outlines our corporate objectives, organisational and governance structures.
- **Operating environment:** an overview on the issues that have an impact on us and our approach to asset management, such as geography, vegetation management, and changes in demand.
- **Stakeholders:** this section describes who our stakeholders are, their interests and expectations, and how these interests and expectations are accounted for in our asset management practices.
- **Our customers:** an overview of our customers including total number of connections; our major customers and their impact on network operations and our asset management objectives; and the load characteristics of our network.
- **Our network:** an overview of the network including coverage areas; the extent it is overhead and underground; and our substation arrangements.
- **Our Assets:** a population summary of our assets by category.

2.1 OUR COMPANY

Network Waitaki (NWL, or the Company) operates predominantly as an Electricity Distribution Business (EDB) in the Waitaki District and parts of South Canterbury. We operate an electricity network, a fibre network and have a contracting operation providing services primarily to meet our own needs, but also undertaking work for other asset owners and contractors.

2.1.1 Ownership structure

NWL is 100% owned by the Waitaki Power Trust (the Trust). The shares of NWL are held on behalf of the NWL consumers by the Trust, who appoint directors to the Board to carry out the governance functions of the business. The Trust has five trustees. Every three years, three trustees are elected by consumers connected to the network.

2.1.2 Mission statement and corporate objectives

Our mission statement and principal objectives are published in our statement of corporate intent (SCI) and provide direction to how we operate the company, including our asset management practices.

Our mission statement is:

> *Promoting regional growth and wellbeing through the provision of innovative and sustainable energy solutions for our customers*

Our corporate objectives cover four areas:

Health and safety

- To ensure that no harm comes to our people or members of the public as a result of our operations and assets.
- To maintain safe systems of work to keep our people safe through the elimination, isolation and minimisation of risk.
- To maintain an accredited public safety management system in accordance with NZS7901.
- To have programmes in place to ensure the health and wellbeing of our people.

Our people and culture

- To be the employer of choice in North Otago and amongst our industry.
- To attract and retain top talent.
- To train and develop our people to meet current and future business needs.
- To be an equal opportunity employer promoting inclusiveness and diversity.

Our customers and community

- To be the service provider of choice for our customers, providing safe, reliable, cost effective and innovative solutions.
- To maintain a positive profile in our community and ensure there is clear value in Trust ownership.
- To provide electricity consumers with a safe, efficient and reliable electricity distribution system.
- To be supportive of activities that provide economic growth and wellbeing in our network area.

Building a sustainable future

- To operate the business in a commercially sustainable manner and use company resources in an efficient manner.
- To preserve and grow the value of the business for the long-term benefit of consumers.
- To provide dividends, discounts and community support activities in accordance with the shareholder’s wishes.
- To promote the efficient use of energy as required under the Energy Companies Act 1992 clause 36 (2).
- To operate in a way that minimises the impact on the environment and ensure compliance with the Resource Management Act.
- To comply with all obligations under relevant legislation and regulations.

Together these four areas form the basis for establishing our asset management practices and processes.

2.1.3 Corporate documents

The Company maintains a number of internal and external documents as part of its annual business compliance, disclosure and planning process. The main documents are the:

- Statement of Corporate Intent (SCI), which is agreed annually between the Board and the Trust, and sets out the objectives, goals, and related performance targets for NWL for the following three years.
- Regulatory disclosure documents, including those associated with information disclosure, financial accounts, and the Commerce Commission's price-quality threshold regime.
- Network Development Plans which detail the demand growth forecast for different growth scenarios for the next 10 years, and the planned response of the network to meet that demand.
- Annual business plan and budget which is approved by the Board for the next financial year.
- Monthly board reports, which update the Board on the progress against the annual budget, along with other issues that they need to approve or be made aware of.
- Suite of emergency preparedness documents that detail the plans to maintain and restore supply following emergency events.

2.1.4 Organisation structure

The Trustees appoint the Directors to the Board to govern the company who in turn appoint the Chief Executive. Ultimate accountability for the performance of the business, including the network assets, lies with the Board who approve this AMP. The Board are also accountable to the Trustees for meeting the requirements set out in the Statement of Corporate Intent (SCI), which includes specific safety, performance, asset management objectives and service targets.

The Board have an involvement in approving projects and budgets needed to support the AMP. The AMP and Network Development Plan signal the need for future investments so that the Board can assess the long-term issues such as funding requirements. The company ensures that members of the public have access to the AMP and other disclosure documents on the Company's website[1].

The management team report (amongst other business performance measures) asset management information such as new risks, outage statistics, network performance, and work program progress to the Board on a monthly basis. Quarterly reports comparing year to date performance against the SCI are provided to the Trust. Annual reports are prepared by both NWL and the Trust.

Most of the annual works program is undertaken by our integrated contracting business unit, which has a staff of approximately 35 people located in Oamaru. Specialist skills are contracted in when required.

[1] https://www.networkwaitaki.co.nz/company/regulatory-disclosures/

2.1.5 Asset management governance

NWL has a relatively small team intended to resource a narrow business model i.e. operational management of a lines business and associated activities.

Asset management responsibilities are allocated between the senior staff as follows:

Chief Executive

The Chief Executive is accountable to the Board to ensure that the strategic objectives of the Board and the Trust are delivered.

Chief Financial Officer

The Chief Financial Officer is responsible for the financial activities of the company, including preparation of annual budgets for operating and capital expenditure with input from all areas of the business as well as providing reports that enable financial performance of works programs to be monitored against budgeted costs.

Engineering Manager

The Engineering Manager has responsibility for the day to day operation of the network and the delivery of the annual capital and maintenance work programs.

Planning Manager

The Planning Manager is responsible for long-term network planning and development, including development of load models and working with key stakeholders such as Transpower and major customers to ensure that our collective future needs are understood and met, and that projects are programmed to address capacity and security constraints.

Asset Manager

The Asset Manager is responsible for development of the asset management processes and systems, the development of standards and policies, and that projects are initiated to address performance, safety and reliability risks on the network.

Regulatory and Network Support Manager

The Regulatory and Network Support Manager is responsible for the preparation of regulatory disclosures, compliance, and pricing, as well as managing the customer services function, and providing support to the engineering, planning and asset teams.

Contracting Manager

The Contracting Manager is responsible for the provision of field services in order to complete the annual works plan in those areas of service provided by our in-house contract team. They are also responsible for managing any work outside our network, for other network companies or private customers, provided the NWL works program is given the focus that it requires.

2.1.5.1 Expenditure Approvals

Operational and capital budgets are prepared annually and approved by the Board. For larger projects, investments in new areas, and projects committing the company to expenditure over several years the approval process includes a formal business case. This provides the Board with an overview of the risk, the options and economic assessment of the proposed solution. Following the completion of a major project, the Board will review any associated project post implementation review to confirm delivery on the benefits stated.

All roles within the company are subject to approved delegated financial authorities. Any expenditure beyond these limits requires specific approval from a manager or the Chief Executive or the Board, depending on the absolute amount of the expenditure.

Work is generally prioritised in the following order:

- Emergency works
- Safety related works
- Planned customer works
- Planned maintenance works
- Planned capital works

2.1.5.2 Asset management capability

Our organisational and governance arrangements are structured to ensure that we have the necessary capability to implement this AMP. We ensure that our AMP work program can be achieved by tracking our progress with monthly reporting on the physical and financial progress of the work program against our plans and budgets. This reporting also includes operational metrics such as SAIDI and SAIFI.

We also regularly review and forecast our future revenue streams to ensure there is sufficient funding to develop and maintain the network. This involves annual price reviews, calculation of the discounts returned to consumers, and setting capital connection levies.

To ensure the maximum efficiency of our work force, the skill set of our field staff is focussed on the core line construction and maintenance roles, including live line work, cable jointing and line construction. Specialist experience such as communications and power technicians and electrical fitters have been successfully contracted in from outside suppliers for several years. This approach is successful due to strong relationships with our preferred service providers, many of whom are local to the Waitaki area. This avoids unnecessary overheads associated with specialised training and support of these trades.

2.2 OPERATING ENVIRONMENT

The operating environment of the Waitaki region is a mixture of coastal plains and alpine areas.

The climate is traditionally dry and cold in winter, and dry and hot in summer. The area is known to suffer from drought conditions.

Extreme weather events can include wind and snow storms, and floods. We expect to experience at least one significant weather event every year. The impact of these events is typically restricted to the inland area of the network, but can occasionally affect the whole region, and in extreme events can affect neighbouring regions as well.

The coastal conditions are comparatively benign with a fairly small zone where equipment corrosion is a concern, although coastal erosion is starting to impact in some areas of the region, with local road networks being affected. We are monitoring these situations with respect to our assets in the specific affected areas.

The major urban population is centred on Oamaru, a coastal town of approximately 13,900 people located on the east coast of the South Island. The population of the wider Waitaki region is approximately 22,300. Statistics New Zealand forecasts modest population growth of up to 5% for the planning period of this AMP.

There are several small townships in the region, most which are located on the two state highways that run North to South (SH1) and East to West (SH83) through the region.

The rural economy of the region is based on a mixture of beef and sheep farming, crops, and dairy. Irrigation is used widely throughout the region, via schemes that include border dyke systems, direct pumping from a local water source, or reticulated systems to the farm gate. Irrigation is a major source of the growth on our network. The Ministry for Business, Innovation, and Employment records that the contribution to the regional economy from the agriculture sector ranges from approximately 12% to 22% GDP up to 2015 (more recent figures are not available).[2]

There is also a significant manufacturing sector in the region, contributing approximately 12% to the regional economy in 2015.[3]

Despite the typically dry summer conditions, vegetation growth is robust throughout most of our network, and management of vegetation near our assets is an ongoing focus of our operations.

[2] Source: MBIE Regional Economic Activity Web Tool. http://webrear.mbie.govt.nz/summary/new-zealand, Feb 2018
[3] Source: MBIE Regional Economic Activity Web Tool http://webrear.mbie.govt.nz/summary/new-zealand, Feb 2018

2.3 REGULATORY ENVIRONMENT

2.3.1 Pricing

From an economic regulation perspective, Network Waitaki is subject to regulation by the Commerce Commission under Part 4 of the Commerce Act 1986. As Network Waitaki meets the 'consumer-owned' criteria set out in section 54D of the Commerce Act, the company is exempt from price-quality regulation. However, compliance with information disclosure regulation is still required.

Network Waitaki is furthermore subject to regulations set by the Electricity Authority as the electricity market regulator, responsible for the efficient operation of the New Zealand electricity market. One of the focus areas of the Electricity Authority is improvement of efficiency of distribution prices to become more cost-reflective, especially with new technologies entering the market and changing the way electricity is consumed and produced.

As a wholesale provider of electricity distribution services, we recognise that there is a mismatch between our pricing structures, which generate much of our revenue through volume-based prices, and our costs, which are essentially fixed. This puts cost recovery at risk due to any changes in volume due to factors not under the company's control. The danger of this under-recovery is that it could discourage the correct levels of investment to maintain our intergenerational asset base.

For this reason, we are pursuing pricing reform, the ultimate aims of which are to:

- reflect the cost of service more accurately through balancing of the fixed and volume-based components of electricity distribution prices
- safeguard revenue reliability through implementation of cost-reflective price structures.

We are minimising the impact of price rebalancing on our customers by putting in place a comprehensive communication plan to communicate changes and by assisting affected customers to mitigate these changes through more effective and efficient use of energy.

2.3.2 Transmission Pricing Methodology

The Transmission Pricing Methodology (TPM) sets out the mechanism by which Transpower, the operator of the Transmission Grid, recovers its operating costs across New Zealand. The Electricity Authority has been reviewing the TPM for over a decade as it is of the view that its current state does not lead to efficient outcomes and sends the wrong pricing signals to participants. In 2019 the Electricity Authority released proposed changes to the TPM.

Under these proposed changes, Network Waitaki could face an increase in annual Transmission charges of $1.6 million (55%) from 2024 onwards for no increase in service level or capacity. We do not accept the propsed changes and have been actively engaged in submissions and dialogue with the Authority to achieve a more favourable outcome for Network Waitaki and our consumers.

Should the TPM proposal remain unfavourable to Network Waitaki when finalised, we will explore alternatives to the use of the current Transpower transmission network in our area and the investment forecasts in this AMP may change in the medium term to reflect this. Being located within the Waitaki valley with over 800MW of hydro generation in our network area may allow us to explore bypass options as these are likely to be more cost effective in the long term.

2.3.3 Emerging Technologies

Technology is constantly evolving, and it is expected that batteries, electric vehicles and smart energy management systems as well as small scale distributed generation will change the role of the distribution grid in the future.

Domestic electricity consumption worldwide has been reducing during the last decade, on a per dwelling basis, due to various factors, including:

- improving energy efficiency of household appliances and lighting
- improved insulation and heating in homes
- the increase in popularity of gas for heating and cooking.

Countering this in our region is increased electricity demand from irrigation, and potential future decarbonisation of process heat to electricity. The increasing market share of electric vehicles (EVs) for transport will also contribute to move energy use from fossil fuels to electricity.

In the future, a significant reduction in the cost of solar panels and/or domestic battery packs may enable residential customers to reduce the amount of energy they require from the electricity grid. Because they would still have a requirement for energy supply from our network at times of peak loading or reduced solar output, our infrastructure requirements would remain the same.

This highlights the importance of Network Waitaki moving to cost-reflective pricing, which will allow the provision of the required levels of network service despite any decrease in the energy that we transport.

There is also the potential for future technological innovations to provide challenges currently not anticipated, given the perceived increased speed of turning ideas into products in certain sectors. We will actively work to stay abreast of emerging technology trends and the implications that they may have on our network.

2.3.4 Environment

Significant changes in the environment and evidence associated with these changes are currently a driving force that necessitate change in the electricity industry in general.

The New Zealand Government recently announced targets to reduce New Zealand's emissions, which included the introduction of a Zero Carbon Bill. Responses to these kinds of pressures are likely to transform the way we use and distribute electricity in the future. Customers from households to industrial customers are likely to face stronger incentives to turn to low emissions energy sources. That means that electricity used for transport purposes and industrial developments could increase the amount of electricity distributed in our region. This is a scenario which we will have to plan for as it is expected that investment in cleaner sources of energy will receive substantial support.

Network Waitaki will continue to be cognisant of the environment we function in and operate our business in a commercially, environmentally and socially sustainable and efficient manner to ensure that our business can continue to operate in an optimal way and maintain our social license to operate over the long term.

To address climate change we will explore opportunities for carbon reduction and waste minimisation in line with government policy and targets and actively promote sustainable energy efficiency and peak demand management.

2.4 STAKEHOLDERS

2.4.1 Stakeholders and their interests

Our stakeholders are the people or organisations that can affect, be affected by, or perceive themselves to be affected by our decisions or activities. Stakeholder requirements are an important driver for our performance, and we place considerable focus on identifying and meeting stakeholder expectations. Our stakeholders are described in Table 3 below, along with their requirements, how those requirements are identified and how they are incorporated into our asset management practices.

Table 3 Network Waitaki stakeholders

Stakeholder	Requirements	Identification of requirements	Requirements incorporated into asset management practices
Customers	Safety; reliability; value for money; effective communication particularly during emergencies and faults; emergency and lifeline preparedness.	Bi-annual customer surveys; face to face interviews with major customers; feedback; public safety performance measures.	Maintaining audited Public Safety Management System and other safety initiatives; price/quality trade off; network development plans; investment planning; asset lifecycle management.
Staff and other workers	Safe and enjoyable work environment; job satisfaction; assurance of work continuity; visibility of forward workload requirements; work/life balance; career development opportunities; fair remuneration; effective support	Staff feedback; regular staff briefings and communications; staff input into decisions affecting work environment and methods	Safety initiatives and reporting; integration of risk management into all business processes; forward planning of work;
Public, and landowners	Safety; emergency and lifeline preparedness; protection of property and amenity values; effective communication regarding access and maintenance	Meetings; feedback; consultations.	Safety initiatives; emergency preparedness planning; service levels.

Stakeholder	Requirements	Identification of requirements	Requirements incorporated into asset management practices
Board of Directors	Governance; risk management; safety performance; business direction and sustainability; Performance of Chief Executive; statutory and regulatory compliance.	Regular board meetings and directives; performance measures.	Integration of risk management into all business processes; regular reporting.
Waitaki Power Trust	Fair and reasonable rate of return on equity; incentives to invest and innovate; good governance; risk management; business sustainability; good reputation with the community; Good asset management	Trustee meetings; performance measures.	Network development planning; investment planning; asset lifecycle management; organisation and governance structures; integration of risk management into all business processes; quarterly and annual reporting
Councils	Alignment with district and regional requirements; statutory compliance.	Meetings; consultations on regional and district plans.	Network development planning for system and load growth.
Electricity generators and retailers	Safety, reliability, effective communication; statutory and regulatory compliance; fair contractual arrangements; transparent; effective delivery of business to business services.	Industry forums, conferences, and seminars; regular consultation, statutory and regulatory requirements; contractual arrangements.	Network development planning; service levels

Stakeholder	**Requirements**	**Identification of requirements**	**Requirements incorporated into asset management practices**
Regulators and Governmental Agencies	Statutory and regulatory compliance; ensure consumers receive a reliable supply of electricity accounting for price/quality trade off; compliance with health and safety requirements.	Statutory and regulatory requirements; consultations; industry forums, conferences, and seminars.	Network development planning; service levels; risk management; governance arrangements; inclusion of safety by design principles.
Transpower (as Grid and System Operator)	Security of supply; new grid investment and planning provisions; effective and timely communication; statutory and regulatory requirements; sustainable earnings from connected and interconnected assets	Operational standards and procedures; regular meetings;	Network development planning; investment planning; asset lifecycle management; risk management
Neighbouring EDBs	Coordinated investigation into shared transmission constraints	Meetings to discuss collaboration opportunities	Decisions will be incorporated in future Network Development Plan

2.4.2 Managing conflicting interests

All stakeholders want to minimise the risk of property damage or injury to the public, customers, staff, or other workers and so safety concerns are given the highest priority.

Other issues that are considered are:

- Obligations to maintain supply to existing consumers at the service levels set out in the SCI
- The sustainability of the network business
- The reliability of electricity supply to consumers
- Compliance issues, including compliance with technical requirements, such as power quality, as well as business compliance

2.5 OUR CUSTOMERS

2.5.1 Load profiles

A summary of the load served by our network for the year 2018/19 and the five years previous is shown in the table below:

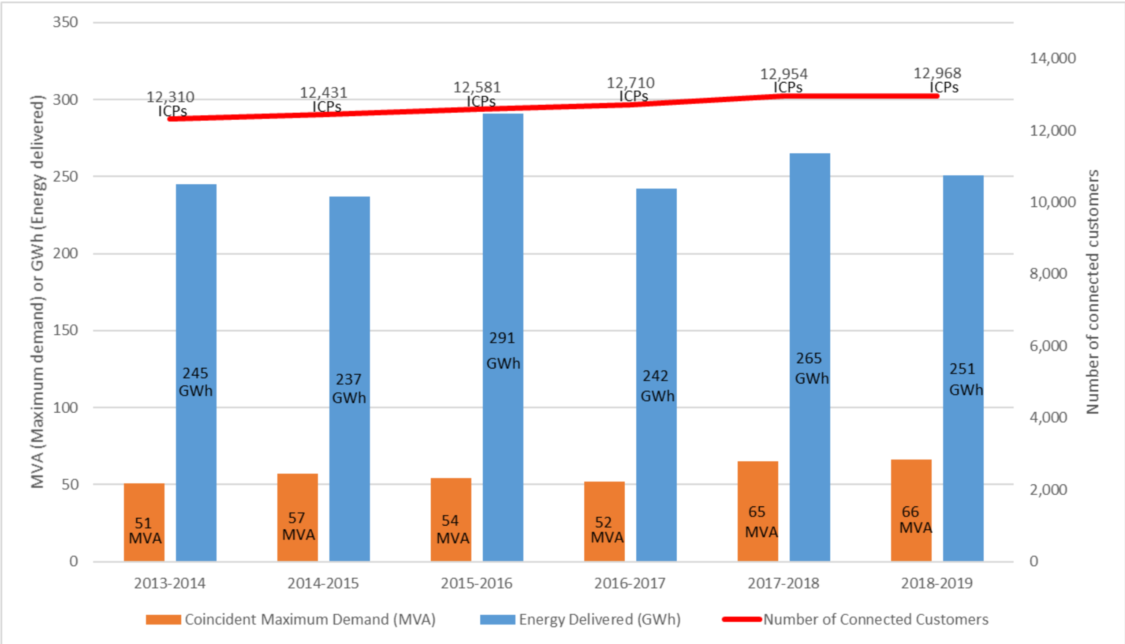

Figure 3 - Network maximum demand, energy throughput and connected ICPs

As shown in Figure 3 the energy delivered to our customers over the last 5 years is variable and does not necessarily match the growth in maximum demand or increase in connected customers. This is primarily due to climatic conditions, where a mild winter will reduce energy demand for heating, and a dry summer will increase energy demand in the irrigation sector.

2.5.2 Major Customers

Our major customer groups are urban residential around Oamaru and other townships, and large rural farming customers (typically dairy and cropping). We have a small but important level of commercial and industrial load on our network and our top 10 customers by volume of energy consumption operate in the industry categories below:

- Meat processing
- District irrigation schemes
- Council utilities and infrastructure
- Supermarkets
- Food manufacturing

We engage with all affected customers whenever we are planning work or any changes to the network that may lead to business disruption or health and safety concerns.

The introduction of a new GIS system in 2017 has enabled better visibility of the impact of network operations on customers, which aids in this consultation process. This system has led to the development of more accurate notifications to customers for planned and unplanned outages, the coordination of works, and identification of contact points for consultation.

2.6 OVERVIEW OF OUR NETWORK

We operate a predominantly overhead rural network supplying the North Otago, Hakataramea, and Ahuriri regions as shown in Figure 4 below. We have one major urban area, Oamaru, and several smaller townships.

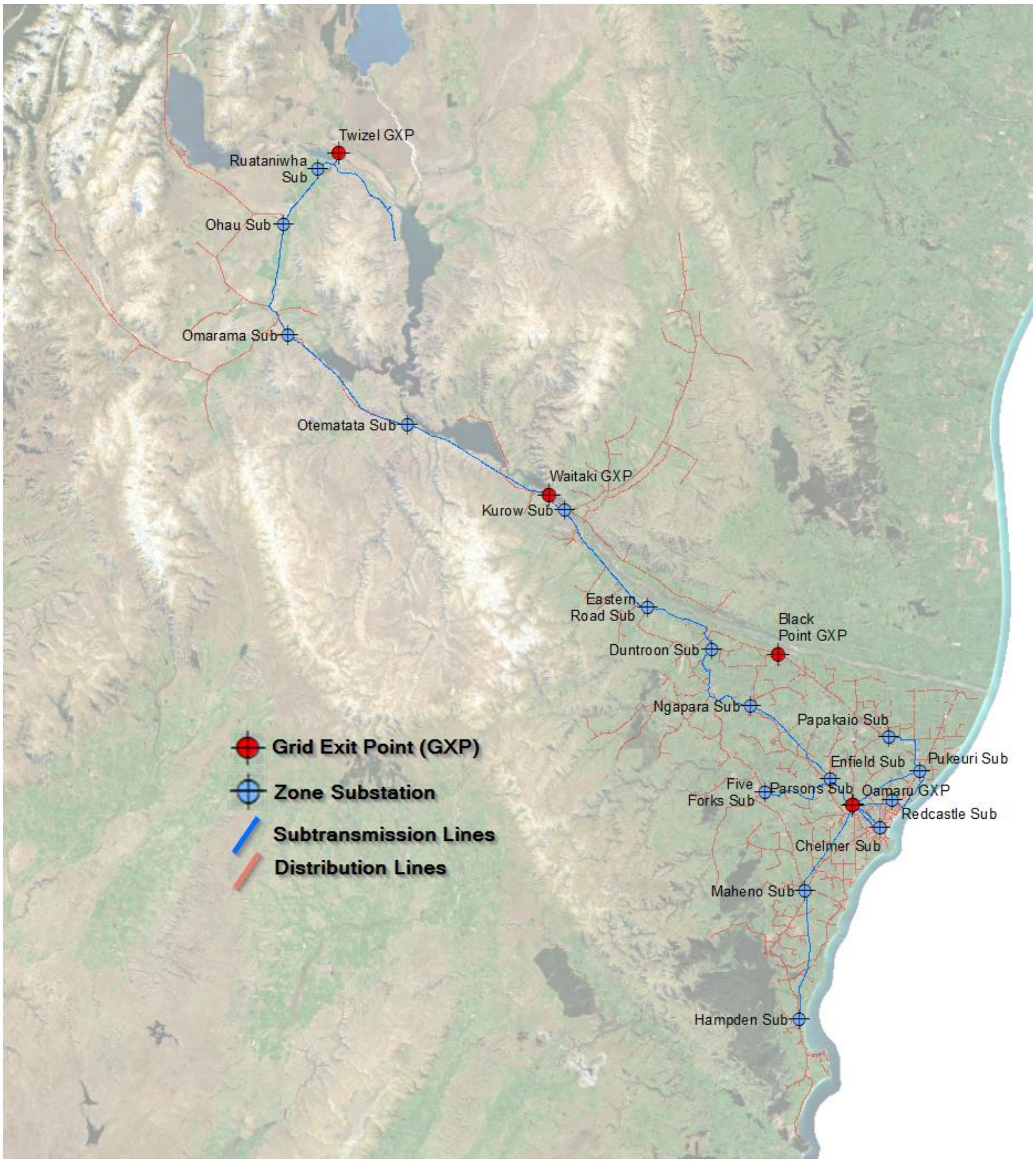

Figure 4 - Map of NWL area of supply and network extent

Bulk supply of electricity is taken from Transpower's network (the national grid) at our four grid exit points (GXPs). This energy is then transported via our subtransmission network at 33,000 volts (33 kV) to our zone substations. Power transformers at the zone substations convert the 33 kV supply to a lower distribution voltage of 11,000 volts (11 kV) which is supplied to some customers directly (generally large commercial and industrial customers) but is more commonly stepped down via distribution transformers to our low voltage system (400 volt, three phase/230 volt single phase) which supplies most of our customers.

The characteristics of our grid exit points (GXPs) are listed in the table below:

Table 4 - Characteristics of NWL grid exit points as at 31 March 2019

Supply point	Voltage	Capacity	Max demand 2019/20 (Non-Coincident)	Zone Substations supplied
Oamaru GXP	110/33 kV	45 MVA	39 MVA	10
Black Point GXP	110/11 kV	25 MVA	13.5 MVA	0
Waitaki GXP	11/33 kV	24 MVA	11.3 MVA	5
Twizel GXP	220/33 kV	20 MVA	3.8 MVA	3

A 33 kV sub-transmission network connects the GXPs to our zone substations. The 33 kV sub-transmission network is predominantly overhead construction, apart from a few short cable sections.

2.7 OUR ASSETS

Key features of the network are shown in Table 5 below:

Table 5 - Key features of NWL network

Parameter	Value
Number of poles	21,702
Length of 33 kV lines and cables	222 km
Length of 11 kV lines and cables	1,329 km
Length of LV lines and cables	343 km
Number of zone substations	18
Number of connected customers	13,070
Coincident max demand	63 MW
Annual energy delivered to customers	262 GWh

These assets are discussed in more detail in Section 5 Renewals and Maintenance.


MAX 2 PERSONS S.W.L. 300
17.5m WORK HEIGHT
WORKING VOLTAGE 46KV
Insulated
Aerial
Work
Platform
DHT-160AS
DONGHAE
LIVE
WIRES
BEWARE

03

SERVICE LEVELS

The Service Levels outlined in this AMP reflect our mission of owning and operating a safe, reliable, and efficient distribution system. This chapter is structured as follows:

Stakeholder engagement: provides an overview of how we interact with our stakeholders, identify their requirements, and how those requirements are incorporated into our asset management processes.

Health and Safety measures and targets: describes our safety objectives, methods, measures, and performance against targets.

Reliability measures and targets: describes our reliability objectives, methods, measures, and performance against targets.

Economic efficiency measures and targets: describes our network performance and efficiency objectives, methods, measures, and performance against targets.

3. Service Levels

3.1 STAKEHOLDER ENGAGEMENT

As illustrated in Section 2.4 we have many stakeholders with varying requirements. We identify these requirements through customer surveys, face to face interviews with major customers, attendance at public events such as agricultural field days and participation in industry forums and conferences. We also participate in consultations on statutory and regulatory changes and Regional and District Plans.

Stakeholder requirements are generally incorporated into our asset management planning processes through our Public Safety Management System, service level measures and targets, our Network Development Plan and asset fleet management processes; if an activity has a direct effect on one or more stakeholders, we will engage directly with them.

3.1.1 Customer surveys

We undertake regular representative surveys to enable a better understanding of what is important to our customers and how they perceive the service that Network Waitaki provides.

Our latest major survey was undertaken in February 2019, where 400 mass market customers were interviewed by telephone. The survey respondents were selected randomly from our full customer database. At the same time, we conducted face to face interviews with 16 of our major customers, picked at random from a sample of our top users (by volume of electricity used). This survey had representative respondents from large industrial, commercial, and farming (mostly irrigation and dairy farming operations) users.

A further targeted survey was also undertaken in July 2019 with customers ranging from internal company customers, small commercial and residential and major customers.

The key insights from these surveys were:

- Reliability of supply and network maintenance are most valued by customers.
- The majority of respondents prefer to pay the same network charges and maintain the same level of reliability.
- The vast majority of respondents who had experienced unplanned outages indicated that supply had been restored within an acceptable timeframe. In the event of unplanned outages communication of accurate restoration time is very important for customers.
- The vast majority of respondents who had experienced planned outages indicated that supply had been restored within the notice time.
- Although a number of customers are still not willing to install smart meters, this number has reduced.
- Less than 30% of customers believe they know enough to make an informed decision on new technologies such as battery storage, electric vehicles and solar energy. Interestingly, 23% of respondents cite these technologies as a ‘green energy source’. This is an indication that customers are becoming more aware of environmental considerations.

Feedback from customers through the customer surveys assist us in understanding our community better and to focus on those matters that are valued most by customers to inform our asset management practices, investment plans and service level measures and targets.

We believe there is a need and the opportunity to develop our ability to share information with our community about energy efficiency, new technologies and environmental initiatives.

We also recognise the need for improvement in our engagement with key customers and in this regard will be considering a key account management point of contact to provide advice as required. This will assist in ensuring we respond to key customer needs in a timely and efficient manner.

We will continue to focus on ways to improve communication of planned and unplanned outages, focussing on improving information regarding the timing of planned outages, responsiveness on restoration times and the reasons for outages in the case of unplanned outages.

3.1.2 Website

Website traffic records show that the most visited page on the new website is the outage page at approximately 2,500 visits a month, followed by views relating to information about the company, careers and connection applications.

Data about customer visits to the company website is analysed to inform our customer relations work as we believe it provides a sense of the type of information that is important to customers.

3.2 SERVICE LEVEL: HEALTH AND SAFETY

We are committed to ensuring that our network remains safe at all times and seek to actively manage risks to the public, public property, and our staff. To facilitate this, we are focused on continuing to foster a positive safety environment for staff and the public. Policies, procedures, and staff training are developed, reviewed, and updated in an ongoing process of continuous improvement.

We operate an audited Public Safety Management System (PSMS) where known and likely hazards and risks to the public are documented, along with the controls used to resolve them (eliminate the risk, or minimisation of the risk or likelihood of it occurring). This system is audited annually against the standard NZS7901:2008 *Electricity & Gas Industries Safety Management Systems for Public Safety* by Telarc, an external auditor. The outcomes of the audit process are analysed by our staff to make improvements to the PSMS and how we use it.

3.2.1 Health and safety objectives

Our overall objective is that staff, workers, the public, and their property are safe and free from harm due to the operation of our business. We will not compromise the health or safety of our staff, workers, the public or their property.

In summary, our safety objectives are:

- Safety is a top priority in all aspects of our business.
- Staff, workers, and the public are not harmed due to the operation of our business.
- A positive health and safety culture is promoted amongst all of our staff and workers.
- Any identified health and safety hazards are assessed for risk, prioritised and mitigated as soon as possible.

3.2.2 Methods

To achieve our objectives, we have undertaken the following initiatives:

- We engage with the public through newspaper and radio safety advertisements to raise public awareness of the hazards associated with working or playing in the proximity of electricity reticulation assets.
- We take part in public events such as agricultural shows to demonstrate electrical safety issues to the public, and to provide opportunities for feedback.
- All known and likely hazards and risks to the public are documented by staff in our Public Safety Management System as they are discovered, along with the controls put in place to mitigate them.

- The instigation of reporting and monitoring of near miss incidents. Staff are encouraged to report near miss incidents with the purpose of identifying cause, mitigating risk, and learning. To facilitate this, we have adopted the Incident Cause Analysis Method (ICAM) methodology for incident investigation.
- Continually improving our data capture and systems to provide accurate and reliable data for informed decision making and information sharing.
- The Board receives and considers health and safety reports at every Board meeting, and maintains a separate committee to monitor health and safety performance.
- Engagement and participation with our staff and contractors through our health and safety committee, critical risk program and field engagements to build trusting relationships, to hear their concerns and learn how they do their work.
- Investment in WorkWell Wellbeing program in collaboration with experienced external providers.
- Involvement in community safety initiatives such as Safer Waitaki, Business Leaders Forum, Electricity Distribution Industry (EDI) forums, Electricity Engineers Association (EEA) forums.
- Investing in developing and improving the capability of our staff through training and professional development.
- regularly reviewing our safety policies, procedures, and staff training so that they are continuously improved.
- Improvements in the type of personal protective equipment (PPE) used by staff to improve comfort in the field, such as using climbing helmets for construction crews rather than ordinary hard hats.
- Providing incentives to staff to encourage them to submit ideas that improve the safety of network operations.
- Utilising modern technology to further assist our highly capable staff
- Installing GPS tracking systems with “man-down” functionality in all vehicles.
- Coordinating with neighbouring EDBs to align safety procedures where possible.
- We will assess the impacts of new global phenomena such as Covid-19.

3.2.3 Measures and targets

Monitoring our safety performance is a focus of our business. We track a number of safety metrics and indicators, including:

- Monitoring of staff safety behaviours for compliance with targets, such as:
    - the number of safety observances or site audits (leading indicators).
    - lost time injuries, near misses, plant damage or environmental incidents (lagging indicators).
- Monitoring indicators of organisational safety behaviours, such as:
    - the number of times staff have worked to the stage where they need to stand down (leading indicators)
    - the amount of sick leave and ACC hours taken across the whole company (lagging indicators).
- Monitoring the number of incidents and accidents on our network involving the public.
- Annual accreditation to NZS7901:2008 for our Public Safety Management System – using Telarc as independent auditors.
- Monitoring mitigation of specific risks e.g. the removal of red tag poles from the network.

Our targets for safety performance are:

- Zero injuries per annum to staff
- Zero injuries to the public
- A downward trend in the number of reported adverse public interactions
- A downward trend in the number of deliberate or accidental unsafe acts by the public
- To work with customers to ensure that no privately owned HV service lines are disconnected because of unsafe condition
- Contracting staff, engineers, managers and Directors are all required to achieve a number of field-based safety interactions every year.

3.2.4 Performance

Historically measurement of safety performance has focussed on lost time injuries and incidents reported for our workers.

We also measure and monitor public incidents and accidents on our network, as shown in Table 6 below.

Table 6 - Public incidents and accidents

Summary of electrical accidents and incidents involving the public					
Activities	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**
Rural/Farming activities	11	19	16	15	10
Construction work	2	7	7	8	4
Trades	3	0	0	0	0
Leisure & sports	0	0	0	0	1
Customer premises issues (Tree cutting/house fires, etc.)	5	11	11	4	0
Vandalism	2	1	1	1	0
Motor vehicles	20	19	19	16	19
Total	**43**	**57**	**54**	**44**	**34**

As can be seen from the historical figures, the number of incidents involving the public has been reasonably static since 2015/16. The bulk of the incidents in recent years have been vehicle accidents or due to unintended contact with our buried cables or overhead lines, typically operators of equipment such as diggers, farm machinery or irrigators.

These are lagging indicators, and while they are of some use, we acknowledge that they are not as effective as leading indicators at improving safety outcomes.

The key method of improving the performance is educating rural workers, trades workers, contractors, and emergency services staff to be aware of the hazards that our network present in the environment, and to manage the risk accordingly.

Actions currently taken to address this issue include:

- Using print advertising in local newspapers and radio advertising on local stations to raise public awareness around the hazards of electricity.
- Engaging directly with contractors to discuss the hazards and processes of working around electricity network equipment, at public events such as the A & P show, as well as holding targeted education sessions.
- Streamlining permitting processes with the introduction of online applications for high load and close approach consents for contractors such as tree trimmers, agricultural workers, and house movers, to encourage voluntary use of the safety systems available.

Assuring that our public safety management system conforms to the New Zealand standard NZS 7901:2008 is an annual exercise carried out in conjunction with Telarc. This accreditation was continued in 2019 with a satisfactory audit resulting in no “unattained” issues, and the verification of our NZS 7901 compliance. Any items raised as “partially attained” or “opportunities for improvement” are corrected as soon as possible.

Public Safety

Telarc. Registered

Public Safety NZS 7901

Over the coming year we will be adjusting our PSMS to align to the latest version of the standard, NZS 7901:2008.

We have also trained staff in the role of internal auditors; these auditors carry out several internal audits annually. The audits assist in identifying opportunities to improve our processes and help identify potential issues in a timely fashion.

With the introduction of the Vault safety management system, recording of our safety performance against targets is simplified. A Health and Safety report is tabled and discussed at each monthly Board meeting and includes performance figures against our goals. Figure 5 below is an example of this reporting. A key feature is the clarity of information on safety performance indicators.

Reported incidents for the Month

	First Aid Injuries	Medical Injuries	Discomfort, Pain, Injury	Lost Time Injuries	Near Miss
Month	**1**	**0**	**0**		
FYTD	**8**	**0**	**1**	**1**	**10**
Last Year: Total	**13**	**0**	**1**	**1**	**3**

			Targets		Tracking	
	Month	FYTD	Month	FYTD	Month	FYTD
Work Observations	14	102	≥15	≥105	↓ 1	↓ 2 ↑
Engineer Site Audits	4	36	≥3	≥21	↑ 1	15
Management Field Visits	5	29	≥4	≥28	↑ 1	↑ 1
Director Field Visits	0	1	≥4 Per Year			—

Figure 5 - Executive summary of safety performance

We have achieved our target of reducing unauthorised access to our network – there was no unauthorised access to our network equipment or substations in the last year. We believe this shows that our site security and public awareness programs are successful.

No high voltage service lines needed to be disconnected because of unsafe conditions in the last year, which meets our safety target for this metric. This indicates that the safety audit program that we operate for these lines is successful.

The target for work site audits by our engineering staff was met. These audits give an opportunity for the staff that are designing, specifying, and managing work to verify first-hand the level of safe work practices that are applied in the field. This reflects the high level of staff engagement in maintaining a safe work environment.

There has been a single lost time incident for the 12 months to March 2020. We recognise that the use of LTI’s as a safety metric is a lagging indicator, and with the implementation of the critical risk program and our training framework, we will be introducing indicators that will help maintain our focus and drive of maintaining a safe work environment.

3.3 SERVICE LEVEL: RELIABILITY

Reliability of our network is of high importance to us and to our customers. Our customer surveys have revealed that the service attributes most highly valued are "*keeping the power on"* and *"getting the power back on if it goes off*".

3.3.1 Objectives

An important part of our corporate mission and objectives is to *"operate a reliable and efficient distribution network".* Results from our surveys tell us that most of our customers have expressed a preference for similar levels of reliability to what they currently experience. Hence our objective is to retain the same levels of reliability over the term of this AMP as we currently provide and minimise outages to as short a time as possible.

3.3.2 Methods

We will meet our reliability objectives by:

- designing and constructing new network to meet modern standards for overhead line construction, taking in to account the prevailing environmental conditions
- applying new technology to improve quality, reliability and customer service
- regularly inspecting the condition of network assets using modern techniques to ensure that deficiencies are discovered
- proactively patrolling the network looking for vegetation related issues
- rectifying vegetation defects in a timely manner
- prioritising and rectifying defects in a timely manner, keeping in mind that minor defects can develop into more serious issues over time
- monitoring condition and age of equipment and proactively replacing assets where it is economical to do so
- where it is not economical to replace aging equipment, deploying automated and remotely controlled devices, such as reclosers, sectionalisers, and tie-switches to limit the number of customers affected by faults
- optimising the location of isolation devices to minimise the number of customers affected by particular outages
- monitoring and analysing faults data to identify emerging trends
- coordinating work within a geographical area to minimise the impact of planned outages
- examining network performance after major events such as snow storms to gain insight into Asset Management changes that may improve performance. Even though these events are normalised out of the SAIDI and SAIFI statistics we realise that they do have an impact on customers and aim to improve our resilience against them.

3.3.3 Measures and targets

Two indicators that we use to monitor the reliability of our network are the industry performance measures of System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI).

SAIDI is the accumulated total time that the average customer connected to the network will be without supply in any measurement year as a result of faults and planned outages on our network. The units are in minutes.

SAIFI is the total number of supply interruptions that the average customer connected to the network will experience in a measurement year as a result of faults and planned outages on the network. The units are outages per customer per year. It should be noted that, while an individual customer can only experience a whole number of outages, the target is set as a real number to allow for the effect of averaging.

In our view SAIDI and SAIFI effectively measure the extent to which we are able to achieve our objectives of supplying a safe, reliable, and efficient electricity supply to our customers. SAIDI and SAIFI are also used by the Commerce Commission for setting a quality threshold which it uses to determine whether the EDBs that it regulates are performing to an acceptable standard. As an exempt EDB we are not regulated to this default price-quality path regulation, however we believe that it makes good sense to subscribe to the same methodology used by non-exempt EDBs. This also allows for functional benchmarking against other EDBs throughout New Zealand.

In line with the approach taken by the Commission, our SAIDI and SAIFI results may be normalised when necessary. Normalisation is designed to exclude the impact of events (such as an extreme weather event or an interruption due to an outage on the Transpower network) that are outside of our reasonable control. We believe that using normalised measures will provide a better indication of the success of our asset management strategies by limiting the extent to which events outside our control impact on our measured performance.

The targets for SAIDI and SAIFI, as published in our Statement of Corporate Intent, are shown in Table 7 below.

Table 7 - SAIDI and SAIFI targets.

Network Non-Financial Performance Measures	***31 March 2021***	***31 March 2022***	***31 March 2023***
Unplanned SAIDI minutes	45	45	45
Planned SAIDI minutes	105	105	105
Total SAIDI minutes	**150**	**150**	**150**
Unplanned SAIFI	0.8	0.8	0.8
Planned SAIFI	0.4	0.4	0.4
Total SAIFI	**1.2**	**1.2**	**1.2**

Our SAIDI results are affected by the length of time it takes us to restore power from an unplanned outage. While keeping safety paramount, we are committed to restoring power to our customers as soon as possible should an unplanned outage occur. Our targets for restoration times for different load classes are shown in section 6.1.5.2.

3.3.4 Performance

Our historical SAIDI and SAIFI performance data is shown below in the figures below. The performance levels shown exclude the impact of Transpower outages.

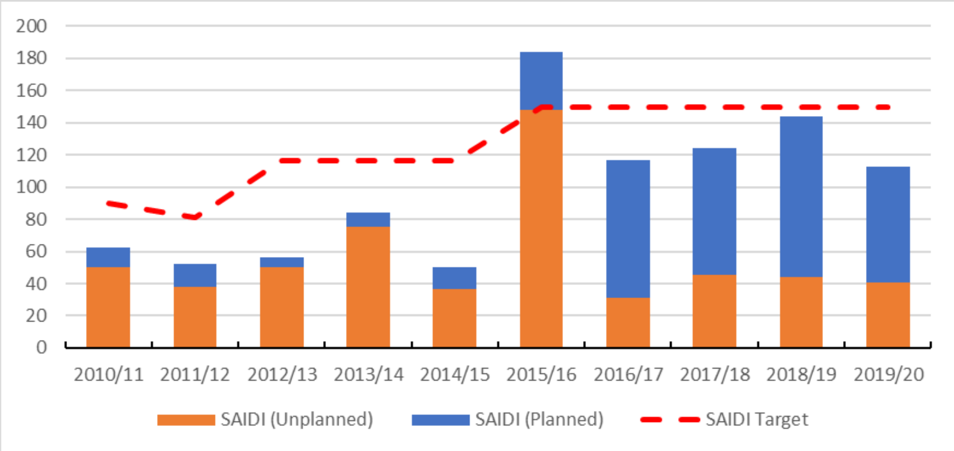

Figure 6 Historical SAIDI performance compared to target

Our SAIDI performance over the last 10 years shows no material change in the impact of unplanned outages. The large increase in 2015/16 year is due to the after effects of a major storm, where some customers were without power for several days.

The impact of our reduction in live line work is partly responsible for the increase in planned SAIDI from 2016/17 onwards. This also reflects the fact that the last few years have involved some significant asset replacement in the area of poles and HV switchgear, necessitating more outages in more densely populated areas of the network.

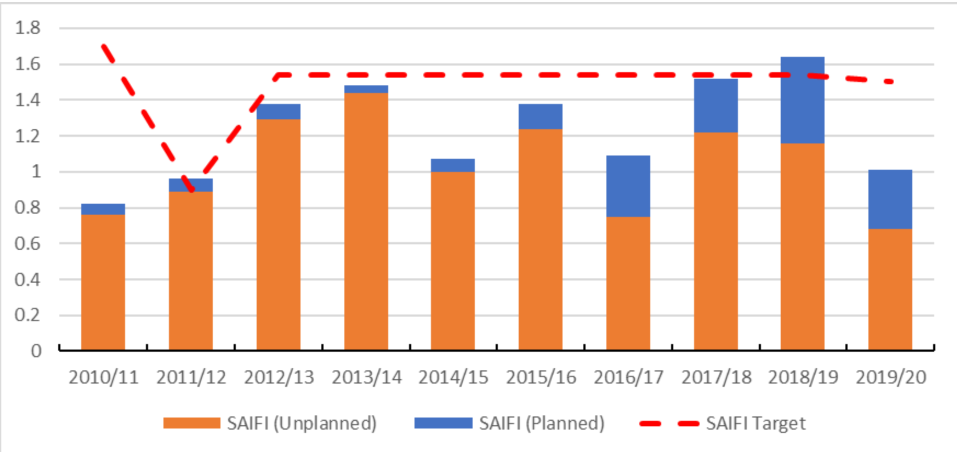

Figure 7 Historical SAIFI performance compared to target

We compare our performance against that of the rest of the industry, to provide a measure of the service level that we provide for our customers against what they might receive in another region. The source for this is performance data published by the Commerce Commission on their website[4], which is taken from the information disclosures provided annually by EDBs to the Commission.

[4] https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-distributor-performance-and-data

One of the common comparative reliability metrics associated is the number of unplanned interruptions (faults) that occur per 100km of circuit length. This provides a normalising factor between networks of different sizes, and the comparison of NWL against all other EDBs is shown in Figure 8 below

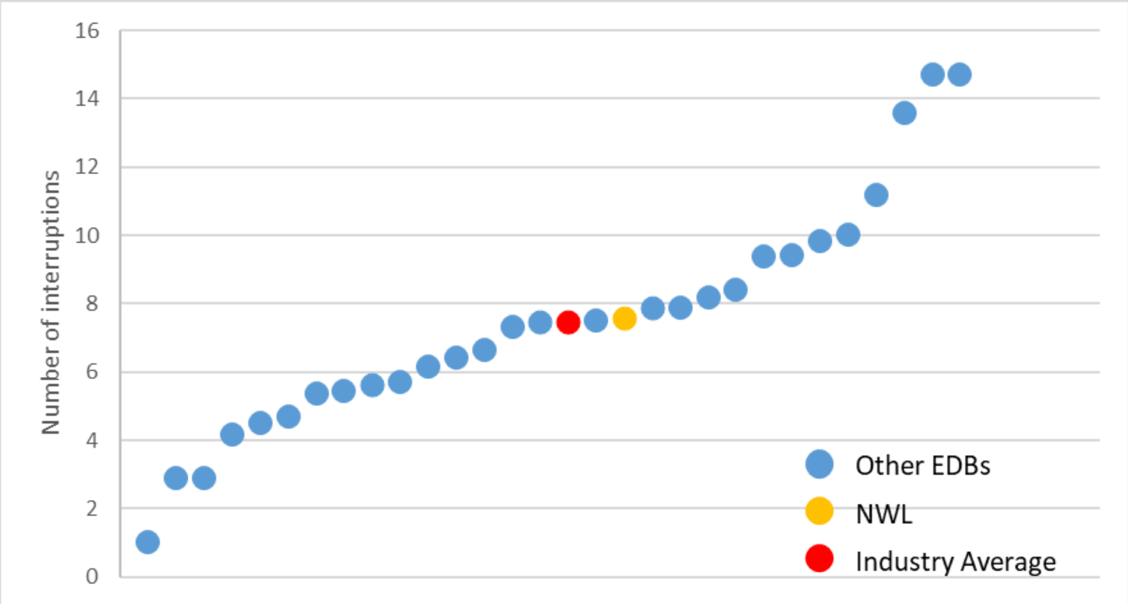

Figure 8 - Comparison of NWL unplanned interruptions per 100km against industry

The number of unplanned interruptions on our network are near the average level for all EDB's in New Zealand.

We also compare our outage statistics against our immediate neighbours and other South Island EDB's with similar operating environments and network characteristics (peer EDB's), as listed in Table 8 below.

Table 8 - Peer EDBs for the purposes of performance comparison

EDB	Region
Alpine Energy	South Canterbury
Aurora	Dunedin, Central Otago
Buller Electricity	Buller region
EA Networks	Mid Canterbury
Mainpower	North Canterbury
Marlborough Lines	Marlborough
OtagoNet Joint Venture	Otago
Westpower	West Coast

The comparison of our unplanned interruption performance per 100km of circuit length to that of our peer EDBs is shown in Figure 9.

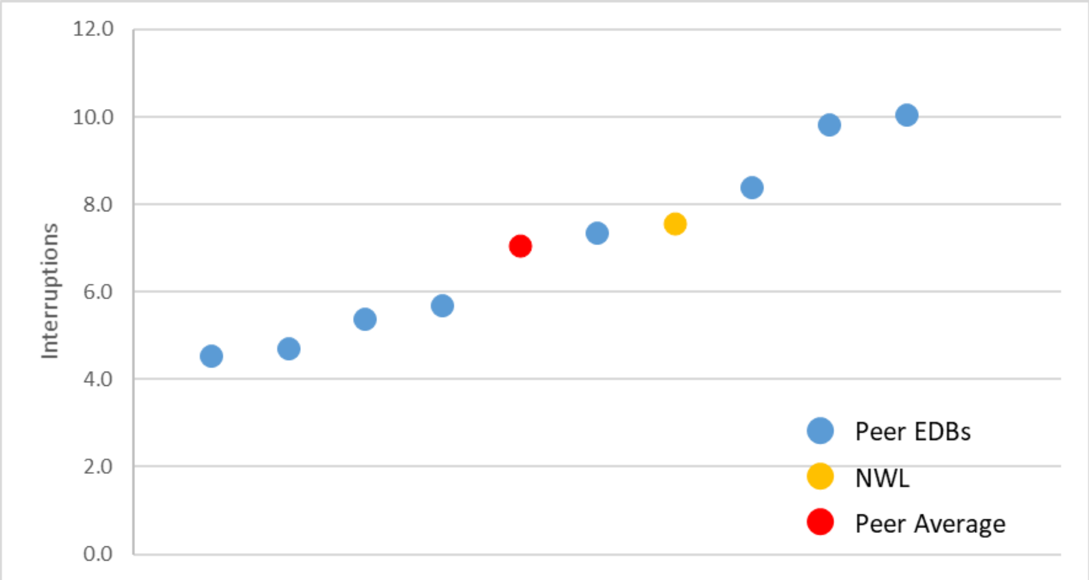

Figure 9 - Comparison of 2018/19 NWL unplanned interruptions against peer EDBs

This shows that our performance for the incidence of unplanned outages within our peer group is also near the average.

When we consider the SAIDI and SAIFI figures for the peer group as shown in the figures below, it is clear that both our unplanned and total outage (planned plus unplanned) performance is favourable compared to our peers. The particularly low SAIDI figure indicates that the combination of network design to restore load quickly, and rapid fault response are providing our connected customers with a good level of service.

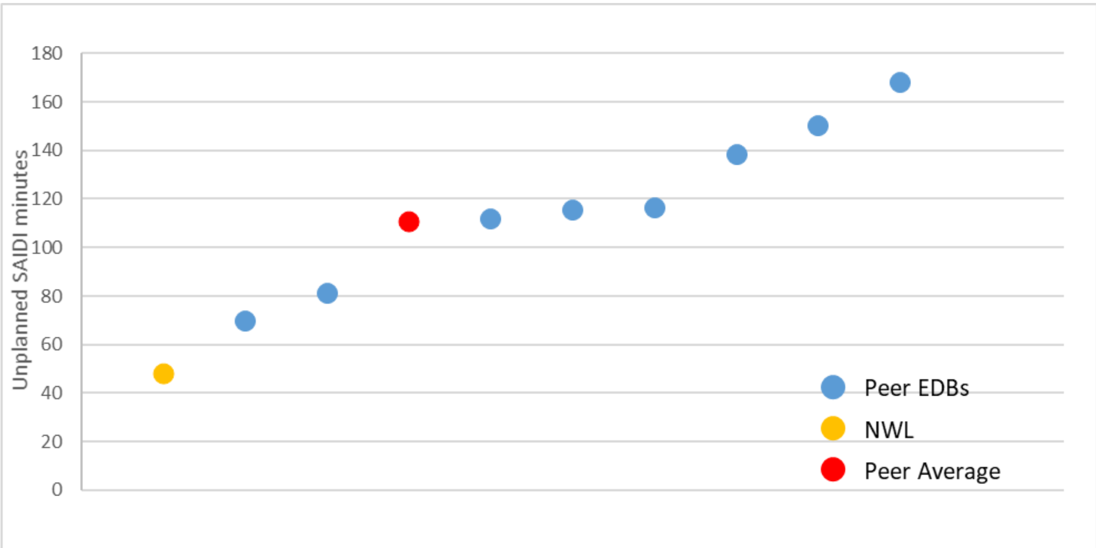

Figure 10 - Comparison of 2018/19 unplanned SAIDI against peer EDBs

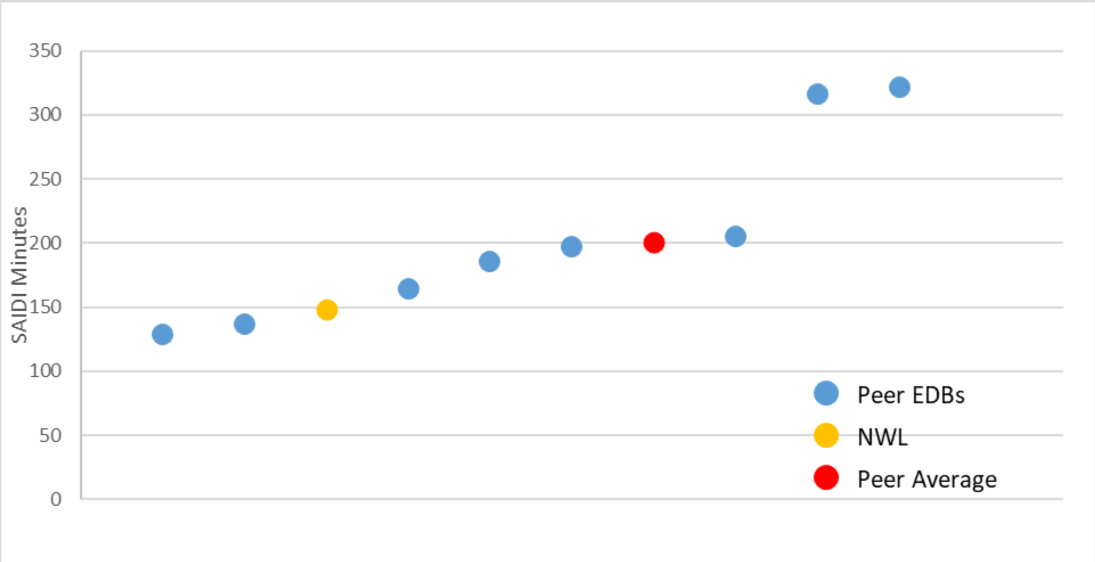

Figure 11 - Comparison of 2018/19 total SAIDI against peer EDBs

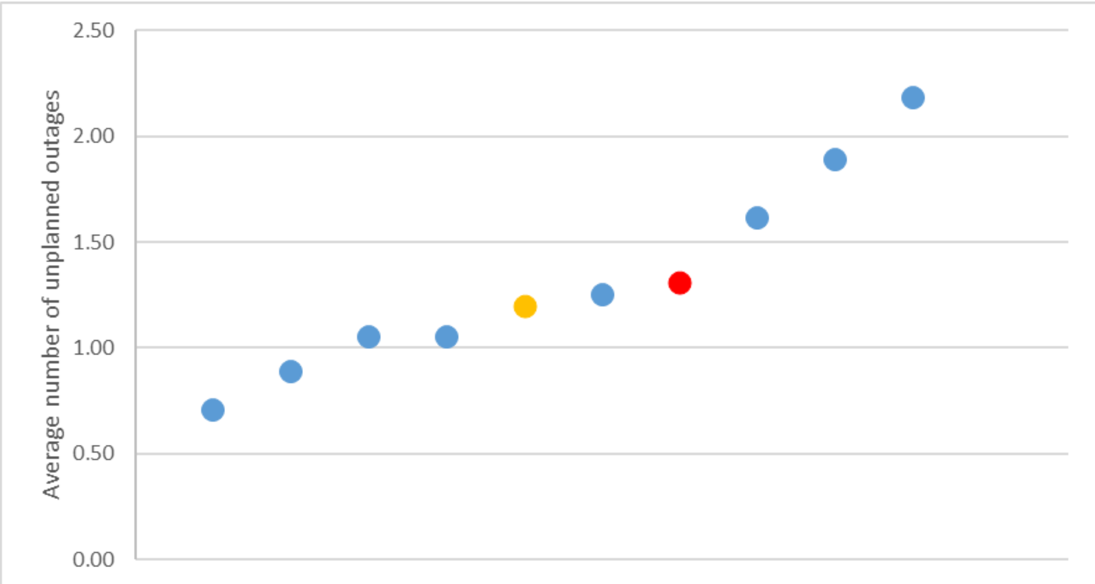

Figure 12 - Comparison of 2018/19 unplanned SAIFI against peer EDBs

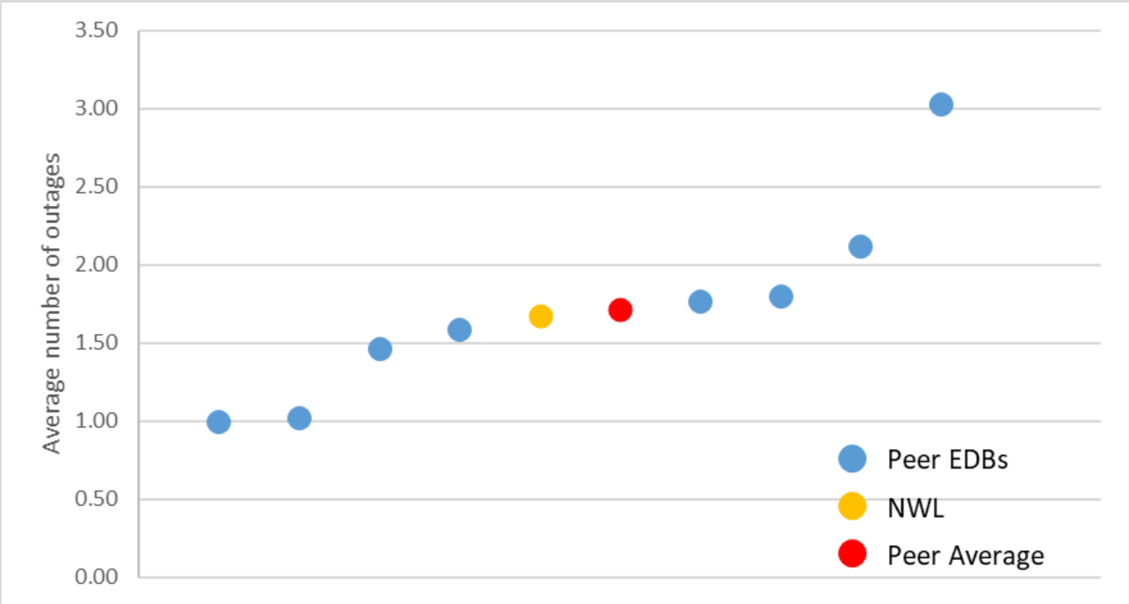

Figure 13 - Comparison of 2018/19 total SAIFI against peer EDBs

We have recently added analysis tools to our operations that will allow better insight into outage statistics, and what they can tell us about the long-term performance of our network. We believe that at this stage the data shown in the figures above can give our stakeholders comfort that we are not lagging behind our peers and are performing to a reasonable level.

3.3.5 Analysis of worst performing feeders

The causes of unplanned outages can show areas that require focus in a network. We have 55 distribution feeders and have analysed the number of faults across these feeders for the last three years. This shows that the 10 worst performing feeders are responsible for approximately 40% of all faults (30% of HV and 60% of LV) associated with network equipment. Note that LV faults do not usually impact upon SAIDI and SAIFI statistics.

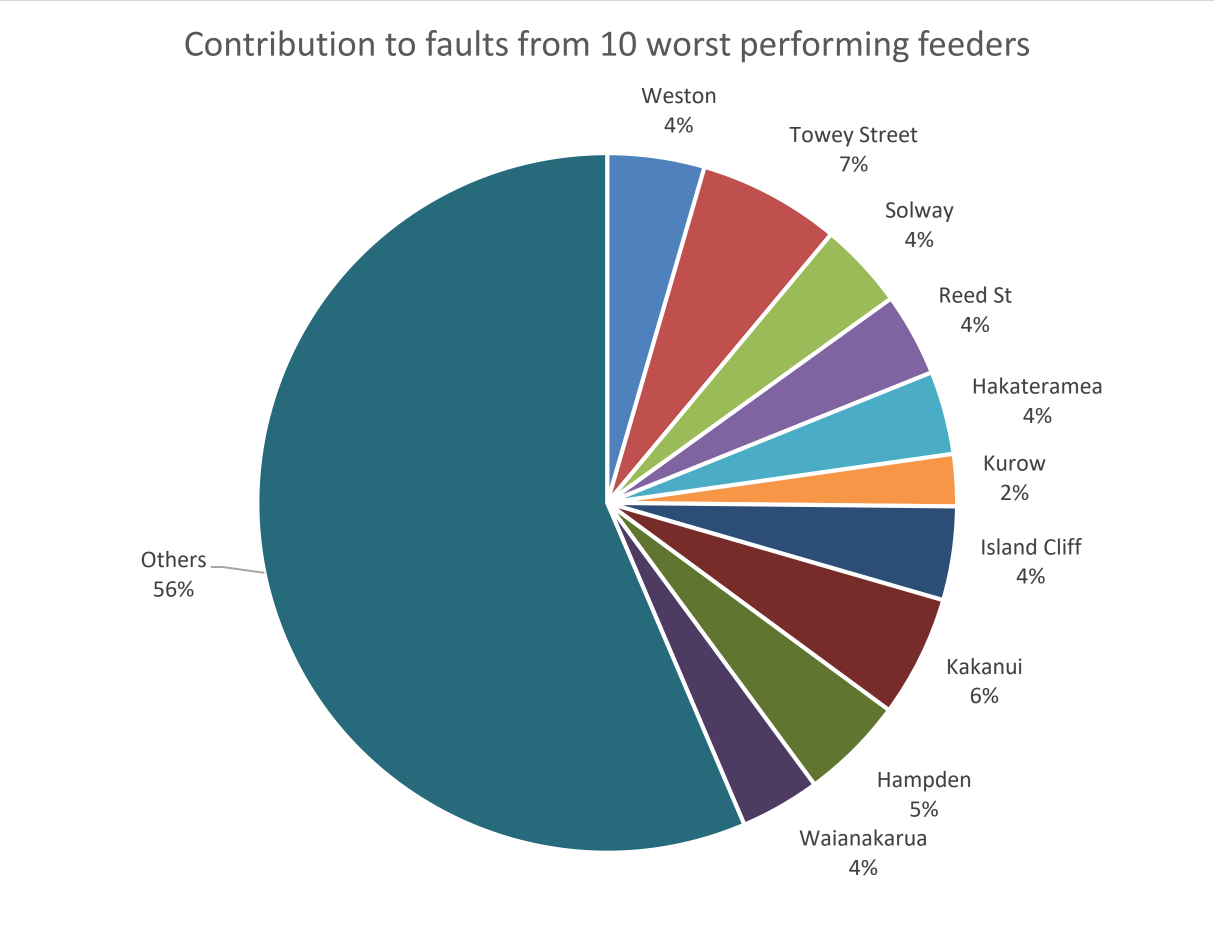

Figure 14 - Worst performing feeders by number of faults

These feeders are all demonstrating higher than average levels of faults in one or more categories. These feeders can be broken into several common groupings, based on geographic location, and common issues.

Common issues causing faults that stand out across these feeders are:

- Defective low voltage switchgear and fuses
- Defective high voltage switchgear and fuses
- Wildlife contacts
- Third party contacts

It should be noted that we will not be specifically targeting work on these feeders, but will be using this data as a way to focus network wide programs, which will include these parts of the network. In the distribution network area of section 5 (Renewals and Maintenance) we detail how we intend our planned renewal spends are likely to improve the performance of these feeders.

3.4 SERVICE LEVEL: ECONOMIC EFFICIENCY

As well as delivering supply reliably, there is a need to ensure customers are supplied in an economically efficient and cost-effective manner. We benchmark several measures against other network companies to understand whether our asset investment strategies are delivering efficient outcomes for the benefit of our electricity customers in the region.

3.4.1 Objectives

We have three economic efficiency objectives. These are to:

- minimise energy losses on our network
- optimise the utilisation of our assets
- manage operating costs to minimise the overall supply costs to our customers.

3.4.2 Methods

To ensure that our economic efficiency targets are achieved we:

- consider the impact of losses when evaluating options for network upgrades and renewals
- optimise loading between our GXPs to improve the efficiency of energy transmission to customers
- actively manage capacity and asset utilisation, and balance equipment loadings where an under or over use becomes apparent
- continually work to improve our works delivery model and processes
- investigate new technology options for improved performance.

3.4.3 Measures and performance

The economic efficiency measures we employ are:

- Operational expenditure per connection point
- Operational expenditure per km of network

3.4.3.1 Operational expenditure per connection point – measure and targets

This measure provides an understanding as to whether operating expenditures are appropriate given the operating parameters of our company. The target levels are based on comparing our forecast operational expenditure budgets against peer EDBs, including an allowance for inflation.

Tracking this measure links our asset management processes to customer and stakeholder preferences for supply reliability. Adequate levels of operational expenditure per connection point are required to ensure sufficient maintenance is performed to maintain overall system reliability.

3.4.3.2 Operational expenditure per connection point - performance

Figure 15 shows a comparison between our 2018/19 total operational expenditure (OPEX) per connection point and that of all other EDBs in New Zealand.

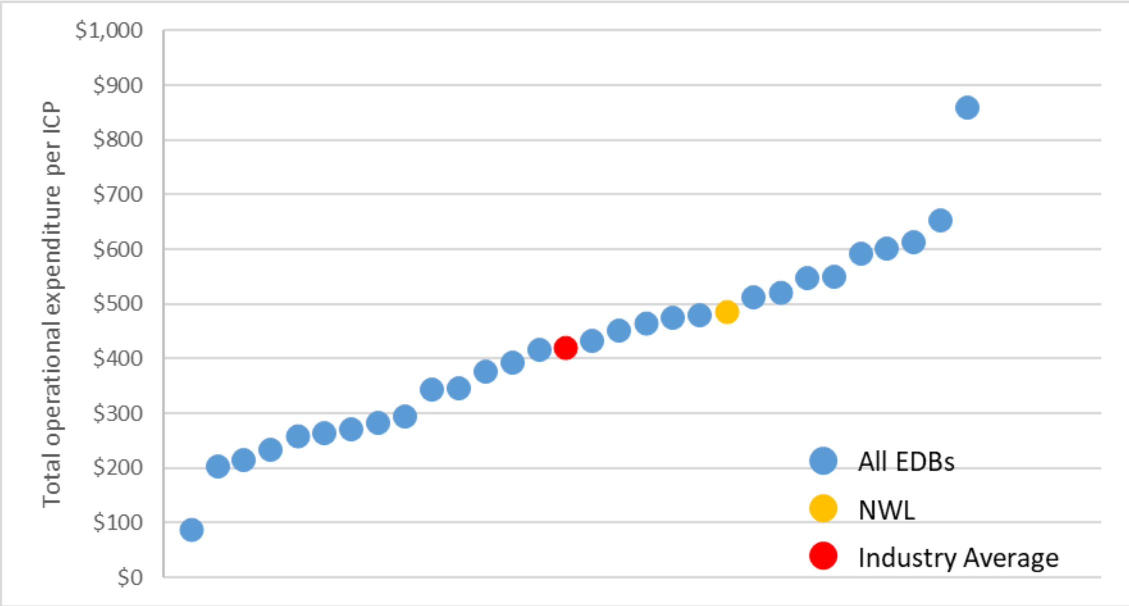

Figure 15 2018/19 NWL total operational expenditure per connection point performance compared to all EDBs

The following graph shows the operational cost comparisons between our peer group of EDBs.

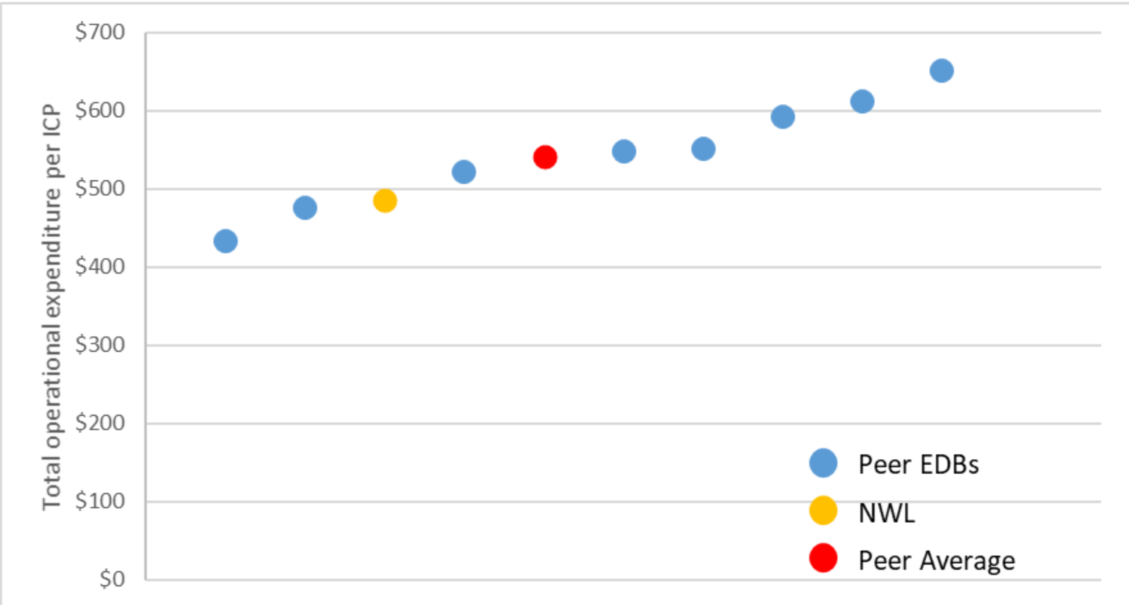

Figure 16 - Comparison of 2018/19 total operational expenditure per ICP against peer EDBs

We believe that we have had the balance between operational costs and network reliability correct, as shown by our OPEX per ICP being in keeping with our peers in the industry.

3.4.3.3 Operational expenditure per kilometre of circuit length –measure

This measure provides another view of whether operating expenditures are appropriate for our network.

Tracking this measure will link our asset management processes to customer and stakeholder preferences for supply reliability. Adequate levels of operational expenditure per kilometre of circuit length in the network are required to ensure sufficient maintenance is performed to maintain overall system reliability.

3.4.3.4 Operational expenditure per kilometre of circuit length -performance

Referring to **Figure 17** below, our operational costs per kilometre of circuit length are at the lower end of our peer group of EDBs.

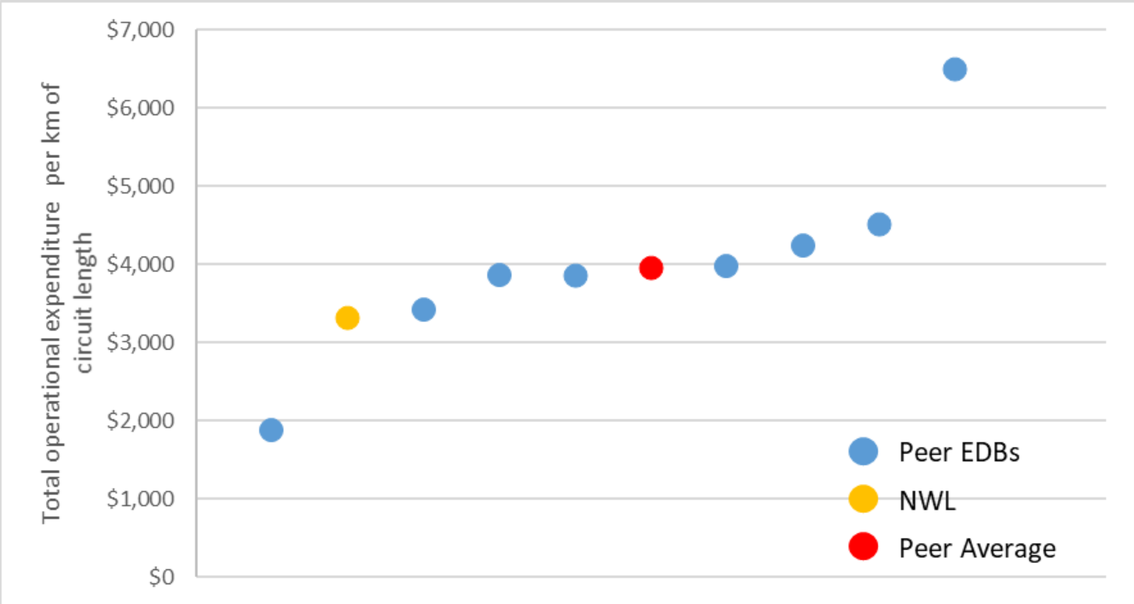

Figure 17 - Comparison of 2018/19 total operational expenditure per metre of circuit length against peer EDBs

Looking at the combination of operational expenses per length of circuit and per ICP shows that we are successfully managing the operational costs associated with operating an electricity network.

We believe that combined with the reliability performance that was analysed in section 3.3 this data clearly shows that we are delivering above average performance while our operational costs are amongst the lowest in our peer group.

We will work on keeping our operational costs low by:

- ensuring proactive maintenance and repairs are undertaken to ensure fewer faults and asset failures occur.
- evaluating and making 'replace versus repair' decisions before undertaking large corrective maintenance projects.
- tracking and capitalising operational costs for our engineers and support staff where their work is involved with a capital project.
- considering ongoing operational costs in the selection of equipment and systems and selecting equipment that balances operational and capital expense.

POWERING NORTH OTAGO

04

APPROACH TO ASSET MANAGEMENT

This chapter outlines the approach that we take to managing our Network assets. It provides an outline of the key parts of the planning and the delivery areas of this discipline. This chapter is structured as follows:

Asset management process: provides an overview of how we view Asset Management as a process and provides detail of how key elements fit the process.

Asset lifecycle management: describes how we approach the different aspects of the lifecycle of our assets, including initial investment, ongoing maintenance, and refurbishment, and how we make decisions on asset investment.

Risk management framework: describes how we apply Risk Management to our business, especially around the treatment of assets.

Public Safety Management System, high impact low probability events and emergency response policies and contingency plans: these sections outline processes that we use to manage keeping our network safe for the public, and how we manage our preparedness for major events.

Asset management maturity: this section reflects on how mature we believe our asset management processes are, specifically using the Commerce Commission's AMMAT system for analysis.

Improvement initiatives/continuous improvement: this section outlines the ways in which we are working to improve our asset management capability.

4. Approach to Asset Management

4.1 ASSET MANAGEMENT PROCESS

The process that we apply to planning our Asset Management is illustrated in Figure 18 below.

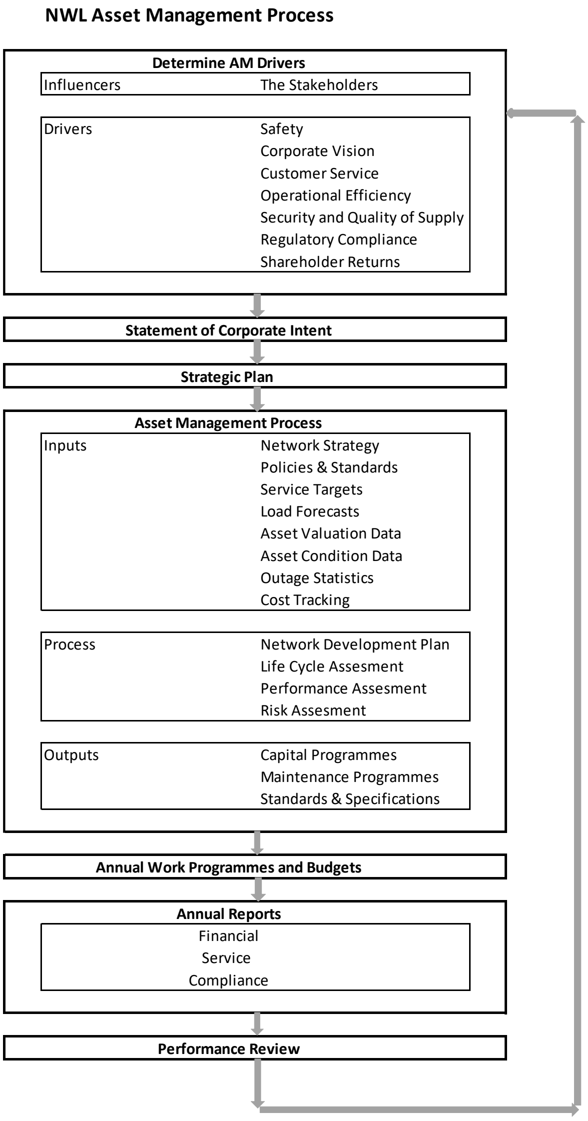

Figure 18 NWL asset management process

The planning process should be viewed as a continuous cycle rather than a hierarchy of documents. Details of some of the key components of this process are described on the following pages.

4.1.1 Asset Management Policy

The purpose of our Asset Management Policy is to ensure that our asset management activities occur within a structured and systematic framework. This framework provides a focus on delivering a safe, reliable, secure, resilient, and cost-effective supply of electricity that meets the performance expectations of our customers, while complying with all relevant New Zealand laws, regulations, and codes of practice.

4.1.2 Asset Management Strategy

Our Asset Management strategy is to ensure that our asset management practices continue to deliver agreed service levels as set out in this AMP at minimum long-term cost.

Our Asset Management strategy aligns with our Asset Management Policy and corporate objectives and encompasses the components listed below.

4.1.2.1 Asset configuration

The following strategies are applied to our consideration of asset configuration:

- We will take a long-term view of asset requirements, noting that customers ultimately benefit from well planned investments.
- We will construct all future subtransmission lines at either 66 kV or 33 kV, in line with our Network Development Plan. Lines may be operated at 33 kV in the short-term prior to a strategic decision to convert to 66 kV.
- When building new substations, we will purchase sufficient land to enable dual transformer 66 kV (where appropriate) substations to be built.
- We will consider using portable or semi-portable generators to help meet security of supply standards during planned and unplanned outages. To enable this, when installing new, or upgrading existing distribution boxes, consideration will be given to installing generator connection plugs to enable quick and easy connection of portable generators.

4.1.2.2 Resourcing

The key strategies applied to resourcing for our company are:

- We will identify the required skill sets needed for effective asset management and have a well-developed recruitment and training plan in place.
- We will ensure that our contracting business has a well-developed recruitment/training plan – an aging workforce means that we need to prepare workers to deliver on the strategy during the planning period.
- We will continue to utilise external contractors to maintain our specialist systems such as communications and SCADA networks.
- We will continue to maintain our engineering skill set through the hiring of qualified engineers and supporting the growth of trained engineers by providing scholarships for local students taking engineering qualifications.
- As technology and systems advance, we will actively identify gaps in skillsets necessary to utilise the best tools and train our staff or recruit to fill those deficiencies.
- We will continue to engage suitable consultants for specialist work including civil design, protection, and regulatory advice.

4.1.2.3 Materials

We recognise that decisions made around material selection for construction projects can have long term implications on capital and operational expenditure. We apply the following principles to purchasing decisions:

- We will use only materials and equipment approved by our internal policies and standards, or by specific design where necessary.
- In assessing offers to supply materials or equipment, we shall consider the total life cycle costs of the offer.
- When bringing new equipment types onto the network we will follow a rigorous procurement process which will examine the risks associated with safety, longevity, maintainability and operability of the equipment.

4.1.2.4 Delivery of works program

Where practical our engineering staff commence design for projects in the financial year prior to the works program. Budgets are developed to provide funds to do this prework where possible. This smooths out the planning process between our designers, project managers and contractors.

This also provides opportunities to pre-order long lead-time material items so that they can arrive earlier in the financial year.

Progress against the works program is monitored by the management team throughout the year, with careful attention paid to the resourcing and prioritisation of work. The timing of a job may be brought forward or deferred depending on the priority. An example of this is when low priority maintenance such as painting an asset may be moved back in the works program to free up resource to carry out safety related work which may not have been in the original works plan but has arisen through routine inspections.

4.1.2.5 Performance reporting for asset management

We believe that the asset management of our network should be implemented in an open and transparent manner. The key formal reporting mechanisms that we employ are shown in Table 9.

Table 9 - Key asset management reporting mechanisms

Reporting line	Reporting mechanisms and content
The Company to consumers and stakeholders	The company website includes the AMP, Company Annual Report, and other disclosure documents. Company annual report includes Chairman and Chief Executive's statements and audited accounts. Annual information disclosure.
The Board to the Trust	Quarterly presentation includes financial and operational performance.
Chief Executive to the Board	Chief Executive's statement in company annual report includes narrative of year's highlights. Monthly board report includes progress on significant Capital projects and major outages. Email updates between meetings on significant developments.
Management Team to Chief Executive and the Board	Annual reports on budget and major projects Monthly reports include network performance and progress against budget. Individual reports on major projects. Daily updates on areas of concern

4.1.3 The Asset Management Plan

This Asset Management Plan (AMP) is intended to provide stakeholders a window into our asset management practices, and to communicate our plans for the next 10 years of operation and development of the network.

In particular, the objectives of this AMP are to:

- Link the asset management processes to customer and stakeholder preferences for prices, supply reliability, and public safety.
- Demonstrate that all asset lifecycle activities, plans and associated costs are systematically planned with a long-term view towards minimising lifecycle costs, which promotes productive efficiency.
- Demonstrate that physical, commercial, and regulatory risks are correctly managed throughout the life of our assets.

4.2 ASSET LIFECYCLE MANAGEMENT

An overview of the typical lifecycle of a network asset is shown in the figure below:

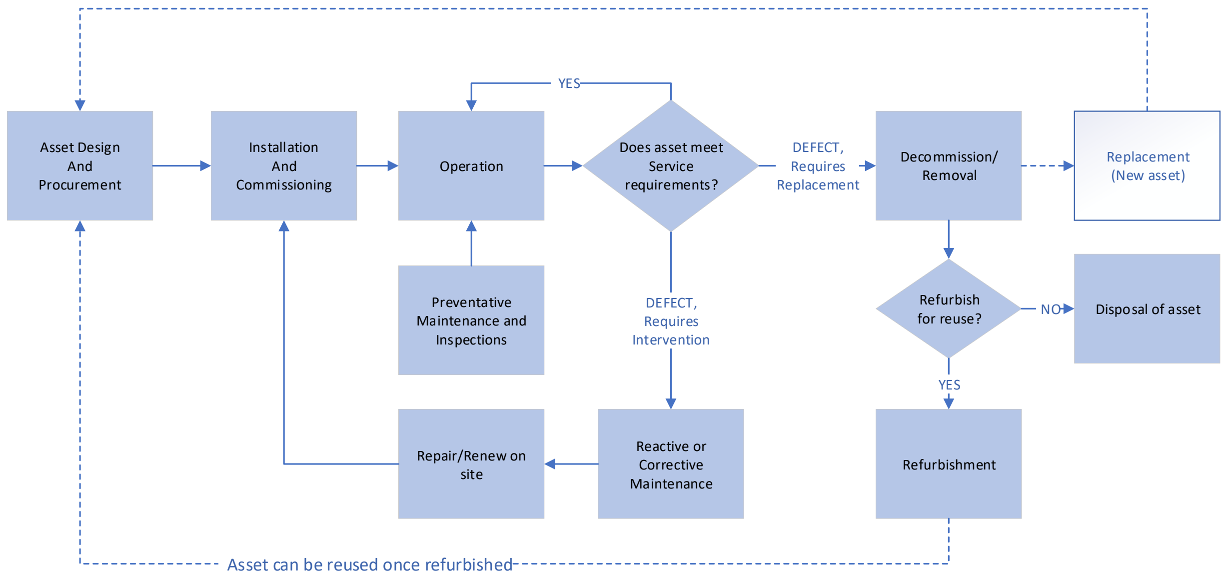

Figure 19 - Typical network asset lifecycle

4.2.1 Design and Procurement

The design and procurement activities are where we begin to influence the service life of our assets. By following good design practice and standards and working with reputable suppliers we control the quality of assets entering service on the network.

We follow a rigorous change management process to ensure that new equipment can be safely installed, operated and maintained on the network. This process also identifies any special tools or techniques that a new type of asset may require to be installed and operated.

4.2.2 Installation and Commissioning

Utilising correct techniques and equipment for installation and commissioning ensures that new assets are installed as per the manufacturer’s intentions and are operated within their design tolerances. Examples of this are following specific handling methods for lifting concrete poles, and having trained staff use the correct tooling for installation of cable terminations

4.2.3 Preventative Maintenance and Inspections

Preventative maintenance is carried out based on the results of inspections as well as at defined intervals in order to keep the equipment in good condition. Preventative maintenance includes activities such as greasing and checking the contacts on an air break switch or maintaining the tap changer on a power transformer. These activities can be scheduled based on time cycles (e.g. 3 yearly) or on operational activity (e.g. after three high current faults).

During the operational period assets are regularly inspected to identify any defects. Inspection intervals are determined according to the type and criticality of the asset in order to make sure that it still meets the required levels of service.

Inspections include visual inspections such as a walk around of a substation fence, as well as more in-depth condition monitoring such as the thermal inspection of a high voltage circuit breaker, or X-ray inspections of a wooden power pole. Periodic inspections are usually scheduled at suitable time-based intervals.

We are also trialling real time monitoring on some assets in order to optimise our response to conditions such as overloading, and in some cases to potentially discover defect conditions much earlier than we presently can.

4.2.4 Asset Defects

Assets that do not meet a required service level are recorded in our defect management database. The defect process includes a risk assessment to identify potential risks, including the safety of the public and our workers, and the possible effects on the network. Defects which have a potential risk of causing serious harm to members of the public, employees, or property; or which could have a large impact on the reliability of the network are treated with high priority and must be resolved rapidly.

Information to trigger renewals or maintenance can also come from analysis of fault reports, from observations of our staff or members of the public, or from wider industry advice of an issue with a particular asset type.

A defect may be due to the failure of an asset to meet a required level of service such as electrical capacity (e.g. an overload on a transformer), structural capacity (degradation of a power pole means it can no longer safely support conductors), or operational (the asset cannot be supported due to age and lack of spare parts). The outcome of the defect can range from a gradual reduction in useable life or capacity, through to catastrophic failure.

4.2.5 Repair, renewal or replacement decisions

When planning the remediation of a defect the risk assessment is reviewed to determine the appropriate intervention strategy. It is important to deal with a defect that has a high safety or network operational risk attached such as a damaged ground mount transformer, whereas a less urgent intervention can be scheduled for a future date, possibly during a planned shutdown. Occasionally the risk associated with a defect is so low that pre-emptive intervention is not considered economical and the asset may be left to run to failure with appropriate monitoring.

Intervention can involve repairing an asset in place (return to pre-defect condition or capacity), renewing it on site (improve on pre-defect condition or capacity) or replacing it with a new asset. The age, condition, urgency of the defect and any known issues with that type of asset are all considered in making this decision.

Sometimes a renewal program will be triggered based on the age and general condition of a group of assets, such as a particular section of an overhead line, rather than specific individual defects. These planned renewals are undertaken to ensure network safety and reliability.

Renewal may also be carried out to ensure that an asset or system will continue to meet its performance requirements, such as capacity or speed of operation.

4.2.6 Standard Life expectancy and asset age data

Our company has applied standard life expectancy figures across all categories of assets for many years. The values for these life figures are developed from industry published figures and are used primarily for accounting purposes such as setting depreciation rates. In practice we are seeing that the useful (and safe) life of our assets is generally higher than the standard life, and can be highly dependent on location, treatment, and loading. For this reason, wherever possible we avoid using age as a proxy for condition and base asset decisions on observed or tested data.

Some classes of asset have incomplete data for installation dates. Where is evidence supporting a likely installation period (such as neighbouring equipment, or staff knowledge) then we will linearly divide the assets across that period. Otherwise, we will take a conservative approach and place the assets in the earliest likely period for that type of asset. Lack of age data is offset by condition assessment, which serves as a better predictor of remaining asset life than the date of manufacture.

4.2.7 Investment decision framework

Before major investment is considered on our network, consideration is given to the following options:

1. **Accept the constraint**

   This option is not usually implemented for long periods of time and may be used where longer-term solutions cannot meet required time frames or where the costs of other options significantly outweigh the benefits. The risks of operating in this mode must be quantified and assessed as acceptable.

2. **Optimise the network**

   This option could involve altering the configuration of 11 kV feeders to shift load from a heavily loaded to a lightly loaded feeder or it could involve installing a voltage regulator on a feeder to avoid a conductor upgrade.

   Consequences such as increasing system losses or a reduction in security of supply should be included in the cost-benefit analysis.

3. **Control customer load**

   This option involves NWL acting to reduce customer load while a constraint is present.

   If new load is likely to exceed a constraint limit NWL may choose to impose conditions that allow NWL to control that load during constraint periods. If the network is upgraded to remove the constraint these conditions may be removed.

   Loads that may be controlled include load traditionally available for interruption such as water heaters and load that is specified as controllable in our Security of Supply Standard (e.g. Irrigation load)

4. **Non-traditional solutions**

   This option may be used to augment parts of our network or in some cases replace them. A remote power system could be used to replace a traditional power line if the lifecycle costs of this are less than the costs of building or maintaining the line or solar and/or batteries could be installed to avoid upgrade of existing assets by reducing peak loading. There is scope in this option for innovative solutions to be developed.

5. **Modify or re-rate existing assets**

   This option could involve a design review to increase conductor maximum temperatures or using dynamic rating on a line or cable to increase capacity. Cooling fans could be added to a transformer to increase capacity.

6. **Install new assets**

   This involves either building new network or upgrading existing assets.

Customer load increases are often signalled to us at short notice (in this context, less than 12 months) which may require that options 1 to 3 are used in the short term, followed by a long-term response following detailed analysis of all appropriate options.

For low cost projects, we use deterministic rules from our design and Security of Supply standards which may result in evaluating only a subset of these options.

All options selected for detailed study are evaluated for cost and benefit (including costs of energy losses and value of lost load where appropriate) and considered for alignment with:

- Our strategic plan (which includes health and safety, environment and sustainability requirements),
- Statutory requirements (e.g. voltage, power quality limits)
- NWL Security of Supply Standard
- Forecast network capacity requirements
- Customer reliability requirements

Options are scored across these categories and ranked according to their scores. The option (or options) with the best score are submitted for expenditure approval.

4.2.8 Expenditure approvals

Following on from this initial prioritisation process, a Project Expenditure Approval is prepared for any individual project over $50,000; any individual project over $500,000 requires a business case which will be presented to the board for approval.

The business case includes details of:

- the risks and issues that the project is designed to address
- analysis of the options that have been considered
- recommendations for solutions
- the rationale for the selected option or options
- financial analysis of the options, including a risk-based assessment of the cost of lost load, if applicable
- analysis of performance impacts with respect to SAIDI and SAIFI and any other service level targets
- any other benefits that will accrue from this project in terms of security, quality, customer/community perception etc.

4.3 RISK MANAGEMENT FRAMEWORK

Our business faces a wide range of risks. Some of those risks relate specifically to our network assets and the physical environment in which they are located, whilst other risks include more generic risks that all businesses face. Risk management is a fundamental part of good management practice and corporate governance, and effective stewardship of our assets.

Our approach to risk management strengthens our asset management decision making and practices. We apply risk management in all our business activities, including policy development, business planning and change management. We adopt a systematic risk management process that is based on *AS/NZS ISO 31000:2009 – Risk management – Principles and guidelines*.

Figure 20 below illustrates the systematic application of risk management according to the standard:

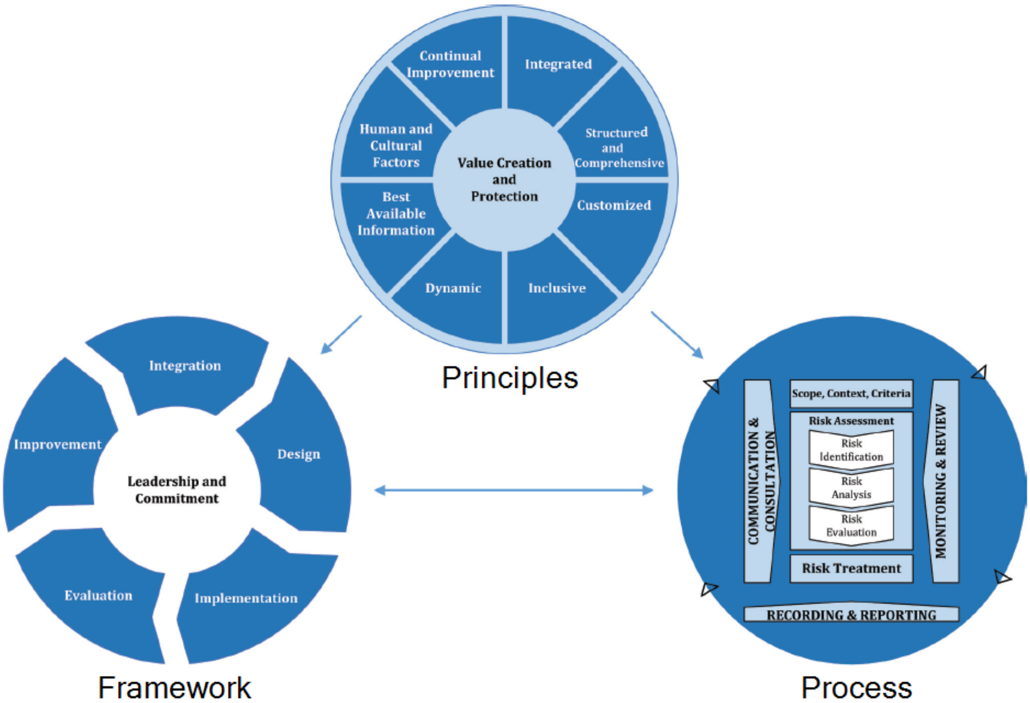

Figure 20 - From ISO31000:2009 relationships between the risk management principles, framework, and process

Our risk management system consists of the following components:

- Specific risk management policy
- NWL risk management framework
- Risk management process
- Risk management plans
- Risk registers
- Risk reporting.

4.3.1 Risk Management Policy

Our Risk Management Policy was rewritten in the past year and focussed on the development and maintenance of a risk management system to:

- promote continuous improvement
- actively encourage the early and accurate reporting of risks, as health and safety and business continuity is dependent on effective risk management
- set risk management objectives and performance criteria for all work areas and review these annually or more often as required
- develop systems and procedures to eliminate or minimise risk and monitor those controls
- investigate all reported risks to ensure controls are identified and, where appropriate, plans are formulated to take corrective action
- review existing risks and take all reasonably practicable steps to control those risks with controls including elimination or minimisation
- ensure that all workers are made aware of the risks they may be exposed to and are adequately trained to manage those risks to an acceptable level
- encourage consultation, coordination and participation with workers, including contracted workers and other Person Conducting a Business or Undertaking (PCBU) in all matters relating to risk as far as reasonably practicable.

4.3.2 Risk management framework

Our Network Risk Management Framework document defines the approach we take to manage risk within our business. It ensures that risk management is integrated into all aspects of our business including governance, strategic planning, operational planning, and reporting.

4.3.3 Risk management process

Our risk management process ensures our risks are identified, understood, and managed consistently across all levels of our business. We assess our known risks in accordance with our likelihood and consequence criteria, to determine which risks need treatment and the priority for treatment.

Our risk management process involves the following steps:

1. **Establishing the context** in which we operate in. This involves understanding our business objectives and values, defining the internal and external environment which we operate in, and setting the scope and risk criteria for the remaining risk management process. We consider many factors including accessibility of our assets by the public, asset age, and location.
2. **Risk identification** is the process of identifying, recognising and describing our risks and the effect those risks have on the ability to achieve our objectives. Our risks are identified through operational processes including hazard identification recording in our Hazard Register by employees in the field, team and project meetings, our Health and Safety management process which includes recording and tracking workplace safety and training data into our safety management system, and our public safety processes.
3. **Risk analysis.** We use both qualitative and quantitative methods during the risk analysis stage. All our identified risks are analysed in terms of likelihood and consequence.
4. **Risk evaluation.** All of our identified risks are evaluated against our likelihood and consequence risk score. This assists us in our decision making to ascertain which risks need treatment and the priority for treatment implementation.

5. **Risk treatment.** We treat a risk depending on the risk score it has been allocated in the analysis and evaluation stage. Risk treatment involves selecting one or more options for modifying risks, and these can include the following:
    - Avoiding the risk by not commencing or continuing the activity
    - Removing the risk source
    - Changing the likelihood
    - Changing the consequences
    - Sharing the risk with another party or parties (e.g. contracts and insurance)
    - Retaining the risk by informed decision
6. **Post treatment risk evaluation.** The risks are reassessed after the application of the treatment to verify that the post treatment level of risk is known and accepted by the company.
7. **Ongoing review of risks.** It is important that once a risk is recorded in the system it is regularly reviewed, as the likelihood and consequence can change. We use the Vault health and safety software package to record and manage risks, including scheduling reviews, and reporting on outstanding risks.

4.3.4 Risk management plans

For complex activities such as major projects or new types of work we employ job safety analysis (JSA) to apply a disciplined risk management approach to planning around the health and safety elements. We are leveraging off this work to develop complete risk management plans for major projects, covering health and safety, financial, environmental, and operating risks for a project. These plans will be developed and approved by the key stakeholders involved in the work in question, such as engineers, managers, and contractors.

4.3.5 Risk registers

Information from the risk management process is recorded, reported, and monitored using our risk registers. There are multiple risk registers in service covering:

- Public Safety Management System
- Health and Safety risks
- Business risks
- Asset risks
- Individual project risks
- Physical risks for specific sites

We are in the process of consolidating the various risks into the online Vault risk management system. This will ensure that all risks can be tracked and managed in one system.

4.3.6 Risk reporting and monitoring

The monitoring of risks is generally carried out at the level of the risk register. The integration of all the registers into Vault has allowed consolidated and consistent management of the different registers. This includes such features as sending emails to staff who have been assigned to manage the risk, and tracking the progress of corrective actions, as well as providing reports summarising the risk items recorded. We have confidence that the monitoring and reporting processes in this area are robust and complete, with monthly reporting on risks in this area going to the board.

Other risks, such as project level performance and commercial risks are monitored by the staff managing the project itself and are normally reported to management on an exception basis if the risk becomes a real threat.

4.3.7 Health and Safety Critical Risks

We maintain a special awareness and focus on critical risks associated with operating an electricity network. These risks have been identified and assessed in collaboration with other EDB's through our involvement in industry safety groups. We are currently in the process of reviewing the risks that represent the greatest risks to our staff, and how we manage them. The critical risks of focus include:

- Health and wellbeing (mental health and fatigue)
- Traffic management
- Asset failure
- Electricity
- Mobile plant and equipment
- Driving
- Working at height
- Dropped objects

The treatment of these risks includes special focus on training and the development of standard work practices, as well as regular monitoring of the risk profile and our performance in these areas. Some of the risk mitigations may involve changes to how we construct or maintain network assets in order to safeguard our staff.

4.4 PUBLIC SAFETY MANAGEMENT SYSTEM (PSMS)

As an electricity network operator, we strive to manage our assets in a way that risk to our people members of the public, and property is reduced to as low as reasonably practical. Our accredited PSMS manages all known hazards and risks to the public or their property, caused by the operation of our business. It records the actions to be taken (or that have been taken) to resolve those risks. Our risks are identified through operational processes such as documentation by field staff, and team and project meetings. This information is also reported to the Board monthly and in annual reports.

Our PSMS is an accredited system to NZS7901 and is audited annually by an external auditor (Telarc). Internal auditors also work to provide assurance that the system is working effectively. In February 2020, we received confirmation that our PSMS again achieved accreditation to NZS7901:2008. Future audits will be against NZS 7901:2014.

4.5 NETWORK RESILIENCE TO HIGH IMPACT LOW PROBABILITY (HILP) EVENTS

4.5.1 Lifeline utility and engineering lifeline groups

The Civil Defence and Emergency Management (CDEM) Act 2002 stipulates the responsibilities and roles of key organisations that provide an essential service within New Zealand. Our core business as an EDB is an essential service and under the CDEM Act we have been classified as a *Lifeline Utility*. As such, we must:

- ensure that we are able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency
- have a plan for functioning during and after an emergency
- participate in CDEM strategic planning
- provide technical advice on CDEM when required.

Our staff are involved in the Otago Lifeline Utilities Steering Group, which allows us to effectively coordinate with other utilities and Civil Defence management on many factors around this important issue.

We also maintain an active relationship with Civil Defence Emergency Management in the Waitaki region, including having a presence at planning workshops, and coordinating post disaster activities.

4.5.2 Improving business resilience

We are subject to the risk of a number of potential high impact, low probability (HILP) events, which could give rise to a major unplanned service outage for an extended period of time. Key examples of HILP events are:

- An earthquake on the South Island's alpine fault
- An earthquake on a major fault line within the Waitaki region
- A tsunami
- A major pandemic
- A large snow storm
- Sustained loss of supply from Transpower's transmission system
- A major communications outage

As a lifeline utility provider, we have a responsibility to plan and prepare for HILP events. We currently have a suite of risk management and response documents and policies in place to guide our response to such an event.

We recognise that our current approach to disaster recovery is dated, and does not reflect current best practice, which emphasises a whole-of-business approach to resilience. Over the next two years we will be improving the ability of our business to ride through an abnormal event such as an earthquake or widespread snow storm, and to operate effectively in the aftermath of such an event. This includes working with a resilience specialist to develop our business continuity processes, as well as focussing on "hardening" specific assets against possible events.

Our goal is to ensure:

- a safe environment for staff, contractors, and the wider community
- reduction in damage to assets where this is economically viable
- the timely restoration of power supply as far as practicable
- effective communication to the public, Civil Defence Emergency Management, our staff, and other stakeholders
- efficient provision and recovery of information tools for critical business activities.

4.5.3 Information system security breaches or losses

Our information technology (IT) systems are an important part of our business and operational systems. Our IT department manage the threat from external sources via industry standard approaches, including antivirus software, restricted administrator access, offsite backup systems and firewall technology.

We are involved with the CSSIE (Control Systems Security Information Exchange) group, which is supported by the National Cyber Security Council (NCSC).

Our IT infrastructure has been designed to be robust and includes a standby generator and UPS support for our server room. We utilise offsite server hosting in a modern data centre and have disaster recovery facilities in place.

All data is backed up to an offsite facility daily to provide protection in case of local site damage.

4.6 ASSET MANAGEMENT MATURITY

We have applied the Commerce Commission's Asset Management Maturity Assessment Tool (AMMAT) to review the maturity of our asset management practices. This assessment tool is a series of questions based around the principles of the ISO55000 suite of standards for Asset Management. The outcomes are also useful to identify gaps in our asset management systems. We are not currently seeking ISO55000[5] accreditation, but we will be looking to align our systems with the principles of those standards within the next two years.

4.6.1 Summary of AMMAT assessment

The latest assessment of our asset management practices against the AMMAT is attached in the Appendices. Our asset management practices scores were generally 2 out of 4. These scores are lower than in previous AMMATs, but this reflects our growing awareness of good practice in asset management rather than a degradation of performance.

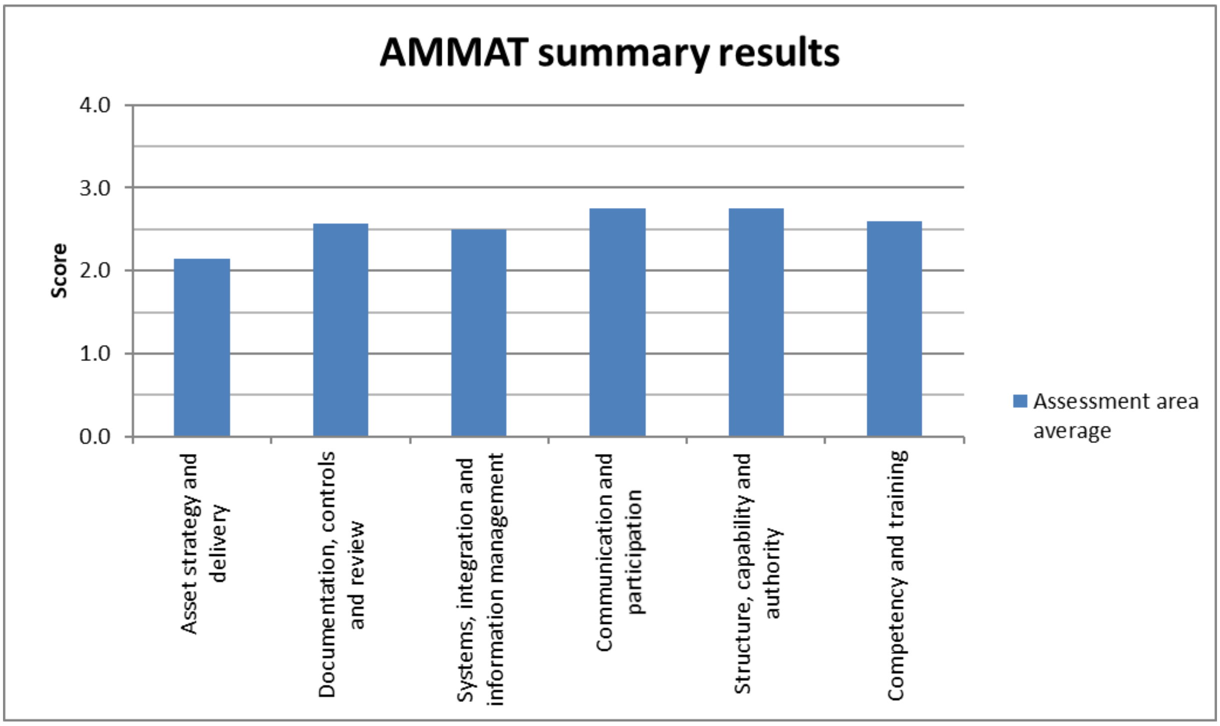

Figure 21 - AMMAT results summary

Generally speaking, our systems and processes are functional but are often not particularly efficient. We are still very reliant on paper forms being manually entered by personnel. Integration and coordination of data across multiple systems can also require considerable human intervention, as can analysis of that data to generate useful information. We are actively involved in improving the efficiency and effectiveness of our systems through the introduction of field-based data capture systems, and the integration of data between software systems such as our GIS and our work management system.

From this original AMMAT assessment point we have been working towards developing an improvement plan for our asset management practices. This work will be ongoing through the first year of the planning period, with the aim to be substantially aligned with the ISO55000 standards for asset management by the 2021/22 financial year.

[5] ISO 55000 – International Standard for Asset management. Overview, principles, and terminology

4.7 IMPROVEMENT INITIATIVES

4.7.1 Integration of asset management data

We currently operate a number of separate systems to manage our asset data, including some that are paper based. We realise that this is inefficient, and we are currently working towards integrating this data across our business in digital form. This will include information in our GIS, works planning, fault recording, and defect management systems, as well as others. This will improve understanding and awareness of network and asset performance and risks and provide for more efficient operation of the business.

This project will result in staff being able to access asset data in the field, and to input information from the field directly into our asset records, rather than being captured on paper for later transcription into our systems. This will reduce errors and increase the speed with which we can react to field information.

The goal is to ensure a tightly integrated system across the following areas:

- Works planning
- Maintenance scheduling
- Condition monitoring and analysis
- Financial management
- Timesheet integration for plant and staff
- Defects recording and location
- Management of controlled documents such as standards and policies
- Fleet management of plant
- Asset registers, operational, financial, and regulatory
- Stores and procurement
- SCADA Data

4.7.2 Asset data accuracy improvement

Many areas of our asset data are complete and accurate, but there are still some where there are deficiencies. This workstream will be ongoing for the next few years and will involve referring to old paper-based records, field surveys and personal knowledge of the network to close any gaps.

In general assets with high criticality will be investigated first, as well as those where a particular knowledge hole has a high potential impact (e.g. the current rating power of a cable, the manufacturer of a circuit breaker or the age of a battery).

4.7.3 Asset criticality

A focus of the early part of the planning period is the analysis of the criticality of assets in the network. Although the criticality of some major parts of the network is well understood from an operational point of view, we lack a formal criticality analysis for all assets. Much recent work has been carried out by the EEA and other EDBs around the Health and Criticality methodology developed by OFGEM in the United Kingdom. This will provide a mechanism to assist in planning the most efficient and effective execution of planned work, and assist greatly in improving the network resilience, as we will be able to focus resources on the parts of the network where they will give the greatest benefit.

POWERING NORTH OTAGO

RENEWALS AND MAINTENANCE

This chapter describes how we renew and maintain our network. It covers how we plan this work, our general approach to inspection and monitoring as well as more specific information about our different groups of assets and how they are maintained. This chapter is structured as follows:

Asset quantity summary: provides an overview of our assets.

Asset categories: Outlines assets by function and criticality, which guides how we apply maintenance and renewal regimes.

Zone substations, Subtransmission network, Distribution network and Other system fixed assets: in these sections, we detail the maintenance and renewal approach for each of the different operational levels of our assets. We show the asset population data, population risks, any specific inspection and maintenance practices, or renewal programs, and a summary of forecast renewal and maintenance expenditure.

Renewals and Maintenance Summary: A graphical summary of the forecast expenditure on renewals and maintenance for the planning period.

5. Renewals and maintenance

5.1 ASSET QUANTITY SUMMARY

The assets that make up our network are summarised in the table below. The renewals and maintenance that we apply to these assets are the primary means by which we achieve the service levels laid out in Chapter 3 and retain the value of the assets for our owners.

Table 10 - Summary of network assets by category

Asset category	Unit	Quantity
Concrete poles / steel structure	No.	8,922
Wood/other poles	No.	12,780
Subtransmission OH up to 66 kV conductor	km	217
Subtransmission UG up to 66 kV (XLPE)	km	4.1
110 kV CB (Outdoor)	No.	1
33 kV Switch (Pole Mounted)	No.	93
33 kV CB (Indoor)	No.	11
33 kV CB (Outdoor)	No.	39
11 kV CB (ground mounted)	No.	81
11 kV CB (pole mounted)	No.	3
Zone Substation Transformers	No.	23
Distribution OH Open Wire Conductor	km	1,258
Distribution UG XLPE or PVC	km	63
Distribution UG PILC	km	8.1
11 kV CB (pole mounted) - reclosers and sectionalisers	No.	58
11 kV Fuses (pole mounted)	No.	3,452
11 kV Air Break Switches (pole mounted)	No.	440
11 kV RMU (individual switches)	No.	192
Pole Mounted Transformer	No.	2,367
Ground Mounted Transformer	No.	535
Voltage regulators (sets)	No.	14
LV OH Conductor	km	231
LV UG Cable	km	112
LV Switchgear (Distribution Boxes)	No.	292

5.2 ASSET CATEGORIES

For the purposes of planning renewals and maintenance we group our network assets into the following functional areas:

- Zone substations
- Subtransmission Network
- Distribution Network
- Other equipment

Maintenance and renewal management plans for each of these groups are detailed in the following sections.

5.3 ZONE SUBSTATIONS

5.3.1 Overview of zone substations

Zone substations house the equipment that connects the bulk electricity supply at subtransmission voltage to our customers for end use. Power transformers convert electricity from 33 kV, which allows efficient transfer of large amounts of energy to 11 kV, which allows for the cost-effective connection of end user load. Switchboards and other switchgear allow the safe and reliable connection of supply to multiple areas from a central point via 11 kV feeders that are monitored by protection relays to swiftly disconnect the supply in the event of a fault.

Our Zone Substations are summarised in the following table. We also own assets at two Transpower GXPs, which are functionally treated under the same regime as our zone substations for maintenance and renewals.

Table 11 - Summary of NWL zone substations

Zone Substation	GXP Supply	Capacity (MVA)	Security	Date of Construction	Year of Manufacture	Age of main Switchgear
Ohau	Twizel	3	N	2006	1959	1997
Omarama	Twizel	3	N	1984	1960 & 1963	1985
Ruataniwha	Twizel	2	N	2015	1971	None
Otematata	Waitaki	3	N	1973	1961	2017
Kurow	Waitaki	12.5	N-1	1991	1966 & 1979	2015
Eastern Rd	Waitaki	7	N	2019	2005	2018
Duntroon	Waitaki	7	N	2010	2010	1969
Ngapara	Oamaru	7	N	1970	2005	1972
Papakaio	Oamaru	7	N	2006	2012	2006
Enfield	Oamaru	7	N	2006	2005	2006
Five Forks	Oamaru	7	N	2017	2005	2016
Parsons Road	Oamaru	10	N	1970	1966	2018
Weston switching station	Oamaru	-	N-1	2005	-	2005
Pukeuri	Oamaru	12.5	N-1	1971	1966 & 1966	2017
Chelmer Street	Oamaru	28	N-1	1967	2009	2009
Redcastle	Oamaru	15	N-1	1967	2014	2008
Maheno	Oamaru	5	N	1967	1965	1968
Hampden	Oamaru	7	N	2010	2012	1968
Waitaki GXP	Waitaki	24MVA	N	2013	2013	2013
Black Point GXP	Black Point	-	N	2006	-	2006

The life expectancy we apply to our zone substation assets is shown in Table 12 below:

Table 12 - Life expectancy of zone substation assets

Asset Description	Standard life expectancy (years)
Site Development/buildings	70
Power Transformers	60
Indoor switchgear	45
Outdoor switchgear	40
Protection relays	40
DC Supplies/Inverters	20
Batteries	5

5.3.2 Management approach

Our zone substation assets are critical assets as a component failure can have a significant impact on system reliability with a large number of customers affected.

Our objectives for the maintenance of zone substations assets are:

- Keep our people and members of the public safe.
- Maintain the reliable supply of electricity to our distribution network and minimise supply interruptions.
- Ensure that zone substations are operable in a post disaster scenario.
- Maintain the value of our investments and prevent negative effects on the neighbourhood.

5.3.3 Zone Substation buildings, fences, switchyards and grounds

5.3.3.1 Age profile and population data

The age profile shown in the following graph is based on the establishment date of the substation. In several cases the buildings, switchyards and fences have been partially rebuilt in the intervening years.

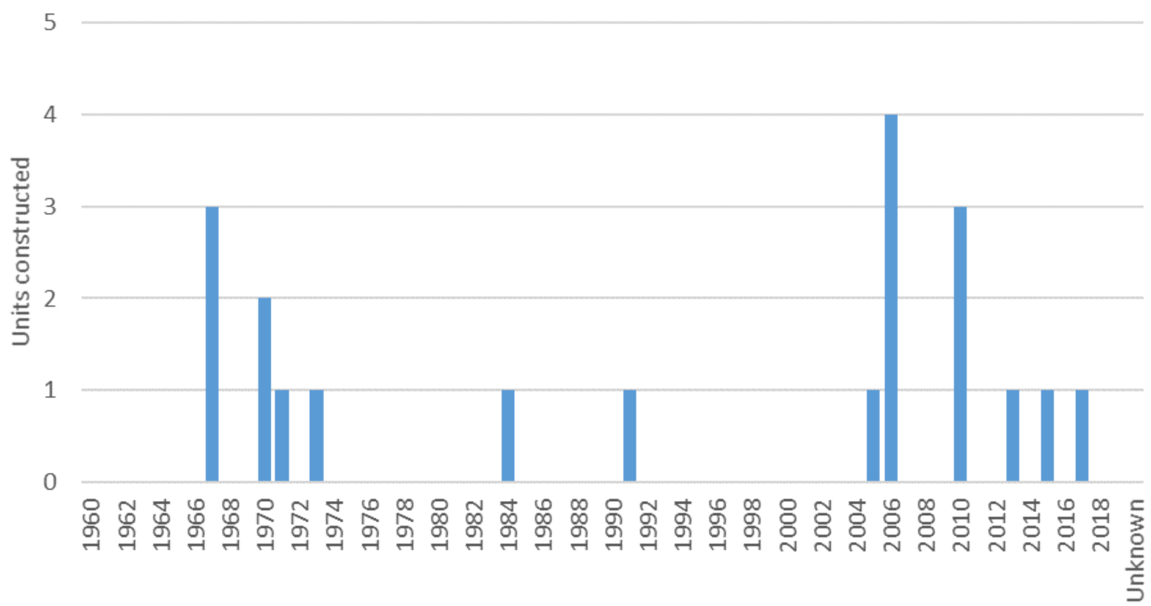

Figure 22 - Age profile for zone substations

Specific risks and issues associated with this asset group include:

- Security breach due to fence condition, failure of locks, etc.
- Damage due to animal ingress into yard (e.g. possums) or into switch room equipment (e.g. mice).
- Water/weather ingress into switch room.
- Work hazards due to condition of switchyard surfaces, including surface levelling, weeds, etc.
- Failure of lighting, heaters and other secondary equipment.
- Electrical hazards from rubbish, straw, and other foreign materials inside switchyards.
- Condition of firefighting equipment, oil spill equipment, etc.

5.3.3.2 Inspection and Maintenance Program

Activity	**Summary**	**Frequency**
Routine visual inspections	All equipment at substation. Check for defects, weeds, issues with weather tightness, housekeeping, pest control etc. Special attention to site security, fences, etc.	3 months
Detailed inspection	Detailed condition assessment of fencing, building envelope, bus structures, etc.	5 yearly
Earthing system test	Specialist test of the performance of the substation earth mat	5 yearly

5.3.3.3 Renewal and Refurbishment Program

In line with our commitments to prepare for HILP events (see section 4.5) our substations need to be able to operate immediately after an earthquake or other disaster, and are therefore required to meet importance level 4 (IL4) under the New Zealand Building Code. In 2019 we assessed the seismic capacity of our substations against the new building standard for IL4 (% NBS IL4) and have developed a remediation plan as shown in the following table. The plan will be executed over the first 3 years of the planning period.

Table 13 - Zone substation remediation required to achieve IL4

Substation	% NBS IL4	Risk level	Structural work	Non-structural work	Land remediation
Black Point	100%	Low	N/A	Minor	no
Waitaki GXP	100%	Low	N/A	Minor	no
Kurow	100%	Low	N/A	Minor	yes
Twizel	100%	Low	N/A	Minor	no
Ruataniwha	100%	Low	N/A	Minor	no
Ohau	100%	Low	Minor	Minor	yes
Omarama	100%	Low	Minor	Significant	no
Otematata	100%	Low	N/A	Significant	no
Pukeuri	70%	Low	Required	Minor	no
Five Forks	60%	Medium	Required	Minor	no
Hampden	60%	Medium	Required	Minor	no
Papakaio	60%	Medium	Required	Minor	no
Duntroon	60%	Medium	Required	Minor	no
Enfield	60%	Medium	Required	Minor	yes
Redcastle	55%	Medium	Required	Significant	no
Maheno	55%	Medium	Required	Minor	no
Parsons	55%	Medium	Required	Minor	no
Ngapara	50%	Medium	Required	Minor	yes
Weston switch room	40%	Medium	Required	Minor	no
Chelmer St	35%	Medium	Required	Minor	yes

The work ranges from spot strengthening actions at some substations through to the addition of internal steel reinforcing frames in others. A few sites also require some work to be carried out on the surrounding environment (streambanks, slopes) to reduce risks. Other aspects of the building envelopes will be refurbished at the same time as this seismic work.

Other refurbishment and renewal programs include repair, upgrade or replacement of fencing and security systems based on condition assessment, and how effective they are compared to current security standards. Other defects such as damage to buildings, are remedied as they are found.

The transformer bunds at Otematata and Omarama substations are in poor condition and will be also be upgraded as part of the seismic work planning period.

5.3.3.4 Expenditure Forecast

ZONE SUBSTATIONS - Buildings, switchyards, grounds	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Seismic resilience improvement at zone substations	327	327								
Substation equipment condition based replacements	87	87	87	87	87	87	87	87	87	87
Operational expenditure forecast ($000)										
Routine Inspections	25	25	25	25	25	25	25	25	25	25
Property maintenance	100	100	100	100	100	100	100	100	100	100
Substation renewals	20	20	20	20	20	20	20	20	20	20

5.3.4 Zone substation transformers

5.3.4.1 Age profiles and population data

The age profile shown in the following graph is based on the date of manufacture of the transformers.

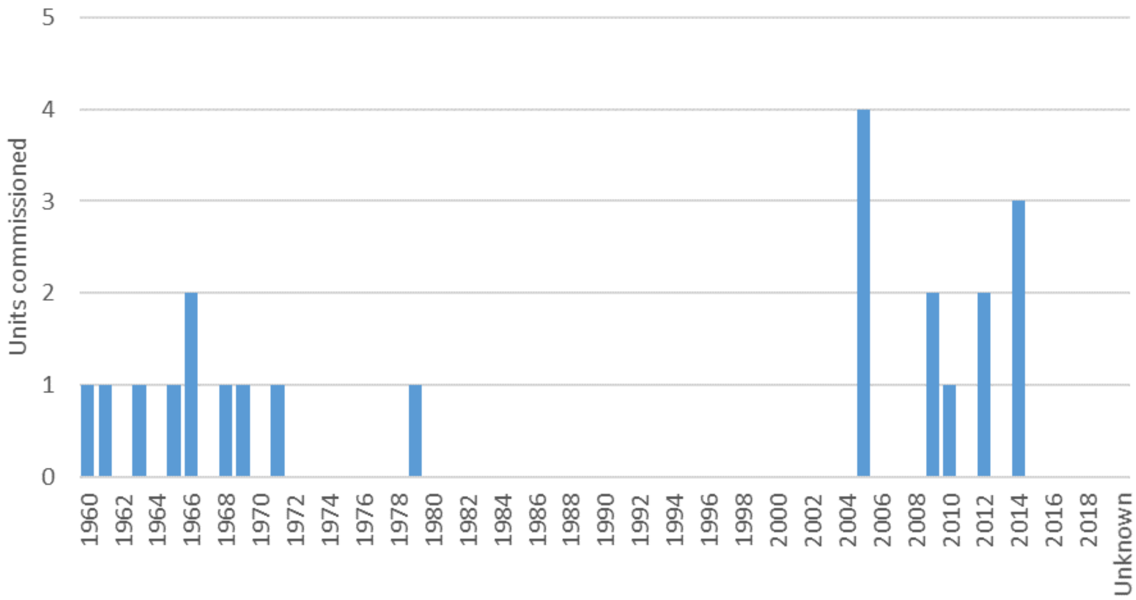

Figure 23 - Zone transformers age profile

Risks and issues commonly associated with zone substation transformers include:

- Degradation of paper insulation resulting in damage during faults
- Reduction in life due to oil degradation
- Catastrophic failure due to internal electrical fault
- Online tap changer failure
- Reduction in capacity due to cooling system (radiators and fans) failure
- Environmental damage due to oil leaks
- Electrical failure due to cracked or damaged bushings
- Moisture ingress into transformer due to dehydrating breather system malfunction
- Reduction in life due to corrosion
- Damage in an earthquake due to failure of seismic hold down equipment

5.3.4.2 Inspection and Maintenance Program

Activity	Summary	Frequency
Routine visual inspection	As part of regular sub inspections	3 months
Partial discharge tests	As part of substation PD testing.	12 months
Transformer detailed inspection	Detailed inspection. Includes expert inspection, thermal imagery, DGA and oil testing.	12 months
Transformer tap changer maintenance	Servicing of tap changer and associated equipment. SFRA and other offline testing carried out during work.	3 yearly, or 10,000 operations

5.3.4.3 Renewal Program

Zone substation transformers are a long lead time item, in that procurement of replacements can take 12 months or more. For this reason, we aim to maintain these assets in good condition, and to predict end of life with sufficient notice to secure replacements.

Transformer online tap changers are refurbished every three years, or 10,000 operations, whichever comes first.

Minor defects such as a damaged breather or cracked bushing are remedied soon after they are detected, as the repair work is relatively simple. Major refurbishment of transformers is based initially on age (mid-life) and then condition and operation characteristics (late-life). An older transformer that shows good results oil and paper condition in routine testing can be a good candidate for late-life refurbishment, which will generally involve core de-tanking for dry out and tightening, as well as refurbishment of the tank, replacement of fans, radiators and auxiliary systems as required.

Replacement of older transformers occurs due to assessment of factors such as outdated major systems, incompatible vector group for normal operation or the condition of insulating paper.

As can be seen from the age profile, several of our transformers will reach or surpass the standard asset life within the planning period. These assets are subject to regular condition assessment through dissolved gas analysis (DGA), which indicates that many are in good condition for their age and are likely to continue to operate safely and reliably. We are in the process of improving the methods that we apply to transformer condition assessment processes, and in the first year of the planning period we will be confirming the refurbishment and replacement program for the transformer fleet.

Capacity upgrades at some substations as part of the network development plan (see chapter 6) will also influence this program, as this work may free up more modern transformers that can replace older units. At this stage we are budgeting to purchase a spare 10/12MVA transformer and replace two transformers of 3 MVA capacity and three of 10/12 MVA capacity within the planning period.

5.3.4.4 Expenditure Forecast

ZONE SUBSTATIONS - Transformers	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Purchase spare power transformer 10/15 MVA		696								
Replace Power transformers			376		704	704	704		376	
Otematata Transformer			376							
Kurow T1							704			
Pukeuri T1					704					
Pukeuri T2						704				
Ohau									376	
Operational expenditure forecast ($000)										
Power Transformer maintenance	191	191	91	91	91	91	91	91	91	91
Zone Tx DGA	30	30	30	30	30	30	30	30	30	30
Zone Tx Oil Processing	10	10	10	10	10	10	10	10	10	10
Zone Tx Maintenance	35	35	35	35	35	35	35	35	35	35
Silica gel replacements	6	6	6	6	6	6	6	6	6	6
Allowance for minor repairs - leaks, corrosion	10	10	10	10	10	10	10	10	10	10
Defect correction zone tx	100	100								
Power Transformer OLTC Overhaul										
3 yearly cycle - 8 per annum @$5k per	40	40	40	40	40	40	40	40	40	40

5.3.5 Zone substation switchgear

Zone substation switchgear allow the control of the individual high voltage circuits that radiate out from the substations. The switchgear provides a safe and convenient way to energise and deenergise sections of the subtransmission and distribution networks for clearance of faults, or to carry out work.

5.3.5.1 Age profiles and population data

The age profile in the following graph is based on the manufactured date of the substation switchgear.

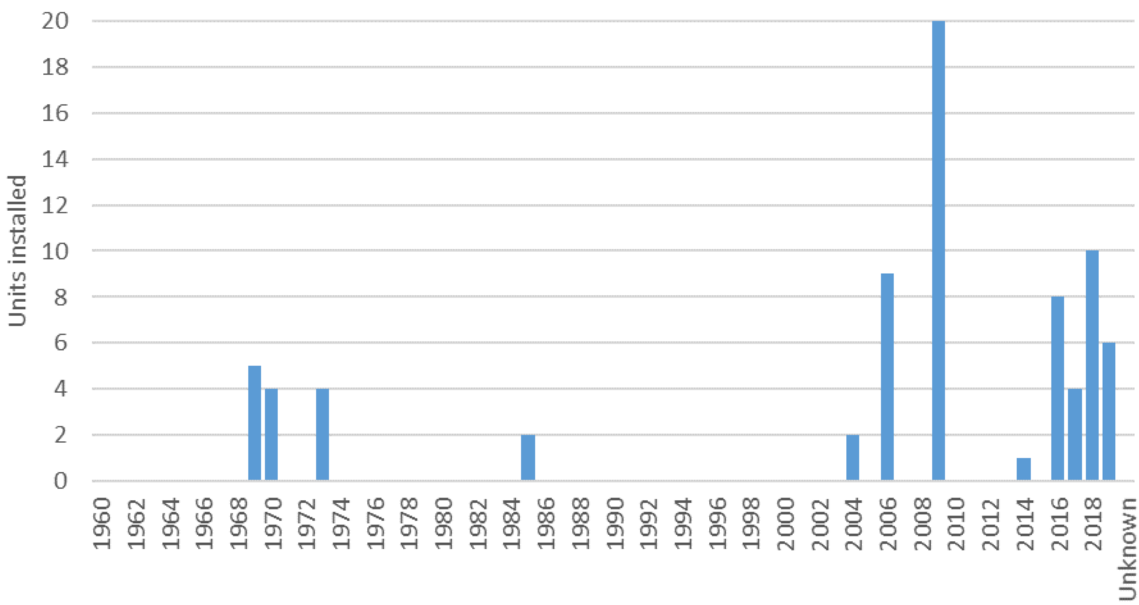

Figure 24 - 11 kV Indoor circuit breaker age profile

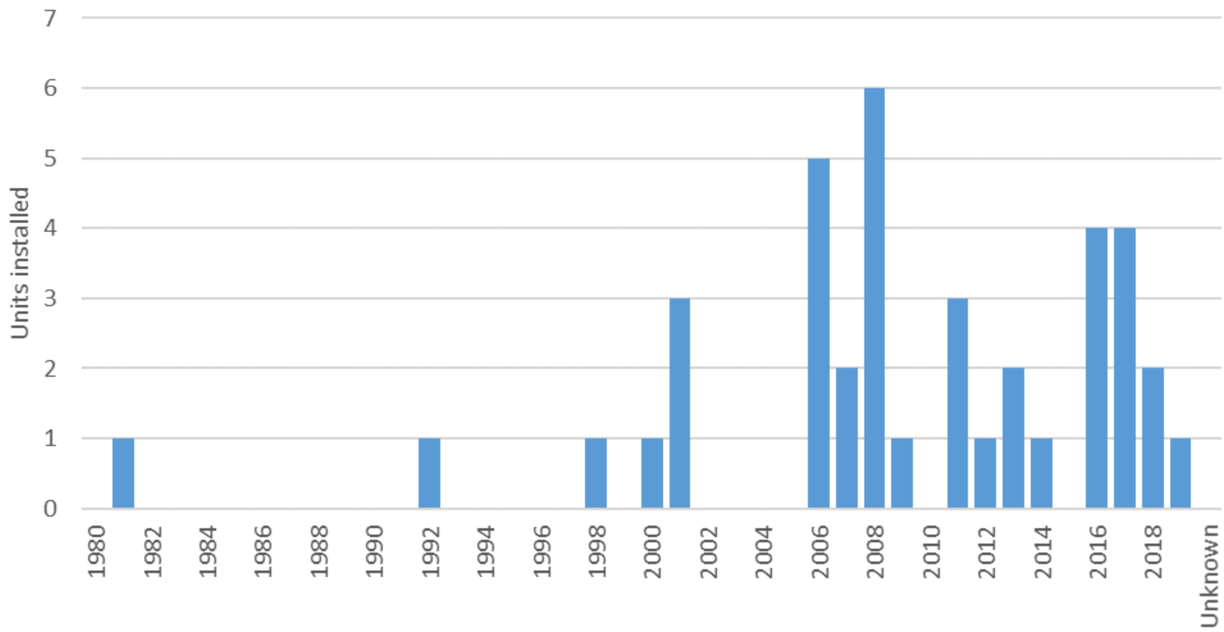

Figure 25 - 33 kV circuit breaker age profile

Common issues and risks associated with this asset group include:

- Failure due to degradation of oil insulation in older switchgear
- Failure due to gas leaks in SF6 equipment
- Failure to operate correctly due to mechanisms binding and slowing down
- Failure due to overheating conductors (busbar, joints, terminations)
- Faults developing due to partial discharge (cable terminations, busbar chambers)
- Arc flash hazard to operators due to switchgear design and type

5.3.5.2 Inspection and Maintenance Program

Activity	**Summary**	**Frequency**
Visual external inspections	As part of regular inspection	3 monthly
Detailed switchboard inspection (non-invasive)	Partial discharge testing, thermal imaging of boards, CBs, cable terminations etc.	12 months
110kV or 33kV gas insulated CB maintenance	Insulation, contact resistance and operational tests.	5 yearly
33kV or 11kV vacuum insulated CB switchboard maintenance	Insulation, contact resistance and operational tests.	5 yearly
11kV oil filled CB switchboard maintenance	Service of oil CBs. Insulation, contact resistance and operational tests.	3 yearly/3 high current fault operations

5.3.5.3 Renewal Program

A program is underway to replace older (pre-1990) oil filled switchboards with modern, arc fault rated switchboards fitted with vacuum insulated circuit breakers. Three switchboards remain to be replaced, at Hampden, Duntroon and Omarama zone substations; all are scheduled for replacement in the first half of the planning period.

We are in the process of retrofitting arc flash rated doors and arc flash detection systems to the switchgear in our zone substations.

Outdoor switchgear (33 kV and 11 kV vacuum/gas insulated circuit breakers and air break switches) are replaced based on condition assessment or as they become obsolete and the management of spares becomes problematic. We expect to replace two examples of this switchgear in the planning period.

There is a known problem with a particular brand of 33 kV air break switch where the porcelain insulators crack and fail. We will be replacing all examples of this type of ABS in the first 3 years of the planning period.

Substation cables are replaced or re-terminated based on the results of condition assessment (such as PD inspection) or based on age and type (e.g. old paper lead insulated cables) when replacement of associated equipment occurs, such as switchgear or power transformers.

5.3.5.4 Expenditure Forecast

ZONE SUBSTATIONS - Switchgear	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**
Capital expenditure forecast ($000)										
Replace 11kV switchboards	55	327	436	262	295					
Duntroon	55	273								
Ngapara		55	382							
Hampden			55	207						
Omarama				55	295					
Arc Flash Protection completion and commissioning	64	64	64	64						
Duntroon, Ngapara, Hampden, Omarama	21	21	21	21						
2 x other substations as per fault level risk	43	43	43	43						
Operational expenditure forecast ($000)										
Switchgear and protection maintenance	25	12	12	12	12	12	12	12	12	12
Ngapara, Omarama, Hampden	25									
Redcastle, Papakaio, Black Point		12								
Five Forks, Kurow, Weston			12							
Otematata, Pukeuri				12						
Parsons, Maheno, Chelmer					12					
Ongoing @ 3 x substations per annum						12	12	12	12	12

5.3.6 Zone substation DC systems

DC systems at substations include the battery chargers and batteries. These systems are considered critical to the network, as they enable the operation of network equipment such as protection relays and circuit breakers in the event of the loss of mains power.

5.3.6.1 Age profile and population data

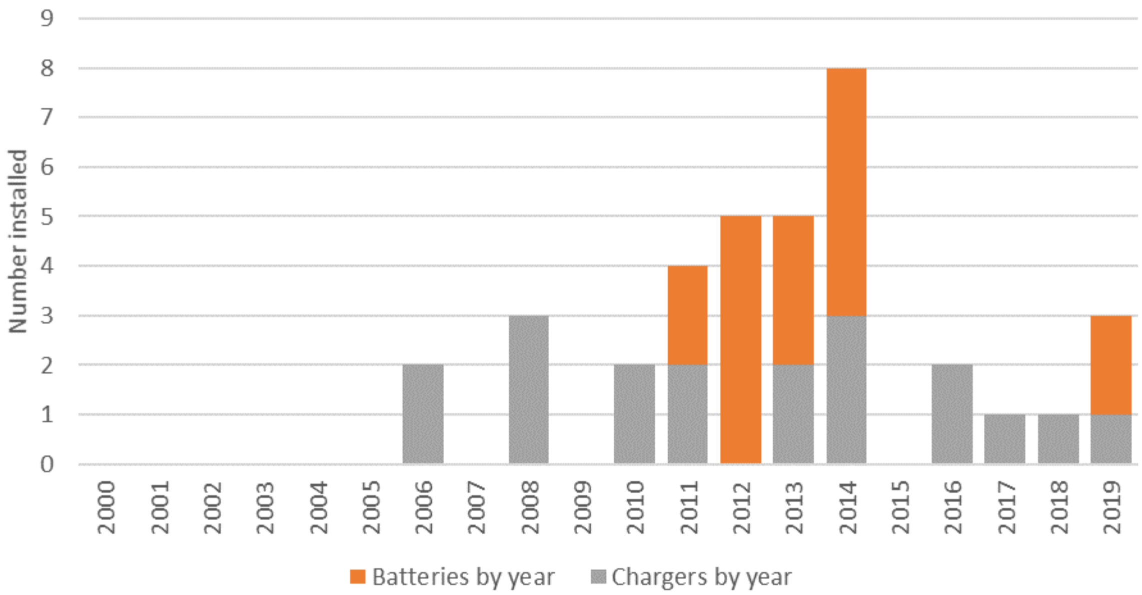

Figure 26 - Age profile data for zone substation batteries and chargers

Specific risks in this asset group include:

- Corrosion on battery terminals
- Loss of battery capacity
- Internal failure of batteries
- Failure of battery charger
- Damage to equipment during seismic event

5.3.6.2 Inspection and Maintenance Program

Activity	Summary	Frequency
Visual inspection	As part of regular sub inspections	3 months
Battery testing	Routine testing of battery bank	12 months
Discharge testing	Discharge testing of battery banks	2 yearly

5.3.6.3 Renewal and Refurbishment Program

Substation batteries are considered to be critical to the ongoing operation of the network. We currently plan to replace complete battery banks after no more than 7 years of life, to ensure that they will be fully capable of operating when required. Individual cells or entire banks may be replaced depending on condition and the results of load test prior to that time. We will be monitoring the performance of more modern batteries to see whether modern charging management is increasing this useful life. We expect to replace up to five battery banks per annum.

Battery chargers and associated switchgear are replaced based on age (if obsolescent) and operating performance. These systems are generally up to date and in good condition.

5.3.6.4 Expenditure Forecast

ZONE SUBSTATIONS - DC systems	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Battery bank replacements										
5 per annum	11	11	11	11	11	11	11	11	11	11
Operational expenditure forecast ($000)										
Annual battery testing										
Annual inspection and measure	4	4	4	4	4	4	4	4	4	4
Discharge test @ 5 per annum	5	5	5	5	5	5	5	5	5	5

5.3.7 Zone substations Protection relays

Protection relays detect faults on the network and signal the circuit breakers to open and remove the supply to the affected assets. The key attributes of this equipment are that it is sensitive and reliable, so that public safety and network performance is maintained.

The protection systems at our substations are all of the modern digital type and are reasonably up to date, and performing satisfactorily. All of our substation protection relays are connected to our SCADA systems, and are remotely controllable.

5.3.7.1 Age profile and population data

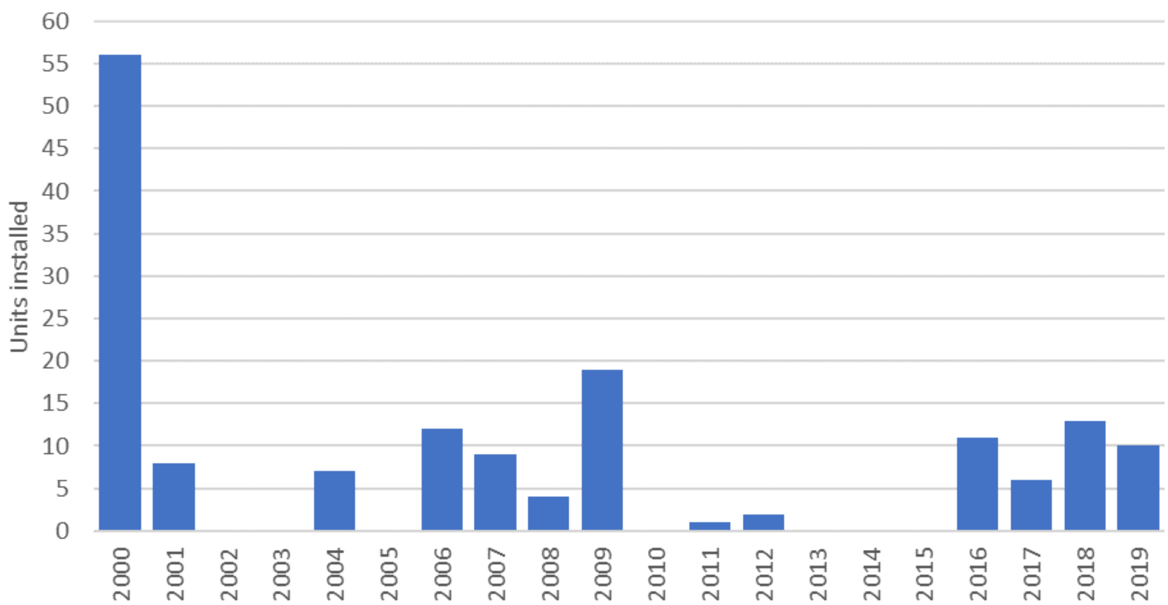

Figure 27 - Age profile data for protection relays

Specific risks in this asset group include:

- Failure of a protection device to operate putting staff or the public in danger.
- Obsolescence of protection device leading to improper operation in the network.

5.3.7.2 Inspection and Maintenance Program

Activity	Summary	Frequency
Visual inspection	As part of regular sub inspections	3 months
Detailed protection relay assessment	Confirm settings and test operation, check and replace onboard batteries, check terminals and wiring.	5 yearly

5.3.7.3 Renewal and Refurbishment Program

We are working through a program to replace some older feeder protection relays (SEL 551 type) with more advanced designs that offer better operational flexibility.

We also take opportunities to improve the quality of our protection relay network when we can, as with the commissioning of differential protection on sections of our 33 kV subtransmission network. These projects are generally carried out as part of wider project work, such as replacement of a switchboard or transformer.

5.3.7.4 Expenditure Forecast

Expenditure on protection relays is included in the budgets for the associated switchgear, in section 5.3.5.

5.3.8 Zone substation ripple control transmitters

NWL owns and operates Enermet solid state 33 kV Ripple Injection Plants at both the Oamaru and Twizel GXP's. An indoor Enermet solid state 11 kV injection unit is installed at the Kurow Zone Substation and services the load connected to the Waitaki GXP. We own the ripple control relays installed at customer's premises.

We utilise Decabit ripple control relays at customer premises to control load in order to minimise line charge costs and control network load below certain constraints. Transmitters are located at the following sites:

Zone substation	GXP(s) served
Parsons Rd	Oamaru
Kurow	Waitaki, Twizel
Twizel	Waitaki, Twizel

5.3.8.1 Age profile and population data

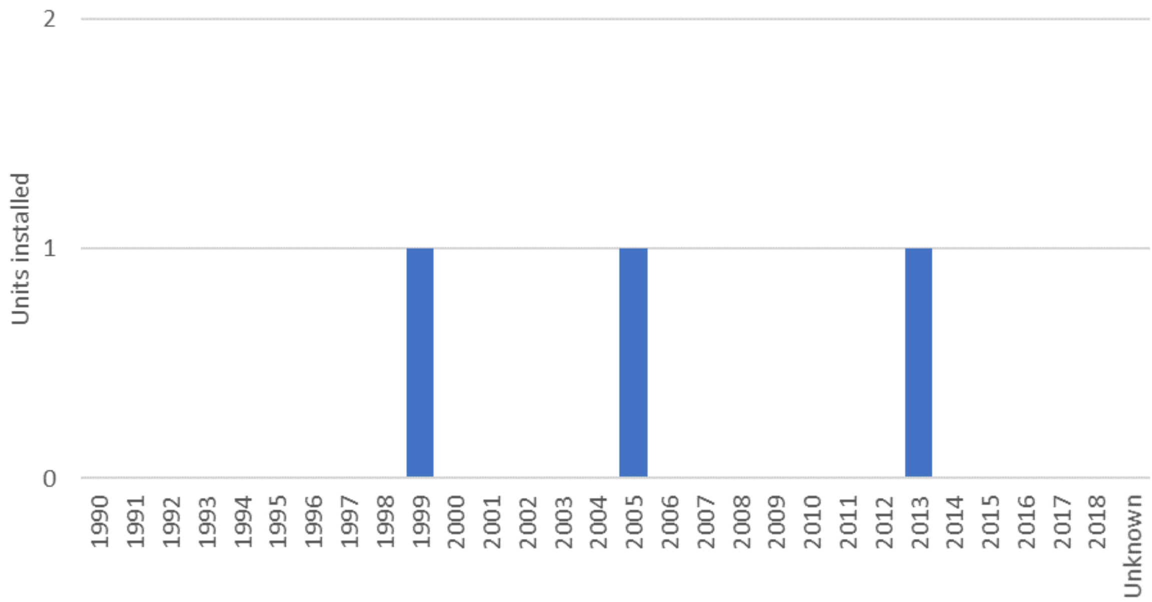

Figure 28 - Ripple control transmitters by installation date

Specific risks for ripple control transmitters include:

- Failure of power electronics in transmitter
- Failure of coupling cell component

5.3.8.2 Inspection and maintenance program

Activity	Summary	Frequency
Visual inspection	As part of regular sub inspections	3 months
Detailed ripple control plant inspection	Check operating signals, test coupling cell components	Annually

5.3.8.3 Renewal program

Our ripple control transmitters are still within their expected lifespan, but they are a highly critical piece of equipment, and the system configuration does not allow for mutual support between all units in the event of the failure of one. For this reason, we will be purchasing suitable spares for a complete ripple control transmitter in the first year of the planning period. This unit will be designed to replace any of the transmitters on our network.

5.3.8.4 Expenditure Forecast

ZONE SUBSTATIONS - Ripple control systems	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Spares for ripple control equipment - containerised system	385									
Operational expenditure forecast ($000)										
Ripple control plant maintenance	8	8	8	8	8	8	8	8	8	8

5.3.9 Total Zone Substation expenditure forecast

ZONE SUBSTATIONS	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Spares for ripple control equipment - containerised system	385									
Seismic resilience improvement at zone substations	327	327								
Substation equipment condition based replacements	87	87	87	87	87	87	87	87	87	87
Replace 11kV switchboards	55	327	436	262	295					
Arc Flash Protection completion and commissioning	64	64	64	64						
Battery bank replacements	11	11	11	11	11	11	11	11	11	11
Purchase spare power transformer 10/15 MVA		696								
Replace Power transformers			376		704	704	704		376	
Total capital expenditure	**929**	**1,513**	**975**	**424**	**1,096**	**802**	**802**	**98**	**475**	**98**
Operational expenditure forecast ($000)										
Routine Inspections	25	25	25	25	25	25	25	25	25	25
Property maintenance	100	100	100	100	100	100	100	100	100	100
Substation renewals	20	20	20	20	20	20	20	20	20	20
Power Transformer maintenance	191	191	91	91	91	91	91	91	91	91
Power Transformer OLTC Overhaul	40	40	40	40	40	40	40	40	40	40
Switchgear and protection maintenance	25	12	12	12	12	12	12	12	12	12
Ripple control plant maintenance	8	8	8	8	8	8	8	8	8	8
Annual battery testing	9	9	9	9	9	9	9	9	9	9
Total operational expenditure	**418**	**405**	**305**	**305**	**305**	**305**	**305**	**305**	**305**	**305**

Table 14 - Zone substation and equipment forecast expenditure

5.4 SUBTRANSMISSION NETWORK

5.4.1 Overview of subtransmission network

The subtransmission network connects the supply of electricity from Transpower grid exit points (GXPs) to our zone substations, where it is distributed to customers. Our subtransmission system currently operates at 33 kV, with future plans to operate some sections at 66 kV.

The network is arranged as shown in Figure 29

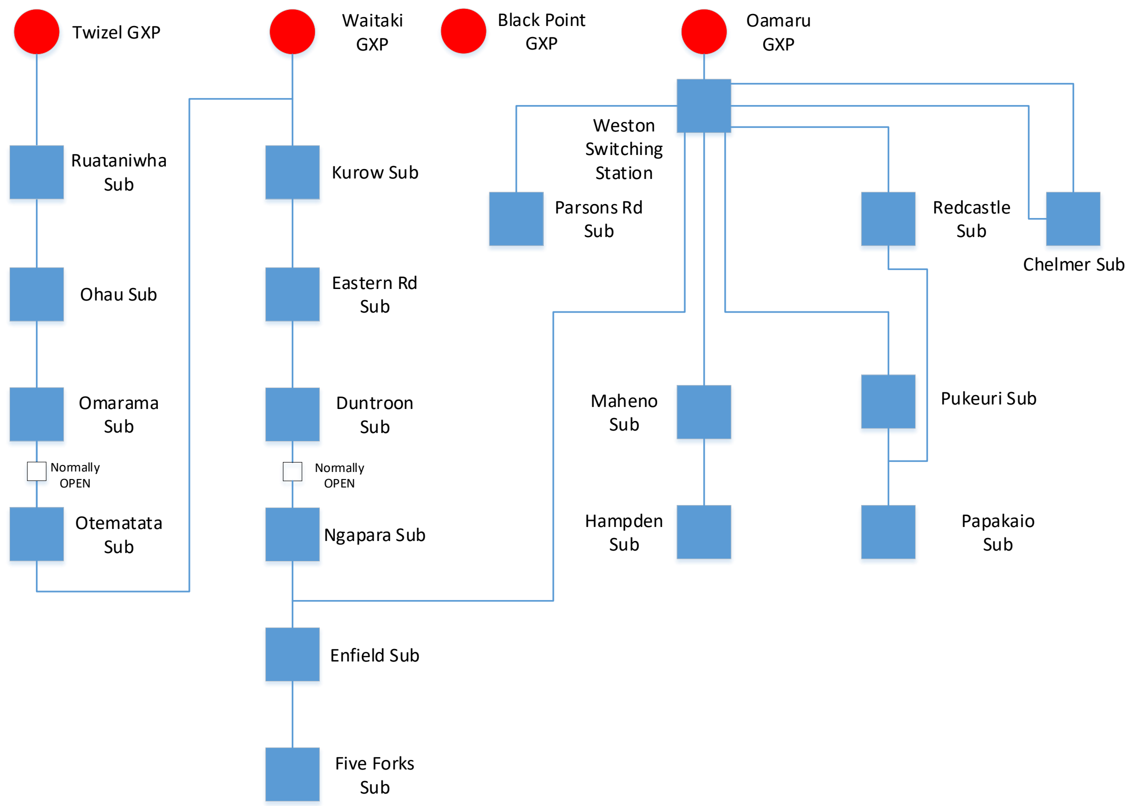

Figure 29- Subtransmission system configuration

The life expectancy we apply to our subtransmission assets is shown in Table 15 below.

Table 15 - Life expectancy of subtransmission assets

Asset Description	Standard life expectancy (years)
Overhead conductor	60
XLPE cables installed <1985	45
XLPE cables installed >1985	55
PILC cables	70
Air Break Switches	35
Concrete Pole	60
Wooden Pole	45
Cross Arm	20

5.4.2 Management approach

The 33 kV sub-transmission network is predominantly overhead construction, apart from some short lengths of cable, generally between the feeder CB's and line terminations, and on the Redcastle to Pukeuri feeder.

Our objectives for the maintenance of our subtransmission assets are to:

- Keep members of the public safe
- Maintain the reliable supply of electricity to our zone substations and minimize supply interruptions.

A failure on the subtransmission system can affect several zone substations, and hence a large number of customers. The construction of these lines is accordingly to a high standard. Subtransmission supplies to zone substations are generally configured so that they have a backup supply from another subtransmission circuit. This makes them relatively easy to remove from service in order to carry out inspections and repairs.

5.4.3 Subtransmission lines and cables

Our subtransmission overhead circuits are a mixture of ACSR, AAC and AAAC conductors. Line supports are mainly wooden poles, although concrete poles are being increasingly used.

We have a small amount of underground cable on our subtransmission network, all of modern XLPE type.

A summary of the subtransmission lines and cables is shown in

Table 16 - summary of subtransmission lines and cables

Asset type	Number
Wooden poles	1,985
Concrete poles	354
Overhead conductors	218 km
Cables	4.1 km

5.4.3.1 Age profile and population data

The age profile of these assets is shown in Figure 30, Figure 31 and Figure 32 below.

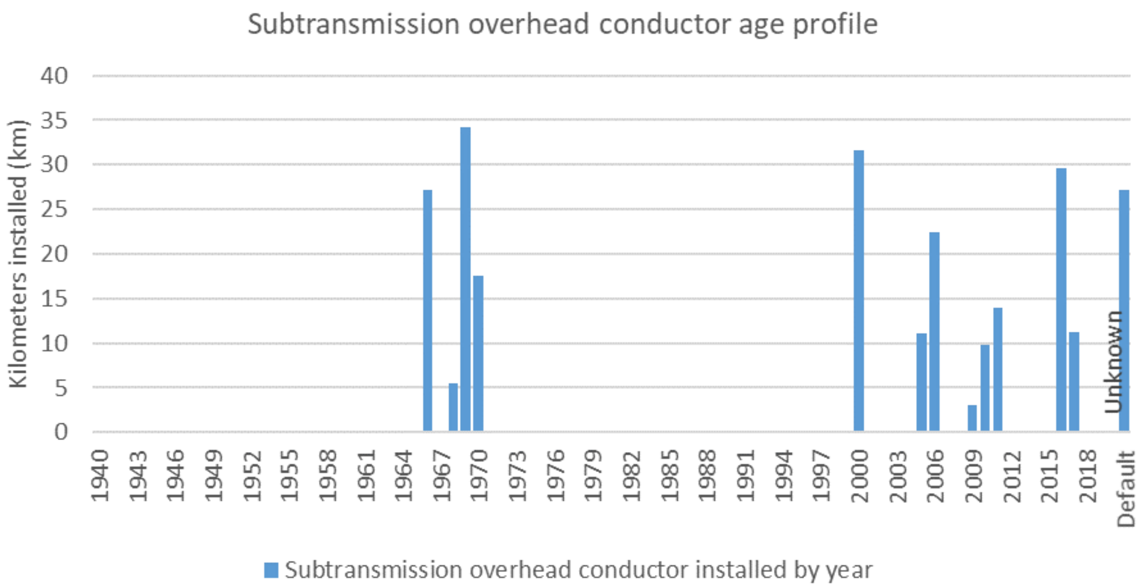

Figure 30 - Age profile of subtransmission overhead conductor

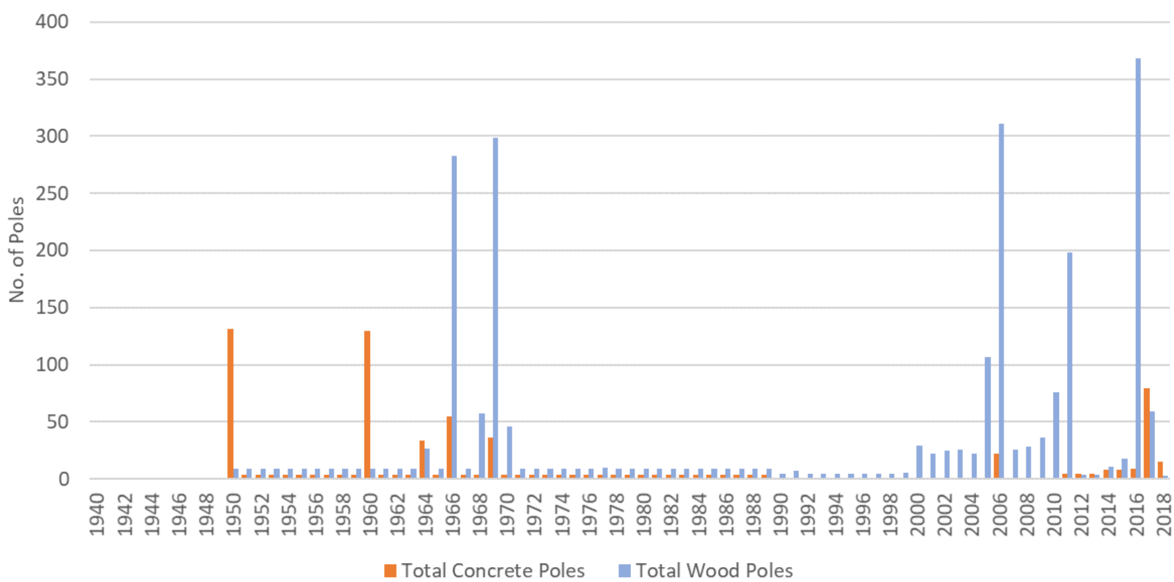

Figure 31 - Age profile for subtransmission poles

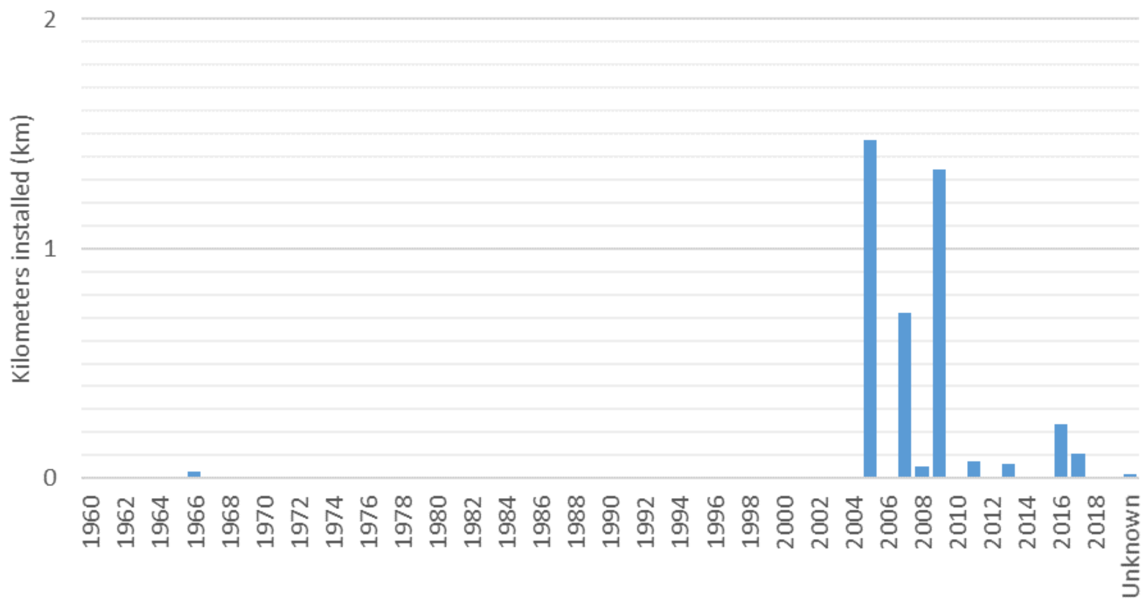

Figure 32 - Age profile of subtransmission underground cables

Major risks to the subtransmission network include:

- vehicle impact – much of the network is built on road reserve
- extreme weather events such as high winds or heavy snow
- external equipment – pivot irrigators moving into, spraying, or being blown into lines
- degradation of structural strength due to age related issues such as corrosion or pole decay.
- Longer spans can cause issues with aeolian vibration in lines constructed to older standards

5.4.3.2 Inspection and Maintenance Program

Activity	Summary	Frequency
Ground patrol	Ground based visual inspection of pole top, cross arms and pole top hardware. Testing of pole structural condition using Thor hammer and Portascan test sets, digging and probing. Thermal inspection of joints and cable terminations Vegetation related defects are recorded to be managed in accordance with the Electricity (Hazards from Trees) Regulations 2003.	Annual
Climbing patrol	Standard ground inspection plus pole top accessed via ladder or EPV in order to tighten fittings, repair loose binders, examine conductor condition etc.	5 yearly
Partial Discharge Testing	Subtransmission cable terminations as part of zone substation partial discharge testing	Annual
Conductor sample testing	Special targeted testing of conductor to check for issues on older lines	As required

5.4.3.3 Renewal and refurbishment program

Renewals in the subtransmission network are largely based around repairs and replacements based on the results of line patrols. Individual poles are generally earmarked for removal due to condition and changed in a suitable shutdown period.

Sometimes the overall age and condition of a particular stretch of overhead line will require a complete rebuild. Some subtransmission circuits that were installed in the 1960's are forecast for such rebuilding during the planning period. We will be carrying out condition testing on samples of conductor from these lines to get a clear picture of the remaining life.

None of the cables on our subtransmission network reach their standard expected life during the planning period, and all are in good condition. We are therefore not planning any renewals of subtransmission cables in the planning period.

5.4.3.4 Expenditure Forecast

SUBTRANSMISSION NETWORK - Lines and cables	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Subtransmission pole and hardware replacements	109	109	109	109	109	109	109	109	109	109
Subtransmission rebuilds due to age and condition										
Weston to Maheno 33kV			818							
Weston to Chelmer St 33kV No.1				327						
Omarama to Twizel 33kV (replacement of old waxwing)							600			
Operational expenditure forecast ($000)										
33kV Line patrols										
33kV climbing patrols	78	78	78	78	78	78	78	78	78	78
33kV ground patrols	52	52	52	52	52	52	52	52	52	52
33kV line renewals	80	50	50	50	50	50	50	50	50	50
Conductor sample condition testing	10	10	10	10	10					

5.4.4 Subtransmission switchgear

We utilise air break, SF6 insulated and vacuum type switchgear in our subtransmission network. Most of this equipment is of recent manufacture, although there are a handful of older items.

5.4.4.1 Age profile and population data

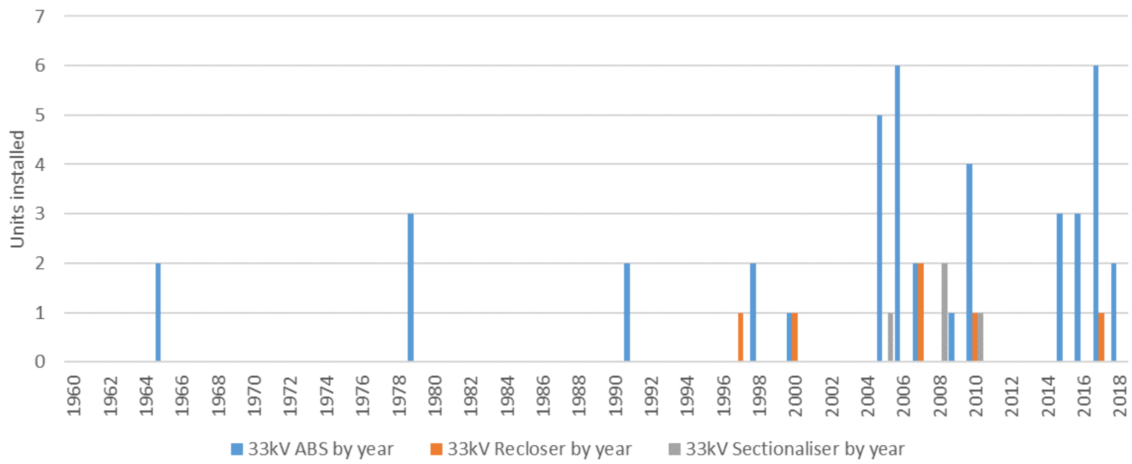

Figure 33 – Age profile of subtransmission switchgear

Risks commonly associated with our subtransmission switchgear include:

- Loss of insulating gas or vacuum
- Failure of porcelain insulator through cracking or age
- Failure due to terminations overheating

5.4.4.2 Inspection and Maintenance Program

Activity	Summary	Frequency
Ground patrol	Thermal inspection of switchgear and terminations	Annual
Climbing patrol	Physical check of terminations, fittings etc.	5 yearly
Operational checks	Verification of settings and trip testing. Battery replacement	5 yearly

5.4.4.3 Renewal and refurbishment Program

Switchgear in this category are replaced based on condition assessment or as they become obsolete and the management of spares becomes problematic. We expect to replace two reclosers in this planning period due to age.

There is a known problem with a particular brand of 33 kV air break switch where the porcelain insulators crack and fail. We will be replacing all examples of this type of ABS in the first 3 years of the planning period.

5.4.4.4 Expenditure Forecast

SUBTRANSMISSION NETWORK - Lines and cables	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Commission line differential protection system Weston Zone sub to Chelmer zone sub	54									
Replace 33kV reclosers				44				44		
Operational expenditure forecast ($000)										
Subtransmission switchgear maintenance	20	20	20	20	20	20	20	20	20	20

5.4.5 Total Subtransmission Network Expenditure forecast

Table 17 - Forecast of maintenance and renewal expenditure for subtransmission assets

SUBTRANSMISSION NETWORK	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Commission line differential protection system Weston Zone sub to Chelmer zone sub	54									
Replace 33kV reclosers				44				44		
Subtransmission pole and hardware replacements	109	109	109	109	109	109	109	109	109	109
Subtransmission rebuilds due to age and condition			818	327			600			
Total capital expenditure	**163**	**109**	**927**	**480**	**109**	**109**	**709**	**153**	**109**	**109**
Operational expenditure forecast ($000)										
33kV Line patrols	130	130	130	130	130	130	130	130	130	130
33kV line renewals	80	50	50	50	50	50	50	50	50	50
Subtransmission switchgear maintenance	20	20	20	20	20	20	20	20	20	20
Conductor sample condition testing	10	10	10	10	10					

5.5 DISTRIBUTION NETWORK

5.5.1 Overview of distribution network

Our distribution network operates at 11 kV. The distribution network reaches out from our zone substations to supply the majority of our customers using distribution transformers to convert the 11 kV supply down to 400/230 V for connection to customer loads.

There are fifty-five 11 kV distribution feeder lines supplied from our 33/11 kV zone substations. Supply restoration in the event of an outage is often possible by connecting neighbouring feeders. To further assist in quicker supply restoration, we have embarked on a program of installing automated open points on 11 kV interconnection between substations.

There are 1,255 km of overhead lines and 72 km of 11 kV cables on our distribution network.

The life expectancy we apply to our distribution assets is shown in Table 18 below:

Table 18 - Life expectancy of distribution assets

Asset description	Standard life expectancy (years)
Overhead conductor	55
XLPE cables installed <1985	45
XLPE cables installed >1985	55
PILC cables	70
Air Break Switches	35
Wooden poles	45
Concrete poles	60
Crossarms	20

5.5.2 Management approach

We maintain our distribution network with the aim of keeping it safe for the public, and minimising outages. Our approach is predominately driven from defects found during regular inspection cycles, or generated from other work such as customer connections, or attendance at faults. When a part of the network is particularly affected by a major event (e.g. a snow storm) we will instigate a special line patrol post event.

Where 11 kV feeders interconnect, they are normally configured as open points, providing the ability to reconfigure the network to support load in the event of an outage. NWL's loadings are such that security provisions are generally focused on switching to restore supply quickly rather than targeting nil interruptions.

This approach, which is backed by a fairly well interconnected distribution network means that outage figures are kept below our targets without over investment on the distribution network.

Our distribution network covers a large area, with a large number of assets located in diverse locations ranging from busy urban streets to isolated mountainsides. Individual components connect fewer and fewer customers the closer they are to the load, down to the level of an individual installation. Accordingly, we aim to balance our maintenance and renewals with the risk and service level associated with each asset.

Key objectives for management of our distribution network include:

- keeping the public safe
- keeping our workers safe
- maintaining the reliability of our network
- no unassisted failures of poles and conductors in normal operating conditions
- reduce the number of third-party contact incidents on our distribution network
- no incidents of unauthorised access to out ground mounted distribution assets
- maintain the visual condition of our assets in neighbourhood areas

5.5.2.1 Analysis of our worst performing feeders

We examine faults data for patterns that may indicate systemic problems with types of equipment on the network. We can then target asset management practices to deal with the identified issues, and thereby improve network reliability and safety. Part of this analysis is examining the performance of our 10 worst performing distribution feeders, as shown in the the following sections. We believe that this analysis can provide insight into asset performance that can be usefully applied across the entire network.

5.5.2.2 Feeders 406, 408, 409 and 427: Aging urban feeders

CB406 Reed St, 408 Solway St and 409 Towey St are urban feeders in the Central and South Hill areas of Oamaru, CB 416 is a semi-rural feeder that supplies into the township of Weston. They are typically older sections of network, and feature a high density of ICPs, with an associated amount of aging overhead low voltage equipment. This can also lead to outages on these feeders having a higher SAIDI and SAIFI impact due to the number of customers that can be affected.

The predominant cause of faults on these feeders is defective low voltage fuses, associated with older pole mounted fuses supplying single customers, as well as some J-type fuses supplying multiple customers. To target reduction of this fault type

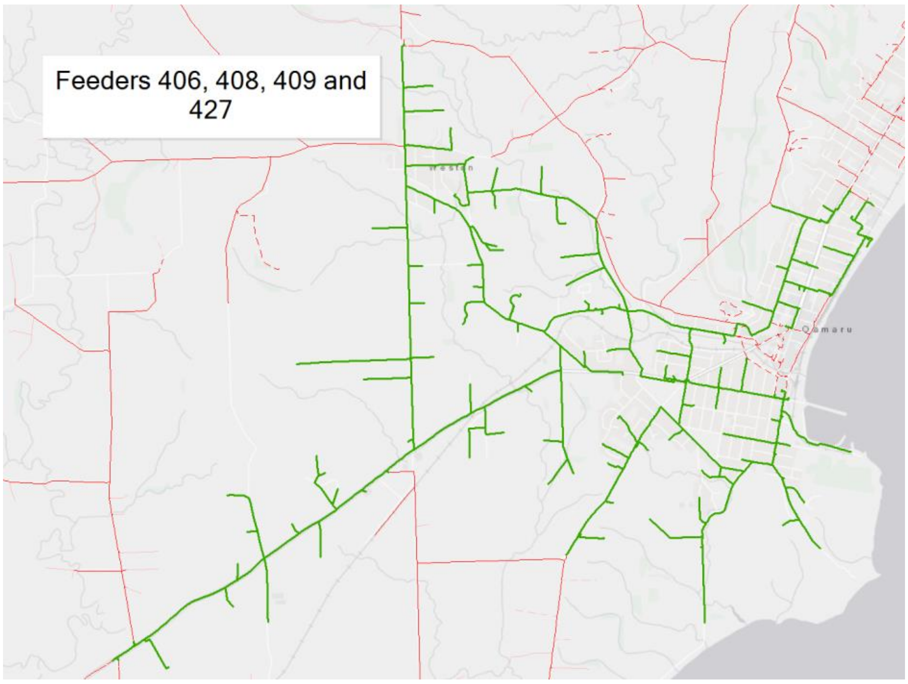

Figure 34 - Urban feeders in the worst performing group

budget allocation has been made for the inspection, identification and replacement of suspect low voltage fuses and switchgear.

5.5.2.3 Feeders 418 Kakanui, 479 Waianakarua and 480 Hampden

CB416, CB 479 and CB 480 are primarily rural feeders that also supply the townships of Kakanui, Herbert, Hampden and Moeraki. These feeders are characterised by being on the Pacific coast in the southern part of our network. They are primarily rural and feature some older sections of HV lines. The terrain ranges from reasonably flat, clear farming land at the coast through to steep and rugged terrain to the west. This area can be more exposed to weather events moving up from the South.

The predominant faults on these feeders are:

- defective LV fuses and switchgear
- third party activities
- vegetation faults.

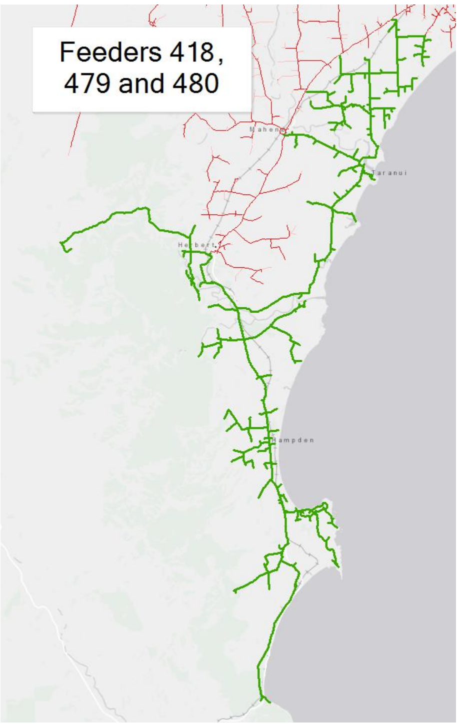

Figure 35 - Coastal feeders in the worst performing group

The issue of defective equipment will be addressed in the same campaign as noted for the urban feeder, with the inspection, identification, and replacement of suspect low voltage equipment. Additionally, budget has been allocated in the planning period to rebuild many sections of older line in this area, including older copper and galvanised steel conductors. Where it is uneconomic to rebuild long lines that feed a low number of customers, we will install reclosers and sectionalisers that will reduce the impact of these outages and continue to repair faults as they occur.

Motor vehicle accidents make up approximately 70% of the third-party interference events. 40 km of state highway run through this section of network, and there is a relatively high traffic flow. There is little that we can do about the actions of drivers, but we will continue to consider the placement of our assets with respect to the road, and as our GIS tools improve, we will be able to analyse crash patterns to try and identify any pre-emptive changes to the network that may improve performance.

We have recently improved the way that we carry out our vegetation management, with the treatment of defects being more closely managed, and proactive patrolling to target problem areas. We will be monitoring the effect of this work on the occurrence of vegetation faults across the network, but especially on these three feeders.

5.5.2.4 Feeders 411 Kurow, 413 Hakataramea and 421 Island Cliff

These feeders are all located in the central area of our network, in the area between Kurow and Ngapara. As can be seen in Figure 36 below, feeder 411 Kurow and 413 Hakataramea are contiguous, with feeder 421 Island Cliff located some distance away. They have been grouped in this way because they all demonstrate similar performance, and a common set of strategies will be used.

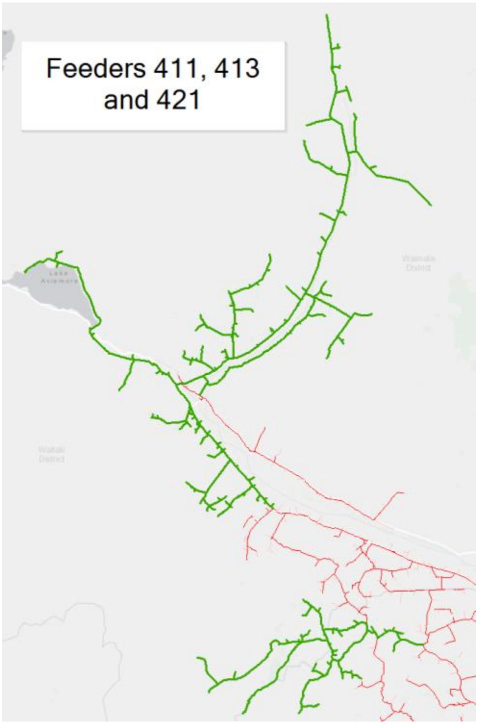

Figure 36 - Central feeders in the worst performing group

The predominant faults on these feeders are:

- Wildlife contacts
- Vegetation and weather-related faults

Wildlife contacts on these feeders have caused around 30% of the outages on network equipment, including possums and rats. We will target the condition of possum guards in this area of the network. Damaged or missing possum guards have traditionally been a low priority defect, and this is obviously having an effect on these feeders. Proximity to the Waitaki river may also have a bearing on the pest population.

Significant portions of these feeders are earmarked for reconductoring during the planning period, at which time the wildlife protection will be updated.

This area of the network can be subject to bad weather due to the topography of valleys and hills, and high winds blowing branches around is often the cause of vegetation related outages on our equipment. The changes to our vegetation management mentioned above are likely to have a positive outcome in this situation, although we cannot control all trees that pose a falling hazard due to the limitations of the Electricity (Hazards from Trees) Regulations 2003. Where we do not have authority to act under the Regulations, we work with tree owners to keep hazards clear of our lines; an example of this is working with NZTA in 2017/18 in the Kurow area to clear-fell large roadside gum trees that were posing a significant hazard to our lines.

5.5.3 Distribution lines and cables

5.5.3.1 Age profiles and population data

The age profile of these assets is shown in the following two charts:

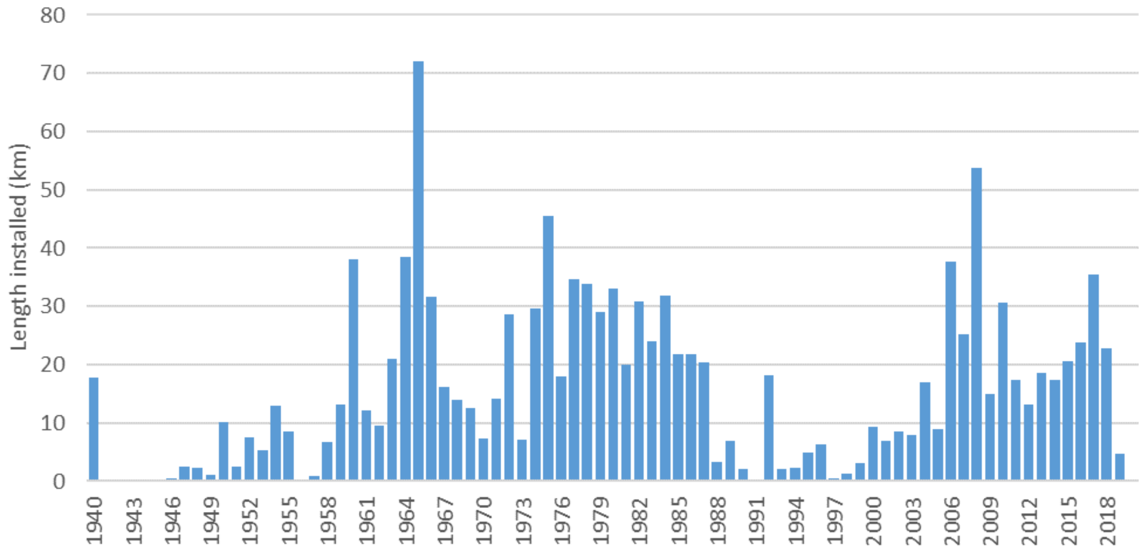

Figure 37 - Age profile of 11 kV overhead lines

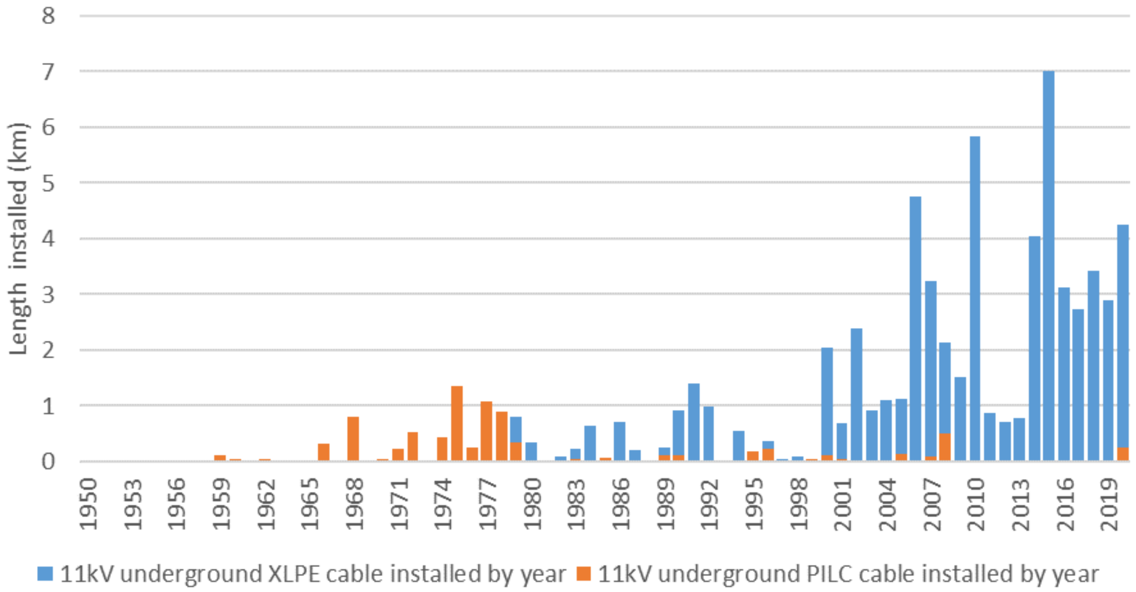

Figure 38 - Age profile of distribution cables

Of the nearly 22,000 poles on our network, approximately 40% are of unknown age. Data collection using the new field collection platform will provide estimated ages as part of the inspection process, supported by condition data for each pole. This should close this age information gap within 5 years.

For this reason, we have been enhancing our inspection techniques, to ensure that our condition-based replacement regime is not degraded by the unknown age data.

Any probable installation dates that are developed during this exercise will also be verified against the details of nearby assets using our GIS systems. In this way, we expect to improve our confidence in the age profile of our network poles.

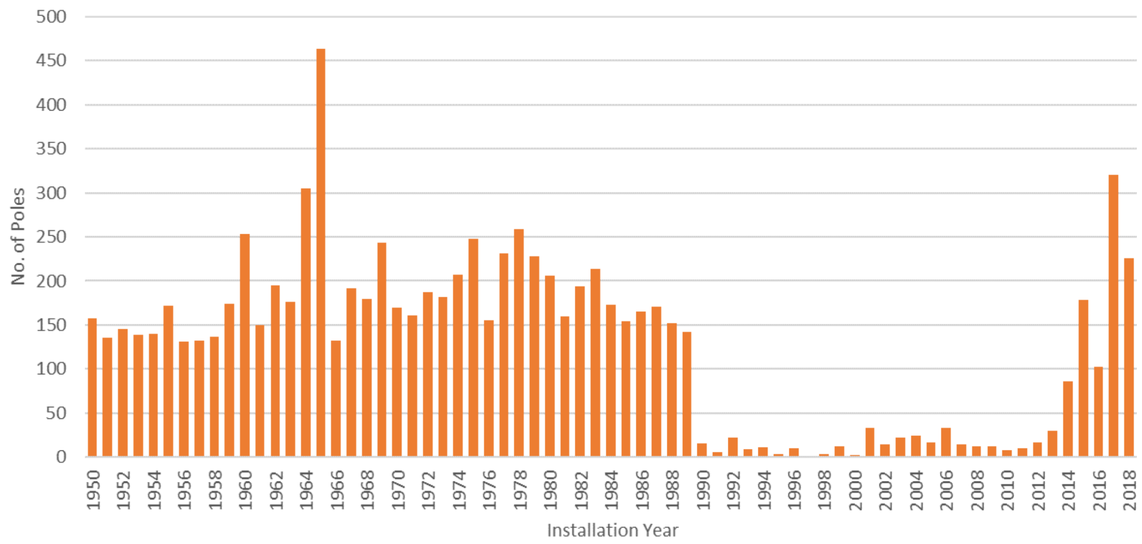

Figure 39- Age profile of wooden poles

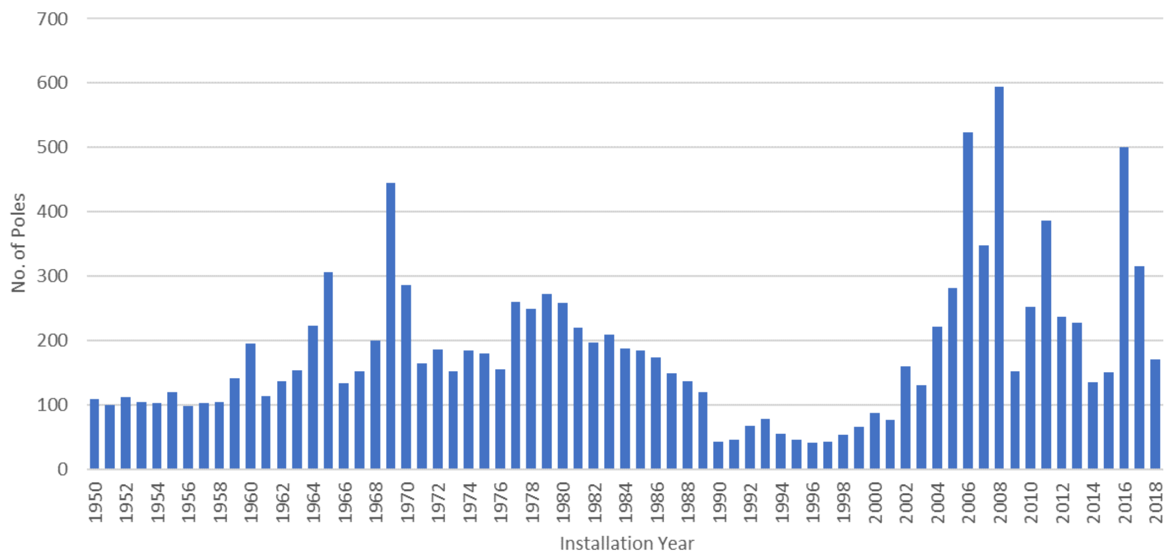

Figure 40 - Age profile of concrete poles

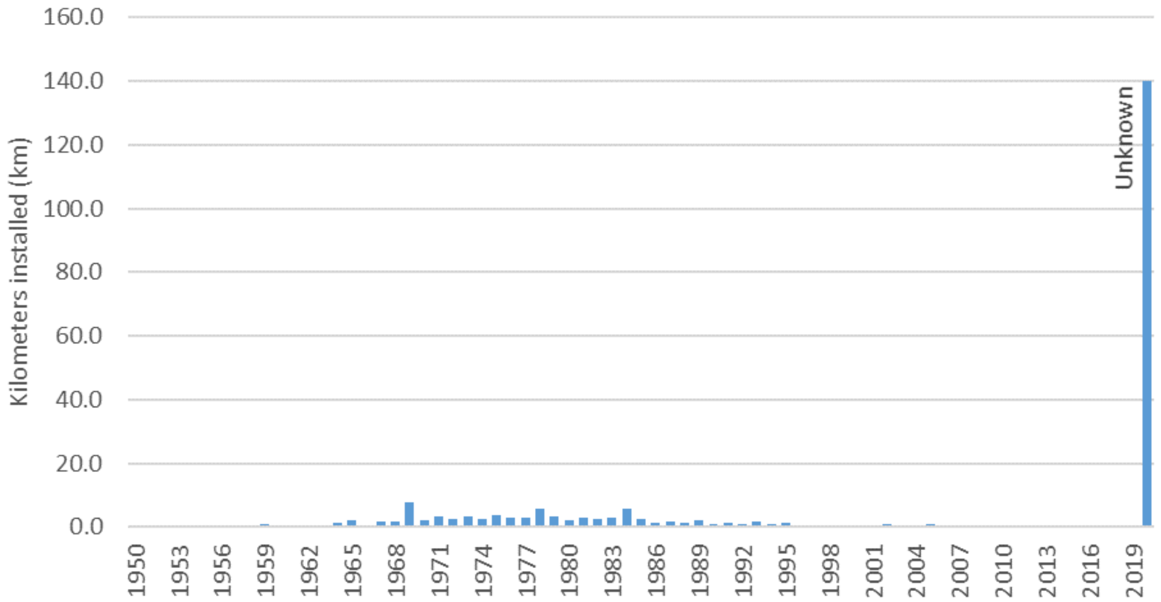

Figure 41 - Age profile of LV overhead network

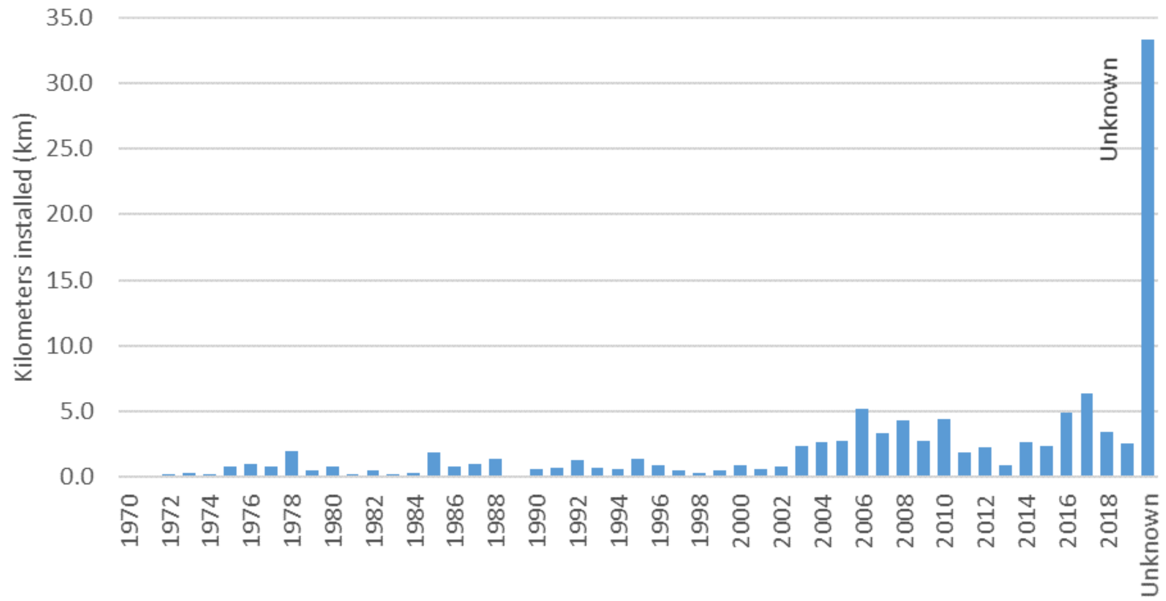

Figure 42 - Age profile of LV cables

We have a number of challenges to with understanding the age data of our low voltage distribution lines and some of our poles. We are working with archived drawings and construction records to try and improve this information where possible, but the overall approach to date has been to maintain and replace assets based on condition, rather than age.

The distribution network is subject to a number of risks, mainly due to the extensive nature of the network. These risks include:

- Vehicle impact – much of the network is built in road reserve
- Extreme weather events such as high winds or heavy snow
- Third party interference – farm plant such as pivot irrigators moving into, spraying, or being blown into lines
- Third party interference from diggers or other mobile plant
- Degradation of structural strength due to age related issues such as corrosion

5.5.3.2 Inspection and maintenance practices

Activity	**Summary**	**Frequency**
Line patrol	Ground based visual inspection of pole top, cross arms and pole top hardware. Testing of pole structural condition using Thor hammer and Portascan test sets, digging and probing. Thermal inspection of joints and cable terminations Vegetation related defects are recorded to be managed in accordance with the Electricity (Hazards from Trees) Regulations 2003.	5 yearly or as required after extreme weather events
Condition and security checks	Visual inspection of lines and cables in high traffic urban areas to identify any public safety risks	Annual
Climbing patrol	Pole top accessed via ladder or EPV in order to tighten fittings, repair loose binders, examine conductor condition etc.	As required based on line patrol outcomes
Partial Discharge Testing	Cable terminations as part of distribution switchgear discharge testing	5 yearly
Conductor sample testing	Special targeted testing of conductor to check for issues on older lines	As required
Vegetation patrol	Inspection of vegetation clearance by specialist vegetation management staff	5 yearly, timed to occur between line patrols

5.5.3.3 Renewal and refurbishment program

Results from detailed analysis of the inspection of over 3,000 network poles over two years, and the remediation work that has flowed out of those inspections indicate that the rate of pole replacement required across our fleet is approximately 1.5%, or about 300 poles per annum. We expect that this rate will be reasonably consistent for the next few years, although we will continue to monitor it to and to allow the development of better forecast models for the latter end of the planning period. We are conmfortable that we can replace poles at this rate in an efficient manner.

5.5.3.4 Expenditure Forecast

DISTRIBUTION NETWORK - Lines and cables	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Distribution pole and hardware replacements due to condition	654	654	654	654	654	654	654	654	654	654
Distribution rebuilds due to line age and condition										
Weston to Ngapara 11kV Cu replacement (19.8 km)	649	649								
Shines Rd 7/14 Cu (600m)	39									
Ngapara No. 8 GS (2900m)	190									
Kurow Township rebuild 7/16 Cu (3000m)	196									
Pig Island Rd No. 8 GS (1800m)		118								
Danseys Pass No. 8 GS (850m)		56								
Windsor No. 8 GS (2900m)		190								
Kauru Hill Rd No. 8 GS (500m)		33								
Tussocky Rd No. 8 GS (3000m)		196								
SH1 Pukeuri North to Waitaki Bridge (11600m)			759							
Ongoing rebuild of lines			768	1,527	1,527	1,527	1,527	1,527	1,527	1,527
Replace cast iron cable terminations	55	55	55	55	55	55	55	55	55	55
Remove LV road crossings on transport corridors for higher clearances										
Remove LV across State Highway 8	55	55	55	55						
Duntroon 11kV feeder relocate to road reserve	131									
Operational expenditure forecast ($000)										
Distribution line patrols	100	100	100	100	100	100	100	100	100	100
Distribution line renewals	120	120	120	120	120	120	120	120	120	120
Conductor sample condition testing	20	20	20	20	20					
Power quality investigations	5	5	5	5	5	5	5	5	5	5

5.5.4 Distribution switchgear

We use 11 kV reclosers and sectionalisers extensively in rural areas to automatically clear transient faults, and to minimise the areas affected by fault outages. Most of these devices are linked to the SCADA system and can be remotely monitored and operated.

11 kV oil filled ground mount switchgear (individual fused switches and ring main units) have been installed since 1990, as part of the major urban undergrounding programs that commenced then, and the more recent network reinforcement programs.

Distribution spur lines and individual 11 kV service lines to customer premises are often connected to the main feeder via drop out type fuses, or manually operated air break switches. These provide a control point for disconnecting the spur during a fault or planned outage, and the fuses provide a level of discrimination for faults on the fringes of our network, minimising the effect of faults on remote parts of the network. Other such switches are used as manual sectionalising points during fault response or to minimise outages during planned work.

Life expectancy for this class of asset are shown in the table below:

Table 19 - Life expectancy for distribution switchgear

Asset description	Standard life expectancy (years)
Air break switch (ABS)	35
Ring Main Unit (RMU)	40
Fused Oil switch	40
Drop out fuse	35
LV Switchgear	45
Service Fuse Box (SFB)	45

We manage distribution switchgear based on its safety impact and criticality in the network. The condition of a ground mounted switch in an urban street has a higher impact on public safety and visual amenity than a pole mounted fuse in a remote farm.

We will often manage distribution switchgear based on the design or age of the equipment, as common failure points become obvious in a particular design.

5.5.4.1 Age profiles

The age profiles of 11 kV distribution switchgear are shown in the following figures:

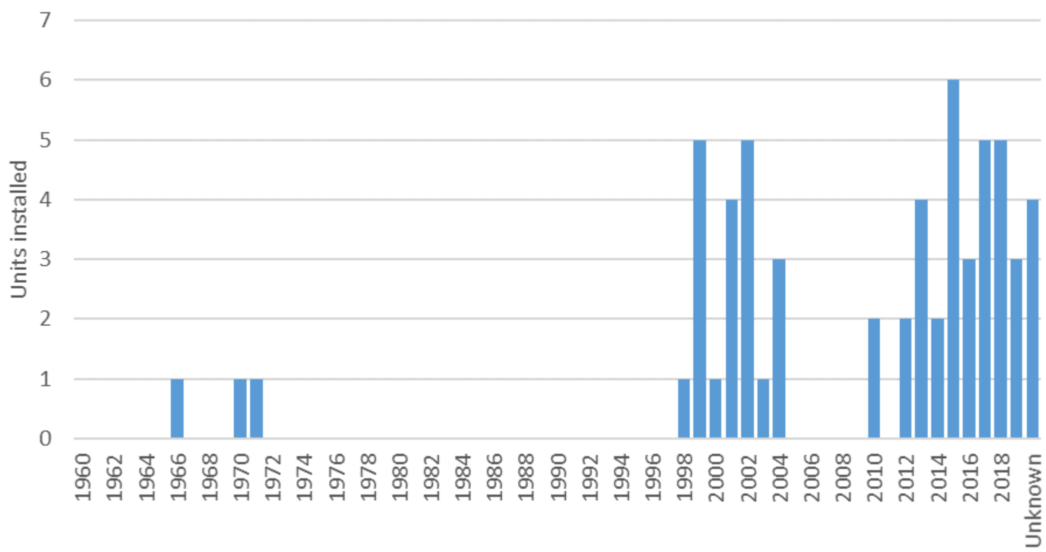

Figure 43 - Age profile of distribution sectionalisers and reclosers

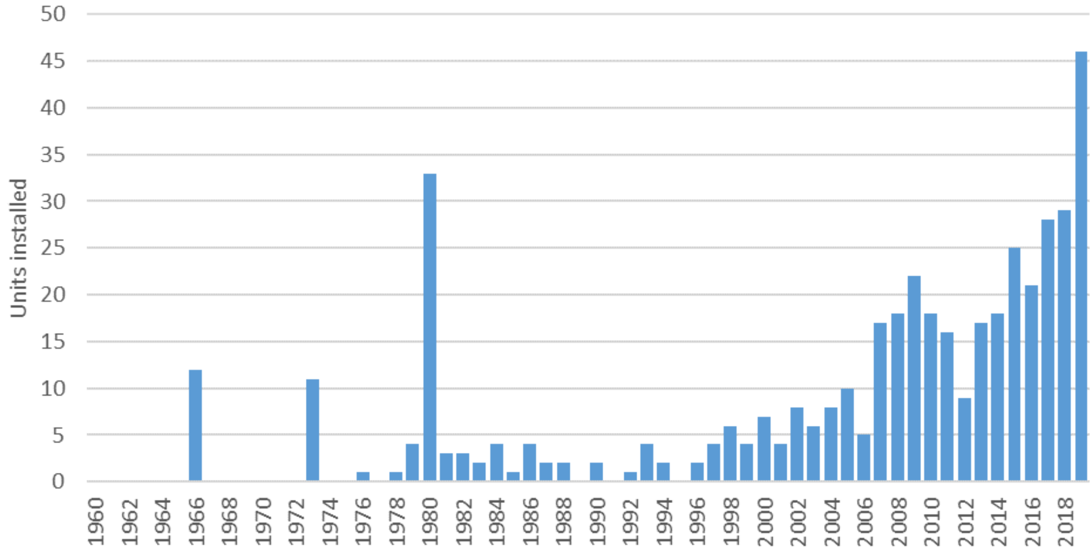

Figure 44 - Age Profile of Pole Mounted ABS

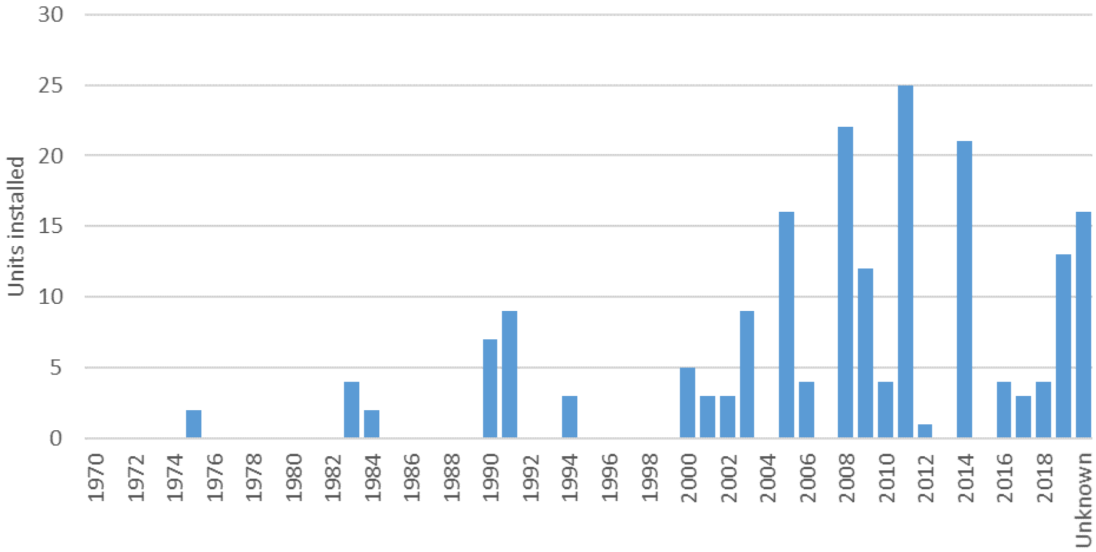

Figure 45 - Age profile of ground mounted distribution switchgear

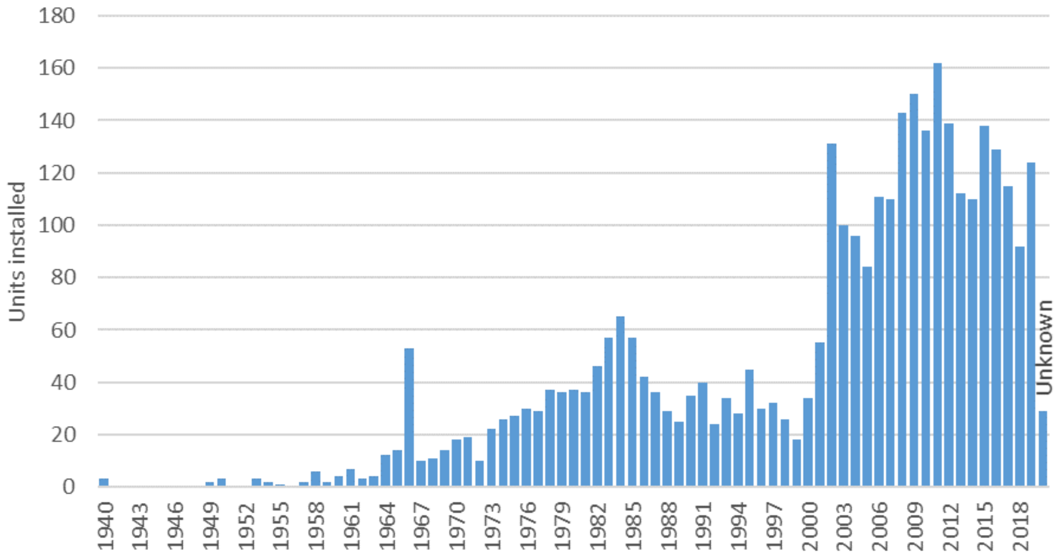

Figure 46 - Age profile of 11 kV fuses

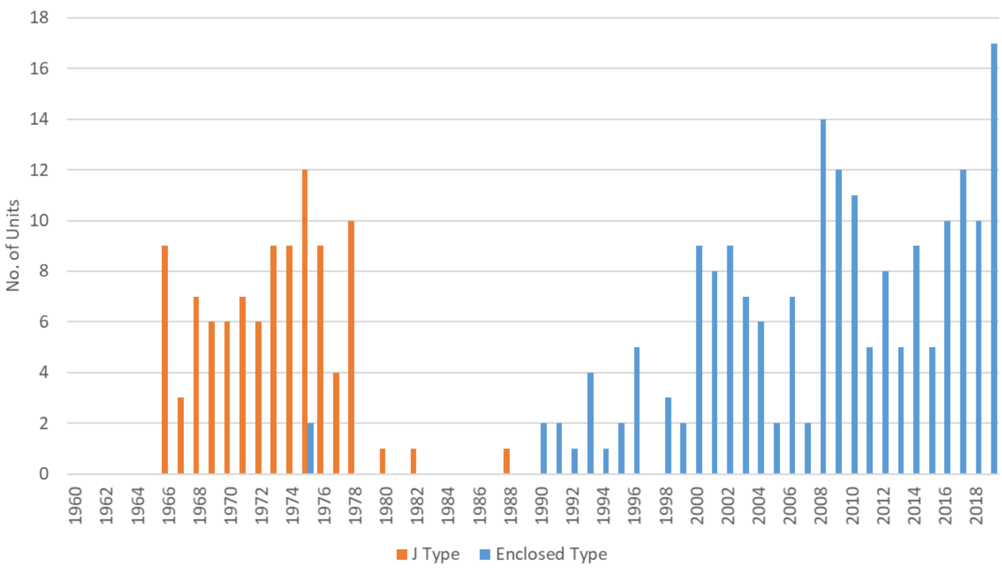

Figure 47 - Age profile of low voltage switch gear

We classify our LV switchgear into two groups:

> *Enclosed* switchgear includes vertical, fully shrouded switchgear, such as the Weber Verti-group unit. These have been installed from the early 1990's until present. We have 160 of these on our network.
>
> *J-Type* switchgear has a variety of types. These were installed on our network between 1964 and 1997. We have 100 of these on our network.

Major risks for the asset class include:

Pole mounted ABSs, reclosers, sectionalisers, pole mounted fuses

- Lightning – although surge arresters are widely used, a direct strike may be destructive
- Animal contacts, such as possums and birds.
- Cracking of porcelain insulators during operation
- Failure of older fuse gear during operation

Ground mounted switchgear

- Cabinets and casings degrading or becoming unsecure
- Vehicle incidents, as many are located in the road reserve
- Failure due to dirty insulating oil
- Failure of cable terminations on the unit
- Failure of mechanism during switching

The operational risk associated with the failure of distribution switchgear is dependent on the location and use. In service failure of a sectionaliser or recloser on a major feeder could either lead to the loss of more customers than necessary during a fault (because upstream protection must clear the fault) or prevent a planned alternate feed being used to restore lost load during an outage. By comparison with this, an ABS or fuse on a spur line or a low voltage fuse supplying one house has lower overall operational risk.

Safety related risks are generally lower for pole mounted equipment but can be more important for ground mounted equipment, where operators are standing in close proximity during switching.

Recent operational experience in New Zealand and overseas has shown that older oil filled switchgear can fail during operation in a way that is dangerous to the operator. Following this we have stopped manual operation of these units and instead use a remote actuator. In practice, these operational restrictions are increasing switching complexity and outage times on the network. We have reviewed and changed our maintenance practices to reduce this risk.

The majority of the ring main units currently in service on our network are Andelect/ABB SD types. These units are no longer manufactured and in some cases are not supported by the manufacturer. We plan to replace three of these units per year with modern vacuum switch ring main units with remote SCADA operation. These will be installed in locations selected to enhance our resilience to faults. This will support future "smart grid" features, such as ring feeders with automatic fault isolation and detection. Removal of the oil filled switchgear will provide an ongoing stock of spares for the remaining units in service.

5.5.4.2 Inspection and maintenance practices

Activity	Summary	Frequency
Line patrol	Visual and thermal inspection of high voltage and low voltage switchgear and terminations, ground mount and pole mount	5 yearly
Condition and security checks	Visual inspection of lines and cables in high traffic urban areas to identify any public safety risks	Annual
Partial Discharge Testing	11kV Distribution switchgear discharge testing	5 yearly
RMU Maintenance	Cleaning, oil testing, operational testing	5 yearly
Air break switch maintenance	Lubrication, checking operation	5 yearly
Recloser and sectionaliser operational checks	Operational tests and checks. Replace batteries	5 yearly
Insulator checks	Special visual inspection for 11 kV air break switches prone to porcelain insulator failure	6 monthly

5.5.4.3 Renewal and refurbishment program

The renewal and refurbishment program for the planning period includes:

- Replace some air break switches with sectionalisers in rural feeders to minimise outage areas during faults.
- Replacement of all 11 kV ABS's of the type prone to insulator failures in the first three years of the planning period
- Replace other switchgear based on condition assessment from scheduled inspections.
- Replace three oil filled ring main units per year with SCADA operable RMUs of the vacuum circuit breaker type to improve operational performance of the network.
- Continuing to replace older J-type low voltage switchgear with more modern enclosed switchgear that is safer to operate.

5.5.4.4 Expenditure Forecast

DISTRIBUTION NETWORK - Switchgear	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Distribution switchgear replacement due to age and condition										
EDE ABS Replacement	545	545	545	545						
ABS age and condition based replacement	33	33	33	33	33	33	33	33	33	33
Recloser/sectionaliser/tie switch replacement	38	38	38	38	38	38	38	38	38	38
Replace Oil filled RMUs										
Taward, RSA, Regina Lane		327								
Awamoa Park, Ribble St			218							
Two conversions per year ongoing				218	218	218	218	218	218	218
Install Reclosers/Sectionalisers/Tie Switches for automation										
Manse Rd Kurow, Ohau Downs	75									
West Belt automation		75								
Ongoing reliability and automation work			75	75	75	75	75	75	75	75
Install ABS and spur fusing	34	34	34	34	34	34	34	34	34	34
LV Distribution Box Replacement										
J-type replacements @ 20 per annum	218	218	262	262	11	11	11	11	11	11
Over Veranda distribution boxes @ 4 per annum	65									
Streetlight Control Replacement	0	0	0	22	22	22	0	0	0	0
Operational expenditure forecast ($000)										
SFB Trial & Patrol - 5 yearly	10	10	10	10	10	10	10	10	10	10
Distribution Boxes - annual	20	20	20	20	20	20	20	20	20	20
RMU visual inspections	4	4	4	4	4	4	4	4	4	4
Distribution switchgear maintenance										
ABS maintenance	45	45	45	45	45	45	45	45	45	45
Distribution CB's & Protection	12	12	12	12	12	12	12	12	12	12
Switching Station Maintenance	32	32	32	32	32	32	32	32	32	32

5.5.5 Distribution transformers

The 11 kV distribution network supplies 2,902 distribution transformers, of which approximately 400 have a capacity in excess of 100 kVA. All new transformers, 200 kVA or over, are ground mount “mini-sub” configured, irrespective of whether they are installed in an underground or overhead reticulated area. LV reticulation in urban areas is typically supplied by 200-500 kVA distribution substations which are located to accommodate three to four LV feeders. Transformer capacity is normally based on an average After Diversity Maximum Demand (ADMD) of approximately 5.6 kW for a domestic customer.

An LV switchboard is normally housed in or near the transformer cabinet with each feeder being independently fused. The LV switchboard is mounted independently of the transformer cabinet and is fitted with an incomer switch to facilitate isolation and removal of the transformer independent of the LV board. In overhead reticulated areas transformers are protected by pole mounted expulsion fuses and in underground reticulated areas with ground mounted fused oil or vacuum switches. In urban areas, the LV system is run in open rings with tie points brought into ground mounted distribution boxes or jumper cuts in the overhead reticulated system. Earths for ground mounted transformers in urban areas incorporate an equipotential earth loop to control step and touch voltages.

Transformers are arranged in a mesh layout such that neighbouring units can support an outage via LV interconnection. Transformers and cables are designed with sufficient spare capacity for this purpose. Maximum Demand Indicators (MDIs) are fitted to determine the need for capacity upgrade and phase balancing. Larger customer supplies may have dedicated LV cables back to the LV distribution frame and/or a dedicated transformer on their own site. Rural supplies tend to have smaller dedicated transformers which are pole mounted.

Voltage regulators are a special type of transformer installed on the 11 kV distribution network to improve voltage regulation of feeders, especially where there is load growth due to dairy conversions and irrigation. They are often used as an interim measure until the load growth warrants reinforcement of the supply. We have 14 installations of voltage regulators in service.

The life expectancy that we apply to distribution transformers is shown in Table 20.

Table 20 - Life expectancy for distribution transformers and substations

Asset description	Standard life expectancy (years)
Pole mounted transformer	45
Ground mounted transformer	45
Voltage regulators	25

5.5.5.1 Age profiles and population data

The latest development period is showing a tendency towards larger sized transformers than the earlier period. The age profile of our ground and pole mounted transformers is shown below.

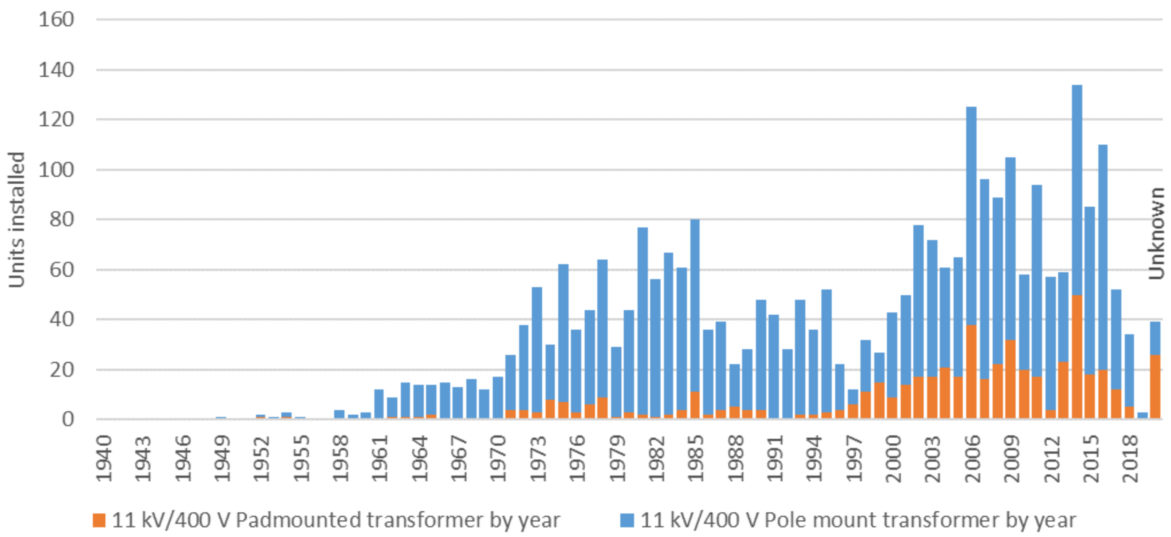

Figure 48 - Age profile of distribution transformers

Our distribution transformer fleet is generally reliable and robust. We aim to maximise the utilisation of our transformers without overloading them during normal operation, although we will apply a managed approach to short term overloading in the event of a fault.

MDI readings are utilised to monitor the loading on large transformers. We have completed trials of distribution transformer monitoring (DTM) units in some of our larger urban transformers and have seen benefits for our asset management processes compared to the traditional maximum demand indicators, which are manually recorded at longer intervals.

The DTM system provides remote monitoring of transformer loading and voltages (actual and historical), allowing much greater information on how our assets are being utilised, and gives visibility of any overloaded transformers, so we can reduce loading before the transformer life is compromised. The function of these systems will be included in the further development of a wider LV monitoring system, which will provide additional data on feeder loadings.

Both pole and ground mount transformers have proven to be reliable and robust in service, with few equipment failures in general.

The main risks to this equipment class include:

- Oil leaks into the environment
- For pole mount transformers – Animal contacts, such as possums and rats
- For ground mount transformers – Vehicle incidents, as many are located in the road reserve
- Overloading of CBD transformers due to offloading of adjacent transformers during faults or planned outages
- Corrosion that may cause issues with security of cabinets and doors

5.5.5.2 Inspection and maintenance practices

Activity	Summary	Frequency
Line patrol	Visual and thermal inspection of transformers	5 yearly
Condition and security checks	Visual inspection of transformers in high traffic urban areas to identify any public safety risks	Annual
MDI reading	Check and record loadings on larger transformers	Annual
Earth testing	Test earth continuity and values	5 yearly

5.5.5.3 Renewal and refurbishment program

The renewal and refurbishment program for the planning period includes:

- General condition-based refurbishment work such as painting cabinets, fixing doors
- Condition based replacements, based on overall condition, or where a transformer is particularly old
- Overhaul regulator transformers as required
- Replace manually read maximum demand indicators with distribution transformer monitoring at ten sites per year

5.5.5.4 Expenditure Forecast

DISTRIBUTION NETWORK - Transformers	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Distribution Transformer replacement due to age and condition	218	218	218	218	218	218	218	218	218	218
Upgrade/renew distribution earths	33	33	33	33	33	26	26	26	26	26
Operational expenditure forecast ($000)										
Ground mount equipment safety and compliance inspections										
Dist Tx. MDI's, inspection	25	25	25	25	25	25	25	25	25	25
Dist Tx. Maintenance	50	50	50	50	50	50	50	50	50	50
Earth Testing - 5 yearly	70	70	70	70	70	70	70	70	70	70
Upgrade/maintain Earths	15	15	15	15	15	15	15	15	15	15

5.5.6 Total Distribution Network Expenditure Forecast

DISTRIBUTION NETWORK	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
Distribution pole and hardware replacements due to condition	654	654	654	654	654	654	654	654	654	654
Distribution rebuilds due to line age and condition	1,074	1,241	1,527	1,527	1,527	1,527	1,527	1,527	1,527	1,527
Distribution Transformer replacement due to age and condition	218	218	218	218	218	218	218	218	218	218
Replace cast iron cable terminations	55	55	55	55	55	55	55	55	55	55
Distribution switchgear replacement due to age and condition	616	616	616	616	71	71	71	71	71	71
Replace Oil filled RMUs		327	218	218	218	218	218	218	218	218
Install Reclosers/Sectionalisers/Tie Switches for automation	75	75	75	75	75	75	75	75	75	75
Install ABS and spur fusing	34	34	34	34	34	34	34	34	34	34
LV Distribution Box Replacement	283	218	262	262	11	11	11	11	11	11
Remove LV road crossings on transport corridors for higher clearances	55	55	55	55						
Upgrade/renew distribution earths	33	33	33	33	33	26	26	26	26	26
Duntroon 11kV feeder relocate to road reserve	131									
Streetlight Control Replacement				22	22	22				
Total capital expenditure	**3,229**	**3,527**	**3,747**	**3,769**	**2,918**	**2,912**	**2,890**	**2,890**	**2,890**	**2,890**
Operational expenditure forecast ($000)										
Distribution line patrols	100	100	100	100	100	100	100	100	100	100
Ground mount equipment safety and compliance inspections	59	59	59	59	59	59	59	59	59	59
Distribution line renewals	120	120	120	120	120	120	120	120	120	120
Dist Tx. Maintenance	50	50	50	50	50	50	50	50	50	50
Distribution switchgear maintenance	89	89	89	89	89	89	89	89	89	89
Earth Testing - 5 yearly	70	70	70	70	70	70	70	70	70	70
Upgrade/maintain Earths	15	15	15	15	15	15	15	15	15	15
Conductor sample condition testing	20	20	20	20	20					
Power quality investigations	5	5	5	5	5	5	5	5	5	5
Total operational expenditure	**528**	**528**	**528**	**528**	**528**	**508**	**508**	**508**	**508**	**508**

5.6 OTHER SYSTEM FIXED ASSETS

5.6.1 SCADA

We operate an Abbey Systems Powerlink SCADA system. The SCADA system is connected to all of our zone substations via Abbey Systems RTUs and provides remote control, indication, logging, and alarm status information for key operating assets. In addition, the majority of reclosers and sectionalisers are also connected to the SCADA system and can be remotely controlled.

The SCADA system uses UHF radio data communications provided by our licensed radio network. Radio repeaters are sited at Cape Wanbrow, Station Peak and Cloud Hill. They are shared by the VHF radio telephone system NWL uses for operational voice communications between the control room and field operators.

The life expectancy of this equipment is shown in the Table 21 below:

Table 21 - Life expectancy of other fixed network assets

Asset Description	Standard life expectancy (years)
SCADA System	15
Radios	15

5.6.1.1 Management approach

These systems are managed with the active assistance of manufacturers and suppliers, as we do not have the expertise in house to carry out the higher-level maintenance functions for this equipment.

We are undertaking a strategic review of our communications equipment, including SCADA system and radios. We expect to upgrade these systems based on the outcomes of this review in the first year or two of the planning period.

5.6.1.2 Age profiles and population data

Our SCADA system is approximately 15 years old.

Failure of the SCADA and/or radio communications system would render the control room inoperative, although a reduced level of network operation could continue in the field using other means of communication, and direct operation at substations and field devices.

The major risks to the radio network are the remote locations of our repeater sites – during extended outages due to snow they have failed in the past.

The major risk to our SCADA system is hardware failure, as they operate on specialised PC's. This is to some extent mitigated by having a master and a backup computer. In addition, we are developing an offsite backup site.

5.6.1.3 Inspection and maintenance practices

Maintenance of the SCADA and Communications Systems involves an annual radio equipment site check and a support contract with the SCADA system provider.

5.6.1.4 Renewal and refurbishment program

Renewal and refurbishment programs for the planning period include:

- Review and upgrade SCADA and radios. As part of this work we expect that we will be installing fibre optic communications to several of our zone substations.
- Replace old cascade streetlight control system with ripple control as necessary.
- Installation of automated low voltage monitoring systems to assist in fault detection and outage recovery
- Creation of a backup control room
- Ongoing maintenance of access tracks on an as-required basis

5.6.2 Total other fixed asset expenditure forecast

Table 22 - Forecast expenditure for other fixed network assets

OTHER NETWORK SYSTEMS	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Capital expenditure forecast ($000)										
LV Monitoring	107	428	428	428	428	321				
SCADA access to Engineering data at substations	32									
Radio Link Upgrade (PC Sums, project development in 2017/18)		161								
SCADA/OMS Replacement		1,254								
Fibre Projects	16	37	32	32	32	32	32	30		
Backup Control room	161									
Total capital expenditure	**316**	**1,881**	**460**	**460**	**460**	**353**	**32**	**30**	**0**	**0**
Operational expenditure forecast ($000)										
Track Maintenance	20	20	20	20	20	20	20	20	20	20
Radio Repeater Maintenance	18	18	18	18	18	18	18	18	18	18
Radio and SCADA support	15	15	15	15	15	15	15	15	15	15
Before U Dig service	8	8	8	8	8	8	8	8	8	8
Streetlight Maintenance	3	3	3	3	3	3	3	3	3	3
Total operational expenditure	**64**	**64**	**64**	**64**	**64**	**64**	**64**	**64**	**64**	**64**

5.7 RENEWALS AND MAINTENANCE EXPENDITURE SUMMARY

Forecast expenditure for renewals and maintenance are summarised by asset category in the figure below:

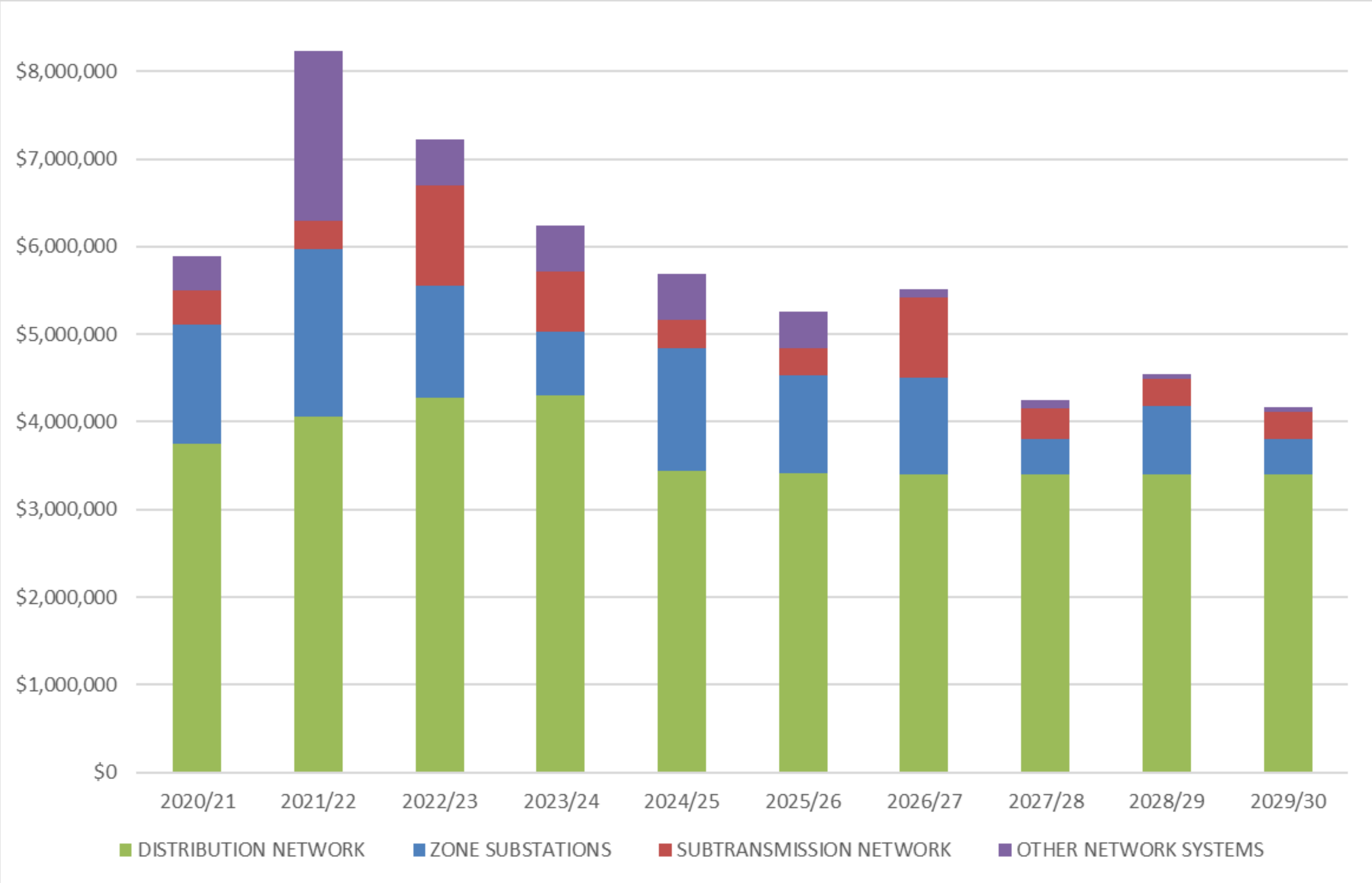

Figure 49 – Renewals and maintenance expenditure forecast by asset category

POWERING NORTH OTAGO

06

NETWORK DEVELOPMENT PLAN

This chapter sets out our Network Development Plan and covers:

Planning approach: Explains our focus, development drivers, planning criteria, and demand forecasting methodology.

Development programs. Each network area has been analysed for forecast demand, forecast constraints and options to solves constraints.

Summary of expenditure forecasts. Proposed expenditure forecast is summarised.

6. Network development plan

6.1 PLANNING APPROACH

6.1.1 Network Development Plan (NDP) focus

Our NDP is focused on:

- setting and maintaining appropriate security and reliability levels
- forecasting future demand and identifying capacity constraints on our network
- analysing and selecting solutions to deal with future constraints.

6.1.2 Our mission

Promoting regional growth and wellbeing through the provision of innovative and sustainable energy solutions for our customers

6.1.3 Planning process

- A development driver is triggered
- A business case is prepared detailing options (including non-network options), costs, benefits, risks and recommendations.
- Business case approval is requested subject to delegation levels.
- Once approved, design is completed, and the project scheduled into our works program.
- Once complete, the project is reviewed for effectiveness.

6.1.4 Development drivers

The main drivers for network development projects are:

- Safety
- Security of supply
- Quality of supply
- System reliability
- Regulatory compliance
- Readiness for the future
- New customer connections

For new customer connections, we will only invest in new network assets once a customer has committed to the new connection to minimise the risk of stranded assets.

6.1.5 **Planning criteria**

6.1.5.1 Safety criteria

The safety of our people and the public is paramount to us and is considered at all stages of planning and design in accordance with our Safety by Design Policy.

6.1.5.2 Security of supply criteria

Security of supply refers to the ability of our network to meet customer demand for energy delivery without interruption. Our deterministic security criteria are detailed on the following page.

Where deterministic criteria are triggered, and as appropriate, we will conduct probabilistic analysis to allow us to determine the probability of an outage occurring, the time to repair, and to quantify the risk in dollars. This allows us to compare the benefits of the avoided risk against the cost to mitigate the risk.

Security of Supply notes

- Repair time is defined as the time taken to sufficiently repair faulted assets to where they can be livened and will support the required load. It includes the response time taken to locate and isolate the fault and allows for prioritisation of supply restoration. In a large outage we place priority on restoring supply to the maximum number of customers, ahead of individual security issues.
- Network assets dedicated to a special industrial load may have a security level determined by customer requirements.
- The security criteria assume we can interrupt irrigation load for up to 48 hours per event.

Target repair times

• Overhead lines	4 hours
• Underground cables	6 hours
• Distribution equipment	8 hours
• Sub-transmission equipment	12 hours

NWL Security of supply standard - deterministic criteria

Table 23- Security of supply - deterministic criteria

Class	Description	Load Size (MVA)	First Outage	Second Outage	Bus Fault or Switchgear Failure
Grid Exit Points (GXPs)					
A1	Urban GXPs	Any	No interruption	Restore 50% in switching time and restore rest in repair time	No interruption for 50% and restore rest in 2hrs
A2	Rural GXPs	>15	Restore 75% in switching time and restore 90% in 8 hrs	Restore 100% in repair time	Restore 100% in repair time
A3	Rural GXPs	<15	Restore 50% in switching time and restore 90% in 12 hrs	Restore 100% in repair time	Restore 100% in repair time
Zone substations and subtransmission feeders					
B1	CBD zone substation	Any	No interruption	Restore 100% in repair time	No interruption for 50% and restore rest in 2hrs
B2	Urban zone substation	Any	No interruption	Restore 100% in repair time	Restore 100% in repair time
B3	Rural zone substation	>12	No interruption for 50% and restore rest in switching time	Restore 100% in repair time	No interruption for 50% and restore rest in switching time
B4	Rural zone substation	2-12	Restore 100% in switching time	Restore 100% in repair time	Restore 100% in repair time
B5	Rural zone substation	<2	Restore 50% in switching time, restore rest in repair time	Restore 100% in repair time	Restore 100% in repair time
B6	Subtransmission feeder	>15	No interruption	Restore 100% in repair time	Restore 100% in repair time
B7	Subtransmission feeder	<15	Restore 100% in repair time	Restore 100% in repair time	Restore 100% in repair time
Distribution feeders and substations					
C1	Urban 11 kV feeders & CBD LV reticulation	1-4	Restore 100% in switching time	Restore 100% in repair time	Restore 100% in repair time
C2	Urban 11 kV spurs & LV reticulation	<1.5	Restore 50% in switching time and restore rest in repair time	Restore 100% in repair time	Restore 100% in repair time
C3	Rural 11 kV feeders	1-4	Restore 50% in switching time and restore rest in repair time	Restore 100% in repair time	Restore 100% in repair time
C4	Rural 11 kV spurs & LV reticulation	<1.5	Restore 100% in repair time	Restore 100% in repair time	Restore 100% in repair time

NWL Security of supply standard - Probabilistic criteria

A probabilistic assessment of the proposed security of supply is based on the quantification of risk via the following formula:

> ***Risk ($) = probability of outage x cost of unserved energy***
>
> *Probability of outage = risk period (yr) x equipment failure rate (failures/yr)*
>
> *Cost of unserved energy =repair time (h/failure) x load at risk (MVA) x VoLL ($/MVAh)*

This allows financial analysis of any proposed change to network security using a net present value (NPV) calculation. This will feed into a business case which will also consider factors such as sustainability, operational flexibility, maintainability, and asset longevity.

The probability of failure for a particular class of equipment is taken from our own statistics in the first case. Where we have insufficient data, industry guidelines such as the EEA Guide for Security of Supply are consulted.

The cost of unserved energy is calculated based on the following values of lost load (VoLL), which were developed based on Transpower's Value of Lost Load Study 2018.

Table 24 – Value of Lost Load

Grid Exit Point	% domestic demand	% commercial/ industrial demand	% Farming demand	VoLL ($/MWh)
Oamaru	27%	59%	14%	$28,300
Waitaki	17%	28%	55%	$36,700
Twizel	23%	57%	20%	$31,400
Black Point	0%	0%	100%	$43,000

Note: No data was provided in the study for Black Point GXP. Bells Pond VoLL has been used instead due to having the most similar load make-up (78% Agricultural).

6.1.5.3 Quality of supply criteria

Allowable voltage drop limits on network lines are detailed in our Network Design Standard NS10-10.

Harmonic voltage limits are specified in our Network Harmonics Standard NS15-05 and NZECP36:1993 *New Zealand Electrical Code of Practice for Harmonic Levels*.

6.1.5.4 Reliability criteria

These criteria are presented in Section 3 – Service Level: Reliability.

6.1.5.5 Regulatory criteria

Voltage

The *Electricity (Safety) Regulations 2010* require that we maintain the voltage at the customer point of supply at 230 V +/- 6% (except for momentary fluctuations). This influences the maximum voltage drop we design for on our network overhead lines and cables.

Our rural network loads are generally spread out on long rural feeders and voltage performance is often a driver for network upgrade projects.

Distributed generation

We welcome the connection of distributed generation (DG) on our network. If the DG has an approved inverter and is in an uncongested area, we aim to approve the connection within two working days.

We publish a list of areas that are subject to export congestion or are expected to become congested in the next 12 months on our website. www.networkwaitaki.co.nz. Any congested areas identified will be analysed to determine whether they trigger a development driver.

We have no areas subject to congestion as at 1 April 2020 and do not forecast any areas to become congested in the following 12 months.

Conductor heights

NZECP34:2001 defines the minimum clearances for conductors from the ground or waterways. As the temperature of an overhead conductor increases, it will increase in length and sag closer to the ground. This code of practice informs our design standards and line thermal ratings.

6.1.5.6 Environmental and sustainability criteria

Minimising impact on our environment is very important to us. When we analyse options for a solution, environmental impact and sustainability are factors we consider, as detailed in our environmental policy. The Resource Management Act 1991 and relevant environmental standards are complied with as appropriate.

6.1.5.7 Climate change criteria

For new assets we consider potential effects from climate change, such as sea level rise, increased coastal erosion, when we are selecting the location and construction style of the asset.

We are monitoring industry guidelines as to any changes to design wind speeds and temperatures in regard to overhead line design and equipment rating resulting from increased frequency and intensity of storms, or changes in weather patterns.

6.1.5.8 Equipment rating and selection criteria

Ratings

Where available, equipment ratings are taken directly from nameplate data or manufacturers' published data. Where this is unavailable, ratings are either calculated from first principles or estimated from similar equipment.

Selection

Conductor, cables and switchgear are generally sized for projected ultimate loadings, provided the incremental cost of upsizing is less than the cost to upgrade the equipment in the future.

Depending on the timeframe of projected loads, distribution transformers may be sized for medium-term loads and upgraded as required for ultimate loads. This approach minimises operating losses and the risk of over investment if the projected load does not eventuate.

Standardisation

Where appropriate, network assets are designed using standard sizes and models to minimise spares, maximise interchangeability and reduce stock levels. Standard equipment sizes are specified in our design standards.

Membership of the Southern Buyers' Group gives us the opportunity to standardise equipment and materials between member EDBs and allows for increased purchasing power. An initial consideration in any design process is to check whether a standard design can be used (or adapted for re-use).

6.1.5.9 Energy efficiency criteria

At times of maximum demand, the network is configured to minimise voltage drop and maximise efficiency.

At feasibility stage for new builds or for network strengthening projects, the present value of energy losses is factored into cost benefit calculations. For example, this may result in a larger conductor being selected to minimise lifecycle energy losses.

6.1.6 Demand forecast

Over the past decade a significant portion of network investment has been driven by load growth and related security and quality of supply upgrades.

A large portion of this growth has been due to the increased uptake of spray irrigation, either new schemes or the conversion of existing gravity-fed schemes to electric pumping.

A benefit of this demand-driven investment is that it has resulted in the upgrade of many rural parts of the network prior to reaching condition-based investment triggers.

Since 2003, our network has been summer peaking network, with peaks occurring between December and February.

6.1.7 Demand forecast methodology

- Growth rates (in terms of numbers of new connections) have been analysed for the period 1990-2019. These have been categorised into three groups based on the premise type.
    1. Domestic
    2. Farming (Dairy sheds, irrigation pumps)
    3. Commercial (Neither domestic or farming)

- Customer load types at each substation have been analysed and a percentage share of the substation summer maximum demand allocated to each group. For example, Papakaio Zone Substation is classed as domestic 10%, farming 90%, Commercial 0%. This allows the growth rate for each group to be applied separately.

- Loads that have been signalled to us with reasonable certainty have been added separately to each appropriate substation. Unless the known load is truly a new type of load (e.g. EV chargers) growth rates have been adjusted downwards to avoid double counting.

- The load growth rates are based on numbers of new connections rather than maximum demand. For this reason, we have also compared the three[6] and ten-year average growth rates of maximum demand. These have been calculated across all GXPs to remove the effect of previous load transfers between GXPs.

  Table 25 - Historic maximum demand growth rates

3 year maximum-demand average growth rate	1.0%
10 year maximum-demand average growth rate	2.5%

- All demands and constraints are presented as apparent power (MVA). To allow addition of apparent power figures, a global power factor is calculated from the peak loading day of the year and assumed for all loads. For the 2017/18 period the power factor recorded at system maximum demand was 0.98 lagging.

- Historical GXP demand data has been sourced from Transpower's 10-minute metering data. Substation demand data has been sourced from NWL's SCADA system. Lower rainfall in 2018/19 meant that maximum demand was less than that experienced in 2017/18. For this reason, 2017/18 maximum demand figures have been used and an allowance added for load growth added in the 2018/19 period.

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[6] It is noted that 2018/19 was wetter than average which means that the 3-year average may tend to underestimate recent irrigation growth.

6.1.8 Demand forecast inputs

6.1.8.1 Domestic load growth

NWL's annual growth rates for new domestic connections are +0.75% (five-year average) and +0.61% (ten-year average).

Recent Statistics NZ figures project Oamaru's annual population growth to be +0.14% until 2040.

NWL's domestic load growth is expected to continue in line with historical rates.

Table 26 - Domestic growth forecast rates

Growth Scenario	Growth per year
Low growth	0.5%
Expected growth	0.6%
Prudent growth	0.7%

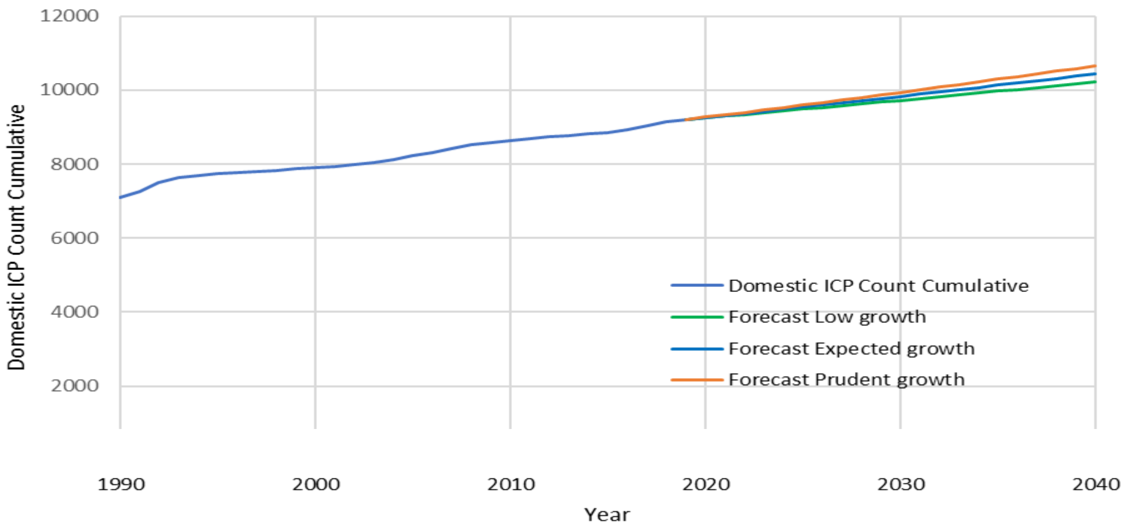

Figure 50 - Historical and forecast domestic growth

6.1.8.2 Commercial load growth

Annually, commercial new connections have grown at +1.0% (five-year average) and +0.7% (ten-year average). Growth is expected to continue in line with the ten-year average rate.

Table 27 - Commercial growth forecast rates

Growth Scenario	Growth per year
Low growth	0.5%
Expected growth	0.7%
Prudent growth	1.0%

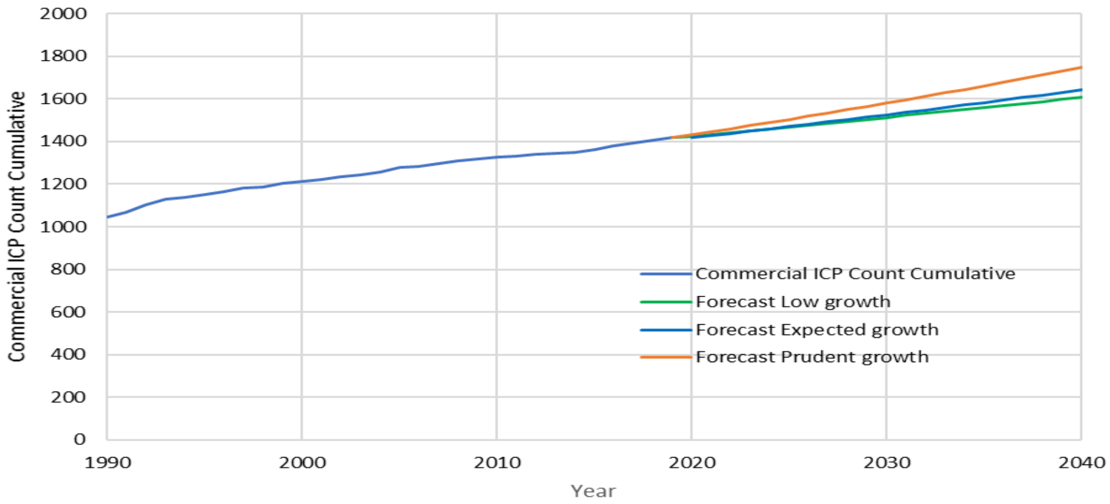

Figure 51 - Historical and forecast commercial growth

There is significant uncertainty regarding process heat that is not included in the growth forecast.

NWL has canvassed our large coal users, including factories and schools in the district and none presently advise that they plan to convert from coal to electricity in the planning period.

A detailed study of process heat energy sources in the region is proposed to be completed in the 2020/21 period.

6.1.8.3 Farming load growth

Dairy shed growth

Annual new connections for dairy sheds have grown at +1.2% (five-year average) and at +2.4% (ten-year average). The three-year average has reduced to +0.6%. From the graph in Figure 52 it can be seen that the growth rate has flattened off significantly.

Conversations with members of the farming community indicate that dairy shed conversions are likely close to saturation in the area supplied by Oamaru GXP. We expect that growth from new dairy sheds will remain low for the foreseeable future.

Table 28 - Dairy shed growth forecast rates

Growth Scenario	Growth per year
Low growth	0.3%
Expected growth	0.4%
Prudent growth	0.5%

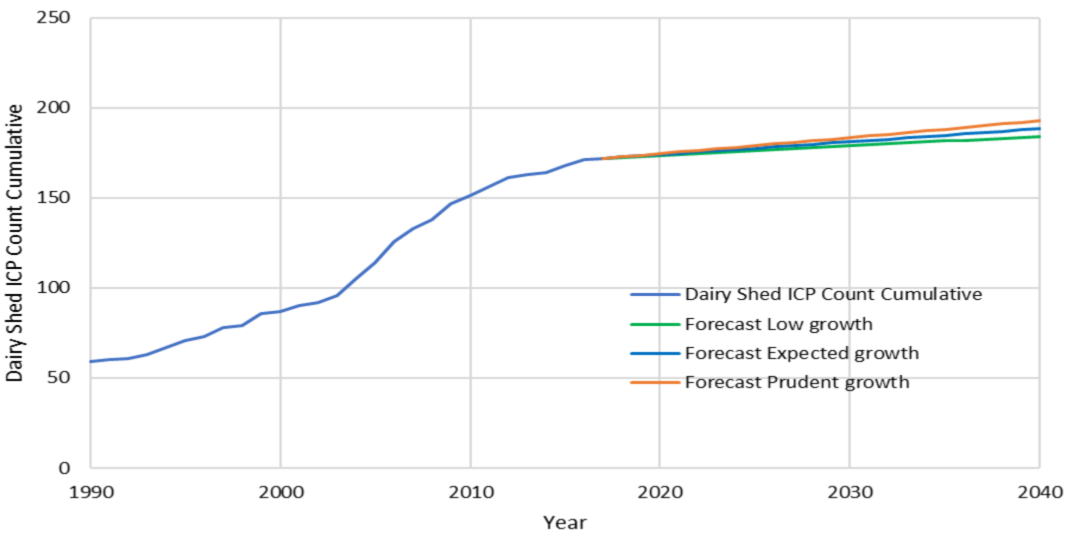

Figure 52 – Historical and forecast dairy shed growth

The Fonterra farmgate milk price[7] is forecast to be between $7.00 and $7.60 per kg of milk solids in the 2019/20 season, with average break-even estimated at $5.95. Fonterra has recently announced[8] that it will not be paying a dividend for the 2018/19 financial year. Banks have tightened up on dairy farming lending. These factors will likely suppress any appetite for any new dairy-related capital projects in the short-term.

[7] https://www.fonterra.com/nz/en/investors/farmgate-milk-prices.html Forecast update 5 – December 2019
[8] https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12257921

Irrigation load growth

Annually, new connections for irrigation pumps have grown at +3.5% (five-year average) and +3.1% (ten-year average).

The three-year average has reduced to 2.4% indicating a slight slow-down in irrigation expansion.

The following irrigation projects are proposed for the Oamaru GXP over the next 10 years and have been included as known loads.

- An irrigation company advises that approximately 5,000 hectares in the Papakaio plains area are highly likely to be converted from gravity to spray irrigation over the next ten years. At approximately 0.6 kVA per hectare this equates to 3 MVA of new load.
- An irrigation company indicates there may be another 1 MW of pumping load to be installed within Waiareka Valley Road, Taipo Road and Dunrobin Road areas.

We expect that total farming growth will be mainly linked to irrigation growth and will continue at similar rates for at least the next ten years. It is likely that irrigation growth rates will flatten off after 10 years. A thorough land use study for the area served by Oamaru GXP is proposed to be completed in the 2020/21 financial year.

Table 29 - Irrigation growth forecast rates

Growth Scenario	Growth per year
Low growth	0.8% (0.1%)
Expected growth	1.5% (0.8%)
Prudent growth	2.5% (1.8%)

Note: figures in brackets are adjusted to remove the effect of known loads.

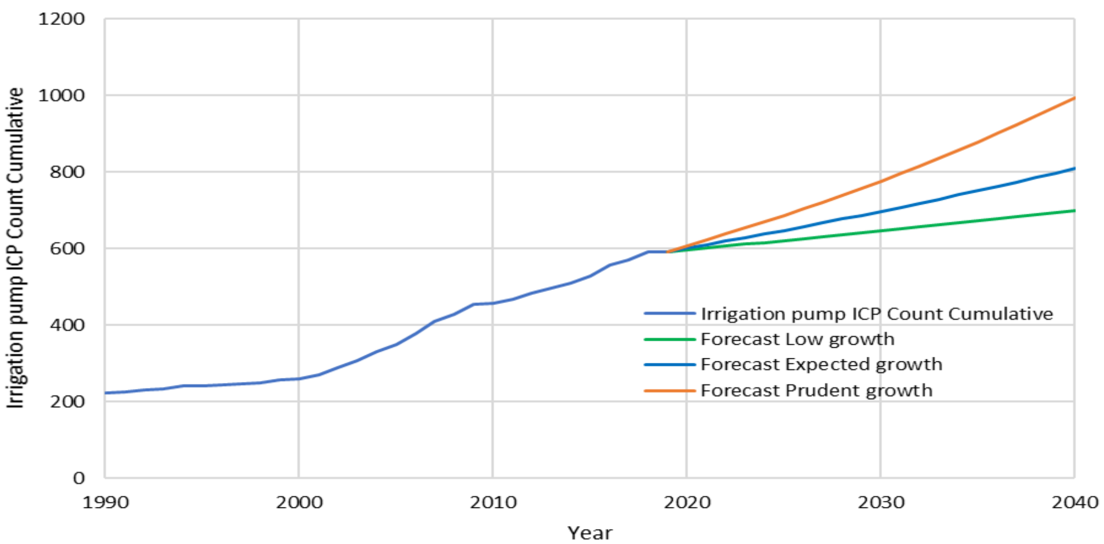

Figure 53 - Historical and forecast irrigation growth

6.1.8.4 Electric vehicles

We have low levels of electric vehicles (EVs) in our network area (28 EV and 9 Petrol Hybrid EV). The rate of uptake of EVs in New Zealand and the impact that these will have on our electricity networks is subject to a high level of uncertainty over the planning period.

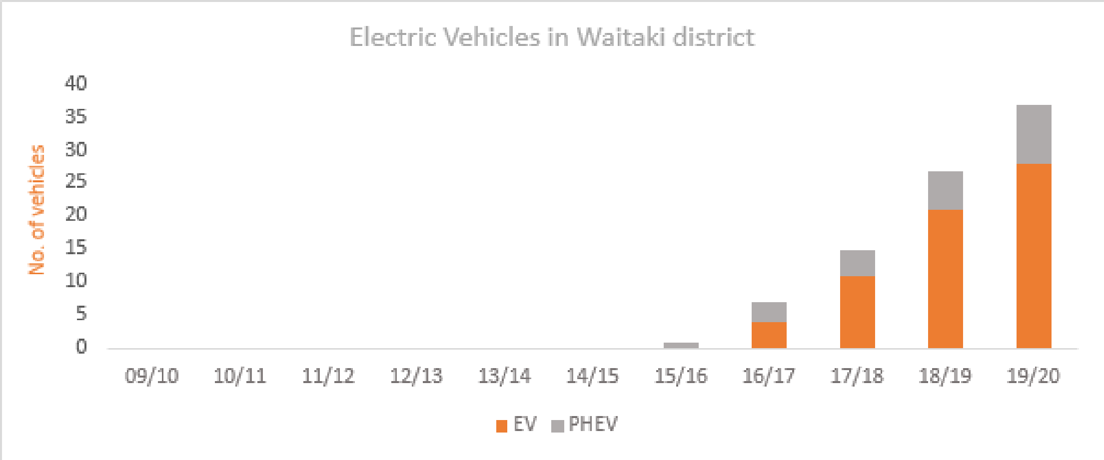

Figure 54 - Electric vehicles in the Waitaki District

For the purposes of modelling, we have based our figures on MBIEs Global Low Carbon Emissions Scenario which estimates 24% penetration of EV vehicles by 2030 and 42% by 2040. This aligns with the Ministry of Transport estimate of 40% by 2040 but is less than Transpower's *Te Mauri Hiko* report which projects 40% penetration by 2030. We are comfortable with this approach as we expect that the EV uptake rate will be higher in large centres than in the provinces.

Waitaki District (less Palmerston) has a population of 21,505 people. Based on the current New Zealand light vehicle fleet makeup of 833 vehicles per 1,000 people, the vehicle fleet in our supply area is estimated at 18,000 vehicles. This would result in 4,320 EVs by 2030 and 7,200 by 2040.

If 80% of 4,320 EVs, with 3 kW chargers, elected to charge their vehicles at 5:00pm about 11 MVA (18 MVA in 2040) would be added to our network maximum demand. Clearly a means of optimising how EVs access our network is required to ensure that we maximise the use of our electricity assets. We are part of the ENA Smart Technology Working Group and are actively collaborating with other EDBs on low voltage network monitoring and EV control schemes.
We have allocated EV energy demand in our model by hour of the day based on the following assumptions[9], which assumes that a scheme is in place to optimise EV charging.

- 80% of charging occurs between 11pm and 5am
- 10% of charging occurs between 5pm and 11pm
- 10% of charging occurs during the day evenly allocated between 9am and 5pm

To allow for the uncertainty in the charging regime, the proportion of EVs charging during our summer maximum demand has been modelled for expected growth at 10% with an average 3 kW charger size and prudent growth at 20% with an average 5 kW charger size.

We haven't included effects of vehicle to grid (V2G) power flows in our model for the planning period but are actively watching developments in this area.

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[9] MBIE, Electricity demand and generation scenarios, August 2016

6.1.8.5 Distributed generation

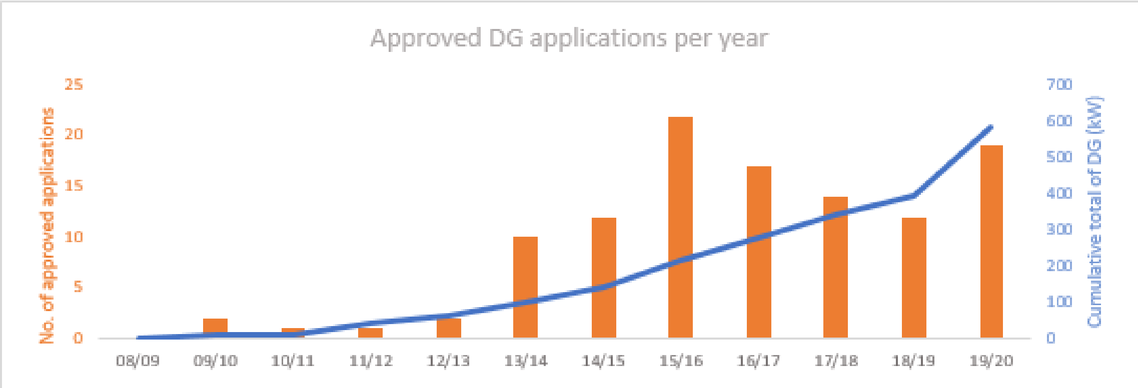

Figure 55 - Distributed generation applications

Distributed generation (DG) in our region is predominantly photovoltaic panels and this continues to grow. There are 112 DG connections approved on the network comprising 0.85% of all connections and equal to a 0.4% reduction in maximum demand (after de-rating to 40%). The average photovoltaic DG installation is 5 kW.

Distributed generation has been modelled in the low growth scenario at 5% penetration by the end of the planning period and in the prudent growth scenario at 4% penetration. We acknowledge that the rate of uptake for DG may increase due to reductions in supply price, increases in electricity supply costs, or changes to regulations. We will continue to refine our models and collaborate with other similar EDBs to share knowledge.

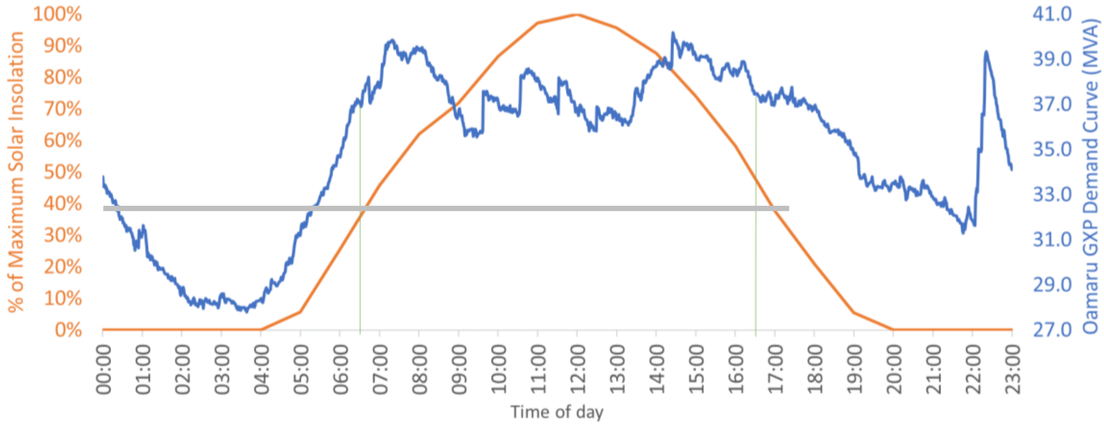

Figure 56 - Oamaru GXP load profile vs solar insolation

The graph above shows the demand (blue curve) for the heaviest loaded day in 2017 compared with the solar insolation figures for Oamaru (orange curve) on the same day. Taking a conservative approach and setting the start of the morning peak at 06:30 and the end of the afternoon peak to 16:30 gives an average solar output of 40% of maximum at times of system maximum demand.

6.1.8.6 Battery storage

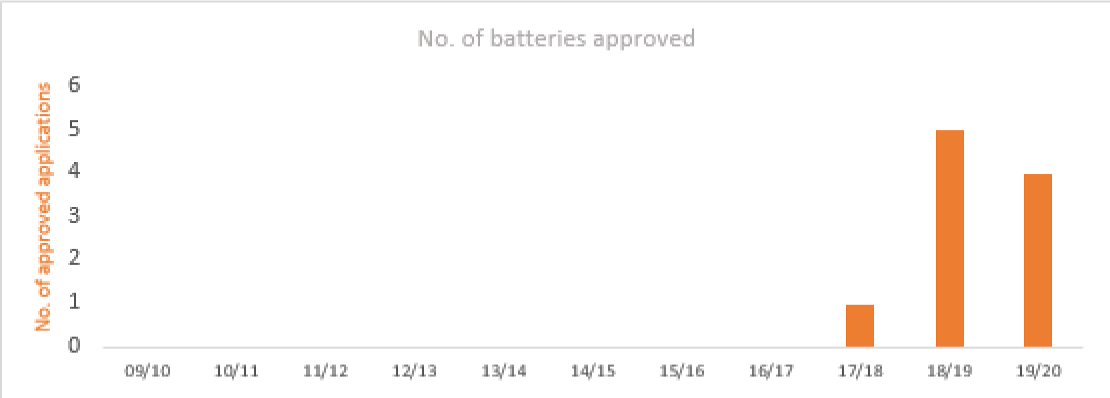

Figure 57 - Batteries approved for connection

We have ten approved customer-owned battery installations on our network. As battery technology improves and costs fall, we will see an increase in the number of distributed batteries connected to our network. This may have the effect of minimising part of our summer peak, but this will be dependent on pricing and associated customer behaviour. For example, customers may choose to use energy from their battery after 5pm when their demand is highest, but the network system demand may have reduced from peak values (as shown in the load profile curve on the previous page)

The rate of potential uptake of customer batteries is subject to uncertainty. We will continue to investigate good practice in this area and will collaborate with other similar EDBs to build and share knowledge.

6.1.8.7 Energy efficiency

The transition of domestic and commercial customers towards LED lighting, higher efficiency appliances and better insulation performance of our buildings, will result in a decrease in the existing maximum demand and energy throughput. The effects of EVs, DG, and batteries will be added to the model separately.

NWL sponsored a customer energy-efficient LED lighting program in the 2019/20 financial year. This will result in a reduction of energy usage by our customers but will not contribute to any reduction of our summer peak loads as these occur during daylight hours.

The impact of energy efficiency, as a reduction in load, has been modelled as:

Table 30 – Energy efficiency forecast rates

Growth Scenario	Growth per year
Low growth	0.3%
Expected growth	0.2%
Prudent growth	0.1%

6.1.8.8 Demand management

The impact of traditional network-controlled load management (storage heating and hot water) is minor during the summer peaks and for these reasons we have not included the effect of this in the demand forecasts.

The control of irrigation load is a tool reserved for managing network loading during unusual conditions on the network and is not regularly used.

We are yet to see the impact of customer demand side management. With the roll-out of smart meters and the availability of spot market pricing in the domestic market, we expect there will be an increase of retailer led pricing signals to customers to encourage demand management.

Transpower operate a national demand response management (DRM) program. NWL currently offer a 0.5 MW diesel genset into this program. This program also has the facility to manage customer demand response. We are currently working on a DRM pilot with Transpower and a key customer to increase our knowledge of technology available and customer behaviour in regard to DRM.

We note that retailer-initiated campaigns such as Electric Kiwi's "hour of free power" or future retailer spot pricing schemes could create artificial demand peaks on our network which are not able to be reliably forecasted or controlled.

6.1.8.9 Heat pumps

The largest heat pump installer in our region estimates that between 6,000-7,000 homes have a single heat pump and 1,000 have two.

Newer inverter heat pumps are more efficient and have less impact on the network when starting but this may be offset by anecdotal evidence from the heat pump supplier that, where in past winters the average customer would set their thermostat at 18°, many are now setting this as high as 21°C.

Heat pumps in our region are not typically used for cooling so will have a minimal contribution to the summer peak, although there is a risk that if we experience hotter days and/or customer behaviour changes that this may have an effect on our summer peak. This has not been allowed for in our modelling and we are trialling heat pump controller options as part of our DRM trial as a potential means to mitigate this risk.

6.2 DEVELOPMENT PROGRAM – OAMARU GXP REGION

6.2.1 Transmission and GXP

6.2.1.1 Transmission overview

Transpower's Oamaru Grid Exit Point (GXP) is supplied by two 110 kV transmission circuits from Lake Waitaki as shown in **Error! Reference source not found.** below.

For the 61 km section from Lake Waitaki to Glenavy, the two circuits are installed either side of a single transmission tower line. These circuits are classed by Transpower as *Interconnection Assets non-core grid*. Transpower's Grid Reliability Standard does not require non-core grid assets to meet the N-1 security level. Transpower advise that any security upgrades to these circuits will not pass their cost-benefit test and must be funded by the connected parties.

The 27 km section from Glenavy to Oamaru GXP is configured with each circuit on a separate pole line. These circuits are classed as *Connection Assets* as they supply NWL only. Any upgrades to these circuits are required to be funded by NWL.

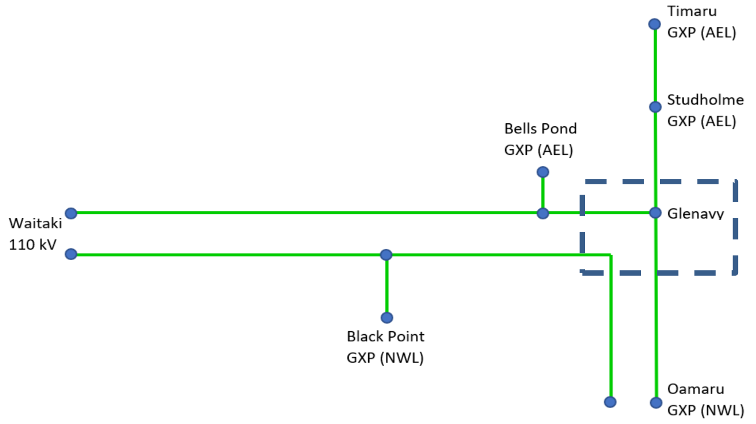

Figure 58 - Transmission single line diagram

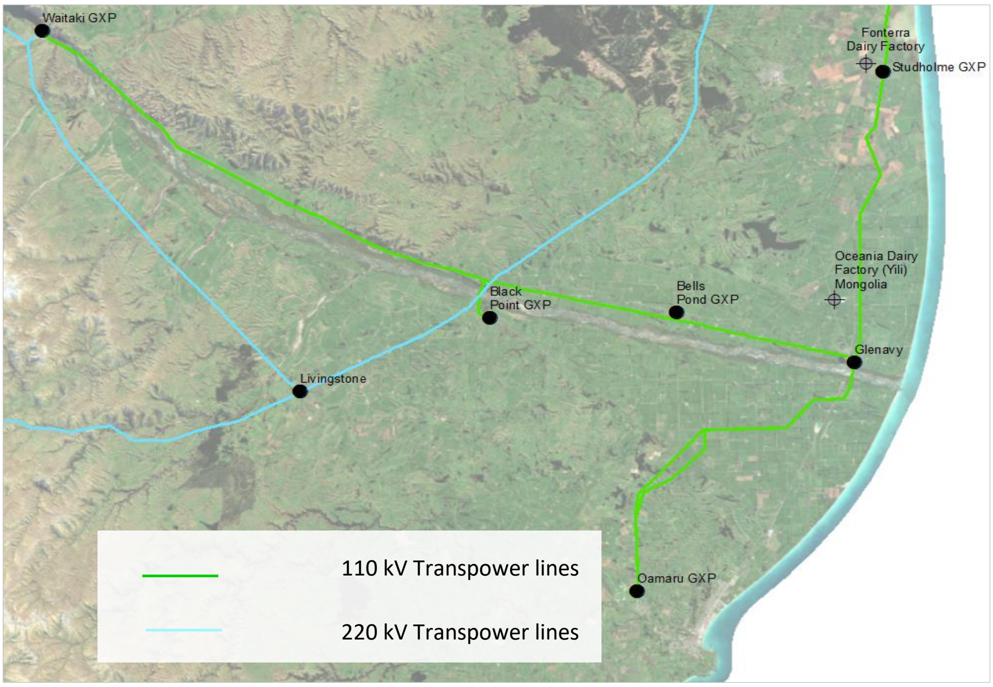

Figure 59 – Existing Transpower regional transmission network

6.2.1.2 Transmission system constraints

Table 31 – Transmission system constraints

Constraint	Type	Constraint limit	Applies pre/post contingency	Description
Waitaki 220/110 kV transformer banks	Transformer thermal rating	100 MVA (N-1)	Both	Thermal limit per transformer bank
Oamaru 110/33 kV transformers	Transformer thermal rating	60 MVA (N-1)	Both	Thermal limit per transformer
Oamaru GXP voltage	Minimum allowable voltage	96.25 kV	Post	Network Waitaki has a *wider voltage agreement* in place with Transpower that allows the voltage at Oamaru GXP to fall to 87.5% of nominal voltage (96.25 kV) after a contingent event.
110 kV circuit from Waitaki via Black Point to Oamaru	Voltage stability	54 MVA	Post	There is a voltage stability constraint if Oamaru load exceeds 54 MVA with the Studholme - Timaru 110 kV circuit out of service and 56 MVA when the circuit is in service. (Note: this is the limiting constraint on a Special protection Scheme)
110 kV circuit from Lake Waitaki to Bells Pond	Conductor thermal rating	45 MVA	Pre	When load reaches 95% of this constraint, Transpower will firstly call for demand response in the region and if that is insufficient, they will open the tie between Glenavy and Studholme, reducing the security at Studholme GXP (supplying Fonterra Dairy Factory) to N security from Timaru direction only.
110 kV circuits from Glenavy to Oamaru	Conductor thermal rating	45-51 MVA	Pre	Use of Variable Line Rating (VLR) has allowed for an increase in the thermal rating of the line from 42 MVA to 45 MVA (during selected periods of each day in Summer elsewise the limit is 51 MVA.)

The VLR determined conductor thermal rating on the Glenavy to Oamaru 110 kV transmission lines is presently the limiting constraint on the maximum demand that can be supplied from Oamaru GXP. The VLR rating has been calculated for the most constrained section of line (Black Point to Oamaru) and has been applied to both lines.

Note: The VLR rating is the maximum allowable rating for a single 110 kV circuit feeding Oamaru GXP if the other circuit is out of service (post-contingency). This constraint is also present when both lines are in service (pre-contingency) as reserve capacity must be left to pick up the load from the other line should it trip out in a fault.

6.2.1.3 Oamaru GXP maximum demand

The graphs below show the Oamaru GXP demand on the highest recorded day to date (8 December 2017) and on a heavily loaded day in February 2018 for contrast. Both graphs have the corresponding monthly Variable Line Rating (VLR) constraint (red line) superimposed.

If the VLR limit curve is lowered (red dotted line) until it intersects the maximum demand curve, it can be seen in both cases that there is 7.5 MVA of spare capacity remaining. (Note: 1.5 MVA of this spare capacity is provisional on optimising the turn-on time for hot water channel boost). This approach allows us to take into account that the maximum demand may not occur at maximum VLR constraint as seen in **Error! Reference source not found.** below.

The effective Oamaru GXP limit has been calculated by adding the spare capacity to the previous Oamaru GXP maximum demand to date.

Effective Oamaru GXP Limit = 7.5 MVA + 40.3 MVA = **47.8 MVA**

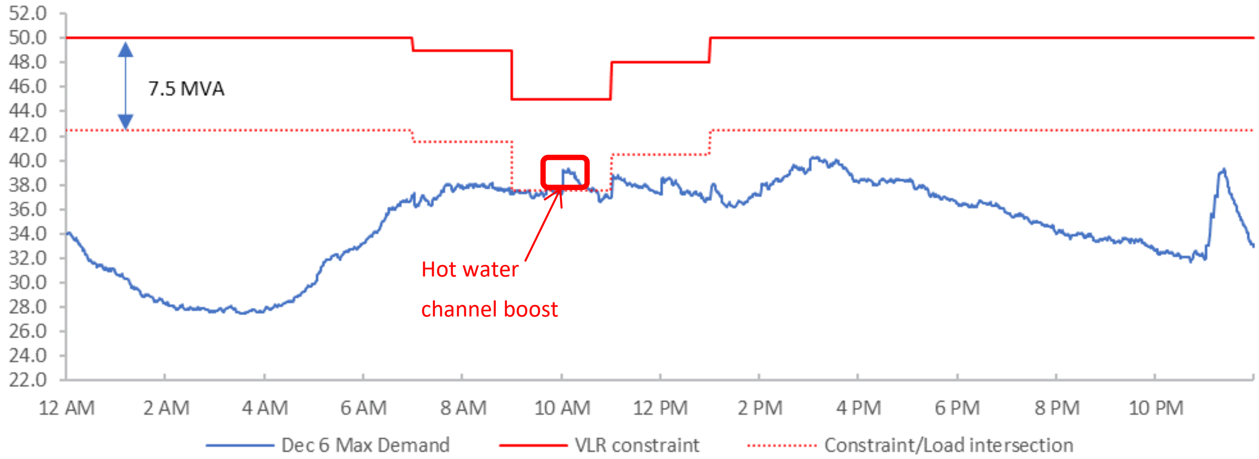

Figure 60 - December maximum demand curve vs. VLR constraint

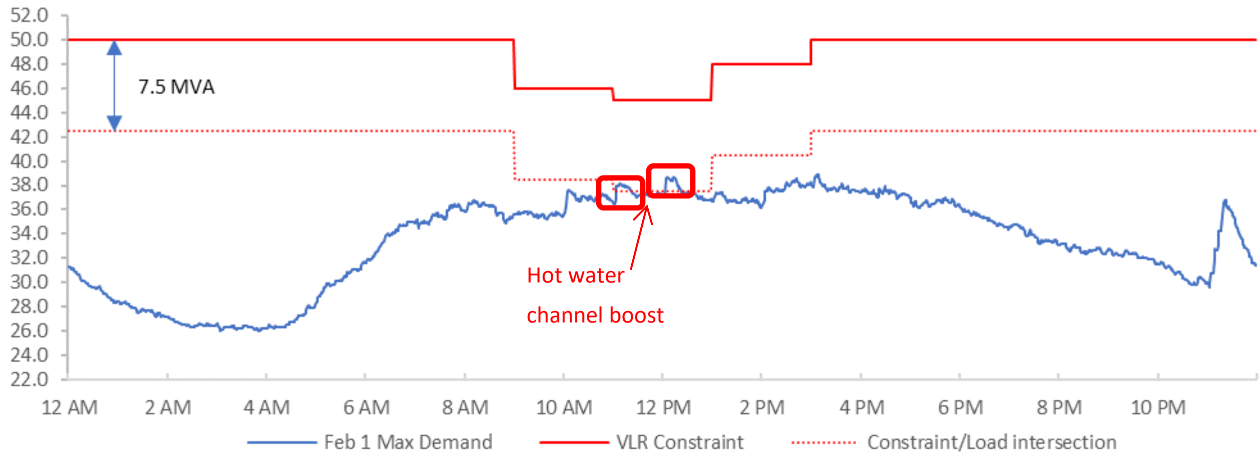

Figure 61 - February maximum demand curve vs. VLR constraint

6.2.1.4 Oamaru GXP load duration

Examining the load duration curves below it can be seen that:

- The top 10 MVA of load was present for 900 hours per year (10%) (**Error! Reference source not found.**).
- The top 3 MVA of load was present for 43 hours per year (0.5%) (**Error! Reference source not found.**).
- The top 1 MVA of load was present for 3 hours per year (0.03%) (**Error! Reference source not found.**).

If a special protection scheme exposed 3 MVA of irrigation load to N security, that 3 MVA would only be subject to N security for 43 hours per year and N-1 for the remainder.

As the amount of load subjected to N Security increases, the time at risk increases exponentially. e.g. 10 MVA of load at N security would be at risk for 900 hours per year.

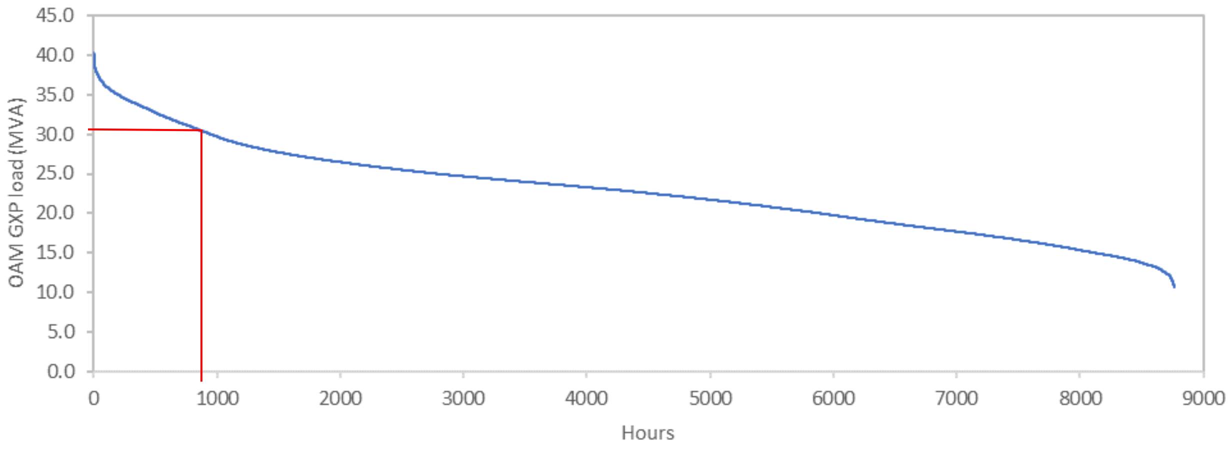

Figure 62 - Oamaru GXP 2017/18 Full year load duration curve

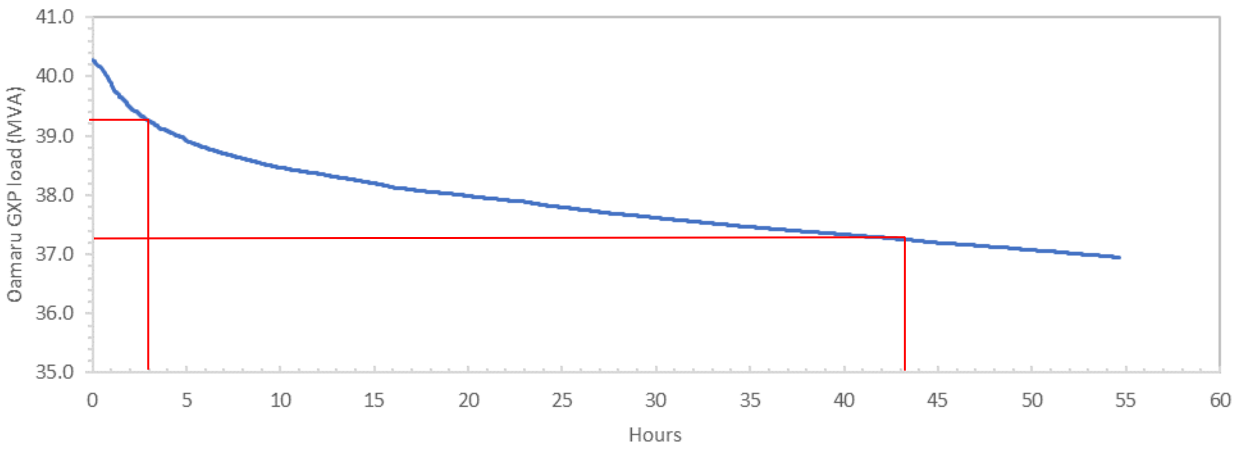

Figure 63 - Oamaru GXP 2017/18 load duration curve - Top 3 MVA

6.2.1.5 Oamaru GXP demand forecast

Table 32 - Known loads

Substation	Load Type	2019 2020	2020 2021	2021 2022	2022 2023	2023 2024	2024 2025	2025 2026	2026 2027	2027 2028	2028 2029
Papakaio	Gravity-Spray conversion		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pukeuri	Gravity-Spray conversion		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Chelmer	Other EV fast Chargers			0.1	0.1	0.1	0.1	0.1			
Redcastle	Meat plant expansion		0.5								
Five Forks	On farm Irrigation		0.2	0.2	0.1						
Maheno	On farm Irrigation		0.2	0.2	0.1						
Hampden	Poultry farm		0.9								
	Total New Load (MVA)		**2.1**	**0.8**	**0.7**	**0.5**	**0.5**	**0.5**	**0.4**	**0.4**	**0.4**

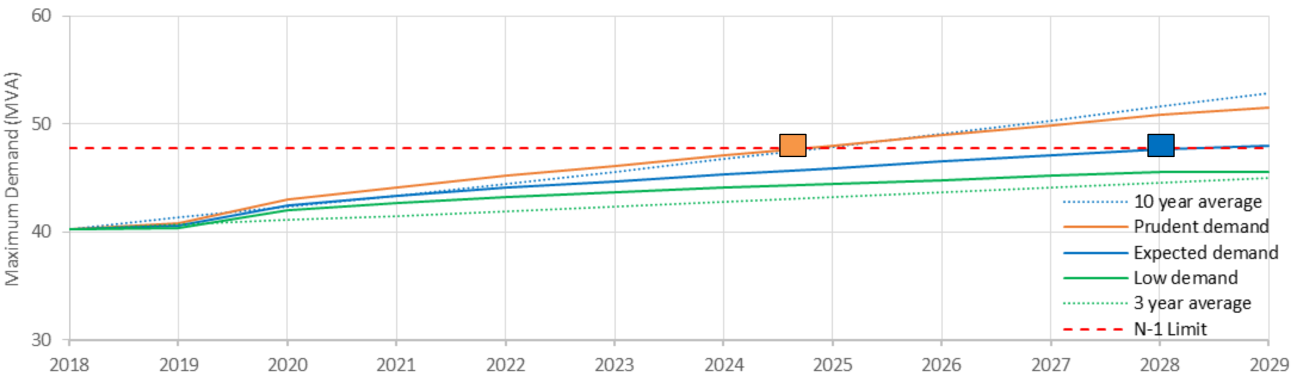

Figure 64 - Oamaru GXP demand forecast

Table 33 - Oamaru GXP demand forecast

OAM GXP	N-1 Security Limit (MVA)	2019 / 2020	2020 / 2021	2021 / 2022	2022 / 2023	2023 / 2024	2024 / 2025	2025 / 2026	2026 / 2027	2027 / 2028	2028 / 2029	2029 / 2030	Average Annual Growth Rate
OAM Low demand	47.8	40.4	42.3	43.1	43.8	44.4	44.9	45.5	46.0	46.5	47.0	47.0	1.4%
OAM Expected demand	47.8	40.6	42.7	43.7	44.6	45.4	46.2	47.0	47.7	48.5	49.2	49.5	1.9%
OAM Prudent demand	47.8	40.8	43.2	44.5	45.7	46.8	47.9	49.1	50.2	51.3	52.4	53.1	2.5%
OAM 3 year average	47.8	40.7	41.1	41.5	41.9	42.4	42.8	43.2	43.6	44.1	44.5	45.0	1.0%
OAM 10 year average	47.8	41.3	42.3	43.4	44.5	45.6	46.7	47.9	49.1	50.3	51.6	52.9	2.5%

6.2.1.6 Transmission constraint options

A capacity constraint can be alleviated by either reducing demand or increasing capacity for the period the constraint is present. This section will investigate the following options:

Reduce demand with non-network options

- Optimise timing of water heater load.
- Special Protection Scheme to put some load at N Security.
- Demand Response Management – Turn off some load at peak times.
- Grid-scale photovoltaic system to reduce demand at Oamaru GXP.
- Diesel generation to reduce demand at Oamaru GXP

Reduce demand with traditional network options

- Reactive support (capacitors) to reduce reactive demand at Oamaru GXP
- Upgrade subtransmission to 66 kV and transfer load from Oamaru to Waitaki GXP.

Increase capacity with traditional network options (Grid investment)

- New Transpower GXP
- Collaborative transmission or GXP investment

Reduce demand with non-network options

Optimise timing of hot water heater load

1.5 MVA of additional capacity can be gained by optimising the hot water channel morning and afternoon boost timing out of the most constrained VLR period (refer **Error! Reference source not found.** and Figure 61). This can be achieved at short notice and at very low cost by changing the timing of the ripple control channel in the SCADA system. This should be further optimised by breaking the hot water control channels into smaller sub groups to allow more granular control.

Note: This additional capacity has already been included in the spare capacity calculation for Oamaru GXP as this can be implemented at very short notice (or achieved by manual intervention immediately).

Special Protection Scheme

We have received a report from Transpower advising that a Special Protection Scheme (SPS) is feasible on the 110 kV circuits supplying Oamaru GXP.

This would allow Oamaru GXP to be loaded to 54 MVA pre contingency and if an outage occurs on one circuit, NWL would be required to reduce load to the lowest VLR rating (45 MVA) within 7.5s otherwise the SPS will remove supply to Oamaru GXP. Due to the limited time available, it is likely that an entire zone substation would be required to be automatically shed, followed by an appropriate amount of irrigation load shed, and then the zone substation supply restored.

This means that all load over the VLR rating in force at the time (45 to 50 MVA) would be subject to N security. The first three MVA would be at risk for 43 hrs per year and if 10 MVA of load was at N security, this would be at risk for 900 hrs per year.

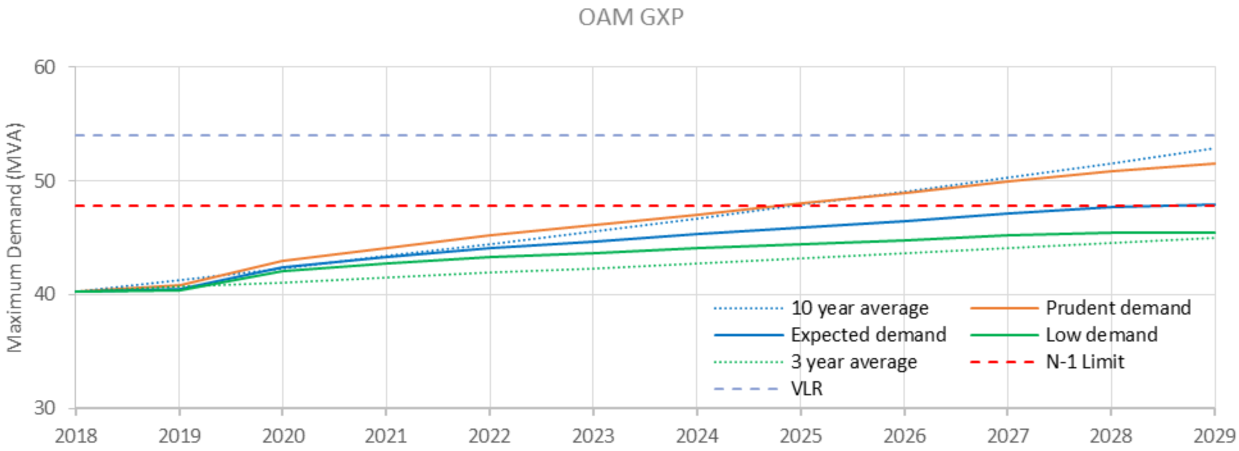

Figure 65 - Oamaru GXP maximum demand with SPS

Transpower advise that, due to the short duration of peak loads at Oamaru GXP, statistically this scheme would be expected to operate once every thirty years.

Transpower advise that the lead time to design and install this scheme is in the order of 18 months and is estimated to cost $430,000.

Control details are yet to be agreed but it is intended that this scheme would only be enabled during periods when load is predicted to exceed the lowest VLR rating and once all other options such as demand response have been fully utilised.

Demand Response Management

Overview

Demand Response Management (DRM) would allow an offer to be made to subscribers to reduce their load via a phone app or email. Subscribers could reduce their load by turning it off, running generation, or utilising battery storage.

Ideally a DRM scheme would only control demand that is able to be shifted in time. This suits demand with an element of thermal storage, such as hot water cylinders, refrigeration, heating and cooling, or load that is only required for a certain number of hours per day such as electric vehicles and potentially some irrigation.

We are conducting a pilot project at present to identify customers that may be interested in signing up to a DRM scheme and we are also trialling control of domestic heat pumps.

This will give us valuable insight into the amount and types of demand that customers are willing to offer into a DRM scheme and the price that they are willing to accept to do this.

Pilot costs are expected to be in the order of $10,000.

Grid-scale photovoltaic system

The output from a grid-scale photovoltaic system would largely coincide with the VLR constraint on the 110 kV circuits supplying Oamaru. High level investigations indicate that 4.2 MW of grid scale photovoltaic system could reduce demand and thus increase spare capacity by between 2 and 3.5 MVA.

While output under full cloud cover may be significantly reduced, in conjunction with a SPS, a grid-scale PV system would reduce the probability of a SPS being called to drop load.

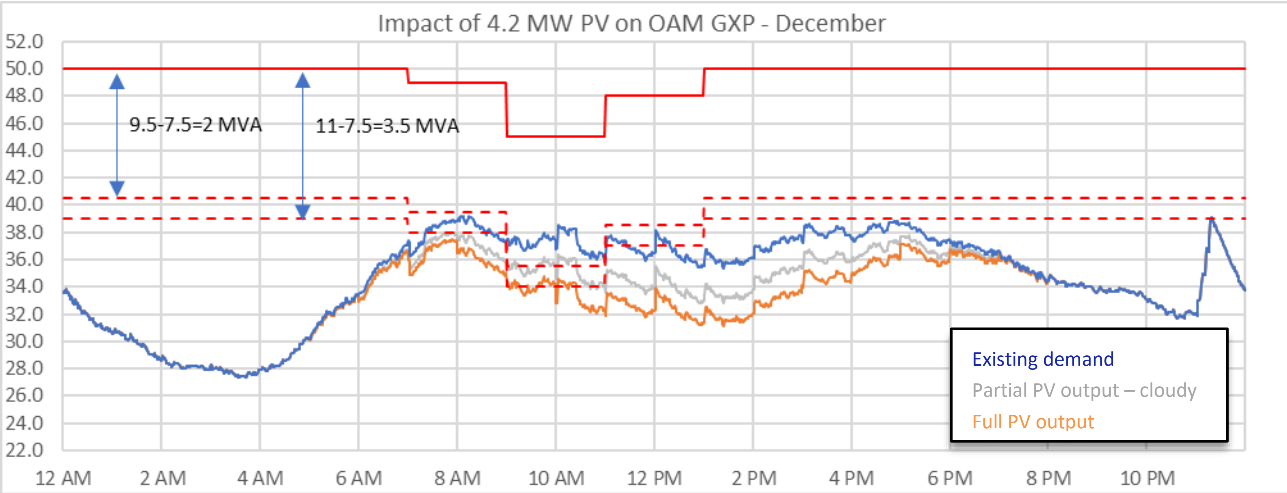

Figure 66 - Impact of 4.2 MW of PV on OAM GXP maximum demand

High level analysis indicates that 4.2 MW of PV would cost between $8.5 and $9.5 million with a payback period of 10 to 12 years (After subtracting a nominal $1.75 million as contribution towards the transmission constraint at 3.5 MVA @$500,000 per MVA).

Further investigation is required to refine costs, potential energy revenue, probabilistic solar output, and risks to energy return such as closure of the Tiwai Aluminium Smelter and the impact of the Transmission Pricing Methodology changes. It is proposed that further investigation is carried out in the 2020/21 financial year. This is estimated to cost $50,000.

Diesel generation

Installing large-scale diesel gensets does not align with the sustainability requirements of our strategic plan and mission statement.

The use of diesel gensets will be limited to short-term hire in an emergency or for network operations purposes. The cost for 1 MW of diesel installed is estimated at $450,000.

Reduce demand with traditional network options

Reactive support

Initial calculations indicate that 9 MVAr of reactive support (capacitors) would be required to free up 1 MVA of capacity on the 110 kV transmission lines. The costs to supply and install 9 MVAr of 11 kV capacitor banks is estimated at $1 million.

At $1 million per MVA, the option of correcting for the last 1 MVA of capacity on this line is not as cost effective as other options considered and will not be considered further. The option may become more cost effective if additional benefits are gained such as smaller distributed units to increase subtransmission line capacity. Further study is required in this area.

Some reactive support could also be supplied to the system from inverters on a grid scale photovoltaic system.

Upgrade subtransmission to 66 kV

Overview

The existing 33 kV subtransmission system between Waitaki GXP and Ngapara Zone Substation would be converted to 66 kV. This would allow Ngapara Zone Substation (6 MVA) to be offloaded from Oamaru GXP onto Waitaki GXP. This expenditure is forecast for the end of the planning period and may not be required if a GXP solution is selected.

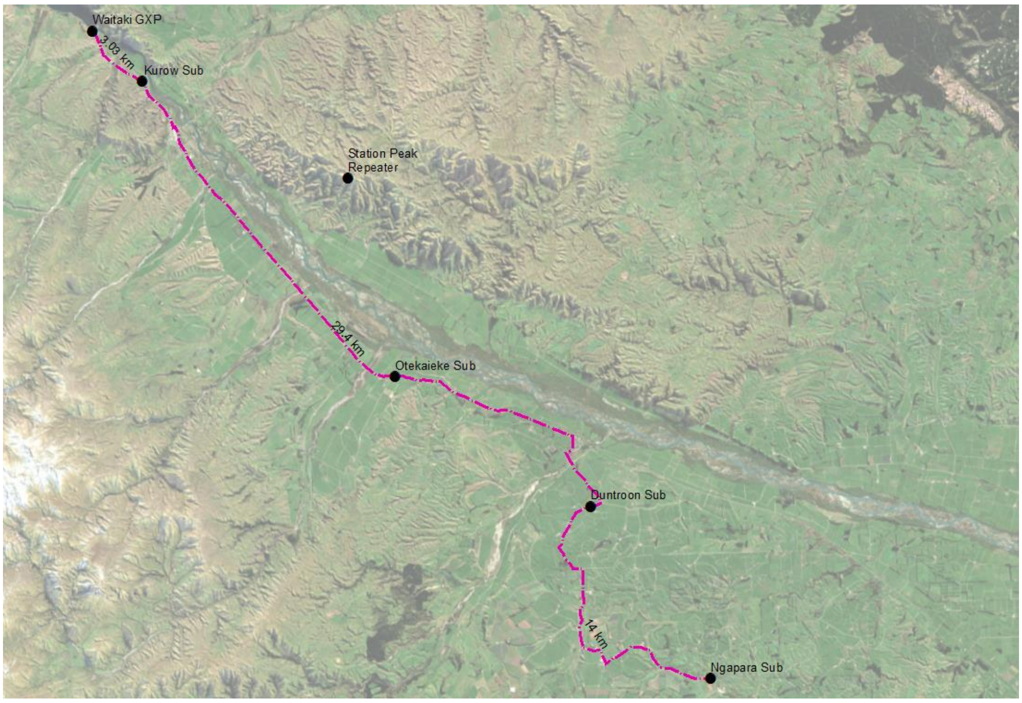

Figure 67 - Proposed 66 kV subtransmission system

- The section of 33 kV line between Duntroon and Ngapara zone substations would be reinsulated to allow for 66 kV operation.
- A second 33 kV line would be installed between Lake Waitaki and Kurow to increase supply capacity and security to Kurow Zone substation and the 66 kV subtransmission system.
- 33/66 kV transformers with On Load Tap Changers (OLTC) would be installed at Kurow and Duntroon substations.
- Otekaieke and Duntroon zone substation transformers would be replaced with 66/11 kV transformers and the system commissioned and livened at 66 kV.

Table 34 – Upgrade subtransmission to 66 kV – Cost and timing

Project Name	Components	Budget cost (000)
Upgrade Duntroon/Ngapara to 66 kV	Reinsulate line for 66 kV	$603
Install 2nd line Lake Waitaki to Kurow	New 66 kV subtransmission line	$678
	Retighten line	$43
Kurow -Ngapara 66kV conversion	Stage 1 and 2 design	$70
	Stage 1 conversion	$3,229
Kurow -Ngapara 66kV conversion	Stage 2 conversion	$3,229
	Total estimated cost	**$7,852**

This option initially frees up 6 MVA of capacity at Oamaru GXP with the option to free up another 3 MVA once Awamoko substation and subtransmission are constructed. The cost of this option is estimated at $0.8m per MVA. This option also provides additional security benefits to NWLs Zone substations.

Increase capacity with traditional network options

New Transpower GXP

Overview

A new 220/33 kV GXP would be constructed at Livingstone. Detailed design and any resource consents would be completed in advance to allow a build time in the order of 2 years.

As load at Oamaru GXP approaches the constraint, we would progressively transfer zone substations from Oamaru GXP onto the new Livingstone GXP in the following order: Ngapara Zone Substation (6 MVA), Enfield Zone Substation (2.7 MVA) and Five Forks Zone Substation (2 MVA) and the proposed Awamoko Zone Substation (3 MVA).

Duntroon Zone Substation (6 MVA) and Eastern Road Zone Substation (4 MVA) would be transferred from Waitaki GXP to the new Livingstone GXP.

Cost Estimate

NWL would pay for new GXP investment through connection charges. NPV of this scenario including lines costs comes in at $21m. This option will provide an extra 60 MVA of capacity at a rate of $0.35m per MVA.

Collaborative Transmission or GXP investment

Network Waitaki is open to investigating a solution with Alpine Energy to jointly solve our capacity issues on the transmission lines feeding our districts.

Proposed development plan

Option	Capacity gained	Cost estimate (000)	Timing
1. Optimise water heating channels - Part 1 - Move channel timings Part 2 – Reprogram ripple receivers	1.5 MVA	$0 $50	2020/21 2021/22
2. Demand Response Management trial	TBC	$10	2020/21
3. Grid-scale photovoltaic system - Further investigation and business case. Install a small PV system at the pole yard to collect solar data.	TBC	$20 $50	2020/21 2021/22
4. Special Protection Scheme - Commission detailed design and implement SPS scheme in 2021/22.	9 MVA (N security)	$430	2021/22
5. Pre-design long-term solution. NWL will engage Transpower to review and reissue the SSR for a GXP solution, then look to complete full design, any land purchases, and easements for a GXP upgrade and any associated lines to allow for a fast rollout.	--	$300	2021/22
6. Commence long-term solution Once the appropriate trigger level is reached long-term solutions should be re-evaluated and a business case submitted for project commencement.	60 MVA	$20,000-$30,000	Dependant on load growth

6.2.1.7 Subtransmission and substations

Oamaru GXP zone substation overview

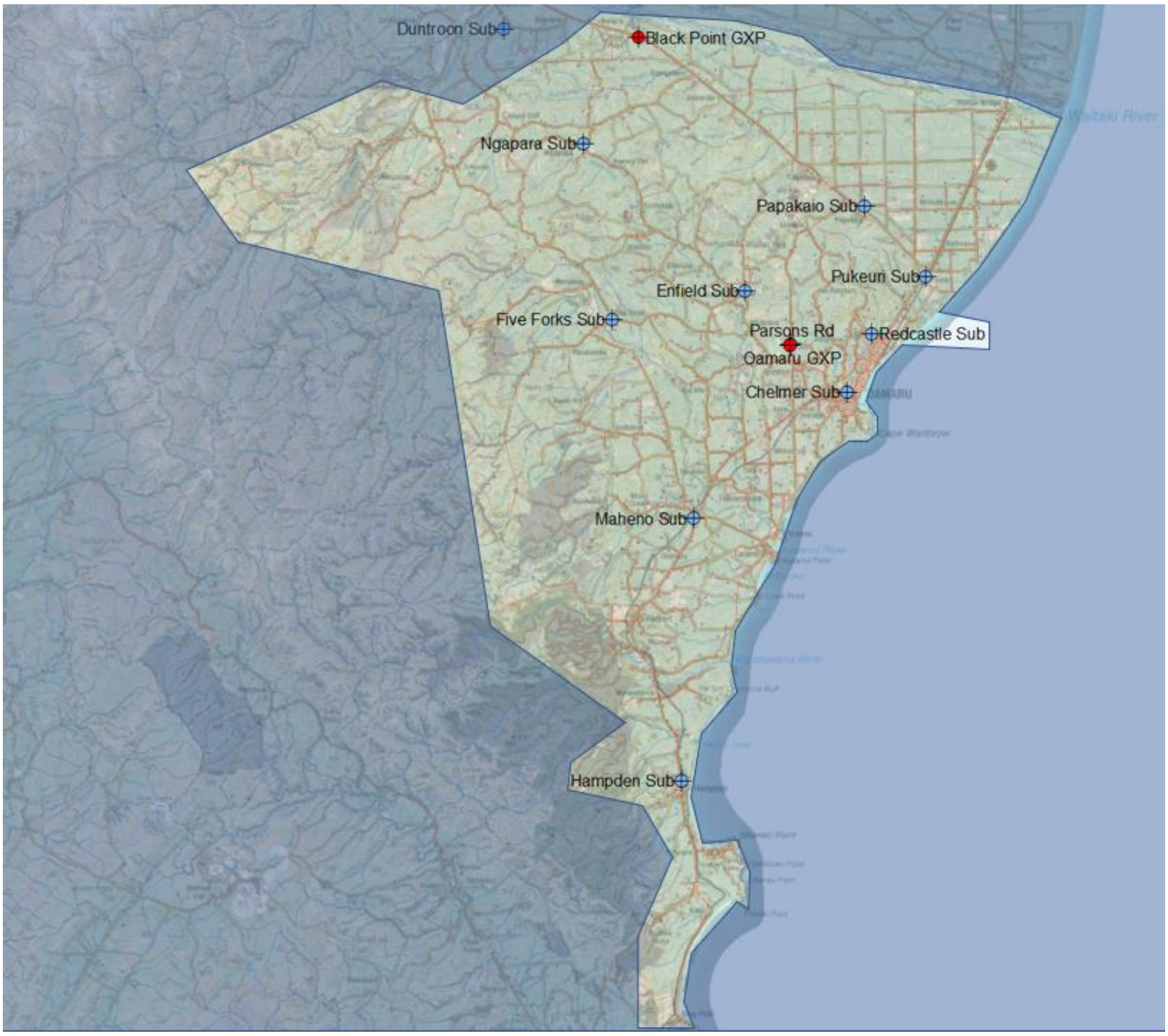

Figure 68 - Oamaru GXP zone substations

6.2.1.8 Ngapara Zone Substation

Security

Table 35 – Security ratings

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security
Subtransmission	N-1 switched security[1]
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security[2]
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Duntroon, Enfield, Papakaio

[1] At times of peak load supply at 33 kV can only be provided from Oamaru GXP.

[2] The existing second transformer will be relocated to the new Eastern Rd Zone Substation in 2020.

During summer peak times, B4 security is only partially achieved for outages to N security components with 11 kV backup from neighbouring substations. Some irrigation load may be required to be shed for up to 48 hrs in an outage.

Load details

Table 36 - Load details

Distribution substations supplied	122
Customer connections supplied	189
Farming	71
Commercial	15
Domestic	103

Existing maximum demand varies from 1 MVA in Winter to 5.5 MVA in Summer which is predominantly due to irrigation load. No security or capacity related upgrades are proposed at Ngapara in the planning period.

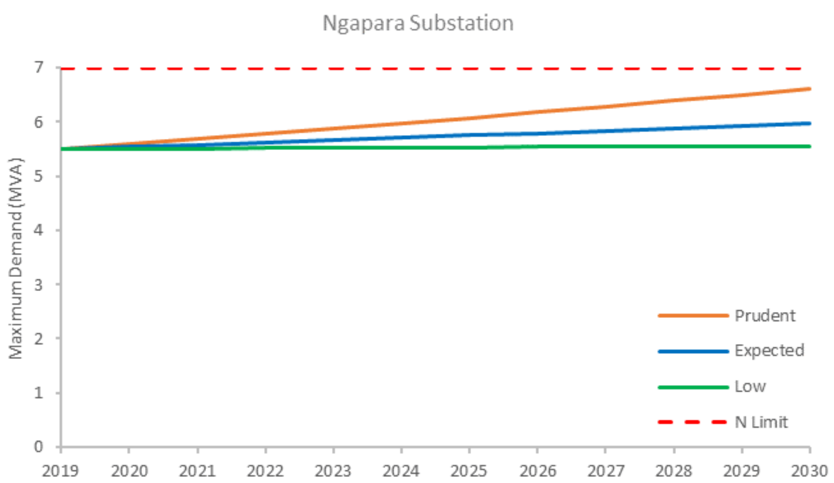

Figure 69 - Ngapara Zone Substation - load forecast

6.2.1.9 Papakaio Zone Substation

Security

Table 37 - Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security
Subtransmission	N security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Pukeuri, Duntroon, Ngapara

During summer peak demand, B4 security is only partially achieved for outages of N Security components with backup at 11 kV from neighbouring substations. Some irrigation load may need to be shed for up to 48 hrs in an outage.

Load details

Table 38 - Substation load details

Distribution substations supplied	259
Customer connections supplied	420
Farming	156
Commercial	28
Domestic	236

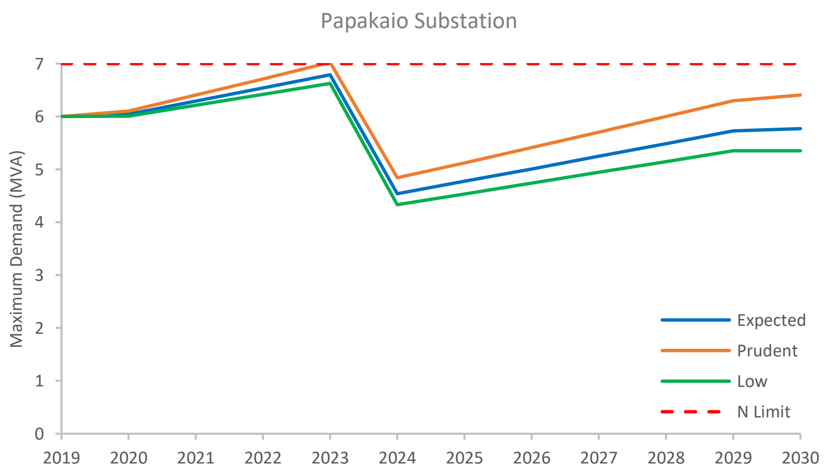

Figure 70 - Papakaio Zone Substation demand forecast

Existing maximum demand varies from 2 MVA in Winter to 6 MVA in Summer which is predominantly due to irrigation load. Under the prudent scenario maximum demand will exceed the zone substation rating from 2023.

A new Awamoko Zone Substation is proposed to be commissioned in the 2023/24 financial year to reduce loading on Papakaio.

6.2.1.10 Awamoko Zone Substation (proposed)

A new zone substation is proposed in the Awamoko area to reduce loading on Papakaio Zone Substation and provide improved backup to Duntroon and Ngapara Zone Substations. 12.5 km of new subtransmission line is proposed to be installed from Papakaio to Awamoko followed by a 16 km of new subtransmission line from Duntroon to Awamoko.

Security

Table 39- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security
Subtransmission	N-1 switched security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Papakaio, Duntroon, Ngapara

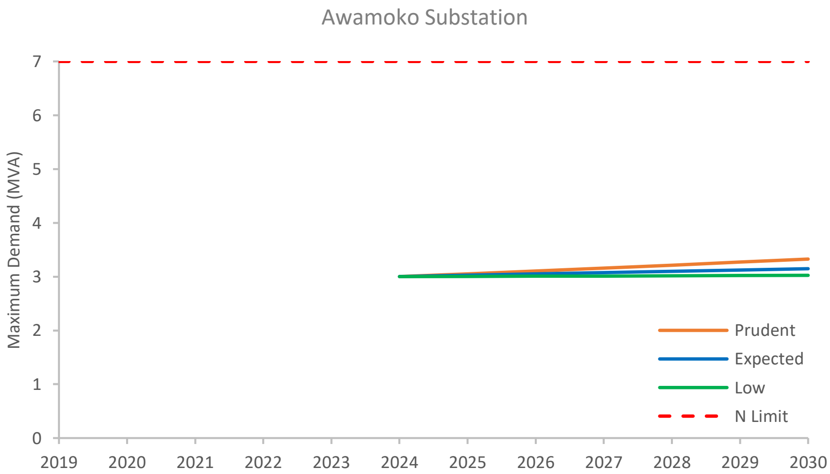

Figure 71 - Awamoko Zone Substation demand forecast

Table 40 - Cost estimate Awamoko Zone Substation

Project Name	Components	Year (s)	Budget cost (000)
Awamoko Zone Substation	Design, Geotech study, procure land	2021/22	$210
	New Zone substation	2023/24	$1,940
Papakaio/Awamoko subtransmission	Design and procure easements	2021/22	$54
	New subtransmission line Stage 1	2022/23	$1,292
	New subtransmission line Stage 2	2023/24	$1,292
	Retighten line	2024/25	$43
Duntroon/Awamoko subtransmission	Design and procure easements	2021/22	$54
	New subtransmission line Stage 1	2024/25	$1,614
	New subtransmission line Stage 2	2025/26	$1,614
	Retighten line	2026/27	$54

6.2.1.11 Pukeuri Zone Substation

Security

Table 41- Security rating

Required security of supply level	**B2 urban zone substation**
Substation rating	**12 MVA N-1 Security**
GXP	N-1 security
Subtransmission	N-1 security
33 kV Incomer circuit breaker	N-1 security
33/11 kV transformer	N-1 security
11 kV incomer circuit breaker	N-1 security
11 kV bus	N-1 security
Inter-tied zone substations (11 kV)	Papakaio, Redcastle

Load details

Table 42- Substation load details

Distribution substations supplied	88
Customer connections supplied	173
Farming	44
Commercial	24
Domestic	105

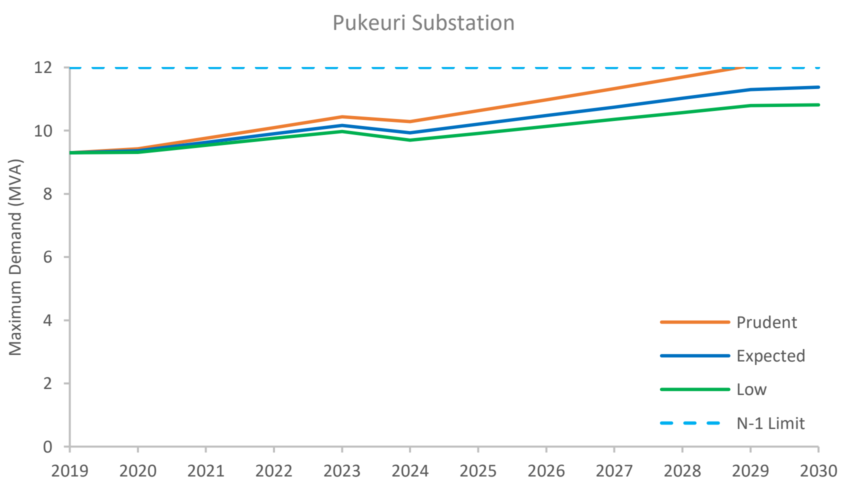

Figure 73- Pukeuri Zone Substation demand forecast

Existing maximum demand varies from 4.5 MVA in Winter to 9.2 MVA in Summer with the difference being predominantly due to irrigation load.

6.2.1.12 Enfield Zone Substation

Security

Table 43- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security
Subtransmission	N-1 switched security[1]
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Ngapara, Parsons, Five Forks

[1]At times of peak load, supply at 33 kV can only be provided from Oamaru GXP.

Load details

Table 44- Substation load details

Distribution substations supplied	177
Customer connections supplied	319
Farming	92
Commercial	23
Domestic	204

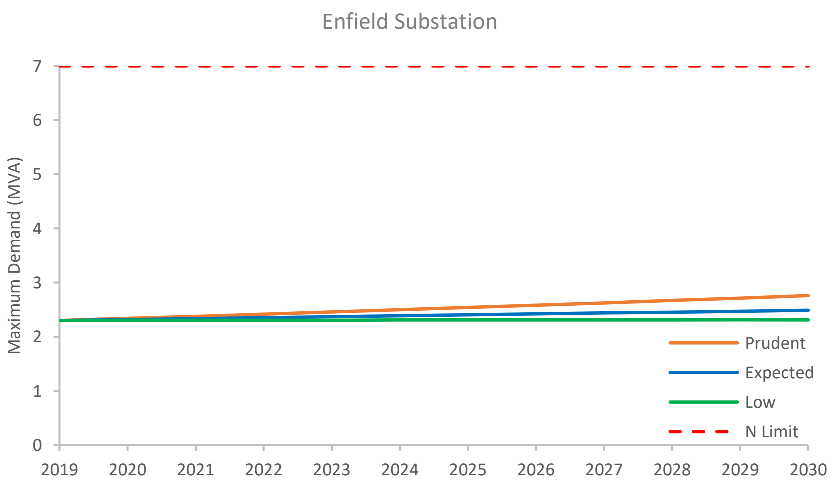

Figure 74 – Enfield Zone Substation demand forecast

Existing maximum demand varies from 0.5 MVA in Winter to 2.3 MVA in Summer with the difference being predominantly due to irrigation load.

6.2.1.13 Parsons Zone Substation

Security

Table 45- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**12 MVA N Security**
GXP	N-1 security
Subtransmission	N-1 switched security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Enfield, Papakaio, Redcastle, Chelmer, Maheno

Load details

Table 46- Substation load details

Distribution substations supplied	309
Customer connections supplied	1,037
Farming	67
Commercial	106
Domestic	864

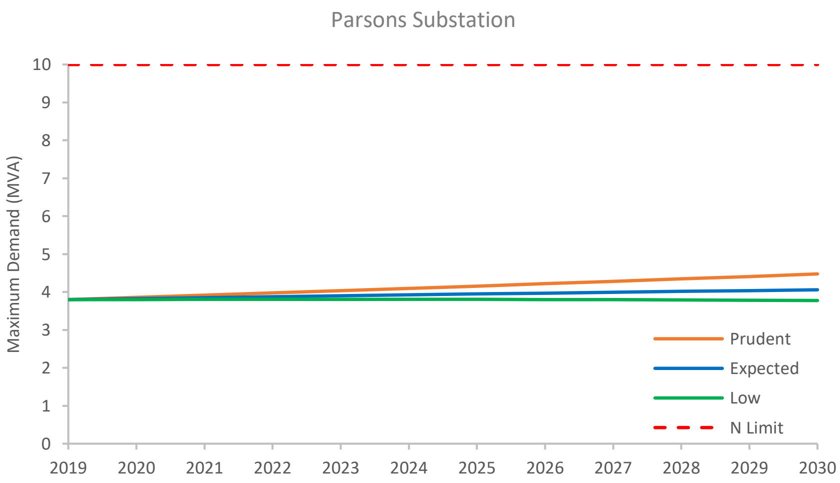

Figure 75 – Parsons Zone Substation demand forecast

Existing maximum demand varies from 2.7 MVA in Winter to 3.8 MVA in Summer with the difference being predominantly due to irrigation load.

6.2.1.14 Five Forks Zone Substation

Security

Table 47- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security
Subtransmission	N security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Ngapara, Enfield, Maheno

Load details

Table 48- Substation load details

Distribution substations supplied	110
Customer connections supplied	175
Farming	61
Commercial	15
Domestic	99

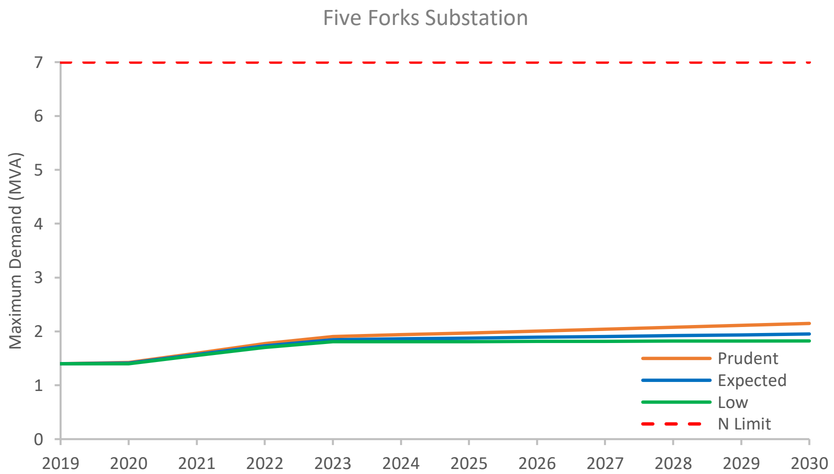

Figure 76- Five Forks Zone Substation demand forecast

Existing maximum demand varies from 0.4 MVA in Winter to 1.4 MVA in Summer with the difference being predominantly due to irrigation load.

6.2.1.15 Chelmer Zone Substation

Security

Table 49- Security rating

Required security of supply level	**B2 urban zone substation**
Substation rating	**28 MVA N-1 Security**
GXP	N-1 security
Subtransmission	N-1 security
33 kV Incomer circuit breaker	N-1 security
33/11 kV transformer	N-1 security
11 kV incomer circuit breaker	N-1 security
11 kV bus	N-1 security
Inter-tied zone substations (11 kV)	Redcastle, Parsons, Maheno

Load details

Table 50 – Substation load details

Distribution substations supplied	133
Customer connections supplied	4,089
Farming	15
Commercial	643
Domestic	3,431

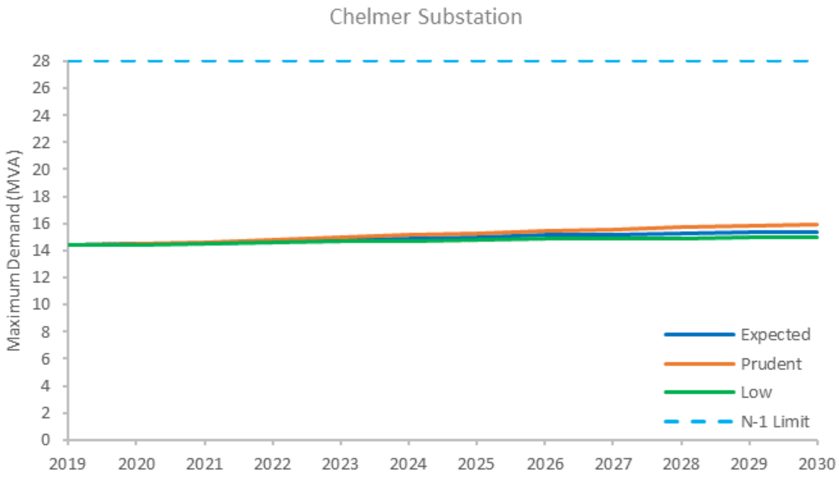

Figure 77 - Chelmer Zone Substation demand forecast

Chelmer Zone substation is a Winter-peaking substation. Existing maximum demand varies from 14.4 MVA in Winter to 9.2 MVA in Summer.

6.2.1.16 Redcastle Zone Substation

Security

Table 51- Security rating

Required security of supply level	**B2 urban zone substation**
Substation rating	**15 MVA N-1 Security**
GXP	N-1 security
Subtransmission	N-1 security
33 kV Incomer circuit breaker	N-1 security
33/11 kV transformer	N-1 security
11 kV incomer circuit breaker	N-1 security
11 kV bus	N-1 security
Inter-tied zone substations (11 kV)	Pukeuri, Parsons, Chelmer

Load details

Table 52- Substation load details

Distribution substations supplied	79
Customer connections supplied	1,522
Farming	8
Commercial	109
Domestic	1,405

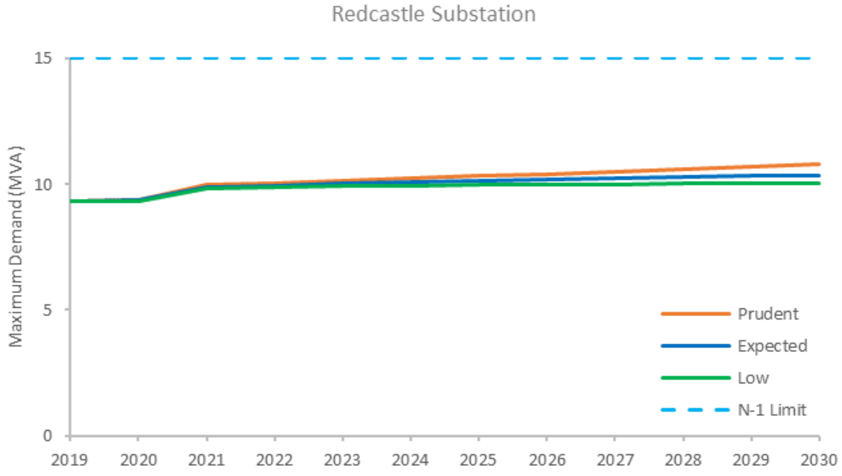

Figure 78 - Redcastle Zone Substation demand forecast

Redcastle Zone substation is a winter-peaking substation. Existing maximum demand varies from 9.3 MVA in Winter to 7 MVA in Summer.

6.2.1.17 Maheno Zone Substation

Security

Table 53- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**5 MVA N Security**
GXP	N-1 security
Subtransmission	N security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Five Forks, Parsons, Chelmer, Enfield, Hampden

Load details

Table 54- Substation load details

Distribution substations supplied	194
Customer connections supplied	366
Farming	81
Commercial	52
Domestic	233

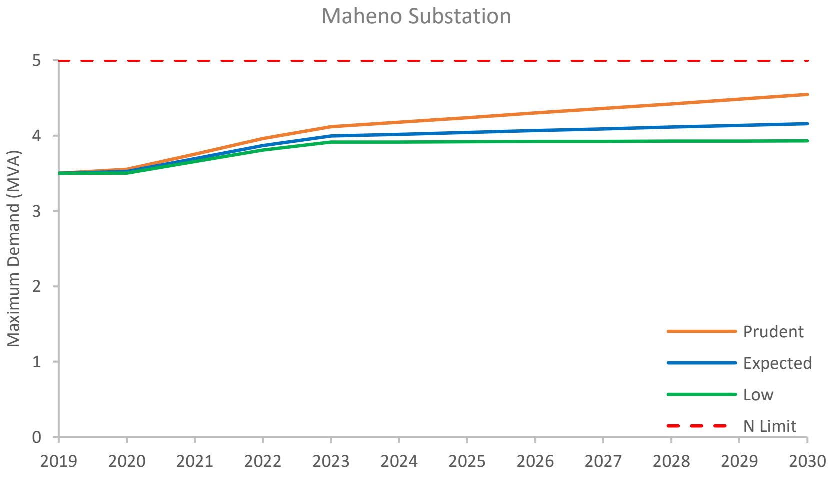

Figure 79 – Maheno Zone Substation demand forecast

Existing maximum demand varies from 1.4 MVA in Winter to 3.5 MVA in Summer with the difference being predominantly due to irrigation load.

6.2.1.18 Hampden Zone Substation

Security

Table 55- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security
Subtransmission	N security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Maheno

Load details

Table 56- Substation load details

Distribution substations supplied	228
Customer connections supplied	795
Farming	66
Commercial	75
Domestic	654

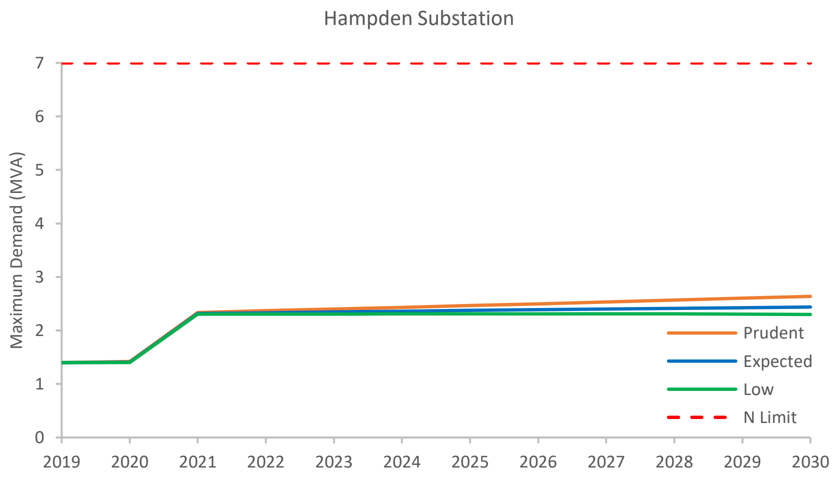

Figure 80 – Hampden Zone Substation demand forecast

Existing maximum demand is flat at 1.4 MVA throughout the year.

At present, an outage on the Weston-Maheno 33 kV line takes both Maheno and Hampden substations out of service. The load at Hampden cannot all be supplied via the 11 kV network from Parsons or Five Forks zone substations due to excessive voltage drop.

A 17 km, 66 kV/11 line (operated at 33 kV) will provide backup to Maheno substation and allow Hampden to be supplied at 11 kV from Maheno in the event of a subtransmission fault between Maheno and Hampden. This will also increase security to Maheno and Five Forks substations.

Table 57 - Project cost estimate - Five Forks Maheno subtransmission upgrade

Project Name	Components	Year (s)	Budget cost (000)
66/11 kV line Five Forks to Maheno	New 66 kV subtransmission line Stage 1	2020/21	$1,829
	New 66 kV subtransmission line Stage 2	2021/22	$1,722
	Retighten line	2022/23	$54

6.2.1.19 HV and LV distribution

Security

Detailed analysis of 11 kV inter-tie capacity and security for zone substations will be completed during the 2020/21 period. The outcome of this work may be the strengthening and upgrading of various 11 kV feeders across the network to adequately support load transfer between substations. Business cases will be completed for any proposed upgrades.

During the 2020/21 year it is expected that growth-related security and capacity issues may arise on the 11 kV and LV networks. The following budget has been provisionally allocated to remedy any issues arising, subject to an approved business case.

Project Name	**Components**	**Year (s)**	**Budget cost (000)**
Provisional budget	HV/LV capacity/security upgrades (across all GXP supply areas)	2020/21	$269

LV Monitoring

Our low voltage network development has historically been based around customer load growth and an expectation that domestic customer loads would not change from the time of design.

Typically, the only performance data collected for our low voltage networks has been from transformer Maximum Demand Indicators (MDIs) which are recorded yearly. MDIs record the maximum current experienced on a transformer during the year but can present false high readings if a transformer is called to provide back up to its neighbour and the MDIs are not reset. MDIs also do not provide any information about the time and duration of load. Relying on this data for asset upgrade can result in unnecessary capital expenditure.

Emerging technologies such as electric vehicles, distributed generation, and battery storage all have the potential to significantly change the load profile on our low voltage systems. The amount of change is highly uncertain. To prudently determine the impact on our low voltage networks we need to start collecting data and monitoring the performance of our assets. This will allow us to develop a base-line of our existing load profiles and to optimise the timing and the quantity of any investment required.

There are also emerging safety benefits from LV Monitoring devices such as:

- Broken neutral detection
- HV wire down detection
- Confirmation that an area is deenergised before commencing work
- Detection of unauthorised generation
- Detection of unintended parallel LV feeds into an area

We are members of the ENA Smart Technology Working Group and are also collaborating with other EDBs to define use cases, share trial information, and standardise our approach to LV monitoring.

We are presently working with Metering Equipment Providers to gain access to this data with an expectation that limited non-real time data may be available from late 2020.

We have completed a successful trial of distribution transformer monitoring (DTM) units on ten of our larger urban transformers.

We aim to firstly gain visibility of our LV networks at our distribution transformers, starting with transformers with the highest number of connected customers.

Our provisional roadmap is:

Table 58 - Provisional LV monitoring roadmap

Project Stage	**Components**	**Year (s)**	**Budget cost (000)**
Investigate	Produce use cases	Q1 2020/21	-
	Prepare business case for LV monitoring	Q1 2020/21	-
	Trial vendor technology	Q1 2020/21	
	Negotiate access to MEP data	Q3 2020/21	-
	Vendor selection	Q3 2020/21	-
Rollout	Phase 1 install (provisional)	Q4 2020/21	$107
	Phase 2 install	2021/22	TBC
	Phase 3 install	2022/23	TBC
	Phase 4 install	2023/24	TBC

6.3 DEVELOPMENT PROGRAM – WAITAKI GXP REGION

6.3.1 Transmission and GXP

6.3.1.1 Waitaki GXP

Figure 81 - Waitaki GXP supply area

6.3.1.2 Waitaki GXP capacity

The Waitaki GXP is rated at *24 MVA N security* and *5.5 MVA N-1 Switched.*

NWL own the 20/24 MVA 11/33 kV GXP transformer which is supplied from the Waitaki Power Station 11 kV generator bus.

6.3.1.3 Waitaki GXP demand forecast

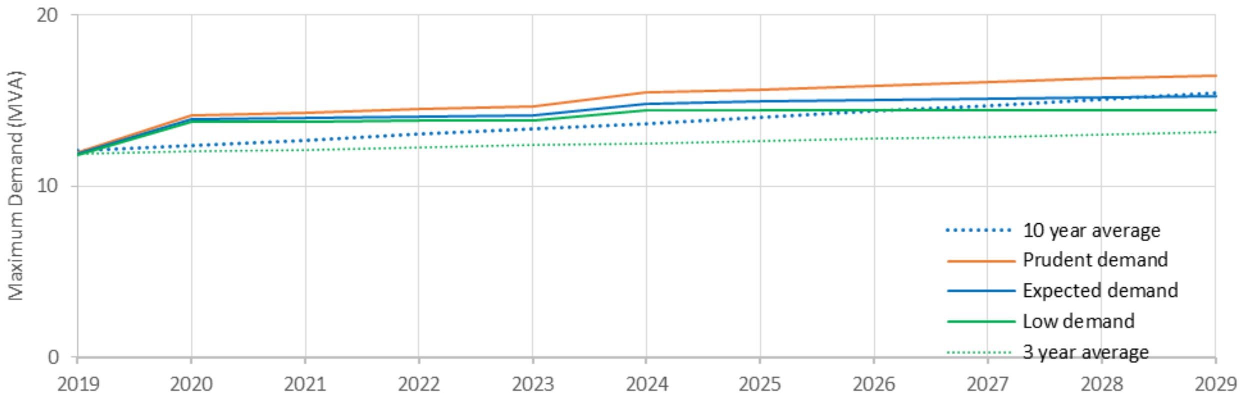

Figure 82 - Waitaki GXP demand forecast graph

WTK GXP (N Security)	N-1 Switched Security Limit (MVA)	2019 / 2020	2020 / 2021	2021 / 2022	2022 / 2023	2023 / 2024	2024 / 2025	2025 / 2026	2026 / 2027	2027 / 2028	2028 / 2029	2029 / 2030	Average Annual Growth Rate
WTK Low demand	5.5	11.8	13.8	13.8	13.8	13.8	14.4	14.4	14.5	14.5	14.5	14.5	1.9%
WTK Expected demand	5.5	11.9	13.9	14.0	14.1	14.2	14.9	14.9	15.0	15.1	15.2	15.3	2.4%
WTK Prudent demand	5.5	12.0	14.1	14.3	14.5	14.7	15.5	15.7	15.9	16.1	16.3	16.5	3.1%
WTK 3 year average	5.5	11.9	12.0	12.2	12.3	12.4	12.5	12.7	12.8	12.9	13.0	13.2	1.0%
WTK 10 year average	5.5	12.1	12.4	12.7	13.0	13.4	13.7	14.0	14.4	14.7	15.1	15.5	2.5%

Figure 83 - Waitaki GXP demand forecast

6.3.1.4 Waitaki GXP constraints

A security constraint is forecast for 2024/25 when the prudent forecast demand is expected to exceed 15 MVA. Waitaki GXP has sufficient capacity to meet our load within the planning period.

Once the security constraint is relieved, no further constraints are forecast at this GXP during the planning period.

6.3.1.5 Waitaki GXP security upgrade

Installation of a second transformer to increase the security of the GXP to *24 MVA N-1 Security.*

This work is required once load reaches our *N-1* security trigger of 15 MVA. Our forecast for this trigger is for Summer 2024.

We will proceed with the design stages of this project as this transformer will be required in 2021/22 if our current development plan is retained. We will defer this investment if the outcome of negotiations with Transpower render this option unnecessary.

Project Name	Components	Year (s)	Cost (000)
Waitaki GXP upgrade	Final design/easements	2020/21	$54
	Purchase transformer, install and commission	2021/22	$1,722

6.3.2 Subtransmission and substations

6.3.2.1 Otematata Zone Substation

Security

Table 59- Security rating

Required security of supply level	**B5 rural zone substation**
Substation rating	**3 MVA N Security**
GXP	N-1 switched security
Subtransmission	N-1 switched security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	None

Existing maximum demand is 0.5 MVA (98.5% percentile) for the majority of the year rising to 0.8 MVA for the two weeks after Christmas.

NWL is contracted to provide a 1 MVA, N Security, 11 kV backup supply to Benmore Power Station.

NWL has a 0.5 MW backup diesel genset installed at this site to provide security of supply to all load for most of the year and to restore power to 50% of ICPs within switching time during the Christmas period. A truck mounted 0.5 MW genset is available to supplement the existing genset to resupply all customers in the event of an outage during the Christmas period.

Load details

Table 60- Substation load details

Distribution substations supplied	35
Customer connections supplied	519
Farming	10
Commercial	45
Domestic	464

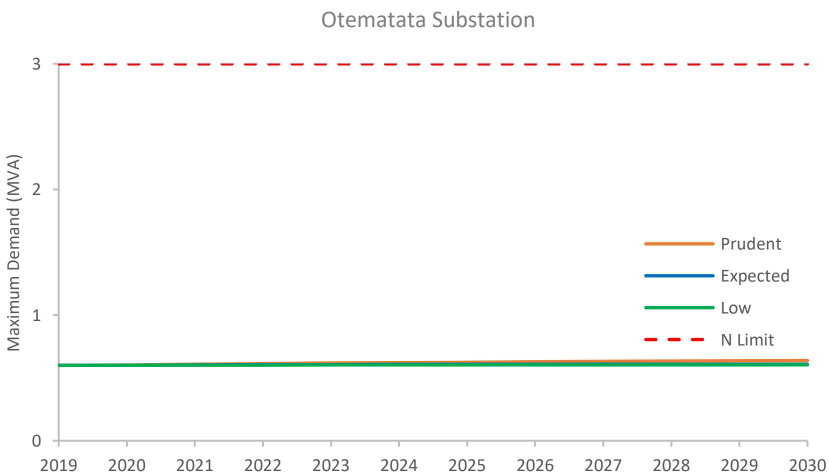

Figure 84 - Otematata substation demand forecast

6.3.2.2 Kurow Zone Substation

Security

Table 61- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**12 MVA N-1 Security**
GXP	N-1 switched security (up to 5 MVA)
Subtransmission	N-1 switched security[1]
33 kV Incomer circuit breaker	N-1 security
33/11 kV transformer	N-1 security
11 kV incomer circuit breaker	N-1 security
11 kV bus	N-1 security
Inter-tied zone substations (11 kV)	Duntroon

[1]At times of peak load, supply at 33 kV can only be provided from Waitaki GXP.

Load details

Table 62- Substation load details

Distribution substations supplied	321
Customer connections supplied	763
Farming	152
Commercial	118
Domestic	493

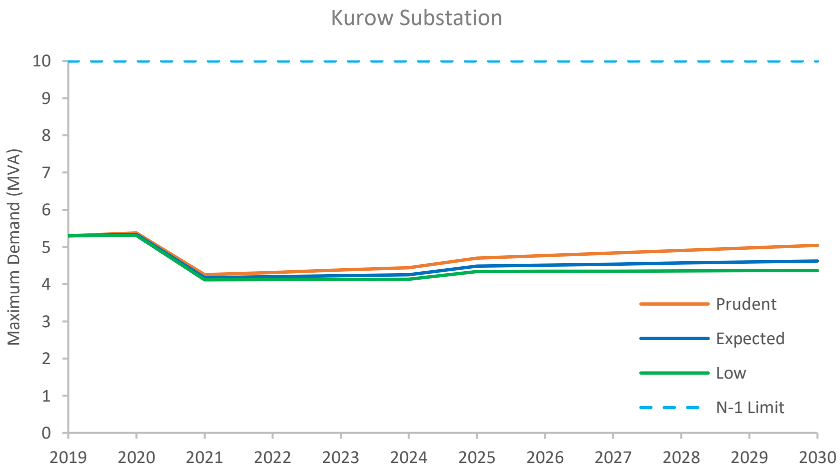

Figure 85 - Kurow substation demand forecast

Existing maximum demand varies from 1 MVA in Winter to 5.5 MVA in Summer which is predominantly due to irrigation load.

No security or capacity related upgrades are proposed at Kurow in the planning period.

6.3.2.3 Eastern Rd Zone Substation

Eastern Rd Zone substation is under construction and scheduled to be commissioned in the 2020/21 financial year. 1.5 MVA of load will be transferred from Kurow Zone Substation and 0.5 MVA from Duntroon. Eastern Rd will also pick up 2.1 MVA of load from an irrigation scheme which is currently being constructed.

Security

Table 63- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security[1]
Subtransmission	N-1 switched security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Kurow, Duntroon

[1]At times of peak load, supply at 33 kV can only be provided from Waitaki GXP

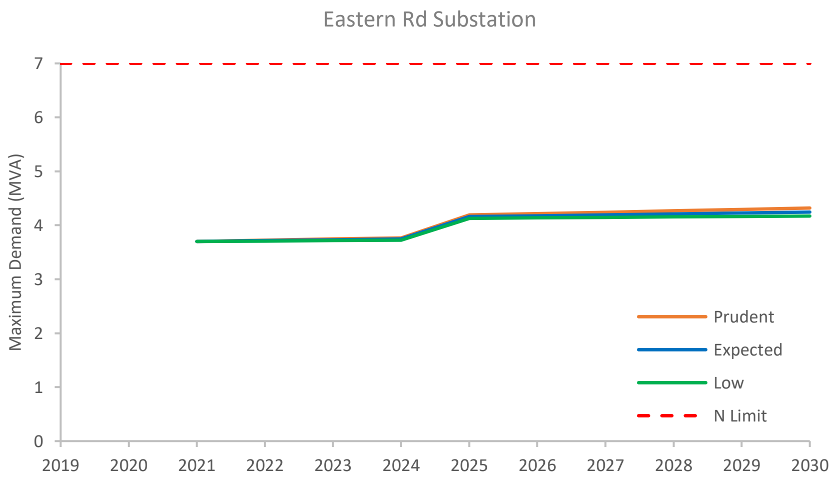

Figure 86 - Eastern Rd substation demand forecast

6.3.2.4 Duntroon Zone Substation

Security

Table 64- Security rating

Required security of supply level	**B4 rural zone substation**
Substation rating	**7 MVA N Security**
GXP	N-1 security
Subtransmission	N-1 switched security[1]
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Kurow, Ngapara

[1]At times of peak load, supply at 33 kV can only be provided from Waitaki GXP.

Loading

Table 65- Substation load details

Distribution substations supplied	194
Customer connections supplied	351
Farming	117
Commercial	33
Domestic	201

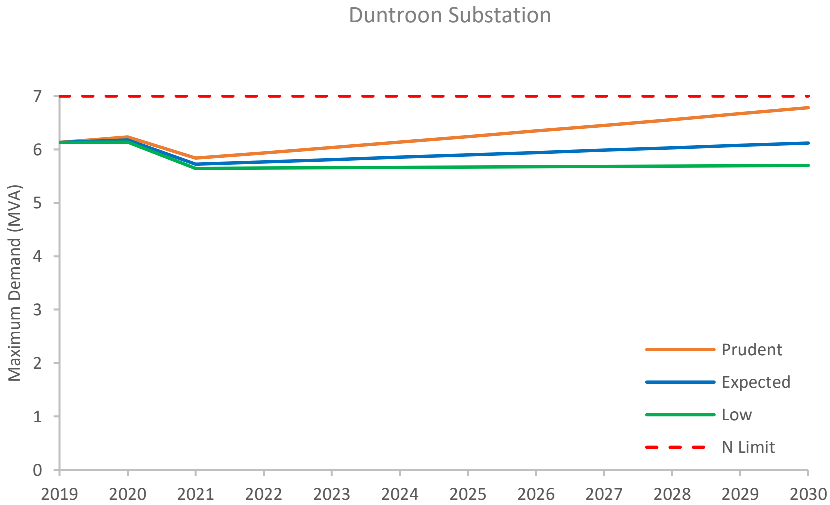

Figure 87 - Duntroon substation demand forecast

Existing maximum demand varies from 0.7 MVA in Winter to 6.1 MVA in Summer which is predominantly due to irrigation load.

6.3.3 HV and LV distribution

This has been included under a provisional budget under the Oamaru GXP. Refer to section **6.2.1.19** for details on HV and LV distribution.

6.4 DEVELOPMENT PROGRAM – TWIZEL GXP REGION

6.4.1 Transmission and GXP

6.4.1.1 Twizel GXP capacity

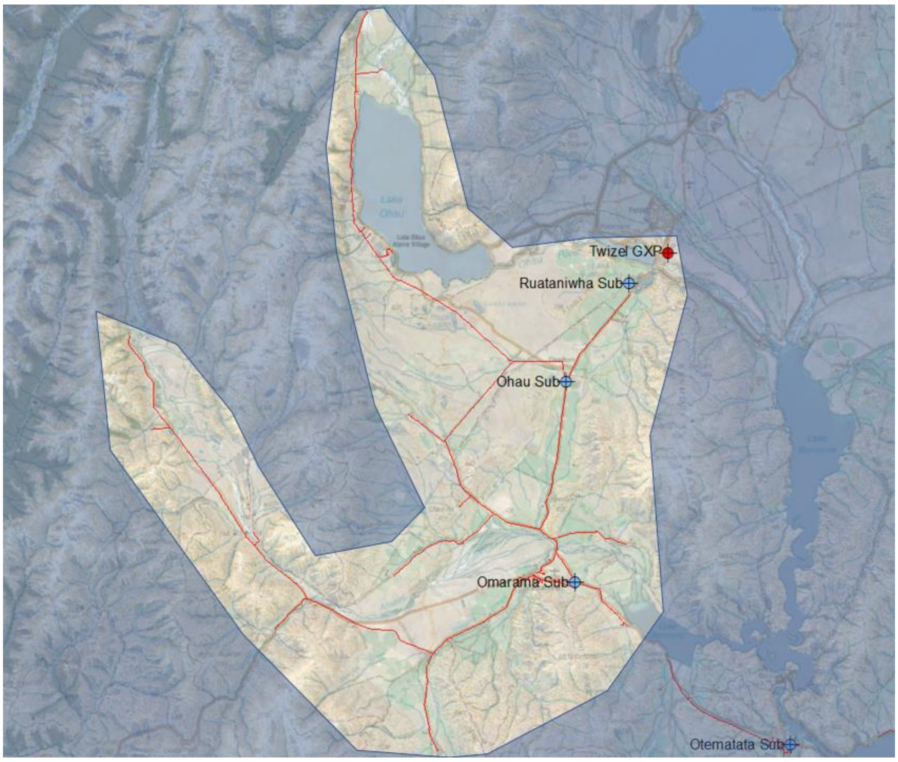

Figure 88 - Twizel GXP supply area

The Twizel GXP supplies NWL and Alpine Energy networks. The GXP has dual transformers and is operated with a split 33 kV bus with one side feeding each network, providing *27 MVA, N-1 Switched* security level to NWL.

6.4.1.2 Twizel GXP demand forecast

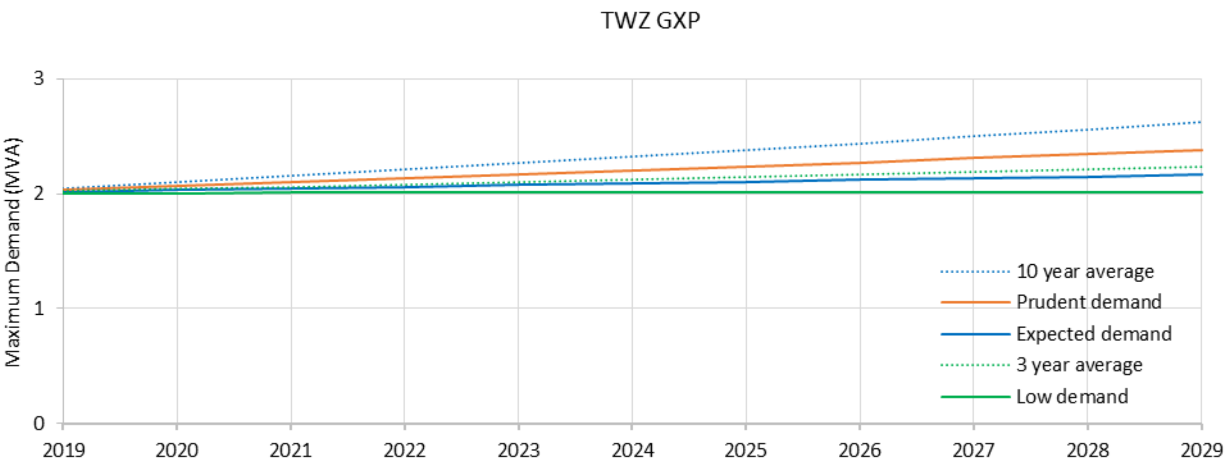

Figure 89 - Twizel GXP demand forecast

Table 66 - Twizel projected load growth

TWZ GXP	N-1 Switched Security Limit (MVA)	2019 / 2020	2020 / 2021	2021 / 2022	2022 / 2023	2023 / 2024	2024 / 2025	2025 / 2026	2026 / 2027	2027 / 2028	2028 / 2029	2029 / 2030	Average Annual Growth Rate
TWZ Low demand	27	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.1%
TWZ Expected demand	27	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	0.7%
TWZ Prudent demand	27	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.4	1.6%
TWZ 3 year average	27	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	1.0%
TWZ 10 year average	27	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.5%

6.4.1.3 Twizel GXP constraints

The Twizel GXP has sufficient capacity to meet our load within the planning period.

There are no constraints forecast at the Twizel GXP during the planning period.

6.4.2 Subtransmission and substations

6.4.2.1 Ruataniwha Substation

Security

Table 67- Security rating

Required security of supply level	**Customer substation**
Substation rating	**2 MVA N Security**
GXP	N-1 switched security
Subtransmission	N-1 switched security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	None

Ruataniwha 33/11 kV substation is a single customer substation. NWL does not have the ability to back up this substation at 11 kV.

Loading

Table 68- Substation load details

Distribution substations supplied	12
Customer connections supplied	18
Farming	10
Commercial	2
Domestic	6

Existing maximum demand varies from 0.1 MVA in Winter to 0.8 MVA in Summer which is predominantly due to irrigation load.

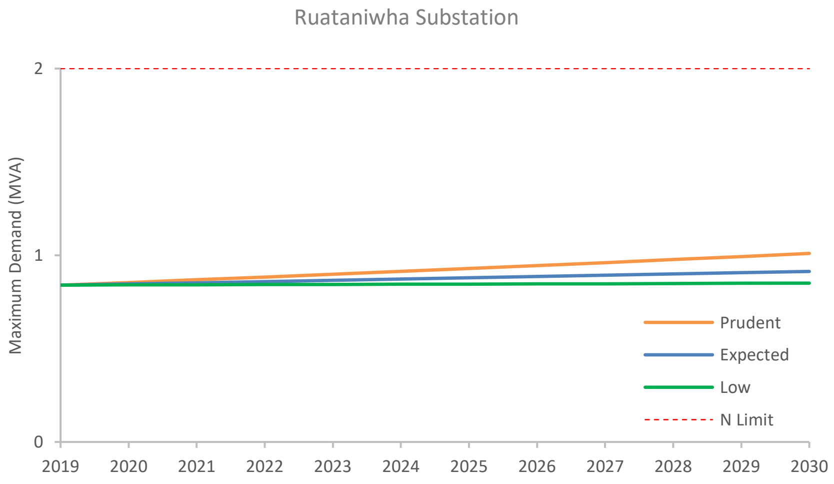

Figure 91 – Ruataniwha Substation demand forecast

6.4.2.2 Ohau Zone Substation

Security

Table 69- Security rating

Required security of supply level	**B5 rural zone substation**
Substation rating	**3 MVA N Security**
GXP	N-1 switched security
Subtransmission	N-1 switched security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Omarama

Loading

Table 70- Substation load details

Distribution substations supplied	59
Customer connections supplied	157
Farming	29
Commercial	23
Domestic	105

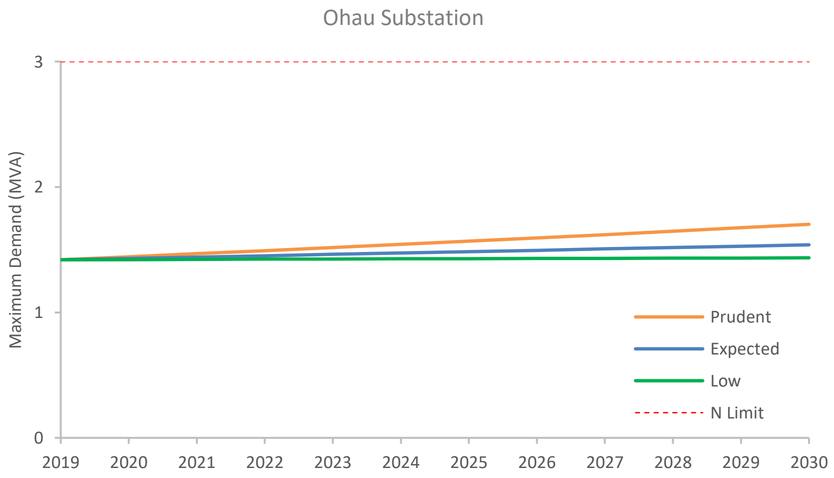

Figure 92 - Ohau Substation demand forecast

Ohau also supplies the Ohau lodge and Ohau Snowfields. Maximum demand peaks in Winter at about 1.1 MVA when snowmaking is occurring at the snowfield and peaks in Summer at 1.3 MVA in the Summer period.

6.4.2.3 Omarama Zone Substation

Security

Table 71- Security details

Required security of supply level	**B5 rural zone substation**
Substation rating	**3 MVA N Security**
GXP	N-1 switched security
Subtransmission	N-1 switched security
33 kV Incomer circuit breaker	N security
33/11 kV transformer	N-1 switched security
11 kV incomer circuit breaker	N security
11 kV bus	N security
Inter-tied zone substations (11 kV)	Omarama

Loading

Table 72- Substation load details

Distribution substations supplied	113
Customer connections supplied	465
Farming	46
Commercial	71
Domestic	348

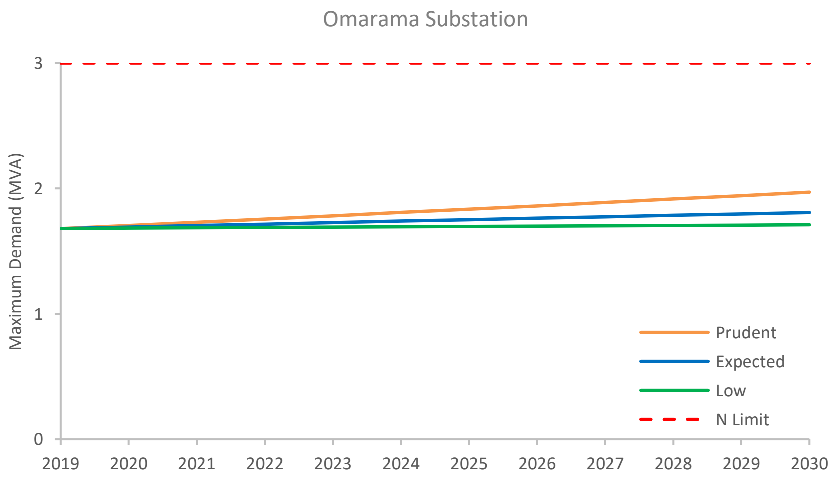

Figure 93 – Omarama Substation demand forecast

Existing maximum demand varies from 0.9 MVA in Winter to 1.7 MVA in Summer which is due to effects of irrigation load.

No security or capacity related upgrades are proposed at Omarama in the planning period.

6.4.3 HV and LV distribution

This has been addressed under a provisional budget under the Oamaru GXP. Refer to section **6.2.1.19** for details on HV and LV distribution.

6.5 DEVELOPMENT PROGRAM – BLACK POINT GXP

6.5.1 Transmission and GXP

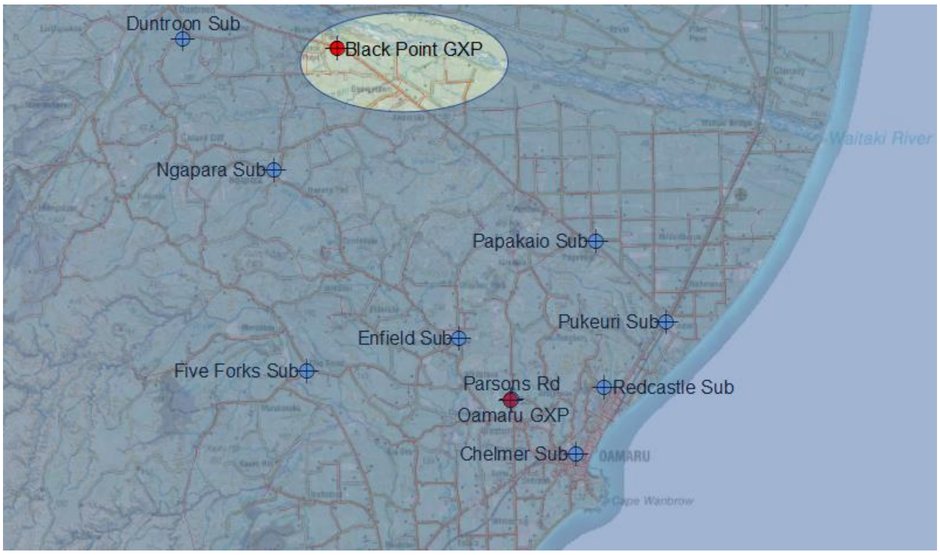

Figure 94 - Black Point GXP location

6.5.1.1 Black Point GXP capacity

This GXP is dedicated to the NOIC Irrigation Scheme, which was commissioned in 2006 and is rated as *25 MVA, N security*.

6.5.1.2 Black Point GXP constraints

NOIC recently completed an expansion to raise their maximum demand from 10.7 MVA to approximately 16 MVA.

Constraints on the Transpower 110 kV supply required the installation of a special protection (load control) scheme between Waitaki GXP, Oamaru GXP, Black Point GXP, Bells Pond and Studholme to allow NOIC to increase their load beyond 10.7 MVA. In the event of a contingent event (fault on the Waitaki-Bells Pond-Oamaru 110 kV line) during a constraint period the special protection scheme may operate to reduce the NOIC pumping load below the constraint.

6.5.1.3 Black Point GXP demand forecast

NOIC advise that they are in the process of selling the remaining shares on the scheme and as a result expect that maximum demand at Black Point GXP will reach 20 MVA by 2021.

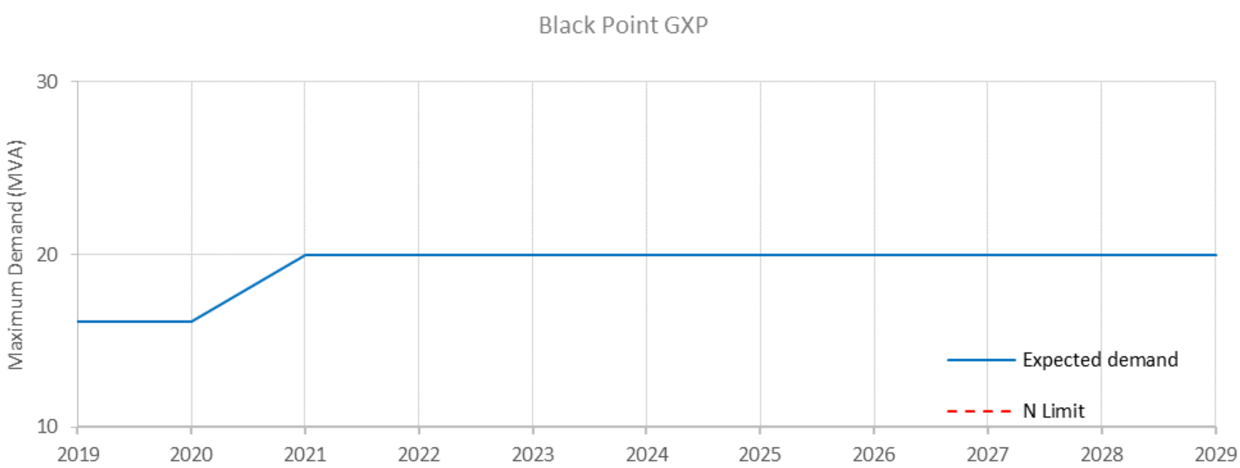

Figure 95 - Black Point GXP demand forecast

6.6 NETWORK DEVELOPMENT EXPENDITURE FORECAST

Table 73 - Summary of system growth projects

System Growth	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
GXP Development										
WTK GXP - Stage 2	$53,818	$1,722,166								
Special protection scheme	$53,818	$376,724								
Subtransmission and Substation Development										
New 7MVA Sub Otekaieke	$107,635									
66/11 kV Line from Five Forks to Maheno	$1,829,802	$1,722,166								
66/11 kV Line from Papakaio to Awamoko		$107,635	$1,291,625	$1,291,625						
New 7MVA Substation at Awamoko		$209,889		$1,937,437						
66/11 kV Line from Duntroon to Awamoko					$1,614,531	$1,614,531				
Reinsulate Ngapara -Duntroon to 66 kV										
66/11 kV Line from Waitaki GXP to Kurow										
Kurow to Ngapara 66 kV conversion Stage 1										
Kurow to Ngapara 66 kV conversion Stage 2										
Post construction - retightens			$53,818		$43,054		$53,818			
Five Forks - Maheno			$53,818							
Waitaki - Kurow										
Duntroon - Ngapara										
Duntroon - Awamoko							$53,818			
Papakaio - Awamoko					$43,054					
Distribution Development										
HV/LV reinforcement (subject to individual business cases)	$269,088	$269,088	$269,088	$269,088	$269,088	$269,088	$269,088	$269,088	$269,088	$269,088
Total - System Growth	**$2,314,161**	**$4,407,669**	**$1,614,531**	**$3,498,150**	**$1,926,673**	**$1,883,619**	**$322,906**	**$269,088**	**$269,088**	**$269,088**

POWERING NORTH OTAGO

07

NON-NETWORK INVESTMENT PLAN

This section details our non-network investment program.

7. Non-network investment plan

7.1 TEN YEAR FORECAST

Component	2020/ 2021 ($000)	2021/ 2022 ($000)	2022/ 2023 ($000)	2023/ 2024 ($000)	2024/ 2025 ($000)	2025/ 2026 ($000)	2026/ 2027 ($000)	2027/ 2028 ($000)	2028/ 2029 ($000)	2029/ 2030 ($000)
Buildings	$3,540	$3,743	$146	$149	$152	$155	$157	$161	$164	$167
Vehicles	$720	$734	$749	$764	$779	$795	$811	$827	$844	$860
Plant	$127	$454	$151	$184	$180	$181	$181	$181	$181	$181
Information Technology	$782	$497	$667	$609	$628	$622	$624	$623	$623	$623
EV Charger	$86	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	**$5,255**	**$5,428**	**$1,713**	**$1,706**	**$1,739**	**$1,753**	**$1,773**	**$1,792**	**$1,812**	**$1,831**

7.2 COMMENTARY

The buildings component of our non-network expenditure forecast includes the redevelopment of the Chelmer Street site between 2020 and 2022. This project will increase the resilience of our operations and involves redevelopment of our yard and construction of a new earthquake rated (IL4) operations building and control room. Also included is development at our Airedale Road site which is used for storage of poles and large plant and materials.

The vehicles component includes end of life replacement of fleet vehicles and additional vehicles required to cater for business growth.

The plant component includes end of life replacement of plant and additional plant and test equipment required to cater for business growth.

Information Technology includes routine replacement of server hardware, computers, and mobile devices. This also includes a website refresh in 2020/21 and the following projects under an Enterprise Application Project:

- Implement new CRM system
- Data integration project
- Field mobility project
- Enterprise Asset Management system enhancements

A fifth electric vehicle fast charger will be installed in our network in the 2020/21 period to continue our strategy to research and support electric vehicle uptake. We will produce a roadmap over the coming year to refine our EV charging strategy.

POWERING NORTH OTAGO

08

EXPENDITURE FORECAST SUMMARY

8. Summary of expenditure forecasts

The summary of our forecast expenditure for the planning period is shown in Table 74 and Figure 96, Figure 103 and Figure 104 presented on the next pages.

These forecasts are considered to be reasonably accurate for the first five years of the planning period, with the figures being indicative beyond that point. Many of our investment, maintenance and renewal decisions will be very dependent the outcomes of inspections in the first five years, customer growth, and other issues that are currently out of our control, such as the development of the Transpower transmission network.

Table 74 - Summary of expenditure forecasts

	Forecast Expenditure ($)									
Network Capital Expenditure	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**
Consumer connection	1,084,189	1,060,096	1,036,003	1,011,909	987,816	963,723	939,630	915,537	891,444	867,351
System growth	2,314,161	4,407,669	1,614,531	3,498,150	1,926,673	1,883,619	322,906	269,088	269,088	269,088
Asset replacement and renewal	2,879,764	4,901,053	5,126,853	4,150,569	3,970,584	3,676,063	4,254,197	2,994,300	3,327,000	2,950,668
Asset relocations	131,000	0	0	0	0	0	0	0	0	0
Reliability, safety, and environment: Quality of supply	928,280	1,495,741	633,843	633,843	569,602	462,534	141,330	139,188	109,209	109,209
Reliability, safety, and environment: Legislative and regulatory	697,793	632,375	348,896	348,896	43,612	37,070	37,070	37,070	37,070	37,070
Other reliability, safety, and environment	0	0	0	0	0	0	0	0	0	0
Subtotal Capital Expenditure	**8,035,085**	**12,496,934**	**8,760,126**	**9,643,368**	**7,498,288**	**7,023,010**	**5,695,134**	**4,355,185**	**4,633,813**	**4,233,387**
Operational Expenditure										
Service interruptions & emergencies	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000
Vegetation management	629,000	629,000	629,000	629,000	629,000	629,000	629,000	629,000	629,000	629,000
Routine & corrective maintenance & inspection	939,636	926,636	826,636	826,636	826,636	796,636	796,636	796,636	796,636	796,636
Asset replacement & renewal	310,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000
Subtotal Operational Expenditure:	**2,328,636**	**2,285,636**	**2,185,636**	**2,185,636**	**2,185,636**	**2,155,636**	**2,155,636**	**2,155,636**	**2,155,636**	**2,155,636**
Total Expenditure	**10,363,721**	**14,782,570**	**10,945,762**	**11,829,004**	**9,683,924**	**9,178,646**	**7,850,770**	**6,510,821**	**6,789,449**	**6,389,023**

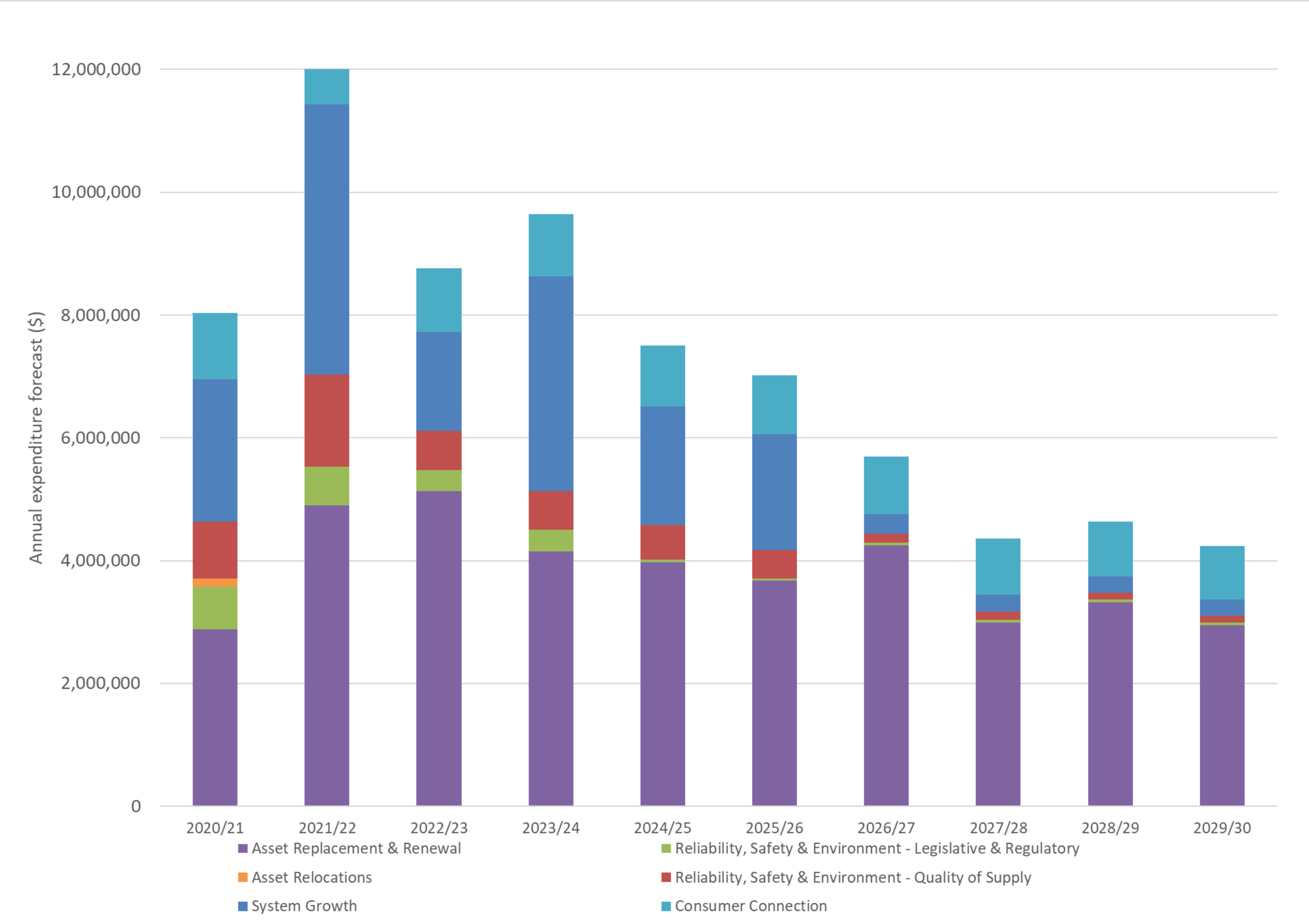

Figure 96 - Annual capital expenditure forecast by category

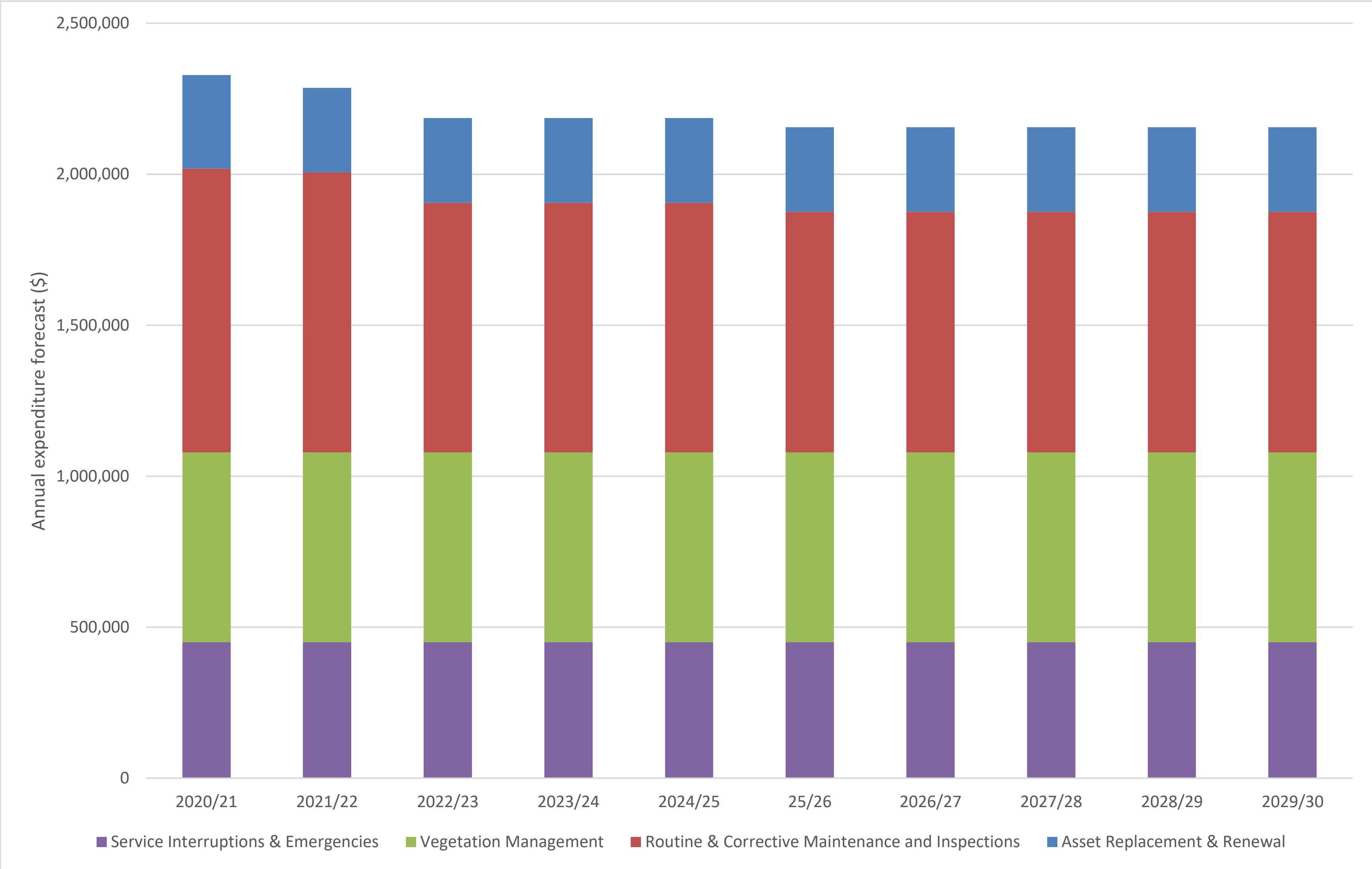

Figure 97 – Annual operational expenditure forecast by category

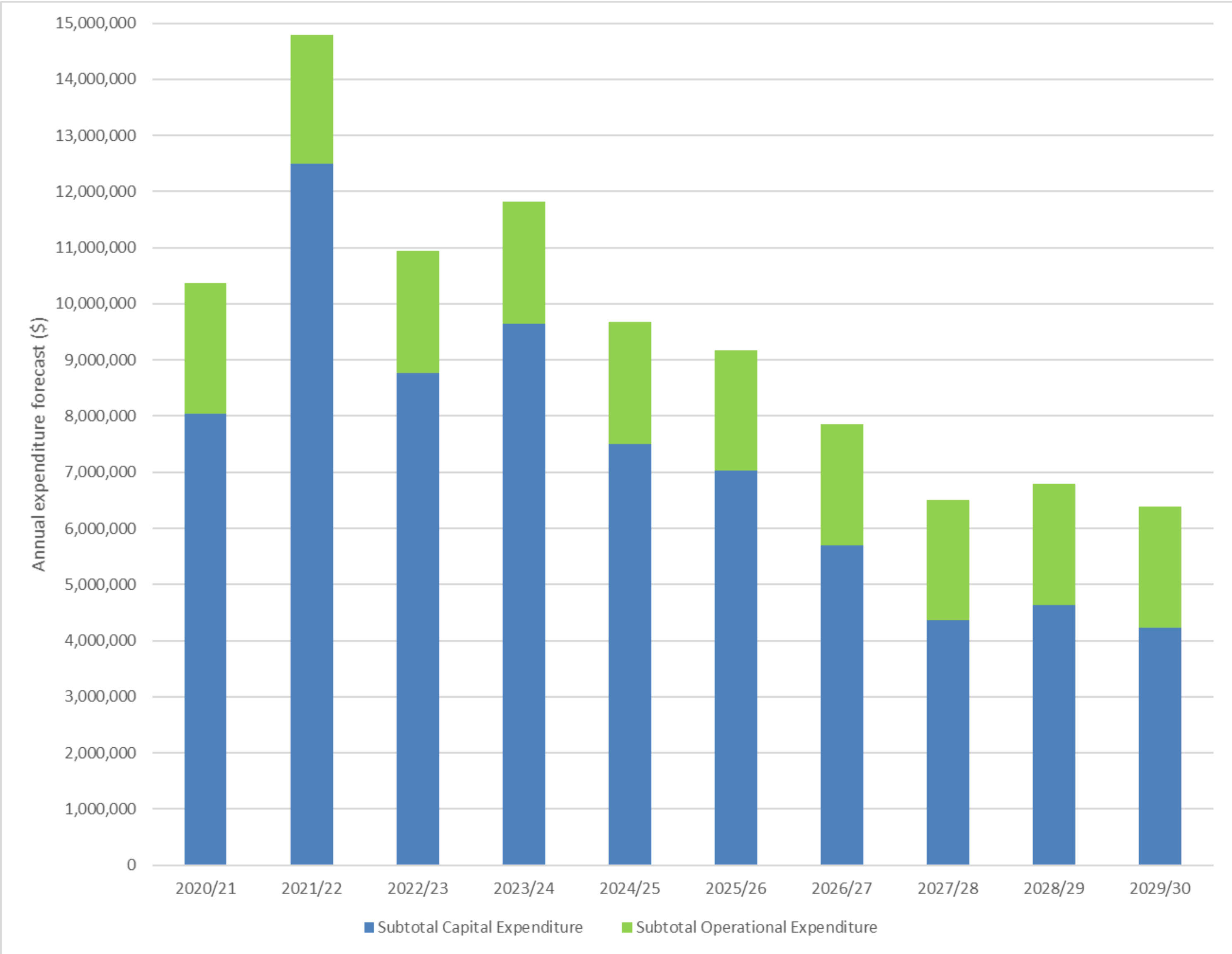

Figure 98- Summary of total network expenditure forecast across planning period

9. Appendices

9.1 APPENDIX A - EDB INFORMATION DISCLOSURE REQUIREMENTS SCHEDULES

COMMERCE COMMISSION
NEW ZEALAND

EDB Information Disclosure Requirements
Information Templates
for
Schedules 11a–13

Company Name	Network Waitaki Ltd
Disclosure Date	31 March 2020
AMP Planning Period Start Date (first day)	1 April 2020

Templates for Schedules 11a–13 (Asset Management Plan)
Template Version 4.1. Prepared 21 December 2017

Table of Contents

Information disclosure asset management plan schedules

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2020 – 31 March 2030**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

This schedule requires a breakdown of forecast expenditure on assets for the current disclosure year and a 10 year planning period. The forecasts should be consistent with the supporting information set out in the AMP. The forecast is to be expressed in both constant price and nominal dollar terms. Also required is a forecast of the value of commissioned assets (i.e., the value of RAB additions)

EDBs must provide explanatory comment on the difference between constant price and nominal dollar forecasts of expenditure on assets in Schedule 14a (Mandatory Explanatory Notes).

This information is not part of audited disclosure information.

sch ref			Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5	CY+6	CY+7	CY+8	CY+9	CY+10
7			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8		for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**
9	**11a(i): Expenditure on Assets Forecast**		**$000 (in nominal dollars)**										
10	Consumer connection		1,300	1,084	1,103	1,122	1,140	1,156	1,175	1,192	1,209	1,225	1,238
11	System growth		900	2,314	4,586	1,747	3,939	2,258	2,297	410	355	369	384
12	Asset replacement and renewal		3,339	2,880	5,099	5,550	4,675	4,653	4,481	5,395	3,951	4,567	4,215
13	Asset relocations		-	131	-	-	-	-	-	-	-	-	-
14	Reliability, safety and environment:												
15	Quality of supply		606	927	1,524	659	672	616	511	159	160	128	130
16	Legislative and regulatory		635	698	646	364	371	48	41	42	43	43	44
17	Other reliability, safety and environment			-	-	-	-	-	-	-	-	-	-
18	**Total reliability, safety and environment**		1,241	1,625	2,170	1,023	1,043	664	552	200	202	171	174
19	**Expenditure on network assets**		6,780	8,034	12,957	9,441	10,797	8,730	8,505	7,197	5,716	6,332	6,012
20	Expenditure on non-network assets		1,220	5,255	5,428	1,713	1,706	1,739	1,753	1,773	1,792	1,812	1,831
21	**Expenditure on assets**		8,000	13,289	18,385	11,154	12,503	10,469	10,258	8,970	7,508	8,144	7,843
22													
23	*plus* Cost of financing		366	607	840	510	571	478	469	410	343	372	358
24	*less* Value of capital contributions		1,234	738	753	768	783	799	815	831	848	865	882
25	*plus* Value of vested assets		700	574	585	597	609	621	634	646	659	673	686
26													
27	**Capital expenditure forecast**		7,832	13,732	19,057	11,493	12,900	10,769	10,546	9,195	7,662	8,324	8,005
28													
29	Assets commissioned		8,000	13,289	18,131	10,787	11,880	9,805	9,456	8,164	6,768	7,216	6,861
30			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
31		for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**
32			**$000 (in constant prices)**										
33	Consumer connection		1,300	1,084	1,081	1,078	1,074	1,068	1,064	1,059	1,052	1,045	1,036
34	System growth		900	2,314	4,496	1,679	3,712	2,086	2,080	364	309	315	321
35	Asset replacement and renewal		3,339	2,880	4,999	5,334	4,405	4,298	4,059	4,791	3,439	3,898	3,527
36	Asset relocations		-	131	-	-	-	-	-	-	-	-	-
37	Reliability, safety and environment:												
38	Quality of supply		606	927	1,524	659	672	616	511	159	160	128	130
39	Legislative and regulatory		635	698	646	364	371	48	41	42	43	43	44
40	Other reliability, safety and environment		-	-	-	-	-	-	-	-	-	-	-
41	**Total reliability, safety and environment**		1,241	1,625	2,170	1,023	1,043	664	552	200	202	171	174
42	**Expenditure on network assets**		6,780	8,034	12,746	9,114	10,234	8,116	7,755	6,413	5,003	5,429	5,059
43	Expenditure on non-network assets		1,220	5,255	5,537	1,782	1,810	1,882	1,935	1,997	2,058	2,123	2,188
44	**Expenditure on assets**		8,000	13,289	18,282	10,896	12,045	9,998	9,691	8,410	7,061	7,553	7,247
45													
46	**Subcomponents of expenditure on assets (where known)**												
47	Energy efficiency and demand side management, reduction of energy losses		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
48	Overhead to underground conversion		N/A	55	56	57	58	N/A	N/A	N/A	N/A	N/A	N/A
49	Research and development		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5	CY+6	CY+7	CY+8	CY+9	CY+10
for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25	31 Mar 26	31 Mar 27	31 Mar 28	31 Mar 29	31 Mar 30
Difference between nominal and constant price forecasts	**$000**										
Consumer connection	-	-	22	44	66	88	111	134	156	179	202
System growth	-	-	90	68	227	172	216	46	46	54	63
Asset replacement and renewal	-	-	100	215	270	354	422	604	511	669	688
Asset relocations	-	-	-	-	-	-	-	-	-	-	-
Reliability, safety and environment:											
Quality of supply	-	-	-	-	-	-	-	-	-	-	-
Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
Other reliability, safety and environment	-	-	-	-	-	-	-	-	-	-	-
Total reliability, safety and environment	-	-	-	-	-	-	-	-	-	-	-
Expenditure on network assets	-	-	212	327	563	614	750	784	714	903	953
Expenditure on non-network assets	-	-	(109)	(69)	(104)	(143)	(182)	(224)	(266)	(311)	(357)
Expenditure on assets	-	-	103	258	458	471	567	560	447	592	596

11a(ii): Consumer Connection

	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25
*Consumer types defined by EDB**	**$000 (in constant prices)**					
Small: residential and commercial to 15kVA	455	379	378	377	376	374
Medium: residential and commercial 16kVA to 50kVA	312	260	259	259	258	256
Large: commercial and industrial 51kVA and above	533	444	443	442	440	438
[EDB consumer type]						
[EDB consumer type]						
**include additional rows if needed*						
Consumer connection expenditure	1,300	1,084	1,081	1,078	1,074	1,068
less Capital contributions funding consumer connection	1,234	738	753	768	783	799
Consumer connection less capital contributions	66	346	328	310	291	269

11a(iii): System Growth

	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
Subtransmission	-	1,830	1,867	1,399	1,371	1,795
Zone substations	650	215	2,355	-	2,056	-
Distribution and LV lines	170	269	274	280	285	291
Distribution and LV cables	-					
Distribution substations and transformers	80					
Distribution switchgear	-					
Other network assets	-					
System growth expenditure	900	2,314	4,496	1,679	3,712	2,086
less Capital contributions funding system growth						
System growth less capital contributions	900	2,314	4,496	1,679	3,712	2,086

			Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
92		for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25
93		**11a(iv): Asset Replacement and Renewal**	**$000 (in constant prices)**					
94		Subtransmission	350	109	111	964	463	118
95		Zone substations	581	153	434	948	429	1,186
96		Distribution and LV lines	1,820	1,729	1,934	2,270	2,316	2,362
97		Distribution and LV cables		55	56	57	58	60
98		Distribution substations and transformers	195	218	222	227	231	236
99		Distribution switchgear	393	616	963	868	885	313
100		Other network assets		-	1,279	-	23	24
101		**Asset replacement and renewal expenditure**	3,339	2,880	4,999	5,334	4,405	4,298
102	*less*	Capital contributions funding asset replacement and renewal						
103		**Asset replacement and renewal less capital contributions**	3,339	2,880	4,999	5,334	4,405	4,298

			Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
106		for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25
107		**11a(v): Asset Relocations**						
108		*Project or programme**	**$000 (in constant prices)**					
109		Duntroon 11kV feeder relocate to road reserve		131				
110		[Description of material project or programme]						
111		[Description of material project or programme]						
112		[Description of material project or programme]						
113		[Description of material project or programme]						
114		**include additional rows if needed*						
115		All other project or programmes - asset relocations						
116		**Asset relocations expenditure**	-	131	-	-	-	-
117	*less*	Capital contributions funding asset relocations						
118		**Asset relocations less capital contributions**	-	131	-	-	-	-

			Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
121		for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25
122		**11a(vi): Quality of Supply**						
123		*Project or programme**	**$000 (in constant prices)**					
124		Spares for ripple control equipment - containerised system		385	-	-	-	-
125		Arc Flash Protection zone sub 11kv Switchboards		64	65	67	68	-
126		Purchase spare power transformer 10/15 MVA		-	710	-	-	-
		Line diff protection Weston to Chelmer 33kV		53	-	-	-	-
		Distribution reclosers and sectionalisers		75	77	78	80	81
		Distribution spur ABS's and fusing		34	35	35	36	37
		LV Monitoring system		107	437	445	454	463
127		Engineering data access to zone substations		32	-	-	-	-
		Radio link upgrade		-	163	-	-	-
		Fibre optic links to zone substations		16	38	33	34	35
		Replace older protection relays	45					
		Rural switchgear/protection	40					
		New Reclosers/Sectionalisers/TSW	45					
		UG ducting	4					
		Post construction retightens retighten	220					
		Pukeuri substation dual transformer upgrade	21					
		Replace rural 2 pole structures	25					
		Install new ABS's	71					
		Communications improvements	5					
		EDE ABS replacement	130					
128		Backup Control room		161	-	-	-	-
129		**include additional rows if needed*						
130		All other projects or programmes - quality of supply						
131		**Quality of supply expenditure**	606	927	1,524	659	672	616
132	*less*	Capital contributions funding quality of supply						
133		**Quality of supply less capital contributions**	606	927	1,524	659	672	616

11a(vii): Legislative and Regulatory

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
	for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25
*Project or programme**		$000 (in constant prices)					
Seismic resilience improvement at zone substations		250	327	334	-	-	-
Distribution box replacements		350	283	222	273	278	12
Remove LV road crossings on high load transport corridors		35	55	56	57	58	-
Upgrade/renew distribution earths			33	34	34	35	36
[Description of material project or programme]							
**include additional rows if needed*							
All other projects or programmes - legislative and regulatory							
Legislative and regulatory expenditure		635	698	646	364	371	48
less Capital contributions funding legislative and regulatory							
Legislative and regulatory less capital contributions		635	698	646	364	371	48

11a(viii): Other Reliability, Safety and Environment

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
	for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25
*Project or programme**		$000 (in constant prices)					
[Description of material project or programme]							
[Description of material project or programme]							
[Description of material project or programme]							
[Description of material project or programme]							
[Description of material project or programme]							
**include additional rows if needed*							
All other projects or programmes - other reliability, safety and environment							
Other reliability, safety and environment expenditure		-	-	-	-	-	-
less Capital contributions funding other reliability, safety and environment							
Other reliability, safety and environment less capital contributions		-	-	-	-	-	-

11a(ix): Non-Network Assets

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
	for year ended	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23	31 Mar 24	31 Mar 25
Routine expenditure							
*Project or programme**		$000 (in constant prices)					
Buildings		118	140	146	152	158	165
Vehicles		664	720	749	779	811	843
Plant		217	127	463	157	195	195
Information technology		221	782	507	694	646	680
**include additional rows if needed*							
All other projects or programmes - routine expenditure							
Routine expenditure		1,220	1,769	1,865	1,782	1,810	1,882
Atypical expenditure							
*Project or programme**							
Buildings and Depot		-	3,400	3,672			
Electric Vehicle charger		-	86	-			
[Description of material project or programme]							
[Description of material project or programme]							
**include additional rows if needed*							
All other projects or programmes - atypical expenditure							
Atypical expenditure		-	3,486	3,672	-	-	-
Expenditure on non-network assets		1,220	5,255	5,537	1,782	1,810	1,882

Company Name	Network Waitaki Ltd
AMP Planning Period	1 April 2020 – 31 March 2030

SCHEDULE 11b: REPORT ON FORECAST OPERATIONAL EXPENDITURE

This schedule requires a breakdown of forecast operational expenditure for the disclosure year and a 10 year planning period. The forecasts should be consistent with the supporting information set out in the AMP. The forecast is to be expressed in both constant price and nominal dollar terms.
EDBs must provide explanatory comment on the difference between constant price and nominal dollar operational expenditure forecasts in Schedule 14a (Mandatory Explanatory Notes).
This information is not part of audited disclosure information.

sch ref			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8		for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**
9	**Operational Expenditure Forecast**		**$000 (in nominal dollars)**										
10	Service interruptions and emergencies		479	450	450	450	450	450	450	450	450	450	450
11	Vegetation management		669	629	629	629	629	629	629	629	629	629	629
12	Routine and corrective maintenance and inspection		969	940	927	827	827	827	797	797	797	797	797
13	Asset replacement and renewal		460	310	280	280	280	280	280	280	280	280	280
14	**Network Opex**		2,577	2,329	2,286	2,186	2,186	2,186	2,156	2,156	2,156	2,156	2,156
15	System operations and network support		887	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003
16	Business support		1,260	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989	1,989
17	**Non-network opex**		2,147	2,992	2,992	2,992	2,992	2,992	2,992	2,992	2,992	2,992	2,992
18	**Operational expenditure**		4,724	5,321	5,278	5,178	5,178	5,178	5,148	5,148	5,148	5,148	5,148
19			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
20		for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**
21			**$000 (in constant prices)**										
22	Service interruptions and emergencies		479	450	459	459	459	459	459	459	459	459	459
23	Vegetation management		669	629	642	642	642	642	642	642	642	642	642
24	Routine and corrective maintenance and inspection		969	940	946	844	844	844	813	813	813	813	813
25	Asset replacement and renewal		460	310	286	286	286	286	286	286	286	286	286
26	**Network Opex**		2,577	2,329	2,332	2,230	2,230	2,230	2,199	2,199	2,199	2,199	2,199
27	System operations and network support		887	1,003	1,023	1,044	1,064	1,086	1,107	1,130	1,152	1,175	1,199
28	Business support		1,260	1,989	2,029	2,069	2,111	2,153	2,196	2,240	2,285	2,330	2,377
29	**Non-network opex**		2,147	2,992	3,052	3,113	3,175	3,239	3,303	3,369	3,437	3,506	3,576
30	**Operational expenditure**		4,724	5,321	5,384	5,343	5,405	5,468	5,503	5,569	5,636	5,705	5,775
31	**Subcomponents of operational expenditure (where known)**												
32	Energy efficiency and demand side management, reduction of												
33	energy losses		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
34	Direct billing*		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
35	Research and Development		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
36	Insurance		115	117	119	122	124	127	129	132	134	137	140
37	** Direct billing expenditure by suppliers that direct bill the majority of their consumers*												
38													
39			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
40		for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**
41	**Difference between nominal and real forecasts**		**$000**										
42	Service interruptions and emergencies		-	-	(9)	(9)	(9)	(9)	(9)	(9)	(9)	(9)	(9)
43	Vegetation management		-	-	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)
44	Routine and corrective maintenance and inspection		-	-	(19)	(17)	(17)	(17)	(16)	(16)	(16)	(16)	(16)
45	Asset replacement and renewal		150	24	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	#REF!
46	**Network Opex**		-	-	(46)	(44)	(44)	(44)	(43)	(43)	(43)	(43)	(43)
47	System operations and network support		-	-	(20)	(41)	(61)	(83)	(104)	(127)	(149)	(172)	(196)
48	Business support		-	-	(40)	(80)	(122)	(164)	(207)	(251)	(296)	(341)	(388)
49	**Non-network opex**		-	-	(60)	(121)	(183)	(247)	(311)	(377)	(445)	(514)	(584)
50	**Operational expenditure**		-	-	(106)	(165)	(227)	(290)	(355)	(421)	(488)	(557)	(627)

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2020 – 31 March 2030**

SCHEDULE 12a: REPORT ON ASSET CONDITION

This schedule requires a breakdown of asset condition by asset class as at the start of the forecast year. The data accuracy assessment relates to the percentage values disclosed in the asset condition columns. Also required is a forecast of the percentage of units to be replaced in the next 5 years. All information should be consistent with the information provided in the AMP and the expenditure on assets forecast in Schedule 11a. All units relating to cable and line assets, that are expressed in km, refer to circuit lengths.

sch ref												
7					**Asset condition at start of planning period (percentage of units by grade)**							
8												
9	**Voltage**	**Asset category**	**Asset class**	**Units**	**H1**	**H2**	**H3**	**H4**	**H5**	**Grade unknown**	**Data accuracy (1–4)**	**% of asset forecast to be replaced in next 5 years**
10	All	Overhead Line	Concrete poles / steel structure	No.	0.50%	5.00%	94.50%				2	5.00%
11	All	Overhead Line	Wood poles	No.	1.00%	8.00%	91.00%				2	11.00%
12	All	Overhead Line	Other pole types	No.							N/A	
13	HV	Subtransmission Line	Subtransmission OH up to 66kV conductor	km		20.00%	55.00%	25.00%			3	3.00%
14	HV	Subtransmission Line	Subtransmission OH 110kV+ conductor	km							N/A	
15	HV	Subtransmission Cable	Subtransmission UG up to 66kV (XLPE)	km		10.00%	90.00%				3	3.00%
16	HV	Subtransmission Cable	Subtransmission UG up to 66kV (Oil pressurised)	km							N/A	
17	HV	Subtransmission Cable	Subtransmission UG up to 66kV (Gas pressurised)	km							N/A	
18	HV	Subtransmission Cable	Subtransmission UG up to 66kV (PILC)	km		30.00%	70.00%				3	
19	HV	Subtransmission Cable	Subtransmission UG 110kV+ (XLPE)	km							N/A	
20	HV	Subtransmission Cable	Subtransmission UG 110kV+ (Oil pressurised)	km							N/A	
21	HV	Subtransmission Cable	Subtransmission UG 110kV+ (Gas Pressurised)	km							N/A	
22	HV	Subtransmission Cable	Subtransmission UG 110kV+ (PILC)	km							N/A	
23	HV	Subtransmission Cable	Subtransmission submarine cable	km							N/A	
24	HV	Zone substation Buildings	Zone substations up to 66kV	No.		6.00%	88.00%	6.00%			3	
25	HV	Zone substation Buildings	Zone substations 110kV+	No.							N/A	
26	HV	Zone substation switchgear	22/33kV CB (Indoor)	No.				100.00%			3	
27	HV	Zone substation switchgear	22/33kV CB (Outdoor)	No.		5.00%	45.00%	50.00%			3	
28	HV	Zone substation switchgear	33kV Switch (Ground Mounted)	No.							N/A	
29	HV	Zone substation switchgear	33kV Switch (Pole Mounted)	No.		10.00%	90.00%				3	10.00%
30	HV	Zone substation switchgear	33kV RMU	No.							N/A	
31	HV	Zone substation switchgear	50/66/110kV CB (Indoor)	No.							N/A	
32	HV	Zone substation switchgear	50/66/110kV CB (Outdoor)	No.			100.00%				3	
33	HV	Zone substation switchgear	3.3/6.6/11/22kV CB (ground mounted)	No.		10.00%	85.00%	5.00%			3	20.00%
34	HV	Zone substation switchgear	3.3/6.6/11/22kV CB (pole mounted)	No.		10.00%	90.00%				3	
35												

	Voltage	Asset category	Asset class	Units	H1	H2	H3	H4	H5	Grade unknown	Data accuracy (1–4)	% of asset forecast to be replaced in next 5 years
36					**Asset condition at start of planning period (percentage of units by grade)**							
37												
38												
39	HV	Zone Substation Transformer	Zone Substation Transformers	No.	5.00%	5.00%	40.00%	27.00%	23.00%		3	10.00%
40	HV	Distribution Line	Distribution OH Open Wire Conductor	km	5.00%	10.00%	80.00%	3.00%	2.00%		3	5.00%
41	HV	Distribution Line	Distribution OH Aerial Cable Conductor	km							N/A	
42	HV	Distribution Line	SWER conductor	km							N/A	
43	HV	Distribution Cable	Distribution UG XLPE or PVC	km		10.00%	87.00%	3.00%			3	
44	HV	Distribution Cable	Distribution UG PILC	km	3.00%	20.00%	77.00%				3	3.00%
45	HV	Distribution Cable	Distribution Submarine Cable	km							N/A	
46	HV	Distribution switchgear	3.3/6.6/11/22kV CB (pole mounted) - reclosers and sectionalisers	No.		5.00%	80.00%	10.00%	5.00%		3	2.00%
47	HV	Distribution switchgear	3.3/6.6/11/22kV CB (Indoor)	No.							N/A	
48	HV	Distribution switchgear	3.3/6.6/11/22kV Switches and fuses (pole mounted)	No.	10.00%	10.00%	65.00%	10.00%	5.00%		3	15.00%
49	HV	Distribution switchgear	3.3/6.6/11/22kV Switch (ground mounted) - except RMU	No.							N/A	
50	HV	Distribution switchgear	3.3/6.6/11/22kV RMU	No.		5.00%	80.00%	10.00%	5.00%		3	5.00%
51	HV	Distribution Transformer	Pole Mounted Transformer	No.	2.00%	3.00%	90.00%	3.00%	2.00%		3	5.00%
52	HV	Distribution Transformer	Ground Mounted Transformer	No.	1.00%	1.00%	91.50%	6.50%			3	2.00%
53	HV	Distribution Transformer	Voltage regulators	No.			40.00%	50.00%	10.00%		3	
54	HV	Distribution Substations	Ground Mounted Substation Housing	No.		30.00%	70.00%				2	
55	LV	LV Line	LV OH Conductor	km		4.00%	96.00%				2	4.00%
56	LV	LV Cable	LV UG Cable	km			100.00%				3	
57	LV	LV Streetlighting	LV OH/UG Streetlight circuit	km		5.00%	95.00%				3	5.00%
58	LV	Connections	OH/UG consumer service connections	No.		2.00%	98.00%				3	2.00%
59	All	Protection	Protection relays (electromechanical, solid state and numeric)	No.		3.00%	77.00%	10.00%	10.00%		3	3.00%
60	All	SCADA and communications	SCADA and communications equipment operating as a single system	Lot			100.00%				3	100.00%
61	All	Capacitor Banks	Capacitors including controls	No.				100.00%			3	
62	All	Load Control	Centralised plant	Lot			100.00%				3	
63	All	Load Control	Relays	No.		20.00%		80.00%			3	
64	All	Civils	Cable Tunnels	km							N/A	

Company Name: **Network Waitaki Ltd**

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SCHEDULE 12b: REPORT ON FORECAST CAPACITY

This schedule requires a breakdown of current and forecast capacity and utilisation for each zone substation and current distribution transformer capacity. The data provided should be consistent with the information provided in the AMP. Information provided in this table should relate to the operation of the network in its normal steady state configuration.

sch ref

7 ### 12b(i): System Growth - Zone Substations

sch ref	*Existing Zone Substations*	Current Peak Load (MVA)	Installed Firm Capacity (MVA)	Security of Supply Classification (type)	Transfer Capacity (MVA)	Utilisation of Installed Firm Capacity %	Installed Firm Capacity +5 years (MVA)	Utilisation of Installed Firm Capacity + 5yrs %	Installed Firm Capacity Constraint +5 years (cause)	Explanation
9	Ruataniwha	1	2	N	-	40%	2	46%	No constraint within +5 years	
10	Ohau	1	3	N	2	43%	3	53%	No constraint within +5 years	
11	Omarama	2	6	N	4	28%	3	60%	No constraint within +5 years	
12	Otematata	1	3	N	2	27%	3	27%	No constraint within +5 years	
13	Kurow	6	12	N-1	7	46%	12	39%	No constraint within +5 years	
14	Eastern Road	-	-	-	-	-	7	60%	No constraint within +5 years	Will be commissioned FY21
15	Duntroon	6	7	N	1	87%	7	89%	No constraint within +5 years	
16	Ngapara	6	7	N	2	79%	7	87%	No constraint within +5 years	
17	Awamoko	-	-	-	-	-	7	44%	No constraint within +5 years	
18	Papakaio	6	7	N	1	86%	7	80%	No constraint within +5 years	
19	Enfield	2	7	N	5	33%	7	36%	No constraint within +5 years	
20	Parsons Road	4	10	N	6	38%	10	42%	No constraint within +5 years	
21	Pukeuri	9	12	N-1	3	78%	12	93%	No constraint within +5 years	
22	Chelmer Street	14	28	N-1	14	51%	28	55%	No constraint within +5 years	
23	Redcastle	9	15	N-1	6	62%	15	69%	No constraint within +5 years	
24	Five Forks	1	7	N	6	20%	7	60%	No constraint within +5 years	
25	Maheno	4	5	N	2	70%	5	82%	No constraint within +5 years	
26	Hampden	1	7	N	6	20%	7	36%	No constraint within +5 years	
27	[Zone Substation_19]					-			[Select one]	
28	[Zone Substation_20]					-			[Select one]	

29 [1] *Extend forecast capacity table as necessary to disclose all capacity by each zone substation*

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SCHEDULE 12C: REPORT ON FORECAST NETWORK DEMAND

This schedule requires a forecast of new connections (by consumer type), peak demand and energy volumes for the disclosure year and a 5 year planning period. The forecasts should be consistent with the supporting information set out in the AMP as well as the assumptions used in developing the expenditure forecasts in Schedule 11a and Schedule 11b and the capacity and utilisation forecasts in Schedule 12b.

sch ref

7 12c(i): Consumer Connections

sch ref			Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
8	*Number of ICPs connected in year by consumer type*				**Number of connections**			
9			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
10		for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**
11	*Consumer types defined by EDB**							
12	Small: residential and commercial to 15kVA		10,996	11,216	11,440	11,669	11,902	12,140
13	Medium: residential and commercial 16kVA to 50kVA		1,442	1,471	1,500	1,530	1,561	1,592
14	Large: commercial and industrial 51kVA and above		567	578	590	602	614	626
15	Indpendent Contract Consumers ("IND")		87	89	91	92	94	96
16	[EDB consumer type]							
17	**Connections total**		13,092	13,354	13,621	13,893	14,171	14,455
18	**include additional rows if needed*							
19	**Distributed generation**							
20	Number of connections		112	132	157	187	222	262
21	Capacity of distributed generation installed in year (MVA)		585	689	820	977	1,160	1,368

22 12c(ii) System Demand

sch ref				Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
23				*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
24		**Maximum coincident system demand (MW)**	for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**
25		GXP demand		63	64	66	67	68	70
26	*plus*	Distributed generation output at HV and above							
27		**Maximum coincident system demand**		63	64	66	67	68	70
28	*less*	Net transfers to (from) other EDBs at HV and above							
29		**Demand on system for supply to consumers' connection points**		63	64	66	67	68	70
30		**Electricity volumes carried (GWh)**							
31		Electricity supplied from GXPs		276	282	287	293	299	305
32	*less*	Electricity exports to GXPs							
33	*plus*	Electricity supplied from distributed generation							
34	*less*	Net electricity supplied to (from) other EDBs							
35		**Electricity entering system for supply to ICPs**		276	282	287	293	299	305
36	*less*	Total energy delivered to ICPs		262	267	273	278	284	289
37		**Losses**		14	14	15	15	15	16
38									
39		**Load factor**		50%	50%	50%	50%	50%	50%
40		**Loss ratio**		5.1%	5.1%	5.1%	5.1%	5.1%	5.1%

Company Name	**Network Waitaki Ltd**
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Network / Sub-network Name	**Network Waitaki Ltd**

SCHEDULE 12d: REPORT FORECAST INTERRUPTIONS AND DURATION

This schedule requires a forecast of SAIFI and SAIDI for disclosure and a 5 year planning period. The forecasts should be consistent with the supporting information set out in the AMP as well as the assumed impact of planned and unplanned SAIFI and SAIDI on the expenditures forecast provided in Schedule 11a and Schedule 11b.

sch ref

8			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
9		for year ended	**31 Mar 20**	**31 Mar 21**	**31 Mar 22**	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**
10	**SAIDI**							
11	Class B (planned interruptions on the network)		105.0	105.0	105.0	105.0	105.0	105.0
12	Class C (unplanned interruptions on the network)		45.0	45.0	45.0	45.0	45.0	45.0
13	**SAIFI**							
14	Class B (planned interruptions on the network)		0.40	0.40	0.40	0.40	0.40	0.40
15	Class C (unplanned interruptions on the network)		0.80	0.80	0.80	0.80	0.80	0.80

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2020 – 31 March 2030**
Asset Management Standard Applied	**N/A**

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY

This schedule requires information on the EDB'S self-assessment of the maturity of its asset management practices .

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	2	NWL has a controlled Asset Management policy. Work needs to be done to incorporate that policy through all aspects of the business rather than simply in the Engineering focussed areas.		Widely used AM practice standards require an organisation to document, authorise and communicate its asset management policy (eg, as required in PAS 55 para 4.2 i). A key pre-requisite of any robust policy is that the organisation's top management must be seen to endorse and fully support it. Also vital to the effective implementation of the policy, is to tell the appropriate people of its content and their obligations under it. Where an organisation outsources some of its asset-related activities, then these people and their organisations must equally be made aware of the policy's content. Also, there may be other stakeholders, such as regulatory authorities and shareholders who should be made aware of it.	Top management. The management team that has overall responsibility for asset management.	The organisation's asset management policy, its organisational strategic plan, documents indicating how the asset management policy was based upon the needs of the organisation and evidence of communication.
10	Asset management strategy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	2	Strategic planning is a developing area in the company. A wider strategic review is being worked through in FY2019/20 to generate goals that can then be used to guide asset management practice to achieve the goals of the organisation.		In setting an organisation's asset management strategy, it is important that it is consistent with any other policies and strategies that the organisation has and has taken into account the requirements of relevant stakeholders. This question examines to what extent the asset management strategy is consistent with other organisational policies and strategies (eg, as required by PAS 55 para 4.3.1 b) and has taken account of stakeholder requirements as required by PAS 55 para 4.3.1 c). Generally, this will take into account the same polices, strategies and stakeholder requirements as covered in drafting the asset management policy but at a greater level of detail.	Top management. The organisation's strategic planning team. The management team that has overall responsibility for asset management.	The organisation's asset management strategy document and other related organisational policies and strategies. Other than the organisation's strategic plan, these could include those relating to health and safety, environmental, etc. Results of stakeholder consultation.
11	Asset management strategy	In what way does the organisation's asset management strategy take account of the lifecycle of the assets, asset types and asset systems over which the organisation has stewardship?	2	The importance of asset lifecycle strategy is understood, but the development of plans to bring the benefits to all classes of asset is still underway. Asset lifecycle factors are taken into account within business decision making, and considered when setting strategies and performance measures.		Good asset stewardship is the hallmark of an organisation compliant with widely used AM standards. A key component of this is the need to take account of the lifecycle of the assets, asset types and asset systems. (For example, this requirement is recognised in 4.3.1 d) of PAS 55). This question explores what an organisation has done to take lifecycle into account in its asset management strategy.	Top management. People in the organisation with expert knowledge of the assets, asset types, asset systems and their associated life-cycles. The management team that has overall responsibility for asset management. Those responsible for developing and adopting methods and processes used in asset management	The organisation's documented asset management strategy and supporting working documents.
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	2	We are in the process of developing asset class plans that will cover the life cycles of all of our asset types. This will be a focus of the FY20/21.		The asset management strategy need to be translated into practical plan(s) so that all parties know how the objectives will be achieved. The development of plan(s) will need to identify the specific tasks and activities required to optimize costs, risks and performance of the assets and/or asset system(s), when they are to be carried out and the resources required.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers.	The organisation's asset management plan(s).

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Asset Management Standard Applied	**N/A**

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	The organisation does not have a documented asset management policy.	The organisation has an asset management policy, but it has not been authorised by top management, or it is not influencing the management of the assets.	The organisation has an asset management policy, which has been authorised by top management, but it has had limited circulation. It may be in use to influence development of strategy and planning but its effect is limited.	The asset management policy is authorised by top management, is widely and effectively communicated to all relevant employees and stakeholders, and used to make these persons aware of their asset related obligations.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
10	Asset management strategy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	The organisation has not considered the need to ensure that its asset management strategy is appropriately aligned with the organisation's other organisational policies and strategies or with stakeholder requirements. OR The organisation does not have an asset management strategy.	The need to align the asset management strategy with other organisational policies and strategies as well as stakeholder requirements is understood and work has started to identify the linkages or to incorporate them in the drafting of asset management strategy.	Some of the linkages between the long-term asset management strategy and other organisational policies, strategies and stakeholder requirements are defined but the work is fairly well advanced but still incomplete.	All linkages are in place and evidence is available to demonstrate that, where appropriate, the organisation's asset management strategy is consistent with its other organisational policies and strategies. The organisation has also identified and considered the requirements of relevant stakeholders.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
11	Asset management strategy	In what way does the organisation's asset management strategy take account of the lifecycle of the assets, asset types and asset systems over which the organisation has stewardship?	The organisation has not considered the need to ensure that its asset management strategy is produced with due regard to the lifecycle of the assets, asset types or asset systems that it manages. OR The organisation does not have an asset management strategy.	The need is understood, and the organisation is drafting its asset management strategy to address the lifecycle of its assets, asset types and asset systems.	The long-term asset management strategy takes account of the lifecycle of some, but not all, of its assets, asset types and asset systems.	The asset management strategy takes account of the lifecycle of all of its assets, asset types and asset systems.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	The organisation does not have an identifiable asset management plan(s) covering asset systems and critical assets.	The organisation has asset management plan(s) but they are not aligned with the asset management strategy and objectives and do not take into consideration the full asset life cycle (including asset creation, acquisition, enhancement, utilisation, maintenance decommissioning and disposal).	The organisation is in the process of putting in place comprehensive, documented asset management plan(s) that cover all life cycle activities, clearly aligned to asset management objectives and the asset management strategy.	Asset management plan(s) are established, documented, implemented and maintained for asset systems and critical assets to achieve the asset management strategy and asset management objectives across all life cycle phases.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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Asset Management Standard Applied	**N/A**

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	3	AMP development includes engagement with internal and external stakeholders. The published version is available to the public, the wider staff, and the Consumer Trust on our website, or by calling into our offices. Our Board reviews and signs off on the AMP.		Plans will be ineffective unless they are communicated to all those, including contracted suppliers and those who undertake enabling function(s). The plan(s) need to be communicated in a way that is relevant to those who need to use them.	The management team with overall responsibility for the asset management system. Delivery functions and suppliers.	Distribution lists for plan(s). Documents derived from plan(s) which detail the receivers role in plan delivery. Evidence of communication.
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	3	The structure of the organisation has been developed to allow clear responsibilities between planning, delivery, field work etc. There is still room for specificity within the developing asset class plans to document these responsibilities, but the organisation is at a small enough size that these are opportunities to deliver efficiency improvements rather than gaps to be closed.		The implementation of asset management plan(s) relies on (1) actions being clearly identified, (2) an owner allocated and (3) that owner having sufficient delegated responsibility and authority to carry out the work required. It also requires alignment of actions across the organisation. This question explores how well the plan(s) set out responsibility for delivery of asset plan actions.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team.	The organisation's asset management plan(s). Documentation defining roles and responsibilities of individuals and organisational departments.
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)? (Note this is about resources and enabling support)	3	The AMP is analysed at approval stage to identify staffing and contractor needs over the period, and work plans may be altered to improve our ability to resource work, and hence improve delivery. We maintain our internal contracting team at a suitable staffing level, with suitable skillsets and equipment to deliver the bulk of the work program without having to bring in outside resources.		It is essential that the plan(s) are realistic and can be implemented, which requires appropriate resources to be available and enabling mechanisms in place. This question explores how well this is achieved. The plan(s) not only need to consider the resources directly required and timescales, but also the enabling activities, including for example, training requirements, supply chain capability and procurement timescales.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team. If appropriate, the performance management team. Where appropriate the procurement team and service providers working on the organisation's asset-related activities.	The organisation's asset management plan(s). Documented processes and procedures for the delivery of the asset management plan.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	2	We have a comprehensive suite of Business Continuity Plans that cover asset failure, natural disasters and interruption to key processes, which are currently (2020) under significant review. We are active in the Lifelines Utilities groups. There is regular discussiion with other EDBs at many levels to discuss mutual support in the event of incidents. Training needs and external alignment are areas that we recognise we can improve, and action plans are currently being worked on to improve in this area.		Widely used AM practice standards require that an organisation has plan(s) to identify and respond to emergency situations. Emergency plan(s) should outline the actions to be taken to respond to specified emergency situations and ensure continuity of critical asset management activities including the communication to, and involvement of, external agencies. This question assesses if, and how well, these plan(s) triggered, implemented and resolved in the event of an incident. The plan(s) should be appropriate to the level of risk as determined by the organisation's risk assessment methodology. It is also a requirement that relevant personnel are competent and trained.	The manager with responsibility for developing emergency plan(s). The organisation's risk assessment team. People with designated duties within the plan(s) and procedure(s) for dealing with incidents and emergency situations.	The organisation's plan(s) and procedure(s) for dealing with emergencies. The organisation's risk assessments and risk registers.

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Asset Management Standard Applied	**N/A**

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	The organisation does not have plan(s) or their distribution is limited to the authors.	The plan(s) are communicated to some of those responsible for delivery of the plan(s). OR Communicated to those responsible for delivery is either irregular or ad-hoc.	The plan(s) are communicated to most of those responsible for delivery but there are weaknesses in identifying relevant parties resulting in incomplete or inappropriate communication. The organisation recognises improvement is needed as is working towards resolution.	The plan(s) are communicated to all relevant employees, stakeholders and contracted service providers to a level of detail appropriate to their participation or business interests in the delivery of the plan(s) and there is confirmation that they are being used effectively.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	The organisation has not documented responsibilities for delivery of asset plan actions.	Asset management plan(s) inconsistently document responsibilities for delivery of plan actions and activities and/or responsibilities and authorities for implementation inadequate and/or delegation level inadequate to ensure effective delivery and/or contain misalignments with organisational accountability.	Asset management plan(s) consistently document responsibilities for the delivery of actions but responsibility/authority levels are inappropriate/ inadequate, and/or there are misalignments within the organisation.	Asset management plan(s) consistently document responsibilities for the delivery actions and there is adequate detail to enable delivery of actions. Designated responsibility and authority for achievement of asset plan actions is appropriate.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)? (Note this is about resources and enabling support)	The organisation has not considered the arrangements needed for the effective implementation of plan(s).	The organisation recognises the need to ensure appropriate arrangements are in place for implementation of asset management plan(s) and is in the process of determining an appropriate approach for achieving this.	The organisation has arrangements in place for the implementation of asset management plan(s) but the arrangements are not yet adequately efficient and/or effective. The organisation is working to resolve existing weaknesses.	The organisation's arrangements fully cover all the requirements for the efficient and cost effective implementation of asset management plan(s) and realistically address the resources and timescales required, and any changes needed to functional policies, standards, processes and the asset management information system.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	The organisation has not considered the need to establish plan(s) and procedure(s) to identify and respond to incidents and emergency situations.	The organisation has some ad-hoc arrangements to deal with incidents and emergency situations, but these have been developed on a reactive basis in response to specific events that have occurred in the past.	Most credible incidents and emergency situations are identified. Either appropriate plan(s) and procedure(s) are incomplete for critical activities or they are inadequate. Training/ external alignment may be incomplete.	Appropriate emergency plan(s) and procedure(s) are in place to respond to credible incidents and manage continuity of critical asset management activities consistent with policies and asset management objectives. Training and external agency alignment is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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AMP Planning Period	1 April 2020 – 31 March 2030	
Asset Management Standard Applied	N/A	

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	3	We have a small team, and the management structure and company organisation are designed to remove silos and encourage coolaboration between the different groups involved in the management of the network, from Engineering to Finance to Field services. Accountability for outcomes ranges from formal KPI's at an annual level, formal monthly management meetings after each Board meeting, to daily discussions of progress. Management staff have appropriate authorisation and support to acheive the asset management goals.		In order to ensure that the organisation's assets and asset systems deliver the requirements of the asset management policy, strategy and objectives responsibilities need to be allocated to appropriate people who have the necessary authority to fulfil their responsibilities. (This question, relates to the organisation's assets eg, para b), s 4.4.1 of PAS 55, making it therefore distinct from the requirement contained in para a), s 4.4.1 of PAS 55).	Top management. People with management responsibility for the delivery of asset management policy, strategy, objectives and plan(s). People working on asset-related activities.	Evidence that managers with responsibility for the delivery of asset management policy, strategy, objectives and plan(s) have been appointed and have assumed their responsibilities. Evidence may include the organisation's documents relating to its asset management system, organisational charts, job descriptions of post-holders, annual targets/objectives and personal development plan(s) of post-holders as appropriate.
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	2	Budget development includes analysis of the ability to resource the required work. This includes field and office based staff. We are actively recruiting trainees to safeguard succession as senior staff retire. We provide training to existing staff to bolster skills and fill any gaps.		Optimal asset management requires top management to ensure sufficient resources are available. In this context the term 'resources' includes manpower, materials, funding and service provider support.	Top management. The management team that has overall responsibility for asset management. Risk management team. The organisation's managers involved in day-to-day supervision of asset-related activities, such as frontline managers, engineers, foremen and chargehands as appropriate.	Evidence demonstrating that asset management plan(s) and/or the process(es) for asset management plan implementation consider the provision of adequate resources in both the short and long term. Resources include funding, materials, equipment, services provided by third parties and personnel (internal and service providers) with appropriate skills competencies and knowledge.
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	3	Senior management track performance against KPIs in order to deliver the required asset management outcomes. These KPIs and other measures are being reviewed to improve the ability to influence outcomes - many of them are laggin		Widely used AM practice standards require an organisation to communicate the importance of meeting its asset management requirements such that personnel fully understand, take ownership of, and are fully engaged in the delivery of the asset management requirements (eg, PAS 55 s 4.4.1 g).	Top management. The management team that has overall responsibility for asset management. People involved in the delivery of the asset management requirements.	Evidence of such activities as road shows, written bulletins, workshops, team talks and management walk-abouts would assist an organisation to demonstrate it is meeting this requirement of PAS 55.
45	Outsourcing of asset management activities	Where the organisation has outsourced some of its asset management activities, how has it ensured that appropriate controls are in place to ensure the compliant delivery of its organisational strategic plan, and its asset management policy and strategy?	2	We follow a Contractor Approval Procedure, which confirms that external contractors are competent and safe enough to work on our assets. External contractors are provided with all network Standards, Procedures etc, and their work is subject to inspections and completion audits. There is still opportunity to improve this area through the use of standardised contracts etc. to guarantee that all external interactions provide the highest levels of performance.		Where an organisation chooses to outsource some of its asset management activities, the organisation must ensure that these outsourced process(es) are under appropriate control to ensure that all the requirements of widely used AM standards (eg, PAS 55) are in place, and the asset management policy, strategy objectives and plan(s) are delivered. This includes ensuring capabilities and resources across a time span aligned to life cycle management. The organisation must put arrangements in place to control the outsourced activities, whether it be to external providers or to other in-house departments. This question explores what the organisation does in this regard.	Top management. The management team that has overall responsibility for asset management. The manager(s) responsible for the monitoring and management of the outsourced activities. People involved with the procurement of outsourced activities. The people within the organisations that are performing the outsourced activities. The people impacted by the outsourced activity.	The organisation's arrangements that detail the compliance required of the outsourced activities. For example, this this could form part of a contract or service level agreement between the organisation and the suppliers of its outsourced activities. Evidence that the organisation has demonstrated to itself that it has assurance of compliance of outsourced activities.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	Top management has not considered the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management understands the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management has appointed an appropriate people to ensure the assets deliver the requirements of the asset management strategy, objectives and plan(s) but their areas of responsibility are not fully defined and/or they have insufficient delegated authority to fully execute their responsibilities.	The appointed person or persons have full responsibility for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s). They have been given the necessary authority to achieve this.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	The organisation's top management has not considered the resources required to deliver asset management.	The organisations top management understands the need for sufficient resources but there are no effective mechanisms in place to ensure this is the case.	A process exists for determining what resources are required for its asset management activities and in most cases these are available but in some instances resources remain insufficient.	An effective process exists for determining the resources needed for asset management and sufficient resources are available. It can be demonstrated that resources are matched to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	The organisation's top management has not considered the need to communicate the importance of meeting asset management requirements.	The organisations top management understands the need to communicate the importance of meeting its asset management requirements but does not do so.	Top management communicates the importance of meeting its asset management requirements but only to parts of the organisation.	Top management communicates the importance of meeting its asset management requirements to all relevant parts of the organisation.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
45	Outsourcing of asset management activities	Where the organisation has outsourced some of its asset management activities, how has it ensured that appropriate controls are in place to ensure the compliant delivery of its organisational strategic plan, and its asset management policy and strategy?	The organisation has not considered the need to put controls in place.	The organisation controls its outsourced activities on an ad-hoc basis, with little regard for ensuring for the compliant delivery of the organisational strategic plan and/or its asset management policy and strategy.	Controls systematically considered but currently only provide for the compliant delivery of some, but not all, aspects of the organisational strategic plan and/or its asset management policy and strategy. Gaps exist.	Evidence exists to demonstrate that outsourced activities are appropriately controlled to provide for the compliant delivery of the organisational strategic plan, asset management policy and strategy, and that these controls are integrated into the asset management system	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	3	We are a small company and we have sought out staff with Asset management experience, and then provided further training. We are active in training staff, and engaging with other EDBs to find about best practice in the area of asset management.		There is a need for an organisation to demonstrate that it has considered what resources are required to develop and implement its asset management system. There is also a need for the organisation to demonstrate that it has assessed what development plan(s) are required to provide its human resources with the skills and competencies to develop and implement its asset management systems. The timescales over which the plan(s) are relevant should be commensurate with the planning horizons within the asset management strategy considers e.g. if the asset management strategy considers 5, 10 and 15 year time scales then the human resources development plan(s) should align with these. Resources include both 'in house' and external resources who undertake asset management activities.	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of analysis of future work load plan(s) in terms of human resources. Document(s) containing analysis of the organisation's own direct resources and contractors resource capability over suitable timescales. Evidence, such as minutes of meetings, that suitable management forums are monitoring human resource development plan(s). Training plan(s), personal development plan(s), contract and service level agreements.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	2	NWL competence framework is detailed in document NC2004. This covers the field staff very well, and we are in the process of developing similar documentation for other roles that are important to asset management. Induction, personal development/training and position descriptions are kept for all staff, and are reviewed for alignment with the requirements of the roles. We seek out information and best practice from external oganisations such as the EEA and the IPWEA to gain insight into what skillsets and competencies are needed to		Widely used AM standards require that organisations to undertake a systematic identification of the asset management awareness and competencies required at each level and function within the organisation. Once identified the training required to provide the necessary competencies should be planned for delivery in a timely and systematic way. Any training provided must be recorded and maintained in a suitable format. Where an organisation has contracted service providers in place then it should have a means to demonstrate that this requirement is being met for their employees. (eg, PAS 55 refers to frameworks suitable for identifying competency requirements).	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of an established and applied competency requirements assessment process and plan(s) in place to deliver the required training. Evidence that the training programme is part of a wider, co-ordinated asset management activities training and competency programme. Evidence that training activities are recorded and that records are readily available (for both direct and contracted service provider staff) e.g. via organisation wide information system or local records database.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	3	As mentioned above, we are actively improving our awareness of the competence of our asset management staff and to identify any training needs. Internal auditors compare the training records of staff against our requirements to keep on top of maintaining adequate numbers of staff with certain compentencies, and keeping up with training requirements. However, the outputs of the question above means that there is still room for improvement in this area to close gaps in the skillset of our staff.		A critical success factor for the effective development and implementation of an asset management system is the competence of persons undertaking these activities. organisations should have effective means in place for ensuring the competence of employees to carry out their designated asset management function(s). Where an organisation has contracted service providers undertaking elements of its asset management system then the organisation shall assure itself that the outsourced service provider also has suitable arrangements in place to manage the competencies of its employees. The organisation should ensure that the individual and corporate competencies it requires are in place and actively monitor, develop and maintain an appropriate balance of these competencies.	Managers, supervisors, persons responsible for developing training programmes. Staff responsible for procurement and service agreements. HR staff and those responsible for recruitment.	Evidence of a competency assessment framework that aligns with established frameworks such as the asset management Competencies Requirements Framework (Version 2.0); National Occupational Standards for Management and Leadership; UK Standard for Professional Engineering Competence, Engineering Council, 2005.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	The organisation has not recognised the need for assessing human resources requirements to develop and implement its asset management system.	The organisation has recognised the need to assess its human resources requirements and to develop a plan(s). There is limited recognition of the need to align these with the development and implementation of its asset management system.	The organisation has developed a strategic approach to aligning competencies and human resources to the asset management system including the asset management plan but the work is incomplete or has not been consistently implemented.	The organisation can demonstrate that plan(s) are in place and effective in matching competencies and capabilities to the asset management system including the plan for both internal and contracted activities. Plans are reviewed integral to asset management system process(es).	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	The organisation does not have any means in place to identify competency requirements.	The organisation has recognised the need to identify competency requirements and then plan, provide and record the training necessary to achieve the competencies.	The organisation is the process of identifying competency requirements aligned to the asset management plan(s) and then plan, provide and record appropriate training. It is incomplete or inconsistently applied.	Competency requirements are in place and aligned with asset management plan(s). Plans are in place and effective in providing the training necessary to achieve the competencies. A structured means of recording the competencies achieved is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	The organization has not recognised the need to assess the competence of person(s) undertaking asset management related activities.	Competency of staff undertaking asset management related activities is not managed or assessed in a structured way, other than formal requirements for legal compliance and safety management.	The organization is in the process of putting in place a means for assessing the competence of person(s) involved in asset management activities including contractors. There are gaps and inconsistencies.	Competency requirements are identified and assessed for all persons carrying out asset management related activities - internal and contracted. Requirements are reviewed and staff reassessed at appropriate intervals aligned to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	3	A high standard of information is provided to staff in the field. Initiatives such as deploying computer based GIS into the field has improved the flow of information regarding assets. We have an open doo policy, whereby field staff are encouraged to discuss assigned tasks with engineering staff - there is no "firewall" between the "planning" and the "doing" personnel. This encourages the free flow of information from the field to the planners.		Widely used AM practice standards require that pertinent asset management information is effectively communicated to and from employees and other stakeholders including contracted service providers. Pertinent information refers to information required in order to effectively and efficiently comply with and deliver asset management strategy, plan(s) and objectives. This will include for example the communication of the asset management policy, asset performance information, and planning information as appropriate to contractors.	Top management and senior management representative(s), employee's representative(s), employee's trade union representative(s); contracted service provider management and employee representative(s); representative(s) from the organisation's Health, Safety and Environmental team. Key stakeholder representative(s).	Asset management policy statement prominently displayed on notice boards, intranet and internet; use of organisation's website for displaying asset performance data; evidence of formal briefings to employees, stakeholders and contracted service providers; evidence of inclusion of asset management issues in team meetings and contracted service provider contract meetings; newsletters, etc.
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	2	We have worked to improve the AMP structure and content, and it now covers much of this requirement. We recognise that there is still more capacity to develop in areas like asset class plans.		Widely used AM practice standards require an organisation maintain up to date documentation that ensures that its asset management systems (ie, the systems the organisation has in place to meet the standards) can be understood, communicated and operated. (eg, s 4.5 of PAS 55 requires the maintenance of up to date documentation of the asset management system requirements specified throughout s 4 of PAS 55).	The management team that has overall responsibility for asset management. Managers engaged in asset management activities.	The documented information describing the main elements of the asset management system (process(es)) and their interaction.
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	2	We examine good industry practice, and work with experienced vendors to determine the data that should be help in our AM systems. These systems are continually being improved upon, with examples being the coming rollout of a new GIS architecture that will enable much improved visibility of network connectivity.		Effective asset management requires appropriate information to be available. Widely used AM standards therefore require the organisation to identify the asset management information it requires in order to support its asset management system. Some of the information required may be held by suppliers. The maintenance and development of asset management information systems is a poorly understood specialist activity that is akin to IT management but different from IT management. This group of questions provides some indications as to whether the capability is available and applied. Note:	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Operations, maintenance and engineering managers	Details of the process the organisation has employed to determine what its asset information system should contain in order to support its asset management system. Evidence that this has been effectively implemented.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	3	Data within the AM systems is checked against inspection data from the field during the work pack recoridng process. Errors are corrected as discovered. Field software and supporting processes are being developed to publish asset information to the field where it can be directly checked and corrected.		The response to the questions is progressive. A higher scale cannot be awarded without achieving the requirements of the lower scale. This question explores how the organisation ensures that information management meets widely used AM practice requirements (eg, s 4.4.6 (a), (c) and (d) of PAS 55).	The management team that has overall responsibility for asset management. Users of the organisational information systems.	The asset management information system, together with the policies, procedure(s), improvement initiatives and audits regarding information controls.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	The organisation has not recognised the need to formally communicate any asset management information.	There is evidence that the pertinent asset management information to be shared along with those to share it with is being determined.	The organisation has determined pertinent information and relevant parties. Some effective two way communication is in place but as yet not all relevant parties are clear on their roles and responsibilities with respect to asset management information.	Two way communication is in place between all relevant parties, ensuring that information is effectively communicated to match the requirements of asset management strategy, plan(s) and process(es). Pertinent asset information requirements are regularly reviewed.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	The organisation has not established documentation that describes the main elements of the asset management system.	The organisation is aware of the need to put documentation in place and is in the process of determining how to document the main elements of its asset management system.	The organisation in the process of documenting its asset management system and has documentation in place that describes some, but not all, of the main elements of its asset management system and their interaction.	The organisation has established documentation that comprehensively describes all the main elements of its asset management system and the interactions between them. The documentation is kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	The organisation has not considered what asset management information is required.	The organisation is aware of the need to determine in a structured manner what its asset information system should contain in order to support its asset management system and is in the process of deciding how to do this.	The organisation has developed a structured process to determine what its asset information system should contain in order to support its asset management system and has commenced implementation of the process.	The organisation has determined what its asset information system should contain in order to support its asset management system. The requirements relate to the whole life cycle and cover information originating from both internal and external sources.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	There are no formal controls in place or controls are extremely limited in scope and/or effectiveness.	The organisation is aware of the need for effective controls and is in the process of developing an appropriate control process(es).	The organisation has developed a controls that will ensure the data held is of the requisite quality and accuracy and is consistent and is in the process of implementing them.	The organisation has effective controls in place that ensure the data held is of the requisite quality and accuracy and is consistent. The controls are regularly reviewed and improved where necessary.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	2	We have sized our asset management information systems to our foreseeable needs, based on industry good practice and by buying reputable products. We are still working with users to identify their ongoing needs, as developments continue. Currently we are focussing on identifying procedural improvements that will deliver efficiency and remove errors, such as streamlining our work pack process to reduce duplication of effort and records.		Widely used AM standards need not be prescriptive about the form of the asset management information system, but simply require that the asset management information system is appropriate to the organisations needs, can be effectively used and can supply information which is consistent and of the requisite quality and accuracy.	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Users of the organisational information systems.	The documented process the organisation employs to ensure its asset management information system aligns with its asset management requirements. Minutes of information systems review meetings involving users.
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	3	Our risk management process is clearly documented in the AMP, and is based on the principles of ISO 31000. Operational risks are regularly reviewed. Compliance to regulatory requirements is reported to the Board each quarter. High focus risks are given special attention. Our PSMS, which includes asset risks, is audited to NZS7901 - we have consistently passed these audits. We are updating the PSMS to move from compliance to NZS 7901:2008 to NZS 7901:2014		Risk management is an important foundation for proactive asset management. Its overall purpose is to understand the cause, effect and likelihood of adverse events occurring, to optimally manage such risks to an acceptable level, and to provide an audit trail for the management of risks. Widely used standards require the organisation to have process(es) and/or procedure(s) in place that set out how the organisation identifies and assesses asset and asset management related risks. The risks have to be considered across the four phases of the asset lifecycle (eg, para 4.3.3 of PAS 55).	The top management team in conjunction with the organisation's senior risk management representatives. There may also be input from the organisation's Safety, Health and Environment team. Staff who carry out risk identification and assessment.	The organisation's risk management framework and/or evidence of specific process(es) and/ or procedure(s) that deal with risk control mechanisms. Evidence that the process(es) and/or procedure(s) are implemented across the business and maintained. Evidence of agendas and minutes from risk management meetings. Evidence of feedback in to process(es) and/or procedure(s) as a result of incident investigation(s). Risk registers and assessments.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	3	Risk management is embedded in our day to day work , ranging from job safety analysis between stakeholders on a project to the "tail gates" and activities on site for a fault response. Feedback from these exercises can be directed either informally (via a conversation with an engineer) or formally (via meeting minutes, specific defects, or discussion at a management meeting).		Widely used AM standards require that the output from risk assessments are considered and that adequate resource (including staff) and training is identified to match the requirements. It is a further requirement that the effects of the control measures are considered, as there may be implications in resources and training required to achieve other objectives.	Staff responsible for risk assessment and those responsible for developing and approving resource and training plan(s). There may also be input from the organisation's Safety, Health and Environment team.	The organisations risk management framework. The organisation's resourcing plan(s) and training and competency plan(s). The organisation should be able to demonstrate appropriate linkages between the content of resource plan(s) and training and competency plan(s) to the risk assessments and risk control measures that have been developed.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	3	We reference ENA & EEA newsletters, and notifications from the Commerce Commission and Electricity Authority. Each manager is formally made aware of their compliance obligations at monthly management meetings, and through the Complywith compliance software system. We have a culture of discussing potential non-compliances with the relevant authorities.		In order for an organisation to comply with its legal, regulatory, statutory and other asset management requirements, the organisation first needs to ensure that it knows what they are (eg, PAS 55 specifies this in s 4.4.8). It is necessary to have systematic and auditable mechanisms in place to identify new and changing requirements. Widely used AM standards also require that requirements are incorporated into the asset management system (e.g. procedure(s) and process(es))	Top management. The organisations regulatory team. The organisation's legal team or advisors. The management team with overall responsibility for the asset management system. The organisation's health and safety team or advisors. The organisation's policy making team.	The organisational processes and procedures for ensuring information of this type is identified, made accessible to those requiring the information and is incorporated into asset management strategy and objectives

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	The organisation has not considered the need to determine the relevance of its management information system. At present there are major gaps between what the information system provides and the organisations needs.	The organisation understands the need to ensure its asset management information system is relevant to its needs and is determining an appropriate means by which it will achieve this. At present there are significant gaps between what the information system provides and the organisations needs.	The organisation has developed and is implementing a process to ensure its asset management information system is relevant to its needs. Gaps between what the information system provides and the organisations needs have been identified and action is being taken to close them.	The organisation's asset management information system aligns with its asset management requirements. Users can confirm that it is relevant to their needs.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	The organisation has not considered the need to document process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle.	The organisation is aware of the need to document the management of asset related risk across the asset lifecycle. The organisation has plan(s) to formally document all relevant process(es) and procedure(s) or has already commenced this activity.	The organisation is in the process of documenting the identification and assessment of asset related risk across the asset lifecycle but it is incomplete or there are inconsistencies between approaches and a lack of integration.	Identification and assessment of asset related risk across the asset lifecycle is fully documented. The organisation can demonstrate that appropriate documented mechanisms are integrated across life cycle phases and are being consistently applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	The organisation has not considered the need to conduct risk assessments.	The organisation is aware of the need to consider the results of risk assessments and effects of risk control measures to provide input into reviews of resources, training and competency needs. Current input is typically ad-hoc and reactive.	The organisation is in the process ensuring that outputs of risk assessment are included in developing requirements for resources and training. The implementation is incomplete and there are gaps and inconsistencies.	Outputs from risk assessments are consistently and systematically used as inputs to develop resources, training and competency requirements. Examples and evidence is available.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	The organisation has not considered the need to identify its legal, regulatory, statutory and other asset management requirements.	The organisation identifies some its legal, regulatory, statutory and other asset management requirements, but this is done in an ad-hoc manner in the absence of a procedure.	The organisation has procedure(s) to identify its legal, regulatory, statutory and other asset management requirements, but the information is not kept up to date, inadequate or inconsistently managed.	Evidence exists to demonstrate that the organisation's legal, regulatory, statutory and other asset management requirements are identified and kept up to date. Systematic mechanisms for identifying relevant legal and statutory requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	3	We have a comprehensive range of Policies, Standards and Procedures that address the entire asset life cycle from planning, design, construction, commissioning, operation, maintenance, renewal and removal. These policies are strictly controlled by a document management system, and are regularly reviewed.		Life cycle activities are about the implementation of asset management plan(s) i.e. they are the "doing" phase. They need to be done effectively and well in order for asset management to have any practical meaning. As a consequence, widely used standards (eg, PAS 55 s 4.5.1) require organisations to have in place appropriate process(es) and procedure(s) for the implementation of asset management plan(s) and control of lifecycle activities. This question explores those aspects relevant to asset creation.	Asset managers, design staff, construction staff and project managers from other impacted areas of the business, e.g. Procurement	Documented process(es) and procedure(s) which are relevant to demonstrating the effective management and control of life cycle activities during asset creation, acquisition, enhancement including design, modification, procurement, construction and commissioning.
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	2	We have a comprehensive range of Inspection and Maintenance Policies and Standards, programmes etc, to manage the implementation of asset management decisions. We are developing improvements to how we monitor outcomes. Business change is managed via a change management system.		Having documented process(es) which ensure the asset management plan(s) are implemented in accordance with any specified conditions, in a manner consistent with the asset management policy, strategy and objectives and in such a way that cost, risk and asset system performance are appropriately controlled is critical. They are an essential part of turning intention into action (eg, as required by PAS 55 s 4.5.1).	Asset managers, operations managers, maintenance managers and project managers from other impacted areas of the business	Documented procedure for review. Documented procedure for audit of process delivery. Records of previous audits, improvement actions and documented confirmation that actions have been carried out.
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	2	We have clearly specified AM objectives that are regularly assessed, with action taken to correct variances. We inspect assets using best practice techniques and monitor the rectification of defects. We are in the process of improving the efficiency and accuracy of the life cycle management activities.		Widely used AM standards require that organisations establish implement and maintain procedure(s) to monitor and measure the performance and/or condition of assets and asset systems. They further set out requirements in some detail for reactive and proactive monitoring, and leading/lagging performance indicators together with the monitoring or results to provide input to corrective actions and continual improvement. There is an expectation that performance and condition monitoring will provide input to improving asset management strategy, objectives and plan(s).	A broad cross-section of the people involved in the organisation's asset-related activities from data input to decision-makers, i.e. an end-to end assessment. This should include contactors and other relevant third parties as appropriate.	Functional policy and/or strategy documents for performance or condition monitoring and measurement. The organisation's performance monitoring frameworks, balanced scorecards etc. Evidence of the reviews of any appropriate performance indicators and the action lists resulting from these reviews. Reports and trend analysis using performance and condition information. Evidence of the use of performance and condition information shaping improvements and supporting asset management strategy, objectives and plan(s).
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	2	We use root cause analysis techniques to investigate incidents where the potential for harm or major damage was high. Defects that are raised in our defect database are assigned an owner, who is responsible for managing the return of the asset to a compliant state. We are working towards ensuring that the lessons learned during the closeout of incidents are adequately processed through into all of our asset management systems and policies.		Widely used AM standards require that the organisation establishes implements and maintains process(es) for the handling and investigation of failures incidents and non-conformities for assets and sets down a number of expectations. Specifically this question examines the requirement to define clearly responsibilities and authorities for these activities, and communicate these unambiguously to relevant people including external stakeholders if appropriate.	The organisation's safety and environment management team. The team with overall responsibility for the management of the assets. People who have appointed roles within the asset-related investigation procedure, from those who carry out the investigations to senior management who review the recommendations. Operational controllers responsible for managing the asset base under fault conditions and maintaining services to consumers. Contractors and other third parties as appropriate.	Process(es) and procedure(s) for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances. Documentation of assigned responsibilities and authority to employees. Job Descriptions, Audit reports. Common communication systems i.e. all Job Descriptions on Internet etc.

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2020 – 31 March 2030**
Asset Management Standard Applied	**N/A**

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	The organisation does not have process(es) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning but currently do not have these in place (note: procedure(s) may exist but they are inconsistent/incomplete).	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning. Gaps and inconsistencies are being addressed.	Effective process(es) and procedure(s) are in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	The organisation does not have process(es)/procedure(s) in place to control or manage the implementation of asset management plan(s) during this life cycle phase.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during this life cycle phase but currently do not have these in place and/or there is no mechanism for confirming they are effective and where needed modifying them.	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process for confirming the process(es)/procedure(s) are effective and if necessary carrying out modifications.	The organisation has in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process, which is itself regularly reviewed to ensure it is effective, for confirming the process(es)/ procedure(s) are effective and if necessary carrying out modifications.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	The organisation has not considered how to monitor the performance and condition of its assets.	The organisation recognises the need for monitoring asset performance but has not developed a coherent approach. Measures are incomplete, predominantly reactive and lagging. There is no linkage to asset management objectives.	The organisation is developing coherent asset performance monitoring linked to asset management objectives. Reactive and proactive measures are in place. Use is being made of leading indicators and analysis. Gaps and inconsistencies remain.	Consistent asset performance monitoring linked to asset management objectives is in place and universally used including reactive and proactive measures. Data quality management and review process are appropriate. Evidence of leading indicators and analysis.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	The organisation has not considered the need to define the appropriate responsibilities and the authorities.	The organisation understands the requirements and is in the process of determining how to define them.	The organisation are in the process of defining the responsibilities and authorities with evidence. Alternatively there are some gaps or inconsistencies in the identified responsibilities/authorities.	The organisation have defined the appropriate responsibilities and authorities and evidence is available to show that these are applied across the business and kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2020 – 31 March 2030**
Asset Management Standard Applied	**N/A**

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
105	Audit	What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	**3**	We have a document management system in place that specifies regular review and amendment of specific Policies, Standards, Procedures etc. The audit requirements for the Safety Management System overlapped some of the AM procedures. We are reviewing our asset management processes in FY2020/21, part of which will be setting up a review cycle.		This question seeks to explore what the organisation has done to comply with the standard practice AM audit requirements (eg, the associated requirements of PAS 55 s 4.6.4 and its linkages to s 4.7).	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit teams, together with key staff responsible for asset management. For example, Asset Management Director, Engineering Director. People with responsibility for carrying out risk assessments	The organisation's asset-related audit procedure(s). The organisation's methodology(s) by which it determined the scope and frequency of the audits and the criteria by which it identified the appropriate audit personnel. Audit schedules, reports etc. Evidence of the procedure(s) by which the audit results are presented, together with any subsequent communications. The risk assessment schedule or risk registers.
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	**2**	Asset failure or defects found during inspection are recorded and communicated via our defects database. Our field staff work closely with our operations team to repair emergency work, and to deal with critical defects in a rapid manner. Defects are assigned owners who are responsible to return the asset to the correct condition. We are working towards the discipline of Root Cause Analysis, and the improving the consistency of actions taken in response to an assert failure. While we can guarantee that all staff have		Having investigated asset related failures, incidents and non-conformances, and taken action to mitigate their consequences, an organisation is required to implement preventative and corrective actions to address root causes. Incident and failure investigations are only useful if appropriate actions are taken as a result to assess changes to a businesses risk profile and ensure that appropriate arrangements are in place should a recurrence of the incident happen. Widely used AM standards also require that necessary changes arising from preventive or corrective action are made to the asset management system.	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit and incident investigation teams. Staff responsible for planning and managing corrective and preventive actions.	Analysis records, meeting notes and minutes, modification records. Asset management plan(s), investigation reports, audit reports, improvement programmes and projects. Recorded changes to asset management procedure(s) and process(es). Condition and performance reviews. Maintenance reviews
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	**3**	We work to apply continuous improvement across all areas of the business. Our safety requirements and asset practices are regulalry updated to meet or surpass good industry practice. Maintenance and Inspection standards are written to ensure that the risk of in-service asset failure is minimised. We subscibe to the NEDERs equipment failure database, and incorporate information on failures into our practices. We track costs against various		Widely used AM standards have requirements to establish, implement and maintain process(es)/procedure(s) for identifying, assessing, prioritising and implementing actions to achieve continual improvement. Specifically there is a requirement to demonstrate continual improvement in optimisation of cost risk and performance/condition of assets across the life cycle. This question explores an organisation's capabilities in this area—looking for systematic improvement mechanisms rather that reviews and audit (which are separately examined).	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. Managers responsible for policy development and implementation.	Records showing systematic exploration of improvement. Evidence of new techniques being explored and implemented. Changes in procedure(s) and process(es) reflecting improved use of optimisation tools/techniques and available information. Evidence of working parties and research.
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	**3**	We activeley monitor external sources of advice or comment such as the EEA and NEDERs asset failure database to inform our asset management practice. Staff are involved in industry forums and up to date training in their area of expertise. We encourage staff to talk with colleagues in other companies and industries, and invite vendors to demonstrate and discuss new techniques and technologies, and engage with other EDB's and suppliers and manufacturers on latest practice and equipment. We actively trial new technologies to verify the utility for our operation. We engage with forums and businesses that are outside our traditional peers in the electrical industry, such as working with District Councils on our GIS project.		One important aspect of continual improvement is where an organisation looks beyond its existing boundaries and knowledge base to look at what 'new things are on the market'. These new things can include equipment, process(es), tools, etc. An organisation which does this (eg, by the PAS 55 s 4.6 standards) will be able to demonstrate that it continually seeks to expand its knowledge of all things affecting its asset management approach and capabilities. The organisation will be able to demonstrate that it identifies any such opportunities to improve, evaluates them for suitability to its own organisation and implements them as appropriate. This question explores an organisation's approach to this activity.	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. People who monitor the various items that require monitoring for 'change'. People that implement changes to the organisation's policy, strategy, etc. People within an organisation with responsibility for investigating, evaluating, recommending and implementing new tools and techniques, etc.	Research and development projects and records, benchmarking and participation knowledge exchange professional forums. Evidence of correspondence relating to knowledge acquisition. Examples of change implementation and evaluation of new tools, and techniques linked to asset management strategy and objectives.

				Company Name	Network Waitaki Ltd		
				AMP Planning Period	1 April 2020 – 31 March 2030		
				Asset Management Standard Applied	N/A		

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
105	Audit	What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	The organisation has not recognised the need to establish procedure(s) for the audit of its asset management system.	The organisation understands the need for audit procedure(s) and is determining the appropriate scope, frequency and methodology(s).	The organisation is establishing its audit procedure(s) but they do not yet cover all the appropriate asset-related activities.	The organisation can demonstrate that its audit procedure(s) cover all the appropriate asset-related activities and the associated reporting of audit results. Audits are to an appropriate level of detail and consistently managed.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	The organisation does not recognise the need to have systematic approaches to instigating corrective or preventive actions.	The organisation recognises the need to have systematic approaches to instigating corrective or preventive actions. There is ad-hoc implementation for corrective actions to address failures of assets but not the asset management system.	The need is recognized for systematic instigation of preventive and corrective actions to address root causes of non compliance or incidents identified by investigations, compliance evaluation or audit. It is only partially or inconsistently in place.	Mechanisms are consistently in place and effective for the systematic instigation of preventive and corrective actions to address root causes of non compliance or incidents identified by investigations, compliance evaluation or audit.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	The organisation does not consider continual improvement of these factors to be a requirement, or has not considered the issue.	A Continual Improvement ethos is recognised as beneficial, however it has just been started, and or covers partially the asset drivers.	Continuous improvement process(es) are set out and include consideration of cost risk, performance and condition for assets managed across the whole life cycle but it is not yet being systematically applied.	There is evidence to show that continuous improvement process(es) which include consideration of cost risk, performance and condition for assets managed across the whole life cycle are being systematically applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	The organisation makes no attempt to seek knowledge about new asset management related technology or practices.	The organisation is inward looking, however it recognises that asset management is not sector specific and other sectors have developed good practice and new ideas that could apply. Ad-hoc approach.	The organisation has initiated asset management communication within sector to share and, or identify 'new' to sector asset management practices and seeks to evaluate them.	The organisation actively engages internally and externally with other asset management practitioners, professional bodies and relevant conferences. Actively investigates and evaluates new practices and evolves its asset management activities using appropriate developments.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

Schedule 14a Mandatory Explanatory Notes on Forecast Information

(In this Schedule, clause references are to the Electricity Distribution Information Disclosure Determination 2012 – as amended and consolidated 3 April 2018.)

1. This Schedule requires EDBs to provide explanatory notes to reports prepared in accordance with clause 2.6.6.

2. This Schedule is mandatory—EDBs must provide the explanatory comment specified below, in accordance with clause 2.7.2. This information is not part of the audited disclosure information, and so is not subject to the assurance requirements specified in section 2.8.

Commentary on difference between nominal and constant price capital expenditure forecasts (Schedule 11a)

3. In the box below, comment on the difference between nominal and constant price capital expenditure for the current disclosure year and 10 year planning period, as disclosed in Schedule 11a.

Box 1: Commentary on difference between nominal and constant price capital expenditure forecasts

Network Waitaki Limited has consistent with previous years used predictions for CPI as extracted from the Reserve Bank of New Zealand Monetary Policy Statement, February 2020.

For CY+1 no CPI adjustment has been made. From CY+2 to CY+10 a CPI forecast of 2% per annum was used as projected for 2021.

Commentary on difference between nominal and constant price operational expenditure forecasts (Schedule 11b)

4. In the box below, comment on the difference between nominal and constant price operational expenditure for the current disclosure year and 10 year planning period, as disclosed in Schedule 11b.

Box 2: Commentary on difference between nominal and constant price operational expenditure forecasts

Network Waitaki Limited has consistent with previous years used predictions for CPI as extracted from the Reserve Bank of New Zealand Monetary Policy Statement February 2020.

For CY+1 no CPI adjustment has been made. From CY+2 to CY+10 a CPI forecast of 2% per annum was used as projected for 2021.

9.2 APPENDIX B - BOARD CERTIFICATION OF AMP

Certification for Year end Disclosures

Pursuant to Schedule 18

Clause 2.9.2 of section 2.9

Electricity Distribution Information Disclosure Determination 2012

We, Messers. C.J. Dennison and A.J. Wood, being directors of Network Waitaki Limited certify that, having made all reasonable enquiry, to the best of our knowledge:

a) the information prepared for the purposes of clauses 2.6.1, 2.6.2, 2.6.6 and 2.7.2 of the Electricity Distribution Information Disclosure Determination 2012 in all material respects comply with that determination; and

b) the historical information used in the preparation of Schedules 11a to 12d, and Schedule 14a has been properly extracted from Network Waitaki Limited's accounting and other records sourced from its financial and non-financial systems, and that sufficient appropriate records have been retained.

C.J. Dennison	A.J. Wood
Chairman of the Board of Directors	Chairman of the Audit & Risk Committee
Date: 30th March 2020	Date: 30th March 2020