Network Waitaki
Powering North Otago

Asset Management Plan

1 April 2018 – 31 March 2028

Public Safety
Telarc. Registered
Public Safety NZS 7901

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Foreword

It gives me great pleasure to introduce the thirteenth publication of Network Waitaki's Asset Management Plan (AMP). The AMP aims to inform readers comprehensively on all actions pertaining to our network.

Network Waitaki is a rural consumer trust-owned electricity distribution business. The management, maintenance and operation of the network is an integral part of our day-to-day operations. In addition, the growth in demand for electricity has necessitated the planning for and investment in new and upgraded distribution assets.

This AMP intends to provide comfort to our consumers, regulators, and stakeholders that Network Waitaki takes its responsibility of providing a safe, reliable, efficient, and cost-effective electricity network service very seriously. In this regard the AMP details the service levels to consumers that we adhere to and the service targets that we strive towards. Our focus on the health and safety of our workers and the public has seen as an increase in the number of disruptions to supply due to the reduced use of live line techniques necessitating an increase in planned outages.

Similarly, our focus is to maintain security of supply to our continuously growing consumer base by planning for and investing in assets with a view not only on immediate but also long-term future demand expectations.

We value comments or questions that you might have on anything raised in this AMP. Please feel welcome to send it to service@networkwaitaki.co.nz, for the attention of Tod Trotman.

Graham Clark

Chief Executive

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1. Introduction

Welcome to our Asset Management Plan (AMP) for the planning period 1st April 2018 to 31st March 2028. 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 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 programme.

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 and management functions 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 programme.

To manage the risk associated with operating an electrical 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 our use of faults data from the UK via the National Equipment Defect Reporting System (NEDeRS) database to assist in asset decision making, and staff training from within the industry e.g. Electricity Engineers Association (EEA) courses, and from other industries e.g. reliability centred maintenance training through the aviation industry.

The implementation of a new ESRI GIS software system in the past year is providing opportunities to improve the coordination of disparate data, which will help to increase performance in this area. We are engaging with experienced users such as district councils to learn how to get the most out of the system. The integration of multiple sources of asset information is a key improvement for the next year, which will enable greater insight into the operation and lifecycle of our assets.

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	21991
Length of 33 kV lines and cables	222 km
Length of 11 kV lines and cables	1333 km
Length of LV lines and cables	340 km
Number of zone substations	16
Number of connected consumers	12872
Coincident max demand	52 MW

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

We have traditionally managed our asset life with robust condition based renewals. We are improving and strengthening these practices, with the use of new technology such as the Thor hammer acoustic pole tester and the Portascan pole density scanner for analysis of poles. 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 trialling a 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 primary driver for development in the last few years has been growth in the irrigation load, which has moved our peak load from Winter to Summer. We have also seeing some modest growth in the industrial sector. Much of the irrigation growth is in the more remote rural areas of the network, which has had the effect of absorbing much of the spare capacity in some areas. Projects are underway to remediate this effect, and to optimise the spare capacity around the network.

We are forecasting continued growth across the network, as shown in Table 2.

Table 2 - Load forecasts for the planning period

GXP	Maximum Demand (MW) – Summer period										
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Twizel	2	2.1	2.1	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.7
Waitaki	10.8	11.1	12.1	12.4	18.5	19.0	22.6	23.3	24.0	24.7	25.5
Oamaru	39.2	42.3	44.3	46.7	43.6	44.9	43.2	44.5	45.8	47.0	48.3
Black Point	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1

We are currently facing a capacity constraint on the Transpower 110 kV transmission lines that supply into Oamaru GXP. This threatens to restrict the available capacity to connect new load in the lower Waitaki, as well as affecting other areas in South Canterbury. We are working with Transpower and other stakeholders to address this situation.

At the network level, we are dealing with this constraint, by continuing with our development of a 33 kV subtransmission network that will enable the migration of load from Oamaru GXP to an expanded Waitaki GXP. More details of these developments are included in Section 6.

1.1.4 Our summary of forecast expenditure

The summary of our forecast expenditure for the planning period is shown in Table 3 below.

These estimates are considered to be fairly accurate for the first 5 years of the planning period, with the figures being indicative only beyond that point. Many of our investment, maintenance and renewal decisions will be very dependent the outcomes of inspections in the first 5 years, consumer growth, and other issues that are currently out of our control, including the Transpower level solutions to the constraint on the Waitaki to Oamaru 110 kV transmission lines.

Table 3 - Summary of forecast expenditure

Forecast Expenditure ($)										
Capital Expenditure	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Consumer connection	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000
System growth	4,210,000	3,330,000	5,180,000	2,000,000	1,400,000	1,780,000	2,280,000	580,000	580,000	580,000
Asset replacement and renewal	3,890,000	3,005,000	2,025,000	2,025,000	1,865,000	1,905,000	1,755,000	1,755,000	1,755,000	1,755,000
Asset relocations	0	0	0	0	0	0	0	0	0	0
Reliability, safety, and environment: Quality of supply	782,000	454,000	204,000	319,000	269,000	249,000	179,000	169,000	139,000	139,000
Reliability, safety, and environment: Legislative and regulatory	286,000	230,000	230,000	240,000	240,000	10,000	10,000	10,000	10,000	10,000
Other reliability, safety, and environment	0	0	0	0	0	0	0	0	0	0
Subtotal Capital Expenditure:	10,418,000	8,269,000	8,889,000	5,834,000	5,024,000	5,194,000	5,474,000	3,764,000	3,734,000	3,734,000
Operational Expenditure										
Service interruptions & emergencies	388,000	388,000	388,000	388,000	388,000	388,000	388,000	388,000	388,000	388,000
Vegetation management	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000
Routine & corrective maintenance & inspection	891,000	891,000	768,000	768,000	768,000	768,000	768,000	768,000	768,000	768,000
Asset replacement & renewal	460,000	460,000	460,000	460,000	460,000	460,000	460,000	460,000	460,000	460,000
Subtotal Operational Expenditure:	2,309,000	2,309,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000
Total Expenditure	**12,727,000**	**10,578,000**	**11,075,000**	**8,020,000**	**7,210,000**	**7,380,000**	**7,660,000**	**5,950,000**	**5,920,000**	**5,920,000**

1.2 Purpose

The purpose of this AMP is to align the management of our assets with our corporate objectives and our mission of "owning and operating a safe, reliable, and efficient distribution system that meets the evolving needs of our consumers, while supporting the economic growth and wellbeing of the community we serve."

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 consumer and stakeholder preferences for prices, supply reliability, and public safety
- 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
- ensure that physical, commercial, and regulatory risks are correctly managed throughout the life of the asset.

1.2.1 Approval date

The 2018-2028 AMP was approved by the Network Waitaki Ltd.'s (NWL) Board of Directors on 26 March 2018. 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 consumers
- 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:

- 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.
- 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.
- The impact on system operation and asset management as a result of the change to our live line working policies.
- In the urban areas, it is expected that load changes will be due to the gradual uptake of new technologies (such as plugin electric vehicles) and migration from traditional heat sources to heat pumps.

1.4 Document structure

Figure 1 below illustrates the structure of this AMP.

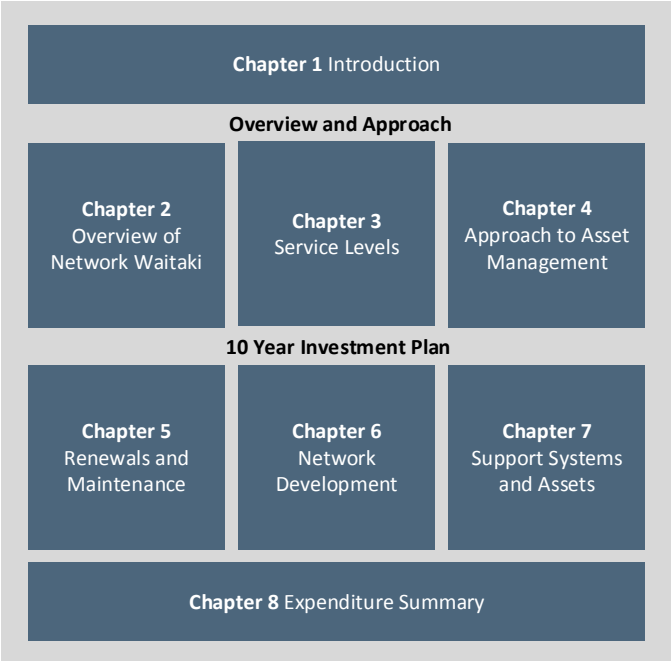

Figure 1 - Structure of Network Waitaki Ltd 2018-2028 AMP

2. Overview of Network Waitaki

This chapter describes who we are and 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 consumers:** an overview of our consumers including total number of connections; our major consumers 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) has a single shareholder, 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 and management functions of the business. The Trust has five trustees. Every three years, three trustees are elected by electricity consumers connected to the network. The *trust deed* holds all trustees collectively accountable to the New Zealand judiciary for compliance with the deed.

We operate primarily as an Electrical Distribution Business (EDB), although other business opportunities within the utilities and related sectors may be investigated. We also, where appropriate, support the growth and well-being of the wider community.

2.1.1 Mission statement and corporate objectives

Our mission statement and corporate objectives require us to manage our assets efficiently and effectively to facilitate the delivery of a safe and reliable supply of electricity to our consumers. To achieve this, we have aligned our asset management practices and objectives with our corporate objectives and mission.

Our mission statement is:

> *To be a locally-owned and operated electricity distribution company that provides the benefits of local consumer trust ownership by:*
>
> - *owning and operating a safe, reliable, and efficient distribution system that meets the evolving needs of its consumers*
> - *supporting the economic growth and wellbeing of the community it serves.*

Our corporate objectives cover eight areas:

Health and safety

- To ensure our activities cause no harm to staff, contractors, the public and property.
- To operate health and safety systems that meet all of our regulatory requirements.

Shareholders

- To pursue policies which will secure the Company's financial position as a consumer trust-owned business for present and future consumers.

Consumers

- To provide consumers with the delivery of a safe, efficient, and reliable electricity distribution system.

Efficient use of resources

- To promote the efficient use of energy as required under the Energy Companies Act 1992 clause 36 (2).
- To efficiently and effectively utilise the resources of the Company.

Public and social responsibility

- To be a good corporate citizen by being a law-abiding company.
- To support activities that provide economic growth in the area serviced by the network.

Employer

- To be an equal opportunity employer.
- To recruit and retain competent, motivated, committed staff.
- To provide training opportunities that will enable individual staff members to attain their fullest potential in the service of the Company.

Environmental

- To ensure compliance with the Resource Management Act.
- To operate in a way that minimises the impact on the environment.

Compliance

- To continue with our comprehensive compliance programmes currently in place and to comply with all obligations under relevant legislation and regulators.

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

2.1.2 Corporate documents

The Company maintains a number of internal and external documents as part of its annual business planning process. The main ones 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.
- Ten-year Network Development Plan which details the demand growth forecast 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.

2.1.3 Organisation structure

The Trustees appoint the Board to govern the company and they in turn appoint the Chief Executive Officer (CEO). Ultimate accountability for 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 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 Board 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 outage statistics, network performance, and work programme 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.

On 31 March 2015, Network Waitaki Contracting Ltd (NWCL) amalgamated with NWL. Prior to this NWCL was a wholly owned subsidiary of NWL, operating at arm's length. Following a review of the future of the contracting business, and recognition of the efficiencies of an in-house field service provider, it was determined that amalgamation offered benefits in the form of reduced overheads and improved alignment of the goals of the management and field delivery sides of the business.

Most of the annual works programme is undertaken by the contracting group, which has a staff of approximately 35 people located in Oamaru.

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

2.1.4 Asset management governance

NWL has a relatively small staffing establishment intended to resource a narrow business model i.e. operational management of a lines business. Our organisation structure encourages team work across defined roles and areas, which reduces the risk of information silos forming, and encourages ownership of planning and delivering network performance by all staff. An example of this approach is that the entire engineering team, from the Network Team Leader to the Engineering Officer, staff the Control Room on a roster basis.

The following is a description of management responsibilities.

Chief Executive Officer

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

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

Chief Operating Officer

The Chief Operating Officer is responsible for overseeing and coordinating the network side of the business, including asset management, network operations, metering, network support and contracting.

Finance Manager

The Finance Manager is responsible for the preparation of annual budgets with input from all areas of the business as well as providing reports that enable actual costs to be monitored against budgeted costs.

Network Operations Team Leader

The Network Operations Team Leader has responsibility for the day to day operation of the network and the implementation of the annual capital and maintenance work programmes.

Planning and Asset Manager

The Planning and Asset Manager is responsible for network planning and development of the asset management process, and the development of standards and policies.

Regulatory and Network Support Manager

The Regulatory and Network Support Manager is responsible for the preparation of disclosures, as well as for customer engagement, and providing administrative support to the operations and planning/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 programme is given the focus that it requires.

2.1.4.1 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 Sanction for Expenditure (SFE). This provides the Board with technical detail and presents the business case for the proposal. Following the completion of a major project, the Board will review any associated SFE to confirm delivery on the benefits stated.

All roles within the company also have approved delegated financial authorities. Any expenditure beyond these limits requires specific approval from a manager or the CEO or the Board, depending on the absolute amount of the expenditure.

Work is generally prioritised in the following order:

- Emergency works
- Planned consumer works
- Planned maintenance works
- Planned capital works

2.1.4.2 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 programme can be achieved by tracking our progress with monthly formal reporting on the physical and financial progress of the work programme against our plans and budgets. This reporting also includes reporting on operational measures 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, such as 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, although coastal erosion is starting to impact in some areas of the region, with local roading networks being affected. We are monitoring these situations with respect to our assets in the 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, with 23% of residents being over 65 years old. 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 this is an ongoing concern.

2.2.1 Live line policy

The Health and Safety at Work Act 2015 came into force in April 2016. Key components of the act and how it is interpreted by WorkSafe New Zealand triggered Network Waitaki to review how operational risks were considered in the planning of live line work. Live line work is where special techniques and insulated equipment are used to carry out physical work on overhead electrical networks without disconnecting the source of electricity. The alternative to this is isolating the worksite from the source of electricity and electrically connecting equipment being worked on to earth (known as “isolated and earthed). The conclusion of that review was that the practice of live line work at that time did not meet the requirements of the Health and Safety at Work Act 2015.

A new policy regarding working on live electrical equipment was introduced in June 2016. This policy was reviewed and revised in December 2017.

This policy requires that the default position for planning any work on the network is that it should be carried out with the network isolated and earthed. Live line work can then be considered if a formal risk assessment shows that the selected, approved live line method “minimises risk to employees, the public, and public property”.

[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

Furthermore, execution of any live line work that is justified based on a risk assessment must be approved by both the Network Operations Team Leader and the Contracting Manager prior to being scheduled.

NWL Contracting can field up to three live line crews for High Voltage (HV) work, and prior to the policy change 45-50% of our HV maintenance and construction work was carried out safely using live line techniques. Since the new policy has come into effect, the amount of work carried out using live line techniques has dropped to approximately 15%, based on analysis of operating logs. Figure 2 shows graphically the percentage change in work from live line to de-energised.

This in turn has an effect on the number of planned outages that are required to develop and maintain the network, which affects our performance targets and measures (see section 3 for more information on service targets).

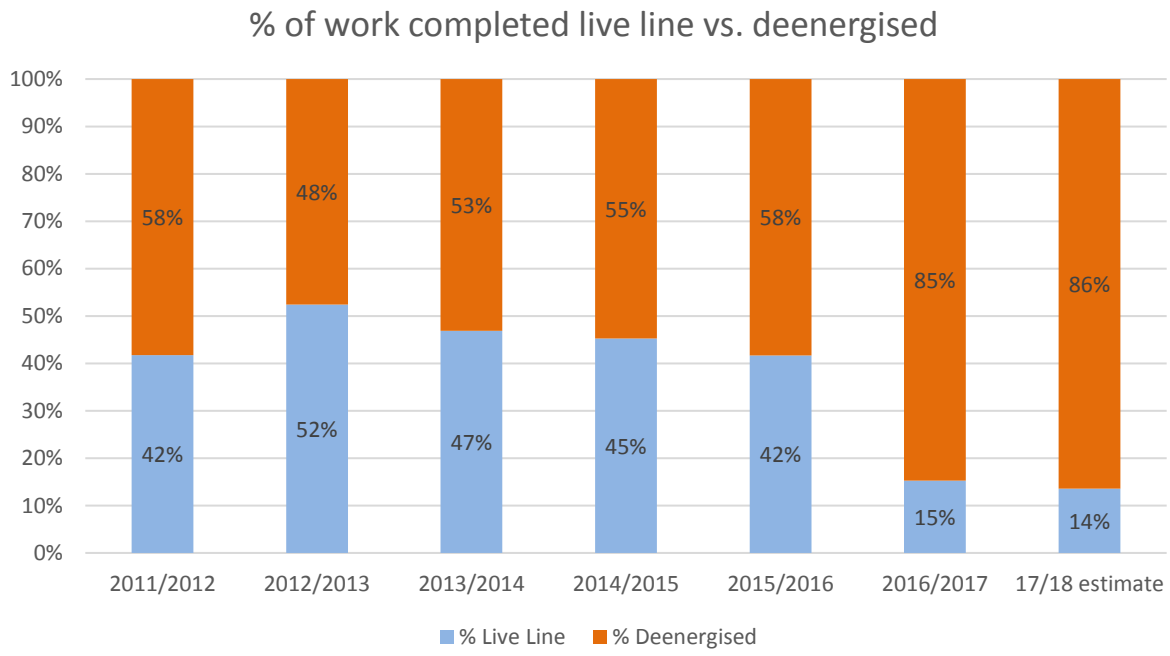

Figure 2 - Graph of proportion of live line work vs. de-energised line work

2.3 Stakeholders

2.3.1 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 4 below, along with their requirements, how those requirements are identified and how they are incorporated into our asset management practices.

Table 4 Network Waitaki stakeholders

Stakeholder	Requirements	Identification of requirements	Requirements incorporated into asset management practices
Consumers	Safety; reliability; effective communication particularly during emergencies and faults; emergency and lifeline preparedness.	Bi-annual customer surveys; face to face interviews with major consumers; 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.
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
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.
Councils	Alignment with district and regional requirements; statutory compliance.	Meetings; consultations on regional and district plans.	Network development planning for system and load growth.

Stakeholder	Requirements	Identification of requirements	Requirements incorporated into asset management practices
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
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
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;

Stakeholder	Requirements	Identification of requirements	Requirements incorporated into asset management practices
Board of Directors	Governance; risk management; 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.

2.3.2 Managing conflicting interests

Any conflicts in stakeholder requirements are normally resolved by prioritising on a risk and obligation basis. All stakeholders want to minimise the risk of property damage or injury to the public, consumers, staff, or other workers and so safety concerns are given the highest priority.

Compliance issues are given the next priority. This includes compliance with technical requirements, such as power quality, as well as business compliance.

Next priority are issues that involve our obligations to maintain supply to existing consumers at the service levels set out in the SCI.

Issues related to the ongoing viability of the company are given next priority, in order for our management of the network to be sustainable.

The reliability of the electricity supply is given fifth priority because a reliable electricity supply is highly valued by our community.

2.4 Our consumers

2.4.1 Load profiles

A summary of the load served by our network for the year 2016/17 is shown in the table below:

Table 5 - Summary of consumer profile 2013-2018

Year	Number of Connected Customers	Coincident Maximum Demand	Percentage of ICPs in Urban Areas	Energy Delivered (GWh)
2012-2013	12278	46	50	227
2013-2014	12310	50	50	245
2014-2015	12431	51	50	237
2015-2016	12581	51	54	291
2016-2017	12710	52	54	242
2017-2018	12872	52	54	272

As shown in Figure 3 the energy delivered to our consumers 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.

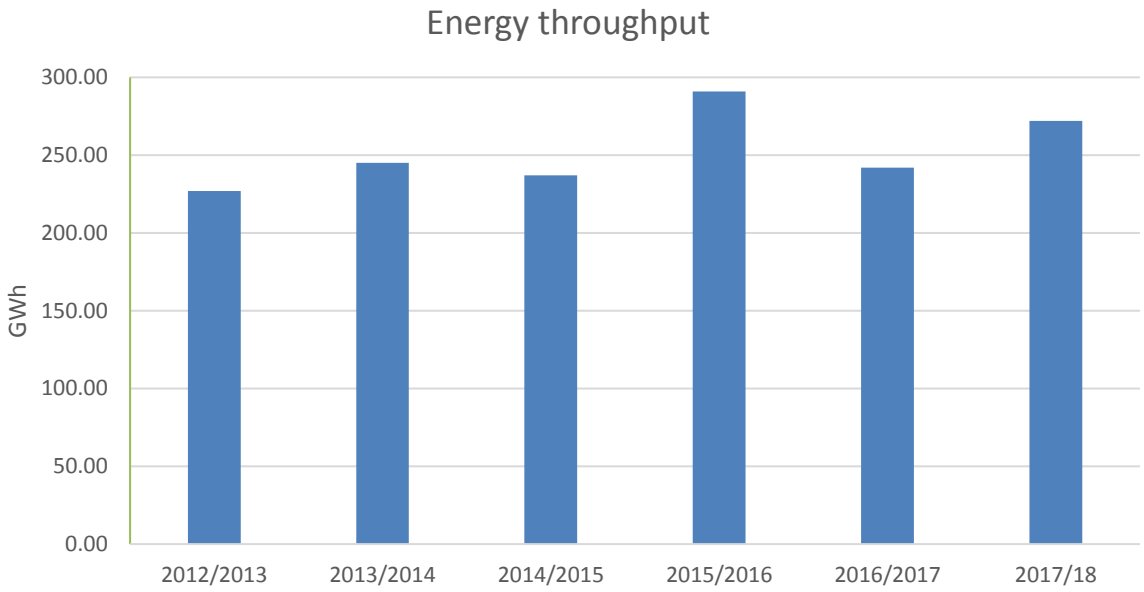

Figure 3 – Energy per annum delivered by the NWL network

2.4.2 Major consumers

NWL has two consumers who could be considered as large by national standards. These are:

Table 6 Large consumers on NWL network

Consumer	Supply Arrangement
North Otago Irrigation Company (NOIC)	Supplied from the dedicated Black Point GXP with *N* level security and no 11 kV interconnection to NWL's network.
Alliance Pukeuri Works	Supplied from the Pukeuri Substation via dedicated dual 11 kV connections to their own 11 kV network. Pukeuri is an *N-1* level security substation with multiple 11 kV substation interconnections. The 11 kV interconnections cannot supply the full load of the works but do provide sufficient capacity to maintain the freezers and essential services.

In addition, there are a number of smaller consumers by national standards that are nonetheless considered to be important to the local economy and community. We endeavour to engage with these consumers 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 consumers, which aids in this consultation process.

2.5 Overview of our network

We are predominantly a rural network supplying the North Otago, Hakataramea, and Ahuriri regions as shown in Figure 4 below.

Bulk supply of electricity is taken from Transpower's national grid at our 4 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 consumers 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 consumers.

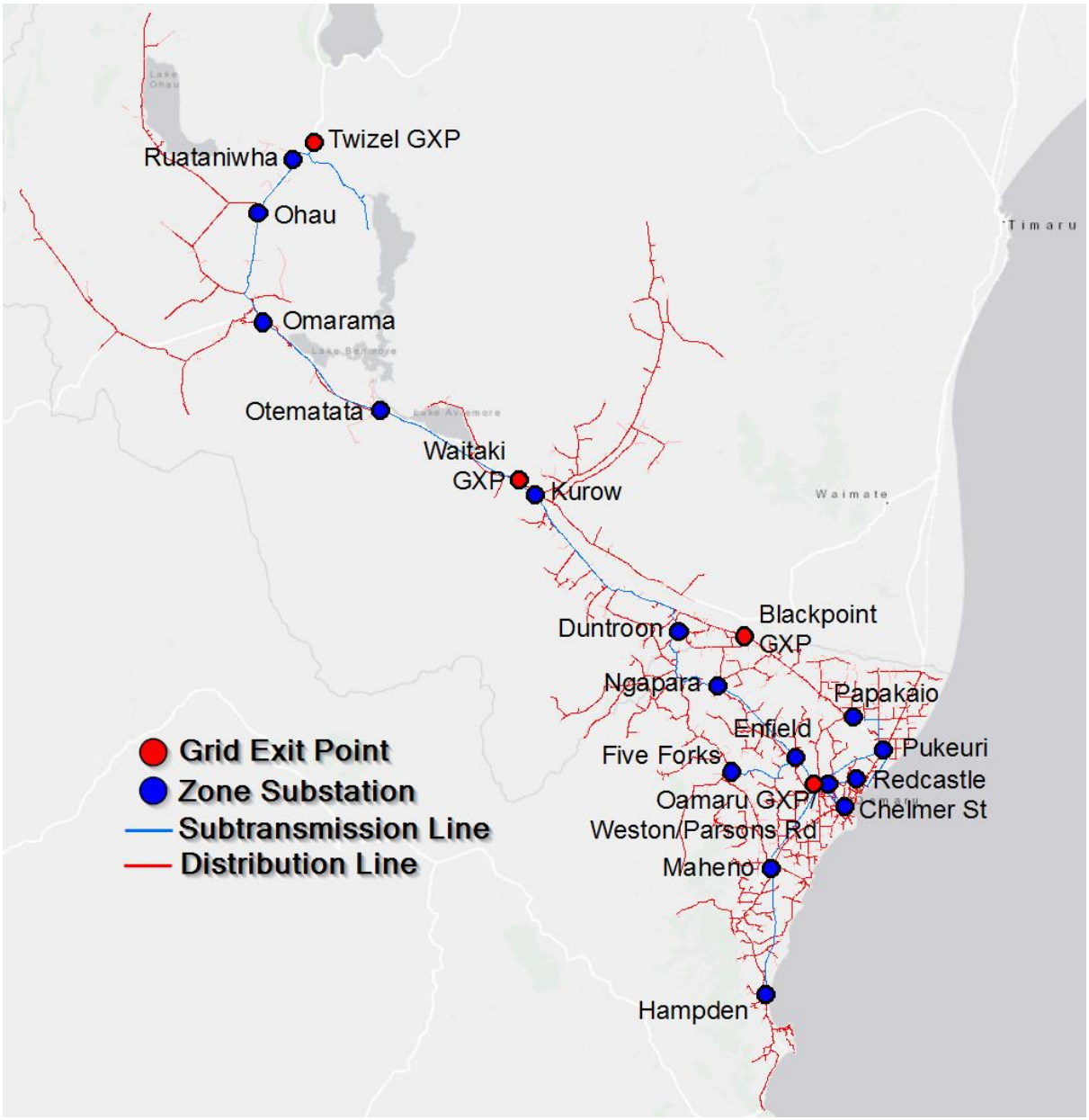

Figure 4 Map of NWL area of supply and network extent

We connect to the Transpower network at four Grid Exit Points (GXPs). The characteristics of these are listed in the table below:

Table 7 - Characteristics of NWL grid exit points as at 31 march 2018

Supply point	Voltage	Firm capacity	Max demand 2017/18	Zone Substations supplied
Oamaru GXP	110/33 kV	40 MVA	41.2 MW	10
Black Point GXP	110/11 kV	25 MVA	11.2 MW	0
Waitaki GXP	11/33 kV	24 MVA	11.7 MW	4
Twizel GXP	220/33 kV	20 MVA	2.3 MW	2

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.

2.6 Our assets

Key features of the network are shown in Table 8 below:

Table 8 - Key features of NWL network

Parameter	Value
Number of Poles	21991
Length of 33 kV lines and cables	222 km
Length of 11 kV lines and cables	1333 km
Length of LV lines and cables	340 km
Number of zone substations	16
Number of connected consumers	12872
Coincident max demand	52 MW

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

3. 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.
- **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.

3.1 Stakeholder engagement

As illustrated in Section 2.3 we have many stakeholders with varying requirements. We identify these requirements through consumer surveys, face to face interviews with major consumers, 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 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.

3.1.1 Consumer surveys

We undertake regular representative surveys to enable a better understanding of our consumers' energy priorities. The most recent survey was in February 2017, where 400 mass market consumers were interviewed by telephone. The survey respondents were selected randomly from our full consumer database. 70% of the respondents were urban and 30% were rural, which corresponds with our overall urban to rural mix.

At the same time, we conducted face to face interviews with 12 of our major consumers, picked at random from a sample of our top 25 users (by volume of electricity used). This survey had representative respondents from large industrial, commercial, and farming (mostly irrigation and dairy farming operations) users.

The key findings from this survey were:

- The service attributes most highly valued by consumers are continuity of supply and network maintenance.
- The vast majority of respondents who had experienced unexpected outages indicated that supply had been restored within an acceptable timeframe.
- The vast majority of respondents who had experienced planned outages indicated that supply had been restored within the notice time.

- The vast majority of respondents are satisfied with reliability of supply.
- The majority of respondents regarded cost as being the main barrier to installation of distributed generation.
- A reasonable number of respondents expressed an unwillingness to install smart meters.

We have used these key findings to inform our asset management practices, investment plans and service level measures and targets.

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, or minimise the hazard 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:

- That 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.
- The promotion of a health and safety culture amongst all of our staff and workers.
- Any identified health and safety hazard is 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 have employed newspaper and radio safety advertisements to raise public awareness of the hazards associated with working or playing in the proximity of electricity reticulation assets.
- 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) system for incident investigation.

- The adoption of the Vault safety management system for recording and analysing workplace safety and training data.
- Involvement in the EEA safety climate project, "Orange Umbrella".
- Wide ranging staff involvement on our health and safety committee.
- Involvement in community safety initiatives such as Safer Waitaki.
- Introduction of vehicle training for staff in 4WD and 2WD vehicles.
- We regularly review 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 objective measures to support decision making, such as Portascan and Thor hammer pole tests.
- Where appropriate we use technology to reduce the risk to our field staff, for instance using pole mounted GoPro cameras to reduce the amount of pole climbing that inspection crews have to carry out.
- Installing GPS tracking systems with "man-down" functionality in all vehicles.
- Coordinating with neighbouring EDBs to align safety procedures where possible.

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 the following:

- Monitoring of staff safety behaviours for compliance with targets, such as:
    - 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 such as the removal of red tag poles from the network.

Our targets for safety performance are:

- Zero lost time injuries per annum.
- A downward trend in the number of reported public.
- A downward trend in the number of deliberate or accidental unsafe acts by the public.
- Zero privately owned HV service lines disconnected because of unsafe condition.
- At least 36 safety audits on work sites by staff per year.

3.2.4 Performance

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

An example of this is to follow the trend of public incidents and accidents on our network, as shown in Table 9 below.

Table 9 - Public incidents and accidents

Summary of electrical accidents and incidents involving the public						
Activities	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Rural/Farming activities	17	19	19	11	19	16
Construction work	8	13	8	2	7	7
Trades	0	5	1	3	0	0
Leisure & sports	2	0	2	0	0	0
Consumer premises issues (Tree cutting/house fires, etc.)	6	1	7	5	11	11
Vandalism	0	1	0	2	1	1
Motor vehicles	13	13	19	20	19	19
Total	**46**	**52**	**56**	**43**	**57**	**54**

As can be seen from the historical figures, the number of incidents involving the public has increased since 2012. The bulk of the increase in recent years is unintended contact with our buried cables or overhead lines, usually equipment such as diggers, farm machinery or irrigators.

These are lagging indicators, and while they are of some use, 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 2017 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.

We also have staff trained to act in the role as internal auditors, and carry out several internal audits annually. These auditors assist in identifying opportunities to improve our processes, and identifying 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.

Safety Performance Table November FYTD 2017

Lagging Safety Indicators

First Aid Injuries		Medical injuries		Discomfort, Pain, Injury		Lost Time Injuries		Totals	
Month	1	Month	0	Month	1	Month	0	Month	2
Year	1	Year	0	Year	8	Year	3	Year	12
								Last year	9

	Month	FYTD	Month	FYTD	Achieved Month	Achieved FYTD
Vehicle Damage	0	19	< 2	< 16	✓	✗
Equipment Damage	1	11	< 4	< 32	✓	✓
Environmental Report	0	0	0	0	✓	✓
Red Tag Poles	2		0 over 3 months		✗	

Leading Safety Indicators

	Month	FYTD	Month	FYTD	Month	FYTD
Work Observations	22	204	> 15	120	✓	✓
Engineer site audits	4	25	> 3	24	✓	✓
Director Field Visits	0	2	4 per year			
Near Miss Reports	0	2				
Safety Communications:						
Network & Industry	50	241				

Human Resources

Sick Leave Hours	Month	FYTD	Totals
Contracting	125	1191.5	1784.5
Network	9	593	

ACC Hours	Month	FYTD	
Contracting	112	2086	2086
Network	0	0	

Stand down Hours	Month	FYTD	
After 13 hours	44.5	99.5	190.5
After 70 hours	9	91	

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 HV service lines were disconnected because of unsafe condition 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 and specifying 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.

The number of lost time incidents for the 12 months to March 2017 is 3. This has not met our target for performance, and we are working to improve this performance.

We recognise that the use of LTI's as a safety metric is a lagging indicator, and we are seeking to add other leading indicators that will help achieve our outcome of maintaining a safe work environment.

3.3 Service level: reliability

Reliability of our network is of high importance to us and to our consumers. Our consumer surveys have revealed that the service attributes most highly valued by consumers 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 consumers 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. Due to the recent trend upwards in SAIDI and SAIFI resulting from reduced use of live line procedures (See Section 2.2.1) we will be working to limit the effect of planned outages on our consumers.

3.3.2 Methods

We will meet our reliability objectives by:

- deploying automated and remotely controlled devices, such as reclosers, sectionalisers, and tie-switches to limit the number of consumers affected by faults
- building ties between neighbouring spurs to form open rings as load growth makes this economically viable. This strategy enables adjacent feeders to provide back-up capacity during planned or unplanned outages
- leveraging subtransmission developments that are driven by load growth to increase the number of zone substations with supplies available from alternative GXPs
- optimising the location of isolation devices to minimise the number of consumers affected by particular outages

- monitoring, analysing, and benchmarking service level performance and reacting quickly when adverse trends appear
- examining network performance after major events such as snow storms to gain insight in to 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 consumers, and aim to improve our resilience against them.

3.3.3 Measures and targets

The two indicators 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 consumer 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 consumer 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 consumer per year. It should be noted that, while an individual consumer 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 consumers. 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 a consumer owned EDB we are exempt from this default price-quality path regulation, however we believe that it makes good sense to subscribe to the same methodology used by regulated 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 targets are normalised. 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 setting targets 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.

In the 2018-2019 Statement of Corporate Intent, we adjusted our targets for these reliability measures from a fixed number to a target band. We believe that this approach serves as a more useful measure for performance than a single fixed value. The revised targets are shown in Table 10 below.

Table 10 - New SAIDI and SAIFI target bands.

Network Non-Financial Performance Measures			
	31 March 2019	*31 March 2020*	*31 March 2021*
System Average Interruption Duration Index (SAIDI)	150 to 250	150 to 250	150 to 250
System Average Interruption Frequency Index (SAIFI)	1.0 to 2.0	1.0 to 2.0	1.0 to 2.0

The use of live line techniques was one of the key strategies used to meet our network reliability targets. Since the change in work practice the SAIDI and SAIFI measures for the network have increased, as work that would have not required an outage in the past now results in lost customer minutes.

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 consumers as soon as possible should an unplanned outage occur. Our restoration time targets are shown in Table 11 below.

Table 11 - Restoration time targets

Consumer type	Maximum time to restore power	Maximum number of power interruptions
Urban	6 hours	4 events per annum
Rural	10 hours	10 events per annum
Remote Rural	12 hours	20 events per annum

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, and have been presented for both actual and normalised results

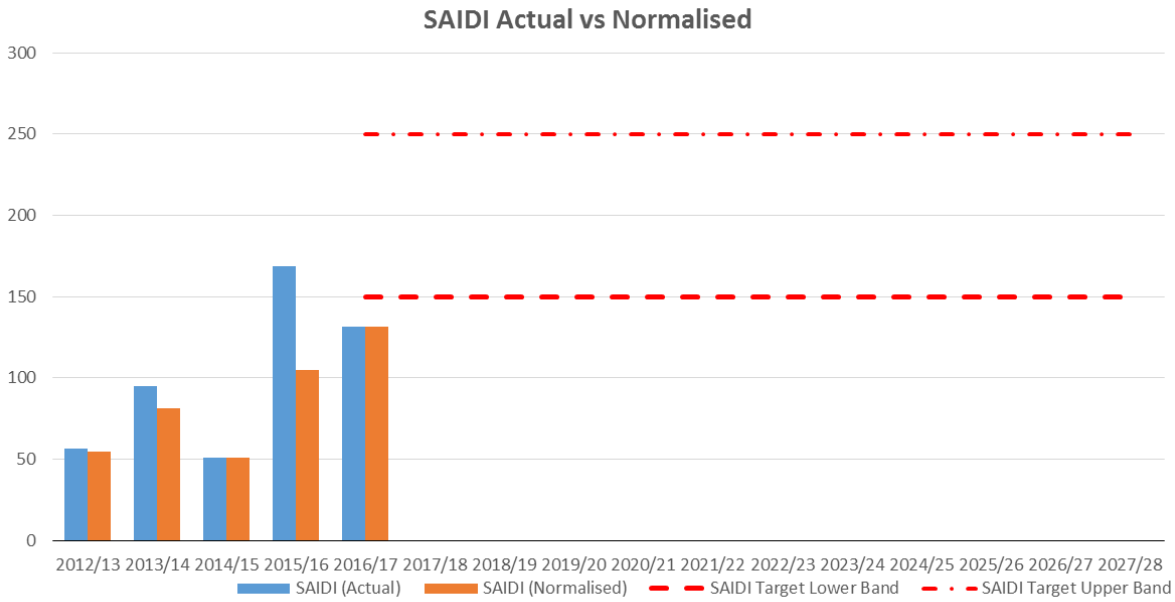

Figure 6 Historical SAIDI performance compared to target

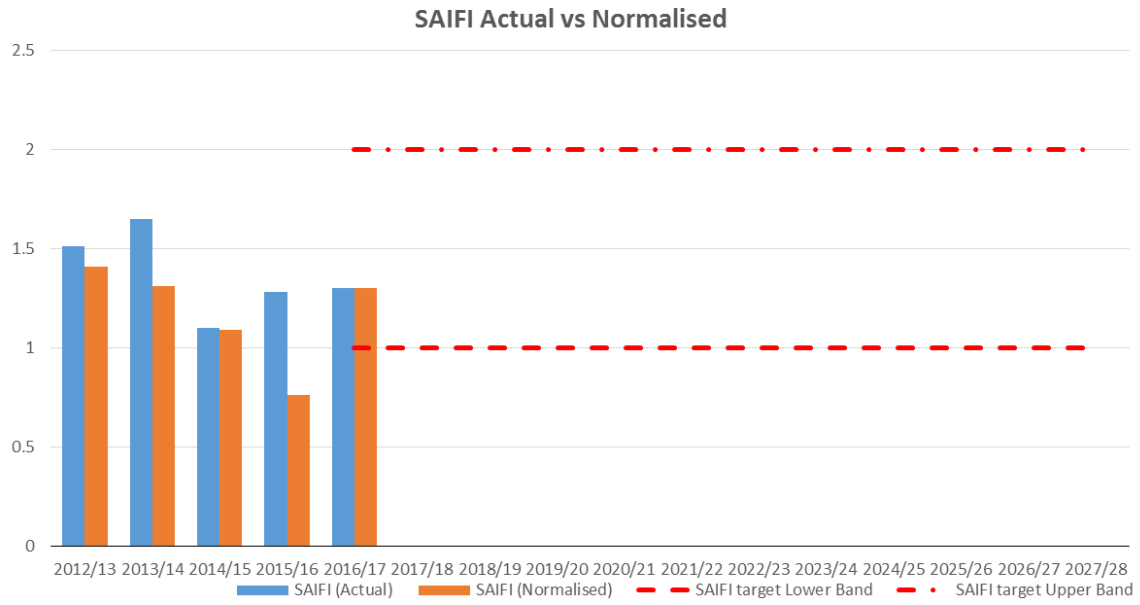

Figure 7 Historical SAIFI performance compared to target

As can be seen from the SAIDI graph in Figure 6 the performance of the network in both SAIDI and SAIFI is within or below our target band. We have undertaken a lot of work to increase reliability and resilience, and data shows that we have improved the performance of the network.

Due to the reduction in live line work and the corresponding increase in planned outages, there has been a noticeable increase in SAIDI from 2015 onwards, (although the total for the year is still beneath our target band as per our SCI). The effect on SAIFI is not as obvious, but is still present.

In the coming year, we will review the ongoing effect of the policy change on SAIDI and SAIFI and may adjust the targets. In addition, we are adjusting our work practices to reduce the impact of the reduction of live line work by:

- reducing the number of individual outages and making more efficient use of them by coordinating and combining as many tasks as possible within a given outage. This happens where possible now, but it is expected that better awareness of future planned work and improvements in scheduling tools will further improve the situation.
- Increased use of our truck mounted mobile generator to minimise the effect of an outage, where the cost is considered appropriate to the reduction in impact.

3.4 Service level: economic efficiency

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

3.4.2 Methods

To ensure that our economic efficiency targets are achieved we:

- have initiated a process to include the cost of losses when evaluating network upgrades and renewals
- regularly optimise loading between our GXPs to improve the efficiency of energy transmission to consumers
- 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:

- Loss ratio
- Distribution transformer utilisation
- Operational expenditure per connection point.

3.4.3.1 Loss ratio-measure and target

Loss ratio is a measure of the amount of energy that is lost on our network between the delivery point at Transpower Grid Exit Points to the connected consumers metering point.

We consider loss ratio to be a valid performance measurement indicator as the minimisation of losses benefits all parties in the energy supply chain, including consumers.

Energy losses on the network can be reduced through good design, asset selection and operation of the network.

Our standing target of 6% is consistent with the long run average past performance and industry best practice.

3.4.3.2 Loss ratio performance

The graph below in Figure 8 illustrates our historic performance for loss ratio and future targets.

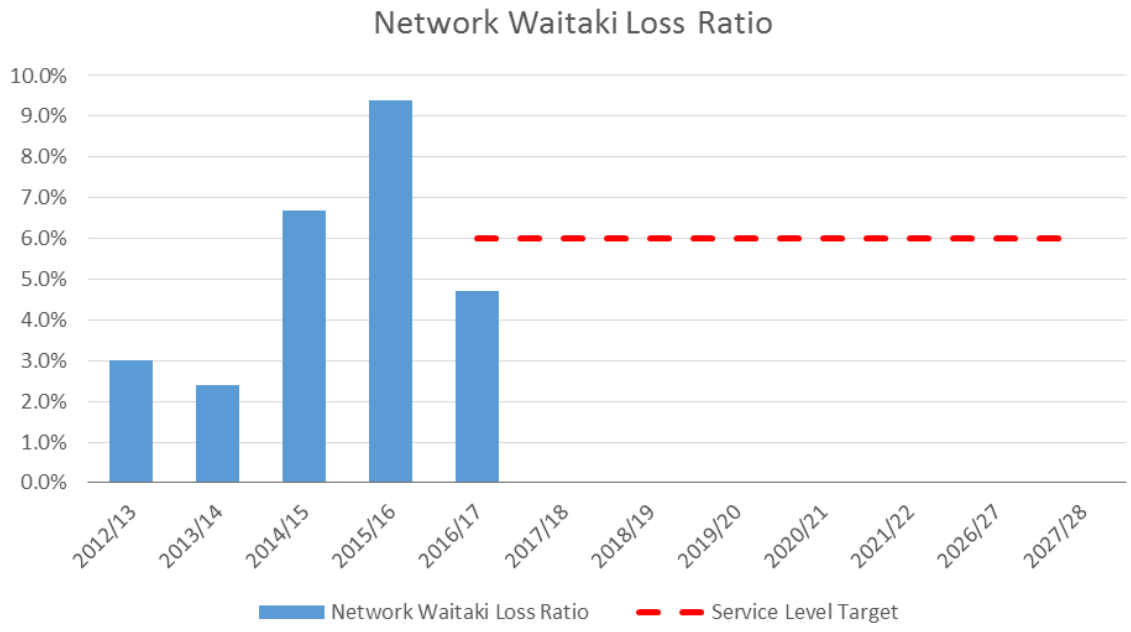

Figure 8 Historical performance of loss ratio compared to our future targets

The 2016/17 calculated loss ratio of 4.7% is lower (better) than our target

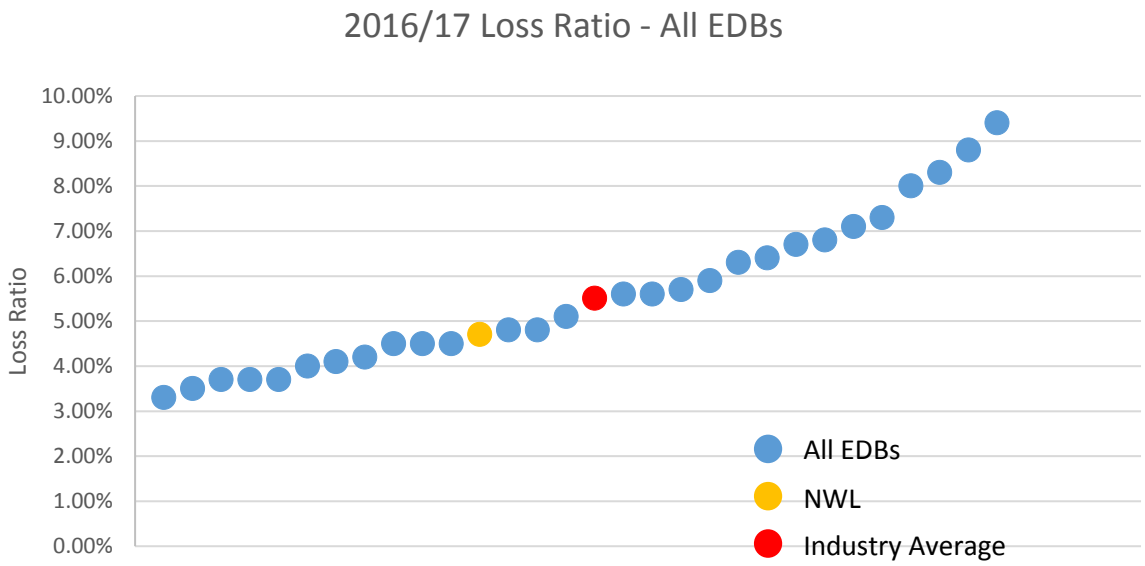

Figure 9 – 2016/17 Loss Ratio compared to all EDBs

Our 2016/17 Loss ratio is lower (better) than the industry average and is considered satisfactory and appropriate for our network.

3.4.3.3 Distribution transformer utilisation–measure and target

This is an indicator of the efficient use of network equipment. Distribution transformer utilisation (DTU) is calculated on the coincident maximum demand from our GXP's versus the installed capacity of all distribution transformers on our network.

Tracking this statistic ties into our asset management objective of ensuring all asset lifecycle activities are systematically planned with a long-term view towards minimising lifecycle costs. If higher transformer utilisation can be achieved, then the number of our transformers is effectively optimised for the requirements of our network.

We believe that our standing target of 27% for transformer capacity utilisation reflects the predominately rural nature of most of our network, where the opportunities for connection of multiple ICPs to a single transformer are limited to the distance between consumers.

3.4.3.4 Distribution transformer utilisation-performance

Referring to Figure 10 below, there is a strong correlation between System Maximum Demand and DTU which indicates that this has a significant influence on year to year variation between 25% and 32%.

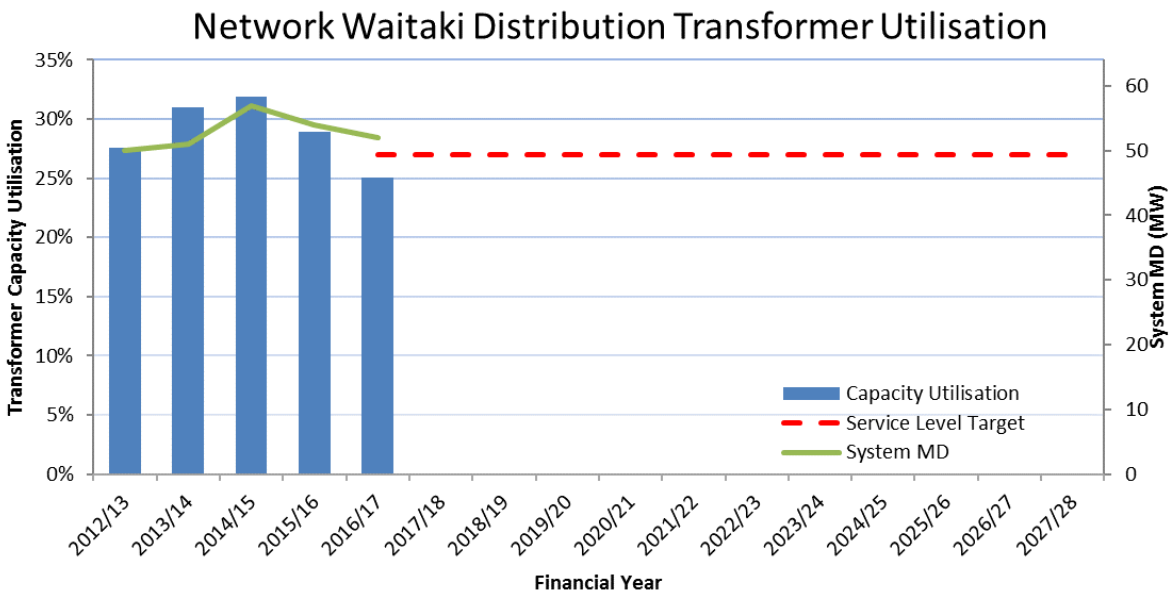

Figure 10 Historical performance of distribution transformer capacity utilisation

A further test of our performance against this metric is to compare our distribution transformer utilisation against that of other EDBs. We would expect to be consistent with EDBs that have a similar network makeup to ours, with a mixture of urban and rural consumers. This comparison (based on figures disclosed by the Commerce Commission in 2017) is shown in Figure 11 below.

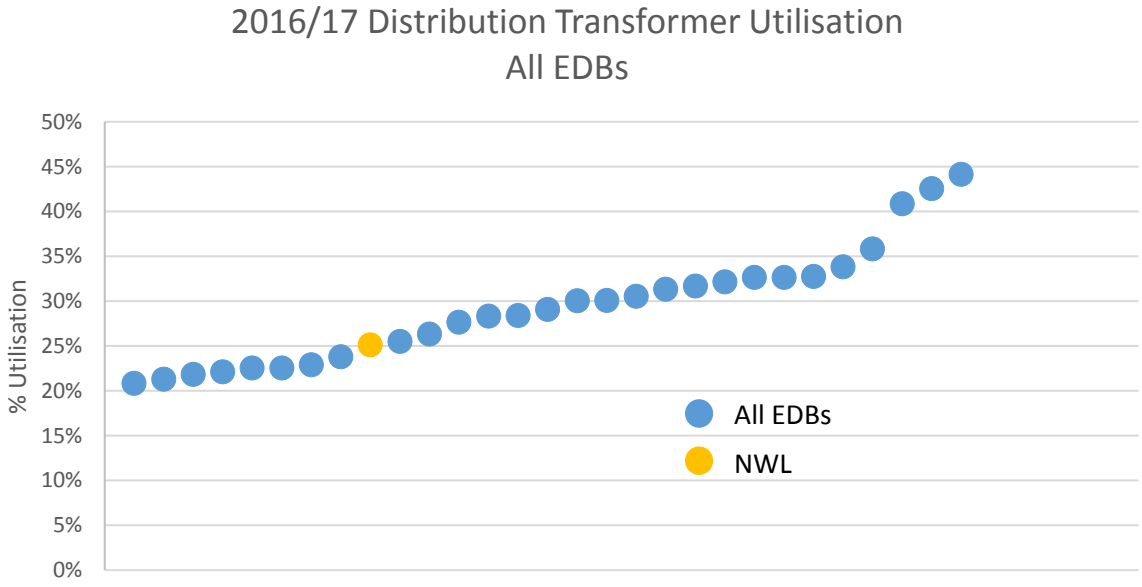

Figure 11 - 2016/17 Distribution transformer capacity utilisation compared to All EDBs

At 25% utilisation we sit at the top end of the lower third for the 2016/17 period which puts our performance in the same band as EDBs with a similar load type and distribution. At the high end of the graph are the distributors with mainly urban load and at the low end are those with a high proportion of rural. We consider our distribution transformer utilisation to be satisfactory and appropriate for our network.

3.4.3.5 OPEX costs 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 our forecast OPEX budgets and include an allowance for inflation.

Tracking this measure links our asset management processes to consumer 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.

Our service level target (Figure 12) is based on known Operational expenditure in 2018/19 and is adjusted for 2% inflation.

3.4.3.1 Operational expenditure per connection point - performance

The graph shown in Figure 12 below illustrates the historical performance of our Operational Expenditure per Connection Point, and our future target.

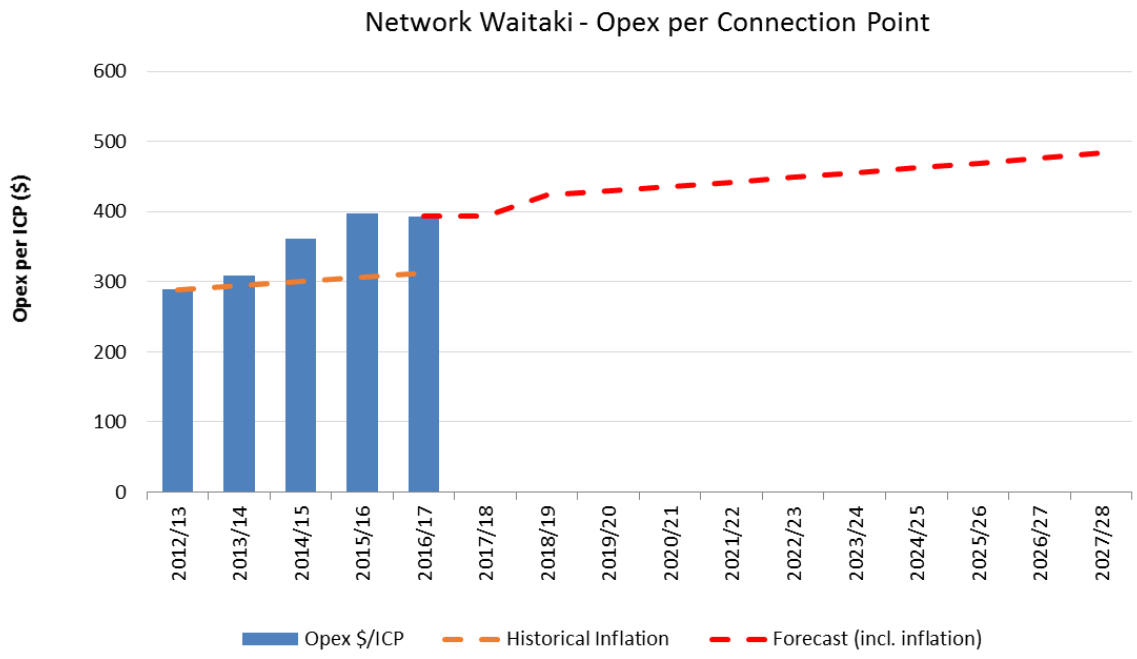

Figure 12 Historical performance of our operational expenditure per connection point compared to our future targets.

Figure 13 shows a comparison between our 2016/17 OPEX per connection point and that of all other EDBs in New Zealand.

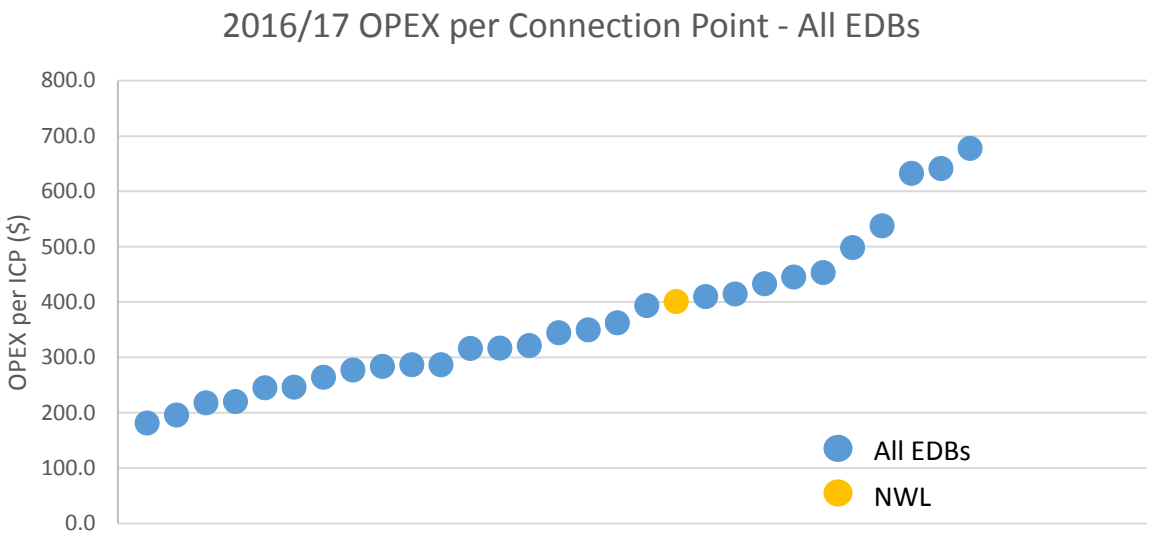

Figure 13 NWL operational expenditure per connection point performance compared to all EDBs

We believe that we have the balance between operational costs and network reliability correct, as shown by our OPEX per ICP being in keeping with the rest of the industry. Analysis of the base data for the graph in Figure 13 shows that EDBs with similar network conditions are grouped around our position.

4. 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 sections outlines the ways in which we are working to improve our asset management capability.

4.1 Asset Management process

The process that we apply to planning our Asset Management is illustrated in Figure 14 below.

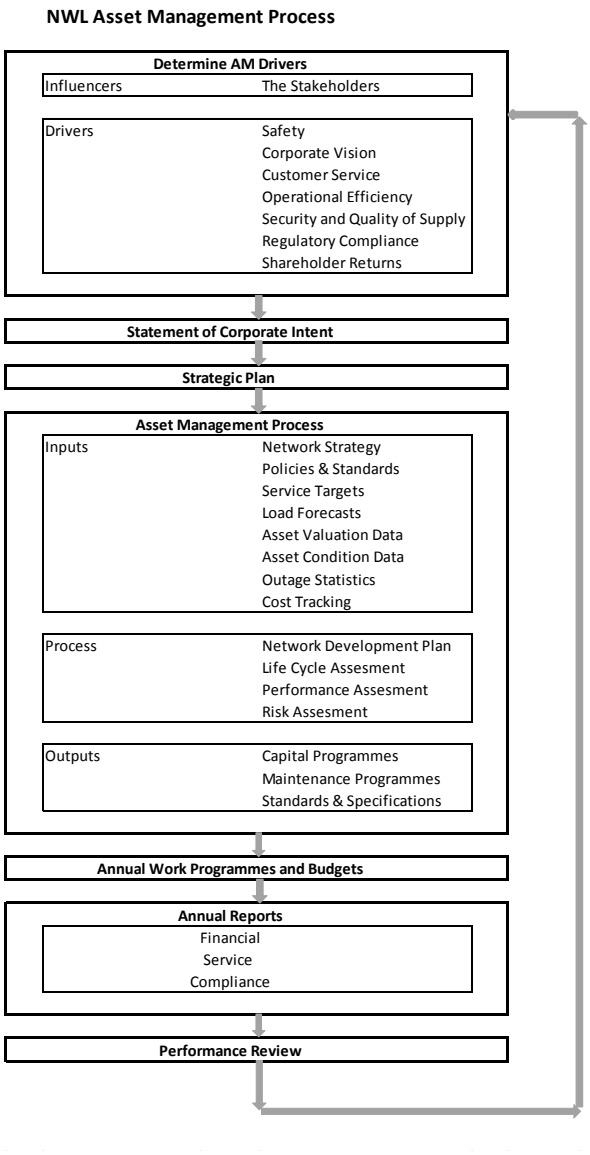

Figure 14 NWL asset management process

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 below.

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 consumers, 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 consumers ultimately benefit from well planned investments.
- We will construct all future subtransmission lines at either 66 kV or 33 kV, depending on location, in line with its subtransmission development strategy, with the expectation of operating at 33 kV in the short-term.
- 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 retain our internal contracting business for fault restoration, maintenance, inspections, and growth and renewal work.
- We will ensure that our contracting business has a well-developed recruitment/training plan.
- We will continue to engage suitable contractors to maintain our communications and SCADA networks, and other specialist systems.
- 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.

4.1.2.4 Delivery of works programme

With approved budgets available, where practical our engineering staff commence design for projects in the financial year prior to the works programme. This allows a seamless planning process between our designers, project managers and our 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 programme is monitored by the Engineering Team Leader and the Contracting Manager and their teams throughout the year, with careful attention paid to the resourcing and prioritisation of work.

Where it becomes obvious that a particular piece of work may not be completed before the end of the financial year in which it was issued, that work will be reassessed and may be either:

- reissued with the same priority the following year
- given a higher priority
- removed from the work programme.

This last situation is uncommon, and usually only occurs when the job analysis indicates that in the time since the job was issued the original job has been superseded by another job, e.g. a job to paint a distribution transformer is made irrelevant by a project to replace the transformer with a larger one because of growth.

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 12.

Table 12 - Key asset management reporting mechanisms

Reporting line	Reporting mechanisms and content
The Trust to consumers and wider community	The Trust's AGM. The Trust's annual report and audited accounts. The company website includes the AMP, Company Annual Report, and other disclosure documents.
The Board to the Trust	Company annual report, includes Chairman and Chief Executive's statements and audited accounts. Annual information disclosure. 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.
Chief Operating Officer to Chief Executive and the Board	Annual report on budget and major projects Monthly report includes year to date performance and progress against budget. Individual reports on major projects. Daily updates on areas of concern
Contracting Manager to Chief Operating Officer	Weekly progress meeting Monthly meetings on progress to budget
Internal and external contractors to Project Engineers	Regular progress meetings on individual projects

4.1.3 The Asset Management Plan

This Asset Management Plan (AMP) provides a summary of the information contained in these internal planning documents, to enable stakeholders to assess our asset management practices. Our AMP is also the main document for communicating our asset management practices and planning processes to our stakeholders.

In particular, the objectives of this AMP are to:

- link the asset management processes to consumer and stakeholder preferences for prices, supply reliability, and public safety
- 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
- ensure that physical, commercial, and regulatory risks are correctly managed throughout the life of the asset.

The AMP is written once the majority of the works programme for the following year has been planned, and the budgets have been approved by the Board. This provides certainty to the stakeholders on the plans contained within the AMP.

4.2 Asset lifecycle management

Investment in the life cycle of assets in operation on our network falls into four categories:

- Planned routine and preventative maintenance
- Reactive maintenance
- Planned renewal or refurbishment

4.2.1 Planned routine and preventative maintenance

We currently operate a time-based inspection and preventative maintenance programme, where all assets are either maintained at regular intervals or inspected at regular intervals to identify defects such as wear and tear. The frequency of inspections is tailored to focus the highest scrutiny on our most critical assets, such as subtransmission systems. We are moving towards using more condition based maintenance planning, and the integration of Asset Management data in new software packages will help with this initiative.

This sort of work may include cleaning and maintenance of a circuit breaker, or the retightening of hardware on a particular section of line. The purpose of planned routine or preventative maintenance is to ensure that an asset can continue to provide its original function through to its design life.

Non-critical defects that are found during inspections or operation of the network are presently managed on a standalone database. Work on asset management data systems is moving to having defects linked directly against the relevant network assets in our GIS. This will allow better visibility of our progress rectifying defects, integrating work packs, ongoing maintenance and fault costs per asset, and better reporting. It will also streamline the process of entering defects, as tools will be available in the field for staff to directly enter information.

4.2.2 Reactive maintenance

Unplanned fault based maintenance not only includes responding to faults but also to incipient fault situations, and critical safety situations. Examples of critical safety situations include such things as disconnecting power to property which is on fire, or isolating a section of line for a car versus pole event.

NWL operates a 24-hour fault service that provides prompt and effective response to faults and emergency situations.

Our faults are presently managed in our works management system. Follow-up analysis of network asset performance occurs in a separate database. We are developing the ability to relate the faults data to asset performance directly through the use of our GIS, which will strengthen our ability to draw conclusions on network performance from our captured faults data.

4.2.3 Planned replacement and renewal

Planned replacement or renewal activities are undertaken to ensure network safety and reliability. This strategy uses network safety, asset criticality, serviceability, performance, economic viability, and the environmental consequences of failure to justify this expenditure. The key drivers for the replacement and renewal programme are age and condition of the assets. This is determined by the outcomes of the routine inspections and preventative maintenance programme.

Renewal generally involves the repair or replacement of components of an asset to maintain the capacity of the asset through to its design life. In certain circumstances, we may choose to refurbish an asset according to the manufacturer's recommendations, or good industry practice. These refurbishment intervals are usually quite long (in the order of 10-25 years) or based on operational conditions (e.g. clearance of a certain number of high current faults).

We may need to replace an asset rather than renewing it. The primary driver for replacing assets versus renewing them is economic, where the discounted cost of on-going repairs exceeds the replacement cost, or the cost to refurbish or enhance the asset to meet the service criteria (e.g. safety, capacity) is not economic. The other major drivers for replacement, which may override taking the most economic course of action are where:

- the risk and consequences of failure of an asset warrant replacement
- removal of risk where an asset is unique in the fleet and may not have spares
- the performance of the asset is likely to be poor following repairs.

4.2.4 Development options available

Whenever a development of the network is required due to a constraint on the network, consideration is given to the options laid out in Table 13 below as alternatives to investment in new assets.

Table 13 - Options for dealing with network constraints

Class of option	Description	Prudency	Efficiency	Remarks
Do Nothing	Connect new load without upgrading capacity	No – a prudent operator would not allow utilisation of specific asset classes to be exceeded.	No – this is not dynamically efficient	
Non-Network	Restrict new load to off-peak periods	Yes – provided that customers understand the implication of off-peak supply, which may be aided by pricing incentives.	Yes – provided the usage of off peak power is energy efficient for the load in question	
	Cycle loads to reduce overall peak demand and to utilise energy at times of low use	Yes – as a short-term measure non-critical loads could be cycled until a permanent solution is put in place.	Yes – can utilise existing assets to transport more energy units over a given period	Load controlling irrigation pumps over 30kVA allows the connection of new load with minimal disruption. Load control of hot water load is encouraged for new consumers.
	Install special protection schemes to shed load for contingent events	Yes – allows connection of load that would otherwise require large, uneconomic investment	Yes – utilises existing assets to a higher level than would be acceptable otherwise	

Class of option	Description	Prudency	Efficiency	Remarks
	Use of onsite generation, battery storage, etc.	Yes – DG is a valid option for consumers to consider when connecting load.	Yes – provided the mixture of technology is correct. For the majority of consumers, the payback and efficiency of these systems is still too low to displace the network. This has been the case in recent line refurbishments, where remote power systems were not economic compared to replacing poles.	As DG becomes more common, developments will drive the viability of these systems closer to Network supply.
Network	Supply from upgraded 11 kV with no subtransmission upgrades	Yes – provided that utilisation of critical equipment can be managed to minimise risk to the network.	No – not dynamically efficient. There is a point when the load in an area warrants higher voltage circuits.	
Network	Installation of distributed generation to remove constraint locally	Yes – provided the constraint is only during part of the daily load cycle, and the system performance can be modelled with confidence	No – DG of a size suitable for displacing traditional investment is generally Diesel, and not as efficient as distributed electricity	We have three diesel gensets to help when a transmission constraint is in effect. One of these also improves the security of supply to the Oamaru town water supply.

4.2.5 Investment prioritisation

Prioritisation of network developments is done by assessing each of the proposed projects against a number of categories. Each category is given a weighting and the weighted sum of all the categories gives a total project score. The total score for each of the projects enables them to be ranked relative to each other.

The categories that the projects are assessed against are:

- mitigation of identified health and safety hazards
- mitigation of identified environmental hazards
- conformance with legal and statutory requirements
- conformance with power supply quality standards
- conformance with network security standards
- conformance with network capacity requirements
- improvement in network reliability (consumer service levels)
- projected net cost-benefits.

4.2.6 Expenditure approvals

Following on from this initial prioritisation process, a sanction for expenditure (SFE) is prepared for all high priority, high cost projects. The SFE will be presented to the board for approval.

The SFE details:

- the issue that the project is designed to address
- the options that have been considered
- the rationale for the chosen option
- the financial benefits that will accrue from this project
- Any other benefits that will accrue from this project in terms of security, quality, consumer/community perception etc.

Our Board requires all requests for major capital funding to be supported by a SFE.

4.3 Risk management framework

Like all businesses, we face 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 business risks that all businesses face. Risk management is a fundamental part of good management practice, corporate governance, and it is required for effective stewardship of our assets. Our approach to risk management ensures that it 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 the international standard *ISO 31000: 2009 – Risk management – Principles and guidelines (ISO 31000:2009).*

Figure 15 below illustrates at a high level the process we have adopted.

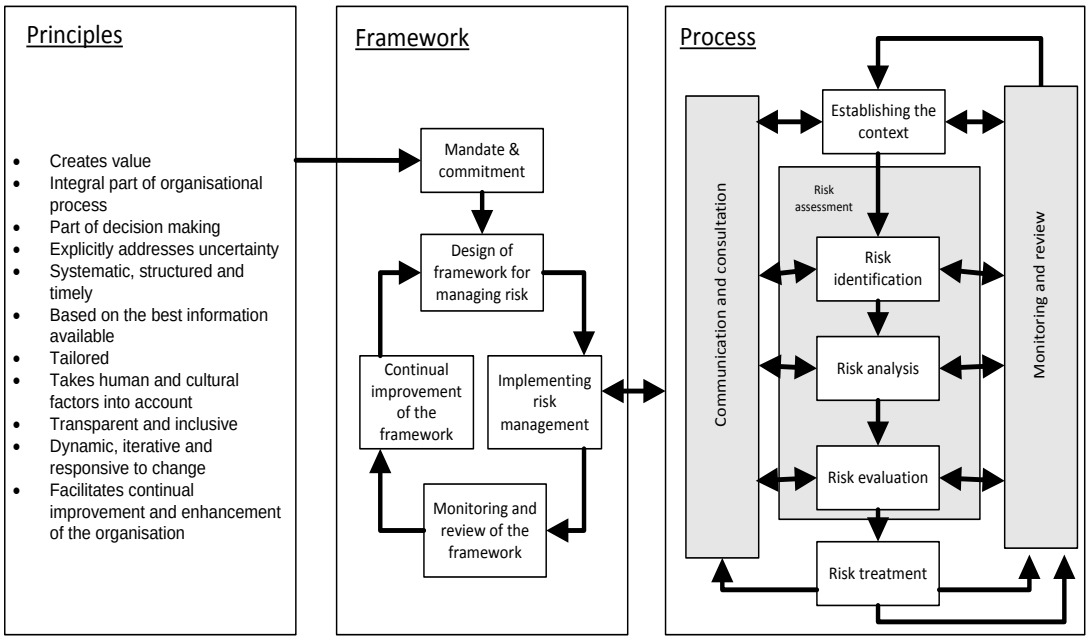

Figure 15 - From ISO31000:2009 relationships between the risk management principles, framework, and process

Our risk management 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 details the treatment of several specific risks identified by the network, namely:

- capacity allocation for new consumer connections
- capital investment for network security
- specific equipment risks around natural disasters
- Specific risks with Transpower's local network
- Environmental effects of oil filled equipment and noise pollution
- the need for coordination with Civil Defence Emergency Management planning.

This is a prescriptive approach to providing a risk policy, which addresses specific threats rather than providing direction for a strong risk management system. This policy is out of step with the rest of the risk management system, and will be rewritten in the coming year to reflect a modern, fully integrated approach to risk management, as demonstrated in the other risk management documentation.

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.
    - Accepting or increasing risk in order to pursue an opportunity.
    - 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

We currently employ job safety analysis (JSA) to apply a disciplined risk management approach to planning around the health and safety elements of a particular job. We will be 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 planning risks
- Individual project risks
- Physical risks for specific sites

As the use of the risk management system matures we are investigating the consolidation of these registers based on broad levels of access and focus. This will ensure that all site and project risks can be compared in one data source, while potentially sensitive information regarding business risk is maintained separately.

4.3.6 Risk reporting and monitoring

The monitoring of risks is generally carried out at the level of the risk register.

Risks related to health and safety are recorded in the Vault safety management system, which provides excellent reporting on the risks recorded in it. 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.

4.4 Public Safety Management System (PSMS)

As an infrastructure company, we strive to manage our assets in a way that residual risk 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. Our PSMS is an accredited system to NZS7901 and is audited annually by an external auditor (Telarc). In February 2017, we received confirmation that our PSMS would again achieve accreditation to NZS7901.

4.5 High impact, low probability events (HILP)

We are subject to the risk of a number of potential HILP events, which could give rise to a major unplanned service outage for an extended period of time. Our exposure to such events is workshopped every few years to maintain currency of the planning, or whenever it is identified that there is a new or changed HILP risk. An example of this would be an assessment of Tsunami risks to our business that was carried out after the Fukushima earthquake in Japan.

HILP events can have a widespread impact, but would be incredibly expensive to avoid, if at all. Accordingly, we have a responsibility to plan and manage for HILP events as best we can within practical limits. Within this context, our policy is to ensure:

- a safe environment for staff, contractors, and the wider community
- the timely restoration of power supply as far as practicable
- effective communication
- efficient provision and recovery of information tools for critical business activities.

Our critical business activities relate primarily to keeping our staff safe, protecting the public from harm from our assets, power security and reliability, consumer service, and quality of supply.

Events that could interrupt our critical business functions include natural disasters such as a large earthquake on the alpine fault, a tsunami, storm events (snow, wind, and floods), a failure at one of the dams on the Waitaki River, major critical asset failure; communications failure; and loss of supply from Transpower.

4.6 Emergency response policies and contingency plans

As an essential service provider, we have a responsibility to plan and prepare for HILP events. We have a suite of risk management and response documents and policies in place to ensure that power supply is restored in the minimum time.

4.6.1 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; and
- Provide technical advice on CDEM when required.

4.6.2 Civil Defence plan

Under the CDEM Act 2002, Regional Councils are required to establish CDEM Groups. As a lifeline utility, we are required to establish planning and operational relationships with our local CDEM Group, which is the Otago Civil Defence Emergency Management Group (Otago CDEM Group). We participate in the development of their plans and provide technical advice as requested. We participate in regular role play scenarios and other exercises organized by Otago CDEM Group.

We have a company Emergency Preparedness Plan in place which details how we will respond to a Civil Defence Emergency. In addition, we have developed emergency response plans for dealing with widespread abnormal situations created by either equipment failure, natural causes, or certain man made scenarios such as fire or bomb threat.

4.6.3 Information system security breaches or losses

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

Our ITT infrastructure has been designed to be robust, and includes a standby generator and UPS support for our server room.

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

4.7 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 PAS-55. The outcomes are also useful to identify gaps in

our asset management systems. We are not currently seeking PAS 55[4] or ISO55000[5] accreditation, but we will be looking at incorporating the principles of those standards into our asset management systems and process as we move forward.

4.7.1 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.

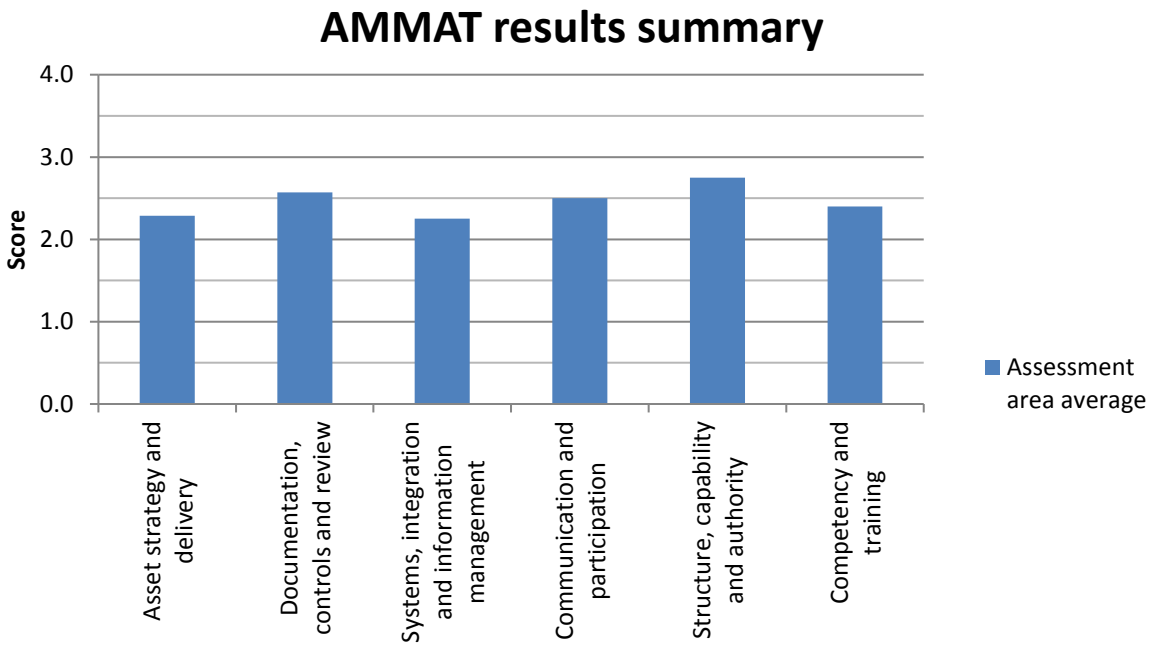

Figure 16 AMMAT results summary

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. The implementation of a new GIS software system in the past year is providing opportunities to improve the coordination of disparate data, which will help in this area.

From this original assessment point we have been working towards identifying and improving our processes where we think we can, in ways that align with the scale of our business.

[4] PAS 55 – Publicly Available Specification 55 – Asset Management
[5] ISO 55000 – International Standard for Asset management. Overview, principles, and terminology

4.8 Improvement initiatives / continuous improvement

One of the key improvement initiatives that we are involved with is the development of our asset data information systems.

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

This will allow us to record and maintain our assets, and to track the work involving them.

The component systems are already operational or under development, and work is now progressing on implementing a data store to allow data from the separate specialist components to be integrated and analysed.

5. Renewals and maintenance

This chapter describes how we 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:

- **Approach to renewals and maintenance:** gives an overview of how we determine what work needs to be carried out on our assets.
- **Asset categories:** Outlines how we apply inspection regimes by asset function and criticality.
- **Asset quantity summary:** This is a summary showing the breakdown of our asset base by various categories.
- **Asset category details:** in these sections, we detail the maintenance and renewal approach for each of the different categories of our assets. We show the asset population data, population risks, any specific inspection and maintenance practices, or renewal programmes, and a summary of forecast renewal and maintenance expenditure. Forecasts are nominal and have been adjusted for the effects of inflation.

5.1 Approach to renewals and maintenance

We currently operate a time-based inspection regime to develop our renewals and maintenance programme. Most assets are regularly inspected to identify any defects. Other information to trigger renewals or maintenance can come from analysis of fault reports, from observations of our staff or from wider industry advice of an issue with a particular asset type.

The results of the routine inspections and outcomes from defect reports are used to trigger specific maintenance or renewal activities. All defects are entered into a defect database. Major defects which have a high 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 within three months.

Our objective is to detect incipient failures in our critical assets and replace them before supply disruption or damage to the asset occurs. The impact of the failure of less critical assets, such as service fuses, may be minor compared to the expenditure and operational impact (such as regular outages) required to inspect and test them at regular intervals, so they may be left to fail while in service if this is the most economic course of action.

NWL field staff carry out the inspection of all lines, distribution assets, and the general inspection of zone substations. Specialist contractors are used to undertake assessments such as dissolved gas analysis (DGA) and partial discharge (PD) analysis of key assets such as substation transformers, ground mount switch gear, and cable terminations.

5.1.1 Maintenance planning

To justify any maintenance expenditure, the maintenance proposals are assessed for each asset based on:

- safety
- severity of the possible defect
- criticality of the particular asset
- serviceability and performance of the asset
- economic consequences of failure
- environmental consequences of failure.

Maintenance falls into two main categories:

- Corrective maintenance, where the work is to remove the cause of a problem on an asset, e.g. a component that is broken or out of tolerance.
- Preventive maintenance, where the work is to remove the cause of a potential problem on the asset, e.g. replacing dirty oil, tightening bolts before a failure occurs.

5.1.2 Renewals planning

Planned renewals are undertaken to ensure network safety and reliability. The methods for justification of a planned renewal programme are the same as for maintenance, listed above.

The difference between renewal and maintenance actions are often around the scale of the work to be carried out on an asset. Common drivers in the renewal programme are age and general condition of a group of assets.

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.

Economic analysis is also completed to decide whether an asset is renewed or replaced.

5.2 Treatment of unknown age data

Where age data is missing from our records and there is evidence supporting a likely particular period of installation then we will linearly divide the assets across that period. Otherwise, we will take a conservative approach and divide the assets across the earliest likely period.

5.3 Use of constant dollar values

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

5.4 Asset categories

The different asset classes that we use for the planning of maintenance and renewals and the frequency of inspections are summarised in the following table.

Table 14 - Overview of inspection regimes by asset class

Asset class	Inspection regime	Frequency
Poles (Section 5.7)	Sub trans -ground patrols Sub trans -climbing patrols Sub trans -vegetation patrols Distribution – ground patrols Distribution Vegetation patrols	Yearly 3 Yearly Yearly 5 Yearly 5 Yearly
Subtransmission (including pole mounted switchgear) (Section 5.8)	Ground Patrols Climbing Patrols Vegetation Patrols	Yearly 3 Yearly Yearly
Zone Substation Buildings, Grounds, Fittings (Section 5.9)	General Inspection	Quarterly
Zone Substation Transformers (Section 5.9)	Dissolved Gas Analysis Tap Changer Overhaul Oil Processing	Yearly Based on loading and operation Based on loading and operation
Zone Substation Switchboards (Section 5.9)	Partial Discharge Testing Trip Testing on older equipment (>25 years old)	Yearly Yearly
Distribution Network (Section 5.10)	Ground Patrols Vegetation Patrols	5 Yearly 5 Yearly
Distribution Switchgear (Section 5.11)	Ground mount: Partial Discharge Testing Pole mount: Ground Patrols	3 Yearly 5 Yearly
Distribution Transformers (Section 5.12)	Ground Patrols MDI Readings Earth Testing	5 Yearly Yearly 5 Yearly
LV Network	Ground Patrols	5 Yearly

Asset class	Inspection regime	Frequency
(Section 5.13)	Vegetation Patrols	5 Yearly
LV Switchgear (Section 5.14)	Ground Patrols	5 Yearly
Other System Fixed Assets Voltage Regulators	Ground Patrols	5 Yearly
SCADA/Communications	Inspection and Testing	Yearly
Ripple Control Transmitters (Section 5.15)	Manufacturer's inspection	2 Yearly
Other Systems	Ad Hoc	As required

5.5 Asset quantity summary

Table 15 - Summary of network assets by category

Asset category	Unit	Amount
Concrete poles / steel structure	No.	8883
Wood/other poles	No.	13108
Subtransmission OH up to 66 kV conductor	km	218
Subtransmission UG up to 66 kV (XLPE)	km	4.1
110 kV CB (Outdoor)	No.	1
33 kV Switch (Pole Mounted)	No.	80
33 kV CB (Indoor)	No.	11
33 kV CB (Outdoor)	No.	32
11 kV CB (ground mounted)	No.	79
11 kV CB (pole mounted)	No.	3
Zone Substation Transformers	No.	22
Distribution OH Open Wire Conductor	km	1259
Distribution UG XLPE or PVC	km	59
Distribution UG PILC	km	15
11 kV CB (pole mounted) - reclosers and sectionalisers	No.	57
11 kV Fuses (pole mounted)	No.	3375
11 kV Air Break Switches (pole mounted)	No.	444
11 kV RMU (individual switches)	No.	186
Pole Mounted Transformer	No.	2349
Ground Mounted Transformer	No.	516
Voltage regulators (sets)	No.	12
LV OH Conductor	km	235
LV UG Cable	km	105
LV Switchgear (Distribution Boxes)	No.	348

5.6 GXP equipment

We are connected to the Transpower network at four Grid Exit Points (GXPs). The characteristics of these are listed in Table 16 below.

Table 16 - Characteristics of NWL grid exit points

Supply point	Voltage	Firm capacity	Zone Substations supplied
Oamaru GXP	110/33 kV	40 MVA	10
Black Point GXP	110/11 kV	25 MVA	0
Waitaki GXP	11/33 kV	24 MVA	3
Twizel GXP	220/33 kV	20 MVA	3

5.7 Poles

5.7.1 Quantity and life expectancy of our poles

Table 17 - Pole population by material

Pole Material	Number in Service
Wood	13108
Concrete	8883

The wood pole group includes hardwood and softwood poles and assumes that the 135 poles on our network classed as “Other” are wood. This is a conservative assumption and we will reclassify these poles based on the returns from the next line inspection.

The concrete pole group contains 6 poles that have been classed as steel or iron. Existence of these and condition will be confirmed during the next line patrol.

The life expectancy we apply to our poles is shown in the table below:

Table 18 - Life expectancy of distribution assets

Asset Description	Standard life expectancy (years)
Concrete Pole	60
Wooden Pole	45
Cross Arm	20

5.7.2 Management approach

We manage our poles with the aim of keeping them safe for the public and our staff, and minimising outages. This is based on condition assessment of poles in service.

Pole renewals are mostly initiated from defects found during line inspections, or as a result of faults.

In order to increase our information on the state of our network we have elected to accelerate (double) the number of distribution poles inspected in the 2018/19 and 2019/20 periods.

5.7.3 Age profiles

Of the 21991 poles on our network, 9866 are of unknown age. We are embarking on a data collection exercise to develop a more accurate age profile for these assets.

An example of this work is using our GIS to analyse the age of nearby assets (other poles, conductors, consumer connections). Another example is referring to archived work records, as there is anecdotal evidence that a considerable number of the unknown age poles were installed in the 1980's under maintenance codes. It is thought that this bypassed the processes at that time, leading to new poles being installed without record.

Any probable installation dates that are developed during this exercise will be verified against the pole details during line patrols. In this way, we expect to improve our confidence in the age profile of our network poles.

5.7.3.1 Wooden poles

The age profile of our wooden poles is shown in the graph below. The unknown hardwood poles have been evenly distributed between 1950 and 1989 at a rate of 103 poles per year and the unknown softwoods between 1990 and 2011 at a rate of 24 per year. We believe that this is a conservative approach and may refine this in the future.

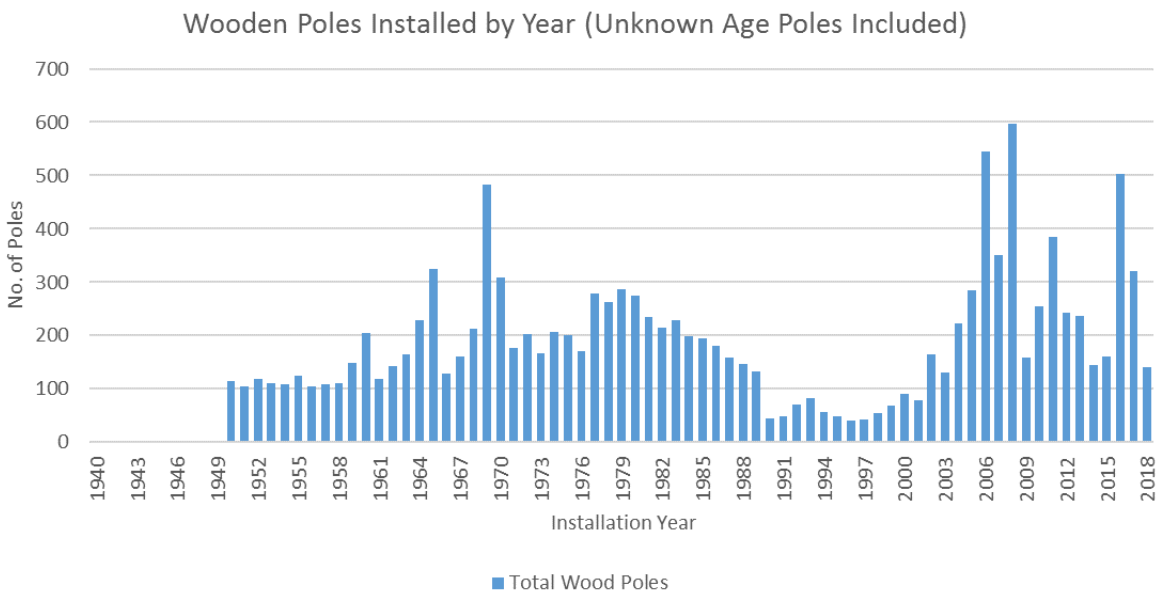

Figure 17 Age profile of NWL wooden poles

At the start of this planning period we have 4178 poles over 45 years of age (<1973). These will all be inspected in the first three years of the planning period.

5.7.3.2 Concrete poles

The age profile of our concrete poles is shown in the graph below. The unknown concrete poles have been evenly distributed between 1950 and 1989 at a rate of 129 poles per year. We believe that this is a conservative approach and may refine this in the future.

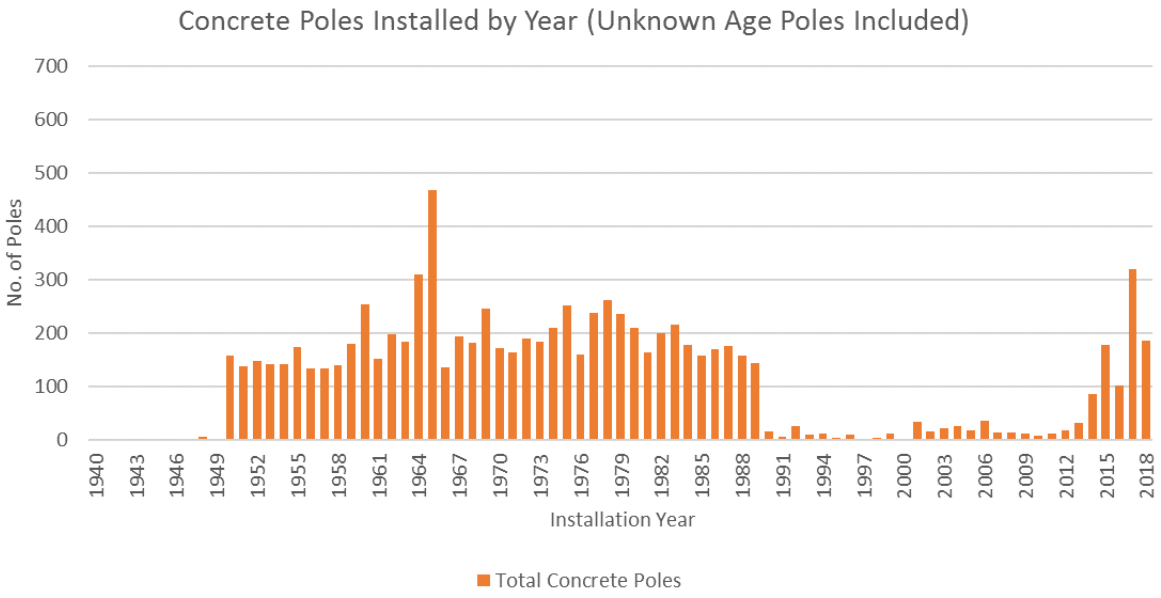

Figure 18 Age profile of NWL concrete poles

At the start of this planning period we have 1322 poles over 60 years of age (<1959). These will all be inspected in the first three years of the planning period.

5.7.4 Asset risk

Major risks to our poles include:

- vehicle impact – many of our poles are in 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 rot or rust.

5.7.5 Inspection and maintenance practices

Our 33 kV poles are inspected each year and 11 kV poles every five years. As part of this inspection we test each pole with our acoustic non-destructive tester (Thor hammer) which assesses pole condition above and below ground. Poles are not replaced based on age, but on assessed condition.

Poles are assessed for remaining life and are either scheduled for replacement or subjected to:

- further below ground inspection
- climbing patrols if pole top defects are identified by ground patrols
- advanced testing with our Portascan timber density scanner.

Research and development in wooden pole test equipment is very strong at present and in collaboration with other EDBs we are actively seeking new and improved methods to test our wooden poles.

When a part of the network is particularly affected by a major event (e.g. a snow storm) we may instigate a special line patrol post event.

NWL has elected to accelerate (double) the rate of our inspections on our distribution and LV poles for the next two years. The early availability of the inspection data coupled with our upgraded asset management systems will put us in a position to make sound decisions regarding our poles.

5.7.6 Renewal programme

Forecast expenditure for the planning period is:

- Pole replacements resulting from accelerated line patrols (Years 1 and 2).
- Continuation of line patrols at normal rate (Year 3 onwards)
- Pole replacements to remove existing defects (Year 1).

5.7.7 Expenditure forecast

Table 19 - Expenditure forecast for our poles

Poles Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	0	0	0	0	0	0	0	0	0	0
Capital Expenditure										
Quality of Supply	0	0	0	0	0	0	0	0	0	0
Legislative and Regulatory	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	2,550,000	1,700,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000

5.8 Subtransmission network

5.8.1 Quantity and life expectancy of subtransmission lines

Our subtransmission network operating at 33 kV connects the grid exit points to the zone substations. These supplies are arranged as shown in Figure 19

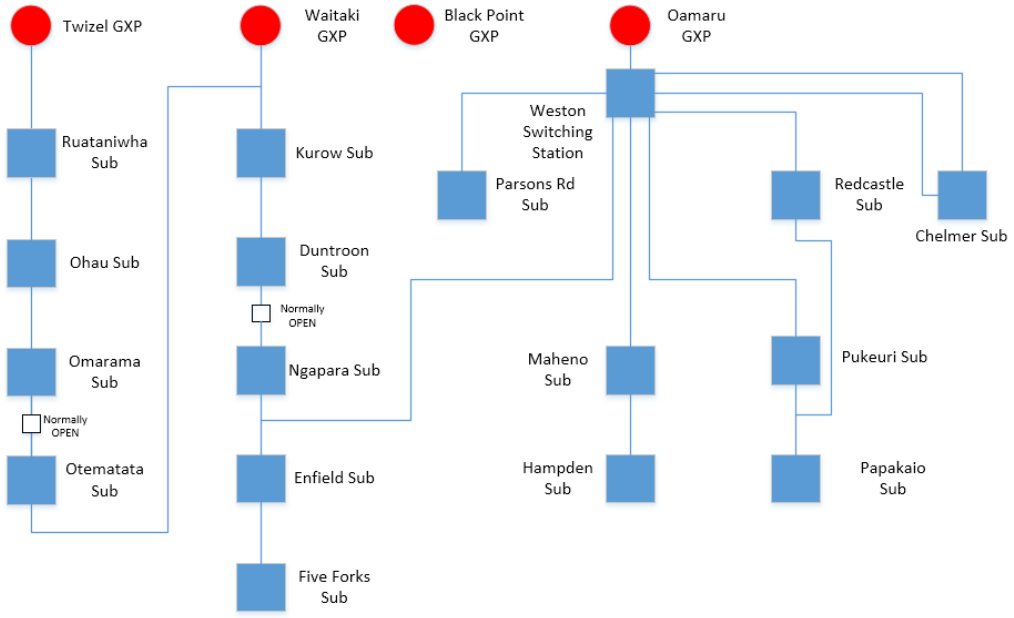

Figure 19 Subtransmission system configuration

Generally speaking, the rated capacity of the subtransmission network is suitable to supply the attached loads as required. There is a voltage support issue with feeding 33 kV supplies from Oamaru to beyond Duntroon, but this has been mitigated by the upgrade to Waitaki GXP, which moved the Duntroon supply away from Oamaru.

There is 222 km of subtransmission network, including 4.1 km of 33 kV cables.

The life expectancy we apply to our subtransmission assets is shown in Table 20 below.

Table 20 - Life expectancy of subtransmission 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

5.8.2 Management approach

Our subtransmission assets are critical assets. A component failure at this level can affect many consumers and have a significant impact on system reliability. Hence these assets are subject to annual inspections rather than five-yearly inspections for lower voltage distribution assets.

5.8.3 Age profiles

33 kV Subtransmission circuits:

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 line. The age profile of these assets is shown in Figure 20 and Figure 21 below.

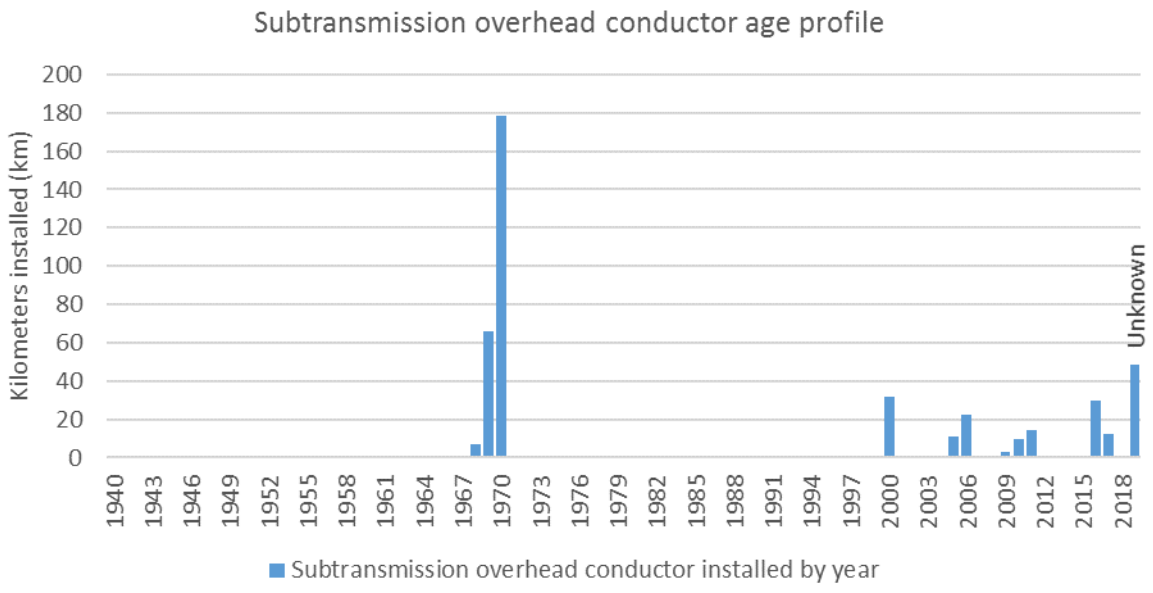

Figure 20 Age profile of subtransmission overhead conductor

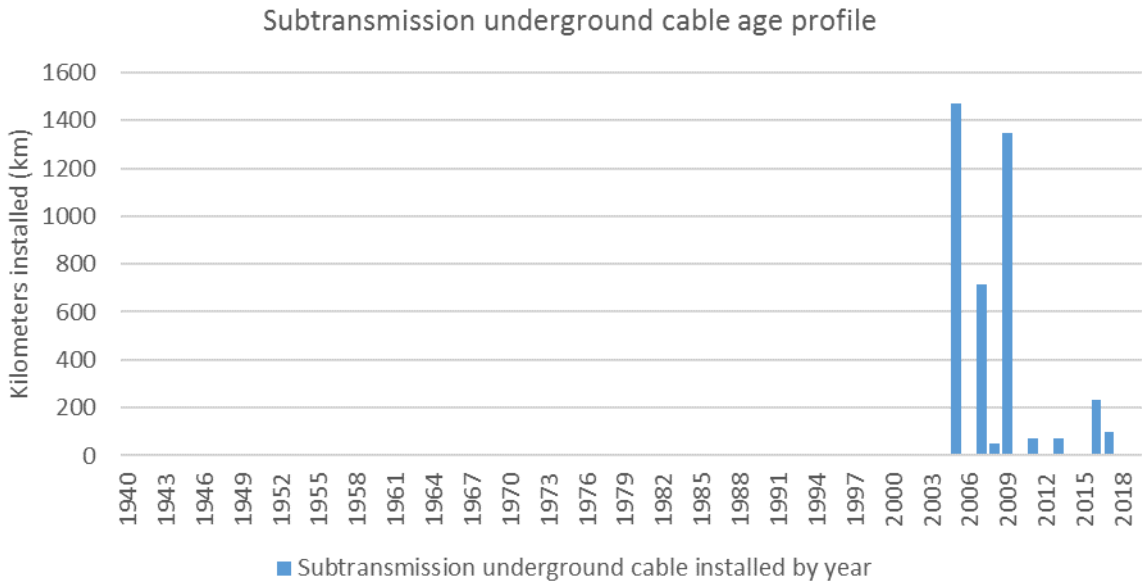

Figure 21 Age profile of subtransmission underground cables

5.8.4 Asset risk

We prioritise maintenance of our subtransmission and zone substation assets above our other asset categories, as a failure of these assets can result in a major impact on our consumers.

Due to the high frequency of inspections and the high priority of defect correction, the subtransmission population is considered to be at low risk of failure.

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.

5.8.5 Inspection and maintenance practices

A pole by pole visual inspection from ground level is made of all 33 kV lines each year. Pole top inspections are performed on a three-year cycle. This is either via remote camera (GoPro camera) or by accessing the pole from a ladder or bucket truck, and includes an assessment of the pole setting in the ground.

If the cause of a 33 kV line fault is not identified during the fault restoration process, we will patrol the affected line segment as soon as possible after the fault.

Vegetation growth is carefully managed around our subtransmission lines. We attempt to clear corridors of trees during the installation of new lines, but during the lifecycle of the lines regrowth is common. Any vegetation is managed in accordance with the Electricity (Hazards from Trees) Regulations 2003.

5.8.6 Renewal programme

Forecast expenditure for the planning period is:

- Ongoing subtransmission line repairs resulting from line patrols
- Line retightening projects in the year following installation for major projects.
- Completion of the Twizel to Omarama subtransmission reinforcement project (Year 1)

5.8.7 Expenditure forecast

Table 21 - Forecast of maintenance and renewal expenditure for subtransmission assets

Subtransmission Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Replacement & Renewal	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Capital Expenditure										
Quality of Supply	320,000	45,000	40,000	40,000	40,000	0	40,000	0	0	0
Legislative and Regulatory	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	0	0	0	0	0	0	0	0	0	0

5.9 Zone substations

5.9.1 Quantity and life expectancy of zone substations

Our Zone Substations are summarised in the following table.

Table 22 - Summary of NWL zone substations

Zone Substation	GXP Supply	Capacity (MVA)	Security	Date of Construction	Age of Power Transformer	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
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	1971
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

The life expectancy we apply to our zone substation assets is shown in Table 23 below:

Table 23 - Life expectancy of zone substation assets

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

5.9.2 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 consumers affected. Hence these assets are inspected every 3 months.

We prefer to use vacuum switchgear with air insulated busbars, rather than the lower cost option of Sulphur Hexafluoride (SF_6) gas insulated switchgear. This decision was based on environmental considerations and future maintenance and compliance costs associated with SF_6 gas.

All of our substation equipment is purchased with a focus on the lowest ongoing preventative maintenance requirements.

5.9.3 Age profiles

5.9.3.1 110 kV switchgear

We own one 110 kV air break switch and one 110 kV switch bay at the Black Point GXP. This GXP is dedicated to the supply of one consumer, NOIC. This equipment was purchased and installed in 2006.

5.9.3.2 Zone substation transformers

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

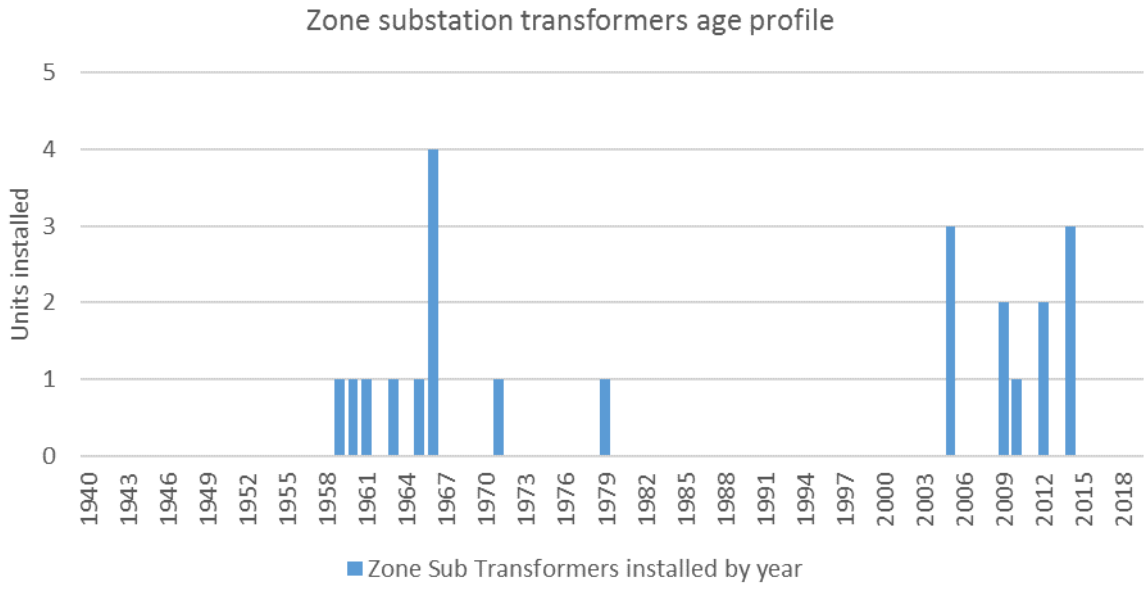

Figure 22 Zone transformers age profile

5.9.3.3 33 kV and 11 kV switchgear

We own and operate the 33 kV indoor switchboard associated with the Oamaru GXP. This 33 kV board is air insulated with vacuum CBs.

The majority of 11 kV circuit breakers are of the bulk oil type with the oldest listed as being installed in 1968. The newest CB's are those associated with the 11 kV switchboards in the Five Forks and Pukeuri substations installed in 2017.

While the average age of the population is 20 years, 37% (23) are over 35 years old and some will reach the end of their 45-year standard life before the end of the planning period covered by this AMP. This equipment is in good condition and much of it is operating well below rated values for fault levels. We therefore expect that the majority of these CBs will be capable of operating safely and reliably beyond their life expectancy of 45 years.

A program is underway to replace older oil filled switchgear at locations that are subject to higher fault levels. This has seen the Pukeuri switchboard replaced in 2017/18, and in the planning period for this AMP we will replace several oil filled switchboards with modern switchboards with vacuum circuit breakers.

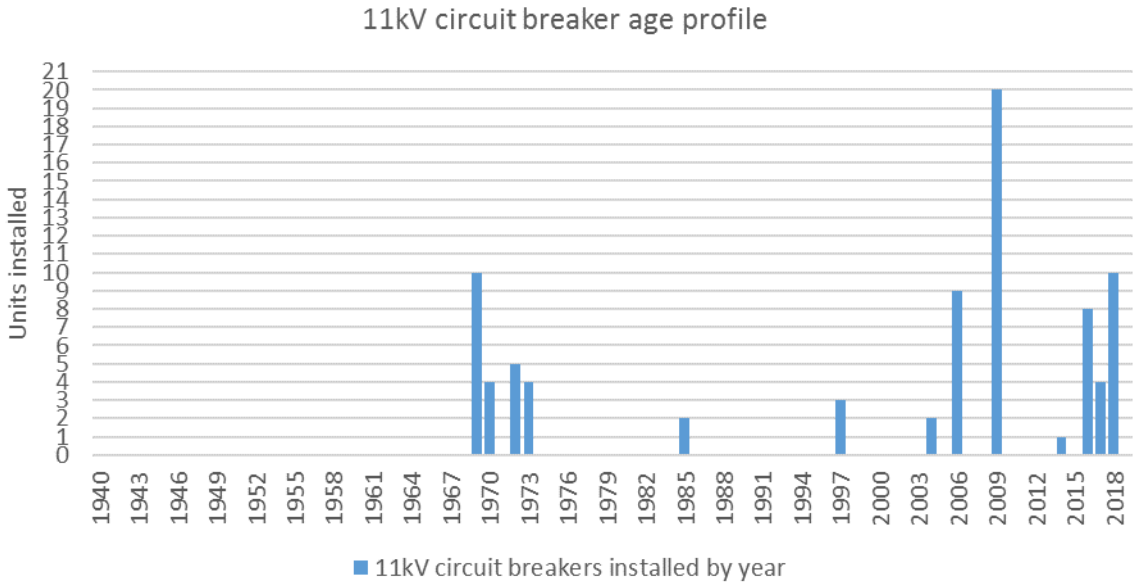

Figure 23 11 kV Indoor CBs age profile

The 33 kV CBs at zone substations are a combination of vacuum, vacuum/oil, and oil type units. The majority of these CBs are less than 20 years old, and are all working well within their load and fault ratings.

An additional two 33 kV CBs have been added to both Redcastle and Pukeuri to allow the 33 kV tie circuit to operate as a closed ring in *N-1* mode.

The two oldest 33 kV CB's have been replaced with new outdoor CB's as part of the transformer upgrade at Chelmer Substation.

33 kV reclosers and sectionalisers installed in the Waitaki – Twizel 33 kV sub-transmission line at each connected zone substation provide automatic sectionalising of the line in the event of a fault. All 33 kV and 11 kV CBs are connected to the SCADA system and can be switched remotely.

5.9.4 Asset risk

The criticality of our zone substations is high, so inspections and maintenance on these assets is a high priority, and is given equal priority with subtransmission work.

Due to the high frequency of inspections and the high priority of defect correction, the zone substations are considered to be at low risk of failure.

The major risks to our substations include:

- animals
- human intruders – theft or vandalism
- external objects being blown into open air switchyards.

5.9.5 Inspection and maintenance practices

5.9.5.1 Zone substation transformers

Inspections on zone substation transformers centre on annual dissolved gas analysis (DGA) sampling. This provides a non-invasive test which is effective at indicating the health of the transformer.

The need for maintenance on zone substation transformers and their tap changers is determined by trend monitoring of DGA results.

On load tap changers (OLTC) on our zone substation transformers are overhauled based on DGA results, service life, or any particular issues found regarding specific models of OLTC. During this work the transformer is usually given an overhaul – the extent of this servicing is decided based on a detailed condition assessment of the transformer in question.

5.9.5.2 Indoor substation switchboards

Partial discharge testing is employed on an annual basis to determine the need for CB maintenance. The frequency of testing is increased as deterioration is detected.

Bulk oil CB's also receive an oil change and contact dressing following a number of major fault trips, depending on the levels of the faults. This is unplanned reactive maintenance.

5.9.6 Renewal programme

Forecast expenditure for the planning period is:

- Two power transformer tap changer overhauls per year
- Replacement of 11 kV switchboards at Parsons road (year 1)
- Replacement of 11 kV switchboards at Maheno (year 2)
- Replacement of 11 kV switchboards at Duntroon (year 3)
- Replacement of 11 kV switchboards at Omarama (year 4)
- Replacement of 11 kV switchboards at Hampden (year 6)
- Replace 110 V Battery Banks & Charger (Years 1 and 2)
- Install arc flash protection (5 Substations, Years 1-2,4-6)
- Replacement of obsolete protection relays (Years 1 and 2)

5.9.7 Expenditure forecast

Table 24 - Zone substation and equipment forecast expenditure

Zone Substations Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	356,000	356,000	356,000	356,000	356,000	356,000	356,000	356,000	356,000	356,000
Replacement & Renewal	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Capital Expenditure										
Quality of Supply	100,000	90,000	0	60,000	60,000	60,000	0	0	0	0
Legislative and Regulatory	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	530,000	530,000	300,000	150,000	0	150,000	0	0	0	0

5.10 Distribution network

5.10.1 Quantity and life expectancy of distribution network

There are fifty-seven 11 kV distribution feeder lines emanating from the sixteen 33/11 kV zone substations. As most zone substations are radially connected to their GXP, supply restoration is therefore dependent on 11 kV interconnection between substations. To further assist in quicker supply restoration, we have embarked on a programme of installing automated open points on 11 kV interconnection between substations. The only zone substations with *N-1* security are the two urban substations, Chelmer and Redcastle which supply approximately half of our total consumer base and the rural Kurow Zone Substation.

Our distribution network operates at 11 kV, and connects zone substations to distribution substations which supply the majority of our consumers at 400/230 V.

There are 1259 km of overhead lines and 74 km of 11 kV cables on our distribution network.

The life expectancy we apply to our distribution assets is shown in Table 25 below:

Table 25 - 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

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.

5.10.2 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 consumer 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.

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

5.10.3 Age profiles

Approximately 25% of the population has survived past 45 years (the wooden pole ODV Standard Life). Maintenance does not appear to significantly extend the life of a line but sustains the line in service until the end of its economic life. The normal driver to upgrade NWL's distribution lines tends to be voltage constraints on conductors due to load growth, which for more critical main line situations tends to happen well before 45 years.

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

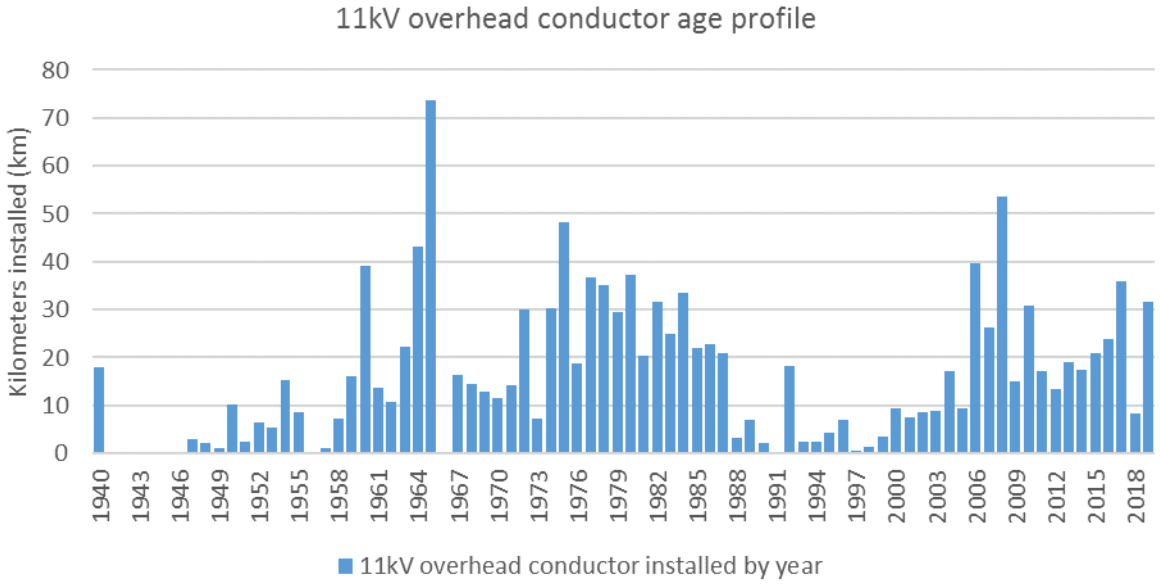

Figure 24 Age profile of 11 kV overhead lines

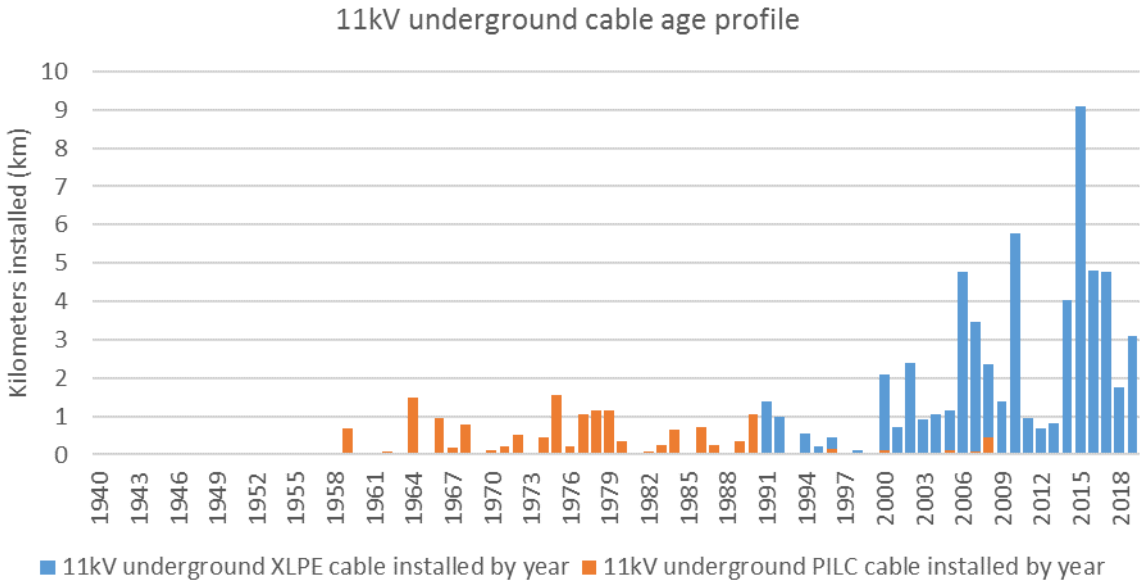

Figure 25 Age profile of distribution cables

5.10.4 Asset risk

The overhead 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
- 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.

5.10.5 Inspection and maintenance practices

All of our 11 kV distribution lines are inspected on a 5-yearly cycle. Any poles which are considered to be suspect are either scheduled for replacement or subjected to a more detailed inspection and testing.

The policy of patrolling after faults when no cause has been identified is also applied to 11 kV lines. Climbing patrols are only undertaken for pole top defects identified by ground patrols.

Vegetation management is a significant ongoing part of the maintenance of our distribution lines. We are in the process of implementing field capture of vegetation information direct to our internal systems, which will streamline analysis and processing of this work stream.

5.10.6 Renewal programme

Forecast expenditure for the planning period is:

- General renewals resulting from inspections and defects.
- Replace one rural two-pole structure per year.
- General urban upgrades.
- Condition based renewal of 11 kV fuses and lightning arrestors.
- Line rebuilds due to condition.
- Conductor investigations.

5.10.7 Expenditure forecast

Table 26 - Expenditure forecast for distribution network

Distribution Network Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	279,000	279,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000	154,000
Replacement & Renewal	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Capital Expenditure										
RSE Quality of Supply	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
RSE Legislative and Regulatory	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	205,000	145,000	155,000	145,000	155,000	145,000	145,000	145,000	145,000	145,000

5.11 Distribution switchgear

5.11.1 Quantity and life expectancy of 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 these devices are linked to the SCADA system and can be remotely monitored and operated. We have 57 of these units in service.

11 kV oil filled ground mount switchgear (individual fused switches and ring main units) have been installed from 1990, as part of the major urban undergrounding programmes that commenced then, and the more recent network reinforcement programs. There are 38 RMUs or fused switches in service, with most located outside, although a few are inside buildings.

Distribution spur lines and individual 11 kV service lines 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.

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

Table 27 - 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

5.11.2 Management approach

We manage distribution switchgear based on its criticality in the network. A sectionaliser or recloser has a bigger impact on our ability to reduce SAIDI and SAIFI figures than an ABS on a spur line, so work is prioritised based on this.

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.

5.11.3 Age profiles

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

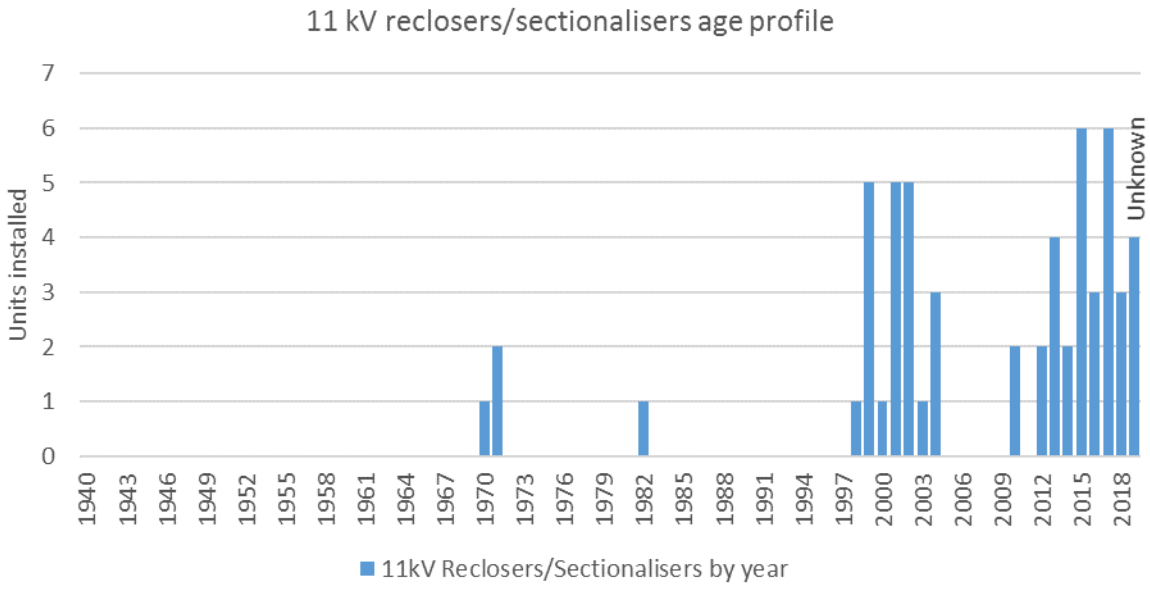

Figure 26 Age profile of distribution sectionalisers and reclosers

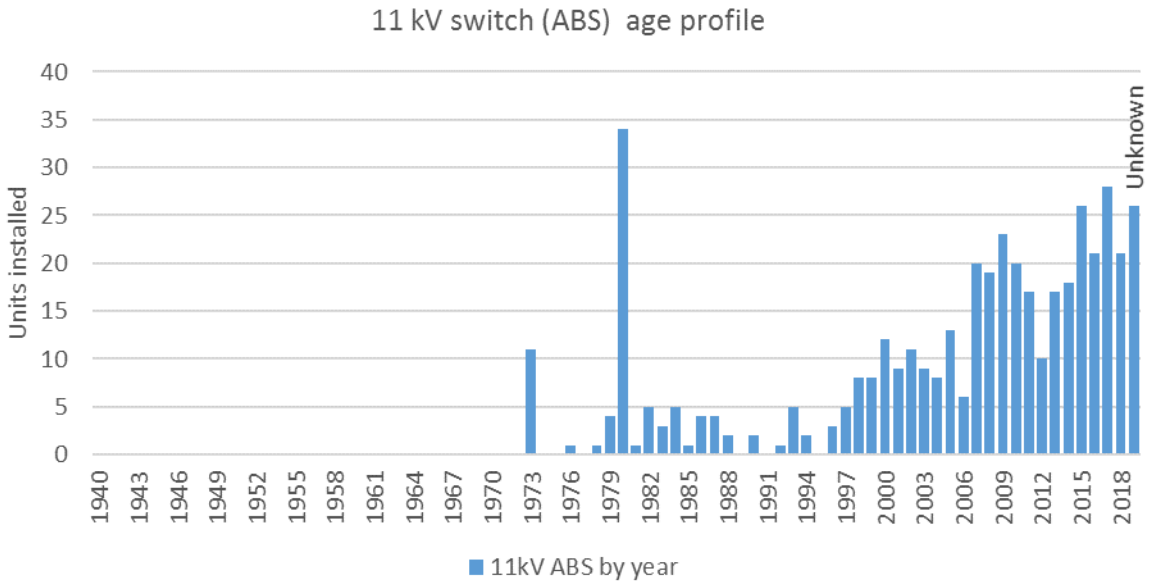

Figure 27 Age Profile of Pole Mounted ABS

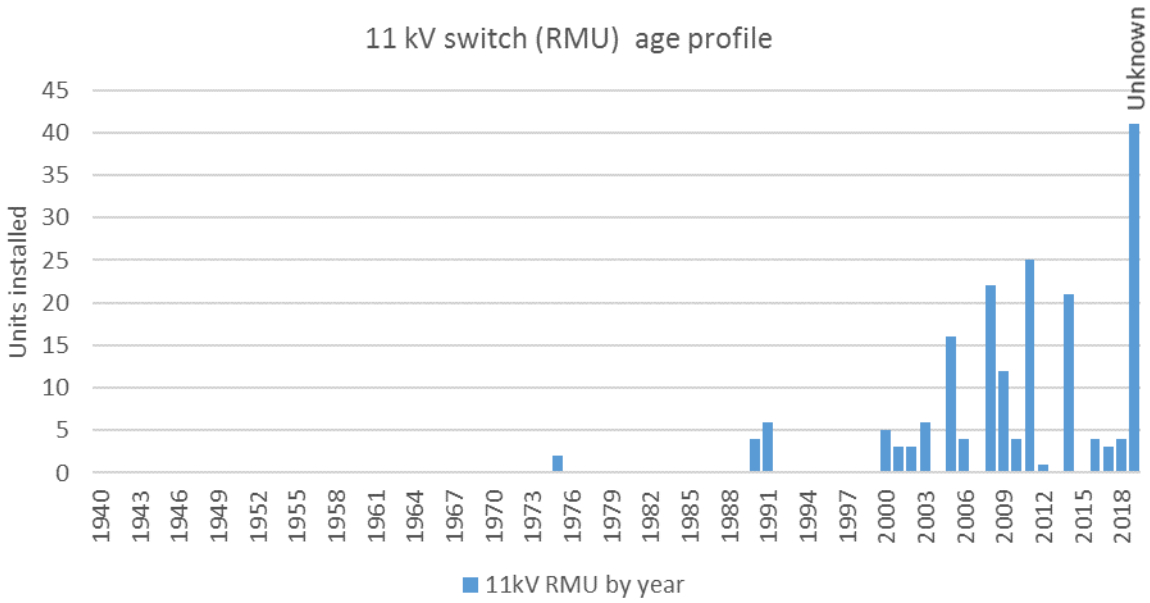

Figure 28 Age profile of ground mounted distribution switchgear

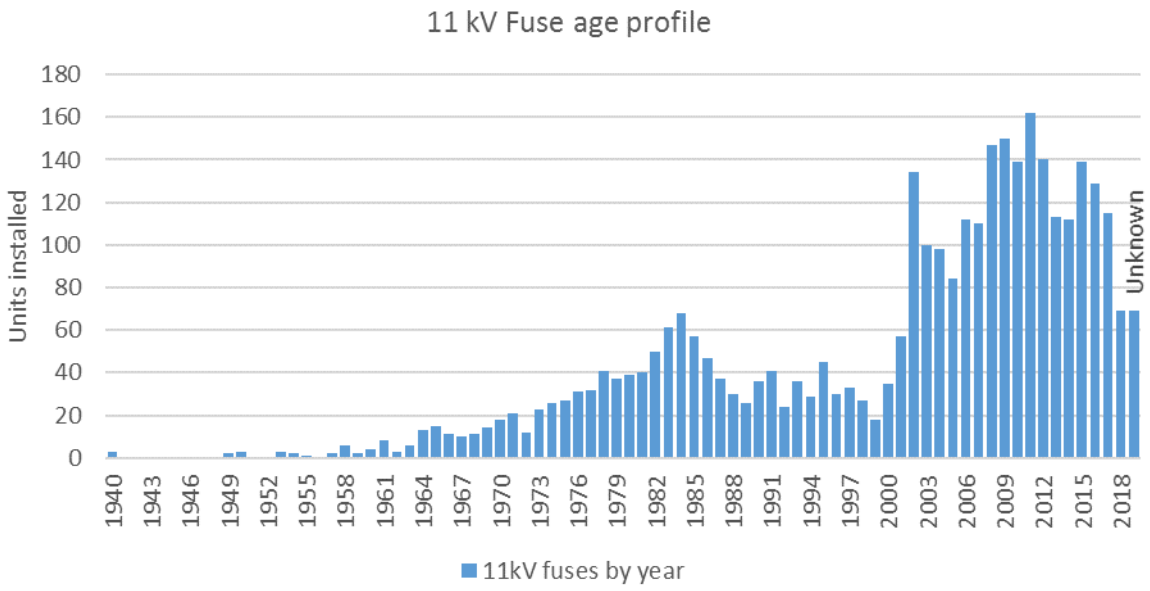

Figure 29 - Age profile of 11 kV fuses

5.11.4 Asset risk

Major risks for the asset class include:

Pole mounted ABSs, reclosers, sectionalisers

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

Ground mounted switchgear

- 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 consumers 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 has low 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.

Of the oil filled switchgear, the Long and Crawford type was involved in a multiple fatality incident in Western Australia in 2015 and has many other safety alerts raised against it. There is no remote actuator option for this equipment so we have elected to replace the four units that we had on our network. Two will be replaced by April 2018 with the final two in 2018/19. No live switching of Long and Crawford switchgear is allowed on our network.

The remainder of our stock is ABB and Andalect. These units are no longer manufactured and in some cases not supported by the manufacturer. We plan to replace three of these units per year with Halo vacuum switch units with 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.

5.11.5 Inspection and maintenance practices

Pole mount switchgear is inspected at the same intervals as the distribution lines on a five-year cycle.

The ground mount distribution switchgear is inspected on a three-year cycle. This includes partial discharge testing and visual checks for rust, vandalism, and obvious signs of damage.

Following an incident on another EDB's network in 2012, and subsequent discussions with the manufacturer, we have a programme to test and maintain all of our ground mount oil switchgear greater than five years old, including:

- test and replace the oil
- clean out any contaminants and sludge in the tank
- check the operating mechanism
- test the resistance of the contacts and fuses.

5.11.6 Renewal programme

Forecast expenditure for the planning period is:

- Replace Gillies Foundry and Woollen Mills Long and Crawford RMU's
- Install 2 sectionalisers in rural feeders to minimise outage areas during faults.
- Ongoing programme to install 4 new ABS's in 11 kV feeders to minimise outage areas during planned outages and fault response.
- Replace selected switchgear based on condition assessment.
- Replace three oil filled ring main units per year to reduce operational constraints.

5.11.7 Expenditure forecast

Table 28 –Forecast expenditure for distribution switchgear

Distribution Switchgear Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Replacement & Renewal	0	0	0	0	0	0	0	0	0	0
Capital Expenditure										
Quality of Supply	109,000	89,000	84,000	89,000	89,000	89,000	89,000	89,000	89,000	89,000
Legislative and Regulatory	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	230,000	280,000	280,000	280,000	280,000	180,000	200,000	200,000	200,000	200,000

5.12 Distribution transformers

5.12.1 Quantity and life expectancy of distribution transformers

The 11 kV distribution network supplies 2,870 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 consumer.

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 consumer 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 15 installations of voltage regulators in service

The life expectancy that we apply to distribution transformers is shown in Table 29

Table 29 - Life expectancy for distribution transformers and substations

Asset description	Standard life expectancy (years)
Pole mounted transformer	45
Ground mounted transformer	45
Voltage regulators	55

5.12.2 Management approach

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 are now field trialling distribution transformer monitoring (DTM) units in our larger urban transformers. To date we have eight units installed which allow cloud based monitoring of transformer loading and voltages (actual and historical). This allows 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. In following years, we will be installing more DTM units to provide continuous coverage for sections of the Oamaru CBD.

5.12.3 Age profiles

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.

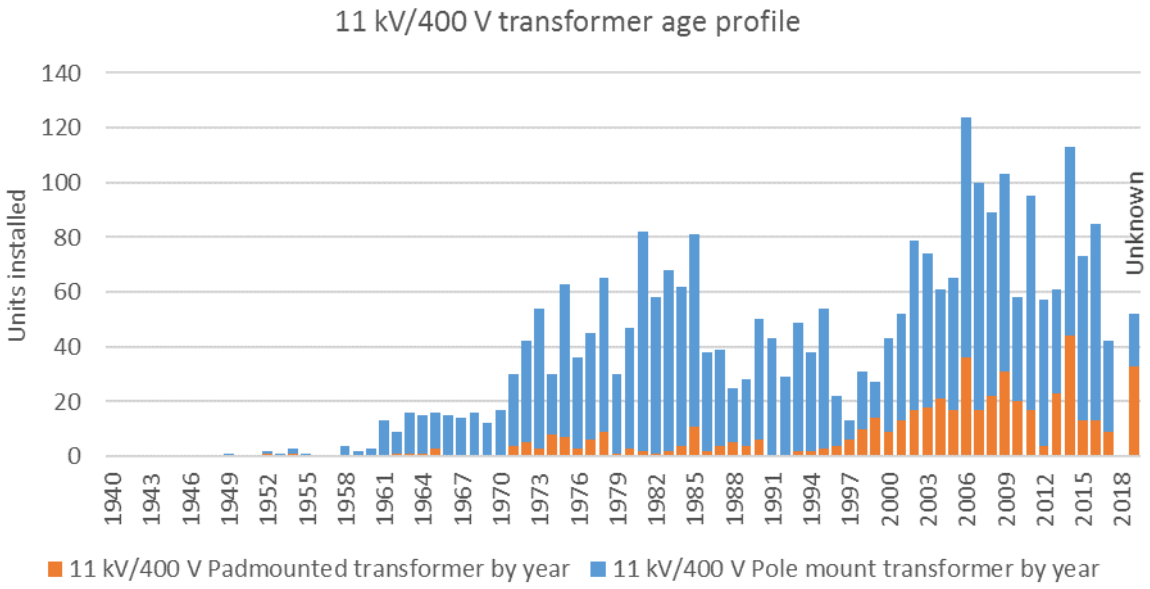

Figure 30 Age profile of distribution transformers

5.12.4 Asset risk

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:

- Lightning – although surge arresters are widely used, a direct strike to a transformer can be destructive.
- 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.

5.12.5 Inspection and maintenance practices

NWL includes management of the other assets associated with distribution substations in our inspection and maintenance cycles.

Pole mount transformers are inspected at the same intervals as the distribution lines on a five-year cycle.

Maintenance actions for ground mount transformers includes:

- Annual maximum demand indicator (MDI) reading to estimate transformer loading.
- General maintenance such as fixing leaks, treating rust, addressing vandalism, repainting etc.
- Earth testing on a five-yearly cycle.

5.12.6 Renewal programme

Forecast expenditure for the planning period is:

- General maintenance work
- Condition based replacements
- Replace one ground mount transformer enclosure per year
- Install distribution transformer monitoring at eight sites per year

5.12.7 Expenditure forecast

Table 30 - Forecast expenditure for distribution transformers

Distribution Transformers Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Replacement & Renewal	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Capital Expenditure										
Quality of Supply	0	0	0	0	0	0	0	0	0	0
Legislative and Regulatory	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	220,000	230,000	70,000	230,000	230,000	230,000	210,000	210,000	210,000	210,000

5.13 Low voltage network

5.13.1 Quantity and life expectancy of distribution and LV cables

LV overhead lines amount to 232 km of our network, with LV reticulation being largely restricted to Oamaru and rural townships. Rural network design does not allow for LV interconnection between distribution transformers due to distance limitations on LV capacity.

Overhead reticulation within residential areas is no longer permitted under the Waitaki District Council District Plan. Therefore, any extension or upgrade work tends to result in conversion to underground. We have 88 km of LV cable network. There are no further undergrounding programmes in progress as the community has not expressed a desire for this in community planning processes (Long Term Council Community Plan and District Plan). Asset management drivers, including cost and outage minimisation, favour the retention of overhead assets.

Table 31 - 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

5.13.2 Management approach

LV faults generally affect less consumers than faults at the higher voltage levels and therefore do not impact overall performance so heavily.

Voltage complaints at LV level are not trending upwards. Most voltage complaints tend to be related to HV capacity on heavily loaded irrigation feeders rather than being an LV issue. Capacity is primarily addressed by transformer upgrades or installing intermediary transformers.

Our management approach to the LV network is to focus preventative maintenance on safety issues.

5.13.3 Age profiles

Our LV overhead lines show a similar age profile to the HV overhead lines, and are predominantly located in urban residential areas. Their age reflects the urban development cycles

Pole management is incorporated into HV pole inspection programmes.

The age profile of the LV lines is shown in the following charts.

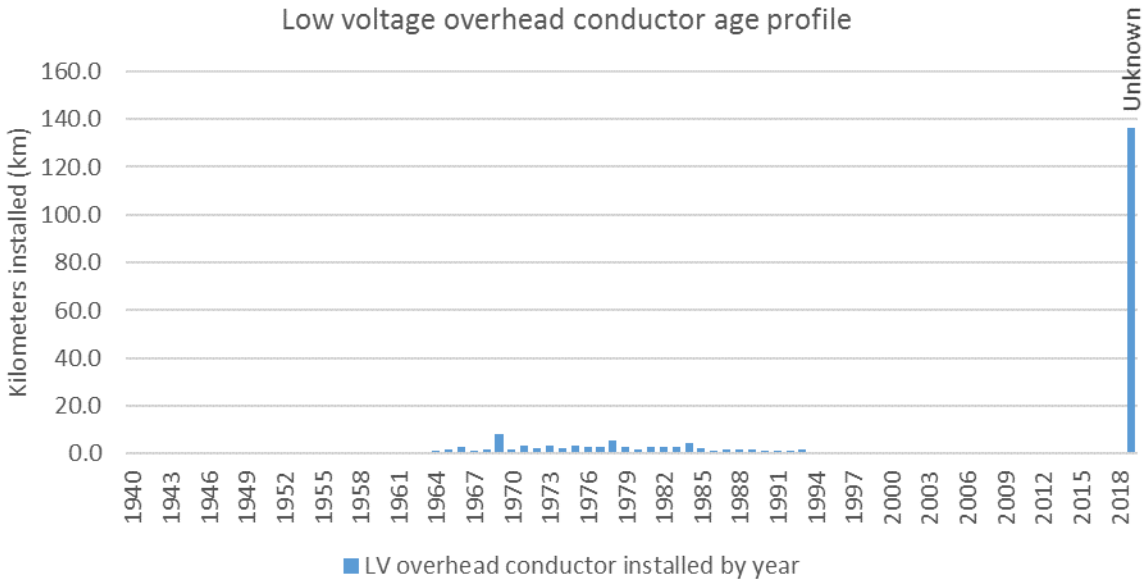

Figure 31 Age profile of LV overhead network

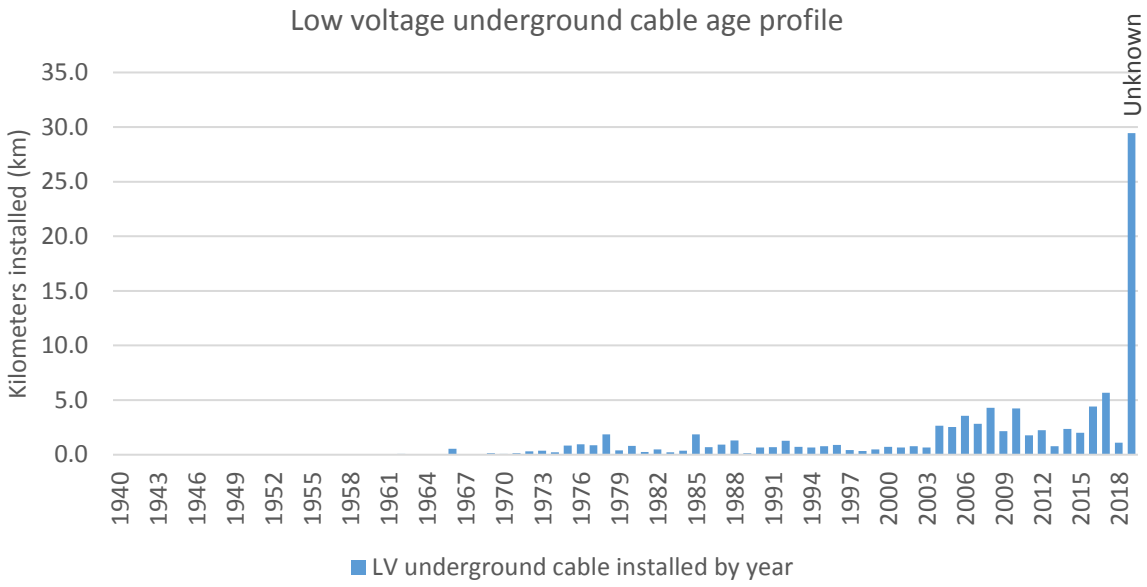

Figure 32 Age profile of LV cables

5.13.4 Asset risk

The LV network is subject to a number of risks, especially because it is predominantly located within urban areas. These risks include:

- Vehicle impact – much of the network is built in road reserve, near driveways etc.
- External equipment – foreign objects being blown into lines.
- Human interaction – vandalism, contact with wires while painting house.
- Damage to cables from excavation.

The focus of risk management on the LV network is public safety.

5.13.5 Inspection and maintenance practices

NWL owned LV distribution poles are inspected on the same 5-year cycle as for 11 kV distribution poles with the same process being applied to poles that are deemed to be suspect.

Cable termination maintenance is identified from cyclic visual inspection.

5.13.6 Renewal programme

Forecast expenditure for the planning period is:

- Condition based renewal of low voltage assets.
- Reinforcement of LV network
- Remove road crossings on State Highway 8 to create higher clearances

5.13.7 Expenditure forecast

Table 32 - Forecast expenditure for low voltage network

Low Voltage Network Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	15,000	15,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000
Replacement & Renewal	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Capital Expenditure										
Quality of Supply	95,000	0	0	0	0	0	0	0	0	0
Legislative and Regulatory	56,000	0	0	0	0	0	0	0	0	0
Replacement & Renewal	135,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

5.14 Low voltage switchgear

5.14.1 Quantity and life expectancy of LV switchgear

We have various types of LV switchgear on our network which may be located in transformer cubicles, stand-alone distribution boxes (DB's), or inside DB's fixed to buildings.

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 188 of these on our network.

Life expectancy based on ODV values for this class of asset are shown in the table below:

Table 33 - Life expectancy for distribution switchgear

Asset description	Standard life expectancy (years)
LV Switchgear	45
Service Fuse Box (SFB)	45

5.14.2 Management approach

Low voltage switchgear is inspected every 5 years.

Reactive maintenance may be carried out as a result of inspections.

5.14.3 Age profiles

The age profiles of our LV distribution switchgear are shown in the following figure. It can be seen that the vast majority of the J-Type switchgear has exceeded its standard life.

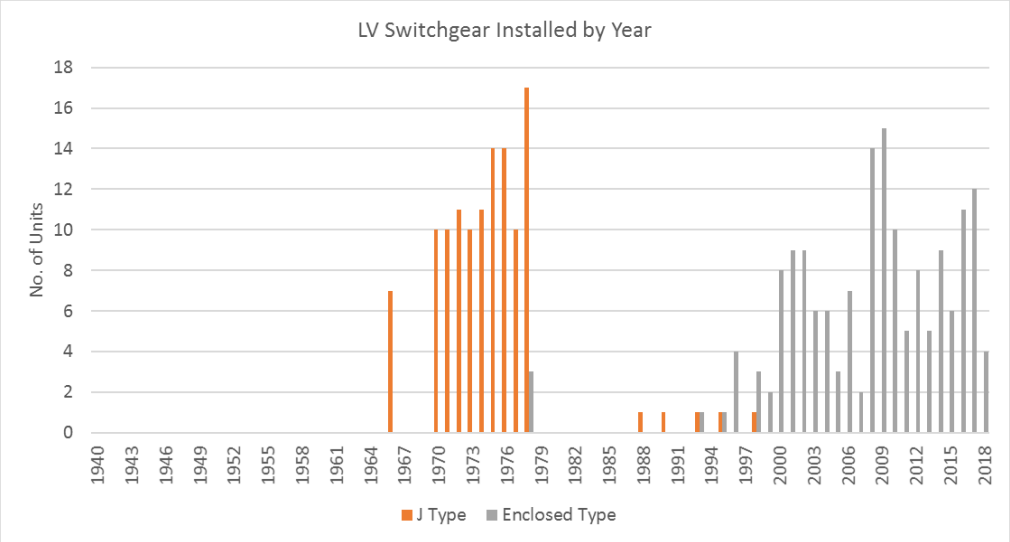

Figure 33 - Age profile of LV switchgear

5.14.4 Asset risk

The operational risk associated with the failure of LV switchgear is dependent on the location and use. Failure of switchgear supplying a large number of consumers can result in large disruption if there is no backup available from another feeder.

Based on our (and overseas) experience we have decided that J-Type fuses shall not be operated live on our network unless a risk assessment indicates that it is safe to do so.

There are a number of J-Type fuse boxes mounted above verandas along Oamaru's main street. We no longer allow ladder access to these and consequently any operation requires significant time and effort with a flow on effect on our network reliability.

While our J-Type fuses have surpassed their book life, there is no evidence from inspection data that the condition of this asset group is substandard.

We plan to replace all J-Type fuses, including over veranda types, over a five-year period for reasons of reliability and operational flexibility rather than condition.

5.14.5 Inspection and maintenance practices

LV switchgear is inspected every five years and any resultant reactive maintenance scheduled.

In 2017/18 NWL commenced a five-yearly service fuse box (SFB) inspection program. This involves checking for defects, recording asset condition and labelling assets.

5.14.6 Renewal programme

Forecast expenditure for the planning period is:

- Condition based replacements of service fuses.
- Replace 24 J-Type switchgear distribution boxes.
- Condition based replacement of other distribution boxes.

5.14.7 Expenditure forecast

Table 34 - Forecast expenditure for low voltage switchgear

Low Voltage Switchgear Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Replacement & Renewal	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Capital Expenditure										
Quality of Supply	0	0	0	0	0	0	0	0	0	0
Legislative and Regulatory	230,000	230,000	230,000	240,000	240,000	10,000	10,000	10,000	10,000	10,000
Replacement & Renewal	0	0	0	0	0	0	0	0	0	0

5.15 Other system fixed assets

5.15.1 Quantity and life expectancy of other system fixed assets

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 consumer's premises.

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 35 below:

Table 35 - Life expectancy of other fixed network assets

Asset Description	Standard life expectancy (years)
Ripple Control Transmitter	20
SCADA System	15
Radios	15

5.15.2 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.

5.15.3 Age profiles

The age profile in this category is shown in Figure 34

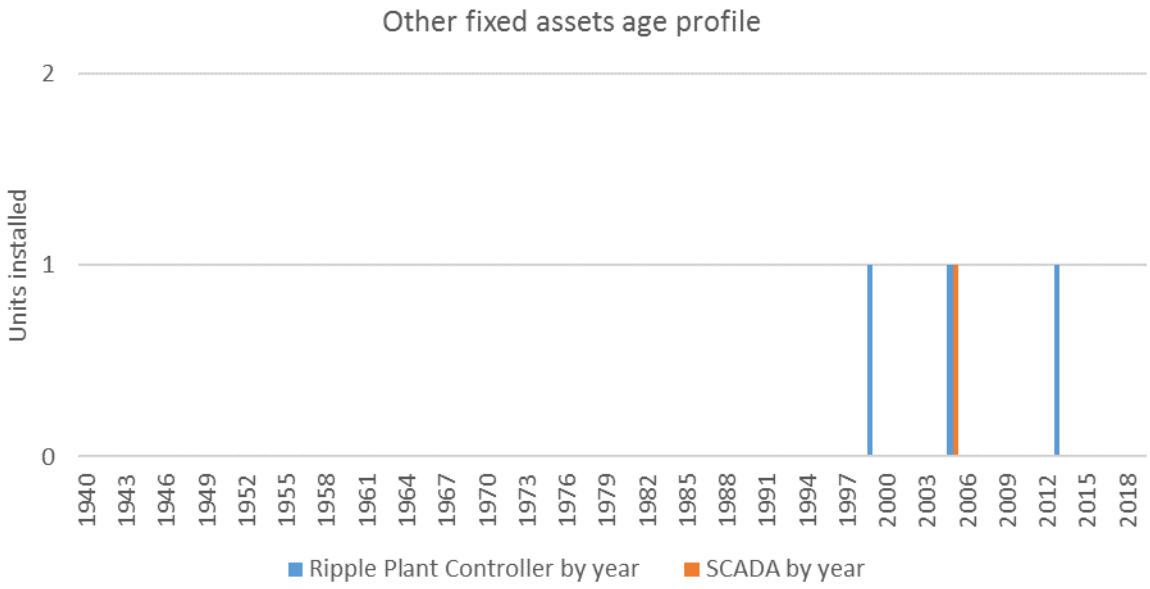

Figure 34 Age profile of other fixed network assets

5.15.4 Asset risk

Failure of our ripple control plants would have a fairly large impact on our network, as we would lose the ability to reduce load in a non-invasive manner during a constraint and could be left unable to switch hot water systems on or off (depending on the state at the time of failure)

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

The major risks to the Ripple control plants are component failure or that an animal accesses the coupling cells and causes damage.

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.

5.15.5 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.

Maintenance of the load control plant involves a two-yearly site check by the New Zealand agent for the ripple plant.

5.15.6 Renewal programme

Forecast expenditure for the planning period is:

- SCADA radio link upgrade (Years 1,2 and 4).
- Replace old cascade streetlight control system with ripple control.

5.15.7 Expenditure forecast

Table 36 - Forecast expenditure for other fixed network assets

Other System Fixed Assets Forecast	2018/19 ($)	2019/20 ($)	2020/21 ($)	2021/22 ($)	2022/23 ($)	2023/24 ($)	2024/25 ($)	2025/26 ($)	2026/27 ($)	2027/28 ($)
Operational Expenditure										
Routine and Corrective Maintenance	41,000	41,000	41,000	41,000	41,000	41,000	41,000	41,000	41,000	41,000
Replacement & Renewal	0	0	0	0	0	0	0	0	0	0
Capital Expenditure										
Quality of Supply	105,000	175,000	25,000	75,000	25,000	25,000	25,000	25,000	25,000	25,000
Legislative and Regulatory	0	0	0	0	0	0	0	0	0	0
Replacement & Renewal	20,000	20,000	20,000	20,000	0	0	0	0	0	0

5.16 Other assets

We own three 635 kVA diesel generator sets, one of which is connected onto the 11 kV bus at Otematata Substation to provide support generation in the event of an outage. A second generator is now permanently deployed to the Waitaki District Council's main water reservoir for Oamaru to ensure continuity of water supply during a large-scale power outage. A third unit is mounted onto a trailer with a step-up transformer and 11 kV vacuum switch which can be quickly deployed onto our network in the event of a fault or a large planned outage.

These units are maintained by outside service providers according to the manufacturer's instructions.

These units are to be upgraded with replacement controllers in the next three years, as the existing units are no longer supported.

5.17 Renewals and maintenance expenditure summary

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

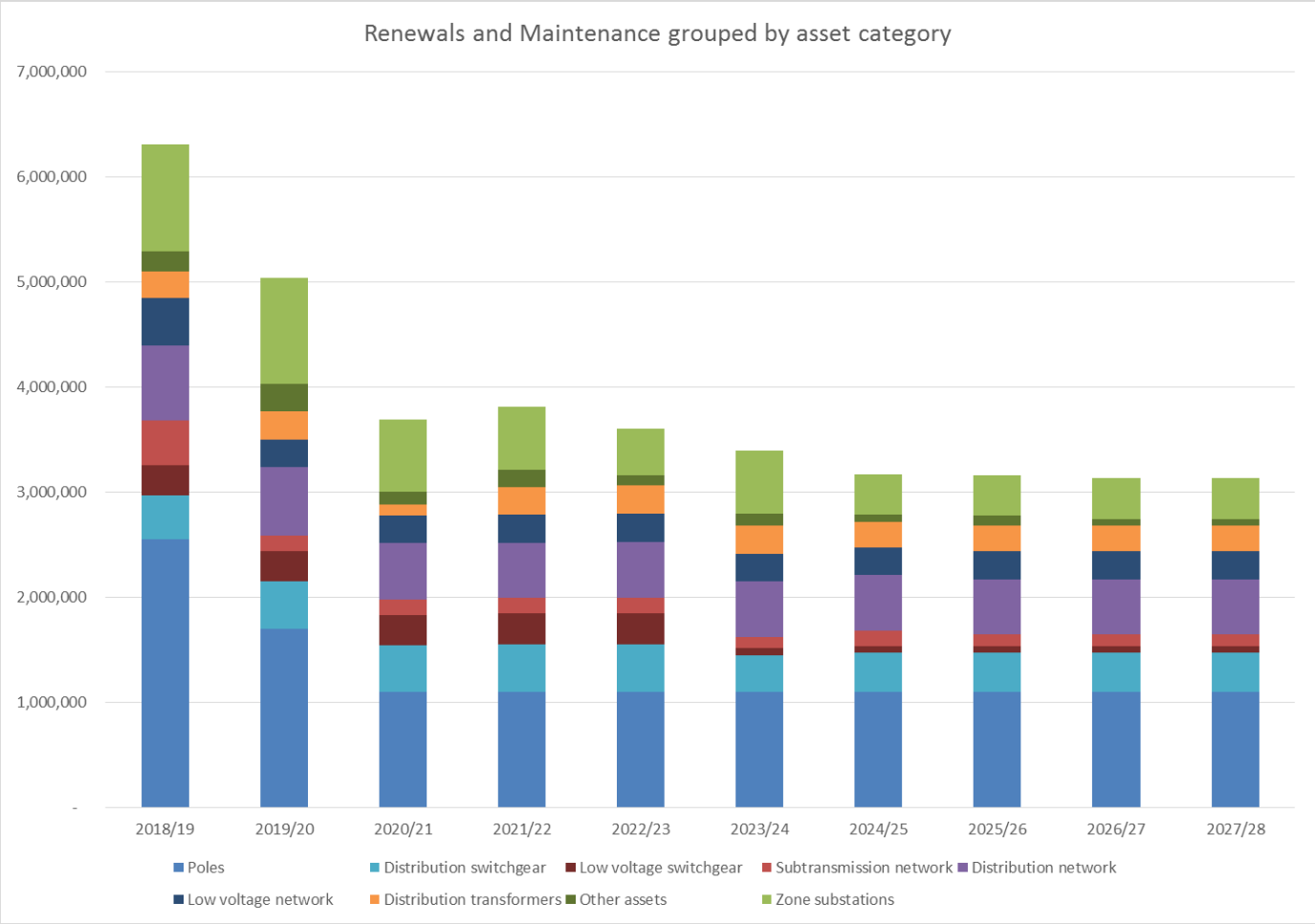

Figure 35 – Renewals and maintenance expenditure forecast by asset category

6. Network Development Plan (NDP)

This section describes our approach to network development and sets out our Network Development Plan (NDP) for the planning period.

This section covers:

- **Planning approach** which explains the approach, process, and assumptions we use for planning the development of our network.
- **Planning criteria** which explains our security, capacity, supply, and reliability criteria. It also outlines the design standards that we have adopted.
- **Demand forecast** which explains how we forecast the amount of energy required for different parts of the region we supply.
- **Network development plan** which explains the constraints within our network and our plans to develop our network to relieve those constraints.

6.1 Planning approach

Our planning approach is centred on achieving our mission of "owning and operating a safe, reliable and efficient distribution system that meets the evolving needs of our consumers." Therefore, our NDP is focused on safety, retaining, and maintaining current service levels to our consumers and providing economic benefits for connection for new consumers.

The process we use to plan and implement development projects is as follows:

- A development driver is triggered.
- Potential options are analysed and costed out. The best option(s) are developed further.
- Each development project is prioritised.
- Approval is obtained via a sanction for expenditure (SFE) from our Board.
- The project is scheduled on the Works Programme and issued to contractors for construction and commissioning.

6.2 Development drivers

The main drivers for network development projects are:

- the provision of sufficient capacity to meet load growth from new connections and from changes in usage patterns
- maintaining the reliability and quality of supply especially during periods of high growth
- ensuring compliance with regulatory requirements and ensuring public safety.

Over recent years significant load growth has driven the need for additional investment within our area, in particular the increased use of spray irrigation, and the development of large pumping schemes within the region.

There are currently a number of large development projects with a high likelihood of progressing that will significantly increase demand on our network. This may affect performance of the network anywhere between the new load and the GXP supply point. Therefore, development of our network to meet consumer demand growth continues to be a significant component of our total investment.

Our NDP combines growth trends in our network area as well as known potential developments with a reasonable likelihood of proceeding. Typically, we perform a full reassessment of the NDP on a three-yearly basis, with annual adjustments following the annual update of the demand forecast, or as development drivers are triggered by external actions, such as the expansion of a major consumer such as a large irrigation scheme.

NWL has identified the following planning assumptions that may impact on its business:

Table 37 - Assumptions for the Network Development Plan

Parameter	Assumption	Basis for the Assumption	Potential Impact of Uncertainty
Consumer Connections	The growth in the planning period is likely to be driven by expansion of traditional businesses, or introduction of new businesses	Recent history supports this assumption. The majority of proposed load that we are aware of is either new irrigation schemes, or growth of existing schemes, or businesses.	System growth projections, and the effect of a very large load which would probably require investment at a GXP level. There is an inherent assumption that business growth will be communicated to us in time to develop the plan. Business development often occurs at a different pace than our NDP, and applications for reasonably substantial loads are often not received until 12 months from livening.

Parameter	Assumption	Basis for the Assumption	Potential Impact of Uncertainty
System Growth	That the growth in demand will continue at the rates that have been experienced during the last 5 years for at least the first part of the planning period.	Discussions with farming and irrigation industry representatives. Industry experience with upcoming technological changes such as distributed generation, battery storage and electric vehicles.	The main impact around the certainty of this growth is the timing required for upgrade of subtransmission assets and the construction of new zone substations. Too conservative a view risks assets not being ready in time to serve load, while too optimistic a view could result in stranded assets, especially for investments made at GXP and Zone Substation level.
Reliability, Safety, and Environment	That consumer feedback will continue to support the present level of reliability and quality of supply.	Successive consumer surveys have confirmed that consumers are happy with the security and reliability of the service that they receive and would not be prepared to pay extra for a higher level of security. Comparison of our performance against other peer network companies (see section 3 for more detail)	Network configurations are optimised to deliver particular level of security and for the types of operational activity carried out. A change in these requirements may require extra investment.

6.2.1 Planning criteria

We have developed our planning criteria so that the network will meet the service level targets described in Section 3. Our planning criteria considers:

- Network Security
- Network Capacity
- Quality of Supply
- Network Reliability

Each of these is addressed below.

6.2.2 Network security criteria

Network security refers to the ability of the network to meet the customer demand for energy delivery without interruption. This covers interruption due to both planned and unplanned outages. We combine a deterministic set of measures with probabilistic analysis to development the required security of supply for any particular part of the network.

6.2.2.1 Deterministic assessment

The deterministic security criteria we use is detailed in Table 38 below. Security is defined for various classes of supply based on the size of the load and the overall consumer type in the area under investigation. For instance, if a feeder to largely urban area includes some rural network, then the security of supply will be based on the most critical class of consumer, i.e. urban.

Three security levels are defined:

- First outage: The required security following the first outage, (planned or unplanned) (compared to the normal system configuration of the network)
- Second outage: The required security following the second outage
- Bus fault or switchgear failure: The required security following a busbar fault or the failure of an item of zone substation switchgear. These events are less likely due to the controlled environment and design of the equipment but will have higher consequences than other outages.

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 excludes the response time taken to locate and isolate the fault as we prioritise restoration of supply to the maximum number of consumers ahead of individual security issues. In the event of a planned outage repair time is the time taken to return the isolated network to normal configuration.

Table 38 - Network Waitaki Ltd Security Standard

Network Waitaki Security Standard					
Class	Description	Load Size (MVA)	First Outage	Second Outage	Bus Fault or Switchgear Failure
GXPs					
A1	Urban GXPs	Any	No interruption	Restore 50% in switching time 100% in repair time	No interruption for 50% Restore rest within 2hrs
A2	Rural GXPs	>15	Restore 75% in switching time Restore 90% within 12 hrs	Restore in repair time	Restore in repair time
A3	Rural GXPs	<15	Restore 50% in switching time Restore 90% within 8 hrs	Restore in repair time	Restore in repair time
Sub-transmission Feeders and Zone Substations					
B1	CBD zone substation	Any	No interruption	Restore in repair time	No interruption for 50% Restore rest within 2hrs
B2	Urban zone substation	Any	No interruption	Restore in repair time	Restore in repair time
B3	Rural zone substation	>12	No interruption for 50% 100% in switching time	Restore in repair time	No interruption for 50% 100% in switching time
B4	Rural zone substation	2-12	Restore in switching time	Restore in repair time	Restore in repair time
B5	Rural zone substation	<2	Restore 50% in switching time 100% in repair time	Restore in repair time	Restore in repair time

Network Waitaki Security Standard					
Class	Description	Load Size (MVA)	First Outage	Second Outage	Bus Fault or Switchgear Failure
B6	Sub-transmission feeder	>15	No Interruption	Restore in repair time	Restore in repair time
B7	Sub-transmission feeder	<15	Restore in repair time	Restore in repair time	Restore in repair time
Distribution Feeders and Substations					
C1	Urban 11 kV feeders and CBD LV reticulation	1-4MVA	Restore in switching time	Restore in repair time	Restore in repair time
C2	Urban 11 kV spurs and LV reticulation	<1.5MVA	Restore 50% in switching time 100% in repair time	Restore in repair time	Restore in repair time
C3	Rural 11 kV feeders	1-4MVA	Restore 50% in switching time 100% in repair time	Restore in repair time	Restore in repair time
C4	Rural 11 kV spurs and LV reticulation	<1.5MVA	Restore in repair time	Restore in repair time	Restore in repair time
Notes: 1. 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 excludes the response time taken to locate and isolate the fault as we prioritise restoration of supply to the maximum number of consumers, ahead of individual security issues. 2. Network assets dedicated to a special industrial load will have a security level determined by consumer requirements. 3. This security criteria assumes we can interrupt irrigation load for up to 48 hours.					

Our target Repair Times for different asset classes are:

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

6.2.2.2 Probabilistic Assessment

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

This allows the cost benefit analysis of any proposed change to network security using an NPV calculation. It should be noted that in the event of particularly high impact risks a strict NPV approach is tempered with an assessment against the overall business risk.

The probability of failure for particular classes of equipment is usually taken from generic electrical industry figures, but where we have sufficient data to generate our own failure information these figures would be used. For planned outages required for maintenance, installation of new connections, or other scheduled work, typical figures will be worked up for a scenario based on the particular circumstances.

The cost of unserved energy is generated for a particular scenario based on the following values of lost load, which were developed based on industry guides and good practice:

Table 39 - Value of lost load (VoLL) used in probabilistic assessment of supply security

Load type	Value of lost load (VoLL)
Standard Domestic Supply	$10/kWh but also test at $20/kWh
Agricultural/Irrigation Supply	$40/kWh but also test at $60/kWh
Light industrial/Commercial Supply	$40/kWh but also test at $60/kWh, particularly for CBD areas
Large customers	Develop a value in association with the customer

The use of two separate values to test against provides for uncertainty in the calculation of VoLL, and is a sensitivity analysis which will help illustrate where a project is nearly over the threshold for approval.

It should be noted that the changes in our approach to live line work may have ongoing impact in the assessment of the security of supply for portions of the network. Much of our network has been designed based on the assumption that outages can be avoided, or minimised using live line techniques. With the change in practice clearly being a long-term proposition, we will be examining the impact to the existing security of supply.

6.2.3 Network standardisation criteria

Network capacity refers to the ability of the network, or the assets that make up the network to deliver the required amount of electricity to consumers. We design our network to have sufficient capacity to deliver electricity during normal conditions and meet our security criteria (See Section 6.2.2) during contingent events, when one or more assets are unavailable.

The table below defines the capacity standards for the different asset classes:

Table 40 - Network Waitaki Ltd standardisation criteria

Asset Class Criteria	Basis for Rating	Standardisation
33/66 kV Overhead Conductor	We size new conductor for the expected loading at the end of the planning period based on common industry sizes, and sizes common in our network We select the conductor size for both electrical load and mechanical strength.	We have standardised conductors used on our network.
33 kV Cables	We size new cables for the expected loading at the end of the planning period based on common industry sizes. Select the conductor and screen size for both load and fault current carrying capability. We ensure terminations have high impulse withstand voltage rating and be of a design that minimises the risk of discharge between cores in the termination area. We protect all 33 kV cables with suitably rated surge arrestors. This criterion also helps to meet network quality targets by reducing surge voltages on the subtransmission network.	
Zone Substation Transformers	We choose Zone Substation Transformers to meet the security criteria for the planning period. This means supplying the existing load and providing contingent capacity for neighbouring substations. For rural areas, we normally use our standard transformer for rural zone substations, which is 5/7 MVA Dyn11.	Rural zone transformers are typically 5/7 MVA, Dyn11.

Asset Class Criteria	Basis for Rating	Standardisation
Distribution Feeder Loading Criteria	We adopt a feeder loading criterion to maintain distribution network transfer capacity between zone substations and provide backup to feeders within zone substations. Where possible, we maintain maximum routine feeder loads within 67% of the rating of the feeder. This will allow the load to be spread around neighbouring feeders if one feeder fails.	Maximum feeder loads are maintained within 67% of the rating of the feeder.
11 kV Overhead Conductor	We size new conductor for the expected loading at the end of the planning period based on common industry sizes. Select the conductor size for both electrical load and mechanical strength. Within 1 km of the coast use all aluminium conductors. For everywhere else, use ACSR conductors.	We have standardised conductors used on our network.
11 kV Backbone Cables	We use 185mm2 Al XLPE insulated cable for all new 11 kV cable for feeder backbones.	185mm2 Al XLPE.
11 kV Spur Cables	We size new 11 kV spur cables for the expected loading at the end of the planning period based on common industry sizes. We select conductor and screen size for both load and fault current carrying capability.	
LV Overhead Conductor	We size new conductor for the expected loading at the end of the planning period based on common industry sizes. We select the conductor size for both electrical load and mechanical strength.	We have standardised conductors used on our network.
LV Cables	We use 120mm^2 or 185mm^2 Al XLPE insulated cables for all new LV cables depending on local LV distribution load characteristics for a given transformer area and assessed voltage regulation under peak loading conditions.	We have standardised cables used on our network.
Distribution Transformers	We select distribution transformers to ensure their capacity exceeds the assessed long term after diversity maximum demand of the current and potential load.	15, 30, 50, 100, 200, 300, 500 kVA

Asset Class Criteria	Basis for Rating	Standardisation
Switchgear	We select switchgear to: • meet the expecting loading at the end of the planning period; • have a maintenance requirement that is equivalent to or less than current plant; and • be able to be maintained using skills available locally. We have a policy of avoiding SF6 gas wherever possible, due to the known environmental impact of the gas.	
Poles	We use poles of adequate strength to comply with design to AS/NZS7000 and be capable of withstanding snow and ice loading experienced with the region. We use the Catan line design software package to analyse forces and loadings to ensure we select correct pole and stay options.	

We achieve cost efficiencies by utilising standard designs for lines and substations. We review these designs periodically and update them where we identify opportunities to improve them efficiently, or we identify new techniques or products that provide a better outcome.

6.2.4 Quality of supply criteria

We have a low-density network with long rural feeders and for this reason voltage drop is usually the limiting factor on network capacity. On long rural feeders, low voltage is generally the first sign of an emerging network capacity issue so it is one of the most common drivers for network augmentation projects.

We design our network to the following voltage limits:

- 33 kV Sub-Transmission: ±5% of nominal voltage
- 11 kV Distribution: ±5% of nominal voltage
- 400 V LV network: ±6% of nominal voltage up to the legal point of supply
- The maximum voltage drop along 33 kV lines in normal configuration shall be no more than 2.5%
- The maximum voltage drop along 11 kV feeders in normal configuration shall be no more than 5.0%
- The maximum voltage drop along LV feeders in normal configuration shall be no more than 10.0%

Projects that improve the voltage levels or voltage control on our network provide the following benefits:

- The ability to meet statutory voltage limit requirements.
- Improvement in distribution circuit capacity.
- Improvement in back feed ability to other distribution circuits in a contingency condition.
- Reduction of power losses.

6.2.5 Distributed generation

Distributed generation (DG) is classed as any form of generation that produces electricity for use at the point of connection or supplies electricity to other consumers through the local lines distribution network at distribution voltages. It does not supply electricity to consumers via the transmission grid.

DG within our network is typically small scale generation (less than 10 kW) at the consumers' premises.

Our approach to DG is based on the following key principles:

- Distributed generation will be able to connect to our distribution network on fair and equitable terms which do not discriminate between different DG schemes;
- the terms under which DG can connect and operate will be as clear and straight forward as possible, within the limitations of the relevant legislation and our mission to operate a safe, reliable, and efficient distribution system; and
- We will work with the industry to investigate issues around widespread DG and work to incorporate mitigations into our network development and operation.

63 of our connected consumers have approved distributed generation, as shown by type of generator in the table below:

Table 41 - Distributed generation by energy source

Type of generator	Number of sites	Total installed generation (kW)
Solar	60	217
Hydro	2	55
Diesel	1	508
Wind	0	0

The amount of DG in our network is not presently very large. Most of the DG is in the form of rooftop solar systems located in or near the urban centre of Oamaru, as shown in Figure 36 on the next page.

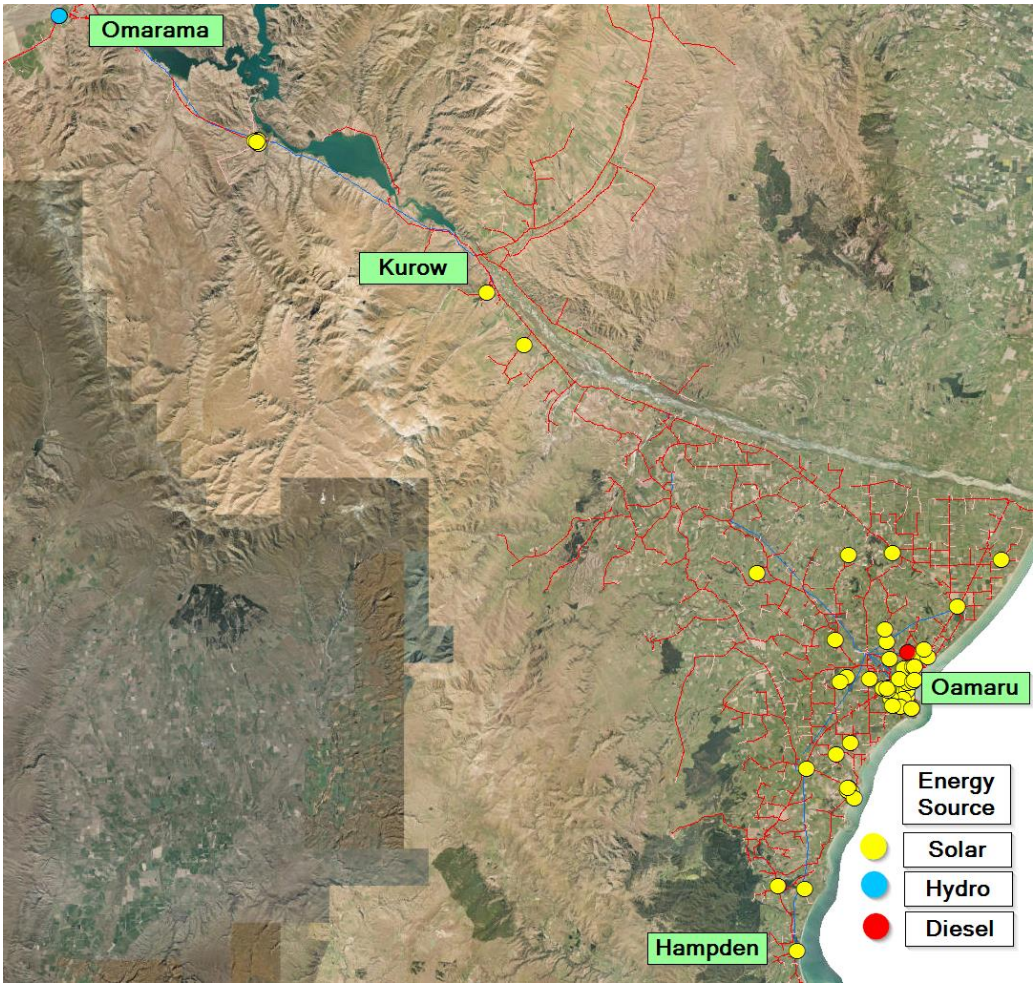

Figure 36- Distributed generation

The effects of this distributed generation on network equipment have not yet become an issue, although we are monitoring the situation, and will continue to look to the experiences of others in the industry when considering the effect of distributed generation on our network.

We are not currently aware of any major distributed generation projects being proposed or planned in our network area, and encourage anyone interested in this area to make contact with our Planning department.

NWL has the following policy documents for the connection of Distributed Generation:

- NI05/35 Regulated terms for connection of distributed generation
- NI05/36 Connection and operation of distributed generation with a capacity 10kW or less
- NI05/37 Connection and operation of distributed generation with a capacity greater than 10kW

These policy documents are freely available to consumers from our website, www.networkwaitaki.co.nz.

The basic conditions for connection of DG to the network are that:

- it must automatically disconnect and lock out from the distribution network if there is a loss of mains power, and

- it must not impact adversely on the quality of supply in the area it is connected.

In the past we have investigated the feasibility of installing and running DG systems ourselves, and will continue to consider them in the current planning period, if suitable opportunities arise. We currently have two grid connected diesel generators that are used for load support when required, usually because of outage requirements. A project is planned for the first year of the planning period to install and monitor a solar/battery system.

6.2.5.1 The effect of DG on network development planning

We consider the impact of distributed generation in two ways as part of the network development planning process. Firstly, DG is considered from how its likely uptake will impact on the demand forecasts developed as part of the network development planning process. We expect that within the planning period of this AMP research into the effects of widespread DG within a network will help our planning. Secondly, DG is considered as an alternative to conventional network solutions for each project in the network development plan.

6.2.6 Demand reduction

We use our load management system to control water heating and other loads at consumers' installations. Load management is presently used to reduce network demand co-incident with peaks for the lower South Island region of Transpower's network, and thereby reduce transmission charges.

Load management is also used to shift demand from peak load times into off peak times to manage the transmission constraint into the Oamaru GXP. While this traditionally involves the demand due to hot water and space heating, we have installed ripple relays on irrigation loads greater than 30 kVA. This load control may be used to manage transmission constraints, or other major threats to the network, where the alternative is to disconnect large uncontrolled load. This is usually only applied as a last resort.

Consumers are encouraged to take advantage of the load control options available to them, and NWL charges are structured to encourage the use of off peak energy. Controllable load is comprised mainly of storage water heating, with a diminishing quantity of night storage and under floor heating. However, the availability of controllable load has diminished in recent years due to the replacement of off peak night storage heating with heat pumps that have traditionally been unsuitable for load control due to the low thermal mass of air. Within this planning period we will be investigating the state of the art in the area of load control using heat pumps, as the penetration of these devices increases.

6.2.7 Energy efficiency

NWL has participated in previous energy efficiency initiatives including the retrofitting of water heating cylinder insulation and the eco light bulb campaign. In the past NWL has contributed to co-funding an irrigation energy efficiency programme initiative carried out by Irrigation New Zealand and the Energy Efficiency and Conservation Authority (EECA).

We have no current energy efficiency initiatives in development, but will continue to investigate options to improve the energy efficiency of our consumers, key stakeholders, and the local community.

6.3 Demand forecast

Over the past decade a significant portion of network investment has been driven by load growth. The growth has primarily arisen from the increased uptake of spray irrigation, with both new schemes, and the conversion of existing gravity fed schemes to electric pumping.

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

As well as increasing the demand on the network assets, the increase in irrigation load has also affected the demand profile of our network. Where we were once a winter peaking network, our current peaks now occur in January or February.

In order to develop and update our demand forecast we engage with existing and potential customers to discuss changes to their load, or new projects that may be planned. This allows us to make some realistic projections for the load growth in the region.

There are no doubt other projects being considered that we are unaware of at this point, and we encourage any stakeholders with knowledge of significant developments in the area to get in touch with our planning department for further discussion.

We have applied certain assumptions to our demand forecasts to assist us with modelling the future requirements of the network. They are shown in the table below.

Table 42 - Demand forecast assumptions

Parameter	Assumption	Basis for the Assumption	Potential Impact of Uncertainty
Consumer connections - irrigation	That the demand for new and upgraded connections, in the dairy and irrigation sector, will continue. Environmental requirements are placing demands on irrigators to be more efficient, but there are also clear economic drivers to the farming industry – irrigated land is generally more profitable. This pressure is expected to see the increased use of spray irrigation, which will require increased investment in the electricity network	NWL has been experiencing strong growth in the irrigation sector due to the availability of irrigation water from the Waitaki river, and the development of larger schemes to capitalise on this resource. Consultation with various irrigation businesses has confirmed the expected growth in the sector.	System growth projections, planning, and capital funding projections, and contractor workload. Uncertainty around major loads, (e.g. large piped irrigation scheme) may lead to stranded assets if investments are made before projects are committed, or may lead to failure to supply in the event of an investment decision made too late.

Parameter	Assumption	Basis for the Assumption	Potential Impact of Uncertainty
Consumer connections – domestic	That the growth in demand will at least continue at the rates that have been experienced during the last 5 years	Infill housing and planned subdivisions are continuing at a seemingly sustainable rate in the greater Oamaru area. At the same time, the uptake of electric vehicles is expected to increase steadily during the planning period. This is likely to offset any drop in demand due to energy efficiency or usage changes. Analysis of applications for new supplies – total capacity purchased is increasing annually.	Urban feeders have a higher associated security of supply, and overestimates of growth may attract extra investment that is then stranded.
Reliability, Safety, and Environment	That consumers remain satisfied with the planned levels of reliability and quality of supply.	Successive consumer surveys have confirmed that consumers are happy with the security and reliability of the service that they receive and would not be prepared to pay extra for a higher level of security. .	To increase the reliability and quality of supply from current levels may require duplication of assets, and a change to the topology of our network to incorporate closed rings to guarantee supply.

Parameter	Assumption	Basis for the Assumption	Potential Impact of Uncertainty
System Growth	That technologies such as rooftop solar panels, home battery storage and electric vehicles do not dominate the distribution network before their impact is understood	Many of these technologies (PV systems, electric cars) are not likely to have an early impact in our network before industry experience builds up. Solar is not well suited to for use as far south as Oamaru, and is still not-economic for the majority of the consumers in our area. Electric vehicles are not yet suitable for large scale use in a reasonably small rural community due to range issues. This is likely to keep initial penetration at a low level and allow time for analysis of the potential effects	The large-scale installation of effective distributed generation or household batteries within a particular area could potentially strand major assets by reducing demand. Conversely, the large-scale installation of Electric vehicle chargers in a particular area could stress some network assets.

6.3.1 Methodology

The development of a robust demand forecast is complex and requires a number of inputs and assumptions. For the purposes of planning network development, we establish a reasonable baseline forecast which is then routinely tested against actual demand outcomes as the years progress, i.e. we test the accuracy of our model by looking at what is actually happening in the network.

Load increases are applied wherever possible based on specific load figures, either from customer supplied information, or by applying calculated rates, such as kW/hectare for spray irrigation. Non-specific network growth (i.e. small business, domestic consumers) is applied via a percentage based on the average load profile growth in the previous 10 years.

The process to establish a baseline demand forecast for our network is as follows:

- Historical demand records are analysed at the 11 kV feeder level to take into account several load categories, including irrigation, dairy farming, large industrial, large commercial and residential load;
- Future demands in each of these categories are extrapolated using different calculated trends. Forecast of irrigation and dairy load is based on actual demand increases in the last 2 to 3 years plus discussions with major stakeholders in the dairy and irrigation industries. Demand forecasts for major industrial loads are based on any known step changes in this type of load gleaned from discussions with major consumers and from media sources. Greater weighting is placed on dry years (when irrigation is being used to a greater extent)
- Historical diversity factors are then used to combine the forecasts at the feeder level to derive forecasts at the Zone Substation level. This process is repeated at the subtransmission level to provide GXP forecasts. (These GXP level forecasts provide an input to Transpower network planning).
- Step loads due to known developments such as major irrigation schemes, large industrial installations and any large subdivisions are added into the forecast at the relevant level (distribution, subtransmission or GXP).

Diversity factors are verified against measured data as they can change over time as new loads are added, or as existing load profiles change (for example irrigation use is changing as farmers seek to use it more efficiently).

6.3.1.1 The impact of demand side management on the demand forecast

The impact of traditional load management (space heating and hot water) is minor during the summer peaks and for these reasons we have not included the effect of demand side management in the demand forecasts. As mentioned in section 6.2.6 the control of irrigation load is a tool reserved for managing unusual conditions on the network, as such is not regularly used, and wherever possible we will continue to design our network to provide capacity for all irrigation consumers, without the requirement to implementing load control.

6.3.1.2 The impact of distributed generation on the demand forecast

To date there has only been a small amount of distributed generation installed within our area of supply. This is intrinsically included in our demand forecast by its impact on the historic measured feeder peak demand and it is assumed that this existing generation will continue to be used at the same level into the future.

There are no clear indicators that distributed generation, or the related technology of household battery storage is making great inroads in our network area in the near future. However, we do acknowledge that the rate of change for these technologies is very high, and uptake is likely to change quite rapidly within the planning period, and with little warning. For these reasons, we have not made any clear allowance for distributed generation in our demand forecast, but within the in the first 1-2 years of the planning period we will be researching experience from New Zealand and overseas to develop useful models for impact.

6.3.1.3 Key developments included in forecasts

Key developments within the region are included in the current demand forecast as per Table 43. These developments are included as they are considered to be reasonably likely to occur. More speculative developments have been avoided. Specific details of each development are not listed due to potential commercial sensitivity of the information.

Table 43 - Key consumer driven developments within the planning period

Load Type	Impact (MW)	Area of Network	Estimated date
Livestock operation	1	Hampden	2018-19
Processing operation	1	Oamaru	2018-19
Irrigation scheme	2	Five Forks/Maheno	2018/19
Irrigation scheme	1	Kurow/Duntroon	2019-20
Irrigation scheme	1.2	Parsons/Papakaio	2019-20
Irrigation scheme	3	Papakaio/Pukeuri	2020-21
Subdivision	0.5	Oamaru	2021-22
Accommodation	0.5	Oamaru	2021-22

We would like to thank our major consumers who have taken the time to discuss their plans with us. Forewarning of future projects is key to developing an efficient network and for providing adequate notice to enable the preparation of our network to meet connection requirements.

6.3.2 The demand forecast

The demand forecast is presented below at two levels, GXP and Zone substation.

6.3.2.1 GXP demand forecasts

GXP forecasts are shown below in Table 44.

Table 44 - GXP level forecasts based on Summer peaks

GXP	Maximum Demand (MW) – Summer period										
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Twizel	2	2.1	2.1	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.7
Waitaki	10.8	11.1	12.1	12.4	18.5	19.0	22.6	23.3	24.0	24.7	25.5
Oamaru	39.2	42.3	44.3	46.7	43.6	44.9	43.2	44.5	45.8	47.0	48.3
Black Point	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1

These figures are shown graphically in Figure 37. Due to the density of irrigation load on the Oamaru GXP, we have modelled the forecast demand as a wet year scenario (low irrigation use) and a dry year scenario (high irrigation use). It is considered prudent to utilise the dry year forecast to drive planning, as failure to do so will result in unserved load.

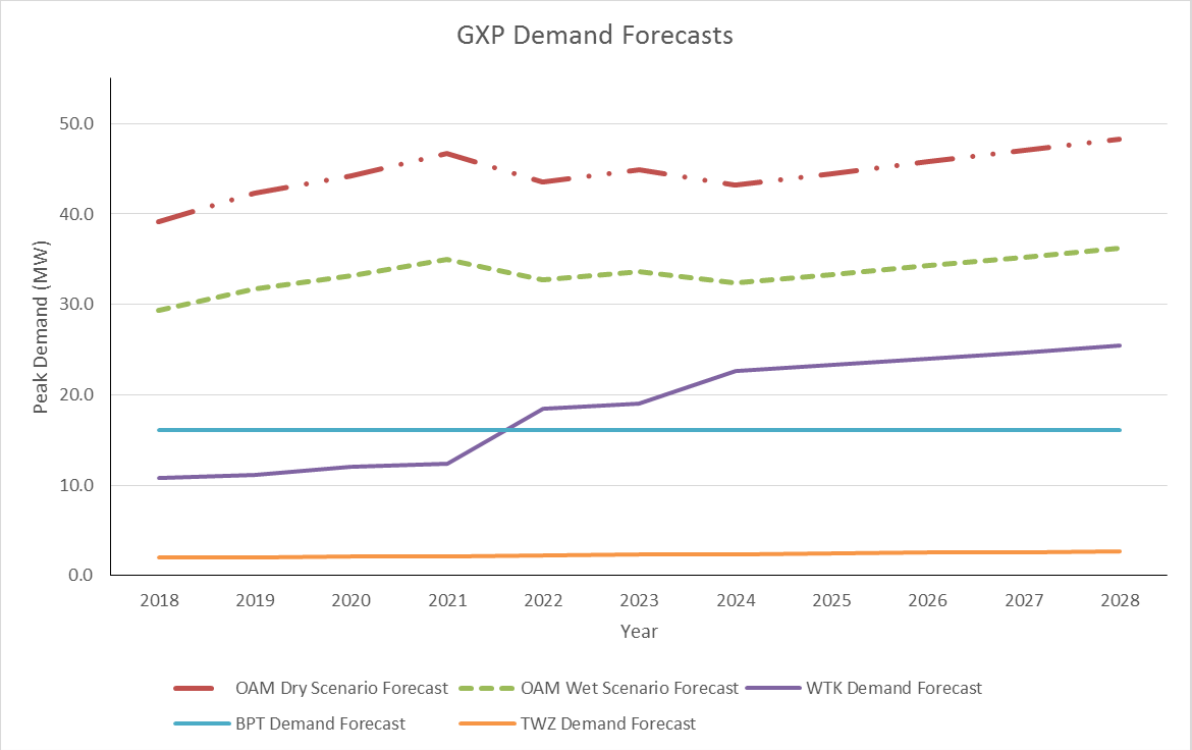

Figure 37 GXP demand forecasts

6.3.2.2 Zone Substation Demand Forecasts

Table 45 below shows the 10-year Zone Sub demand forecasts. As well as expected load growth, these include the significant consumer projects noted above in Table 43.

Table 45 - Zone substation maximum demand forecast 2018/19 to 2028

Substation	Forecast Maximum Demand (MW)											
	2017/18 (Actual)		2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Ruataniwha	0.8		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Ohau	1.4		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8
Omarama	1.6		1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2
Otematata	0.6		0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
Kurow	5.0		3.7	4.3	4.4	4.5	4.6	4.7	4.9	5.0	5.1	5.3
Otekaieke (Future)			3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9
Duntroon	5.2		3.9	4.5	4.6	4.7	4.8	5.0	5.1	5.2	5.4	5.5
Awamoko (Future)						2.0	2.1	2.1	2.2	2.3	2.3	2.4
Ngapara	5.2		5.3	5.5	5.6	5.8	6.0	6.2	6.3	6.5	6.7	6.9
Peebles (Future)								4	4.1	4.2	4.4	4.5
Papakaio	5.7		5.9	6.8	8.5	6.7	6.8	4.9	5.0	5.2	5.3	5.4
Enfield	2.2		2.3	2.3	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9
Parsons Road	3.6		3.7	4.2	4.3	4.4	4.5	4.6	4.8	4.9	5.0	5.1
Pukeuri	8.8		9.0	9.3	11.1	11.3	11.6	9.9	10.2	10.5	10.8	11.1
Chelmer Street	13.9		14.0	14.2	14.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4
Redcastle	8.8		10.0	10.3	10.6	10.8	11.1	11.4	11.7	12.0	12.3	12.6
Five Forks	1.3		2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.7	2.7
Maheno	3.3		4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3
Hampden	1.3		2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.7	2.7

Notes:

1. Maximum demands are not necessarily coincident, i.e. MDs for different substations may occur at different times of day or throughout the year.
2. Blacked out cells indicate that the substation is not yet commissioned.

6.4 Development programme

The development requirements for each of the GXPs, subtransmission and zone substations is described below. A summary of the resulting capital expenditure is provided at the end of the chapter.

Our development strategy for the planning period remains unchanged from the previous few years, with the overall objective of:

- implementing a staged migration to subtransmission at 66 kV in the area between Oamaru GXP and Waitaki GXP as demand grows across the region;
- Shift existing load and future growth away from the Oamaru GXP which is constrained by Transpower's 110 kV transmission system and onto the Waitaki GXP.

We consider this overall strategy the most economic means of continuing to meet the increasing demand from our consumers. At a distribution level the growth in load has led to the need to upgrade feeders to provide extra capacity both directly to the loads, and to maintain the level of support available between substations. This affects our security of supply, and therefore the reliability of the supply to our consumers.

Our goal is to retain and service our existing consumers, and connect new consumers as they require, while maintaining the current levels of service provided.

There are no plans to reticulate new areas of the region apart from minor changes due to new subdivisions within the existing network.

There are also no plans to remove reticulation from less economic areas. We have had several situations arise where renewal of existing lines seemed to make an attractive case for non-network solutions to supply consumers, and provide an opportunity to remove reticulation in this situation. Following rigorous analysis, including consultation with EDBs that are experienced in the application of off-grid supply to consumers (such as solar/battery supplies), we found that the business case did not stack up in these situations. We will however, continue to view non-network solutions as an alternative to investing in new poles and wires, and will investigate on a case by case basis.

The development plan is separated into the following investment areas, discussed in more detail in the following sections:

- GXP development
- Transpower's 110 kV development
- Subtransmission development
- Zone substation and distribution development

6.5 GXP development

6.5.1 Oamaru GXP

The Oamaru GXP is a Transpower substation currently supplying a peak load of around 40 MVA during dry summers. The Oamaru GXP has a security rating of *N-1* (i.e. supply should be available after the failure of any single component in the supply chain).

The 110 kV Transpower supply to the Oamaru GXP has a dynamic operational constraint (see section 6.6 below) which limits the *N-1* capacity at this Oamaru GXP to approximately 41 MVA, depending on transmission system and climatic conditions.

During the dry summers (with high irrigation loads) of 2009/10 and again in 2015, the load at the substation was held just below this level by the use of load control, with Transpower declaring a grid emergency in 2015. These events have been occurring in the region of total of a week per summer season, but this is likely to become more common in the coming years. Our forecasts, shown in Table 44 show that the maximum demand at Oamaru GXP is expected to hit this transmission constraint from Summer 2018 through to the end of the planning period.

During these events, we employ additional load control measures by managing irrigation load, and also using additional local diesel generation at the 11 kV network level to help mitigate the transmission constraint.

Development options that have been considered to overcome the 110 kV system constraints are detailed further in section 6.6, with the following options considered as being possible:

- Replacing or augmenting Oamaru GXP with a new GXP supplied from the 220 kV system, thereby bypassing the constraints on the 110 kV system. Initial investigation was undertaken around a GXP at Livingstone, which would effectively enable any new load between Kurow and Oamaru to be supplied from this GXP. Recent discussions have focused on a new Transpower 220 kV GXP in South Canterbury which would free up capacity on the existing lines, and/or provide a shorter path to supply.
- Thermally upgrade the conductors on the 110 kV lines supplying Oamaru.
- Install a special protection scheme that will automatically reduce load at Oamaru GXP following the forced outage of one the circuits supplying Oamaru to bring the load below the *N-1* constraint.
- Install peaking plant (diesel generation or battery storage) at Oamaru GXP to provide additional energy during constraint periods.
- Reconfiguring the Oamaru GXP to allow operation at a reduced security level of *N*, by splitting the load between each of the 110 kV lines
- Use load control during constraint periods – this would include load controlling irrigation, probably on a roster basis;
- Move load from Oamaru GXP onto Waitaki GXP via the NWL subtransmission system.

As a result of this investigation it was determined that the best short term option is to continue to move load from the Oamaru GXP onto the Waitaki GXP.

We are working through long term solutions for the problem with Transpower and other regional stakeholders, with a long-term solution to be developed in the 2018/19 financial year.

6.5.2 Waitaki GXP

The Waitaki GXP was an *N* security GXP with a 5 MVA transformer, supplied from the Waitaki Power Station 11 kV Generator bus. With continuing load growth in the region, and the necessity to move load away from the Oamaru GXP, the capacity of the Waitaki GXP was fully utilised in 2015.

The GXP was upgraded in 2015 with a single new 20/24 MVA transformer and associated controls and switchgear as stage 1 of a two-stage project. The substation now has a capacity at *N* security of 24 MVA. The original 5 MVA transformer is still on site and can be returned to service with some switching, but cannot operate in parallel with the new transformer.

This upgrade has allowed the transfer of Duntroon substation from Oamaru GXP onto Waitaki GXP, removing approximately 5 MW from the maximum demand. We plan to add more substations to the Waitaki GXP (see development sections below), subject to the limitations of the 66 kV network.

An additional benefit of this load transfer is that the 33 kV sub-transmission network supplied by the Oamaru GXP is becoming voltage constrained. These constraints are most evident in the growth areas to the west of Oamaru (Ngapara through to Duntroon) that are remote from the GXP. This will become more pronounced as more irrigation and dairy development occurs west of Duntroon, and on the lower Waitaki plains. Moving the Duntroon and Ngapara substations onto Waitaki GXP will improve our ability to meet forecast growth in these areas.

Stage 2 of the project at Waitaki GXP will involve the installation of a second 24 MVA transformer to increase the security of the GXP to *N-1* at 24 MVA. This work is dependent on the load hitting our GXP trigger for security of 15 MW. At this point our forecast for this trigger is for 2020/21, following the addition of the Ngapara load to the GXP (see section 6.7 for more detail).

This upgrade will provide adequate capacity for this GXP through the planning period.

Project Name	Components	Year (s)	Budget cost
Waitaki GXP Second Transformer	• Duplicate 20/24MVA transformer • Install switchgear, extend control system etc.	2020/21	$1,600,000

6.5.3 Twizel GXP

The Twizel GXP supplies both NWL and Alpine Energy networks from a split 33 kV bus. Although this is a dual transformer installation it is operated as two *N* security GXPs with a 33 kV backup supply available from the other transformer and bus. Options for upgrading the protection at this GXP to upgrade it to an *N-1* security supply have been investigated but cannot be justified on a cost per consumer basis.

The Twizel GXP has sufficient capacity to meet our load within the planning period. Following the Waitaki GXP upgrade we have reviewed which substations are normally connected to the Twizel GXP and have optimised this to ensure that we are making the most efficient use of our GXP connections.

There is no development proposed at the Twizel GXP during the planning period.

6.5.4 Black Point GXP

The Black Point GXP is dedicated to the NOIC Irrigation Scheme, which was commissioned in 2006.

NOIC has recently completed an expansion to raise their maximum demand from 10.7 MVA to approximately 16 MVA. The GXP is designed to meet a firm capacity of 25 MVA, but operational issues on the Transpower 110 kV supply (see section 6.6) required the installation of a special protection scheme between Waitaki GXP, Oamaru GXP, Black Point GXP, Bells Pond and Studholme. In the event of a contingent event during a constraint period the protection scheme will operate to reduce the NOIC pumping load to bring the Black Point demand below the constraint.

There are no other developments planned at Black Point for the Planning period.

6.6 Transpower's 110 kV transmission development

We take supply from the National Grid via Transpower's 110 kV network. The Transpower supplies to our primary GXPs from Waitaki are shown in Figure 38. Our Twizel GXP is located at the Transpower Twizel substation.

The 110 kV line from Waitaki to Oamaru GXP is a dual circuit system, with both circuits sharing poles and transmission towers for most of the length of the line. As well as supplying Network Waitaki loads at Black Point and Oamaru GXPs, at times the lines supply into the southern part of the South Canterbury region, specifically:

- Bells Pond
- Studholme
- Timaru

Load growth within these GXP areas has increased significantly in the last 5 years with the NOIC development at Black Point and new dairy factories at Studholme and Glenavy. A number of large irrigation developments are also on the horizon. Unfortunately, the nature of the load in the area means that this section of the network is heavily loaded during Summer, the peak load period on our network.

The two 110 kV lines each have a dynamic thermal constraint which restricts the total energy that they can carry, depending on the ambient temperature, load profiles and other factors. The limiting factor is primarily line sag reducing the safe clearances to ground. This means that at times Transpower does not have the ability to supply the complete load at Oamaru GXP from one line by itself if the other line is out of service.

The summer loading due to the combined load of the offtakes on the circuit is nearing this constraint, which based on experience within the 2017/18 period appears to be approximately 41 MVA load at Oamaru.

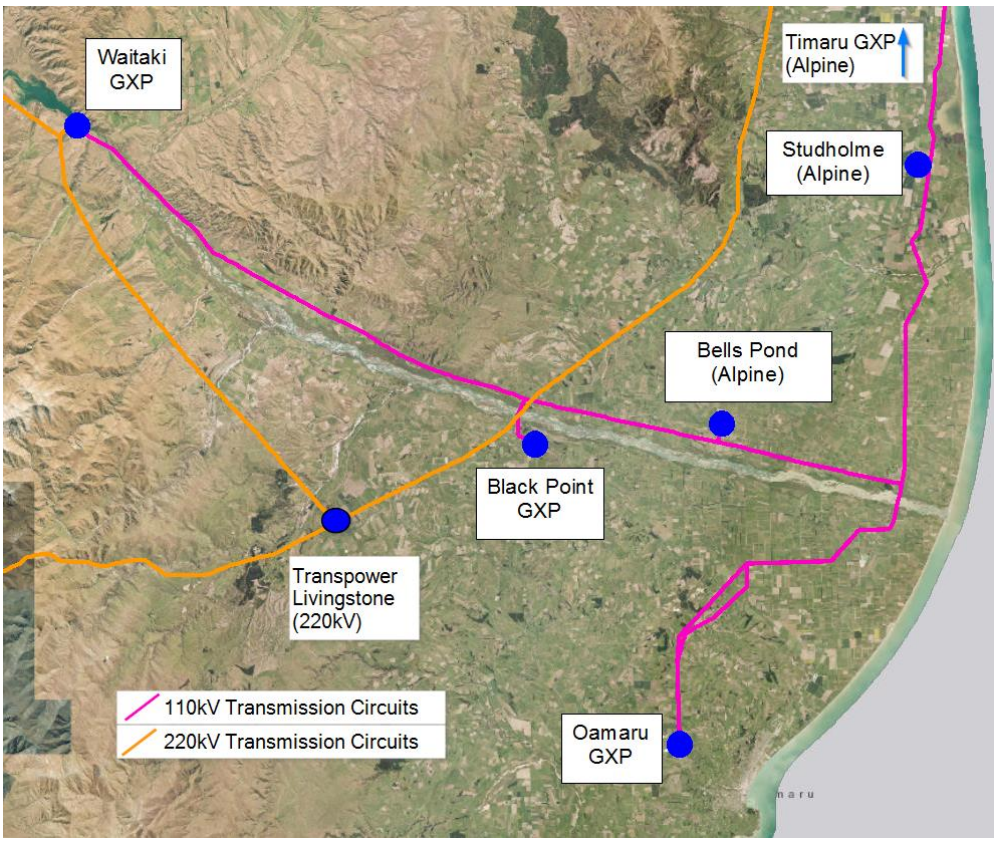

Figure 38 – Transpower 110 kV and 220 kV circuits and connected GXPs

Since the Oamaru GXP has a security rating of *N-1* (i.e. supply should be available after the failure of any single component in the supply chain) this is a constraint on the maximum load that can be supplied from Oamaru.

In response to this constraint, Transpower are working with NWL, Alpine Energy and major stakeholders to develop options to improve the situation.

Options being considered include:

- Thermally upgrading sections of the line to remove the constraint;
- A new GXP somewhere in the region to remove some of the demand from the 110 kV lines, possibly supplied from the 220 kV network;
- Installing special protection scheme between GXPs that allow the constraint to be managed in a less conservative manner – the addition of such a system between Black Point, Bells Pond and Studholme allowed a recent expansion of load at the Black Point scheme;
- Reconfiguring the Oamaru GXP to allow operation at a reduced security level of *N* during peak periods, by splitting the load between each of the 110 kV lines. In the event of an outage on one Transpower circuit half the load would be lost, followed by a staged recovery to the limits of the single transmission constraint. This would require a change in our security of supply policy for loads served by the Oamaru GXP.
- The use of peaking plant (e.g. Diesel generation or battery storage) at Oamaru GXP. We have access to 1.5MW of diesel generation at the moment, which can be increased reasonably quickly for example by installing rental generator sets at key substations during peak load times.

- Load control of irrigation load during peak periods. This may incorporate incentive based demand side management.

6.7 Sub-transmission development

There are three key drivers for development of our subtransmission network:

- The transfer of load from Oamaru GXP to Waitaki GXP.
- Voltage constraints on subtransmission feeders.
- Area specific upgrades for zone substations for load growth.

Specific subtransmission development projects are discussed below.

6.7.1 66 kV subtransmission from Waitaki GXP

As discussed above the presence of a constraint of approximately 41 MVA on peak summer supply from of Oamaru GXP means that we need to transfer load away from Oamaru GXP to the Waitaki GXP to allow spare capacity at Oamaru for expected growth in the area. This project involves creating a 66 kV network running from Waitaki GXP to Ngapara in the South and Awamoko in the North. The planned configuration is shown in Figure 39 below.

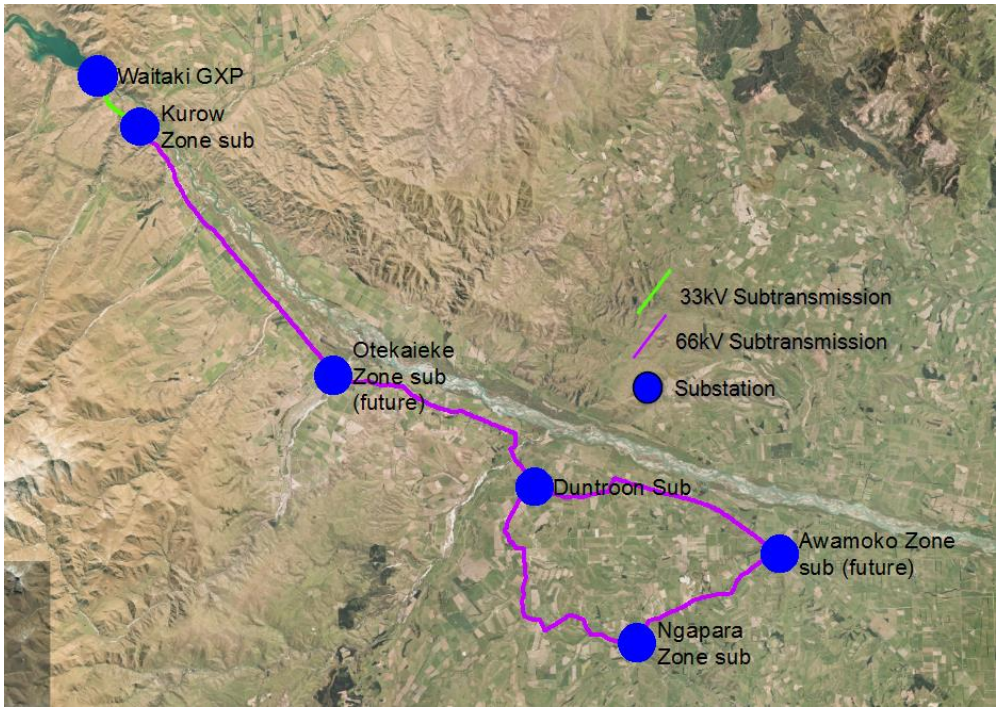

Figure 39 – 66 kV Subtransmission development project – Waitaki GXP to Ngapara/Awamoko

The first stage of this work was the construction of a new subtransmission line between Kurow and Duntroon Substations, which was completed in the summer of 2015. This development has allowed us to move up to 5 MW of load from the Oamaru GXP onto the Waitaki GXP. This subtransmission circuit is operated at 33 kV, but was designed and constructed for 66 kV operation. It is planned to convert to the higher voltage in 2019/20.

The next phases of the 66 kV subtransmission system development are discussed further in the following sections.

6.7.1.1 New Otekaieke Zone Substation

This project involves the construction of a new 5/7 MVA single transformer rural substation in the Otekaieke area between Kurow and Duntroon. This area has been subject to high growth in the last few years, primarily due to irrigation load.

The present loads in the area are supplied from Duntroon or Kurow, depending on network configuration. These substations are normally supplied from Waitaki GXP. At times of high load, we have been experiencing difficulties maintaining voltage support in the area. In addition, the loads on the 11 kV feeders mean that mutual support between the two substations has been eroded.

The presence of Otekaieke will also free up more capacity on Duntroon substation to provide support for the heavily loaded Papakaio Zone substation.

Discussions with local businesses have revealed a high probability of new load of 1 MW in the area, which increases the need for the new substation.

The new substation will be constructed for a primary voltage of 66 kV, but will operate initially supplied from the existing 33 kV subtransmission, through the use of an existing spare 33/11 kV transformer. The existing 11 kV feeders in the area will be reconfigured to suit the location of the substation.

Project name	Components	Year (s)	Budget cost
New Otekaieke Zone Substation	• New 5/7MVA rural substation in Otekaieke area.	2018/19	$1,200,000

6.7.1.2 Duplicate Supply from Waitaki GXP to Kurow Substation

In 2018/19 a second 33 kV subtransmission line is to be constructed from Waitaki GXP to Kurow zone substation. The line will be configured so that Kurow can be supplied from either line, and so that the subtransmission supply to Duntroon can bypass Kurow completely. A fibre optic cable will also be strung to provide protection functions.

Project name	Components	Year (s)	Budget cost
Duplicate supply from Waitaki GXP to Kurow	• Duplicate 33 kV supply to Kurow • Configured to allow Waitaki to split Kurow supply from Duntroon supply	2018/19	$480,000

6.7.1.3 Convert Kurow to Duntroon to 66 kV

This project will enable the subtransmission lines between Kurow and Duntroon to operate at 66 kV. This voltage upgrade allows more efficient transport of the energy, and enables substations further on from Duntroon to be supplied from Waitaki GXP without voltage constraints. In turn this will allow us to offload Oamaru GXP which will provide spare capacity at that site for local growth.

The project involves stepping up the 33 kV supply to 66 kV via an autotransformer located immediately east of Kurow substation, and stepping it back down to 33 kV via another autotransformer at Duntroon substation. This allows the existing equipment at those substations to be utilised while gaining the advantages of the higher subtransmission voltage.

The substation at Otekaieke will be upgraded to 66 kV operation during this project, by swapping the 33 kV transformer for a new 66 kV 5/7 MVA transformer, and recommissioning the site.

Project Name	Components	Year (s)	Budget cost
Convert Kurow to Duntroon to 66 kV	• 33/66 kV autotransformer at Kurow • 33/66 kV autotransformer at Duntroon • New 66 kV transformer at Otekaieke	2019/20	$900,000 $900,000 $500,000

6.7.1.4 Convert Duntroon to Ngapara to 66 kV

This project will enable Ngapara Substation to be supplied from the Waitaki GXP via the 66 kV subtransmission network. This will move load from the Oamaru GXP, providing capacity for growth on that GXP.

The existing 33 kV line was originally designed and constructed with future conversion in mind, so this upgrade will primarily involve replacing existing 33 kV insulators and hardware with 66 kV equipment.

In addition to the subtransmission line between the two substations, the autotransformer at Duntroon will need to be relocated to Ngapara to provide the interface between the Oamaru 33 kV and the Waitaki 66 kV networks. The primary voltage at Duntroon will also be changed from 33 kV to 66 kV with installation of a new 66 kV 5/7 MVA transformer and associated 66 kV switchgear.

Project Name	Components	Year (s)	Budget cost
Convert Duntroon to Ngapara to 66 kV	• Reinsulate existing 33 kV line • Relocate 66/33 kV autotransformer from Duntroon to Ngapara • Install 66 kV 5/7 MVA transformer and switchgear at Duntroon	2019/20 2020/21 2020/21	$350,000 $30,000 $700,000

6.7.1.5 New Awamoko Substation and Subtransmission Supply

The growth in the Duntroon/Awamoko/Papakaio area is high, and the existing substations (Duntroon and Papakaio) and 11 kV feeders servicing this load are becoming constrained. If either of these substation transformers has an outage it can be difficult to supply the peak load of these substations from neighbouring substations on the 11 kV network. We are also working with stakeholders to quantify proposed irrigation load growth in the area.

Forecast load growth indicates that we will require a new substation in the Awamoko area. The substation will be a 5/7 MVA single transformer rural type substation, with a primary voltage of 66 kV to allow direct connection to the Waitaki 66 kV supply. Distribution feeders in the area will be reconfigured to suit the new location.

A new 66 kV subtransmission line will be constructed from the existing Duntroon substation, connecting via the Kurow to Duntroon subtransmission network to the Waitaki GXP.

Project Name	Components	Year (s)	Budget cost
New Awamoko Zone Substation	• New 5/7 MVA rural substation in Awamoko area • 66 kV primary voltage	2020/21	$1,700,000
Duntroon to Awamoko 66 kV	• New 66 kV subtransmission line	2020/21	$1,950,000

6.7.1.6 New Ngapara to Awamoko 66 kV Supply

This line will connect the new substation at Awamoko with the existing Ngapara substation, and close the 66 kV Duntroon/Ngapara/Awamoko ring. This configuration will provide operational flexibility for the subtransmission supply in the area, with most circuits being able to be isolated to deal with a fault or planned maintenance without removing load.

Project Name	Components	Year (s)	Budget cost
Ngapara to Awamoko 66 kV	• New 66 kV subtransmission line	2021/22 2022/23	$1,200,000 $1,200,000

6.7.1.7 New Peebles substation and subtransmission supply

Forecasts show load growth in the lower Waitaki plains area will push both Papakaio and Pukeuri zone substations to the limit of their firm capacity in the 2023/24 summer period.

Based on likely load growth areas, this will require a new zone substation in the Peebles area, supplied at 66 kV via a new subtransmission line from the Awamoko zone substation. This new substation will service the north-eastern area of the network. This will reduce demand at Pukeuri and Papakaio substations, and therefore on the Oamaru GXP.

Project Name	Components	Year (s)	Budget cost
Awamoko to Peebles 66 kV line	• New 66 kV subtransmission line	2023/24	$1,200,000
New Peebles Zone Substation	• New 5/7MVA rural substation in Peebles area • 66 kV primary voltage	2024/25	$1,700,000

6.7.2 Subtransmission expenditure summary

The table below lists the expected timing and costs of major subtransmission development projects:

Table 46 - Sub-transmission projects in the planning period

Project Name	Components	Year (s)	Budget cost
New Otekaieke Zone Substation	• New 5/7 MVA rural substation in Otekaieke area. • Operate initially at 33 kV with spare transformer	2018/19	$1,200,000
Duplicate supply from Waitaki GXP to Kurow	• Duplicate 33 kV supply to Kurow • Configured to allow Waitaki to split Kurow supply from Duntroon supply	2018/19	$480,000
Convert Kurow to Duntroon to 66 kV	• 33/66 kV autotransformer at Kurow • 33/66 kV autotransformer at Duntroon • New 66 kV transformer at Otekaieke	2019/20	$2,300,000
Convert Duntroon to Ngapara to 66 kV	• Reinsulate existing 33 kV line • Relocate 66/33 kV autotransformer from Duntroon to Ngapara • Install 66 kV 5/7 MVA transformer at Duntroon	2019/20 2020/21 2020/21	$350,000 $30,000 $500,000
New Awamoko Zone Substation	• New 5/7 MVA rural substation in Awamoko area • Operating at 66 kV	2020/21	$1,700,000
Duntroon to Awamoko 66 kV	• New 66 kV subtransmission line	2020/21	$1,950,000
Ngapara to Awamoko 66 kV	• New 66 kV subtransmission line	2021/22 2022/23	$1,200,000 $1,200,000
Awamoko to Peebles 66 kV line	• New 66 kV subtransmission line	2023/24	$1,200,000
New Peebles Zone Substation	• New 5/7MVA rural substation in Peebles area • 66 kV primary voltage	2024/25	$1,700,000

6.8 Distribution development

Development of the distribution network has been driven by load growth and new connections in the past decade. NWL expects this trend to continue in the early part of the planning period.

At the same time, we are experiencing the erosion of mutual support on inter-ties between substations, associated with rapid load growth.

6.8.1 Investigate and remediate 11 kV inter-ties

Where once inter-ties between 11 kV feeders could be used year round to provide backup between substations, we are increasingly running into capacity issues on these inter-ties when used during the irrigation season. An investigation is underway to model the performance of the lines under high load conditions to identify inter-ties that may not perform as required by our security standard. Remedial work will be carried out where risk assessment shows that it is cost effective.

It is likely that similar work will also be necessary in the second half of the planning period as growth eats into the spare capacity of substation interties.

Project Name	Components	Year (s)	Budget cost
11 kV inter-tie upgrade	• Identify substandard, critical interties, and upgrade as necessary	2018/19 2019/20 2023-28	$500,000 $500,000 $500,000

6.8.2 Hampden feeder upgrade

This project involves upgrading a portion of conductor on the existing Hampden feeder to provide sufficient capacity to supply a new 1 MW load located in the Trotter's Gorge area. The existing network was not designed for such a large load located at the extremities of the network.

Project Name	Components	Year (s)	Budget cost
Hampden feeder upgrade	• Provide capacity upgrade for new 1MW load	2018/19	$200,000

6.8.3 New 11 kV feeder at Pukeuri

This project involves the creation of a new 11 kV feeder supplying the area between Pukeuri substation and Waitaki Bridge.

The Lower Waitaki plains is an area of high growth, with a steady rate of conversions from traditional border dyke irrigation to spray irrigation. Ongoing discussion with irrigation stakeholders has shown that more growth is highly probable. The existing network in the area is becoming voltage constrained at times, and the future density of load has triggered the development of a new 11 kV feeder to support the growth.

The existing 11 kV network will be reconfigured by installing new open points, switchgear, and supply cable from Pukeuri substation. As part of the Pukeuri substation upgrade in 2017/18, the new 11 kV switchboard has a spare circuit breaker ready to supply the new feeder.

Project Name	Components	Year (s)	Budget cost
New 11 kV feeder at Pukeuri	• Develop 11 kV network to support growth in Lower Waitaki Plains	2018/19	$450,000

6.8.4 Voltage regulator installation Ohau feeder

The installation of an 11 kV three phase voltage regulator is planned on the Ohau feeder for 2018/19. This will provide voltage support for a rural part of the 11 kV network that has quite a large point load (Ski field snowmaking facilities) located along it. Operational experience has shown problems with voltage support during times of high load on the ski field, and a predicted increase in load will exacerbate this issue. Voltage regulators will provide a cost-effective method to maintain health of the supply to consumers in the area.

Project Name	Components	Year (s)	Budget cost
Ohau voltage regulator	• Install 11 kV voltage regulator on Ohau feeder to improve voltage support during high load periods	2018/19	$130,000

6.8.5 Various voltage regulator projects

In the first five years of the planning period we are planning to install at least one set of 3 phase voltage regulators per year on the distribution network.

We have found regulators to be cost effective solutions to provide voltage support where load growth has eroded the available distribution network capacity during an abnormal configuration, e.g. during a feeder tie situation while restoring power after a fault. This work will be coordinated in conjunction with the inter-tie investigation project and will improve our ability to minimise the effect of planned and unplanned outages.

Project Name	Components	Year (s)	Budget cost
11 kV voltage regulators	• Install 11 kV voltage regulator on 11 kV feeders where cost effective to correct voltage issues	2018/19 2019/20 2020/21 2021/22 2022/23	$120,000 $120,000 $120,000 $120,000 $120,000

6.8.6 Install distribution transformers – load growth

The majority of load growth in our network is new irrigation projects, which typically have dedicated transformer assets. However, we are forecasting a moderate number of transformers will need to be installed to deal with load growth. These will most likely be in the township areas, and will be identified by modelling loads, and verified with readings on maximum demand indicators (MDIs) of existing transformers.

Project Name	Components	Year (s)	Budget cost
Install distribution transformers for growth	• Install 11 kV distribution transformers where required to account for growth. • Upgrade existing transformers, or install at new sites	2018/19 2019/20 2020/21 2021/22 2022/23	$80,000 $80,000 $80,000 $80,000 $80,000

6.8.7 Customer dependent developments

Various 11 kV distribution projects have been identified that are dependent on third party developments. Due to uncertainty in the projects they are provisional both in scope and budget, but are included for the sake of completeness. It is likely that if the consumer projects are given the go ahead the timing will place these in the first year of the planning period.

Project Name	Components	Year (s)	Budget cost
New 11 kV feeder Redcastle substation	• Subject to increase in load at industrial site	2018/19	$600,000
New 11 kV feeder Kurow substation	• Subject to new irrigation scheme	2018/19	$100,000

6.8.8 Distribution expenditure summary

Table 47 - Distribution network development items

Project Name	Components	Year (s)	Budget cost
11 kV inter-tie upgrade	• Identify substandard, critical interties, and upgrade as necessary	2018/19 2019/20	$500,000 $500,000
Hampden feeder upgrade	• Provide capacity upgrade for new 1 MW load	2018/19	$200,000
New 11 kV feeder at Pukeuri	• Develop 11 kV network to support growth in Lower Waitaki Plains	2018/19	$450,000
Ohau voltage regulator	• Install 11 kV voltage regulator on Ohau feeder to improve voltage support during high load periods	2018/19	$130,000
11 kV voltage regulators	• Install 11 kV voltage regulator on 11 kV feeders where cost effective to correct voltage issues	2018/19 2019/20 2020/21 2021/22 2022/23	$120,000 $120,000 $120,000 $120,000 $120,000
Install distribution transformers for growth	• Install 11 kV distribution transformers where required to account for growth. • Upgrade existing transformers, or install at new sites	2018/19 2019/20 2020/21 2021/22 2022/23	$80,000 $80,000 $80,000 $80,000 $80,000
New 11 kV feeder Redcastle substation	• Subject to increase in load at industrial site	2018/19	$600,000
New 11 kV feeder Kurow substation	• Subject to new irrigation scheme	2018/19	$100,000

6.8.9 LV development plan

Our LV development plan is based around response to consumer load growth. We have no network development programme items for this asset class apart from this new load. Due to the variable nature of new connections in our network we have elected not to forecast the nature of this growth to any detail.

6.9 Network development capital expenditure summary

Capital expenditure forecasts across all categories for the planning period are summarised in the table below. It should be noted that this only includes projects that we are aware of and that have a possible chance of proceeding, and is quite dependent on the timing, location, and size of future customer projects:

Table 48 - Summary of forecast for capital development

Category	Network development forecast expenditure ($)									
	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
System growth	4,210,000	3,330,000	5,180,000	2,000,000	1,400,000	1,780,000	2,280,000	580,000	580,000	580,000

7. Non-network investment plan

7.1 Asset information systems

Our Asset Management attribute, condition and operational information has been traditionally stored in a number of disparate systems and databases. We in the process of integrating these information sources to our new GIS system. The new system is an ESRI product and provides a more flexible and easy to use analytic platform than the system that was previously in use.

7.2 Electric vehicle charging systems

In the 2016/17 works programme we installed high power electric vehicle chargers at:

- Oamaru
- Hampden
- Kurow
- Omarama

The purpose of this was to gain data and experience of the impact that electric vehicle charging may have on our network in the future, as well as to enable the uptake of long distance electric vehicle travel throughout our region.

The chargers are remotely monitored and files are downloaded and analysed monthly. Usage figures for the first nine months of operation are shown in Figure 40.

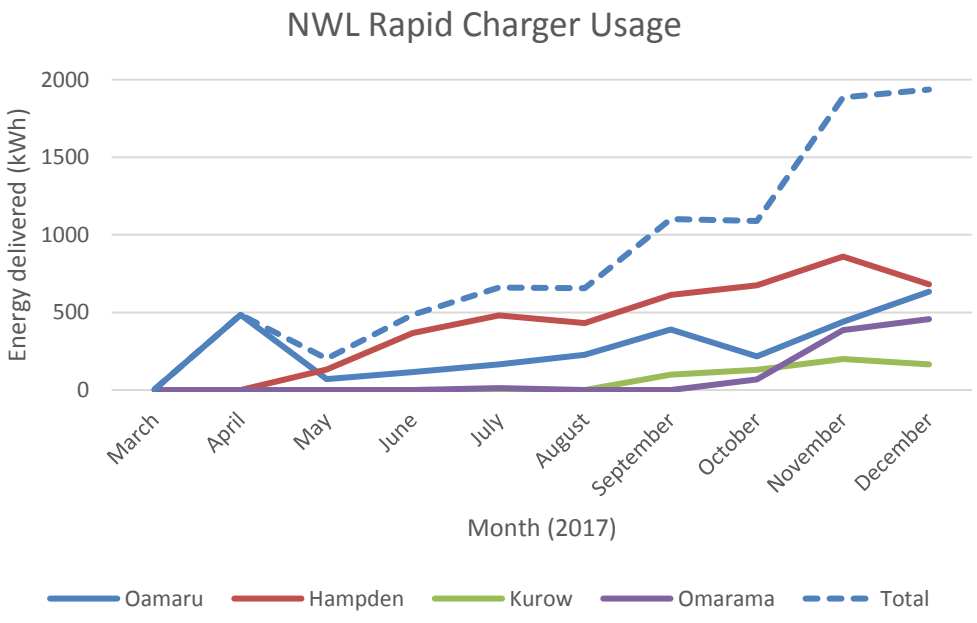

Figure 40- Energy delivery to electric vehicles via NWL rapid charger, March to December 2017

This clearly shows that electric vehicle use in the region is growing. In conjunction with data from other sources this charging information will help inform future iterations of our network development plan.

8. Summary of expenditure forecasts

The summary of our forecast expenditure for the planning period is shown in Table 49 and Figure 41, presented on the next pages. Figure 35, which shows renewals and maintenance expenditure by asset category and was originally presented in section 5.17, is also repeated here.

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, consumer growth, and other issues that are currently out of our control, such as the development of the Transpower transmission network.

Table 49 - Summary of expenditure forecasts

Forecast Expenditure ($)										
Capital Expenditure	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Consumer connection	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000	1,250,000
System growth	4,210,000	3,330,000	5,180,000	2,000,000	1,400,000	1,780,000	2,280,000	580,000	580,000	580,000
Asset replacement and renewal	3,890,000	3,005,000	2,025,000	2,025,000	1,865,000	1,905,000	1,755,000	1,755,000	1,755,000	1,755,000
Asset relocations	0	0	0	0	0	0	0	0	0	0
Reliability, safety, and environment: Quality of supply	782,000	454,000	204,000	319,000	269,000	249,000	179,000	169,000	139,000	139,000
Reliability, safety, and environment: Legislative and regulatory	286,000	230,000	230,000	240,000	240,000	10,000	10,000	10,000	10,000	10,000
Other reliability, safety, and environment	0	0	0	0	0	0	0	0	0	0
Subtotal Capital Expenditure	10,418,000	8,269,000	8,889,000	5,834,000	5,024,000	5,194,000	5,474,000	3,764,000	3,734,000	3,734,000
Operational Expenditure										
Service interruptions & emergencies	388,000	388,000	388,000	388,000	388,000	388,000	388,000	388,000	388,000	388,000
Vegetation management	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000
Routine & corrective maintenance & inspection	891,000	891,000	768,000	768,000	768,000	768,000	768,000	768,000	768,000	768,000
Asset replacement & renewal	460,000	460,000	460,000	460,000	460,000	460,000	460,000	460,000	460,000	460,000
Subtotal Operational Expenditure:	2,309,000	2,309,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000	2,186,000
Total Expenditure	**12,727,000**	**10,578,000**	**11,075,000**	**8,020,000**	**7,210,000**	**7,380,000**	**7,660,000**	**5,950,000**	**5,920,000**	**5,920,000**

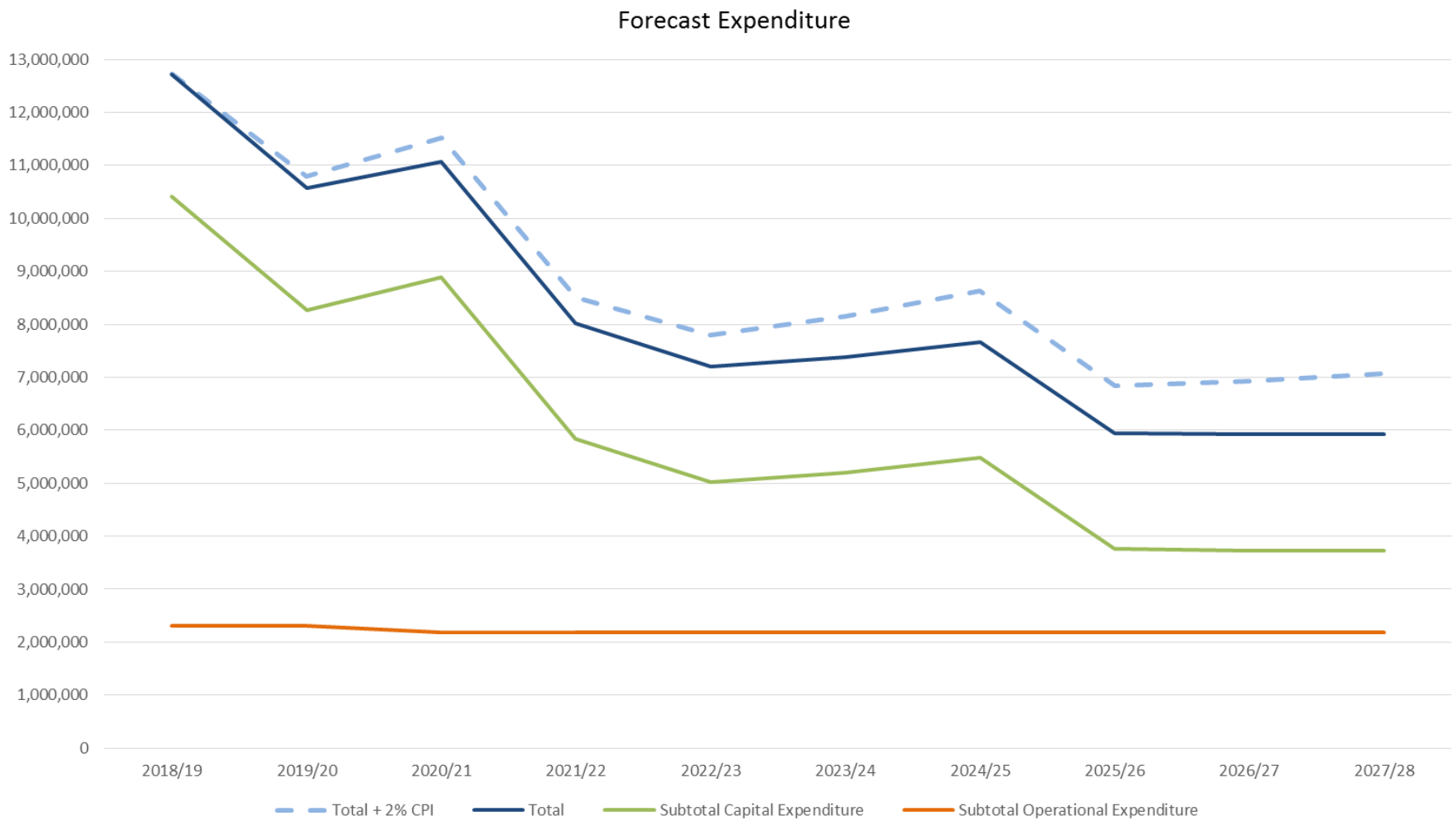

Figure 41- Summary of network expenditure forecast across planning period

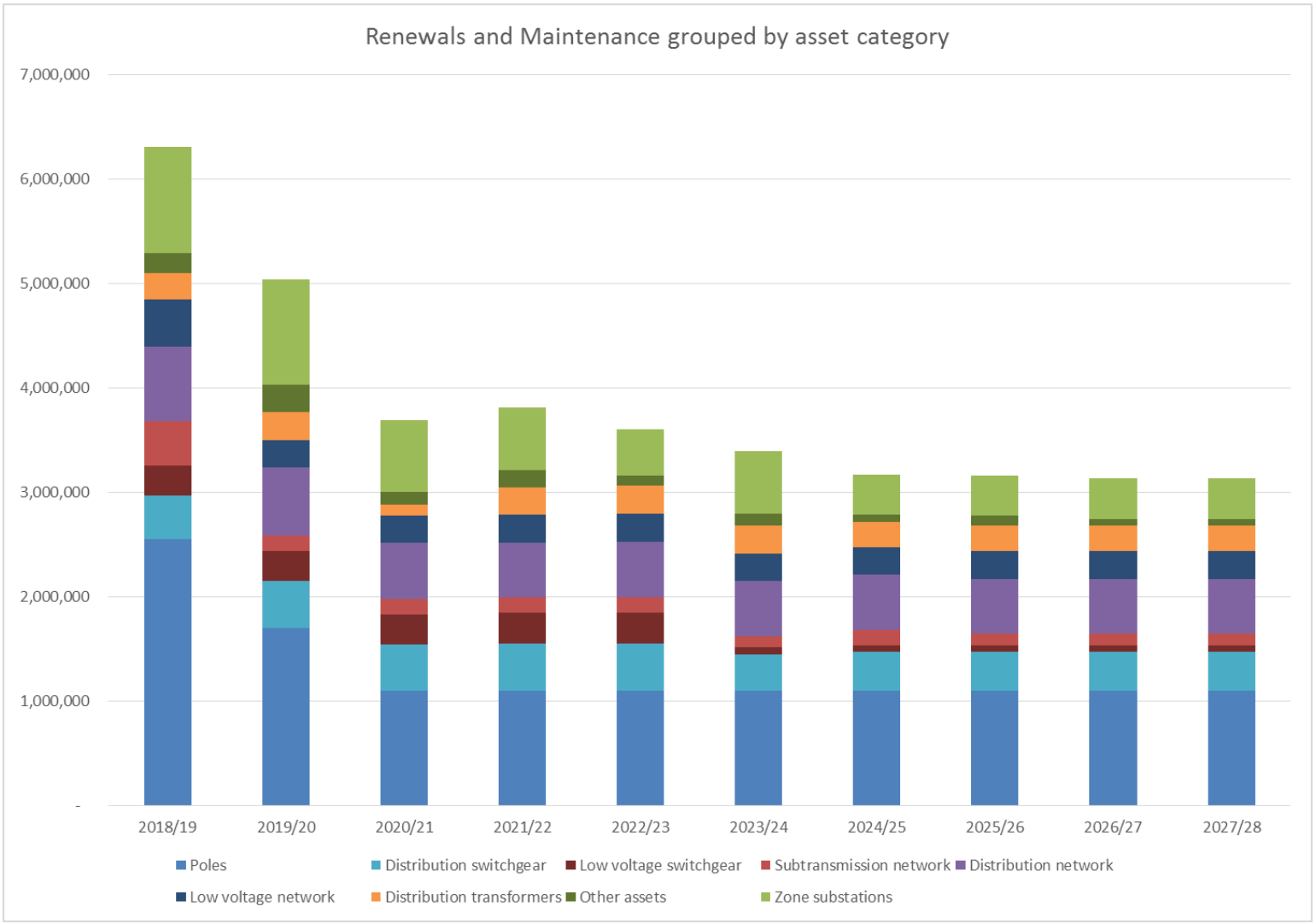

Figure 42 – Renewals and maintenance forecast expenditure by asset category (repeated from section 5.17)

Appendices

Appendix A - EDB Information Disclosure Requirements Schedule 13

Company Name	Network Waitaki Ltd
AMP Planning Period	1 April 2018 – 31 March 2028
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	We have an Asset Management policy approved by the CEO and reviewed by top management. It is available for staff in the policy section of the document library, and available to the public on the company website along with the AMP under the information disclosure section. Communication of the policy, and how it affects staff in their day to day work, is not as effective as it needs to be to warrant a score of 3.		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	Key items in the Asset Management drivers are closely linked to stakeholder direction, such as the consumer surveys, and in some cases (such as the AMP)are subject to signoff from our board of directors. There is regular reporting on our asset management performance to stakeholders such as the board and the Consumer Trust. There is feedback through to modify the drivers where necessary, for example in 2017 the approach to consumer engagement and the content of the surveys was extensively overhauled with the intention of getting more actionable information. However, we cannot say that "all linkages are in place" to say that there is no missed opportunities to align internal strategies and policies with the asset management strategic focus, therefore cannot score 3 in this section.		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	There is a comprehensive range of planning, maintenance and inspection standards that reflect asset lives and characteristics. These are regularly updated according to the Document Control system. Recent work has shown that these are focussed on high risk and high value assets, and that there are gaps in coverage for "less important/less critical" assets.		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	The entry of new types of assets initiates the generation of policies and operating /maintenance documentation, based on industry practice and our specific circumstances. These plans reflect the expected lives, unique characteristics and recommended maintenance intervals for assets. However, there is still scope for the update and retroactive generation of this documentation for existing asset types.		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).

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2018 – 31 March 2028**
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.

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2018 – 31 March 2028**
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	The AMP is available to the public, the wider staff, and the Consumer Trust on our website, or by calling into our offices. Many staff, including senior management and the CEO, as well as key contractor personnel are involved in the preparation and review of the AMP. Our Board approves our budgets and 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 AMP is available to the public, the wider staff, and the Consumer Trust on our website, or by calling into our offices. Many staff and key contractor personnel are involved in the preparation and review of the AMP. Our Board approves our budgets and signs off on the AMP.		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	We are well resourced for our current Asset Management regime. Specific detail design and construction expertise will be contracted in as required. We monitor our workforce to identify gaps in training and competencies. We have been employing new trainees to build up staff levels to account for staff who are nearing retirement age. Recent structural changes were made to further improve the performance of the company in this area.		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?	3	We have a comprehensive suite of Business Continuity Plans that cover asset failure, natural disasters and interruption to key processes. We review these plans at regular intervals, or when a specific event (such as the Christchurch earthquakes) causes concern. Our plans include working with external agencies such as the Police, Fire Service, and Civil Defence. Regular incidents such as cars hitting poles provide on-going training and opportunities to review plans. These plans have been developed as part of a wider risk management framework based on ISO 31000 that considers a range of mitigation measures.		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.

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2018 – 31 March 2028**
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.

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2018 – 31 March 2028**
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	Our management structure and company organisation are designed to remove silos and encourage cross talk between the different groups involved in the management of the network, from Engineering to FInance to Field services. The small size of the business and the culture of working together means that all members of the management team have involvement in asset management. 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.		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	We discuss the ongoing works programme with our field staff in order to predict resource levels required for delivery of the plan. If resources are not available for a particular reason we will decide between contracting in extra resources, or rescheduling the work to fit around our existing workforce. We are actively recruiting trainees to safeguard succession as senior staff retire. Long term planning is still a challenge at times, and we are developing methods for improving this.		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	After each monthly Board meeting, our CEO presents the Board's feedback at a staff meeting. This meeting is supported by regular meetings amongst all staff to determine details of the works programs. Because we are a small company, communication is constant and managers work to remove any information barriers between staff.		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 have a Contractor Approval Procedure, which allows to vet external contractors against our safety and skill requirements prior to them working on our assets. All 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.

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2018 – 31 March 2028**
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
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.

Company Name	**Network Waitaki Ltd**
AMP Planning Period	**1 April 2018 – 31 March 2028**
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
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. Our organisation structure was changed in 2017 to align along asset management, engineering and field work streams. This will allow a more constant focus on further developing our Asset Management systems. 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, but there is scope fir improving the coverage of 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.		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?	2	We are a small company and our managers and senior personnel monitor the skillsets of their workers to help 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?	2	We have put a lot of focus into providing work packs of a high standard to field services that are suitable for the safe and efficient delivery of our asset management tasks. We have an open door policy, whereby contracting staff are encouraged to dicsuss assigne3d tasks with engineering staff. This encourages the free flow of information from the field to the planners. However, there is evidence that there are still perceived to be barriers in effective communication between all levels of the business, and are working towards identifying ways to improve communication.		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	NWL has a comprehensive range of policies, standards and procedures that address all Asset Management activities. NWL also has a Safety management System in place, which requires a high level of document control. These documents are regularly revised and amended. Our understanding of best practice in asset management has revealed gaps which we were previously unaware of, and documentation is being developed to fill these, such as 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 have focussed on upgrading our GIS and our works and asset management system to store useful asset information and to integrate and coordinate information, including external sources. The asset information that we capture into these systems is driven both by industry good practice (talking to peer EDBs, working from standards, using fit for purpose software platforms) and by local experience. We are developing methods to accurately capture field data direct to these systems, with several in test. The next major step is using the data in the systems for comprehensive, deep analysis of the lifecycle of our assets.		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: To be effective, an asset information management system requires the mobilisation of technology, people and process(es) that create, secure, make available and destroy the information required to support the asset management system.	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?	2	Our on-going inspections and pre-work site preparation provide confirmation that asset data is accurate. At regular intervals the records team carry out audits on asset records against the real world.		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.		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.		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 that we have implemented in the last year. 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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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. Complared to best practice we can improve the formal feedback loops that will verify that successful outcomes are consistently occurring.		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, primarily Reliability and Safety, but also including other measures such as Works Programme progress and financial performance. These measures are continually assessed against targets by respective managers, with action taken to correct variances. These measures are informally reported to the CEO daily, and formally to the Board each month. We are developing improvements in how the capture and use of this data adds value to the asset management process.		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 the Incident Cause Analysis Method (ICAM) to investige incidents where the potential for harm or major damage was high. We are developing Root Cause Analysis skills and practices to ensure that lessons can be captured from all incidents. 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.

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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.

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AMP Planning Period	**1 April 2018 – 31 March 2028**
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 subscribe to the PowerCo standards system, which provides extra expertise in certain technical areas.		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 incipient failure from and inspection is recorded and communicated via our defects database. Defects are assigned owners who are responsible to return the asset to compliant state. 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 safety first and foremost, closely followed by consumer supply issues, it is likely that in some cases we are missing opportunites to improve how we manage our assets due to lack of post incident feedback.		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 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 subscribe to the NEDERs equipment failure database, and incorporate information on failures into our practices. We track costs against various categories of work which allows the monitoring of performance against planning.		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 actiivley monitor external sources of advice or comment such as the EEA and engage with other EDB's and suppliers and manufacturers on latest practice and equipment. We are actively using data from the NEDERs asset failure database to inform our asset management practice. Design staff are involved in industry forums 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. 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.

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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
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.

Appendix B - Board certification of AMP

SCHEDULE 17

Certification for Year-beginning Disclosures

Clause 2.9.1 of section 2.9

We,

Christopher John Dennison
Anthony James Wood

Being directors of Network Waitaki Limited certify that, having made all reasonable enquiry, to the best of our knowledge-

a. The following attached information of Network Waitaki Limited prepared for the purposes of clause 2.6.1 and clause 2.6.6 of the Electricity Distribution Information Disclosure Determination 2012 in all material respects complies with that determination.

b. The prospective financial or non-financial information included in the attached information has been measured on a basis consistent with regulatory requirements or recognised industry standards.

Christopher John Dennison

Anthony James Wood

DATED: 26 March 2018

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