Asset Management Plan

1 April 2023 to 31 March 2033

Marlborough Lines

Contents

List of Figures

List of Tables

1. Summary

This Asset Management Plan (AMP) outlines Marlborough Lines Limited's (MLL's) asset management strategy to facilitate the safe and reliable distribution of electricity to consumers in the Marlborough region. MLL is committed to providing a network that meets the needs of its key stakeholders. MLL recognises the key role that a safe, reliable, and resilient electricity network has in supporting the livelihoods of people and businesses throughout Marlborough.

Owning and managing an electricity network in Marlborough is not without its challenges, with a large area to service coupled with a low population base. This challenge is exacerbated in remote areas such as the Marlborough Sounds, where MLL has a vast network over challenging topology supplying very low-density connections, many of which are holiday homes that are unoccupied for significant periods of time. Many kilometres of overhead lines require significant vegetation and track management to keep vegetation clear of lines and to allow access to network assets.

The majority of the network in the Marlborough Sounds (and other remote Marlborough areas) was constructed in the 1960s and 1970s utilising grant funding from the Government of the day. Many of these assets are approaching the end of their economic life, and significant investment by MLL will be required to renew them.

As a community owned company, MLL seeks to ensure that its assets are well maintained, that investment decisions are prudent and that replacement decisions are optimally timed. The consumers connected to MLL's network ultimately fund its network operations and are also the beneficiaries of the network. MLL will endeavor to act in the best interests of its beneficiaries.

In recent years, MLL's renewal investments have focused on critical 33kV network assets – zone substations, power transformers, overhead structures and underground cables. This is reflected in the now relatively low average age profile of these asset classes. For the ten-year planning period covered by this AMP (1 April 2023 to 31 March 2033 = RY2024 to RY2033), investment will focus on renewal of areas of the 11kV and Low Voltage (LV) network driven by Asset Health Indicator (AHI) ratings and type-based replacement, to further build resilience of the network and to maintain a high level of network reliability. In the early years of this plan, a large portion of the investment is also focused on meeting growth that is mainly occurring due to decarbonisation, but also other areas of customer business growth. It is unclear how long this growth will continue.

This AMP commences by providing an overview of the basis and structure of the AMP, followed by a discussion on significant changes that MLL is responding to, sometimes through innovative means, to satisfy the changing needs of MLL's customers. It goes on to provide an overview of MLL's customers and infrastructure followed by a description of the means by which MLL aligns its objectives and performance levels to the interests of its stakeholders. The network, including each of its planning areas, is described along with detail on the quantity and condition of the more significant asset classes. This AMP then sets out the strategy and actions MLL will undertake in delivering the objectives and service levels it has set and the level of financial investment required.

1.1 Highlights of this AMP

The following sections discuss some selected changes from previous AMPs that are discussed in this document.

1.1.1 Sub-Transmission Enhancement

From 2020 MLL has been working on a major programme to enhance the reliability, security, and safety of its 33kV core network around the Blenheim area. Seven of MLL's zone substations are involved in this work plus a number of 33kV lines. MLL is moving these substations from operating in a traditional radial network to operating as a meshed network. As part of this work, a number of solid 33kV line tees are also being removed to upgrade the network to modern standards. This has required a number of new lines sections to be constructed. Many of the 33kV protection systems are also being replaced and upgraded to differential protection schemes to enable the mesh arrangement which is anticipated to be complete in 2025.

1.1.2 Decarbonisation

A new section has been added to the AMP to underscore the changes that are occurring due to energy decarbonisation. Decarbonisation is now having an impact on MLL's network as illustrated through the anticipated doubling of the Picton area load due to KiwiRail's new diesel electric ferries. Further transport electrification is being considered such as air and road travel. Process industries are starting to discuss their additional needs with MLL as they consider moving from fossil fuels.

The installation of small scale distributed generation within the network, solar and batteries in particular, has increased significantly from levels in 2012, however the levels are still small in total and a gathering rate of increase is not yet evident. However, interest in large scale embedded generation and the rate of applications to connect has increased significantly in the last few years.

The current level of secure network capacity will allow the business time to assess the effects of additional load as it arises. A close watch will be maintained on these new technologies to continuously assess their effects through monitoring and modelling. The Ministry for the Environment are developing a fossil fuel gas transition plan in 2023 which will discuss the phase out of gas, with some replacement by electricity envisaged. MLL's secure network capacity allows time to monitor these developments. Overall, load growth within the network is not expected to challenge the network capacity within this planning period, as further detailed in the network development section of this plan.

1.1.3 Waitohi Substation

To support KiwiRail's ferry electrification, a new zone substation at the Picton (Waitohi) Wharf is required to be in operation by late 2025. Rebuilds of major sections of the Picton 1 and 2 lines and reconfiguration of the Picton area 33kV supply to a looped arrangement from Spring Creek to Waitohi to Picton to Spring Creek is also necessary.

1.1.4 Asset Replacement and Renewals

MLL recognises that a large amount of its overhead network equipment was installed in the 1950s and 1960s and that many of these assets are likely to deteriorate to a condition requiring their replacement over the next 15 years. MLL undertakes replacements largely based on condition rather than age. This will therefore require MLL to continue to ramp up its condition monitoring efforts as well as its replacement work in order to optimise investments.

In order to manage the predicted increase in replacement and renewal of poles and conductors MLL anticipates a significant step up in replacement expenditure within the planning period, from 2026 onwards.

1.1.5 Extreme Event Resilience and Reliability

Storms in 2021 and 2022 had a major impact on many homes and businesses in Marlborough with many still recovering. The Marlborough Sounds experienced many slips, with many roads and buildings still badly damaged. The ongoing sustainability of Marlborough District Council roads in the area is still under discussion by the Council.

MLL has lifted its target SAIDI from 150 minutes to 165 minutes for the 2024 and 2025 regulatory periods. This reflects the longer response times that will occur for faults on the Sounds feeder, as a result of the damage to the roads in the area. It is also reflective of a MLL's intention to use the fleet of diesel mobile generators more judiciously for planned outages, in order to cut costs and greenhouse gas emissions.

Vegetation control is a key requirement for storm resilience. A targeted fall distance strategy for tree felling on strategic lines has been adopted, particularly in the Marlborough Sounds.

MLL is planning a new control room based at its Taylor Pass depot from lessons learnt from the storms. The new control room not only will be more secure than the current control room, but it will enable improved coordination between MLL's staff and external emergency services.

MLL is also improving its visibility and control of the network and improving its network awareness and dispatch processes through ongoing installation of remotely controllable assets, and a new Advanced Distribution Management System (ADMS) is anticipated to be in service by 2025.

Continuous review of network security and resilience to extreme natural events is undertaken by MLL, which feeds into MLL's asset management planning. MLL also considers improved resilience for new assets and is currently considering whether a 1:100 year flood level standard is appropriate for critical assets or whether 1:250 or 1:450 (such as Transpower now use) is appropriate.

1.1.6 Uneconomic Reticulation

The network in the Marlborough Sounds area is extensive and problematic from an economic perspective for MLL. The network in this area was originally developed to meet the regulatory requirement of the day with the assistance of the Rural Electrical Reticulation Council. However, no assistance is currently available for its renewal, meaning that all consumers connected to MLL effectively bear these costs and cross subsidisation between economic and uneconomic consumers therefore occurs.

While MLL agrees in principle with current pricing reforms towards cost reflectivity, the scale of cross subsidisation occurring makes truly cost reflective pricing difficult to design and implement.

MLL is legislatively required to meet continuance of supply obligations, even for those consumers that are grossly uneconomic. As the assets supplying these remote connections are drawing closer towards end of life (age-based), these issues are increasing in scale and as discussed above MLL will soon be required to replace many of the overhead assets in the Marlborough Sounds.

Allowing its remote network to deteriorate as a means of deferring expenditure is not an option as MLL has the higher priority objective of operating a safe network and this may drive renewal regardless of any other service or cost objectives.

MLL has discussed with some customers the opportunity to move to self-supply by Remote Area Power Supplies (RAPS), however in general customers prefer the reliability and service that MLL provides over other options. MLL is running a pilot RAPS programme and will continue to assess options for alternative supplies as a way of reducing the cost of renewal.

1.1.7 Potential Major Customer Funded Projects

MLL is in discussion with a number of potential large consumers who may financially support large increases in their supply. Major developments required by customers are being discussed and considered such as new substations at Kaituna and Hammerichs Rd. These potential developments are dependent upon the major individual parties who need the additional network capacity for their business development committing to funding of the substations near their or on premises.

MLL anticipates that the major customer requiring the use of a new zone substation at Kaituna is highly likely to commit to funding the Kaituna zone substation and therefore it is included in MLLs AMP capex forecast.

The Upper Wairau Valley, which is supplied by an 11kV line from Renwick, has become constrained and can no longer support significant increases in demand. A number of irrigators are interested in converting their diesel driven irrigation to electricity. If sufficient financial support is provided by these major potential electricity consumers, then MLL will build a 33kV line to the Wairau Valley township area where a new zone substation will be developed.

As discussed above, MLL is receiving a significant number of large scale distributed generation enquiries and connection applications. These potential power stations are typically solar generation and larger than one or two MW. Some will require connections to the 33kV sub-transmission network if they proceed, requiring new substations.

1.2 Disclosure of this AMP

This AMP is required to be publicly disclosed and to provide particular information to comply with the requirements of Section 2.6 and Attachment A of the Commerce Commission’s Electricity Distribution Information Disclosure Determination 2012. Regulatory disclosure schedules have been completed and are disclosed separately to this AMP. Appendix 12.3 includes regulatory disclosure requirements map between the regulatory disclosure requirements and this AMP.

2. Introduction

2.1 Purpose of this AMP

The delivery of a safe, reliable electricity supply of adequate capacity to meet consumer requirements is essential for their lives, their homes and businesses. Concurrent in meeting its obligations in the delivery of electricity, MLL recognises its responsibilities not only to consumers but to its staff, contractors and the public to ensure that all practicable steps are taken to ensure all components of the network are safe and all parties are kept free from harm.

It is a requirement of the Energy Companies Act 1993 that MLL has regard to energy efficiency and this aspect is considered fundamental in all aspects of MLL's operations and is integral to the considerations within this AMP.

MLL recognises that it has an obligation to not only have regard to energy efficiency but the overall efficiency of its operations.

Accordingly, within MLL there is a commitment to continuous improvement.

MLL has achieved certification of internationally recognised standards which are an integral part of its operations including quality (ISO 9001), environment (ISO 14001), health and safety (ISO 18001) and public safety (NZS 7901).

Achievement of these standards is indicative of MLL's commitment towards achieving excellence but MLL recognises that the ultimate means of optimising performance within MLL is through a culture of seeking quality in all that is undertaken.

MLL is experiencing changes in the electricity industry occurring due to decarbonisation. MLL is in a key position to support the transition to cleaner energy. A new section on decarbonisation and innovations to support the future network has been added in this AMP.

This AMP provides an overall strategy which will enable MLL to meet its identified objectives over the next ten years and beyond.

2.2 Basis of AMP

This AMP documents MLL's asset management strategy and objectives for its asset management processes. It sets out the assets, their condition, service levels, achieved performance, network development planning, lifecycle planning, fleet management and forecast expenditure. More specifically, this AMP provides detail on how MLL:

- maintains and operates all assets in a safe manner to safeguard the health and welfare of staff, consumers, contractors, landowners and the general public consistent with legislative requirements and best industry practice;
- optimises energy efficiency relative to costs and practical considerations;
- set service levels for its network that will meet consumer, community, other stakeholder and regulatory requirements;
- understands the levels of network capacity, reliability and security of supply required now, and in the future, as well as the issues that drive these requirements;
- has robust and transparent processes in place for managing all phases of the network life cycle from initial concept to disposal;
- adequately considers the classes of risk relative to its network business and ensures there are processes in place to mitigate identified risks;

- makes adequate provision for funding and resourcing all phases of the life cycle of its network assets;
- makes decisions within structured frameworks at each level within the asset management process; and
- increases its knowledge of its assets in terms of location, age, condition and the likely future behaviour of the overall network as it ages.

This AMP is the key strategic document used by MLL as part of the asset management system. Disclosure of this AMP also assists MLL in complying with the requirements of Section 2.6 and Attachment A of the Commerce Commission's Electricity Distribution Information Disclosure (ID) Determination 2012.

This AMP is limited to MLL's network business only, not the wider MLL group which also includes the following entities:

- a 50% stake in Nelson Electricity Limited, which has its own AMP and is independently disclosed;
- full ownership of Yealands Wine Group Limited, which is independently managed; and
- full ownership of Energy Marlborough Limited, which is a company established in 2021 to provide energy related products and services of benefit to Marlborough Lines' consumers.

The interrelationship of these entities along with the various holding companies and other investments by MLL, details of shareholders, together with MLL's financial accounts is provided on MLL's website and within its Annual Report.

2.3 Key stakeholders and objectives

MLL's key stakeholders are:

- Its owner, Marlborough Electric Power Trust;
- the public within its region;
- approximately 26,700 [1] installation control points (ICPs, or consumers) to whom MLL delivers electricity (some of whom receive supply at 11kV);
- generators who are directly connected and embedded within the network and produce electricity for use by others;
- the (currently) 23[1] electricity retail brands trading on our network;
- the territorial authorities, the NZTA, and other government agencies who MLL engage with;
- the MLL staff and contractors who work in or on our network; and
- the local Iwi of Marlborough.

The interests of these and other stakeholders underpin the strategy, plans and actions set out in this AMP. These objectives are generally expressed through compliance achievement and measurable service level targets set within this plan.

This publicly disclosed AMP also serves as a means of communicating MLL's intentions to its stakeholders.

[1] The ICP and retailer numbers are from February 2023.

2.4 Link to other documents

Other documents related to this AMP include:

- MLL's Statement of Corporate Intent (SCI) is published annually and is available on MLL's website. It was significantly revised in 2021 and updated in 2022. This document sets MLL's key strategic objectives each year including network reliability targets, consumer engagement objectives, business development goals (accreditations etc.), consumer discounts, and rate of return to shareholders. Asset related objectives in the SCI are encapsulated within this AMP to ensure achievement.
- MLL's annual report, which discloses the accounting position and reports on the business performance against budget and on SCI objectives achievement.
- The regulatory disclosures (schedules 1 to 10) required by the Commerce Commission.
- The MLL annual works plan aligned to the first year forecast of this AMP and subsequently updated for each successive year.
- The various internal standards, policies and procedures that ensure works are undertaken safely and to appropriate quality standards and in consideration of our stakeholders' wider interests.
- MLL undertook an Independent Asset Review in 2022 by engaging an experienced consultant to review MLL. The objective of this periodic review is to provide assurance to MLL's board and the Marlborough Electric Power Trust that the state of MLL's asset base and MLL's planned investment profile over the next three to five years is at least sufficient to meet NZ regulatory, safety and reliability standards and meet expected service levels for its customers in line with MLL's SCI. The outcome of the 2022 review is broadly aligned with MLL's view of its assets.

2.5 Period covered

This AMP covers the period 1 April 2023 to 31 March 2033 being regulatory years RY2024 to RY2033. It was adopted by the MLL Board of Directors on 31 March 2023. A statutory declaration has been made to the Commerce Commission on behalf of the MLL Directorate for this full AMP.

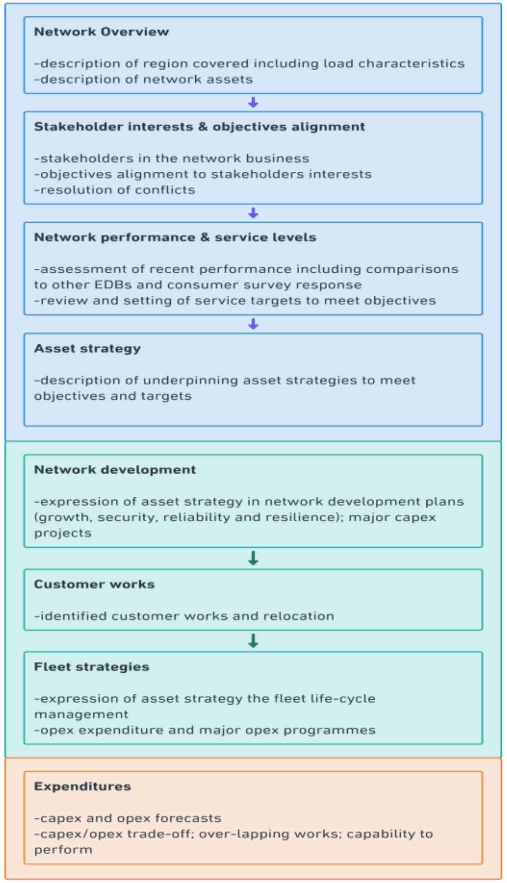
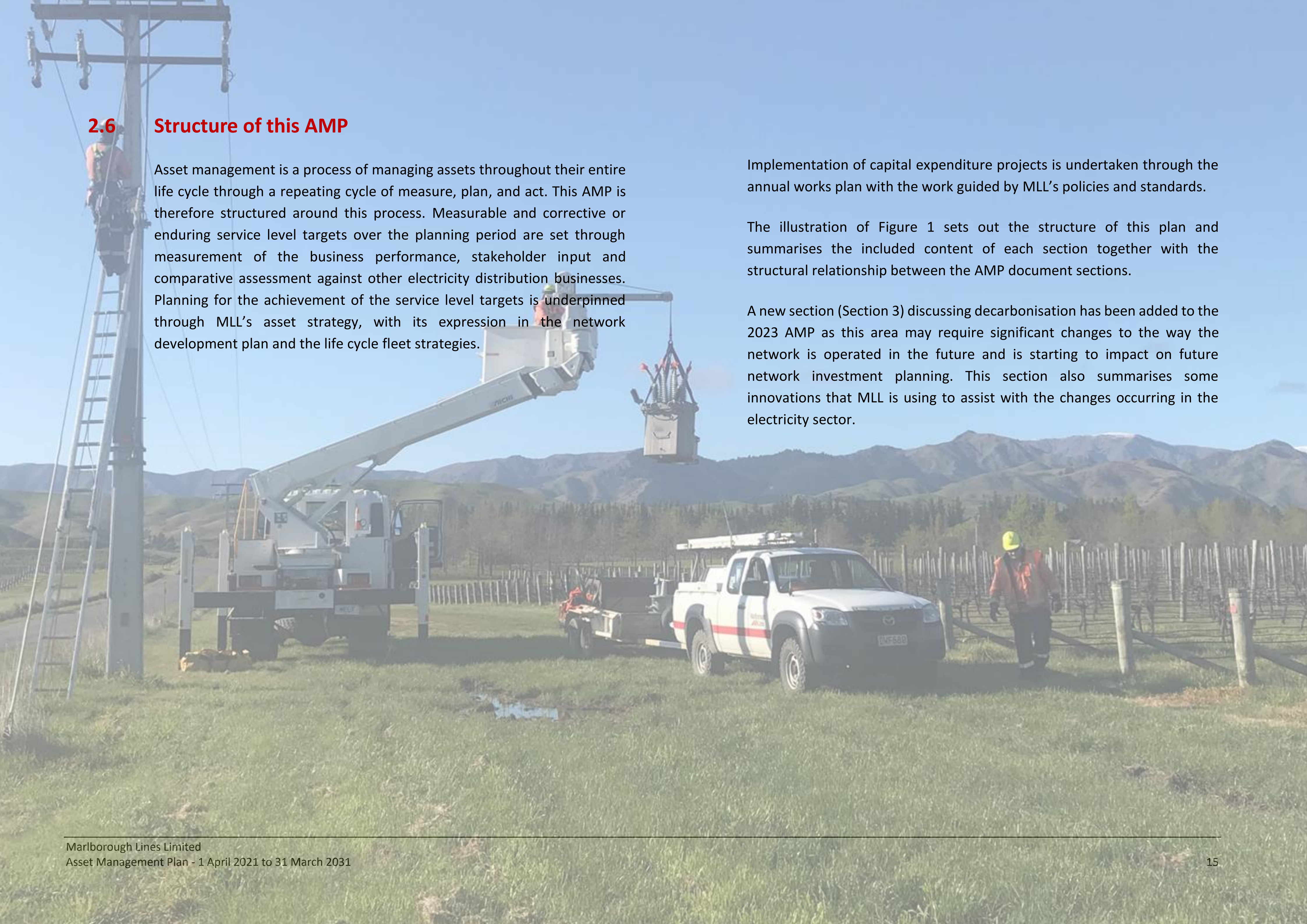


Figure 1: Overview of the structure of this AMP



2.6 Structure of this AMP

Asset management is a process of managing assets throughout their entire life cycle through a repeating cycle of measure, plan, and act. This AMP is therefore structured around this process. Measurable and corrective or enduring service level targets over the planning period are set through measurement of the business performance, stakeholder input and comparative assessment against other electricity distribution businesses. Planning for the achievement of the service level targets is underpinned through MLL's asset strategy, with its expression in the network development plan and the life cycle fleet strategies.

Implementation of capital expenditure projects is undertaken through the annual works plan with the work guided by MLL's policies and standards.

The illustration of Figure 1 sets out the structure of this plan and summarises the included content of each section together with the structural relationship between the AMP document sections.

A new section (Section 3) discussing decarbonisation has been added to the 2023 AMP as this area may require significant changes to the way the network is operated in the future and is starting to impact on future network investment planning. This section also summarises some innovations that MLL is using to assist with the changes occurring in the electricity sector.

3. Decarbonisation of Energy

In 2015, the New Zealand government signed the Paris Agreement which committed it to significant carbon reduction targets. To meet its commitments in this agreement the government passed the Climate Change Response (Zero Carbon) Act in 2019. A target has therefore been legislated to achieve net zero emissions of long-lived greenhouse gases (other than biogenic methane) by 2050. This is anticipated to result in decarbonisation and increased electrification of the New Zealand economy.

EDBs are expected to play a key role in enabling decarbonisation, particularly as large amounts of new electricity generation and electrical loads will need to be connected at the distribution level. In order to do so, EDBs' networks and the systems that support their networks will need to adapt. These changes will take many forms and may require a shift in the way EDBs invest in and operate their businesses.

MLL's electricity network has been designed and operated predominantly to distribute electricity from the single Blenheim transmission Grid Exit Point owned by Transpower to electricity consumers in Marlborough. Decarbonisation, increased electrification, and distributed renewable generation will lead to a more complex electricity distribution system with two-way power flows which may challenge the quality and efficiency of MLL's services.

A major challenge with high penetration of renewable energy generation across island power systems is how to balance intermittent generation such as solar and wind generation, with customer load requirements. New technologies have been developed that are being embedded at the distribution level to balance the variable generation with variable load. MLL is keeping abreast of these technologies.

One target in MLL's Statement of Corporate Intent (section 5.3.1.3) focuses on Technology and Innovation:

> *MLL will empower our consumers and region by deploying technology and commercial innovation to accelerate electrification and provide for future load growth.*

This section provides a summary of potential impacts of decarbonisation, actual changes that MLL see are required during this planning horizon, and actions being taken to address these changes.

3.1 Electrification of Energy Loads

MLL is examining its own journey towards a low carbon electrified economy and working with local enterprises to understand their journeys. MLL is well positioned to support significant reductions in carbon emissions within its core network in Marlborough. A key part of enabling the region to reduce its carbon footprint is to understand the quantum of fossil fuel and thermal fuel load to be displaced and when those changes will occur, as this will influence network strategy and investment.

3.1.1 Process Energy Fuel Substitution

In its 2021 report, the Climate Change Commission signalled a phased withdrawal from natural gas, with LPG space heating and hot water stopped in new builds from 2025 followed by a phasing out to 2050, with fuel transfer to electricity or biomass[2]. A phasing out of LPG is also likely to affect commercial customers where it is used for process heat. This signalled fuel substitution towards electricity (as one option) has the potential to increase both GWh throughput and peak demand on the MLL network.

MLL has the advantage of having existing spare capacity in its network allowing it time to measure the effects of such fuel transfer and act accordingly.

A significant challenge for MLL is that remote parts of the network which currently have small electrical rural loads and are therefore served by low-capacity distribution assets, could require large core network investment should customers wish to electrify their fossil fuelled processes such as irrigation, heating, cooling, frost control and transport. Some of these network investments would appear uneconomical due to their transient nature, for example irrigation load has a relatively narrow season and varies significantly from year to year making it difficult to justify investment in long term fixed network assets. MLL is having ongoing discussions with major customers and investigating options to assist their transition.

MLL undertook an industrial consumer survey in May 2021 to better understand the potential for decarbonisation load growth. There is significant fossil fuel (gas, coal and some diesel) heating and other load in Marlborough, primarily wineries, food processing and hospital load. The survey sought to form a view on the potential to displace fossil fuels by options such as the conversion of solid fuel boilers to electrical options.

Although electrical load growth due to decarbonisation may be substantial, timing of changes and details such as seasonality and load diversity require further investigation. MLL will continue to engage with its consumers with high thermal loads and modify network planning when appropriate to do so.

3.1.2 Transport Electrification

The transportation sector utilises a significant amount of energy and produces approximately 21% of New Zealand's carbon footprint. The way forward with transport decarbonisation is becoming clearer as businesses commit to decarbonisation investments.

KiwiRail's partial electrification of new Cook Strait ferries is a major decarbonisation project. KiwiRail has ordered two diesel electric ferries that will require approximately 7MW while in port from late 2025. This new load combined with expected related new loads at the port will double Picton's existing peak load. KiwiRail's needs may increase substantially by 2033 due to further decarbonisation and changes in battery technology. The electric ferry battery upgrade path and resulting load increase is unclear, however, to achieve complete decarbonisation of the ferries, KiwiRail's peak load requirements will be a number of times larger than its 2025 needs. MLL has developed a long-term network development strategy for Picton load

[2] Climate Change Commission's Draft Advice for Consultation report, 31 January 2021, page.60.

growth that caters to this uncertainty and results in an efficient upgrade path that defers substantial investment until it is needed.

MLL is supporting Sounds Air's industry leading journey to electrical commercial flights to and from Marlborough. The anticipated increase in demand from this initiative is being factored into network planning.

In 2021 the New Zealand Climate Change Commission recommended stopping the import of light road vehicles with internal combustion engines by no later than 2035, together with developing a charging infrastructure plan for rapid EV charging. The government also introduced a Clean Car Discount and High Emission Vehicle fees for new vehicle purchases. The number of new vehicles sold in New Zealand with a form of electrification (full EVs and hybrids) doubled in both 2021 and 2022 indicating a potential exponential growth in EVs.

The number of EVs in Marlborough continues to increase. MLL expects that this will increase significantly in coming years. MLL conducted a high-level EV and/or PV hosting capacity assessment in late 2021. This study showed a good level of capacity available in some parts of the LV network for residential EV charging, and quite limited capacity available in other parts of the LV network. It suggested simple investments that may lift capacity in some areas, such as re-phasing ICPs. Some EDBs have found that most EV owners are not using fast charging at their homes and are using normal residential supplies to charge overnight. Provided that vehicles are largely charged frequently and/or off peak and largely from standard domestic wall sockets, the impact on the network may be marginal. If charging is encouraged to occur after the evening peak (approximately after 8 pm) there may be minimal impact on the network. MLL will continue to consider

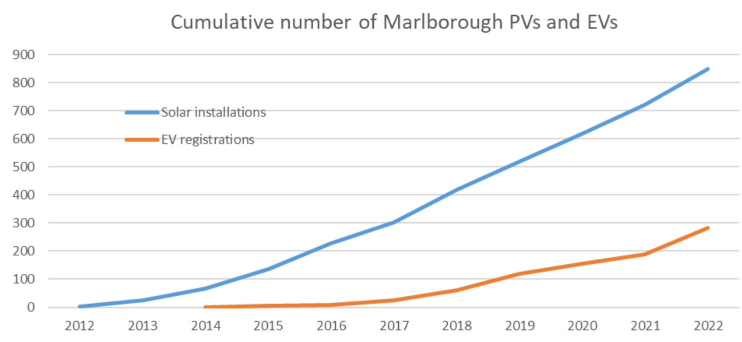


Figure 2: Increase in Solar PV and EV Uptake in Marlborough

alternative line delivery price structures[3], to manage potential significant increased demand from EVs. MLL's existing ripple system could be utilised in accord with user requirements to assist in maximising the efficiency of charging relative to time of use.

It is not expected that EV numbers in Marlborough will increase at such a rate that MLL will not be able to respond to meet the demand. The long-term impact of EVs on the network remains to be determined but, due to the present level of secure network capacity margins in the network, peak demand could increase significantly without triggering growth expenditure. Additionally, anecdotal evidence suggests the effects on EV charging will be moderated by the short journey distances experienced to date (perhaps due to range anxiety), the high cost of implementing fixed chargers, combined with the relative high efficiencies of these vehicles (in km/kWh).

Applications for fast EV chargers (which may have loads of several hundred kilowatts) are being dealt with on a case-by-case basis. It is difficult to predict where these may be requested, and how large their loads may be. These typically require upgrades in existing connections or new connection assets which are funded by the fast charger developer. At present there is no indication that core assets such as feeders and zone substations will require upgrades to cater for these potential load increases in the next five years.

MLL will continue to monitor EV technology and uptake in the region but has no plans for network augmentation at this time in relation to it. MLL will consider alternative line delivery price structures, if deemed appropriate, to manage potential significant increased demand from EVs.

A close watch is being maintained on new loads and the impacts of incentives to continuously assess their effects through monitoring and modelling.

3.2 Distributed Generation

Section 4.3 describes existing generation within MLL's network. MLL currently has a small number of embedded medium-scale generators connected to its network. This includes an existing hydro station (from 1927), three small windfarms (2010, 2011, and 2014), and a solar farm (2020).

Section 4.3 illustrates the capacity of solar PV and wind distributed generation installed into MLL's network. This shows steady uptake of solar PV and the accumulation of many small-to medium-scale installations. While wind does have significant installed capacity, this is dominated by a small number of medium-scale installations.

[3] From 1 April 2022 consumers may elect to install dedicated EV chargers or charge points as MLL controllable load. MLL has offered this option as a mitigation for potential peak load increases, and the consumer benefits through a lower c/kWh energy price.

Total installed capacity of distributed generation, as at the end of the 2022 calendar year, had reached approximately 6.8MW of solar PV and 2.4MW of wind.

3.2.1 Small Scale Generation

The drive to reduce New Zealand's carbon emissions is accelerating the adoption of small-scale solar photovoltaics and stationary batteries. Residential and industrial customers are becoming electricity generators through the installation of solar PV arrays on their buildings. Section 4.3.2.1 describes this further. Whilst the installation of small-scale distributed generation within the network (particularly roof top solar) is increasing, the levels are still small in total (approximately 3.7MW to December 2022) and a concerning rate of increase is not yet evident.

As more cost reflective network pricing which is weighted towards fixed charges is introduced, the attractiveness of roof top photovoltaic installation may diminish with the actual saving being specifically related to a reduction in energy consumption (variable) prices.

Widespread installation of solar SSDG, particularly in the Marlborough Sounds, has the potential to cause voltage problems on the network. MLL gives this due consideration when assessing network (and feeder) capacity and when reviewing applications for the installation of DG.

Some consumers wish to store energy in batteries and EVs and trade electricity across MLL's network. Typically, these storage devices (discussed in more detail in section 7.8.6 and section 7.9.1) charge from customer generation or off peak. There are opportunities to improve network efficiency through these technologies. As with EV chargers, MLL is looking to incentivise charging behaviour that optimises network investment and does not degrade power quality.

Perversely for MLL, the areas where MLL might see benefit from consumers disconnecting into home or micro grids is in remote and uneconomic areas (for MLL to supply), but consumers there have less incentive to invest in this technology as, generally, the premises they own are not continuously occupied and so the total kWhs consumed is low lessening the return on investment in off-grid generation.

3.2.2 Larger (Utility Scale) Generation

Reports commissioned by the Ministry of Business, Innovation and Employment[4] suggest that Marlborough is a relatively attractive location for further wind and solar generation development. Undeveloped flat land is relatively scarce in Marlborough due to extensive viticulture. Good quality wind resource that supports large scale economic wind generation developments is located remote from MLL's core network and therefore would require very substantial network investment to connect it to the

[4] "Wind Generation Stack Update", June 2020, Roaring40s Wind Power Ltd.
"Economics of Utility-Scale Solar in Aotearoa New Zealand" May 2020, Dr Allan Miller.

power system. It is therefore difficult to predict where and when new generation development will occur.

Manawa Energy (formerly TrustPower) operates the Branch Power Scheme (which is connected to Transpower's transmission grid) and was granted resource consents in 2008 to extend this scheme, which could have resulted in a connection to MLL's network. Manawa Energy put the proposals on hold in 2012, due to low electricity prices combined with rising construction costs. The resource consent to take water expires in 2046.

Section 4.3 of this plan discusses wind and solar generation in MLL's network. A number of large MW scale solar plant developers have applied for resource consents in Marlborough. MLL works with each developer to tailor design network solutions that efficiently maintain network reliability, safety, and power quality. These large-scale new generation applicants typically request from MLL a guide to the existing network generation injection capacity at a location, and then develop generation within that network limit in order to optimise their investment's returns by minimising network costs. If power quality requirements are not met by a generation development, then MLL requires that development to fund appropriate augmentations to the network. Given that generation developers generally size their generation to avoid network augmentation, the number and scale of generation enquiries does not currently place pressure on the existing distribution network and offtake customers' needs.

Very large-scale developers are directing queries to Transpower for potential connections to Transpower's transmission grid. Transmission connected generation in the region is not currently expected to negatively impact on MLL's services.

As per MLL's Technology and Innovation targets in its Statement of Corporate Intent, MLL (through its subsidiary, Energy Marlborough Limited) is completing a 0.85MW solar plant in April 2023 at its Taylor Pass depot and has a resource consent for a plant near Seddon. There are a number of applications for other generation connections however they are at less advanced development stages and it is unclear whether they will progress.

Predicting the future installation of wind generation and large-scale photovoltaic installation is uncertain. This will be influenced by a number of factors, including the 2019 removal of avoided cost of transmission benefits, falling installation cost, improving solar panel efficiencies, reducing storage battery costs, the degree of marketing undertaken by suppliers, the potential for local or national government subsidies/funding schemes, and changes to standard connection and operating standards of EDBs and possibly the Electricity Industry Participation Code.

Solar and wind DG generate intermittently. They can lead to an increase in the voltage swings in the network requiring network investment. It is likely that there will be little reduction in the network peak demand due to solar DG unless it is integrated with batteries. MLL therefore does not see PV or wind by themselves as non-network solutions (see section 7.9) or as an opportunity to reduce network and transmission investment.

MLL plans to develop its network to satisfy generation needs as they become evident and appropriate.

A relatively high level of interest is being shown in large scale solar generation in the region. As discussed above, developers that wish to develop generation that exceeds the networks limits will pay for any required augmentations however an interesting challenge for MLL is that it is conceivable that there may be brief periods within the 5 year planning period (particularly during end-of-year statutory holidays when the total network load may drop to approximately 30MW during daytime), when the Transpower Grid Exit Point may become a net exporter and inject power into Transpower's national grid. This may cause Transpower grid voltage and control issues. It is not clear where the costs of resolving these potential issues may lie i.e. who should pay to resolve them? This issue is unlikely to occur before the summer of 2026/27 and is therefore not of immediate concern. MLL is ensuring that large scale generation within its network can be remotely curtailed by MLL SCADA systems should grid limitations be exceeded.

3.3 Innovation and Tools for Managing Change

MLL will embrace and adopt new technologies when it believes there will be benefit to the network and/or consumers. The benefits being sought typically focus on improved network reliability, power quality, or cost improvements however advancing customer service is also desirable. For example, MLL is actively working with EDBs across New Zealand, and other industry participants to consider the likely impacts from the rise of Distributed Energy Resources (DERs) and options for its management.

MLL and/or its staff is a member of and supports a number of electricity industry institutions such as:

- New Zealand Electricity Networks Association
- New Zealand Electricity Engineers Association
- Engineers New Zealand
- CIGRE (International Council on Large Electric Systems)
- International Institute of Electrical and Electronic Engineers
- Canterbury University Electrical and Computer Engineering Department
- New Zealand Electric Power Engineering Centre (EPECentre)
- New Zealand Power Engineering Excellence Trust (PEET)

Largely through contributing to these organisations, working with suppliers, and through close relationships with similar NZ EDBs MLL gathers information and develops potential new and innovative practices. As a relatively small EDB, MLL does not see itself typically as a developer of new technologies but rather as a fast follower, picking up new technologies and processes that have been trialled successfully by others. MLL for example, would be unlikely to procure network equipment that has not already been trialled successfully by other EDBs in New Zealand or Australia with supporting services developed in New Zealand.

Investments that require more than $100,000 investment go into a portfolio prioritisation process according to MLL's approved internal business procedures and typically require a Business Case that justifies the expenditure against MLL targets to be completed and approved by the delegated level of authority that is appropriate as per MLL policies. Smaller investments (generally under $50,000 in value) are trialled in pilots before further investment is approved. Section 7.8.5 describes the measures that MLL uses to make decisions on whether to develop innovative practices and whether MLL should commence, continue, or discontinue innovative practices.

MLL is currently investigating and implementing innovative processes and technologies such as:

1. Moving from Radial to Mesh Topology

Historically EDBs have used radial (also known as star) network topologies, however many are moving to loop or mesh topologies that are typically used at the transmission level. MLL is currently reconfiguring its core 33kV network from a radial network to a meshed network. The reconfigured 33kV network will enable the 33kV substation buses to continue uninterrupted supply to urban substations when single 33kV line faults occur, improving power supply reliability and power quality. This fundamental change to MLL's network consists of a number of projects over multiple years such as new line sections, zone substation circuit breakers, and upgraded protection systems. Parts of the network will have its capacity lifted to support forecast load by the new investments and the solution was found to be a cost-effective solution to augmenting network capacity to meet load growth. This topology also reduces the risk of islanded distributed generation becoming separated from the main grid and causing severe large scale dynamic over-voltages.

2. Introducing Synchrophasor Technology

Power quality issues that can arise from increased penetration of active loads and distributed generation are often not detected by traditional monitoring tools such as SCADA. The reconfigured network requires replacement of aging electrical protection, control and communications equipment. MLL is also working through a zone substation protection relay replacement programme that should be largely completed by 2028 to avoid existing relays surpassing 20 years of life. As MLL works through this multi-year project to upgrade these systems to the latest technology, a partial by-product of the new relays is that MLL will be able to monitor power quality at an advanced level using modern synchrophasor technology. These upgrades will result in improved monitoring and control of Marlborough's core 33kV and 11kV network electricity distribution system, enabling MLL to more quickly detect and take appropriate actions if issues occur on the network. Should the increasing penetration of inverters within the network cause power quality issues then this technology should catch problems earlier and reduce the potential investment required to resolve them.

Synchrophasor technology has been successfully introduced to other distribution networks, sometimes resulting in surprising new insights into the network's operation due to the improved power system visibility. MLL anticipates that these relatively minor incremental investments will assist to detect faults before they result in major outages and thereby improve reliability.

3. Improving Customer Connection GIS Data Quality

Historically the recording of low voltage and 11kV connection asset information has been less than disciplined. To monitor, analyse and understand the changes occurring due to decarbonisation occurring at the customer level, the customer connection assets need to be accurately known. MLL is aiming to improve its records in the next few years, focusing on urban networks down to the customer transformer level, so that advanced analysis systems can more accurately model the impacts of accelerating decarbonisation.

4. Monitoring Smart Appliance Technologies

New technologies are being embedded in customer appliances to enable supply to demand balancing. These Demand Response (DR) devices include:

- smart heating and air conditioning
- smart EV charging and vehicle to grid technologies
- smart dishwasher, clothes washers and dryers
- roof top solar generation
- small scale wind generation
- utility scale and behind-the-meter batteries

Most of these technologies have advanced customer interfaces through "Apps" that enable monitoring and control of home appliances and loads (smart home technologies). Smart demand response appliances are being aggregated by third parties to provide efficient power infrastructure investment typically through third party internet control.

MLL is involved in a number of forums through which it is monitoring the development and use of these technologies with a view to assist with decarbonisation and network optimisation when it becomes appropriate to do so.

5. Developing an Advanced Distribution Management System

MLL is planning to replace its aging and partly obsolete SCADA (Control Room network monitoring and control systems) over the next few years. An Advanced Distribution Management System (ADMS) will be put in its place to improve network monitoring, automation, control and management. Outage modelling, outage management, and network monitoring and control may be done through a "single pane of glass" with an ADMS system providing significant improvements in safety, network reliability, and efficiency over traditional SCADA systems.

ADMS systems can have advanced modules such as Distributed Energy Resource Management Systems (DERMs) included in them for the management of new customer technologies such as batteries, distributed generation, and smart appliance technologies. The good management of DER will be crucial to maintaining acceptable power quality and reliability, and potentially avoiding significant investment in network capacity upgrades.

The first stage of the ADMS project will replace the SCADA system which requires replacement. Following stages will include an Outage Management System and related modules to improve safety and efficiency. The addition of further modules may be delayed until the cost benefit balance becomes optimal, for example a generation management module would not be added until sufficient embedded generation justified the additional investment. MLL intends to select an ADMS solution that is similar to other EDBs that have adopted ADMS's in NZ, however its level of implementation may differ due to different needs.

ADMS implementation is dependent on the improvement of GIS data discussed above.

6. Smart Switches

To reduce the outage times after remote network faults have occurred, MLL is working through a multi-year programme to install smart 11kV switches to reduce the number of customers effected by some network faults and improve monitoring of the network in these locations. Where economically appropriate to do so, these are remote controlled and connected to the SCADA / ADMS system. The switches used by MLL range over several different types such as load break switches, reclosers, smart fuses, Intelliruptors etc so that each location can use an appropriate level of technology depending on the network topology and benefits provided at that point. MLL has selected devices that are well supported and in use already in NZ.

7. Low Voltage Monitoring Technologies

Traditionally EDBs have not had real time monitoring or recorders placed at the consumer level (such as 11kV to 400V transformers) to know precisely how consumers are using their connection assets, and whether the assets are being stressed. Following industry typical diversity factors, this has required the oversizing of connection assets in many cases. With the advancements in electronics and communication systems it is becoming easier to place measurement devices at the customer level.

MLL is conducting several pilot trials of consumer connection monitoring technology (see section 6.1.4) in order to select equipment for monitoring the impact of EV, PV and other consumer devices. This will assist engineering analysis and enable MLL to operate equipment closer to its full capability, and possibly avoid primary equipment upgrades.

8. Low Voltage PV and EV Penetration Analysis

MLL has trialled bulk GIS data analytics on parts of its network to better understand the potential impacts of growing EV chargers and small scale (rooftop) PV. Using advanced analytics, automated data analysis has been used to identify areas of potential congestion in MLL's network. This may be used to guide decisions about equipment ratings when replacing aging equipment, identify potential problem areas, and guide decisions on where to focus new low voltage monitoring technologies.

MLL has found that significant GIS data improvement is needed to conduct this analysis over much of the network. Implementation is therefore dependent on the improvement of GIS data discussed above.

MLL has not made decisions on whether bulk GIS data analytics is the best approach for investigating EV and PV congestion and is investigating alternatives such as LV monitoring technologies.

9. Improved DG Connection Guidance and Standards

MLL revised its small-scale distributed generation requirements and medium to large scale distributed generation requirements in 2022 and 2021 respectively and published them on its website. MLL has relied heavily on international standards such as AS/NZS 4777 and the EEA Guide for Connection of Small-Scale Inverter-Based Distributed Generation. If these standards are followed, high penetration of distributed generation can generally occur and some of the negative impacts of distributed generation on power quality can be mitigated. To enable a high proportion of DG to be connected to its network, MLL is giving customer compliance with these standards more attention, through more stringent records and information requirements.

MLL will occasionally revise the DG requirements as the industry learns improved ways of achieving high DG penetration.

4. Network overview

This section provides a summary of MLL's network and the region it operates in. Specific details about the composition of MLL's assets, and the work undertaken (and forecast to be undertaken) on the network itself, are presented in Section 8: Network development, and Section 10: Fleet management.

4.1 Region and context

MLL's electricity network currently distributes electricity to approximately 26,700 consumer connections (ICPs) with an instantaneous maximum demand (as at RY2023) of 79MW (recorded 10:21am on 21 June 2022). MLL's consumers are predominantly residential (85%) and small-to-medium commercial consumers. Despite making up only 15% of MLL's network connections, non-domestic consumers use 60% of the region's electricity.

MLL's network covers the Marlborough region in the north-eastern corner of the South Island as illustrated in Figure 3. The red lines show MLL's 11kV distribution network.

4.1.1 Supply area characteristics

MLL's network is located across a diverse area. This can be broken down into the main urban areas of Blenheim and Picton, Marlborough's East Coast, the Marlborough Sounds and the region's major inland valleys (Awatere, Waihopai, and Wairau).

Major consumers are typically located outside Blenheim, and include food processing, vineyards, wineries, timber processing and manufacturing.

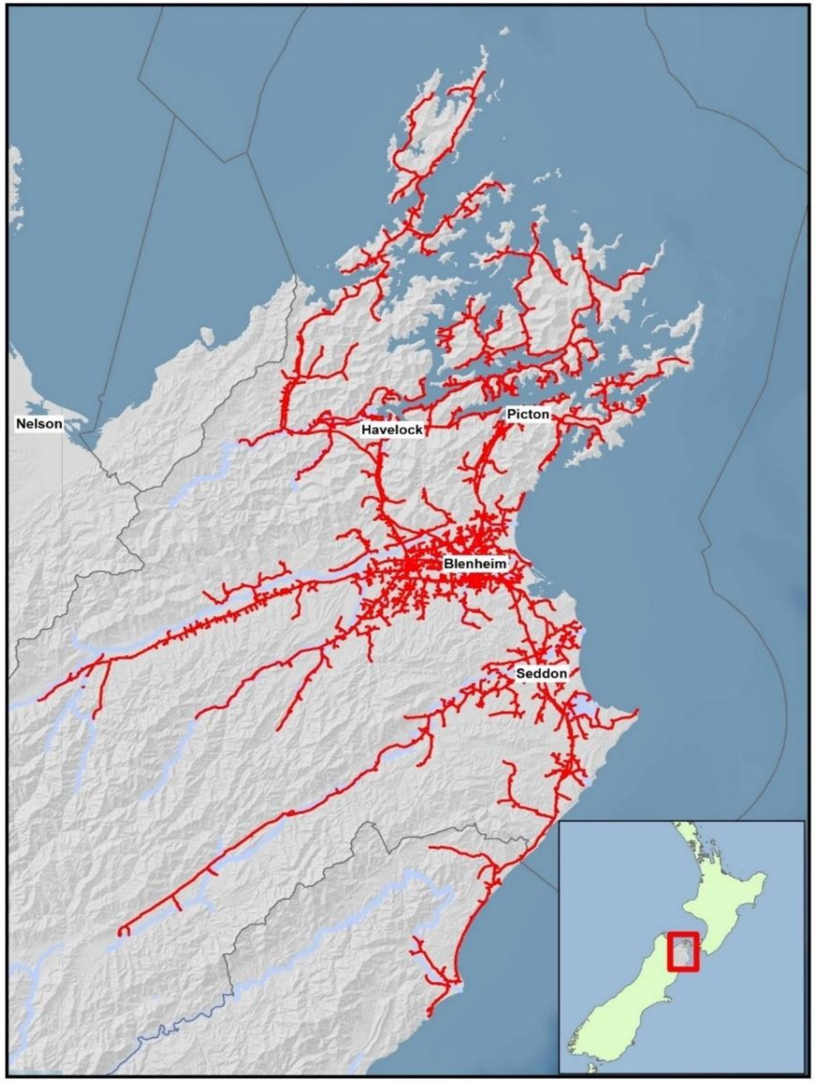


Figure 3: Extent of MLL's distribution network

The load is typified by residential connections peaking in winter, and wineries processing grapes at the time of vintage, typically April. High demand in summer can occur due to irrigation load however this is weather dependent and difficult to forecast from year to year with high load driven by prolonged dry and hot periods and relatively low irrigation load can occur during wet summers as occurred in 2021/22 and 2022/23. During very high load periods the grid exit point load can be high and flat for long periods up to 14 hours a day, rather than having shorter daily peaks. This tends to be driven by irrigation and storage cooling loads.

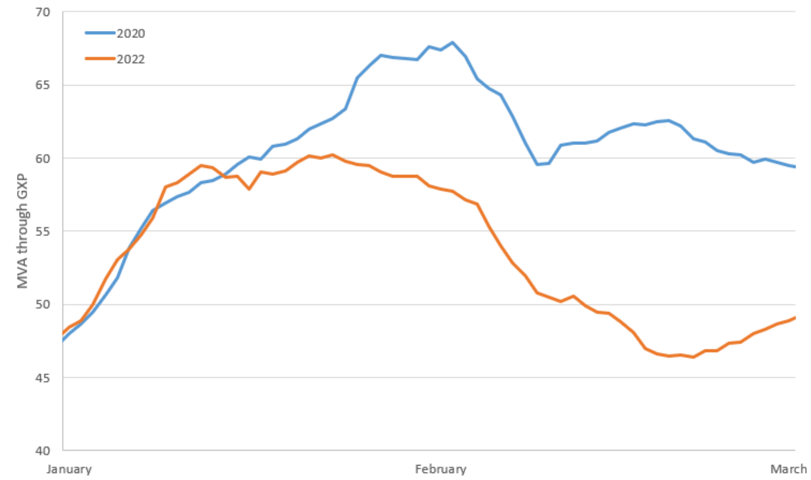


Figure 4: Impact of dry/wet years on summer load variability

4.1.1.1 Urban Areas

Blenheim and Picton contain a mix of residential, small commercial and industrial consumers. The maximum demands are predominately a result of winter heating in homes and typically occur between 7am to 11am and 4pm to 8pm during cold spells. In total, the towns of Blenheim and Picton represent approximately 60% of the total ICPs and 45% of the load. The reason for a lower percentage of the load compared to consumer numbers is that there is a concentration of industrial and larger commercial consumers located in the Riverlands industrial estate east of Blenheim and other large consumers are dispersed over the network. The Picton load and profile is anticipated to change remarkably in late 2025 when KiwiRail's first new diesel electric ferry may almost double Picton's current peak load.

Figure 5: Sustained peak during winery vintage period

Residential load growth in Blenheim and Picton is relatively static due to several factors including increased use of energy efficient lighting and other appliances and the use of heat pumps rather than conventional heaters. But this general reduction in individual consumption is, to an extent, offset by modest growth in consumer ICP's. Typically, growth in residential ICP's has been constrained by availability of residential sections.

4.1.1.2 Wairau Plains

Significant features of this area include Woodbourne airbase and airport, Renwick township and a substantial horticultural/ agricultural area with extensive vineyards. The load tends to be driven by wine processing (late March to early May) and the need for irrigation (typically December to March). Vineyards cover a substantial area of the Wairau Plains as well as significant areas of the lower Awatere Valley.

4.1.1.3 Inland Valleys

While vineyards (and, to a much lesser degree, dairy farms) have expanded into the inland valleys, these areas are still of low connection density and relatively low connection loadings. The inland valleys tend to be sheltered from storms and this, combined with their topography, pastoral land use and MLL's lines being relatively clear of vegetation, makes supply in these valleys relatively reliable, especially given the long lengths of their radial feeders.

Dry conditions and forested areas sometimes give rise to extreme fire risks in summer. MLL recognises these risks in both its network design and operation as further detailed in other sections of this plan.

4.1.1.4 Marlborough Sounds

Supply in the Marlborough Sounds poses many operational challenges. Significant parts of the network in this area are constructed over rugged terrain with difficult access. Many areas can only be reached by foot, tracked vehicle, helicopter and/or boat as there is no road access to many parts.

Often line spans are relatively longer in length where valleys need to be traversed and are frequently over significant vegetation. There are also significant spans across waterways (the largest being over 2km in length) utilised by shipping. These spans are subject to annual inspection.

The Marlborough Sounds has a relatively high rainfall and a temperate climate that encourages rapid vegetation growth, leading to the need for tree trimming and vegetation control on a short return basis.

Lines located near the coastal margins are subject to salt spray. These lines require higher levels of inspection and maintenance, with special provisions required to minimise corrosion damage to conductors and transformers, as well as managing salt build-up on insulators and the potential spalling on concrete poles. This is evident in the north-western parts of the sounds where high winds are common.

The winds in the Marlborough Sounds can be extreme and accordingly the lines must be designed, constructed, and maintained to ensure their mechanical integrity.

MLL has approximately 750km of 11kV distribution lines (in the order of 20% of the network) in the Marlborough Sounds, supplying approximately 2,500 (<10%) consumers by way of approximately 15,000kVA of distribution transformer capacity. There are on average three consumers per km of HV line compared with close to nine consumers per km for the remainder of the network. Many of the installations in the Marlborough Sounds are holiday homes with intermittent occupation - approximately 50% of consumers in the Marlborough Sounds use less than 2,000kWh per annum. This compares to an average residential/domestic household consumption of approximately 7,500kWh per annum.

Because of the physics of electricity and supply within the Marlborough Sounds and the low consumer load factors, there is an inherent low utilisation of distribution capacity. The maximum demands on the various lines supplying the Marlborough Sounds typically occur over long weekends or public holiday periods, particularly the Christmas and new year holidays. This holiday occupation also leads to a much lower diversity of demand at times of maximum load within the Marlborough Sounds.

Many parts of the Marlborough Sounds are remote – some sites involve drive times from MLL's base of up to three hours to reach. Typically, the most cost effective first line of response is to utilise a helicopter.

Many areas in the Marlborough Sounds are subject to prolonged and/or intense rain and/or extreme wind events. MLL has an on-going programme of vegetation control to minimise interruptions caused by debris such as tree branches blown across the lines. There are, however, practical limits to the amount of vegetation control which can be undertaken, particularly given the sensitive environment in which these lines are constructed and the distances that branches can be blown. In some areas, the lines have been constructed in environmentally sensitive areas and in others the lines have been surrounded by forestry planted after line construction.

In 2021 and 2022 extreme rain events caused many landslides in the Marlborough Sounds that damaged or placed MLL's assets at risk. Many public roads were damaged and out of service for some months, making line access only possible by helicopter and barge operations. State Highway 6 from Blenheim to Nelson was closed for repairs for seven weeks in late 2022. The future viability of some public roads in the area remains uncertain and undecided by the Marlborough District Council. Some of MLL's line access tracks were damaged or destroyed and some have been subsequently abandoned in favour of helicopter access only.

These various factors significantly increase both the cost of construction and the operation and maintenance of the network. They also reduce the overall operating efficiency of the network relative to installed capacity. The situation is exacerbated by the fact that revenue from these consumers does not meet the costs incurred and cross subsidies are required from the consumers in the economic areas.

Significant issues facing MLL regarding reticulation in this area are load growth and supply upgrade. Many of the existing lines are built on private or Government-owned land and were constructed in the 1960s and 1970s, with access protected by wayleaves and the "existing works" provisions of the Electricity Act. MLL has limited easements over line routes. Therefore, upgrades which necessitate changes to the existing layout or create an injurious effect on the land require new easements to be created. This is a challenging, often costly and time-consuming process. Any future major developments in the Marlborough Sounds area will require careful analysis and design of both asset and non-network (e.g. demand control) alternatives to ensure optimal solutions are found.

In addition, environmental regulations and changes in line construction code requirements are now more stringent than when the lines were constructed. This is likely to affect the establishment (or in some cases, re-establishment) of tracks and access to lines as they are re-constructed, thereby likely increasing the time to plan and undertake works, as well as increasing cost.

A further issue with respect to lines in the Marlborough Sounds is that of supply reliability. The various lines supplying sections of the Marlborough Sounds are all radial/spur lines with no interconnection to other parts of the network. The longest radial feeder has a length of 326km.

MLL has installed automatic switching devices (sectionalisers, reclosers, etc.) at various points along each of the radial spurs to minimise the areas affected by faults to the network. There is, however, a practical limit to the number of switching devices which can be installed. Over recent years the dedicated SCADA radio system linked to the devices has been expanded and will be further developed to enable increased remote control of switching devices within the network.

MLL installed a ground fault neutraliser at its Havelock zone substation in 2016. Much of the Marlborough Sounds network is supplied from the Havelock and Linkwater zone substations.

MLL has experienced disruption to the network by forestry, especially during harvesting operations or during severe storms when trees are not only blown over but in several cases have slid down hillsides. The current tree legislation restricts the ability of MLL to proactively remove potential hazards to the lines services it provides as it only allows trimming of trees in close proximity to the lines.

In light of the challenges in supplying the Marlborough Sounds it is not realistic to expect that reliability to consumers in this area will be the same (or similar) to that of urban areas. Supply in the Marlborough Sounds also includes the aerial crossings of four navigable waterways[5] with significant spans.

The supply in the Marlborough Sounds has been constructed primarily using treated pine (TP) poles, principally because of their relatively light weight (ease of transport) and resilience to handling.

At the time of installation, these poles were anticipated to have a useful life of 35 years to 40 years. Over the years, the TP poles have been routinely tested and found to be in good condition. Accordingly, MLL now considers their useful lifespan to be in the order of 55 years to 60 years although the poles are now approaching this age given much of the reticulation was undertaken in the 1970s. Difficult access and the remote location mean that the cost of replacing poles in the Marlborough Sounds is markedly higher than in other areas.

4.1.1.5 East Coast

The East Coast consists of a relatively narrow strip of land running sub-parallel to the coast down to Marlborough's southern boundary with some sparsely populated inland river valleys running typically west towards the centre of the South Island. Much of the network in this area was constructed in the late 1950s using reinforced concrete poles and copper conductors. The long radial nature of the area means there are no alternative supplies available during faults or planned outages (outside of mobile generation). However, the sheltered nature of the land and predominantly pastoral land use, together with relatively small areas of trees and vegetation, leads to relatively high reliability of supply in this area.

[5] Crossings of French Pass to D'Urville Island, Greville Harbour (D'Urville Island), and to Forsyth and Arapawa Islands from the South Island.

4.1.1.6 Demographics and GDP

At the time of the last published Census (2018), MLL's network area had a resident population of about 48,700 people, which was a 1.7% average annual increase from the 2013 Census. Of this population, about 23,000 live within the urban Blenheim area. Key demographic features of the resident population within MLL's network area are:

- that the population is older than the national average, with a median age seven years greater than the national median, and about 22% of the population is aged over 65 years (for NZ only 15% of the population is aged over 65 years)[6];
- that there is significantly lower unemployment than the national average, with the most common occupational class being labouring, typically within the viticulture industry, which is almost twice the national average by percentage;
- that the median income is slightly lower than the national median across all age groups; and
- fewer people are involved in manufacturing with more people involved in agriculture, forestry and fishing.

The key demographic implications for MLL are therefore: low population growth, lower levels of discretionary spending in the community at large, and an increasing proportion of connected consumers shifting to retirement-level incomes.

At the time of writing, the Statistics NZ GDP figures[7] published for the Marlborough region were up to RY2021 and show an ongoing growth trend in spite of COVID19 challenges and a potential recession as illustrated in Figure 6. From this, MLL anticipates that relatively constant consumer connection growth will occur in average at the historic mean levels over the planning period.

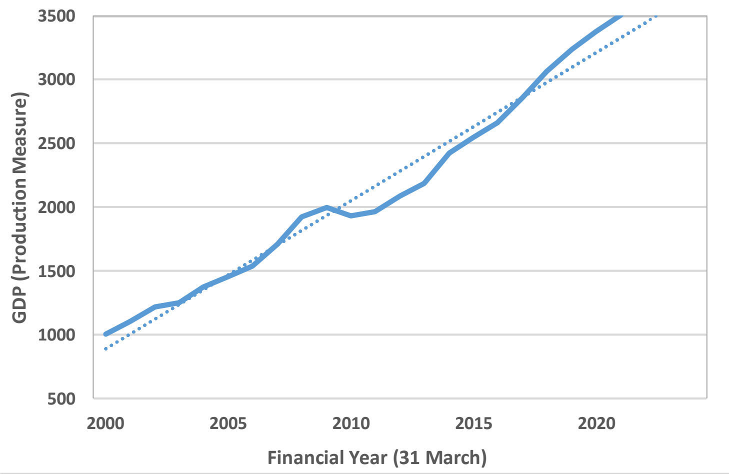


Figure 6: Marlborough GDP ($m)

4.1.1.7 Key Economic Activities

Marlborough's key economic activities include:

- viticulture and winemaking;
- aquaculture, including greenshell mussels and salmon farming;
- forestry;
- timber processing;
- food (particularly vegetable) processing;

[6] From 2018 NZ Census data.

[7] From stats.govt.nz table RNA001AA, 25 March 2022.

- tourism;
- aviation (Woodbourne Air Force base and Marlborough Airport);
- pastoral farming;
- engineering manufacturing; and
- dairying.

The area’s economy is therefore strongly influenced by:

- success of the viticulture industry and markets for wine;
- demand for aquaculture products, greenshell mussels and salmon;
- any sustained climate change which impacts on the viticulture or agriculture industries;
- markets for forestry production and timber processing;
- markets for dairy products;
- government policies on land use, particularly in relation to forestry and climate change;
- government policies on major defence installations;
- access to water for crop and stock irrigation and wineries;
- algae bloom, rough seas or sea temperature warming within shellfish farming areas; and
- the incidence and severity of frosts when grapes are flowering and the extent of rain when grapes are ready for harvest.

The impact of these issues on MLL’s electricity distribution business is broadly set out in Table 1.

Table 1: Economic influences and impacts on the network

Issue	Impact
Shifts in market demand for wine	Currently there is strong demand for Marlborough wine with over 80% of New Zealand's wine produced in Marlborough. All major wineries are planting more grapes. This will result in more electricity used for irrigation and processing of grapes.
Shifts in market demand for aquaculture	Currently there is strong demand for aquaculture products (both greenshell mussels and salmon). The growth of these industries is constrained by the difficulties in obtaining further consents for increased areas for aquaculture. Aquaculture is a long-established industry in Marlborough with considerable diversity of location of farm sites and processors. This industry is likely to be sustainable long term with the greatest threats being the introduction of disease, and adverse effects from climate change which is encouraging the movement of farms to the outer channels and open seas.
Shifts in market demand for timber	As with any international market, demand for timber can vary but prices have been relatively steady. Any short-term downturn within log/timber markets will result in a delay of harvesting until prices increase. Log/timber production has increased markedly in Marlborough in recent years and MLL understands that further growth in this area is being considered, although the timings for this remain uncertain. The impacts of CO2 farming incentives are yet to become clear in Marlborough.
Government policy on nitrogen-based farming	May lead to contraction of dairy shed demand. May lead to contraction of dairy processing demand.
Milk prices	A return to higher prices may lead to further conversion of pastoral land to dairying and subsequent increases in demand, although this now appears unlikely due to environmental concerns and alternative high value land uses. Maintaining levels or reduction of prices are unlikely to have much effect unless prices fell to a level where production was uneconomic.
Climate change increases frequency of droughts or major storm events	May lead to increased irrigation demand.
Government policy on defence installations	Could lead to a significant contraction of demand at a single site, followed by a knock-on decline in disposable income in the community.
Insufficient generation and/or electricity supply nationally	Very uncertain in the current decarbonisation environment. MLL is facing an increased number of applications for renewable energy generation however it is difficult to forecast how many may be developed.
Increase in distributed generation including photovoltaic installation on consumer premises	This trend can be expected to continue especially as the costs reduce. This has the potential to diminish electricity distributed over the network and ultimately may necessitate changes to MLL's pricing structure to ensure equity and fairness by greater recovery of costs on a fixed or capacity basis.
Major earthquake/tsunami	The likelihood of future catastrophic events is unknown, but Marlborough is in an area deemed a 'high seismic zone' and is accordingly subject to earthquake risk. An earthquake has the potential to cause significant disruption to both Marlborough's economy, particularly in relation to production, and MLL itself. Within practical limits, MLL has sought to insulate its network and operations from the effects of major disaster and has emergency preparedness plans.
Government Decarbonisation Policy	Decarbonisation/ electrification of transport, temperature control, irrigation and process industries is occurring however the pace and location of electricity growth is unclear. Skilled labour shortages could result in MLL being unable to develop the network to meet growth sufficiently quickly.

Low probability outcomes are considered and addressed within MLL's risk management framework. Other outcomes are managed on a case-by-case basis.

4.1.1.8 Other drivers of electricity use

Other drivers of electricity use include:

- low temperatures during winter where -5°C frosts can occur in significant areas of Marlborough, and;
- the use of heat pumps as air conditioners in the summer time;

This AMP anticipates regional climate and appliance utilisation to exhibit similar trends to the past.

Decarbonisation and electrification appear likely to be the major driving factor for change in electricity network usage and is therefore highlighted in Section 3 in this AMP.

4.1.2 Large consumers

Table 2 summarises MLL's five largest electricity consumers. Generally, the load on the network consists of a large number of smaller consumers and while the loss of any large load would affect operation of the network, the effect would be relatively minor compared to the overall impact of changes to the economy, or a decline in one of the significant regional industries. For example, an overall sustained downturn in the wine industry would have a much greater effect on the operation and development of MLL, than the loss or gain of two or three of the largest consumers.

Table 2: MLL's five largest ICPs (based on peak demand from the previous 12 months)

Ranking by size	Nature of business	Nature of demand
1	Food processing	Mild seasonal variation
2	Wine	Cyclical with peaks during harvest/vintage season
3	Wine	Cyclical with peaks during harvest/vintage season
4	Wine	Cyclical with peaks during harvest/vintage season
5	Timber processing	Relatively constant throughout year

4.1.3 Regional Risks

4.1.3.1 Earthquake (including liquefaction and tsunami)

Two major fault lines cross the Marlborough region; the Wairau fault line (an extension of the Alpine Fault) and the Awatere Fault. A third relatively significant fault line, the Vernon fault line, is located southeast of Blenheim.

Subsequent to the November 2016 Kaikoura earthquake, further work undertaken by GNS, and other experts has identified that Marlborough is at risk from the Hikurangi subduction zone which runs under the sea out from the east coast of the North Island to Marlborough. This subduction zone has the potential to generate a major earthquake and/or tsunami. MLL is cognisant of the Earthquake risk and this risk is always considered in the planning and operation of the Network with lessons learnt applied to ensure network resilience during future earthquake events. MLL will consider the location, diversity, and type of construction used when it looks to replace aging buildings such as office and control room infrastructure.

4.1.3.2 Summer fire danger

Marlborough enjoys high sunshine hours, but this also often leads to very dry summer conditions, both in the inland regions and the Marlborough Sounds. Consequently, a high fire risk frequently results. In response to this, MLL works with the rural fire authority to obtain information on a real time basis. This, amongst other things, includes the disablement of circuit breaker auto-reclose in areas designated as fire danger, not re-livening lines in at risk areas without undertaking inspection along the entire length of the line[8], and removal of equipment identified as a fire ignition source (such as drop-out fuses with cardboard cartridges).

4.1.3.3 Significant adverse weather events

While infrequent, Marlborough is not immune to extreme weather events.

MLL has a heightened awareness of the potential for more extreme weather events linked to climate risks due to the recent storms July 2021 and August 2022 discussed in section 4.1.1.4. The need for good network resilience and recovery response was tested by this series of events, and MLL was pleased with its performance in these areas.

More recently infrastructure in the Marlborough Sounds has been significantly damaged however in June 2013, an intense weather system from the southeast caused relatively significant damage to parts of Marlborough's East Coast – hundreds of trees were blown over. The network suffered numerous outages during this storm with significant damage caused by trees well outside the regulatory growth limit zone being blown over the lines and restoration works were substantial.

Snowstorms, while rare, can potentially impact MLL's assets which are located at higher altitudes.

[8] Safety is always given priority over restoration of supply and reliability targets.

4.2 Network and demand

4.2.1 Consumers and load serviced

In RY2023, the network delivered roughly 409GWh of electricity to approximately 26,700 connected consumers. The maximum coincident (instantaneous) system demand was 79MW with a load factor of 62%.

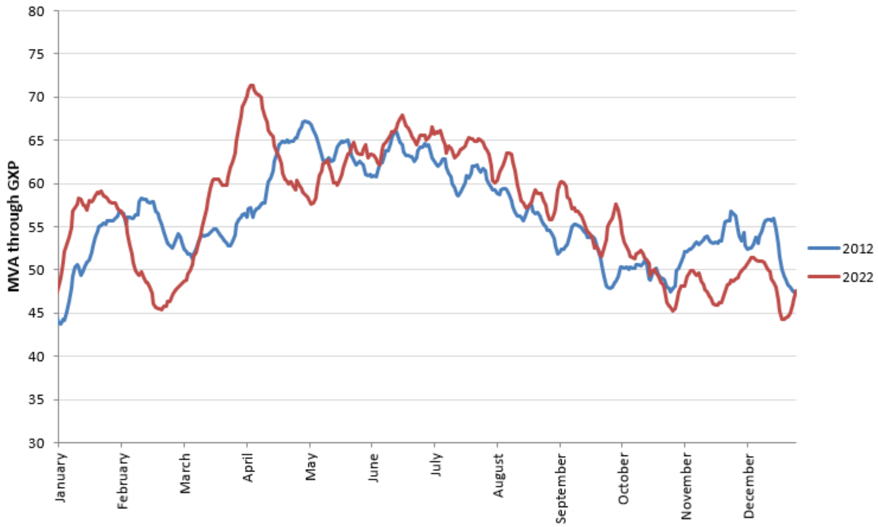


Figure 7: MLL's seasonal load profile

Overall MLL's load factor has only changed marginally over a period of some 40 years.

MLL's seasonal load profile is largely driven by winter load and the wine harvesting season in April. Maximum demand in summer months is typically subject to the vagaries of weather with prolonged hot spells resulting in a marked increase in irrigation consumption for both crops and viticulture. This is reflected in Figure 7, which also shows (generally) the increase in the wine harvesting peak load, winter peak, and summer irrigation peaks from 2012 to 2022.

MLL's daily load profile, especially in winter, consists of twin peaks; one in the morning and then again at night. Load management utilising ripple control is applied when appropriate. Generally, within urban and industrial areas, the MLL network is not capacity constrained. The summer's day profile follows this pattern with much less exacerbated

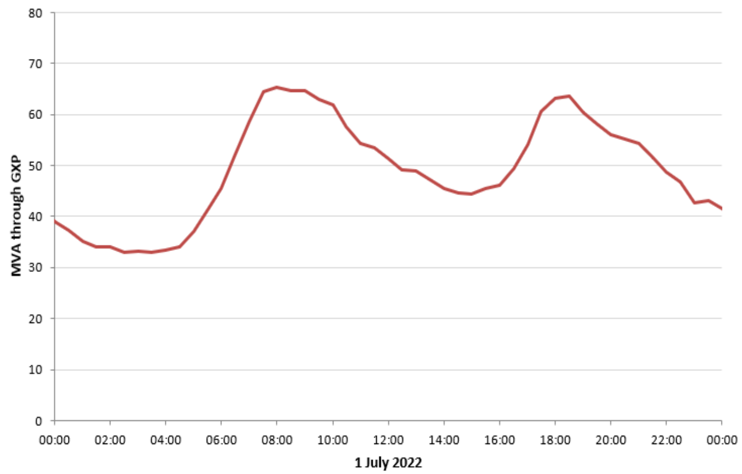


Figure 8: Daily GXP load profile

peaks in part due to the constancy of the irrigation load, however with increasing solar generation, the mid-day trough is expected to deepen, emphasizing the peaks.

4.2.2 Network servicing consumers

MLL distributes electricity throughout Marlborough to approximately 26,700 consumers (ICPs) on behalf of 23 energy retail brands. Figure 9 indicates MLL's position in the electricity supply industry.

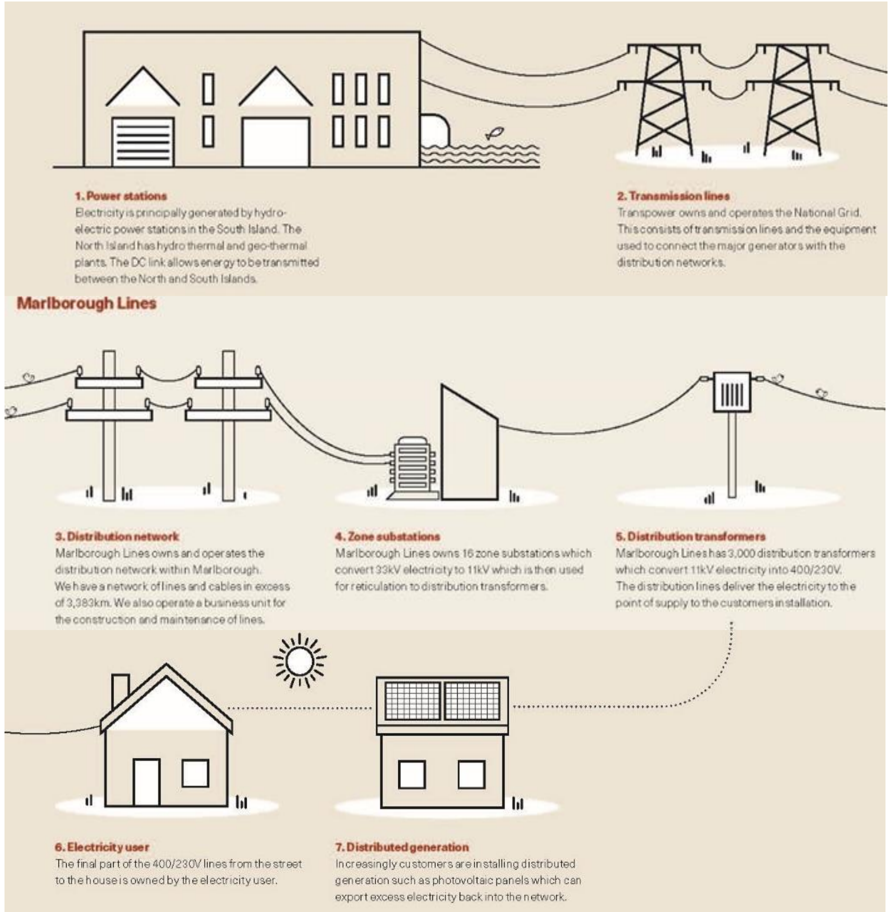


Figure 9: Illustration of the New Zealand electrical supply industry

4.2.2.1 Background to MLL network

MLL's network originally began as three historically distinct networks:

- the Marlborough Electric Power Board (M.E.P.B.), which was established in 1927 and began to supply the region from its own 1MW Waihopai River scheme.
- the Havelock Town Board electricity department, which commenced in 1917 with a 9kW Pelton Wheel, and was merged into M.E.P.B. in 1927.
- the Picton Borough Council electricity department, which commenced in 1917 with a 10kW Pelton Wheel, and was merged into M.E.P.B. in 1947.

Subsequent to 1947 these networks have operated as a single integrated system. The only surviving generation from the three above individual networks is the Waihopai hydro station now owned by Manawa Energy Limited.

In 1993, the MEPB was corporatised and became a company trading as Marlborough Electric Limited with the shares held by the Marlborough Electric Power Trust. The beneficiaries of the Trust are the ICP's connected to the Marlborough network.

In 1999, the Electricity Industry Reform Act (Bradford reforms) required the separation of generation and retailing from distribution. Marlborough Electric's generation and retailing businesses were sold and Marlborough Electric Limited became Marlborough Lines Limited with responsibility for electricity distribution in Marlborough. In 2004 the Electricity Industry

Reform Amendment Bill was passed to encourage and allow the owners of lines businesses to invest in generation from renewable energy[9].

4.3 Supply within Marlborough

Supply to the region is transmitted by three 110kV lines owned by Transpower New Zealand Limited to the Blenheim Grid Exit Point (GXP). As there is only a single GXP, MLL has an extensive, interconnected 33kV sub-transmission network to provide reliability and security for the transfer of electricity to the 33/11kV zone substations across the network.

The zone substations transform the 33kV voltage level down to 11kV. Each of the 16 zone substations has between two and six 11kV feeders radiating outwards, with some meshing in urban areas. These feeders collectively supply approximately 4,000 distribution transformers that range from pole-mounted 5kVA units to ground-mounted 1,000kVA units. In turn, each distribution transformer has a number of 400V feeders radiating outwards, again with some meshing in urban areas.

The majority of consumers take supply at 230/400V, with nine of MLL's larger consumers taking supply at 11kV.

4.3.1 Transpower point of supply/transmission lines

MLL has a single Transpower GXP in Blenheim (on the corner of Murphy's and Old Renwick Roads) where supply from the national grid enters MLL's network. Blenheim's GXP is currently supplied by three separate Transpower-owned 110kV circuits, one from Kikiwa and two from Stoke. The Kikiwa line is an "H" structure hardwood pole line, although a number of structures have been replaced with pre-stressed concrete (PSC) poles. This line has a summer rating of 56MVA and winter rating of 68MVA.

The two Stoke-Blenheim 110kV circuits are installed on the same towers. These circuits are rated at 76MVA for the original circuit and 105MVA for the second circuit added in 2005.

The 110/33kV transformer capacity at Blenheim GXP consists of two banks of three single phase 50MVA units and a third 60MVA three phase unit. The 60MVA unit was commissioned in January 2011. The three 110kV/33kV transformers supply three 33kV bus bars (buses). This gives an N-1 continuous capacity of 100MVA. The smaller units (T1 and T2) have a summer post contingent rating of 58.5 MVA. This means that the GXP could supply 117 MVA (n-1) during daytime in summer.

From the Transpower 33kV circuit breakers, the 33kV sub-transmission network distributes supply to MLL's 16 separate 33/11kV zone substations. The bulk supply characteristics are summarised in **Table 3**:

GXP	Demand	Voltage	GXP rating		Line rating	
			(N) rating	(N-1) rating	(N) rating	(N-1) rating
Blenheim	74.6MVA controllable to about 62MVA	110/ 33kV	160/ 172MVA	100/ 112MVA	189/ 202MVA	110/ 136MVA

Table 3: Bulk supply Maximum Continuous Rating characteristics

[9] https://www.legislation.govt.nz/bill/government/2007/0191/5.0/DLM1100197.html

Note that the supply through Transpower is relatively complex and can be limited by transmission outages in Stoke or Kikiwa. For example a Stoke 220 kV / 110 kV transformer outage could limit the Blenheim GXP to approximately 85 MW if Cob Power Station is on half generation output. A double circuit outage in Transpower's network could limit power supplied to Blenheim to approximately 50 MW.

Transpower's past charging scheme was based on the network load coincidence to the 100 highest half hourly upper South Island peak demands. This has changed in 2023, with the peaks no longer driving MLL Transpower charges.

4.3.2 Embedded Generation

4.3.2.1 Distributed generation on consumer premises

Increasingly, consumers are opting to offset their electricity consumption through the installation of distributed generation (DG) at their premises. MLL continues to receive applications for such generation systems, both small-scale (≤10kW) and large-scale (>10kW).

Consumer interest is expected to grow as the affordability of DG systems improves. This is becoming particularly apparent with solar PV installations where falling costs of photovoltaic panels, greater availability of battery storage solutions and the rise of subscription-based models has resulted in notably increasing uptake since 2018, as shown in Figure 10.

Figure 10 is derived from data contained in the Electricity Authority's Electricity Market Information database and includes an "other" category of distributed generation which has been growing since 2017. This category applies to DG systems which feature either energy storage (e.g. battery) or multiple fuel types. This recording of information by the Electricity Authority has resulted in an anomaly where the uptake of "solar" would appear to be stagnating in recent years, however in reality the uptake of solar is masked by the uptake of "other" systems which include battery storage systems. These "other" systems in the majority include solar. As it becomes more common for solar systems to also include battery storage, many systems that would have previously been "solar" will instead be recognised as "other".

MLL receives approximately 200 applications per year for the connection of new, or alteration of existing, small-scale distributed generation (SSDG).

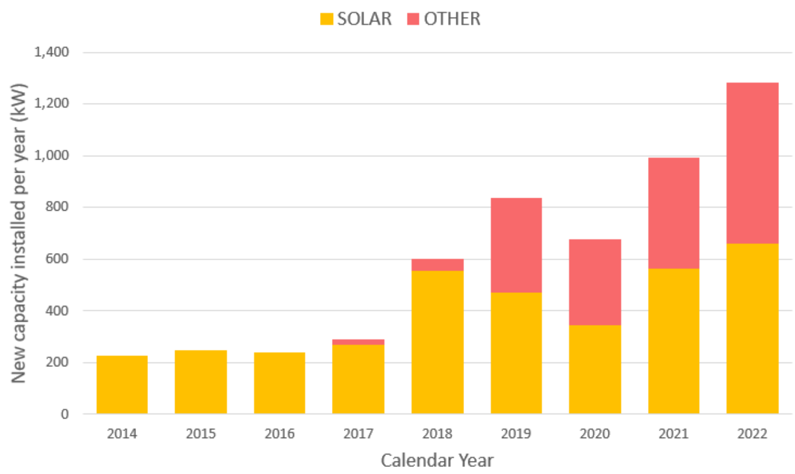


Figure 10: Residential uptake of distributed generation

Several consumers with large or sensitive loads also have standby generation available for back-up purposes and/or demand management. These are typically diesel generators ranging from 10kW up to 1MW. Notable examples include the Wairau Hospital, communications sites and wineries seeking to manage their peak demands during the vintage period. These are presented separately to other DG since their primary purpose is load management and not the generation and/or export of energy.

4.3.2.2 Generation at high voltage

There are eight installations with generation embedded into MLL's network at 11kV or above.

Manawa Energy operates a 2.5MW 'run-of-river' hydro generator at Waihopai which is embedded into MLL's 33kV sub-transmission network.

Energy3 owns two wind farms in Marlborough. One is located at Weld Cone, near MLL's Ward substation, where there are three 250kW turbines. The other is located at Lulworth, just north of the Ure River, where there are four 250kW turbines installed which, due to their metering arrangement, are considered as four separate installations.

Because of the location of the Energy3 windfarms and their consumption of reactive power, MLL installed a Static Var Compensator (SVC) at the Ward 33/11kV substation.

Dominion Salt Limited installed a 660kW wind turbine, which is embedded into its own 11kV installation.

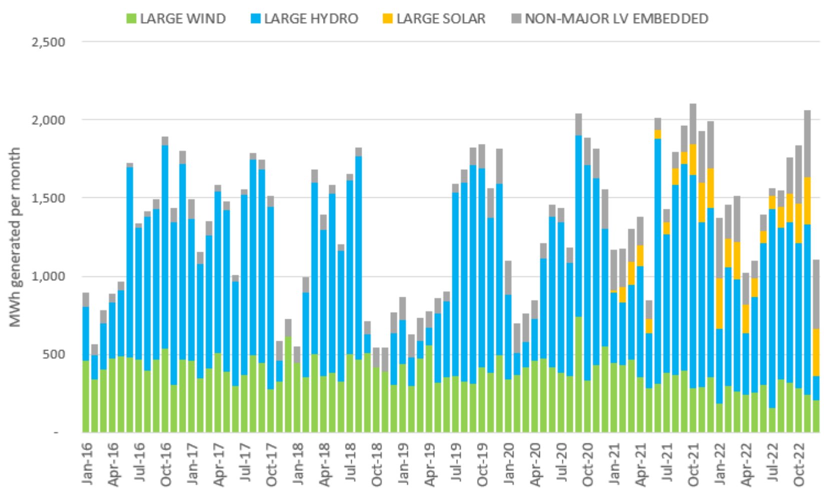


Figure 11: Electricity supplied by distributed generation in MWh

Figure 12: Wind turbine

Kea Energy Limited installed a 1.85MW solar farm in the Wairau Valley (commissioned in January 2021). This installation includes its own reactive power voltage support.

Collectively, these eight installations produced approximately 14GWh of energy in RY23. This is typically mostly from the Waihopai hydro scheme as illustrated in Figure 11. As expected from hydro and wind generation, changes in river flow and the vagaries of the wind can result in significant variations in output.

Figure 11 shows the electricity supplied by HV connected distributed generation for the years from 2016 and illustrates the monthly and yearly variability. Also shown is the combined energy injected into the grid by smaller DG systems embedded into installations at low voltage.

The potential wind resource in the Marlborough Sounds and on the East Coast is significant. However, the development of substantial wind farms requires construction of new lines to convey the output to load centres.

Further detail on embedded generation is described in Section 8.4.

4.3.2.3 Further Marlborough generation

MLL anticipates seeing utility scale batteries come into play within the planning period due to the ongoing fall in battery system prices. MLL treats these as generation as they can inject power into the network. MLL's generation standards are prepared for this eventuality.

The implications on MLL's asset management/network of distributed generation (DG) is ensuring the network voltage regulation is properly managed due to the solar variation (clouding) effects; that the effects of the generation on the line protection arrangements are properly considered; that maintenance/fault work on the associated lines can be undertaken safely; and that MLL does not become unduly constrained in its ability to manage its network.

4.3.3 Sub-transmission system

MLL's 33kV sub-transmission network uses radial duplicated feeders and provides N-1 security of supply to the 33kV bus at all zone substations, except Rai Valley, Linkwater, Leefield and Ward[10]. About 7% (by length) of the 33kV network is underground. MLL has 16 zone substations across its network, with four of these zone substations supplying Blenheim.

From a total of 300km of 33kV lines, 278km is overhead, most of which has been constructed since 1960. Lines constructed earlier than 1960 include a galvanised tower line constructed in 1926 between Waihopai Power Station and Leefield (noting that much of this from Blenheim to the Leefield zone substation has recently been renewed and part of the line between Riverlands and Seddon (where the majority of this has recently been renewed).

In the early 1970s, a 33kV and 11kV line utilising the same poles was constructed between Okiwi Bay and Elaine Bay in the Marlborough Sounds. The 33kV line was operated at 11kV to provide two circuits. This

[10] Security is either N-1 or N-1 (switched).

line contained a high proportion of larch poles treated with creosote. These poles have since been replaced.

Further poles between Elaine Bay and French Pass also need to be replaced.

Figure 13 shows the overall 33kV sub-transmission system (blue lines) together with zone substations and embedded generation (Waihopai Hydro). The graphs at each zone sub highlight MLL's secure availability relative to maximum and average substation loading.

A single line diagram is included in Appendix 12.4. All new 33kV line construction in rural areas is currently insulated at 66kV or 110kV.

4.3.3.1 Zone substations

Zone substations transform the voltage from 33kV to 11kV for reticulation to 11kV/400V transformers. All of the zone substations transformers are equipped with on-load tap changers and automatic voltage regulators to regulate the 11kV supply and maintain voltage within a controlled band. The major components of the substations are transformers and switchgear and the buildings within which they are housed.

Table 4 sets out the zone substation capacities, security level and 2022 (calendar year) loading. Section 10.5.2.6 outlines MLL's current plans to renew and upgrade transformers over the planning period. Note that the substation security level (n) describes the 33kV supply line and main transformer redundancy level with the lesser redundancy of the two setting the level.

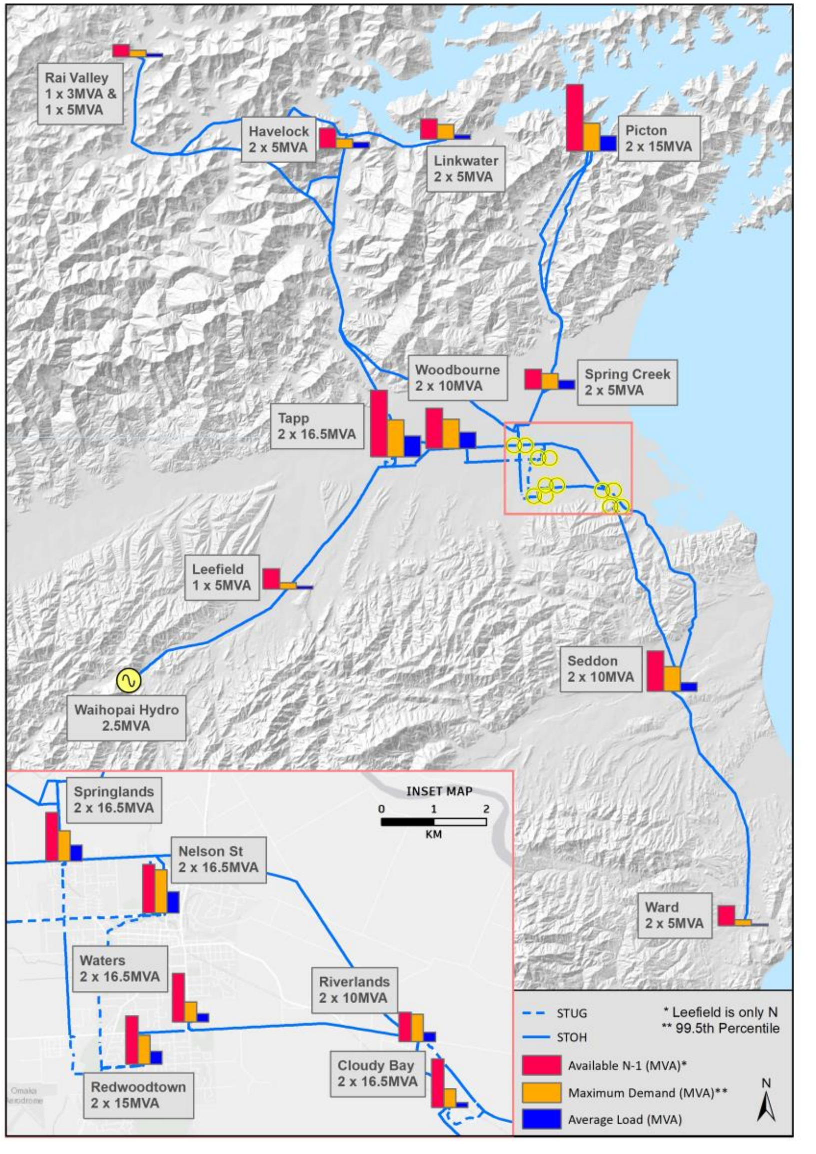


Figure 13: Overview of MLL's 33kV network, with zone substation capacity

Table 4: Zone substation capacities and security levels

Zone substation	T1 capacity (MVA)	T2 capacity (MVA)	Max demand (MVA)	Average load (MVA)	Security level
Cloudy Bay	16.5	16.5	5.8	1.6	N-1
Havelock	5.0	5.0	2.5	1.5	N-1
Leefield	5.0	N/A	1.8	0.9	N
Linkwater	5.0	5.0	3.5	1.1	N
Nelson Street	16.5	16.5	13.6	6.6	N-1
Picton	15.0	15.0	7.3	3.9	N-1
Rai Valley	3.0	5.0	2.2	0.9	N
Redwoodtown	15.0	15.0	10.3	4.7	N-1
Riverlands	10.0	10.0	9.7	3.3	N-1
Seddon	10.0	10.0	6.5	2.3	N-1
Spring Creek	5.0	5.0	3.7	2.2	N-1
Springlands	16.5	16.5	8.9	4.8	N-1
Tapp	16.5	16.5	10.4	5.2	N-1
Ward	5.0	5.0	0.9	0.3	N
Waters	16.5	16.5	8.0	3.1	N-1
Woodbourne	10.0	10.0	8.6	4.2	N-1

All of MLL's zone substations other than Leefield have (N-1) security for the 33/11kV transformers, e.g. for a zone substation to have a firm (N-1) 16.5MVA rating it must have two transformers of 16.5MVA. Linkwater, Rai Valley, Leefield and Ward substations only have a single 33kV line supplying them, and consequently have an overall security of supply of (N).

Consistent with its planning horizon, MLL has recognised the potential need for new zone substation sites and that opportunities to purchase substation sites are limited. At present, four new zone substation sites may potentially be developed within the current planning period at Picton Ferry terminal (Waitohi), Wairau Valley, Hammerichs Road, and Kaituna - subject to the expected load eventuating and other engineering and value reviews as further detailed in the network development section of this AMP. New consumer requirements can change in a short timeframe and MLL will accordingly move to respond, as and if such load eventuates.

MLL considers the usual loading of a substation and its N-1 capability and the ability of the network to maintain supply if a complete substation has to be removed from service. This could be from a cause on the MLL network or an external event such as a major earthquake. Ideally, zone substations should be able to be removed from service without a long-term disruption of consumer supply. For this reason, the capacity of the major zone substations typically provides for flexibility in network operation.

4.3.4 Distribution system

MLL operates an 11kV distribution network which is largely radial with some meshing in urban and higher density rural areas. Approximately 11% of the 11kV (by line length) is underground. The total length of cable and conductor operating at 11kV is approximately 2,300km.

Generally, underground cable is considerably more expensive to purchase and install than overhead line. The decision whether underground cable is more appropriate than overhead conductor involves several factors, for example surrounding land use, safety, public amenity, risk avoidance and economic considerations.

Some other key features of the 11kV system include:

- lightning protection is generally installed on all underground to overhead transitions and in areas prone to lightning.
- all new/replacement 11kV lines in rural areas are insulated at 22kV to allow for possible future increases in supply voltage and to increase reliability.
- distribution substations are installed to step down the voltage from 11kV to 400V/230V in locations appropriate to service consumers' needs.
- protection devices are installed across the network. The selection of locations for protection devices involves consideration of a number of factors such as downstream consumers, location and cost.
- MLL's distribution network includes approximately 540 km of Single Wire Earth Return (SWER) lines. SWER lines are cheaper to construct when reticulating low density rural and remote areas having low demand requirements but requires special attention to the transformer earthing arrangements given the ground itself is utilised as the return conductor.

4.3.4.1 Distribution substations

MLL owns close to 4,000 distribution substations. Of these, approximately 480 are ground-mounted and the remainder are pole-mounted. All transformers greater than 300kVA are ground-mounted, in general, smaller transformers are pole-mounted. In future, all transformers from 200kVA upwards will be ground-mounted.

Key features of MLL's distribution substations are the following:

- typically 200kVA, 300kVA or 500kVA in urban areas;
- fused on the HV side;
- LV cables with HRC fuses;
- LV typically runs along both sides of the street, i.e. no multiple service lines crossing the street; and
- LV runs are typically limited to a maximum of 350m to reduce incidences of low voltage.

In rural areas, the distance between consumers and voltage typically limits the utilisation of low voltage lines. Also, 11kV lines are generally built with a pole spacing of 80m to 100m on the flat and a greater distance depending on the terrain. These distances inhibit the installation of low voltage (LV) in some situations and, combined with a low density of consumers, necessitate many rural consumers having their own transformers. This results in a lower coefficient of transformer utilisation than urban areas but is a function of the physics of electricity supply.

4.3.4.2 Low voltage network

MLL operates a 400V (LV) reticulation network totalling approximately 830km[11]. There is significant meshing in urban areas. About 45% (by length) of the LV is underground. As noted above, in many rural areas, pole spacing and consumer locations result in consumers having individual transformers with less use of an LV conductor.

The LV network supplies the bulk of the ICPs, the majority of which are domestic consumers (i.e. residential properties) in urban areas. Typically, LV supply to ICPs in most cases is single phase but can be two or three phase depending on the supply for the area and the needs of the consumer.

4.3.4.3 Consumer service lines

MLL's assets extend to the point of supply, which (in most cases) is the property boundary line crossed by a consumer's service line. This means that the majority of a consumer's service line is owned by the property owner, not MLL.

MLL has observed some privately-owned assets in very poor condition with associated safety and/or reliability of supply risks. Management of these assets is outside MLL's jurisdiction and has therefore been excluded from this AMP.

Where privately-owned assets in poor condition are identified by MLL, the property owner is notified of the risk and their obligations as the asset owner.

4.3.4.4 Ripple control, SCADA and communications

MLL's ripple control system is utilised for the management of loads such as water heating, irrigation, industrial heating and the control of street lights.

Whilst MLL's network is generally not constrained, the ripple control system is used to minimise the cost of Transpower peaks. In future the ripple control system is expected to continue to make a valuable contribution within the network and may be utilised to provide an option for encouraging the charging of electric vehicles off peak.

MLL operates 217Hz and 1050Hz ripple injection systems. These both inject at 33kV. The injection equipment is installed at the Springlands substation site. All ripple relays are owned by the energy retailers. The 1050Hz equipment was originally installed in 1967 and is planned to be retired in 2023.

4.3.4.5 SCADA

SCADA covers all of the zone substations and 33kV reclosers. This system allows staff to monitor and control the network remotely. Communication for SCADA consists of dedicated radio equipment, as well as use of internet and cell phones and including voice radio. The SCADA

[11] Includes street lighting circuits.

radio network is being progressively extended to ensure greater reliability in the event of major civil emergencies or widespread power outages and to extend the reach of remote control of network switches. Further detail on MLL's SCADA is included in Section 10.10.

4.3.4.6 Major asset groups

Table 5 presents a summary of MLL's major asset groups. Further breakdown of the assets (poles, conductor, etc.) including age profiles is provided within section 10 Fleet Management of this AMP.

Table 5: MLL major asset classes (RAB values from 2022 Information Disclosure)

Type	Unit	Number	Average age (years)	RAB $000
Sub-transmission lines	km	277	35	26,580
Sub-transmission cables	km	26	10	10,821
Zone substations	-	-		47,807
Buildings	each	16	21	
Switchgear	each	282	11	
Transformers	each	31	11	
Distribution and LV lines	km	2,545	38	53,653
Distribution and LV cables	km	556	17	46,532
Distribution transformers	each	4,085	22	20,786
Distribution switchgear	each	2,829	14	16,907
Other network assets	-	-		7,242
Non network assets	-	-	-	18,396
Total				248,723

5. Stakeholder interests and objectives alignment

This section of the AMP sets out the various stakeholder interests and the alignment of those interests with MLL's asset management objectives as further articulated within this plan.

5.1 Stakeholder interests

MLL defines its stakeholders as any person or class of persons that:

- has a financial interest in MLL (equity or debt);
- pays money to MLL (either directly or through an intermediary) for delivering service levels;
- is physically connected to the network;
- uses the network for conveying electricity;
- has an interest in land on which MLL assets are located;
- has an interest in land that provides access to MLL assets;
- supplies MLL with goods or services;
- is affected by the existence, nature or condition of the network (especially if it is in an unsafe condition);
- has a statutory obligation to perform an activity in relation to the network's existence or operation such as: request disclosure data, regulate prices, investigate accidents, investigate consumer complaints, include in a District Plan, protect archaeological sites, Wahi Tapu sites, etc.;
- has an interest in the safety of the network; and/or
- is employed by MLL.

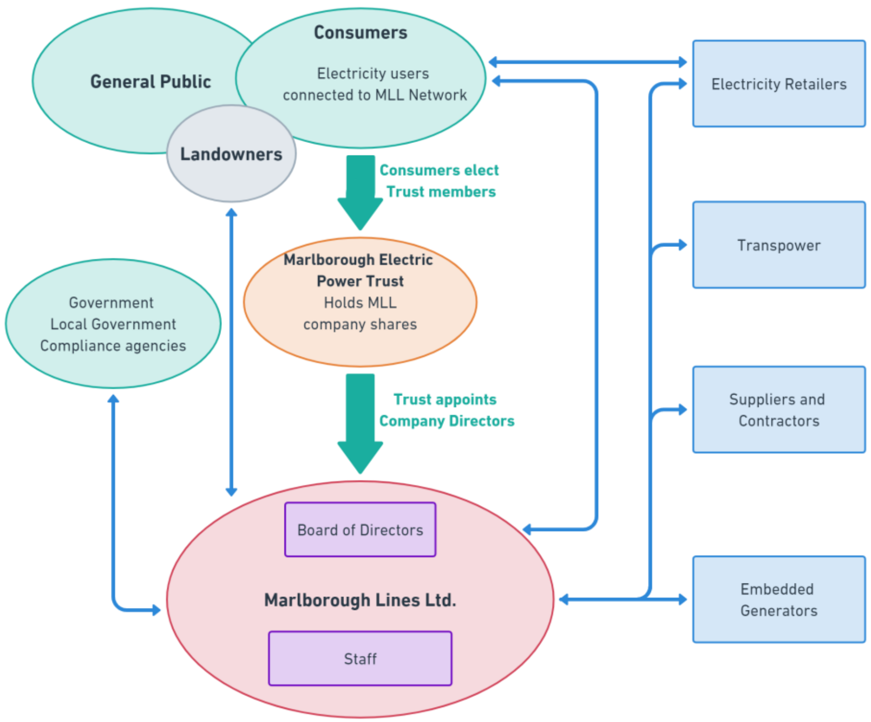


Figure 14: Our key internal and external stakeholders

Figure 14 highlights MLL's key internal and external stakeholder groups as well as the nature of their relationships with MLL.

Table 6 also gives a general indication of the most significant interests of various stakeholders. Most stakeholders generally have an interest in all aspects of the business.

Table 6: Summary of MLL's stakeholders with respect to the interests shown

Stakeholder	Interests					
	Viability	Price	Supply Quality	Safety	Compliance	Energy Efficiency
MEPT	✓	✓	✓	✓	✓	✓
Bankers	✓	✓		✓	✓	
Connected Consumers	✓	✓	✓	✓	✓	✓
Energy Retailers	✓	✓	✓	✓	✓	✓
Mass-market Rep Groups	✓	✓	✓	✓	✓	✓
Industry Rep Groups	✓	✓	✓	✓	✓	
Staff and Contractors	✓	✓	✓	✓	✓	✓
Goods and Services Suppliers	✓	✓	✓	✓	✓	✓
Embedded Generators	✓		✓	✓	✓	
Public				✓	✓	
Landowners				✓	✓	
Councils (as regulators)				✓	✓	✓
NZTA (Marlborough Roads)				✓	✓	
MBIE	✓	✓	✓	✓	✓	✓
Energy Safety/WorkSafe				✓	✓	
EECA					✓	✓
Commerce Commission	✓	✓	✓	✓	✓	✓
Electricity Authority		✓	✓		✓	✓
Utilities Disputes		✓	✓		✓	

5.2 Stakeholder engagement

Table 7 sets out those stakeholders that MLL typically engages with, and the ways in which it engages that it may formulate business objectives that meet varied and numerous requirements.

Table 7: Summary of MLL's stakeholder's whom it engages

Stakeholder	How Expectations are Identified
Marlborough Electric Power Trust	• By its approval or amendment of the SCI. • Regular meetings between the MLL directors and the MEPT trustees.
Bankers	• Regular meetings between the bankers and MLL staff. • Adherence to MLL Treasury procedure.
Connected Consumers	• Discussions with large industrial consumers. • Consumer satisfaction surveys. • Public disclosure documents including this AMP. • Connections newsletters. • Website.
Energy Retailers	• Annual consultation with retailers, regular contact and discussion.
Mass-market Representative Groups	• Informal contact with group representatives.
Industry Representative Groups	• Informal contact with group representatives. • WorkSafe website. • Safety bulletins from EEA. • Exchange and contribution towards industry best practice.
Staff and Contractors	• Staff briefings and meetings with contractors.
Suppliers of Goods and Services	• Regular supply meetings. • Letters.
Embedded Generators	• Website • Formal responses to queries and connection applications • Public disclosure documents including this AMP
Public (as distinct from consumers)	• Informal talk and contact. • Feedback from public meetings.

Table 7: Summary of MLL's stakeholder's whom it engages

Stakeholder	How Expectations are Identified
	• Information made available on MLL's website (including how to stay safe and how to report network damage).
Landowners	• Individual discussions as required.
Councils (as regulators)	• Formally, as necessary, to discuss issues such as assets on Council land.
Iwi	• Formally, informally and as required.
NZTA	• Formally, and as required.
MBIE	• Regular bulletins on various matters. • Release of discussion papers. • Analysis of submissions on discussion papers.
Energy Safety/WorkSafe	• Promulgated regulations and codes of practice. • WorkSafe website. • Audits of MLL's activities. • Audit reports from other Lines Companies.
Commerce Commission	• Regular bulletins on various matters. • Release of discussion papers and direct communications. • Analysis of submissions on discussion papers. • Conferences following submission process.
Electricity Authority	• Weekly update. • Release of discussion papers. • Briefing sessions. • Analysis of submissions on discussion papers. • Conferences following submission process. • Information on Electricity Authority's website.
Utilities Disputes	• Reviewing their decisions in regard to other Lines Companies. • Assistance with any complaint investigations.

Stakeholder engagement, both formal and informal, underpins MLL's response in setting its objectives as discussed next. MLL is a Trust-owned business, and the consumers directly elect the Trustees. In turn, the Trustees appoint the Directors, approve the annual Statement of Corporate Intent (SCI) and receive MLL's Annual Report and accounts.

5.3 Business and planning response

This AMP is the key document that translates MLL's data, analysis, procedures, policies, and strategic aims into planned actions and defines performance criteria and timeframes. It is also used as a means of communicating MLL's intentions to stakeholders.

MLL, as a supplier of electricity lines services, is included within Part 4 of the Commerce Act 1986. The Commerce Commission has regulatory oversight of the MLL network through the Company being subject to information disclosure regulation, including monitoring levels of return on investment. However, as a Trust-owned business, MLL is exempt from the default price/quality path requirements of the Commerce Commission.

5.3.1 Strategic Planning Documents

MLL's key strategic planning documents are constructed around its vision and mission statements which are reviewed and published annually in its Statement of Corporate Intent (SCI) on MLL's website.

5.3.1.1 Vision

MLL's Vision is:

Energising Marlborough's Future

Changes in the energy environment such as EVs, electrification of transportation, solar generation, and new electricity industry technologies will increase demand on the MLL network and require future thinking and great planning. The changes have us challenging key network assumptions to ensure the elimination of potential barriers and bringing forward future projects that enable demand growth, while also investing in generation projects that will be utilised to provide value to consumers and target energy equity.

Our team is ready to energise the Marlborough community, not only by delivering our core function of reliable distribution of electricity, but also through sponsorships, employment, education, and positive financial and environmental outcomes.

5.3.1.2 Mission

Supporting the Vision, MLL's defined mission is to:

Deliver sustainable regional growth and equity through people, technology, and environmental leadership.

MLL's network is a key enabler for regional change to occur. For Marlborough to grow, MLL needs to provide a resilient, reliable, and future-proofed electricity network.

MLL's primary objectives, in accordance with the Energy Companies Act 1992, are to:

- operate as a successful business in the distribution of electricity and other related activities; and
- have regard to the desirability of ensuring the efficient use of energy.

In achieving these objectives, MLL will:

- develop and maintain a network that responds to present and future demands of its consumers;

- ensure that all resources – financial, physical and human – are utilised efficiently and economically;
- meet commercial and productivity targets;
- fulfil market requirements in terms of quality and price on a competitive, commercial basis;
- ensure staff health and safety, and the safety of all systems, plant and equipment under MLL control and promote electrical safety within Marlborough;
- care for the environment and ensure that any impact of MLL activities is minimised or, where possible, eliminated;
- use all legislative powers fairly and in accord with the principles of natural justice; and
- be a good employer by observing and applying best practice in all areas relating to employment.

5.3.1.3 Statement of Corporate Intent

MLL's SCI is a requirement under section 39 of the Energy Companies Act 1992 and forms the principal accountability mechanism between MLL's Board and its shareholder. The SCI includes, *inter alia*, revenue and performance targets, which form the heart of the asset management activity.

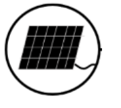
Section 36 of the Energy Companies Act 1992 establishes that the principal objective of an energy company is to operate as a successful business and to have regard to the desirability of ensuring the efficient use of energy. The directors and the shareholder of MLL believe that a "successful" electricity business is one which earns a commercially realistic rate of return, while maintaining its social licence to operate. For MLL, this goes beyond the business as usual requirement of maintaining a safe and reliable electricity network and includes behaving in a socially responsible and sustainable way.

MLL significantly revised its Statement of Corporate Intent (SCI) in 2021. A number of aspects of the revised SCI impact upon MLL's Asset Management Strategy.

To achieve MLL's mission and vision of the future, in 2021 MLL developed the following six **Strategic Objectives** that are at the core of MLL's business:

Assets

Optimise our assets to provide a flexible, dynamic, and resilient network to accommodate future technologies and promote regional growth.



Technology and Innovation

Empower our consumers and region by deploying technology and commercial innovation to accelerate electrification and provide for future load growth.

Financial Objectives

Deliver value to all of our consumers through efficient operations and investment success.

Our People

Provide a workplace where our people are valued, engaged, and inspired to deliver positive personal and Company outcomes for the benefit of all consumers.

Community

Improve energy equity and support regional growth through education, employment, sponsorship and investments.

Environment

Minimise our environmental footprint through operational efficiencies, reducing net carbon emissions, and supporting regional environmental initiatives.

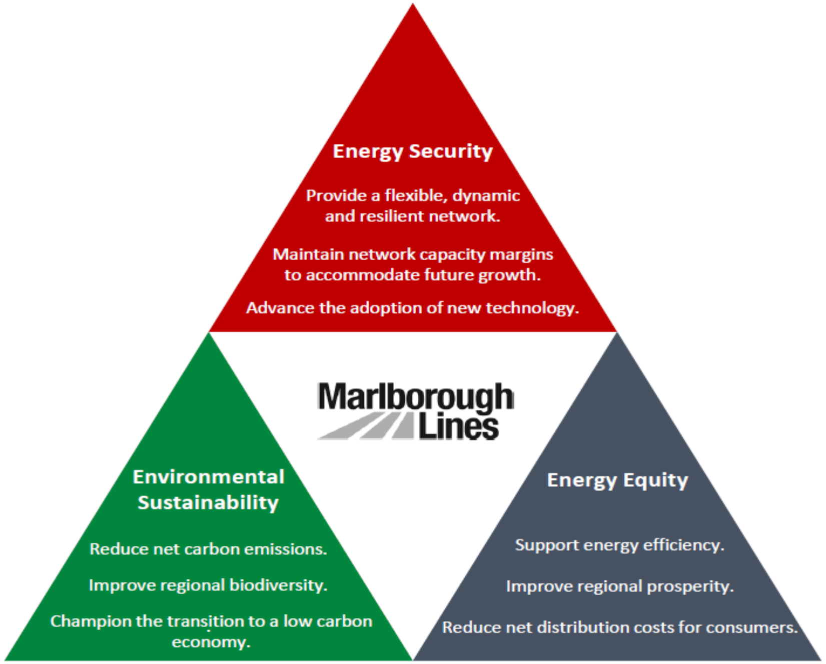
To measure MLL's performance against these Strategic Objectives MLL has the following **Performance Targets**. These strategic objectives and performance targets guide MLL's Asset Management Planning. This AMP sets strategies to achieve these targets. MLL's Group performance targets that impact upon the Asset Management Plan for the next three financial years assuming a normalised operating environment are:

	Performance Targets	2023 Target	2024 Target	2025 Target
	Assets • Asset Maturity rating	3.4	3.5	3.5
	• Total SAIDI	165 min	165 min	157 min
	Technology and Innovation • Cumulative number of deployed non-network solutions • EML Owned Renewable generation	2 1MW	4 4MW	8 8MW
	Our People Number of serious harm incidents	0	0	0
	Community Overall consumer satisfaction score	> 85%	> 85%	> 85%
	Environment MLL net GHG tonnes (negative = removals > emissions)	(750)	(800)	(1000)

MLL's Statement of Corporate Intent refers to The World Energy Council's Energy Trilemma which defines energy sustainability as being based on three core dimensions, which need to be balanced:

1. Energy security;
2. Energy equity; and
3. Environmental sustainability of energy systems.

MLL intends to advance regional energy sustainability through objectives encompassing each of the core dimensions of the trilemma, as detailed in the diagram below. MLL therefore considers the balance of these sometimes competing aspects during its asset planning and management.



5.3.1.4 Interaction between Planning Documents

The interaction between MLL's major planning documents and processes is depicted in Figure 15. These plans are compiled annually (with the exception of the AMP) and are subject to regular review during the financial year.

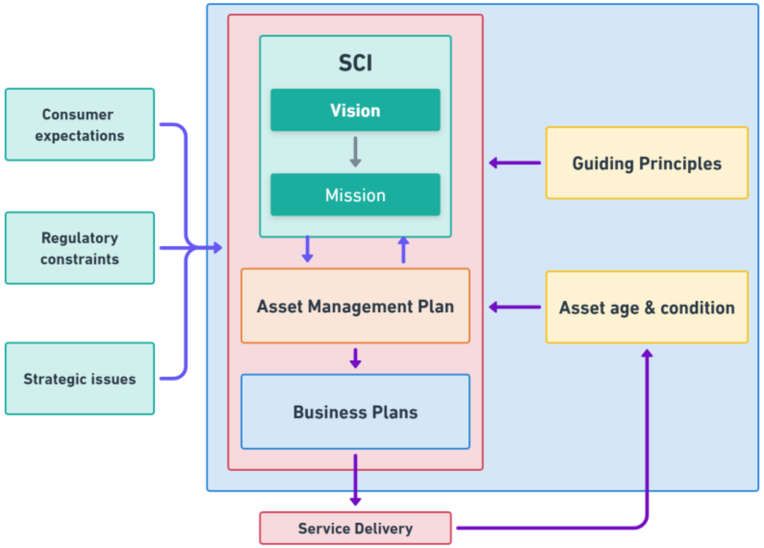


Figure 15: Overview of the key documents and the interaction between them

The vision statement guides MLL's mission statement. These documents provide an overall direction to the MLL's key planning documents, the SCI and this AMP. MLL's Asset Management Policy is contained in the AMP (Section 7.1) and MLL's Asset Management Strategy is in the AMP (Section 7). Business plans and annual budgets are developed from this AMP.

5.3.1.4.1 Guiding principles

The guiding principles within which stakeholder interests are accommodated are broadly set out in Table 8.

Table 8: Further detail on stakeholders' interests

Interest	Description	How Interests are Accommodated	Asset Management Actions
Viability	Viability is necessary to ensure that shareholders (and if required, other providers of finance, such as a bank), have sufficient reason to keep investing in, or provide funding for, MLL and for the shareholder to retain ownership.	MLL will accommodate stakeholders' need for long-term viability by delivering earnings that are sustainable and reflect a realistic commercial rate of return (broadly in keeping with the Commerce Commission's allowable rates of return for non-exempt EDBs)	Ensure expenditure is appropriate to maintain or enhance the viability of network, subject to consumer requirements.
Price	Pricing is a means of gathering the revenue required to operate the business and signal underlying costs. Setting prices correctly is important for both the consumers and MLL. The pricing methodology adopted by MLL sets an appropriate total target revenue and then sets tariff structures for different categories of consumers. As only a portion of network assets is dedicated to individual ICPs, this process involves elements of cost sharing between consumer groups, an approach commonly taken by most electricity network companies. The low fixed charge regulations require tariffs to be set at a level for some consumers that means that their service is subsidised by other consumers on the network.	Target revenue is set at a level which ensures MLL is sustainable in the long term and ensures there are sufficient funds to provide reliable assets. MLL takes a medium-term view of revenue requirements so as to avoid price shocks from year to year. The pricing methodology is expected to be cost reflective and pricing signals reflect the cost of services and supply where possible. The low fixed charge regulations and the cross subsidy of uneconomic areas cause significant distortions between consumer groups. MLL has an exemption from applying the low fixed charge regulations across some areas on its network (those classified as "Remote") which helps to reduce the level of cross-subsidisation required.	Although not subject to the Price Control mechanism in the default price quality path, MLL revenue is quite consistent from year to year. MLL aims to fund its expenditure through its annual revenues and therefore plans relatively smooth expenditure from one year to the next.

Interest	Description	How Interests are Accommodated	Asset Management Actions
Supply Quality	Emphasis on continuity of supply of regulatory voltage, restoration of supply and preventing voltage flicker is essential to minimising interruptions to consumer's homes and businesses. Ensure that ICP supply is not subject to interference by other network users.	MLL will accommodate stakeholders needs for supply quality by focussing resources on continuity and the capacity of supply and restoration through ensuring assets are of a quality and standard to meet consumer requirements. MLL Require all ICPs to meet appropriate standards relative to power factor, harmonics and utilisation of supply.	MLL has a strong community mandate to maintain/improve reliability and to reduce flicker. MLL adheres to regulatory requirements in the provision of electricity supply and has connection criteria which must be met by all ICPs. MLL also undertakes monitoring of the quality of supply to ICPs.
Health and Safety	Staff and contractors must be able to work on the network in total safety. The general public must be able to move safely around network assets.	MLL will minimise the risk to the safety of the public by ensuring that all assets are structurally sound, live conductors comply with regulatory clearances, all enclosures are kept locked, all exposed metal is securely earthed and assets are built and maintained in accordance with legislative requirements and best practice. MLL will prioritise the safety of staff and contractors by providing all necessary equipment, training, improving safe working practices, and ensuring that workers are stood down in unsafe conditions. MLL will work to and in accordance with applicable industry standards and codes of practice.	All work is subject to rigorous safety standards with safety given the highest priority for expenditure. The Public Safety Management System (PSMS) documents MLL's procedures for ensuring safety of the public. MLL has circulated its own safety booklet to all staff. All staff are encouraged to stop any work if it is considered unsafe.
Compliance	MLL must comply with many statutory requirements ranging from safety to disclosing information.	MLL will document all safety issues and make them available for inspection by authorised agencies. MLL will disclose performance information in a timely and compliant fashion.	Undertake sufficient monitoring and inspection for maintaining compliance, documented as appropriate.
Energy Efficiency	Consistent with the provisions of the Energy Companies Act 1992 and as a good corporate citizen, MLL endeavours to maximise energy efficiency within its own operations and promote energy efficiency to consumers connected to the network.	MLL will consider losses within its system and minimise where practical. MLL will assist consumers by providing advice and assistance on energy efficiency. MLL will advise large embedded generators of any additional network losses that they may create and their loss factors.	Comparative assessment of network losses and setting of appropriate loss targets. Energy efficiency is an integral component in the consideration of the purchase and design of network assets and operation of the network.

5.3.2 Conflicting interests

Most activities result in a need to balance several different factors, e.g. quality, cost, time. Section 5.3.1.3 refers to the Energy Trilemma of balancing the competing aspects of Energy Security, Energy Equity and Environmental Security. Finding a balance acceptable to all stakeholders requires that various solutions are carefully considered, and priorities evaluated according to specific circumstances and environment. The general priorities, in order of highest to lowest, for managing conflicting stakeholder expectations and interests are set out below:

1. **Safety**: MLL gives top priority to safety. MLL will not compromise the safety of its staff, contractors and/or the public. Safety is fundamental to the way MLL undertakes any activity.
2. **Compliance:** MLL gives priority to compliance, noting that safety related compliance is given highest priority.
3. **Viability:** MLL gives high priority to business viability.
4. **Return:** MLL recognises the need to operate as a successful business and earn a realistic commercial rate of return. This ensures that funding will be available for future activities and ongoing supply continues to be available to consumers.
5. **Supply Quality and Security:** MLL recognises that supply quality is important to consumers to allow them to utilise electricity in a reliable and safe manner.
6. **Energy Equity:** MLL seeks to reduce the net distribution costs for its consumers. MLL considers maximising energy efficiency in all aspects of its operations.
7. **Environment Sustainability:** As a socially responsible organisation, MLL respects the environment and ensures that its operations are based on sustainable practices. MLL considers environmental issues in all aspects of its operations and seeks to eliminate or mitigate the impact of MLL operations on the environment.

Aside from safety, the priority given to these issues may vary slightly from that outlined, according to the particular issue or issues, their magnitudes and the affected stakeholders. In practical terms, the general priorities set out above are not mutually exclusive.

5.3.3 Accountabilities and responsibilities for asset management

MLL's accountabilities and accountability mechanisms are shown in Figure 16and are discussed in detail in the following sections.

The ultimate accountability is to connected consumers. The Commerce Amendment Act recognises this accountability and accordingly the price path threshold does not apply to beneficially owned EDBs such as MLL. MLL undertakes independent surveys of consumers annually and the overall satisfaction levels have been at or about 90 % for a number of years.

5.3.3.1 Accountability at ownership level

MLL has a single Shareholder – the Marlborough Electric Power Trust. The Trust currently has six trustees, each of whom holds 4,666,650 shares (with the exception of the Chair who holds 4,666,750 shares) in MLL on behalf of the Trust.

The Trust is subject to the following three accountability mechanisms:

- an election process;
- the Trust Deed which holds all Trustees collectively accountable for compliance with the Trust Deed; and
- the provisions of the Trustee Act 1956.

5.3.3.2 Accountability at governance level

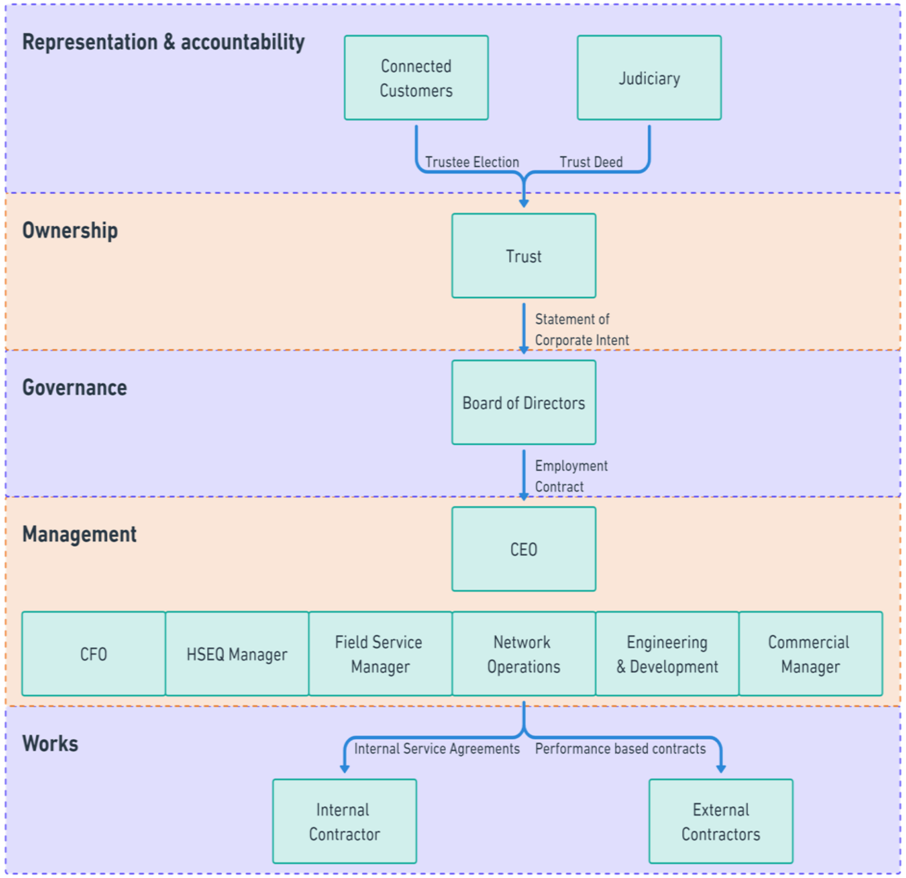


Figure 16: Summary of key MLL organisational responsibilities and accountabilities

MLL currently has seven directors who are collectively accountable to the Trust through the SCI. The current directors are:

- Phil Robinson (Chair);
- Alexandra Barton;
- Donna Bridgman;
- Steven Grant;
- Rob Jamieson;
- Jonathan Ross; and
- Ivan Sutherland.

The Board approves the annual budgets, SCI and this AMP. Each month it receives reports on the overall performance of MLL and the key activities undertaken.

5.3.3.3 Board reporting

MLL's regular board reports include the following:

- the capital expenditure programme (progress and spend against budget);
- the maintenance programme (progress and spend against budget);
- incidents and major outages; and
- any major changes to asset management processes or practices.

Each quarter a report on legislative compliance and risk management is presented, which includes:

- all health and safety accidents and near-misses;
- all incidents of third-party contact with the network; and
- details of major consumer works.

5.3.3.4 Accountability at CEO level

The CEO is accountable for all aspects of MLL's operations to the directors primarily through his employment contract and the required objectives of the Board.

5.3.3.5 Accountability at management level

The second tier of management reports to the CEO. Accountability for asset management at the second tier is:

- accountability for managing the operation of existing assets lies with the Network Operations Manager.
- responsibility for minute-by-minute continuity and restoration of supply also lies with the Network Operations Manager, principally through control and dispatch, switching and fault restoration. The Network Operations Manager also has responsibility for asset maintenance.
- short, medium and long term planning of the network considering issues such as capacity, security and asset configuration are managed by the Engineering and Development Manager who also guides asset management practices.
- accountability for the line delivery pricing lies with the Commercial Manager.
- accountability for all administrative and financial activities lies with MLL's Chief Financial Officer.

The key accountabilities of the second-tier managers are to the CEO through their respective employment contracts and required performance criteria.

5.3.3.6 Accountability at works implementation level

MLL has an in-house contracting department that primarily implements work in the field. This operates as a separate division of MLL. With the implementation of the Electricity Industry Reform Act 1998, many EDBs sold their contracting operations. MLL recognised it was very unlikely that active competition would be present in the Marlborough market and therefore chose to retain its contracting staff, rather than being subject to limited competition and consequent price gouging.

MLL Field Services undertakes the majority of the physical work on the MLL network. Broadly, this is:

- construction of new assets;
- maintenance of existing assets; and
- operation of existing assets.

It also undertakes work such as the construction of line extensions for external consumers.

MLL retains relativity with prevailing market rates and undertakes testing from time to time to compare the commercial performance of MLL's Field Services division with other similar businesses in the area and throughout New Zealand.

The Field Services Manager is accountable both to the Operations Manager and Engineering and Development Manager for the quality of work done, and to the CEO for the overall performance of the Contracting business unit

6. Network performance and service levels

This section of the AMP discusses the relative performance of the MLL network and business against several measures including quality of supply, cost performance, network continuance (essentially the adequacy of replacement levels), and losses and utilisation.

In concert with the assessment of relative performance against other businesses, this section also measures performance against MLL's internal targets for network and consumer satisfaction as notified through its annual SCI, specifically quality of supply, consumer engagement and satisfaction, and performance against other objective targets.

This analysis provides the framework for setting the consumer-oriented performance targets that, together with MLL's wider business goals, this AMP then sets out to achieve.

Detail of the comparative assessments and reliability performance analysis is extended further in Appendix 12.6.

In overview, this section shows that MLL:

- has satisfactory network reliability given the length of its network and its low consumer density, and when excluding major network events such as storms;
- is achieving its targets in consumer engagement and consumer satisfaction;
- has total costs in keeping with the network services it provides;
- has relatively high opex costs driven by high vegetation management cost, which peaked in RY2016 (on a $/km basis) and has lowered subsequently;
- is performing at expectation levels for network losses and transformer utilisation;
- has set capital replacement levels in keeping with good industry practice relative to MLL's asset quantities, condition, and age profiles;
- does not have an over-aged network;
- is operating as a profitable business; and
- has lifted its target SAIDI from 150 minutes to 165 minutes for the 2024 and 2025 regulatory periods. This reflects the longer response times that will occur for faults on the Sounds feeder, as a result of the damage to the roads in the area from successive major floods in 2021 and 2022. It is also reflective of a ML's intention to use the fleet of diesel mobile generators more judiciously for planned outages, in order to cut costs and lessen emissions.

The comparative performance discussed in the following sections sets MLL's performance against the 28 other Electricity Distribution Businesses (EDBs) within New Zealand using the RY2022 public information disclosure data as provided to the Commerce Commission.

The comparative SAIDI statistics for all networks illustrate that the MLL network was the 11th most reliable in New Zealand (see Figure 18).

6.1 Quality of supply

6.1.1 SAIFI/CAIDI/SAIDI

The average duration of non-supply per consumer per annum (SAIDI) [12] is the key measure of the "average" consumer's experience of supply reliability. SAIDI is derived from the multiplication of the average number of interruptions per consumer (SAIFI) and the average duration of an interruption (CAIDI). Comparative SAIFI

Considering average unplanned SAIFI over the last five years, MLL performs well, being approximately 0.5 average interruptions per consumer below comparative expectation.

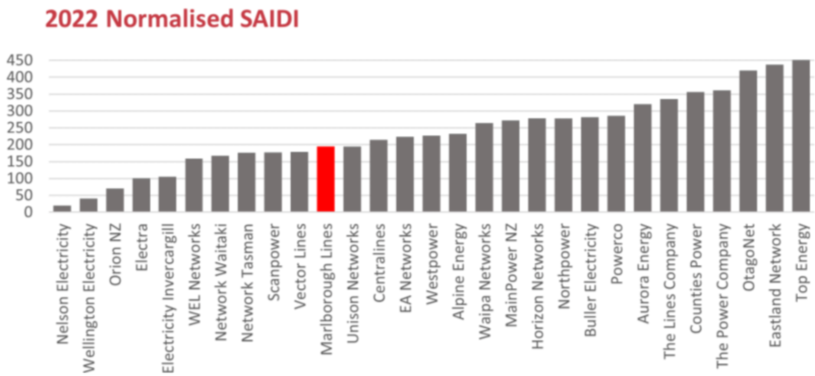


Figure 18: NZ lines companies 2022 Normalised SAIDI

The trend in overall (planned and unplanned) SAIFI is also downward for MLL compared to a relatively flat trend for all distribution businesses combined, as illustrated in Figure 17 (MLL=red line; includes the effect of the 2017 Kaikoura earthquake). This, together with the comparatively low unplanned interruption frequency, shows the MLL network is responding to reliability improvement strategies. The lift in SAIFI in FY2020 arose from a lightning storm in late 2019 and MLL's policy shift to opening feeders with any public report of a line down.

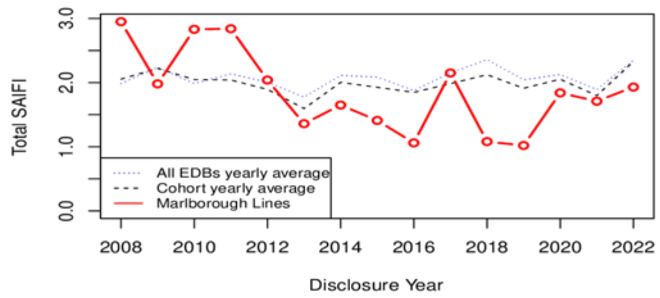


Figure 17: MLL's SAIFI trend

[12] SAIDI = System Averaged Interruption Duration Index expressed in minutes per consumer; SAIFI = System Averaged Interruption Frequency Index measured in interruptions per consumer; CAIDI = Customer Averaged Interruption Duration Index measured in minutes per interruption. SAIDI = SAIFI x CAIDI.

6.1.1.1 CAIDI

CAIDI measures the average duration of the interruptions and is generally highly variable between years, particularly when the total number of interruptions is not large, as is the case for smaller EDB's like MLL. CAIDI is also affected by the types of faults occurring as some faults are more difficult to locate and repair (e.g. underground cable faults) and the difficulty of getting to the fault location (e.g. remote faults in the Marlborough Sounds). Multiple faults occurring simultaneously (e.g. storms) also impact CAIDI as fault restoration must then be prioritised over the available fault crews.

MLL sets a fault CAIDI target of 120 minutes, which is generally achieved in years without major storms or system events (e.g. earthquakes). This target is retained for this planning period given it remains a stretch target and is at a reasonable level for a network with MLL's characteristics.

6.1.1.2 SAIDI performance

Figure 19 shows the planned and fault SAIDI from RY2013, with targets extending out to RY2025.

As shown in Figure 19, targets in both planned and fault SAIDI have decreased over time to reflect both consumers' expectations and the desire to lock in periodic performance improvements. Over this time MLL has proactively implemented reliability-based projects and initiatives (such as the installation of reclosers and remotely operated switches) that have been key to meeting these targets. As the benefits from installing these devices diminishes due to saturation, ML continues to seek other ways to improve reliability, through for example relocating poorly positioned roadside pole and removing selected high risk fall distance trees.

MLL's policy (introduced in 2019) of opening the nearest upstream switch to isolate supply upon any public report of a line down has had the effect of increasing unplanned SAIDI by approximately five SAIDI minutes per year. In many cases, the public report is resolved to be a LV or telecommunications line down. However, as safety is MLL's first priority, and the public safety implications of a line down are potentially high, MLL's view is that this loss of reliability has to be suffered.

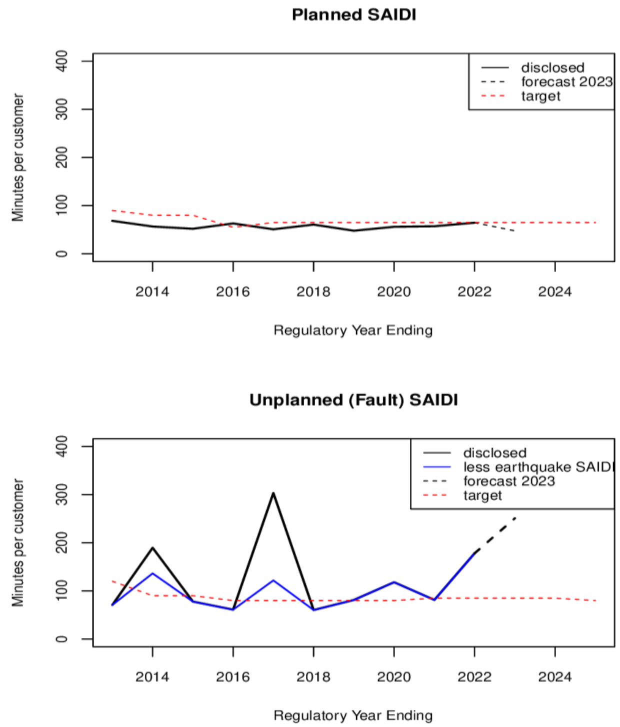


Figure 19: MLL's Planned and unplanned SAIDI vs target values

While MLL is always striving to improve Network reliability as described above, we have carefully considered reliability targets following the major floods that have severely affected the Marlborough Sounds in July 2021 and August 2022. The floods have caused major damage to a number of roads, with numerous slips rendering them unsuitable for plant and heavy equipment. Some roads have not been repaired since the 2021 state of emergency declaration. There is uncertainty as to the timeline and extent of the repairs on these roads, and boats, barges and helicopters will now be relied on more heavily, although even the use of these is subject to weather. MLL expects the response time to several hundred customers will be increased, and therefore considers a lift in the unplanned SAIDI target to be appropriate. Accordingly, ML has raised the unplanned SAIDI target from 85 minutes to 93 minutes. These increases will be applied for the next 2 years after which the unplanned SAIDI will revert to the levels prior to the August 2022 floods.

A review of planned SAIDI target has also been carried out, primarily in respect of the use of the MLL fleet of mobile diesel generators which are used frequently to control planned and overall SAIDI. MLL has invested in both generators and connection points on the network and intends to continue to use this equipment to supply customers affected by planned outages. As the deployment of these generators is costly, and at times technically problematic, and to assist with MLLs greenhouse gas targets, MLL now intends to apply stricter criteria for the use of generators. This requires a lift in the planned SAIDI target, which has been calculated as an increase of 7 minutes, from 65 to 72 minutes.

As shown, MLL is achieving current targets in average across the years (omitting extreme events and noting RY2017 included a number of storm events as well as the 14 November 2016 Kaikoura earthquake) and as such these remain stretch targets. These targets also represent better than expectation performance on a comparative basis as discussed in Appendix 12.612.6. MLL's RY2022 SAIDI performance, RY2023 projection and forward SAIDI targets to RY2028 are set out in Table 9:

Table 9: MLL's SAIDI targets

Measure	RY2022	RY2023 Projection	Target RY2024 to RY2025	Target RY2026 to RY2028
Planned SAIDI	56.1	45	<=72	<=72
Unplanned SAIDI	118	259	<=93	<=85
Total SAIDI	174.1	304	<=165	<=157

6.1.2 Outage durations compared to service level targets

MLL sets internal targets for supply restoration differentially based on four fault location areas within the network. This is due to a combination of both the importance of fast restoration when large numbers of consumers are involved (e.g., higher density urban areas) and the practicality of restoring service across the different parts of the network away from its base in Blenheim. The target for Rural/Remote has been increased from 8 to 10 hours to reflect the ongoing access difficulties that will occur from road damage and closure. It also provides a more realistic target for instances where faults have occurred in these remote areas at night and that the circumstances are such that it is not safe to attend the fault until first light the next day.

The fault restoration target times for the four defined areas of the Network are as follows:

- Blenheim Urban 1.0 hours
- Urban Other 1.5 hours
- Rural 4.0 hours
- Rural/Remote 10.0 hours

The "box-and-whisker" chart of Figure 20 illustrates MLL's performance in fault restoration times against these internal targets for the RY2022 year. The fault restoration times for each fault plot on the x-axis. Rather than plot each fault restoration time, in this chart the boxes represent the bounds for 50% of the restoration times spanning from the 25th to the 75th percentile points and the whiskers are a measure of the spread beyond that. The box centre bar represents the median restoration time, and the red bars identify the MLL restoration time targets. Faults plotting outside the whiskers (outliers) are shown as individual circles. The number of faults in each area is also noted on the chart.

Whilst most faults are restored within the target times, these targets remain stretch targets. Also, whilst the worst performance against target is recorded against the Blenheim Urban area, this is also the most aggressive target and the total number of faults in this urban area is low compared to the other groups.

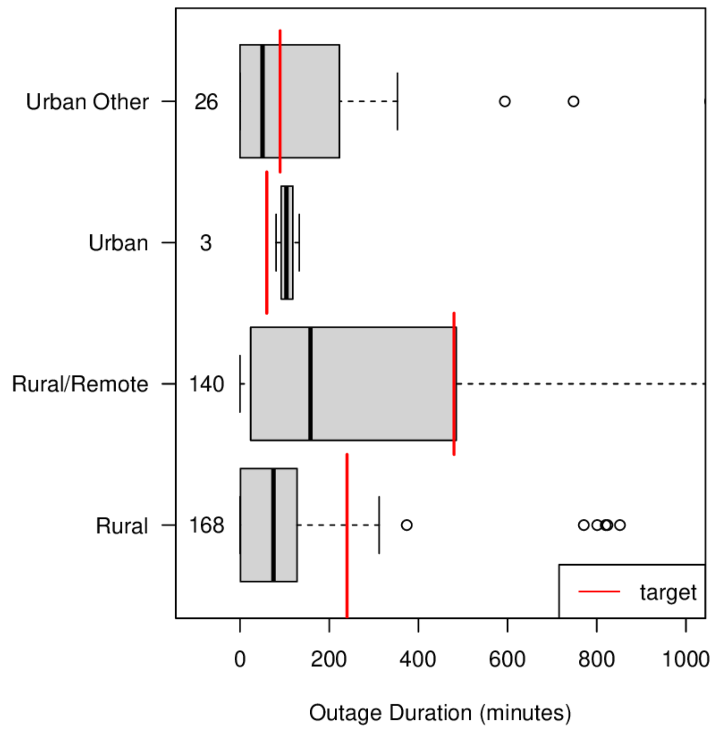


Figure 20: MLL's fault restoration times vs target values

6.1.3 Fault causes and response

Appendix 12.6 examines the total consumer minutes lost to 11kV faults by fault cause over the period RY2018 to RY2022 (five years) together with the average number of incidents per annum. This directs attention to the following:

- the major fault cause on the network remains material or equipment failure, although this is reduced substantially from the previous comparison period 2016 to 2020.
- weather related causes such as wind, lightning, and flooding, along with vehicle accidents are also major contributors to unplanned faults on the Network.

Further detail on the performance of the network in both planned and unplanned reliability is provided in Appendix 12.6, which shows:

- steady improvement in performance over the last 10 years (comparing RY2010 to RY2020);
- that this improvement has largely been in the Urban and Rural areas; and
- that SAIFI is now believed to be turning up (deteriorating) in the remote sections of MLL's network.

Based on this analysis, MLL needs:

- to maintain its current asset inspection programme which has been responsible for detection and prevention of imminent faults and the subsequent reduction in faults from equipment failure
- change focus slightly with remote line rebuilds to target worst condition assets only including replacing pole top hardware and componentry only where the data supports these decisions and
- continue to install isolating and sectionalising devices in remote and extreme weather prone areas to limit the effect of extended outages.

6.1.4 Voltage Quality

MLL has a good understanding of the voltage at the network level through MLL's remote monitoring of zone substations and remote devices and recording of these in its SCADA system. As per historical EDB practice, MLL has very low visibility of voltage quality at the customer connection level. Historically for EDBs, the relatively high reliability of LV networks compared with the potential cost of physically inspecting a considerable number of LV circuits has meant that visibility has not been a high priority.

However, expectations of network reliability are increasing, alongside the complicating addition of Distributed Energy Resources (DER), and therefore the benefits of increased visibility are increasing. DER can be high load in nature (e.g. electric vehicles, heat pumps) or injecting in nature (e.g. solar, batteries). Alongside this, the cost of monitoring is falling as the technology evolves and is implemented at scale elsewhere.

Monitoring at the LV level provides MLL with data that can identify issues and assist with planning, design and control of LV networks. The efficient use of monitoring data can reduce costs, optimise investment, and improve customer service and safety.

As per sections 3.3, MLL is piloting and investigating a number of technologies to improve MLL's monitoring of voltage at the customer level. The intention of the trials is to determine what parameters are useful to monitor, sampling intervals, outage detection, installation procedures and cloud system data analytics.

MLL records approximately six voltage complaints per annum, mostly in the rural network and usually associated to irrigation pumping loads. These are treated on a case-by-case basis, often being rectified through simply increasing the voltage tap of the associated distribution transformer. Few voltage complaints are recorded in the urban parts of the network.

Low voltage and other forms of voltage disturbance (e.g. flicker) are rare on the network and so no specific target or strategy is applied other than the usual consideration of voltage regulation that is routinely applied in network design and upgrade.

MLL currently has no known ESR 2010 voltage requirements non-compliances on its network. MLL has a complaint procedure that logs voltage issues brought up by customers. When an issue arises, it is recorded in the log, investigated if relevant using available data sources such as SCADA and protection records. If it appears that there might be a network issue at that customer's connection point, then MLL takes appropriate action such as checking network equipment and/or installing a logging instrument to further investigate the issue. From these investigations MLL decides on an appropriate course of action and notifies the customer the customer.

MLL typically communicates any work to improve voltage quality on its network directly with affected customers on an individual basis.

6.2 Consumer responsiveness

MLL commissions an independent annual consumer satisfaction survey containing various questions to better understand consumers' views on MLL's services and performance including for the areas of network reliability, quality, pricing, consumer discounts, community sponsorship, information dissemination and company management. MLL targets an 85% consumer satisfaction rating for overall performance.

The survey is sent out via email, allowing consumers the opportunity to choose to respond in their own time. The most recent survey was conducted in August 2022, with 15,985 consumers emailed. 2,574 responses were received (a 16.1% response rate) with the mix of respondents broadly reflecting the breakdown of MLL's consumer types and numbers.

The 2022 survey returned an 87% satisfaction rate, down from 89% recorded from the August 2021 survey. Of consumers who were satisfied/very satisfied in the weighted overall performance there was a decrease of 2% on the previous year.

Satisfaction ratings over specific categories surveyed were broadly consistent with previous years, including the key areas of reliability, faults, faults duration and faults service. Most survey respondents were satisfied with the number of interruptions, the duration of interruptions and MLL's services in restoring interruptions.

As MLL is a consumer owned EDB, MLL is an active supporter of community initiatives and events and provides an annual sponsorship programme. Consumers are canvassed for their views on MLL's sponsorship (particularly what specific areas MLL provides sponsorship support, e.g. environment, youth education and development) with most respondents in agreement with MLL's sponsorship programme.

MLL will continue to strive to achieve consumer satisfaction at >85%. MLL believes that a strong focus on maintaining network reliability should continue to drive consumer satisfaction coupled with the standards of MLL's service.

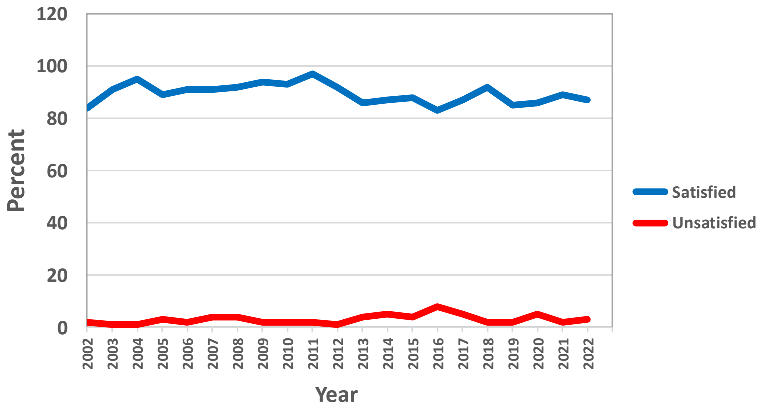


Figure 21: Consumer satisfaction survey results

6.3 Cost performance

This section considers MLLs costs. It examines the expenditure performance against forecast for the current (RY2023) year as published in the last AMP update (published in March 2022).

6.3.1 Comparative cost performance

The comparison of the relative costs of EDBs needs careful consideration. of network age, condition, environment, level of reliability and the reasonableness of capital and maintenance expenditure. Network businesses may be broadly compared on cost as long as the limitations of such comparisons are recognised. In MLL's case, it has an extensive remote area to manage in the Marlborough Sounds, sometimes requiring helicopter access and/or long hours of travel for staff, thereby increasing its costs. Postponement of prudent capital and maintenance expenditure is also not a measure of efficiency but may be instead a deferment to a greater cost at a future date. MLL therefore recommends caution when comparing capex and opex costs with other EDBs.

6.3.2 Expenditure vs. budget

Projected expenditure (based on the regulatory year to December 2022 extrapolating through to 31 March 2023) is set out in Table 10 and is compared to the expenditure projected in the AMP update prepared for the RY2023 year.

Table 10: Summary of RY2023 expenditure vs forecast (constant RY2023 $)

Item	Projected for RY2023 ($000)	Forecast for RY2023 ($000)	Variance as % of forecast
Capex: consumer connection	206	527	156%
Capex: system growth	2,544	2,383	-6%
Capex: reliability, safety and environment	3,078	3,060	-1%
Capex: asset replacement and renewal	8,637	5,611	-35%
Capex: asset relocations	1,122	100	-91%
Subtotal - Capex on network assets	**15,587**	**11,681**	**-25%**
Opex: Service interruptions and emergencies	1,235	1,472	19%
Opex: Vegetation management	2,315	2,607	13%
Opex: Routine and corrective maintenance and inspection	4,106	4,440	8%
Opex: Asset replacement and renewal	720	733	2%
Subtotal - Opex on network assets	**8,376**	**9,252**	**10%**
Total direct expenditure on distribution network	**23,963**	**20,933**	**-13%**

This shows an overall outcome of 13% under expenditure comprising 25% under-expenditure on network capital and a 10% over-expenditure on direct opex. The reason for the underspend of capital expenditure is largely in relation to the August 2022 storm event in Marlborough which disrupted the capital programme and resulted in field crews focussed on the supply restoration effort and subsequent maintenance works, with a delay to major planned works. A major planned asset relocation project also did not proceed during the year.

6.4 Network continuance

To provide a safe and reliable electricity lines service, the network must be managed such that its condition is not allowed to run down. General assessments on whether the network is being responsibly managed in this regard may be seen in:

- the distribution of Asset Health Indicators (AHIs) applicable to each asset category;
- the expected lives and the consumption of those lives in the regulatory accounts;
- age profiles in relation to average industry age profiles; and
- the replacement capital forecast in relation to an age-based model forecast.

AHI's are measures of asset health based on a set of criteria developed for a number of network asset categories. MLL has adopted the AHI criteria developed by the NZ Electricity Engineers Association (EEA). AHI charts are provided in the fleet management section of this AMP and in Schedule 12A in Appendix 11.2. These show no issues of concern, with most of the network showing AHI's commensurate with the asset ages and their expected lives.

Other measures of network continuance are discussed within this section and indicate that, in overview, MLL does not have an over-aged network, has an expectation for lives of its network assets in keeping with general industry practice and the level of replacement expenditure is broadly in keeping with the capital that would be spent by an average distribution business given the number, type and ages of MLL's assets.

6.4.1 Expected lives and comparative age profiles

Figure 23 describes the spread of the percentage consumption of those lives.[13] MLL's expected life and percentage consumption of that life is represented by the red dot points in the charts. Figure 22 describes the spread of cost-weighted depreciation-based lives (in years) amongst the different EDBs; that is the average accounting-based life expected for these asset classes. MLL shows mostly within the +/- 50 percentile boxes for expected lives indicating that MLL intends to achieve the asset lives commonly anticipated within the industry.

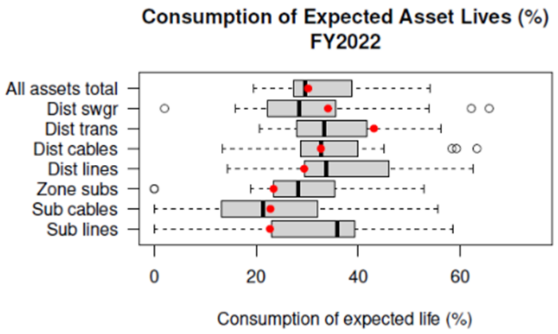


Figure 23: Consumption of expected asset lives

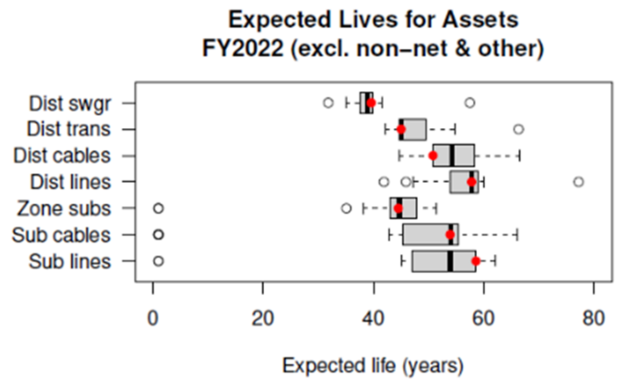


Figure 22: Comparison of expected asset lives

Further age information is depicted in Figure 24 (concrete poles) and Figure 25 (wood poles).

These figures show the disclosed age profiles for MLL's poles (orange bars) in comparison to New Zealand EDB's combined age profiles (blue bars).[14]

[13] We have used a calculation of life consumed based on the component depreciation and its depreciated life as there are issues with the regulatory disclosure values in their calculation. These are box-and-whisker charts; the boxes represent the 25th to 75th percentile bounds; the whiskers either the maximum or 1.5 x the inter-quartile length; and the chart circles the outlier points beyond that. Data is from RY2022 Information Disclosure Schedules.

[14] Age in years is on the x-axis and age distribution density on the y-axis. Density is used as the charts show the relative proportionality of asset quantities by age between MLL and all NZ EDBs summed together.

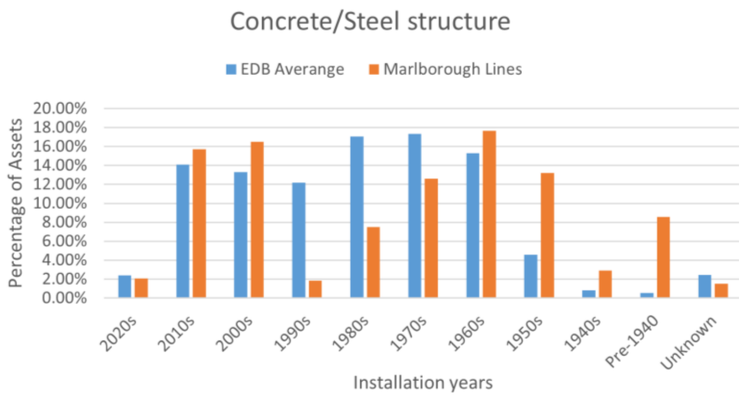


Figure 24: Comparison of MLL concrete and steel poles vs New Zealand EDB average

MLL's concrete poles show a proportion in excess of the NZ average age profile. MLL does have a significant number of reinforced concrete poles approaching 90 years of age (as described in the fleet strategy section). However, these poles are typically in reasonable condition and the final life expectation of concrete poles (pre-stressed poles in particular) is not yet determined. The NZ average age profile continues to advance in age almost year-for year. In MLL's case, replacement of many of these older concrete poles will be co-incident with conductor replacements due to the increased conductor weight and the reconstructed line design code requirements.

Whilst MLL does not have a large population of old wood poles, its wood pole age profile is becoming weighted above 40 years. Wood poles are considered to have increasing condition deterioration between 40 and 60 years of age. MLL is therefore increasing wood pole replacements on its network. The strategic enhancement of its condition inspection processes, described later in this AMP, is part of that forward thinking together with the budgetary preparation for these works provided within MLL's replacement capital forecasts.

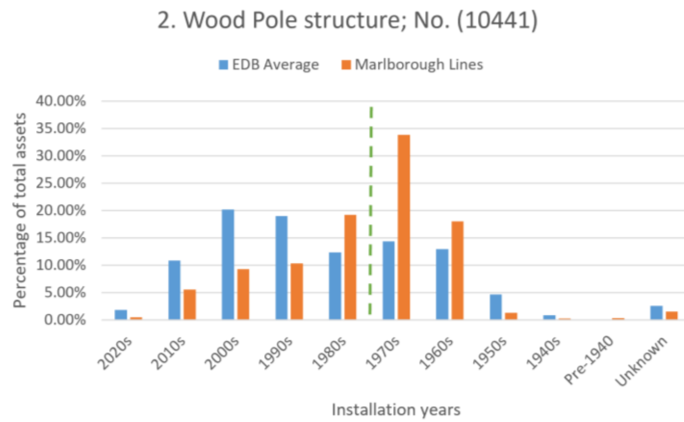


Figure 25: Comparison of MLL wood poles vs New Zealand EDBs average

Further analysis of the individual asset age profiles for MLL's assets in relation to the all-NZ average age profiles for the same asset classes reveals little evidence of a substantive "backlog" of over-age assets on the network, as further illustrated in Appendix 12.

This is illustrated in the above figure with the orange bars being the MLL HV conductor age profile and the blue bars being the all EDB age profile for this asset class. MLL has recently commenced a programme of progressive conductor replacements of its older and at-risk conductor types such as galvanised steel and light copper based mainly on the risk assessments it has undertaken. However, this strategy is also supported in principle by this comparative age assessment as it indicates MLL's conductor replacement programme commencement is neither too early nor too late in relation to the experiences of other businesses.

Whilst age is a useful proxy, network components needs prudent assessment relative to condition, location and importance, and not age alone.

6.4.2 Replacement levels

MLL's replacement capital forecasts are also supported by a "top-down" (repex) modelling based on the Hyland McQueen Ltd comparative benchmarking review of electricity distribution businesses for RY2022 using Disclosure data. The model applied considered the replacement probabilities with age of network assets under 51 categories and is

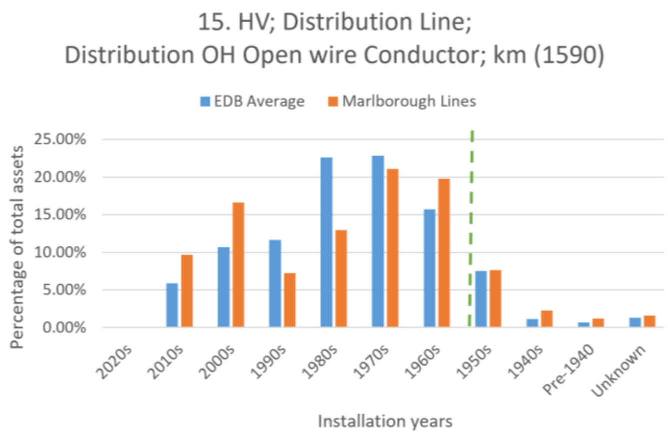


Figure 26: MLL vs all NZ EDBs HV conductor age profile

determined using the combined age profiles of asset classes over all EDB's in New Zealand and how those age profiles shift in time. When applied to each business separately, the model indicates, in broad terms, the expected renewal and replacement capex forecast of the "average" EDB's business in the circumstances of the asset numbers and asset ages of the particular business.

When applied to MLL, the model predicts greater replacement expenditure, as shown in Figure 27, indicating MLL's forecasts for replacement expenditure (blue line) is similar in comparison to what

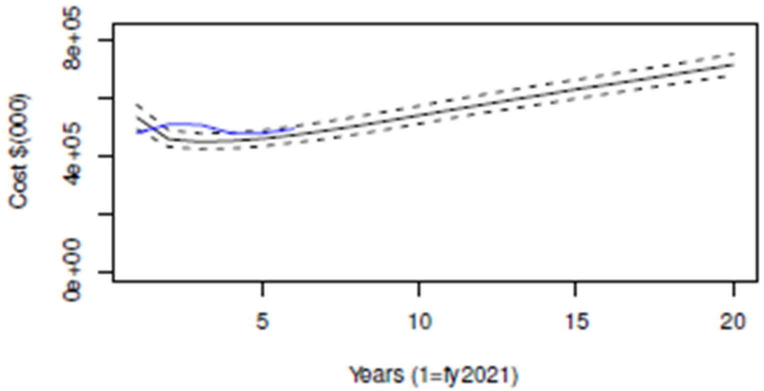


Figure 27: MLL replacement expenditure – model and forecast

other businesses might spend in its particular circumstances.[15] The gradually rising model line is indicative that MLL should anticipate similar to higher levels of replacement expenditure into the future to arrest its network ageing.

[15] Previously, the MLL repex forecast matched more closely with this age-based model. The model forecast has increased largely due to the higher levels of HV conductor replacement occurring in the industry, which has consequently raised the replacement expectation in this asset class.

6.5 Utilisation and losses

6.5.1 Network losses

MLL seeks the efficient use of energy and its delivery over its network. In general terms, the losses derived for the MLL network are consistent with those expected for a network of this kind i.e. a predominantly radial network supplied from a single point of supply and with low consumer density. MLL's RY2022 line losses are approximately 5%. This is relatively consistent from year to year. In this AMP, the target of 5% is set for the current planning period.

6.5.2 Capacity of utilisation

MLL's utilisation has declined over recent years and is expected to decline further in the coming years. This is due to the continued take up of energy efficient appliances, distributed generation and continued growth of electricity connections that do not typically contribute to maximum network demand within the Marlborough region. For example, baches in the Marlborough Sounds, wineries and irrigation all require transformer capacity, but these loads make little or no contribution to maximum demand set during winter months, thereby reducing capacity utilisation. The current target of 21% for transformer utilisation is retained in this AMP.

Overall, the utilisation of transformer capacity cannot be regarded as a primary indicator of network performance given the location and number of transformers on a network are largely a function of ICP location, physics of supply and consumer utilisation of connected capacity and are therefore largely out of the control of MLL.

There is some potential for much higher utilisation of parts of the network in future years if large scale new generation is embedded. Generation applications tend to seek to use the maximum capacity of the part of the network where they are being connected in order to maximise economic returns by the generator investor. This may increase losses and utilisation and make these a more difficult measure of network performance.

6.5.3 Load factor

Load factor is a measure of the constancy of the load as it measures the average load in relation to the peak load principally set by consumer demand and not by MLL. Load factor can be influenced by the manner in which load control, primarily hot water cylinders, is used to limit peak demand. To date, Transpower charges were based on the maximum demand on the Blenheim GXP at the time of maximum total demand of the upper South Island. This meant that, at other times, there was no financial incentive to cut hot water supply to houses. The result of this was to not limit maximum demand through load shedding during high load periods within Marlborough that were not coincident with upper South Island maximum demand. With Transpower's new pricing structure that is more dependent on actual assets employed rather than their usage MLL will gradually change its load control in order to limit network expenditure rather than Transpower transmission grid expenditure, however in the current circumstances, load factor is largely irrelevant as a performance measure and so is not currently longer targeted or tracked.

6.6 Objective commitments

Through its SCI, MLL sets other objective targets for its network business as discussed in section 5.3.1.3. The performance against these objectives is included in the MLL annual report published against an accounting year ending 30 June.

6.7 Business continuance

MLL seeks to provide a commercial return to its shareholder. By providing a reasonable rate of return, MLL's ability to borrow to cover asset expenditure is enhanced through reduced lending rates and a greater ability to borrow. Further commentary on MLL's financial performance and ability to cover infrastructure expenditure is illustrated in MLL's annual report.

6.8 Performance summary and response

The service level targets that MLL has described and set within this AMP have been derived from a combination of consumer engagement, comparative assessment and a commitment to continuous improvement. These targets recognise the practical limits of a mostly radial network covering a mix of urban, rural and remote areas.

Consumer engagement arises from planned periodic focus group engagement, particularly with key stakeholders, and through annual satisfaction surveys on the consumer base. Whilst the latter cannot, by its nature, provide specific direction, it does support the network reliability and faults response that is being achieved and driven by the internal performance targets that are set.

In 2022 MLL engaged an independent and experienced consultant to conduct an Independent Asset Review. MLL plans to conduct an independent review of the state of its assets every five years. The Independent Asset Review showed that MLL's assets are in general in a very good state, however it indicated that a significant increase in the rate of asset replacements will be needed in the next ten years. The report stated that the actual rate of replacement needed will depend on MLL's asset management practices of which condition monitoring is a key part.

Comparative assessment and the Independent Asset Review indicates the MLL network is achieving above expectation reliability while managing costs within expectation levels and that the network is not over-aged and will not become so provided MLL manages its asset fleets through condition inspection and targeted replacement and through executing the renewal works set out in this AMP.

System losses and the capacity of utilisation are of less interest to consumers than reliability although they ultimately impact on the cost of supply. To a large extent, these performance measures are a direct consequence of design standards and previous decisions on system configuration.

This performance analysis reveals the following key directives:

1. MLL is entering a period requiring increasing replacement of aging assets, in particular wood poles and conductor.

2. whilst reliability has over time improved overall, and in urban areas in particular, MLL can expect a decreasing reliability trend in the remote parts of the network driven by a potentially increasing fault count if assets are allowed to deteriorate. Aside from the economic issues of being forced to rebuild this uneconomic part of the network, proper targeting of renewal will require a greater focus on inspection and condition assessment as described later in this AMP.

3. given the expected deterioration of the remote areas of the network and the renewal investment that would trigger, MLL is considering alternative supply options against what would be otherwise an uneconomic reinvestment in network infrastructure.

4. no change in strategy is indicated as being necessary to achieve other performance targets such as line losses etc.

7. Asset management strategy

This section sets out the underpinning strategies that MLL will employ to realise the asset management objectives it has set, and the performance targets it endeavours to meet.

7.1 Overarching asset strategy

7.1.1 Asset management policy

MLL's Asset Management Policy is strongly linked to MLL's Statement of Corporate Intent, Vision and Mission as described in section 5.3.1.

MLL will:

- always regard safety as the highest priority;
- define its supply quality targets by consulting with its respective consumer classes, and by considering other strategic, comparative, economic and regulatory drivers (as addressed in the preceding sections of this AMP);
- achieve supply quality targets by maintaining existing assets and building new assets in accordance with MLL's design and construction standards, prevailing engineering standards and best applicable industry practice;
- build and maintain its network and assets to minimise lifecycle costs, recognising that its stakeholders are representative of its consumers;
- seek to continuously improve its asset management practices to a level that is appropriate and where priority will be given to strengthening the practices and skills which result in greatest benefit for stakeholders; and
- ensure that the capacity of the network is sufficient to meet the expectations of its consumers.

7.1.2 Service levels

MLL will:

- provide a safe environment for the public and staff through efficient and effective management of its network;
- continue meeting the service levels described in the performance analysis and service levels section of this AMP;
- meet the minimum of statutory levels or agreed terms for supply voltage;
- follow its security of supply standards unless the required investment levels are inconsistent with good engineering practice and/or commercial criteria;
- endeavour to limit flicker to levels specified by AS/NZS 61000.3.7:2012, by educating and requiring consumers to comply with this standard;
- endeavour to limit harmonics to levels specified in ECP 36:1993 and AS/NZS 61000.3.2:2013 by educating and requiring consumers to comply with these standards;
- target an overall power factor of greater than or equal to 0.95 lagging at times of high load on the network and require that all ICPs meet this requirement;
- facilitate connection of embedded generation where it does not compromise safety, network operation, quality of supply to other consumers, or power factor. MLL may require an embedded generator to pay the economic costs of connection, including

reactive power compensation, where these costs are consistent with Part 6 of the Electricity Industry Participation Code;

- interrupt supply to domestic consumers before interrupting supply to hospitals, industrial and commercial consumers for purposes of emergency demand management; and
- encourage and facilitate energy efficiency.

7.1.3 Asset configuration

MLL will:

- work with Transpower to minimise its fixed asset requirements commensurate with providing a reliable and secure supply to consumers;
- take a long-term view of asset requirements;
- build all future sub-transmission lines insulated to at least 66kV;
- ensure that, where possible, land purchases for new zone substations provide sufficient land to allow additional future transformer capacity to be installed;
- build all future rural distribution lines at 22kV;
- consider non-network solutions including demand-side management and distributed generation;
- use fixed generators on long radial feeders such as the those supplying the Marlborough Sounds to improve reliability of supply;
- seek opportunities to improve the network meshing for security and reliability where it is both feasible and economic to do so;
- use mobile generators where feasible and economic to improve reliability and reduce the effects of faults and planned work on consumer's supply; and
- take a wide view of the available technologies, including STATCOMs, remote area power supplies and grid-scale batteries when assessing the most economic and reliable solutions for relieving network constraint and optimising network investment.

7.1.4 Resourcing

MLL will:

- identify the required skill sets on a timeframe equal to this AMP and ensure that recruitment and training plans are consistent with its needs and, where appropriate, use relevant contractors;
- endeavour to procure resources locally, where and when appropriate;
- retain its current field services staff for fault restoration, inspections, maintenance and renewal work; and
- use contractors/consultants where its staff do not have the required skill sets, where resources are inadequate for its works programmes or where it is more cost effective to do so, e.g. specialist work such as civil engineering design and radio equipment installation and maintenance.

7.1.5 Materials

MLL will:

- make safety the primary consideration in all purchases;
- only use, or allow onto its network, materials and equipment which meet recognised industry standards approved by its own internal standards and policies;
- endeavour to procure materials locally, where and when appropriate relative to cost and other considerations;
- consider the total lifecycle costs of network components when assessing offers;

- recycle materials where practical, taking into account the total lifecycle costs and overall risk;
- purchase timber products such as cross-arms and poles from sustainable and renewable resources; and
- consider all environmental impacts in the purchase and utilisation of all items in its operations.

7.1.6 Risk

MLL will:

- adopt a risk-averse position, especially with regard to worker and public safety;
- regularly review its risk position using the prevailing standard ISO 31000:2018; and
- err on the side of over-investment in network capacity, recognising that under-investment can lead to supply interruption and that the overall economic cost suffered by consumers can be markedly greater than the cost of prudent investment taken before it is required. Systems and information management

7.2 Systems and information management

7.2.1 Business management processes and standards

MLL recognises the importance of adopting best practice in its business management practices to undertake its work safely, efficiently and to achieve its objectives. It also recognises it is important to provide confidence and transparency to its stakeholders and its various management practices are consistent with required standards and best practice.

To this end, MLL has sought and achieved certification for the following management systems:

- Quality – ISO 9001:2015;
- Environmental – ISO 14001:2015;
- Occupational Health and Safety – ISO 45001:2018; and
- Public Safety – NZS 7901:2008 (legislative requirement), and NZS 7901:2014 (best practice).

Certificaiton with ISO 9001 Quality Management System indicates that MLL's procedures and work practices meet with recognised industry best practice. Compliance with this system's procedures is integral to MLL's operations and, as such, regular audits (both internal and external) are completed.

Through ISO 14001:2015 Environmental Management System, MLL seeks to minimise impacts and manage adverse effects of its activities upon the natural and built environment as well as the local community. MLL has documented environmental policies. All staff are required to undertake work in accordance with these policies.

Where appropriate, consultation will be undertaken to assist in obtaining an amicable outcome for MLL and affected parties.

In demonstrating its commitment to health and safety, MLL was one of the first New Zealand companies to achieve OHSAS 18001:2007 certification and also ISO 45001:2018.

NZS 7901:2014 - Safety Management Systems for Public Safety, is designed for organisations to develop a safety management system that operates to safeguard the public (including property) from safety-related risks arising from the presence or operations of MLL's assets. Accreditation to this standard also enables MLL to be exempt from some prescriptive requirements within the Electricity (Safety) Regulations in favour of its own risk-managed practices.

ISO 45001:2018 - Occupational Health and Safety Management Systems is designed to help the organisation improve employee safety, reduce workplace risk and create better and safer working conditions.

During the planning period, MLL intends to remain certified with the above standards.

7.2.2 Information systems

Information systems are key to the performance of almost all modern organisations and therefore need to be planned and managed. MLL has a suite of information systems which have all been configured and developed for its needs. The systems are primarily used to house and manage asset data and are then used to drive many of the network activities. Table 11 highlights MLL's key systems, their roles within the organisation, some of the more significant data that they hold and how these systems integrate together.

Table 11: Overview of Asset Management Information Systems

System Name	Description	Functionality/Usage	Integration
EAM	Asset and works management system.	Project and work order records including preventative maintenance programmes. MLL's primary database for electrical and non-electrical assets, and work orders management used for analysis and reporting.	Data sharing between ArcGIS and EAM to ensure consistency in asset information.
Milsoft	The Milsoft suite of products primarily allows management of electrical outages (duration, consumers affected etc.).	Electrical connectivity model – capacity and load calculations, electrical network analysis. Outage management – recording and reporting of service interruptions and duration. Ability to log consumer calls.	Integrated with ArcGIS (spatial model and selected assets).
ArcGIS	Primary resource for managing spatial information of assets.	Spatial information, e.g. grouping and/or analysis of assets by area for example, spatial reporting (e.g. line lengths). MLL is currently employing a mobility application to facilitate asset data capture in the field.	Data sharing between ArcGIS and EAM and ArcGIS and Milsoft to standardise asset information across systems.
Eagle Tech LocalMaps	Map viewer of electrical assets and other map features.	Used by staff to confirm location of assets and use other map features (aerial imagery, property information, etc).	The information available in NetMaps is based on that which is held in ArcGIS.
Technology One's Financials	Financial record keeping.	Records and reporting of expenditure on projects and works by cost type and category.	EAM to Financials integration – when a work order is created in EAM it integrates to Financials to create a corresponding record which financial information is then recorded against.
Estimator	Bespoke software developed for MLL to allow creation of cost estimates for jobs based on material picks lists, labour and plant inputs, etc.	Preparation of cost estimates for projects and works for review by MLL network.	Integrated with EAM. Estimator receives project/work records for estimating from EAM.
Gentrack's Velocity	Revenue and billing.	Stores consumer connection information and is used for billing purposes.	No integration.
Mango Live	Repository for key health and safety and other documentation.	Repository for policies, procedures, standards, incidents, forms and staff training register/competencies (some of which relates to asset	No integration.

Table 11: Overview of Asset Management Information Systems

System Name	Description	Functionality/Usage	Integration
		management at MLL).	
SCADA	Database for equipment which is SCADA enabled.	Allows remote operation of SCADA-enabled network equipment.	Integrated with Milsoft – switches opened/closed in SCADA open equivalent equipment in Milsoft for outage recording purposes.

The primary asset management system at MLL is EAM, an asset and works management programme. EAM consists of a series of modules built around a central database of over 110,000 items that make up MLL's network assets. The functionality covered by these modules includes:

- asset creation, modification and deletion;
- asset attribution and history;
- management of MLL's capex projects (creation and management of project records and information);
- management of MLL's opex works (creation and management of opex tasks and information), including preventative maintenance tasks, whereby future works are pre-determined and managed by the system;
- integration with MLL's financial system; and
- GIS (map viewer) integration.

Most asset information (including many non-network asset classes) is contained in EAM with ArcGIS containing the spatial attributes of network assets. A third system, Milsoft, manages the connectivity of electrical assets, manages outage data and allows for engineering analysis of the network. The three databases are synchronised, i.e., they contain data in common and new data is entered into each system simultaneously through a database interface.

Information on connected ICPs is contained in Velocity's software 'Gentrack' and MLL's electrical connectivity software Milsoft.

Reliability and regulatory reporting uses the connectivity in Milsoft to determine any ICPs affected by an outage. This module has been configured to suit the information disclosure requirements of MBIE and the Commerce Commission.

For each fault, the time, the consumers affected, and the operation of assets is recorded and the network reliability figures (i.e. SAIDI, SAIFI, etc.) are calculated based on the connectivity model and consumer connection data. This information is generally tracked within Milsoft.

The network is inspected every five years (annually for assets in public places) and the condition and other asset information updated accordingly in EAM.

Vegetation is inspected annually in forestry and in areas such as the Marlborough Sounds.

7.2.3 Asset data and data quality

Asset management at MLL is dependent on accurate asset data. The storage and management of asset records, including various asset attributes, is fundamental in ensuring that appropriate asset management decisions are made. This pertains to the operations of the assets, maintenance regimes for various asset classes, and assessing renewal of assets based on factors such as age, condition and criticality.

7.2.4 Asset data

MLL holds records of over 110,000 electrical items. Along with this, records of non-electrical equipment such as plant, vehicles, office furniture and equipment, and field tools and instruments, are recorded and managed. The assets are separated into distinct classes, such as poles, and then categories, such as concrete or wooden. The attributes held by assets varies by class.

The information that is recorded and managed by MLL is based upon the following requirements and purposes:

- Safety. Having knowledge of asset location and condition is imperative in facilitating the safe operation of the network.
- Reliability. Knowing the types of assets operating on the network, including the manufacturer, for example, their location, condition, their relationship (including connectivity), allows the assets to be managed effectively to assist in minimising failures which can result in network outages.
- Regulatory. MLL is required to disclose certain information (age and condition for example) under specified asset categories.
- Expenditure. Managing asset records allows for analysis of cost trends and determining internal cost rates thereby allowing better planning of maintenance and/or renewal activities.

Asset information is managed by Engineering, GIS and administrative staff in MLL's head office. Changes to assets (and some asset components in the field) are recorded by field staff, then passed back to MLL's Network staff to update the asset management system(s) as appropriate.

MLL reviews and updates the information held through adding attributes for various assets when and where it becomes apparent that there is benefit in holding that information. Apart from zone substations, MLL manages relatively high volumes of low value assets which are geographically dispersed making invasive inspection techniques uneconomic. This lessens the scope for data collection to mostly visual inspection records.

Whilst each asset type has its own attributes, MLL generally determines the data it collects from a framework of failure modes and consequence assessment. For example, spalling on a reinforced concrete pole generally has to be extensive for the pole strength to be affected. A small exposure of steel within a pre-stressed concrete pole is considered cause for repair or replacement. MLL's inspection templates reflect these different asset-specific risk assessments.

MLL also utilises information disseminated from organisations such as the EEA and ENA, to identify particular asset types that may exhibit specific failure modes or symptoms, as experienced by other EDBs, which may be monitored for.

7.2.4.1 Data locations

The types of data held in the various information systems is set out in Section 12.8.

7.2.4.2 Data limitations

While MLL endeavours to maintain its asset data as complete and correct as possible, there are general limitations (gaps) to this. These include:

- Data Accuracy. The occasional challenge in getting accurate and consistent asset information data following fault events. There is the potential for this information to be overlooked when the physical works themselves (including making sites safe and the restoration of supply from outages) is the primary focus. MLL has an as-built standard which specifies the information to be captured by field staff and the time frames for providing the information through to the GIS department. MLL is actively communicating the importance of recording changes to assets in the field through the roll out of the new as-built standard.
- Legacy data. MLL's network was first established approximately 90 years ago. Historically data has not always been captured in the manner required by current standards. Records have been lost at times. During the transfer from one asset system to another, data may have been compromised or lost. Asset records today are therefore not always entirely complete and accurate. Whilst the existence of visible assets is known, for a small proportion of assets, the installation date (for example) is unknown. MLL believes it has a good understanding of what asset information is not complete or accurate. MLL does not have a programme of retro-populating this data as, in most cases, there is no viable way to determine it and/or the costs of doing so are prohibitive.

More specifically, known data limitations include the following:

- Aerial conductor condition data. There is no practical means of assessing conductor condition other than by visual observation (which does not always provide sufficient information). As such, conductor condition is generally assumed based on type, age (where known), location and operational experience. This limitation may result in the risk-based rather than a condition-based renewal of conductor where renewal is based on type, age and location (and hence deterioration risk) along with the condition of the supporting poles. The installation age of MLL low voltage (mains) overhead conductor is not detailed in records, although this is a common issue across the whole industry sector for this particular asset class.
- Underground cable condition. Condition assessment of cable can only be undertaken through cable testing. However, some types of cable testing are known to prematurely age cables and results can be uncertain. For the purposes of assessing condition alone, cable testing of distribution cables is generally not undertaken. As such, other than testing infrared emissions at cable terminations, cable renewal is largely based on age, failure consequence and operating history of the cable sections.
- Underground cable location. MLL has a policy to ensure that new cables installed are accurately plotted on plans using GPS. However, historically there are cables whose plotted location is less accurate.
- Pole condition. Pole condition is assessed during routine inspections/condition assessments. MLL has trialled various pole testing methodologies (including Porta Scan, Pole Scan and the Thor Hammer) with limited success (the results of MLL's testing were inconsistent and therefore inconclusive). Pole testing is generally undertaken by digging around the pole, sound testing with hammer impact and/or visual observation. This has limitations and results in subjective and usually conservative assessments. Conservatively assessing the condition of poles may result in their risk-based rather than their true condition-based replacement. However, a risk-based approach is deemed more appropriate than the alternative from a public safety perspective and is in keeping with MLL's approach to prioritise safety. MLL monitors industry practice and pole testing innovations and reviews its practices.

- Timeliness of inspections. Due to the extent of MLL's network, and in particular the remoteness and difficulty in accessing many parts of it, asset condition assessments can be expensive to undertake. While asset data is critical in achieving MLL's asset management objectives, there is a balance to be met in achieving appropriate quality data against the cost incurred in obtaining and managing such data. MLL periodically reviews its data management systems and processes to evaluate where improvements could be made in data quality and data management that are both useful and cost effective.

7.2.5 Communication and participation processes

MLL's asset management practices are communicated internally to staff and externally to other stakeholders through MLL's policy and standards and this AMP.

MLL has a suite of documentation relating to asset management practices which sit within MLL's asset management system. Some of the key documentation is summarised in Table 11. Section 5.3.1.4 highlights the interaction of the asset management system with other key components of MLL's business such as the SCI and the annual works plan.

Table 12: Summary of communication asset management processes/documentation

Processes/Systems/ plans within asset management system	Description and Purpose	Stakeholders and Communication of processes/systems/ plans	Management of processes/systems/plans
MLL Integrated Management System (IMS)	MLL has its own comprehensive IMS system. This includes a number of policies and procedures relating to asset management held and available through Mango .	Some policies and procedures contain content about the engagement and management of consultants and contractors working on the network. MLL's staff attend regular meetings whereby a policy/procedure from the IMS system is reviewed. The ISO system is part of new staff members' induction. Monthly senior management meetings review issues arising from policies and/or procedures within the IMS system.	Each policy/procedure within the IMS system is internally reviewed on an annual basis. Similarly, an external audit is undertaken on the IMS system annually.
MLL Network Design Standards	MLL has its own Network Design Standard Suite which is driven by safety and recognised good industry practice, and is used by MLL staff primarily in designing infrastructure (assets) for and on the network.	Internal design team, in-house contracting department, external consultants engaged by MLL. Network design standard made available to staff through Mango Live.	The standard is reviewed and updated internally on an as-needed basis.
MLL Maintenance Standards	MLL has its own Maintenance Standards. These are used to specify processes and procedures relating to the maintenance of assets on MLL's network. This includes inspection requirements and frequency.	The document is communicated to relevant staff by the Network Operations Manager.	In-house management of the maintenance standard by MLL's Network Operations Manager.
MLL Construction Standards	MLL has its own Construction Standards Suite which its own internal contracting company use for constructing (installing) and maintaining equipment on the network. These Standards are disseminated to external contracting staff also, as appropriate.	Internal design team, in-house Contracting department, external contractors engaged by MLL. MLL instructs external contractors as part of the procurement process that works are to be undertaken in accordance with MLL's standards.	The standard is reviewed and updated internally on an as-needed basis.

Table 12: Summary of communication asset management processes/documentation

Processes/Systems/ plans within asset management system	Description and Purpose	Stakeholders and Communication of processes/systems/ plans	Management of processes/systems/plans
Other relevant industry Standards	Designs should be undertaken in accordance with relevant industry best practice (i.e. following current applicable standards). Consultant engineers engaged by MLL are required to undertake design in accordance with relevant industry standards, such as AS/NZS 1170.5: 2004 – Structural design actions, Part 5: Earthquake actions. Another example is AS/NZS 7000: 2016 – Overhead line design: Detailed procedures.	MLL staff work to applicable Standards. The internal standards are formulated on the basis of applicable national/international standards.	MLL is a subscriber to Standards New Zealand. MLL receives electronic notification when relevant standards are updated.
Asset Management Plan (including AMMAT)	Summary of assets and their management for the next ten-year period.	Numerous stakeholders. AMP is publicly disclosed.	Regulated by the Commerce Commission. Internally reviewed and updated and signed off by the Board.

7.3 Compliance

One of the key drivers of MLL's asset management strategy is the need to comply with legislative requirements. The following list is a selection of some of the key statutory instrument (Acts and Regulations) relating to MLL's asset management activities:

- Health and Safety at Work Act 2015
- Electricity Act 1992 (including subsequent amendments)
- Commerce Act 1986
- Utilities Access Act 2010
- Energy Companies Act 1992
- Companies Act 1993
- Electricity (Safety) Regulations 2010 (and subsequent amendments)
- Electricity (Hazards from Trees) Regulations 2003
- Various Electrical Codes of Practice (tied to the Electricity (Safety) Regulations)
- Resource Management Act 1991

Other legislation and/or regulations are relevant to MLL's activities (for example, the Employment Relations Act 2000).

MLL's procedures and policies are written to comply with legislative requirements and codes and are updated as and when revisions come into effect.

Relevant MLL staff complete six monthly legislative compliance surveys. Legislative breaches are reported to the MLL Board as they occur.

7.4 Risk management

7.4.1 Introduction to risk management at MLL

Risk management is an important part of MLL's operations. The MLL Board is ultimately responsible for risk management at MLL and has established an Audit and Risk Committee to assess MLL's risk management practices.

MLL's Risk Management Policy outlines MLL's approach to risk management, supported by a more detailed risk management procedure that describes the risk management process.

7.4.2 Risk management process

Risks can be variable in their nature and scale. The conveyance of electricity (MLL's core function) potentially involves significant health and safety hazards the risks of which must be mitigated. MLL is also exposed to considerable business-related and other forms of risk. To manage that risk and to keep exposure within acceptable levels, MLL has adopted a systemic approach to risk management through following the Australian/New Zealand standards ISO 31000:2018 *Risk Management* and NZS 7901:2014 *Electricity and gas industries – Safety management systems for public safety.*

Figure 28 shows the risk management process suggested by ISO 31000 and adopted by MLL.

This process has five key steps:

- establish the risk context;
- risk identification;

- risk analysis;
- risk evaluation; and
- risk treatment.

Figure 28: Risk management process overview

These are supported by a framework for:

- risk monitoring and review; and
- communication and consultation with stakeholders.

7.4.2.1 Risk context

The above process allows for better management of risk types affecting MLL. The definition of risk (based on ISO 31000) is the effect of uncertainty on objectives.

The risk management process considers risks relative to the operations of MLL, which are broadly grouped into the following risk category types:

- health and safety;
- public safety;
- quality;
- environmental;
- financial;
- reputational;
- business interruption; and
- regulatory compliance.

7.4.2.2 Risk identification

At MLL, risks are identified by a variety of methods including (but not limited to):

- on site checklists, prior to starting work (tailgates);
- re-assessments during the day as the work environment changes;
- regular visual hazard inspections of work areas;
- analysis of accidents/incidents or near misses;
- internal and external feedback;
- condition assessment of the network to identify public safety risks;
- external information from specialists;

- risk workshops;
- external risk reviews; and/or
- industry information.

Identified risks are reported into Mango (either directly by employees or from paperwork provided to the Contracting Administration Manager).

7.4.2.3 Risk analysis

Once risks have been identified. These are analysed to:

- identify the source and cause of the risk;
- assess current controls and their effectiveness, and identify gaps;
- consider how likely the risk is of occurring and what the impacts are (likelihood and consequences); and
- determine the risk rating (likelihood x consequence).

MLL uses the risk criteria and matrix described in Section 12.9 to analyse risks. This categorises likelihood into 5 categories (from rare to almost certain) and consequence, into 5 categories (from insignificant to catastrophic). This analysis is performed on the "raw" (uncontrolled) risk, and then again on the "controlled" (mitigated) risk.

MLL's risk profile is then mapped onto the matrix described in in Section 12.9, which allows MLL to identify which risks its needs to focus the most attention on (e.g. risks that fall into the Red and Amber categories – its Priority 1 and 2 Risks).

7.4.2.4 Risk evaluation

Once a risk has been analysed, it is then evaluated based on the outcome of the analysis and against the risk assessment criteria to:

- escalate to the necessary reporting levels;
- prioritise risks;
- consider options for managing risks;
- decide what action is required; and
- identify resources required to manage the risks.

7.4.2.5 Risk treatment

Risks are treated either through elimination, or the application of controls to reduce the likelihood and/or the consequences of the risk occurring. MLL seeks to put controls in place that will reduce risk to a tolerable level. Ongoing monitoring and review is undertaken to verify that.

For non-health and safety related risks, treatments may avoid, transfer, reduce, remove or modify (or in rare instances, accept) the likelihood and/or consequence of risk(s). Non-health and safety risks may be treated in a variety of ways. Some examples of controls include (but are not limited to):

- changing policies, systems and processes;
- changing plant and equipment;
- redesign;
- new or different technology;
- training and education;
- inspections or increased inspection frequency;

- testing; and
- insurance.

In accord with the Health and Safety at Work Act 2015, when determining the appropriate control to effectively manage a health and safety related risk, a specified sequence of controls is followed to conform to MLL's Health and Safety Charter. Detail in relation to health and safety risk management is included in MLL's separate procedure document CSM6 – Risk/Health and Safety Management.

7.4.2.6 Risk registers

MLL maintains an electronic central risk register (in Mango). The centralised register identifies risks in the broad category types as listed in MLL's risk context above. Health, Safety, Public Safety, Quality and Environmental risks are held in the Mango register. Financial, reputational, business interruption and regulatory compliance risks are recorded in a separate register held by the Chief Financial Officer with oversight from the CEO and the Board.

7.4.2.7 Risk monitoring and review

MLL has a proactive approach to public safety, safety to its staff, contractors, and consumers.

Regular surveillance and monitoring relative to safety is undertaken in respect of network assets, e.g. ongoing measurement of line heights, inspections of substations, inspections of pillar boxes, and aerial and ground surveillance of lines and vegetation in proximity to the line.

Network standards prescribe the standards to be followed in respect of network surveillance.

Serious incidents and near misses are investigated in accord with the recognised incident cause analysis method (ICAM) procedure to identify the cause and better enable their prevention in the future.

The importance of both lead and lag indicators relative to safety is recognised within MLL with an emphasis on proactivity.

The performance of the network and the effectiveness of work programmes relative to health and safety are regularly reviewed by MLL's senior management and where appropriate change is made.

These reviews focus on ensuring that the controls in place are effective and efficient. Notifications of risk reviews are triggered from Mango, and records relative to reviews are maintained in Mango. For business-wide risks that fall into the Priority 1 and 2 categories, a report is generated from Mango and circulated with IMS (Integrated Management System) meeting papers for review and discussion.

7.4.2.8 Communication and consultation

Risk evaluation and communication is integrated within MLL's daily operations and processes including Board meetings, Audit and Risk Committee meetings, Health and Safety Committee meetings, team meetings, training, visitor and employee induction, inspections, etc. Where appropriate, specific meetings are held with industry groups, e.g. wineries and vineyards relative to the utilisation of grape harvesting equipment in the proximity of power lines. Other avenues for communication are set out in MLL's risk management procedure PR79.

7.4.3 Key risks

MLL has a number of Priority 1 risks included on its risk register that are asset related risks, including the following, as set out in Table 14:

7.4.3.1 Priority 1 risks

Table 13: Key risks – Priority 1

Risk source	Risk type	Risk causes and controls
People	Damage to the network and or harm to public as a result of accidental contact with the Network	Causes include: operating mobile plant and equipment; vehicle accidents; sabotage/vandalism; and cable strikes. Controls include: safety in design, education campaigns (close approach permits, etc.), remove or relocate high risk areas of network, cable location services, network security (fences, controlled access, etc.).
Assets	Fault causing extended outage	Causes include: natural event; third party interference; asset failure Controls include: network automation, periodic inspections/testing/monitoring of critical assets, pole inspection; assets constructed to legislative standards, inventory of critical spares, Emergency Preparedness Plan; and Mobile generator fleet.
Assets	Asset failure causing harm to people/property/environment	Causes include: poor design/installation; operator error; aged equipment; faulty equipment; and overloading Controls include: safety in design; equipment standards; operator training; periodic inspections/testing/monitoring of critical assets; pole inspection; and asset procurement, including inbuilt safety mechanisms (e.g. arc flash containment).

7.4.4 Risk mitigation initiatives

Aside from the ongoing surveillance and monitoring of MLL’s network and operations, three mitigation projects pertaining to risk are set out in this AMP:

- continuation of the programmed renewal of copper and galvanised steel conductor, which is approaching “end of life”. This renewal programme will mitigate public safety and fire ignition risk due to anticipated increase in conductor failures if no action is taken.
- increased surveillance of the network.
- staged replacement of MLL’s two-pole distribution substations following a review of seismic safety and in consideration of both the asset condition and risk priority.

7.4.5 Contingency planning

MLL's Emergency Preparedness Plan (EPP) documents procedures for use in the event of major damage to the network. It contains information on Transpower, the 33kV system, the zone substations, the 11kV lines, supplier's contact details, staff, consumers including those on medical support and other information which may be useful at times of emergency. Contingency planning is regularly reviewed with consideration given to various "what-if" scenarios.

MLL operates a 24/7 fault service, with sufficient staff available to ensure appropriate responses to most foreseeable events

For a major event such as a severe earthquake, MLL expects to utilise resources external to Marlborough, if possible. The availability of resources within Marlborough is necessary, however, because road access to Marlborough may be cut off.

MLL is involved in Civil Defence and emergency management activities in conjunction with the Marlborough District Council and other community groups. Liaison is, in the first instance, through the emergency services groups of each organisation. Regular meetings between MLL and the other groups are held to review and assess current plans.

Civil Defence involvement is not restricted to natural disasters but includes any event – planned or unplanned – which disrupts the Marlborough area.

Following the Christchurch earthquakes, MLL reviewed its EPP and the location of the control room. An emergency control room is available within MLL's Springlands system control building, and another could be quickly setup at the Taylor Pass contracting depot. An emergency repeater has been purchased to allow communications to be quickly re-established in the event of loss of the existing repeater.

The MLL radio system is interlinked with backup provision to maximise its reliability. Over the life of this AMP, it is intended to further strengthen the radio infrastructure.

MLL is part of the group of South Island EDBs that have agreed to a Mutual Aid Cooperative in the event of major disruption to individual or multiple networks.

7.5 Lifecycle management

MLL considers its network assets within a lifecycle framework that covers the assets from design and purchase, through operation and maintenance, and finally to renewal and disposal. The goal of lifecycle management is to maximise the utility of the assets while minimising total cost over the life of the assets. Examples of this include the trade-off between cost and quality/capacity and purchase cost and the total operating costs over the asset's lifetime.

Practical examples include:

- distribution transformers in salt prone areas have galvanised tanks and longer insulators; and
- distribution lines with 22kV insulation in rural areas which improves defence to transient earth faults and allows for future capacity upgrades.

In addition to work undertaken on MLL's network assets, it is also necessary to maintain access to assets and the environment around the assets, e.g. keeping trees clear of overhead lines and maintaining tracks to access assets such as switches. For MLL, a significant part of the maintenance budget is allocated to the maintenance of access tracks and vegetation control.

Network assets are exposed to wind, corrosion and other environmental effects and, therefore, deteriorate over time, albeit at different rates. Indeed, asset type and age can be a key predictor in assessing the general state of the network although it is often unreliable in predicting the particular state of any single asset. To manage total lifecycle cost, the cost of condition inspection is balanced against the cost of premature replacement and the costs and risk from asset failure, with the latter often being significantly larger for electricity conveyance assets.

7.5.1 Key strategies

7.5.1.1 Condition-based maintenance programme

MLL undertakes a condition-based maintenance programme centred on regular inspection and testing of network equipment. The programme includes the following aims:

- To manage the risk from hazards to staff, consumers and the general public;
- To achieve a reliable, secure system in accordance with service levels and consumer expectations;
- To comply with MLL's environmental policy;
- To identify required corrective maintenance before failure;
- To minimise the total cost of ownership and maximise the efficiency of MLL's operations; and
- To satisfy legislative requirements.

MLL seeks to achieve these aims by undertaking maintenance efficiently and effectively. It is a process of continuous improvement and one that will become more effective over time. MLL endeavours to purchase quality new equipment with minimal maintenance costs to assist with both future reliability and to minimise the total cost of ownership.

Typical maintenance tasks on critical equipment include the following classes of activities:

- Identification of any abnormalities;
- Maintenance in accord with manufacturer's requirements;
- Checking and/or replenishment of grease and insulation components such as oil or SF_6;
- Checking and minor repairs or replacement of semi-consumable components e.g. brushes, contacts, gaskets, seals;
- Checking and minor repairs to breakable components, e.g. sight glasses; and
- Calibration of components such as thermocouples, protection relays, etc.

The key criteria for these tasks are that they restore the original service capacity or utility. They do not increase that capacity or utility.

7.5.1.2 Asset replacement and renewal

MLL endeavours to obtain maximum value from each asset, without compromising safety and reliability. Allowing assets to run to failure is generally not a viable strategy given the safety considerations incumbent to electricity conveyance. As such, network assets are renewed when condition assessment indicates that they no longer meet their design requirements. Small pole-mount distribution transformers are an example of the exception where run-to-failure would be considered acceptable because the failure and safety consequences are usually minor.

MLL may choose to replace assets ahead of "end of life" where there are advantages from doing so through economies of scale, for example, in undertaking whole line section renewal where most (but not all) poles and components in the line section are assessed in poor condition. Such a strategy is economically efficient due to the one-off project and site set-up costs especially in rural and remote locations.

Much of the existing network was developed in the 1960s and 1970s and could, without prudent monitoring and maintenance, reach the end of its useful life over a short span of time. MLL's policy is to spread renewal expenditure to maximise efficiency and achieve consistency in operations. It is possible to defer this type of expenditure. However, that runs the risk of increasing failures (incumbent with safety and liability consequences), attendant increased costs and the possibility of inadequate resources being available to correct the problem in a timely manner.

MLL must continually and systematically renew its assets but replacement of assets is not always straightforward. Consultation with stakeholders is important and may represent the longest activity in the time line of executing the works. It can take considerable time to reach agreements with stakeholders such as landowners over access and asset configuration.

In general, asset replacement and renewal is prioritised towards areas where parallel renewal drivers exist, for example, low capacity or low strength lines, ties between substations without (N-1) reliability, safety concerns, and/or assets that are expensive or difficult to maintain (e.g. iron rail poles).

Consideration is given to making assets "smarter" on renewal. Developments in smart grid technologies are making new assets easier to monitor and operate remotely, which is an advantage when assets are difficult to access or the journey time is significant.

7.5.1.3 Routine maintenance and inspection

Where possible, MLL prescribes time-based condition monitoring over time-based servicing. Benefits of condition monitoring are:

- Increased visibility of an asset's health;
- Ability to identify trends across asset groups;
- Maintenance actions become more timely (and therefore efficient) as they are driven by asset condition;
- Ability to identify, plan, prioritise or defer preventative maintenance works; and
- Assistance in planning future CAPEX work.

Monitoring schedules are prescribed tasks designed to detect potential failure conditions. The schedule is determined by balancing inspection frequencies against the potential failure interval and the cost of the monitoring activity against the cost of the asset failure.

Most of the preventative maintenance is planned within EAM's Work Order Planning module. Most asset classes have preventative maintenance plans.

A plan is made up of a list of assets that have a series of schedules. A schedule is a set of tasks undertaken at regular intervals. The inspection interval may be based on time between inspections or other units of measure like run hours or number of operations. For efficiency, tasks with similar intervals at the same site are packaged together.

The due date for each task is updated based on one of two methodologies:

- Variable: The task is due in one period from the previous occurrence's completion date. This method is generally used for schedules that have a high cost per task occurrence, e.g. out of service tests on a power transformer.
- Fixed: The task is due in one period from the previous occurrence's original due date. This method is preferred for schedules with high task occurrence rates, due to either large asset populations or relatively short task frequency. In this case, there is greater efficiency to be gained by grouping tasks in a similar geographical area using a fixed date, rather than strict adherence to maintenance frequency.

During routine maintenance, field staff undertake a condition assessment on each asset that then leads to a condition score based off the definitions[16] in Table 14.

Table 14: EEA's AHI scores (with definitions)

AHI category	Meaning
H5	As new condition – no drivers for replacement
H4	Asset serviceable – no drivers for replacement; normal in-service deterioration
H3	End of life drivers for replacement present; increasing asset-related risk
H2	End of life drivers for replacement present; high asset-related risk
H1	Replacement recommended

[16] Condition scoring and definitions from Commerce Commission and EEA guide to Asset Health Indicators.

These scores are the AHI levels promoted by the EEA, and MLL has adopted these.

7.5.1.4 Corrective maintenance

Asset conditions scored Grade 1 (H1) are reported immediately through to the Control Room. A brief risk assessment is undertaken and appropriate reactive work put in train. This may include emergency shutdowns.

Defects on assets scored Grade 2 (H2) and corrective tasks identified by the field staff are assessed by the maintenance team. Corrective tasks are raised as a "work request" work order in EAM. These tasks are then prioritised based off a risk assessment as follows:

Consequence of functional and/or secondary failure in terms of:

- Risk to public safety;
- Risk to reliability (number consumers affected, restoration time, availability of alternate supply);
- Risk to environment; and/or
- Cost of asset replacement.

Probability of failure is assessed in terms of:

- Known asset health;
- Defect severity;
- Asset environment; and/or
- Predicted "time to fail" based on field experience.

The risk-based approach gives priority to serious defects, assets serving large numbers of consumers, specific high-value consumers, or places where public safety is a concern. This system always ensures that corrective maintenance is being performed efficiently and the most critical tasks are focused on.

The corrective action to be undertaken is determined by:

- Risk to operator safety (during action);
- Risk to service levels (during action);
- Labour and material cost of action; and/or
- Remaining asset life (post-action).

MLL uses GIS to plan and schedule maintenance. Outstanding corrective maintenance tasks are plotted within a GIS viewer against the affected asset. This enables corrective maintenance to be grouped geographically and scheduled alongside known planned outages, thereby improving efficiency.

MLL is in the process of consolidating a mobile module into EAM with earth testing results and pole inspection data is now being recorded electronically. This allows field assessments to be recorded on electronic tablets rather than the current paper-based system. MLL is aiming to decrease the costs associated with data processing and allow for faster communication of poor assessed asset health through to relevant staff through the shift to a mobility-based system.

7.5.1.5 Maintenance levels

Maintenance tasks are categorised by a maintenance level. These levels act as a rough guide to the complexity of the maintenance task. Maintenance levels also provide an indication to the level of access required to complete the task required. Maintenance levels used at MLL are described in Table 15.

Table 15: Maintenance level definitions

Maintenance level	Level code	Description	Definition
1	SHI	Security and Hazard inspection	Examples include: • Zone substation building inspection. • Distribution transformer visual inspection.
2	ISCA	In Service Condition Assessment	Assessment or testing of an asset based off a pre-determined criteria whilst the asset is in service. Examples include: • Earthing system resistance test. • SF_6 switch pressure gauge reading.
3	OSCA	Out-of-Service Condition Assessment	Assessment or testing of an asset based off a pre-determined criteria whilst the asset is out of service. Dependent on task, may require an access or test permits. Examples include: • HV cable Tan delta testing. • Circuit breaker functional test.
4	NIM	In Service/Out of Service Non-intrusive Maintenance	Maintenance activity where access to compartments containing HV conductors is not required, i.e. access/test permit not required Operational control or NESS may be required. Examples include: • Substation cleaning. • Ground-mounted switch operational test.
5	OSIM	Out of Service Intrusive Maintenance	Maintenance activity where access to compartments containing HV conductors is required. Access or test permits required. • Circuit breaker maintenance. • Tap changer overhaul.
6	SS	In Service/Out of Service Specialist Survey	Surveys undertaken by specialists generally external to MLL. Task is usually non-standard and will require a dedicated health and safety plan approved by the Operations Manager. May require Access or Test Permits. Examples Include: • Partial discharge survey. • Earthing system review.
7	PFM	Post Fault Maintenance	Assessments, testing or maintenance required on an asset after a fault has occurred.
8	OSM	Other Specific Maintenance	Other items that do not fit into the above categories, such as systemic reviews, For example: • Earthing system classification review.

7.6 Vegetation management

7.6.1 Overview

Vegetation management makes up a significant component of MLL's non-network expenditure. It is necessary to maximise public safety including minimising fire risk and maintaining reliability of supply by preventing interference to lines and the provision of access to network assets. MLL's network extends through heavily vegetated areas, including many parts of the Marlborough Sounds. Vegetation growth rates are typically high, which, in dry summers, exacerbates the fire risk. Expenditure includes frequent assessment of the network to establish where vegetation is encroaching (or approaching encroachment of) MLL's overhead lines. It also includes liaising with landowners with subsequent first-cut costs borne by MLL associated with physical trimming or felling of vegetation and related network support activities (such as provision of mobile generation to allow continuing operation of the network if large shutdown areas are required).

7.6.2 Legislation

Current legislation[17] specifies minimum distances that vegetation must be clear from overhead power lines "growth limit zone" with distances varying depending on voltage and conductor span length). The legislation also stipulates that EDBs must advertise suitable safety information to vegetation owners in appropriate publications as well as contacting those owners whose vegetation is approaching, at, or exceeding the specified minimum distances.

MLL considers the current tree regulations to be unduly prescriptive rather than principles-based, and consequently they are ineffective in remote rural locations where tree growth is relatively high and fire risk can be elevated. It is impracticable to measure the growth limit zone many metres above the ground where the vegetation is dense.

Vegetation owners have the option of taking ongoing responsibility for maintaining vegetation outside the minimum distance(s), or granting the line owner (i.e. MLL) approval to maintain the vegetation outside the minimum distance by appropriate trimming or removal. MLL must cover the costs of the first trim of an individual tree, along with appropriate record keeping, liaison and advertising. Costs associated with subsequent trims are borne by the vegetation owner. However, the same process of cut and trim notice must be repeated for every individual tree on a property. A network owner has no mandate to remove a small tree from under a line but must wait until it encroaches within the growth limit zone before any action can be taken.

7.6.3 Risks with vegetation management

These regulations are not leading to optimal outcomes. The growth limit zones are not adequate for ensuring safety of the public in relation to trees, particularly with trees of high growth in rural and remote environments. In many rural situations, the tree regulations do not enable a network operator to protect the lines from trees and/or to eliminate the risk of fire. In addition, the complex formulas stipulated require detailed and costly survey work to be undertaken if landowners require strict adherence to the legislation.

[17] Electricity (Hazards from Trees) Regulations 2003.

Of particular concern to MLL is areas of forestry plantations in the vicinity of MLL's network, of which there are many in Marlborough[18]. Forestry plantations involve high volumes of large trees which have the potential to damage MLL's network and/or result in fires. The minimum distances specified in the legislation are impractical to measure and manage on such a scale. They provide minimal protection to MLL's network.

Trees are one of the significant causes of outages on MLL's network. The current tree legislation only permits minimal clearances and removal of vegetation within the prescribed growth limit zone. In areas of high growth, this means that the limits are quickly exceeded after trimming, thereby requiring frequent return visits and high ongoing costs. These costs are further exacerbated in the remote area of MLL's network where access is difficult, and the work is undertaken at significant height resulting in relatively high costs of mobilising to work sites.

Upon advice from the Rural Fire Authority, MLL prevents the automatic reclosing of supply at times of specified high fire risk, which typically occurs during dry summers. This action has the potential to result in prolonged network outages. However, a fire is deemed to be a much greater threat to the public. MLL willingly compromises network reliability in the interests of public safety.

Another concern MLL has is with vegetation owners who put themselves at risk by carrying out the vegetation trimming or felling work themselves. In some instances, when MLL notifies vegetation owners of the requirements to maintain minimum distances to overhead lines, vegetation owners elect to undertake vegetation work themselves, against MLL's advice. This puts the vegetation owners at risk of electrocution, or may elevate the risk of a fire being initiated.

7.6.4 Vegetation management strategy

MLL undertakes routine inspections of its network to identify areas where vegetation has the potential to (or already is) breaching the minimum specified legislative distances. The inspections are criteria-driven – factors such as asset criticality (i.e. 33kV vs 11kV vs low voltage), rural vs urban, topography and land use are considered to determine the frequency of inspections for various areas of the network. The inspections are undertaken by vehicle, boat, foot, use of unmanned aerial vehicle, or, in other remote/inaccessible areas, by helicopter. Because of the potential for extreme fire risk in the summer months, inspection of these high-risk fire areas is undertaken at least annually. Whilst more frequent inspections increase cost, this is balanced by the risk mitigation benefit.

Records of vegetation that present a risk to MLL's network are established and managed within EAM in a similar way to an asset, i.e. a record is created with attribute data and specific location details assigned to it. Liaison with the vegetation owners then occurs as appropriate and, where applicable, work packs are designed and compiled to allow either MLL or external contractors to undertake the corresponding vegetation control work.

Despite the inadequacies of the tree legislation, MLL has directed its efforts to manage risk of vegetation interference by, where possible, obtaining greater clearances than those provided by the legislation with the cooperation of vegetation owners. Obtaining greater clearances than

[18] Forestry is a significant industry in Marlborough with over 70,000 hectares planted.

the minimum values specified in the regulations reduces the potential for network damage, reduces the frequency of inspection required (and subsequent re-trimming of vegetation) and enhances the safety of landowners.

Following the storms and flooding of July 2021 and August 2022 ML is now placing more emphasis on the removal of high-risk trees. High risk trees are those within fall distance of lines (but outside the scope of the Electricity (Hazards from Trees) Regulations 2003 that through factors such as age, health and location present a risk of falling and damaging ML assets. ML are reviewing such trees and will selectively remove where the trees are located adjacent to strategic lines. This includes 33kV lines, main or backbone 11kV lines, and lines located “close in” to substations.

Further detail is provided in Section 10.13.4.

7.7 Surveillance

Asset surveillance (inspections, monitoring, testing and condition assessments) is a major input to determining the health of the network assets and provides MLL with information that can be used to assess safety risks and reliability issues. A balance must be struck between repeated surveillance and condition or time-based servicing or replacement. Factors to be considered include:

- expected asset conditions and environment;
- setting the surveillance period in relation to the known defect rate; and
- balancing the cost of the surveillance activity against the cost of life extending maintenance or replacement or the consequences of asset failure.

Where asset defects are identified from surveillance, there are a number of approaches that can be considered depending upon the circumstances. These include:

- planned asset replacement;
- remove asset from service;
- increase frequency of monitoring;
- plan preventative maintenance work, including additional diagnostic testing;
- reprioritise existing works; and
- do nothing and continue to survey at normal frequency.

The approach adopted will principally be governed by risk of failure, public safety and then the criticality of the asset with respect to network reliability, cost of replacement and the cost of more frequent re-inspection in relation to earlier renewal.

7.7.1 Fault recording and analysis

MLL records faults within the outage management system (OMS) of Milsoft. Details, such as time of occurrence, the asset that failed, failure type/cause (where known), and external conditions are recorded against each failure event. Each failure recorded assists with establishing trends for the remaining in-service population and provides drivers for replacement or maintenance campaigns. In depth analysis of faults is prioritised by the impact on network reliability and the potential risks to safety that might be exposed by the fault.

7.7.2 Inspections

The majority of MLL’s surveillance comes in the form of asset inspections performed by field staff. Due to the spatial diversity of MLL’s network -

the Marlborough Sounds in particular - the cost per asset of field inspections is high.

As part of a wider mobility project in 2018, MLL introduced device-based (electronic) pole inspections (condition assessments), which assist in improving data quality and turn-around time for inspections. The inspections undertaken are largely based on MLL maintenance standards, some of which have recently been revised. As this area develops, the intention will be to extend mobile inspections to other asset classes.

Data quality of the majority of MLL's asset surveillance is affected by the proficiency and consistency of the field staff undertaking the work. MLL recognises that the way to build and maintain proficiency is through education, training, and support for MLL's asset inspectors and analysts. A team of 4 dedicated inspectors now carry out this work. Additionally, drone surveillance is used to supplement the routine inspections, to assist with difficult to access areas and to provide detailed images of pole top equipment where required.

MLL endeavours to keep clear, open lines of communication between its asset management and field staff to ensure the inspection process is undertaken within a continuous improvement cycle.

7.7.3 Digital mobility

MLL's mobility pole inspections (condition assessments) platform enables field staff to capture data directly onto devices in the field, instead of the traditional "pen and paper" approach.

MLL also has a tablet-based system for undertaking earth testing of distribution transformers and other assets.

Other features that have been introduced within the scope of the mobility initiative include field access to digital work and policy documentation, network asset information and to MLL's geographic information systems.

The benefits MLL expect to see from this approach are:

- better access to information resulting in improved operator safety;
- improved communication channels between project management, engineering and field staff;
- removal of the requirement to double enter inspection data, resulting in faster inspection turnaround time and improved data quality;
- less time spent on preparation of printed documentation for site visits;
- improved confidence in system data;
- better planning decisions based on better data quality;
- reduced revisits to sites to collect missed information;
- ability to assess progress in the field through real time field tracking; and
- increased opportunity to group tasks in the same area.

MLL is considering how digital mobility may be utilised elsewhere across field work, e.g. capturing of as-built data in the field.

7.7.4 Online monitoring

MLL's SCADA system provides measurement and logging of the network utilisation and system events, which can then be used to identify unusual operating conditions and indicate accelerated service-based aging.

The data provided from online monitoring can reduce the requirements of on-site work and inspections and allows MLL's Operations team to respond faster to abnormal conditions on the network. MLL's online monitoring systems currently operate almost exclusively on the sub-transmission and 11kV distribution systems.

Increasing amounts of Small Scale Distributed Generation (SSDG) is being embedded into MLL's LV networks. To monitor the effect of this technology on MLL's quality service levels, MLL is considering improving its electrical surveillance of low voltage reticulation. It may be possible to utilise this monitoring infrastructure as part of a future network congestion management scheme. Online LV monitoring devices are being trialled on a selection of transformers around the network. Refer to section 6.1.4.

When procuring new assets for installation on the network, MLL specifies products that have the ability to be remotely monitored. Examples of online monitoring that MLL undertakes on its 11kV and 33kV network are included in Table 16.

Table 16: Types of online monitoring

Telemetry type	Measured at	Used for identifying	Relevant Assets
Current	Zone substations Recloser sites Switch rooms LS Embedded Generation	Asset failure (electrical protection) Thermal aging Network utilisation and growth	All electrical assets Transformers Cables Overhead conductors
Voltage	Zone substations Recloser sites Switch rooms LS Embedded Generation	Asset failure (Electrical Protection) Abnormal operating conditions	All electrical assets
Temperature	Power transformers Generators Plant rooms	Thermal ageing Abnormal operating conditions	Transformers Generators Power factor correction equipment
Oil/fuel pressure and levels	Power transformers Generators	Abnormal operating conditions Leaks	Power transformers Generators
Operation counting - cyclometers	On load tap changers Generators Circuit breakers	Service wear	Power transformers Regulator transformers Circuit breakers Generators

7.7.5 Engagement of external parties and external reviews

MLL engages external resources for specialist activities. These tasks generally require skillsets and experience that are not available within MLL. Examples include:

- civil and mechanical engineering design;
- technical surveys for zone substation earthing systems;
- thermographic surveys; and
- partial discharge surveys of switchgear and cables.

MLL also engages consultants and auditors to independently review and provide quality assurance of its systems. In 2022 MLL engaged a consultant who completed an Independent Asset Review to review the state and likely future state of MLL's network. MLL intends to repeat the review every five years.

7.8 Network development strategy

MLL undertakes development expenditure in a timely manner to ensure that appropriate levels of network service and reliability are provided in accordance with consumer expectation and in line with organisational strategies.

MLL has adopted planning processes and technical and engineering standards to ensure that network assets meet the following requirements:

- load demands of its consumers;
- the safety of its public, consumers, staff and contractors;
- maximise efficiency of operations;
- prevent unnecessary investment;
- minimise risk of long-term stranding;
- comply with regulatory requirements;
- maximise operational flexibility;
- maximise fit with organisational capabilities such as engineering and operational expertise and vendor support;
- comply with environmental requirements; and
- appropriate to environment.

For example, the fundamental criterion considered for 11kV/415V transformers is the maximum demand and delivery of required voltage. Transformers of 200kVA, or greater, are monitored together with other transformers as appropriate and any transformer where the indicated load exceeds the transformer rating is considered for upgrade. Other options such as rebalancing, and/or moving load to other transformers are also considered. Other factors considered are the load duration, i.e. how often the transformer is close to, or above its ratings, and the time of day and year of the highest loadings.

Increases in load are then reflected in planning upstream through the various classes of MLL assets back to the Transpower GXP. The load on all 11kV feeders, zone substations and the 33kV feeders is continuously monitored and the data is used for system modelling and project planning purposes.

7.8.1 Trigger points for planning purposes

MLL has a broad range of criteria that represent trigger points for action across its varying classes of fixed assets. These are summarised in Table 17.

Table 17: Summary of planning trigger points

Asset class	Capacity criteria	Reliability criteria	Security of supply criteria	Voltage criteria
400V reticulation network	Conductor or fuse rating.	Blenheim CBD – 50% of load restored within 0.5 hours of fault, 100% within 1 hour. Elsewhere – restored within repair time.	(N) security of supply for standard residential or commercial connection.	Voltage falls below minimum regulatory voltage or 0.94pu at consumer's point of supply based on 1st percentile and 99th percentile.
11kV/400V distribution substation	Transformer rating (kVA).	Blenheim CBD – 50% of load restored within 0.5 hours of fault, 100% within 1 hour. Elsewhere – restored within repair time.	(N) security for most subs, with rapid transformer replacement, or use of mobile generator.	
11kV distribution network	Current exceeds 90% of thermal rating for more than 15 hours per year.	Meshed feeder - 50% of load restored within 0.5 hours of fault, 100% within 1 hour. Radial feeder – target restore time dependent on location.	(N-1) security for most of the urban 11kV network. (N) security for rural 11kV network.	Voltage falls below 0.95pu for more than 100 hours per annum.
11kV distribution hardware	As appropriate to equipment. Not to exceed maximum rating.			
33/11kV zone substation	Firm capacity available 98% of the time, i.e. can exceed firm capacity for 2% of time.	50% of load restored within 2 hours of fault.	(N-1) > 5MVA (N) < 5MVA	Able to cope with 0.85pu to 1.05pu on 33kV network and provide 11.2kV on bus.
33kV sub-transmission network	Current exceeds 66% of thermal rating for more than 1,500 hours per year.		(N-1) > 5MVA (N) < 5MVA	>0.85pu at all zone substations connections with 1.0pu at GXP.

7.8.2 Standardising assets and designs

MLL's Network Standards document the design and construction of network assets. The Network Standards are used for assets where ownership and/or maintenance responsibility ultimately rests with MLL.

The standards contain information and drawings to be used in designing network assets and detail the procedures for design approval and construction. These standards and policies include consideration for public safety at the design stage and assist MLL in meeting its obligations under the Electricity (Safety) Regulations 2010. They also assist in standardising assets to help achieve reliability of supply targets.

MLL, along with other EDBs, has access to, and the use of, the PowerCo Contract Works and Network Operations guide. Where appropriate, PowerCo's documents are used to develop and update MLL's standards. This also increases the standardisation across the industry.

MLL is also part of a group of South Island EDBs buying group for cable, line hardware and store items. This has led to cross-company standardisation and reduction in the number of store items, unit costs and inventory held.

MLL is a member of the Collective Network Operations Group, which includes all South Island EDBs. The group's purpose is to work towards common access processes, documentation, competency training and assessment, consistent operational requirements and emergency plans.

Table 18 summarises some of the key strategies for standardising assets and designs at MLL.

Table 18: Summary of standard strategies for assets/design

Asset category	Standardised features	Standardising methods
Sub-transmission, distribution, and, LV lines	Standard suite of conductors/cables to be selected from – generally available conductor/cables.	MLL Design Standard. Other types not included in standard needs specific network review and management approval.
Sub-transmission, distribution, and, LV cables		
Distribution substations/ transformers	Size of transformers (pole-mounted) generally dictate supporting pole. Off the shelf" models for network consistency.	MLL Design Standard.
Distribution switchgear	Selection generally from preferred suppliers of off the shelf goods – bespoke options avoided unless exceptional circumstances warrant.	MLL Design Standard. MLL preferred suppliers list.
Poles	• New concrete poles are pre-stressed type. • Load changes to iron rail, hard wood, larch or lattice tower poles result in replacement. • Select from approved manufacturers and limited pole types only.	MLL Design Standard. Relevant utility pole standards to apply to new poles.
Other network assets	Generally, procure from preferred (i.e. pre-approved) suppliers.	MLL preferred suppliers list and Design Standard.

7.8.3 Strategies for asset efficiency

MLL monitors and considers losses when looking at the system configuration and network development. In practice, the physical considerations (e.g. conductor size and pole spacing) and the requirement to deliver regulatory voltage tend to take priority at the asset design and construction phases of the lifecycle and this determines the losses.

Demand management also plays a part in energy efficiency. Where trends indicate future increases in demand, for example, this is factored into the capacity of new or replacement transformers.

MLL specifies the level of power factor required to be met by users of the network to maximise the efficiency of utilisation. Similarly, maximum harmonic levels are specified for consumer installations.

MLL considers energy efficiency when purchasing and replacing transformers and the cost of the fixed and variable losses over the life of the transformer are considered.

Lines pricing is designed to incentivise consumers to install transformers of an appropriate rating. However, in many cases, consumers and their consultants prefer to over specify transformer capacity in anticipation of future requirements (thus increasing standing losses).

Energy efficiency initiatives also pertain to electricity users. MLL has interposed Use of System Agreements (UoSA) with electricity retailers. MLL, therefore, does not have direct contact with consumers, limiting its ability to influence consumer behaviour. As the local EDB, though, MLL provides advice to consumers through publications, e.g. newsletters.

7.8.4 Setting asset capacity

The theoretical starting point for quantifying new capacity is to build, “just enough, just in time”, and then add incrementally over time. However, MLL recognises the following practical issues:

- The standard size of many components, which makes investment “lumpy”.
- The requirement for MLL to obtain a commercial return on investment.
- The one-off costs of construction, consenting, traffic management, access to land and reinstatement of sealed surfaces, which may make it preferable to install additional capacity rather than returning in the short to medium-term. This is especially the case since network assets typically have long lives, far in excess of the regulatory period and the 10-year planning period of this AMP.
- The addition of extra capacity can, in some cases, require complete reconstruction, for example, where larger conductor requires stronger poles or closer pole spacings, leading to considerable increases in total cost of ownership if an incremental approach is used at the outset.
- The need to avoid over-load risk. Over-load can lead to asset failure, reductions in service and reductions in asset lives.
- In terms of some items, e.g. power transformers and underground cables, the marginal cost of providing additional capacity for the future is typically small relative to overall project costs.

MLL’s guiding principle is therefore to minimise the level of investment ahead of demand while minimising the costs associated with doing the work as well as the total cost of the asset over its lifetime. This recognises that the costs of investment in advance of requirements is far preferable to investment after failure has occurred or consumer supply is lost.

Generically, in determining capacity requirements, MLL monitors and reviews loading data across the network (and specific areas depending on what is being considered) and assesses trends in data and liaises with other relevant stakeholders in the district (for example, the Marlborough District Council around its development plans), whilst reviewing existing infrastructure and any current capacity restraints. Considering these, and other factors, in combination is generally the best approach for determining capacity. More specifically at the asset level, more detailed criteria are considered in determining asset capacity. Some of these are summarised in Table 19.

Table 19: Summary of criteria used to determine capacity of network assets

Asset category	Criteria to determine capacity*
Sub-transmission lines	Loading, growth forecasting, health and safety considerations. Surrounding land use (man-made or natural environment), climatic conditions, topography.
Distribution and LV lines	
Sub-transmission cables	
Distribution and LV cables	
Distribution substations and transformers	Expected demand within next 10 years, considering diversity.
Distribution switchgear	Expected future fault and load levels – generally only available in step sizes
Poles	Conductor mechanical loading (i.e. size of conductor and span lengths drive pole size), environment, loading from other sources (i.e. steady state and/or dynamic loads).
Zone substations - transformers/switchgear/ buildings	Current loading, expected future growth and demand forecasting.

* Note – not an exhaustive list.

7.8.5 Prioritisation of development projects

In prioritising development work, MLL assesses the estimated cost and benefits. The drivers of the work are considered along with the benefits to stakeholders. Table 20 summarises the ratings of typical benefits.

Table 20: Considerations in prioritising development projects

Description	Comments	Rating (10 = highest)
Safety	MLL will not compromise the safety of staff, contractors and the public. Safety is fundamental to the way MLL undertakes its activities and as such has highest priority.	10
Capacity	Overloading can lead to overheating, reduction in asset life, fire, explosion or cascade tripping.	9
Reliability	Consumers want a reliable supply.	8
Voltage	Consumers want items of their electrical plant and equipment to perform. This requires stable voltage levels free of harmonic interference.	7
Environ-mental	Managing impact on the environment is a key part of MLL's values, especially in highly sensitive areas.	5
Energy Efficiency	Low consumer-density EDBs like MLL have relatively high numbers of transformers, all of which incur losses regardless of consumption. Energy efficiency is considered during design and purchase of network assets. MLL also seeks to maximise the efficiency of its network through operations, notwithstanding the limitations from MLL's network physical constraints.	5
Renewal/ end of life	Lower priority, if it is safe, has adequate capacity and voltage and low costs.	6

In assessing the potential benefits of the work, consideration is also given to the number of affected consumers, the total kW/kWh and the impact (if any) on revenue/costs, e.g. reductions in maintenance/increased line charges.

Potential projects come from a wide range of work including technical studies of the network, e.g. load flow analysis, consumer requests, consideration of load growth, information on proposed load changes, examination of existing constraints and limitations within the network and asset monitoring (e.g. large concentrations of maintenance work may result in line renewal), and reliability studies.

Projects are developed and budget pricing is undertaken on an annual basis. The benefits are assessed in terms of the criteria above and projects ranked accordingly. This is undertaken by the Network engineering staff. From this information, a draft plan and budget is developed. This is then discussed with, and approved by the CEO before being submitted to the Board for approval or alteration. Once approved, it is included within MLL's annual budget. The programme of projects is then managed on an ongoing basis (both underway and planned projects) to track expenditure and to ensure that any planned projects are still relevant. The programme is then updated accordingly. Monthly reviews are undertaken by engineering and finance staff to manage the status of Capex projects and capitalise or expense costs when and where appropriate.

7.8.6 Grid connected batteries

Across the world, and in Australia and New Zealand, grid-connected large-scale battery storage (LSBS) is finding application for a range of network and commercial services. Key services, and notes on their application, are listed in the following table together with an indication whether the service generally falls into a generator/retailer category.

Table 21: Grid-connected battery services

Service	Description	Generator/Retail
Arbitrage	Battery storage and discharge is arranged to take advantage of electricity market daily price variation. Given battery 'round-trip efficiency is (about) 88%[19], the expected average price differential must be greater than 14% as the baseline.	Yes
Peak Demand Control	Battery generation may be employed to cap system maximum demand and so limit the load on the Transpower's Grid Exit Point and any related transmission charges including deferring transmission upgrades. MLL's Grid Exit Point peak demand is well controlled through existing load control technologies and therefore MLL's peak demand tends to last many hours, making mitigation by battery technology very expensive due to the high storage needed to reduce peaks.	No
Ancillary Services	The electricity market will contract for short-and medium-term frequency support where the battery plant may be contracted to respond to over and under frequency by absorbing or generating active power respectively and in proportion to the frequency deviation. Such contracted capacity cannot be 'double dipped', thus restricting the supply of other services to ensure the battery is at a state of charge to accept or discharge energy as required. The recent upgrade of the inter-island HVDC controls system, to affect power transfers for frequency control, has reduced the market price for such ancillary services (frequency and reserves), particularly in the South Island. Voltage support through var control is another market service but is achieved through the kVA capacity of the battery inverter, rather than the battery itself, so competes with cheaper technologies like STATCOM or switched capacitors. Voltage support tends to be a resulting secondary benefit from a Large Scale Battery Storage(LSBS) project.	Yes
Capital Deferment	Placing battery plant at zone substations or at load points on constrained 11kV feeders to alleviate peak demand. This defers capital upgrades to the supply lines or transformer capacity. The economic return depends on a number of project-specific factors including the load peaking profile, the rate of load growth (and hence the length of the upgrade deferment), the remaining life of the transformers and lines and the viability of other options such as off-loading to other zone substations or demand-side solutions for load curtailment.	No
Network Support	Ability to firm voltage for increased power transfer or enhance fault capacity. Generally, the ability to supply these services is incidental in that they derive from the ability of the battery inverter and its controls rather than the battery itself. As such, they compete with other technologies such as STATCOM but can provide this as an additional benefit if the battery plant is required for other services.	No
Reliability/Security	Battery plant may support load in an islanded network and so increase the supply reliability or dispense with the need for duplicate lines where (N-1) reliability is required. Reliability as a service on its own is usually not economic unless it is supporting high value load and must be compared to competing options such as mobile or fixed diesel generation with its lower capital costs, higher fault capacity and the ability to refuel.	No

[19] Transpower: Battery Storage in New Zealand; Discussion Document Sept 2017; table 4.

7.8.6.1 Opportunities for grid storage batteries

Opportunities for LSBS within the MLL Network are evaluated under consideration of the following:

- MLL's maximum demand charge has been based on its contribution to the Upper South Island (USI) 100 peaks. As MLL's maximum demand is seldom co-incident with these wider area peaks, its incentive for demand management was reduced. Transpower prices in the future under its new pricing methodology will be based on the actual assets employed rather than their utilisation. The capacity of the Transpower transmission network is currently well above that needed within the next ten years. Therefore, at this time there is little need for batteries to assist with managing the network's total peak demand.

- Contribution from ancillary services (frequency management) is not included in MLL's calculations due to the relatively small MW size of the batteries being considered, the low ancillary reserve prices in the South Island, and the cost of an interface for dispatch.

- MLL has a (largely) interconnected 33kV network and has plans for further meshing, largely to remove "T" connections. Where MLL has only '(N)' security at the zone substation level, these substations (Leefield, Linkwater, Ward, and Rai Valley) all show demand growth out to 2031 below 5 MVA, which is MLL's threshold for upgrading security (in line with EEA supply security recommendations). A number of MLL's rural zone substations peak loads are predominantly caused by irrigation load which tends to operate 24/7, often for some weeks. Battery support is currently not economic for multi-day load support. Support for any special load with a high loss value would be customer specific and may attract a capital contribution, and so would be assessed on an individual basis.

- In terms of demand capacity, only the Nelson St zone substation is projected to exceed its security rating within this AMP horizon (circa 2025). However, this substation may be off-loaded through re-configuring feeder ties or uprate the transformer cooling with fans, so the load growth may be accommodated without the need for significant capital expenditure.

- Due to the differences between Upper North Island and Upper South Island energy and ancillary service market prices, any comparisons to grid battery investment projects in the North Island must therefore be performed with caution.

- MLL's main contributor to network SAIDI is the long feeders in the Marlborough Sounds traversing rugged terrain at risk from vegetation growth. As each instance has few, mostly residential customers, the total value of lost load is small in relation to the capital cost to address this through placement of battery storage. In addition, repair times in these areas may be long during storms and sometimes extended due to mandatory stand-down times if lightning is present. This means the battery storage size must be large to avoid outages, so increasing the cost of this option. MLL also has existing fixed diesel generators and has placed plug-in connections for mobile generators in the most affected lines. Diesel generators also have the advantage that they may be refuelled if the network outage is prolonged and can source greater fault current to clear spur fuses under secondary faults.

- Placing grid batteries within the 11kV network to allow new load on weak feeders is a possibility but requires that the additional load has a peaked daily profile such that the placed battery storage may flatten the load back to the feeder capacity – which may be enhanced to a degree by the voltage support ability of the battery inverters. In general, the nature of additional large load in such area (remote and served by weak feeders) is more likely to be flat and seasonal (grape processing or irrigation).

Overall, the reduced benefits in energy arbitrage due to MLL's location in the upper South Island, and long-run cost uncertainty in demand management benefits, means the grid-connected batteries have a higher economic bar to clear than similar projects in the North Island. However, the secondary benefits of a battery option may favour this if supporting a new network development with a primary driver in deferred capital expenditure.

7.9 Non-network solutions

The electricity distribution model has, until recently, remained relatively unchanged for many decades. However, the industry is now seeing the increasing availability of alternative technologies to the traditional network assets of poles and wires, mainly through small scale distributed generation and battery storage. The use of non-network solutions, where appropriate, can offset investment in standard network assets. However, it needs to be recognised that an effective electricity network provides significant diversity benefits of electricity utilisation between ICP's and typically can provide more flexibility in meeting consumer demand.

Historically, MLL has implemented non-network solutions including ripple control of water heating, night-store heaters, peak demand tariffs and reactive power tariffs. These legacy solutions have become less applicable as the line and energy segments of the electricity supply chain have been vertically disaggregated and line charges have diminished relative to the costs of energy. By way of example, the cost difference between delivered day/night energy has been markedly reduced over time.

Irrespective, the ripple control system remains a valuable tool for load management and is used to good effect when there are restrictions in Transpower's capacity to supply.

Significant uptake of electric vehicles may result in the need for the introduction of alternative line delivery pricing structures, for example, if network capacity constraints are experienced. MLL has recently introduced a ripple controlled tariff for EV charging and will consider its usefulness and alternative pricing incentives.

With respect to new non-network solutions (technologies), MLL is part of a national industry group considering the potential impact of disruptive technologies, and the manner in which network assets will be operated and managed in the future. Technologies which are becoming increasingly available and affordable are likely to impact the network. These include distributed generation (PV in particular), to a lesser extent wind, and EVs in conjunction with capability improvement and cost reduction in storage batteries.

7.9.1 Battery technology

Battery technology is an important factor in both EVs and in the uptake of PV. Low-cost batteries could enable some installations to become independent of the electrical network if the flexibility and reliability of supply capacity provided by the network is not a high priority. Batteries can provide electricity consumers and traders with a means to store the generation and use it at times that produce maximum benefit. But, as with the utilisation of PV, the cost of the batteries needs to be balanced

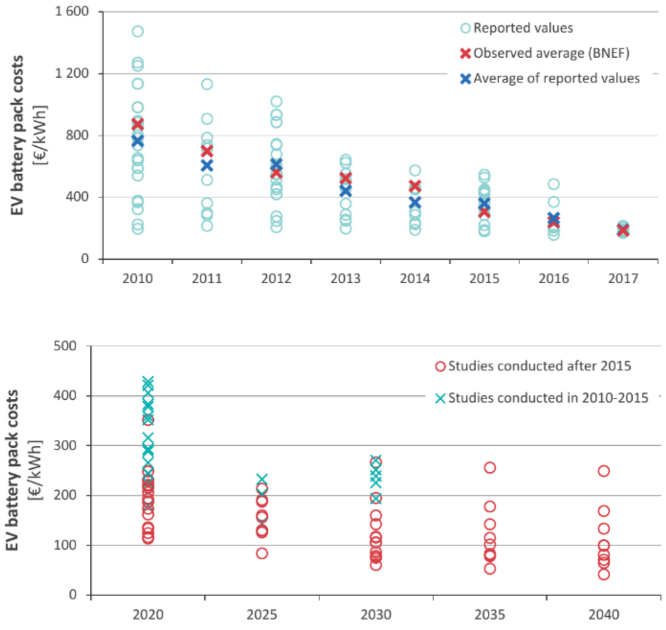


Figure 29: Forecast lithium-ion battery costs

against the introduction of cost reflective network prices, the requirement for which has been signalled by the Electricity Authority.

A study of battery costs for EV and stationary storage commissioned by the EU in 2018 forecast falling battery costs as illustrated in Figure 29.[20] Battery prices have subsequently increased due to COVID pandemic related supply constraints however it is thought that costs will fall back to the anticipated downward trend. This shows past falling costs and projected costs out to 2030 down to €100/kWh, representing an approximate halving of current costs.

These cost reductions are expected to drive increased take-up of both battery storage for PV installations, thereby increasing their utility, and the take-up of EVs assuming these costs pass below price threshold points for consumers. The main issue from a strategy perspective is that the future take-up rates for these technologies is uncertain. MLL is mindful of this and will monitor this technology closely.

7.9.2 Remote Area Power Supplies

Remote Area Power Supplies (RAPS) are essentially an alternative electricity supply from a standalone generation system to that of a network connection. A RAPS system typically utilises a combination of solar generation, battery storage and diesel generator backup to provide supply security. Existing RAPs within MLL's region tend to include diesel generation, and therefore they are not generally part of a decarbonisation strategy.

[20] "Li-ion batteries for mobility and stationary storage applications "JRC science for Policy Report; ISBN 978-92-79-97254-6".

As has been outlined in this AMP, MLL has a significant number of uneconomic connections, particularly at the extremities of the network. There are a very small number of instances where RAPS may provide immediate benefit, by minimising economic losses, typically at sites characterised by:

- Extreme remoteness resulting in increased line and vegetation maintenance costs.
- Extremely low consumer counts per km of line requiring renewal.
- Poor asset health driving a case for short-term renewal.

While MLL does not currently have plans for any significant investment in RAPS within the next five years, MLL is proactively reviewing this situation and is currently piloting a RAPS system near Riverlands.

Depending on the outcome of the trials, MLL may look to implement RAPS systems at other suitable sites. The potential to install RAPS as an alternative electricity supply will need to consider:

- significant renewal of the assets where RAPS may be most suitable as a replacement alternative is not likely to be required within the next five years;
- battery technology and asset life cycles;
- uncertainty around the safety risks and maintenance costs associated with a RAPS scheme;
- costs and risks associated to the transport of back-up diesel fuel (particularly over water ways in the Marlborough Sounds), and the storage, maintenance and security of managing diesel fuel in remote areas;
- uncertainty in the regulatory environment particularly in regard to battery and generation ownership; and
- MLL’s obligations for the continuance of supply under the Electricity Industry Act 2010.

MLL believes that a coordinated approach with government and its regulators would be beneficial to EDBs and consumers alike. MLL has a significant proportion of ICPs in areas that are uneconomic and have always been uneconomic. Continuance of supply to these ICP’s will add costs for consumers in economic areas in a form of indirect cross subsidy.

MLL has been in the process of negotiating with a number of consumers to utilise RAPs for their electricity supply, however, no consumers have agreed to move during the year, preferring the reliability of their existing network supply.

7.9.3 Network adaption

The role of network services may diversify to range from a traditional full lines service to provisioning firm capacity, fault current and frequency regulation support for micro networks. The greatest risk for MLL may not be mastering the technology involved but rather the ability to properly reflect its long-run and marginal costs for the services it provides.

It is generally believed that the factors driving the uptake of new technologies will not result in a need for major change in asset management practices within the period of this AMP or that future plans can be adapted as the technology becomes established and its effects more certain. MLL intends to implement an Advanced Distribution Management System which will assist MLL to manage the real time impacts of these technologies (see Section 3.3). MLL will continue to monitor these technologies and consider how the network can best be managed to give maximum benefit to all stakeholders. MLL does not anticipate any difficulty meeting the requirements of EVs as and when their additional demand commences.

7.10 Key assumptions

In preparing this AMP, and undertaking its asset management activities, one of the key assumptions made by MLL is that its business will carry on in perpetuity.

Other key assumptions (quantified where possible) are set out in Table 22.

Table 22: Significant assumptions underpinning MLL's asset management (and AMP)

Assumption	Sources of uncertainty	Possible impact of uncertainty
That no major disasters or widespread systemic problems will occur.	While contingency planning and emergency response plans are in place, it is difficult to predict the timing, extent and location of events with any great degree of certainty.	Extensive damage to significant proportion of MLL's network requiring significant expenditure (both opex and capex) in a relatively short timeframe. MLL has no debt, a strong balance sheet and is expected to have the capacity to deal with all but the most serious of disasters.
That there are no significant changes to local authority (i.e. Marlborough District Council (MDC)) long-term plan.	MDC may alter existing plans. This may allow opportunity for cost sharing with MLL – for example, if road widening, or renewal of underground services occurs, then there may be opportunity for MLL to renew electrical infrastructure (or underground overhead sections) at the same time.	Inclusion of as-yet unplanned activities by MLL.
Inflation assumptions.	Inflation is managed by the monetary policy of the Reserve Bank of New Zealand (RBNZ). While RBNZ aims to keep inflation near the 2% target midpoint, this could vary.	Inaccuracies in forecast expenditure amounts (either over or under depending on actual vs assumed price inflator allowed for). Further detail is presented in the expenditure forecasts section.
There are no significant changes to forecast load demand.	Step change in district population growth, or load demand from industry growth.	Additional or reduction in forecast growth expenditure.
Consumers remain satisfied with current reliability and resulting costs.	Consumers may change preferences – i.e. accept less reliability for lower lines charges. Uncertainty here is knowing consumers' future preferences.	Less revenue, which in turn would result in less expenditure. Ultimately, this would result in a less reliable network.
No significant changes to regulatory regime and requirements.	Change in Government, changes to regulatory nature/requirements of EDBs.	Revision of the AMP may be required to adhere to any changes in regulatory requirements.

Table 23: Significant assumptions underpinning MLL's asset management (and AMP)

Assumption	Sources of uncertainty	Possible impact of uncertainty
The rate of uptake of new technologies (e.g. EVs, PV).	The rate of uptake of new technologies is largely unknown at this stage.	The widespread charging of EVs on the network has the potential to provide a source of revenue which currently does not exist, particularly given that MLL's network is typically not capacity constrained in urban areas. The widespread installation of PV can have two principal effects. A reduction in delivered energy to ICPs where all of the output is consumed within the premises and if large numbers of consumers sought to inject into the network the level of PV or their internal control, would need to be limited to prevent voltage problems. In event of injection from ICP PV, the network will be required to deliver to other ICPs. The introduction of cost reflective line charges will likely dampen enthusiasm for PV given line charges should relate to installed network capacity not delivered energy. If the cost of battery storage were to significantly be reduced, the benefits of photovoltaics, would be further enhanced but if network charges related to the provision of capacity required for security of the network capacity, the utilisation of photovoltaics and batteries would be constrained.
That no major new loads or new sources of generation connect to the network.	Inability to accurately predict future growth which is controlled by others, change in economic opportunities for various industries.	May require upgrade and/or modification(s) to the network depending on the nature and scale of new load(s) or generation. Addition to growth expenditure above forecast.
That MLL continues to obtain its grid connection from one Grid Exit point	Although the Blenheim Transpower GXP's capacity is rated sufficiently for the foreseeable future, there are resiliency concerns in relying on one source of supply.	MLL's network planning is centred on the existing Blenheim GXP. If MLL decided that it was justifiable to develop a second GXP, this could have effected network planning had a plan for a second GXP been made earlier.

7.11 Asset management improvement

Completion of the AMMAT has identified areas of improvement in MLL's asset management. A selection of improvements (those deemed as having the greatest importance/benefit) based upon the AMMAT assessment are summarised in Table 23.

Table 23: Asset Management Improvements for MLL

Improvement Area	Details	Improvement Action
Asset management framework	Compare existing asset management practices to assess whether they fit with industry standard asset management framework.	Consider modifying and aligning existing asset management to fit with ISO 55001 framework.
Personnel/resourcing	Effective asset management requires adequate resourcing (staffing) to develop, implement and manage asset management policy, processes and procedures.	Continually review staffing structure and determine whether changes in roles may benefit existing asset management at MLL. Asset management could be improved with staff solely dedicated to asset management. This is challenging given the relatively small size of this organisation and breadth of work. In 2022 MLL employed a dedicated asset management engineer.
Asset data	Certain assets and/or their attributes data is less accurate than desired by MLL. Greater focus should be placed on asset data to ensure data integrity.	Continually review asset data and if requirements are meeting MLL needs and where improvements can be made. Undertake a retrospective data capture on selected asset classes. In 2022 MLL piloted a desktop review of GIS data over a small area of its network to test the ability to perform data improvements. MLL intends to engage a further GIS specialist I 2023 to focus on correcting legacy GIS data.
Asset data	Review success of the new as built standard and continually improve including the method of collecting data.	Implement new as-built process and review effectiveness. In 2022 MLL purchased new GPS equipment to improve the accuracy of as-built data of asset and in particular cables
Information systems	A number of information systems are in use.	Review information systems to ensure appropriateness and that correct asset data is held.
Information systems	Mobility.	Further develop and expand mobility solutions to capture more asset information in the field.

8. Network development

8.1 Overview

MLL's network has been developed over time in response to the demand of its consumers. This will continue into the future. This section provides details on the anticipated forecast growth in demand and changes that are expected to the network to accommodate that.

8.2 Growth/demand projections

8.2.1 Demand trends

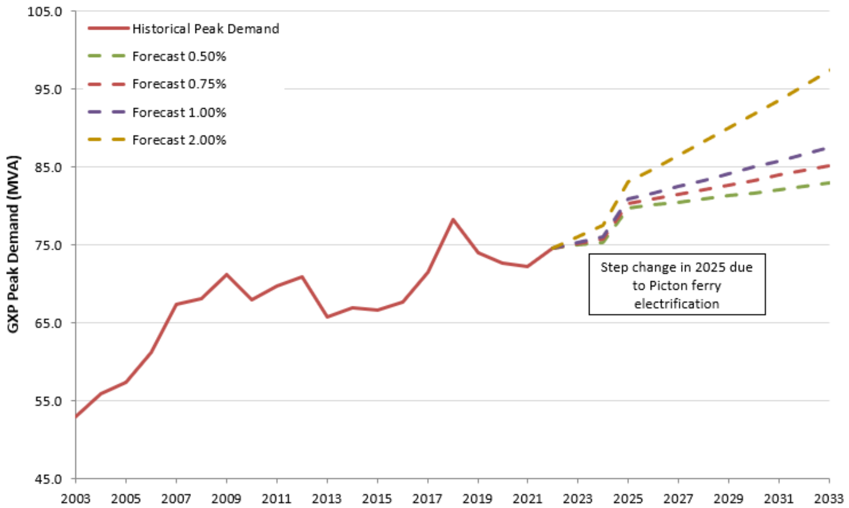


Figure 30: Network peak demand trend and forecast

Figure 30 shows both the historical and forecast demand for MLL's sole GXP. The growth rate is projected to be approximately 0.75% per annum, however, higher and lower rates are included to illustrate the effect of variability when carried forward over the 10-year planning period.

Notable features of this forecast are steady growth across the planning period and a step increase occurring around 2025.

The steady growth is mainly a result of:

- residential subdivision activity, especially in the Springlands, Omaka, Taylor Pass and Wai Iti areas; and
- changes in the demand of some larger industrial consumers, particularly viticulture, driven by economic growth as described in Section 4.1.1.6.

A step change is expected to be seen at the GXP level due to the electrification of the KiwiRail ferries. Figure 30 does not reflect the full capacity of the development, earmarked as approximately 9MVA in Section 8.5.1.2.1, as some degree of diversity is expected. MLL will look to revise this forecast once more is known about charging profiles, peak coincidence factors, and secondary port developments coinciding with the new ferries and terminals.

MLL continues to keep under review the uptake of electric vehicles and the charging requirements that come with them. While a widespread shift to EVs will undoubtedly have a significant effect on electricity consumption, it is unclear how this will impact peak demand particularly at the GXP level. There may be technical mitigations, such as controllable load, and behavioural factors, such as off-peak incentives and tendency to trickle-charge each night rather than fast-charge once a week, which could curtail increases to peak demand.

Figure 30 shows an upper growth rate of 2%. This is considered very aggressive growth by MLL, well above the projected rate of 0.75%. Even if a mass adoption of EVs did increase MLL's growth rate, it is not expected to exceed the secure capacity available at the Blenheim GXP during the current planning period.

Table 24 presents a summary of the maximum forecast Blenheim GXP demand, noting that column headers are calendar years. Note that the GXP post contingent (n-1) summer rating is 117 MVA which allows for normal loading profiles to exceed the 100 MVA continuous summer rating. The GXP rating is currently limited by the GXP 110 kV / 33 kV transformers and their connections.

Table 24: Blenheim maximum demand forecast

Substation	Security rating	Secure capacity (MVA)*	2022 (actual)	2023	2028	2033
Blenheim GXP	N-1	100	74.6	75.1	82.1	85.2

*Maximum continuous summer daytime capacity

8.3 Area plans

The network is split into five planning areas to better segment demand forecast and associated planning. The areas are based on both geographical and load type features. These area plans are summarised in the following sections.

8.3.1 Blenheim planning area

Stable residential and commercial growth is forecast for the Blenheim area. This, together with other drivers such as improving network resilience to major contingent events, will be the main drivers of investment in this area. Security in the area is generally satisfactory with all substations supplied by at least two separate 33kV circuits.

Security and growth project spend over the 10-year planning period is set out in the Expenditures section of this AMP.

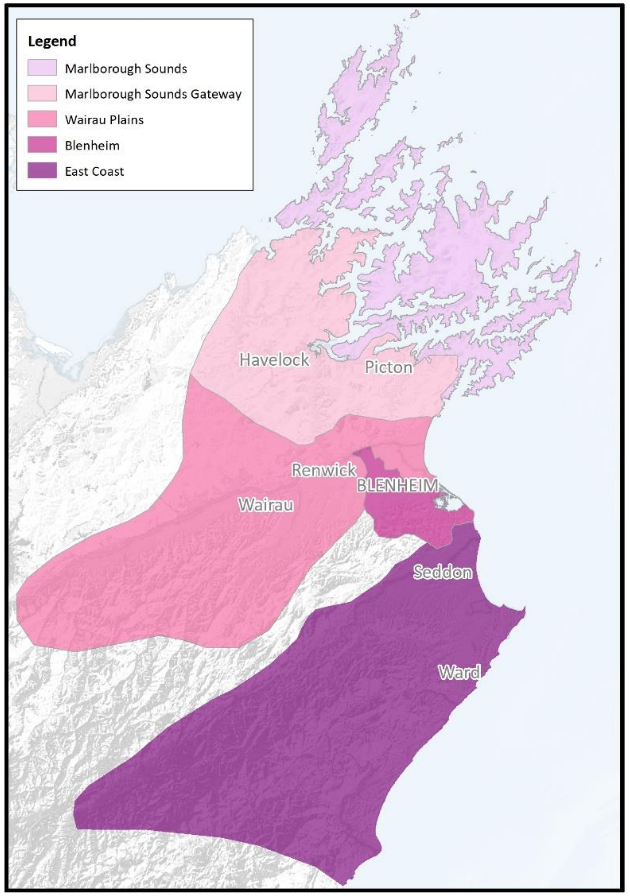


Figure 31: MLL network planning area

8.3.1.1 Area overview

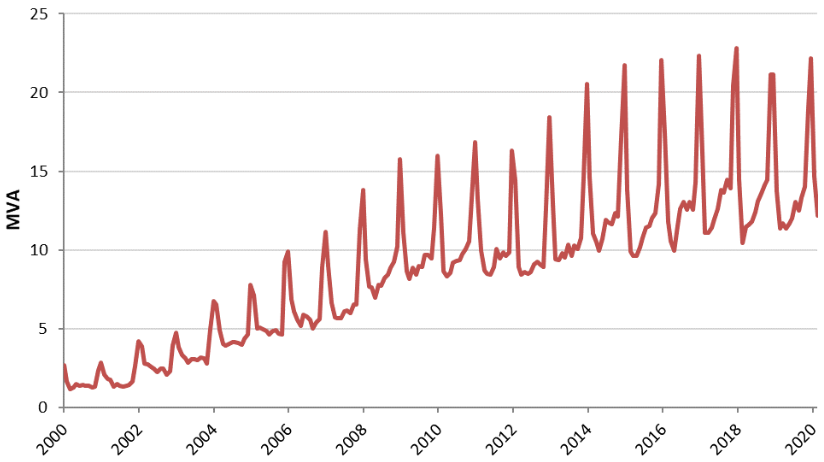


Figure 32: Winery maximum demand by year (MVA)

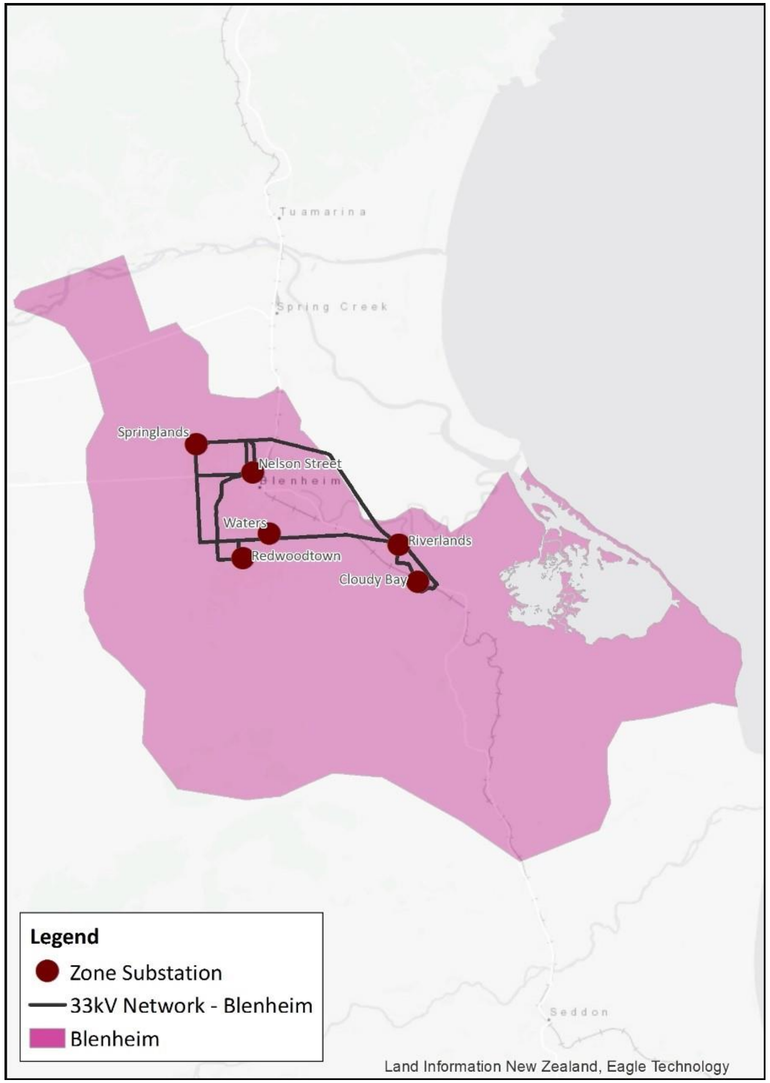


Figure 33: Blenheim urban area

The Blenheim area terminates roughly at the town boundaries but also includes the industrial zones at Riverlands. Six of the 16 zone substations are within this area: Springlands, Nelson St, Waters, Redwoodtown, Riverlands, and Cloudy Bay. These substations are all supplied by the single Blenheim GXP located near Springlands.

Blenheim contains a mix of residential, commercial and small industrial consumers. The maximum demands are predominately a result of winter heating and tend to occur at 7am to 11am and 4pm to 8pm during cold and/or wet times. In total, the Blenheim area represents over half of MLL's total ICPs.

When viewed at an individual consumer level, individual residential load growth is static or falling slightly due to a range of factors, including increased use of energy-efficient lighting, use of heat pumps rather than conventional heaters, etc. This trend is expected to reverse with the increase in EV uptake, the effects of banning residential gas connections in new homes from 2025, and from the increasing number of consumers due to steady population growth.

The industrial type load tends to be driven by wine processing (late March to early May) and can be when Marlborough reaches its peak demand. Load growth generally follows the viticulture industry growth. The nature of the wine processing load is illustrated in Figure 32. It is anticipated that this type of load will continue to grow.

8.3.1.2 Demand forecasts

Demand forecasts for the Blenheim zone substations are shown in Table 25 (column headers are calendar years).

The Blenheim area has a relatively high rate of growth with much of that coming from the Riverlands and Cloudy Bay industrial areas. Considerable investment has recently taken place in this area with two of the six zone substations less than 15 years old.

Table 25: Blenheim area zone substation maximum demand forecasts

Substation	Security rating	Secure capacity (MVA)	2022 (actual)	2023	2028	2033
Cloudy Bay	N-1	16.5	5.8	5.9	10.0	11.3
Nelson St	N-1	16.5	13.6	13.8	14.9	16.1
Redwoodtown	N-1	15.0	10.3	10.5	11.3	12.1
Riverlands	N-1	10.0	9.7	9.9	7.8	8.6
Springlands	N-1	16.5	8.9	9.1	9.8	10.5
Waters	N-1	16.5	8.0	8.1	8.8	9.4

Cloudy Bay is forecast to grow considerably but a large part of that is planned load transfer from the nearby Riverlands zone substation. This growth is largely based on a continued and stable viticulture industry. An inland transport hub is being planned for this area which may increase load further.

Nelson Street is predicted to almost reach its secure N-1 capacity by the end of the planning period if increases in demand in Blenheim's commercial CBD occur. This can be addressed by the transfer of load to other zone substations or uprating the transformers with air forced cooling

Aside from the normal capacity utilisation of a particular substation, it is also necessary to consider flexibility of operation within the network should circumstances preclude the utilisation of a zone substation requiring its load to be transferred to those adjacent.

8.3.1.3 Area constraints

Growth constraints affecting the Blenheim area are the zone substation capacities. As noted above, peak demand is expected to approach the secure capacity at Nelson Street zone substation near the end of the planning period unless otherwise mitigated.

8.3.1.4 Growth and security projects

Various future projects relating to growth, security, reliability, and safety are outlined in Section 8.5. These consist mainly of completion of 33kV network meshing projects, protection upgrades and Nelson Street transformer upgrades.

8.3.2 Wairau Plains planning area

Tapp zone substation was recently constructed and commissioned to replace the Renwick zone substation due to a combination of growth, aged equipment and proximity to the Wairau Fault.

Steady growth in this area is not forecast to trigger any security constraints. However, many long radial feeders are located in this area which pose their own security implications.

8.3.2.1 Area overview

The Wairau Plains area surrounds the Blenheim planning area and covers the more rural parts of Marlborough. Four of the 16 zone substations are located in the Wairau Plains planning area and include Woodbourne, Tapp (replacing Renwick), Spring Creek and Leefield.

Significant features of this area include Woodbourne airbase and airport, Renwick Township and a substantial horticultural/agricultural area with extensive vineyards. The load tends to be driven by wine processing (late March to early May) and the need for irrigation in the vineyards (December to March).

8.3.2.2 Demand forecasts

Demand forecasts for the Wairau Plains zone substations are shown in Table 26 (column headers are calendar years).

Table 26: Wairau Plains area zone substation maximum demand forecasts

Substation	Security rating	Secure capacity (MVA)	2022 (actual)	2023	2028	2033
Leefield	N	5.0	1.8	1.8	2.1	2.3
Spring Creek	N-1	5.0	3.7	4.1	4.4	5.0
Tapp	N-1	16.5	10.4	10.6	11.7	13.0
Woodbourne	N-1	10.0	8.6	8.7	9.6	10.6

The growth in this area is forecast to be steady at 1.5-2.5% based largely on previous data and anticipated growth in the area (primarily residential and vineyard related (irrigation and/or processing) developments).

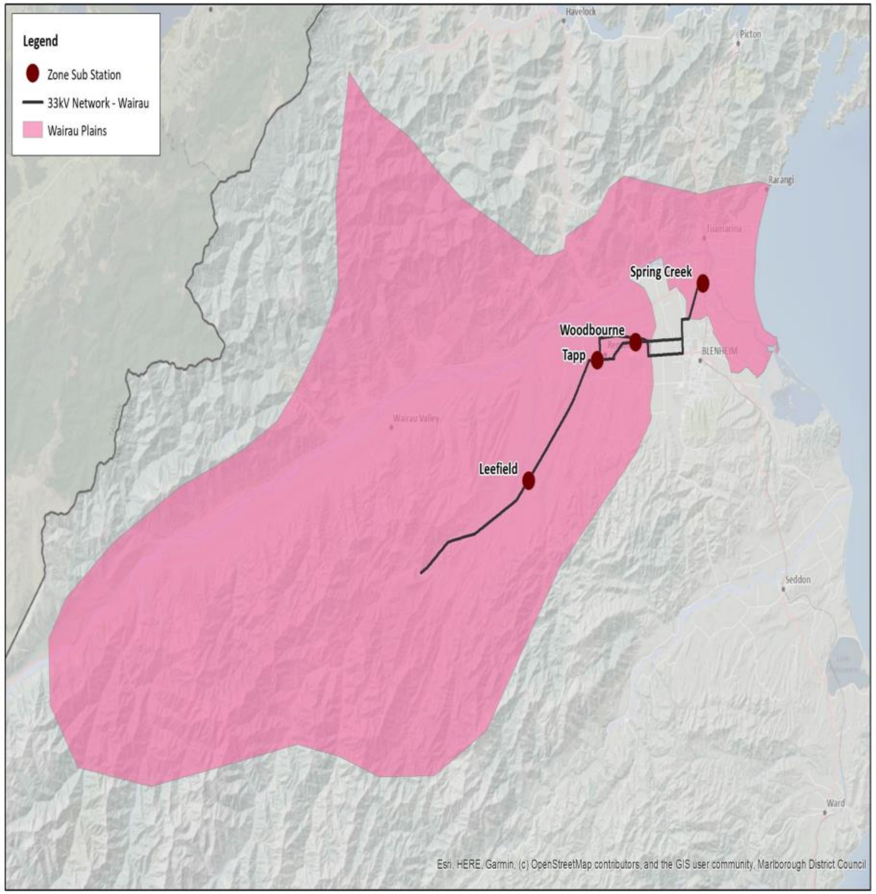


Figure 34: Wairau Plains area

8.3.2.3 Area constraints

Major constraints affecting the Wairau Plains area are:

- Kaituna Valley load capacity constraint (should there be a significant demand increase).
- Leefield zone substation at only N security (but loaded below the 5MVA security trigger level).

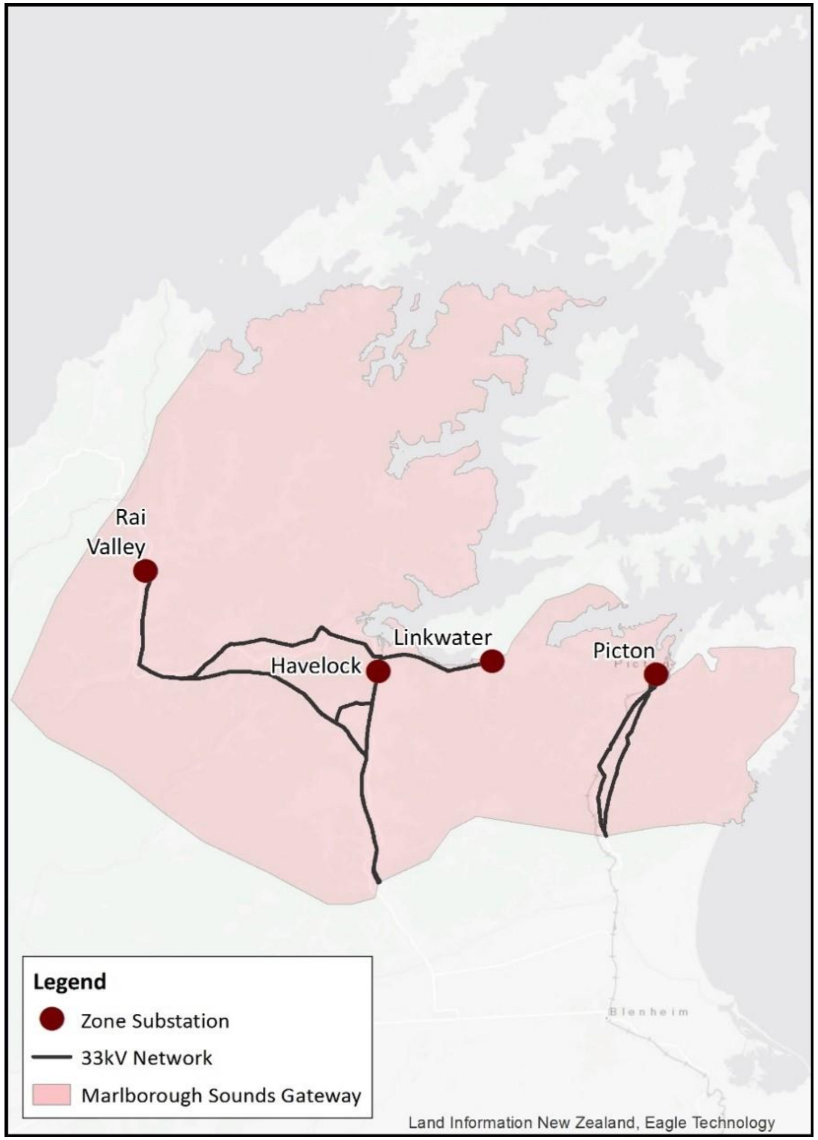


Figure 35: Marlborough Sounds "gateway" areas

- The Upper Wairau Valley cannot accept significant load increases due to voltage drops on its 11kV feeder which already has four series regulators along it.
- Spring Creek zone substation supplied by dual circuit strung on the same towers such that one event could impact both circuits and supply to the substation.

8.3.2.4 Growth and security projects

Projects planned for the Wairau Plains area are:

- Spring Creek Substation Upgrade in conjunction with the planned new Waitohi substation in the Picton Wharf area.
- Kaituna substation, subject to confirmation of a major consumer increasing its demand through expansion and funding arrangements (combined with inability to supply this load from adjacent substations).
- Wairau Valley Capacity Upgrade, subject to financial commitments of major customers in the Upper Wairau Valley. The 11kV feeder constrains the addition of irrigation loads in the Upper Valley, and a 33kV feeder and substation is required in the area to lift this constraint.
- Woodbourne and Spring Creek transformers are planned to be replaced within the planning period, and a second transformer added to Leefield as described in section 10.5.2.6.

These, and other less substantial projects in the area are set out in Section 8.5 and 10.12.

8.3.3 Marlborough Sounds "gateway" planning area

Most forecast load growth in the Sounds Gateway area is low at only 0.1-0.3% with the residential sector converting to more efficient appliances and lighting. Irrigation load in the Rai Valley area is steady and there is limited industrial growth other than major harbour related growth in Picton.

MLL is working with KiwiRail on a probable 9MVA load increase within Picton due to electrification of its ferries. This will necessitate a new zone substation, as detailed in Section 8.5. Otherwise, few projects other than renewals are planned for this area.

8.3.3.1 Area overview

The Marlborough Sounds gateway area includes the townships of Rai Valley, Havelock and Picton. Four substations supply this and the Marlborough Sounds area and include: Rai Valley, Havelock, Linkwater and Picton. These substations are all supplied by the Blenheim GXP, with Picton being supplied by dedicated 33kV dual circuits.

Parts of the planning area are largely pastoral (beef/sheep) with a low ICP density. The inland valleys tend to be sheltered from storms. Pastoral land use combined with some irrigation means that the load tends to peak in the winter months.

The planning area also includes Waikawa, a suburb of Picton.

8.3.3.2 Demand forecasts

Demand forecasts for the Sounds Gateway zone substations are set out in Table 27 (column headers are calendar years):

Table 27: Sounds gateway area zone substation maximum demand forecasts

Substation	Security rating	Secure capacity (MVA)	2022 (actual)	2023	2028	2033
Havelock	N-1	5.0	2.5	2.8	2.9	2.9
Linkwater	N	5.0	3.5	3.5	3.5	3.5
Picton	N-1	15.0	7.3	7.3	7.6	7.9
Rai Valley	N	3.0	2.2	2.3	2.3	2.4
Waitohi	-	-	-	-	10	14

Based on previous years' data the forecast load in this area is very low with a flat load for all except Picton zone substation and the wharf area where an approximately 9MVA load increase within the Picton area is anticipated in 2025 largely due to ferry electrification. There is potential for:

- Further commercial and/or light industrial development at the Havelock marina area. Should this development materialise, then the figures forecast for Havelock will likely be exceeded; and/or
- Significant further demand in the Picton and Waikawa areas from mainly marine transport electrification.

8.3.3.3 Area constraints

Constraints affecting this area are:

- Rai Valley and Linkwater zone substations at N security.
- All four zone substations are supplied by a dual 33kV circuit strung on the same towers (over some sections of the line) where one event could affect both circuits and supply to these substations (Picton is separate to Rai Valley, Linkwater and Havelock but suffers the same problem over some sections of those respective lines).

- The network was not designed to cater for large scale step changes of the marine loads due to transport electrification.

8.3.3.4 Growth and security projects

The electrification of KiwiRail's ferry necessitates a new zone substation at the Waitohi Wharf (Waitohi substation), upgrades to both of the 33kV lines to Picton, and connection of the Waitohi substation to the network by 33kV underground cables, as detailed in Section 8.5. Otherwise, few projects other than renewals are planned for this area in the shorter term.

In the longer term, an alternative 11kV feeder into the Waikawa area is anticipated. This is likely to be mostly underground works in the urban Picton environment and therefore will be a major undertaking.

The aged Rai Valley 3MVA T1 transformer will be replaced with a refurbished transformer as described in Section 10.5.2.6. These, and other less substantial projects in the area are set out in Sections 8.5 and 10.12.

8.3.4 Marlborough Sounds planning area

MLL does not have any substations in this planning area. However, it has approximately 750km of 11kV distribution lines (in the order of 20% of the network) in the Marlborough Sounds. These 11kV lines supply approximately 2,500 consumers by way of 15,000kVA of distribution transformer capacity. There are on average around three consumers/km of HV line compared with over nine consumers/km for the entire network. Many of the installations are holiday homes with intermittent occupation - approximately 50% of consumers in the Marlborough Sounds use less than 2,000kWh per annum (note, this compares to an average residential/domestic household consumption of approximately 7,500kWh per annum).

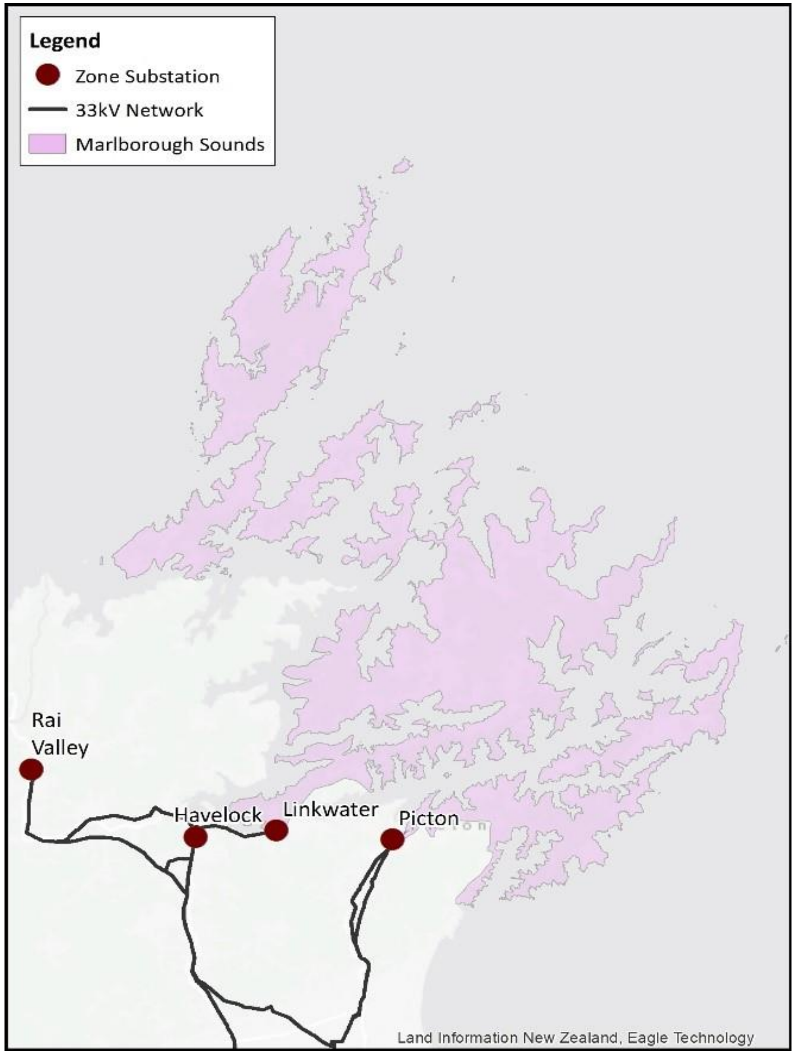


Figure 36: Marlborough Sounds planning area

The maximum demands on the various lines supplying the Marlborough Sounds generally occur over long weekends or public holiday periods – Easter, Christmas, Queens Birthday or Labour Weekend. This holiday occupation also leads to much lower diversity of demand than would usually be expected from most areas.

8.3.4.1 Area overview

Reticulation in the Marlborough Sounds poses many construction and operational challenges. Most of the lines are constructed over rugged terrain, with access to many areas for construction and maintenance limited to foot, tracked vehicles or helicopter. Often spans are relatively large in length where valleys need to be traversed. Some areas do not have road access and can only be accessed by boat and/or on foot. The Marlborough Sounds has a relatively high rainfall and a climate that encourages rapid vegetation growth, leading to the need for tree trimming and vegetation control on a short return basis. These issues have been exacerbated further by recent storms and landslides which have destroyed public road and MLL track access to some parts of MLL's network. The future of some of the Marlborough Sounds public roading system is under review by the Marlborough District Council. Outcomes of this process may impact upon load and MLL's ability to service the network. MLL is following developments closely.

A significant issue facing MLL regarding reticulation in this area is also associated with load growth or supply enhancement.[21]

Many of the existing lines are built on private-or Government-owned land and constructed in the 1960s and 1970s, with access protected by the "existing works" provisions of the Electricity Act. MLL has limited easements over line routes. Therefore, upgrades which necessitate changes to the existing layout or create an injurious effect on the land require new easements to be created. Any future major developments in the Marlborough Sounds area would require very careful analysis and design of both asset and non-asset (e.g. demand control) alternatives to ensure the optimal solutions are found.

In many instances, the access utilised to construct the lines has long since gone. Lines which were constructed over rugged bush-clad terrain by helicopter pose particular problems, especially in relation to line access and vegetation maintenance.

A further issue with respect to lines in the Marlborough Sounds is that of supply reliability. Lines supplying the Marlborough Sounds are radial/spur lines, with no interconnection to other parts of the network.

8.3.4.2 Demand forecasts

Demand forecasts for the Marlborough Sounds main 11kV feeders are shown in Table 28 (column headers are calendar years).

[21] Whilst load is decreasing in average across the area, there remain instances of load increase or supply enhancement at some points.

Table 28: Demand forecasts for main 11kV feeders in Marlborough Sounds

Feeder (zone sub)	Zone substation security rating	Zone substation secure capacity (MVA)	2022 (actual)	2023	2028	2033
French Pass (Rai Valley)	N	3.0	0.9	0.9	0.9	0.9
Sounds (Linkwater)	N	5.0	2.4	2.4	2.4	2.4
Waikawa (Picton)	N	15.0	3.8	3.8	4.0	4.2

The load in this area is forecast to be relatively static based on recent load trends.

8.3.4.3 Area constraints

Constraints affecting the Marlborough Sounds area are:

- Radial feeders, although MLL does have emergency generation installed at Kenepuru Heads and Elaine Bay.
- All three substations which supply the 11kV feeders (Table 28) are themselves supplied by a dual circuit strung on the same poles (over certain sections) where one event could affect both circuits and supply to these substations.
- There are limited opportunities to transfer 11kV load between substations because of the distance involved and the radial nature of the feeders.
- Backup substation supply is best provided by mobile generators owned by MLL.
- Much of the area is supplied by SWER. MLL places limitations on the load that can be placed on SWER lines largely for safety reasons.

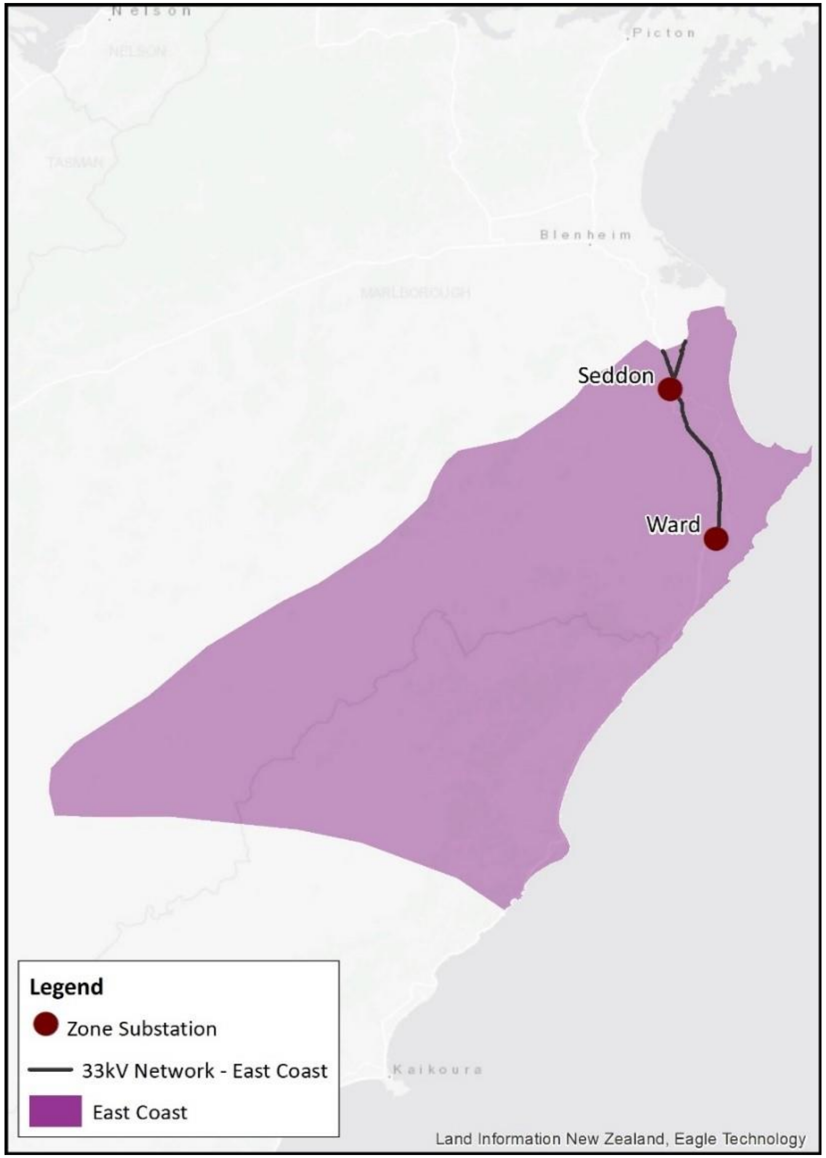


Figure 37: East Coast area

8.3.4.4 Growth and security projects

Growth or security (reliability) related projects for the Marlborough Sounds planning area are set out in Section 8.5.

MLL is also encouraging the use of non-network solutions in this area such as RAPS as discussed in section 7.9.2. To date, customers have shown little interest in RAPS due to the good service and price already provided by the network in the area.

8.3.5 East Coast planning area

Forecast load growth in the East Coast area is low. The terrain and environment lend itself to mainly pastoral farming. The viticulture industry has been expanding in the Seddon area, but water is limited further south constraining expansion into these areas. However, MLL understands that a significant irrigation project in the Ure River area has been considered. If this materialises, it will result in intensified land use including viticulture and dairying. Any pumping station proposed at Ure River may ultimately necessitate an upgrade of the capacity of the existing line.

8.3.5.1 Area overview

The East Coast area includes the townships of Seddon and Ward. Each town is the location of a substation.

The East Coast consists of a narrow strip of coastal land running down to Marlborough's southern boundary, with some sparsely populated river valleys running into the centre of the South Island. Much of the network in the coastal area was constructed in the late 1950s using concrete poles and copper conductor. The long radial nature of the area means there are no alternative supplies available during faults or planned outages. The low population density makes it difficult to justify the high levels of expenditure required to provide alternative supplies through feeder interconnections.

The sheltered nature of the land and pastoral land use, with relatively small areas of trees and vegetation, leads to high reliability of supply in these valleys, unless impacted by snow or significant events.

8.3.5.2 Demand forecasts

Demand forecasts for the East Coast zone substations are set out in Table 29 (column headers are calendar years).

Table 29: East Coast area zone substation maximum demand forecasts

Substation	Security rating	Secure capacity (MVA)	2022 (actual)	2023	2028	2033
Seddon	N-1	10.0	6.5	6.6	7.2	7.8
Ward	N	5.0	0.9	1.3	1.3	1.3

The forecast load for both Seddon and Ward is relatively flat based on loading data from recent years. However, MLL is aware of current investigations into an irrigation scheme at Ure River. If this proceeds, then maximum demand at Ward is likely to increase and MLL may then need to facilitate this growth by upgrading its existing 11kV East Coast feeder from Ward.

8.3.5.3 Area constraints

Constraints affecting this area are:

- Radial feeders; and
- Wind generation consumes line capacity.

8.3.5.4 Growth and security projects

Growth or security (reliability) related projects for the East Coast planning area are set out in Section 8.5. Wind and solar generation developers may financially support future network upgrades and/or connections due to generation projects that may arise in this area. This is discussed in section 3.2.2 and 8.4. MLL will support these if the funding by generation developers arises.

8.4 Grid Exit Point and embedded generation

8.4.1 Grid Exit Point

MLL receives electricity at 33kV from the transmission grid, owned by Transpower at the single GXP at Springlands. The GXP post contingent (n-1) summer rating is 117 MVA which allows for practical loading profiles to exceed the 100 MVA continuous summer rating. The 117 MVA limit is set by Transpower's 33kV cables. If these were replaced the post contingent summer (n-1) GXP limit would be 128 MVA. Forecast load growth over this planning period does not see the load exceed the 100 MVA summer continuous capacity of this GXP

No growth or security projects are therefore planned.

Due to the long-time frames involved in developing GXPs, and the potential for significant generation or load developments in Marlborough, MLL is considering future GXP options including additional GXPs. For example, future Cook Strait ferry battery enhancements could require further step changes in demand in the Picton area, necessitating a 110kV line and substation to be developed in Picton. Major wind farm developments in the East coast area would require a 110kV line and substation. Considering that Renwick is one of the top three load centres in Marlborough, it may be prudent to consider a future 110kV substation in this area. As discussed elsewhere, the existing GXP is sufficient within the planning period, however a new further GXP may be an efficient solution for future large-scale load or generation developments. A second GXP may also be considered based on resilience concerns in order to provide a backup for the existing GXP in case of a major disaster.

8.4.2 Embedded generation

Aside from the need to meet increased consumer demand, it also may be necessary for MLL to extend or increase the capacity of its network to provide for new sources of generation from larger single sites.

If, and when, additional generation sites are proposed, MLL will work in good faith with prospective parties, and in accordance with relevant industry requirements (for example Part 6 of the Electricity Industry Participation Code).

8.4.2.1 Policy

MLL is committed to facilitating the connection of new generation to its network subject to generators meeting appropriate technical and commercial criteria. MLL's policies are on its website under "Get Connected". Guidance for embedded/distributed generation is set out in separate categories – generation of 10kW or less, and generation of greater than 10kW.

8.4.2.2 Distributed generation

Embedded or distributed generation with solar and/or wind as the primary energy source is not considered to be sufficiently diverse or reliable enough to reduce or defer capital expenditure for meeting peak demand. Solar has limited production during the winter months where

MLL's peak loads and highest energy flows often occur, while the production from wind is highly variable.

Low solar (i.e. thick cloud cover) and windless days occur despite Marlborough being one the sunniest regions of NZ and, accordingly, it is necessary to have sufficient capacity within the network to cope with days where solar and wind generation is limited.

Manawa Energy operates a 2.5MW "run-of-river" generator at Waihopai which is embedded into MLL's 33kV network. Output of this generator is dependent on rainfall in the catchment area.

Energy3 has two wind farms. At Weld Cone, near the Ward zone substation, there are three 250kW turbines. At Lulworth, just north of the Ure River, four 250kW turbines are installed. Both schemes are embedded into MLL's 11kV network.

Dominion Salt Limited has installed a 660kW wind turbine which is embedded into their 11kV installation.

Kea Energy has installed a 1.85MW solar farm in the Wairau Valley which is embedded into MLL's 11kV network.

The potential wind resource in the Marlborough Sounds and on the East Coast is significant. However, the development of substantial wind farms requires the construction of new lines to convey the output to load centres and careful consideration of the need for reactive power compensation.

MLL has applications for connections of solar generation which will likely use all the remaining capacity for large scale generation of the existing network in the East Coast area.

Manawa Energy operates the Branch Power Scheme and was granted resource consent to extend this scheme. Manawa Energy does not currently intend to proceed with construction of this scheme. Land use consents have lapsed with water use consents due to lapse in 2046.

The Wairau Hospital and a number of wineries and local businesses have small diesel generators which are used for load management and emergency power supply. Some of these units are capable of embedded operation.

The current low cost of PV cells has seen an increase in interest in small scale solar distributed generation. Details on the installations on the network are set out in Section 4.3.2.1.

8.5 Major network development projects

The following subsections provide a summary of the major projects identified under network development. In most cases, the alternative option is to "do nothing" and not realise the reliability benefits or facilitate potential future growth. Where other alternative options to "doing nothing" are available and have been considered, these are noted.

8.5.1 Growth and security

8.5.1.1 Year one (RY2024)

8.5.1.1.1 Picton Ferry Terminal (Waitohi Zone Substation)

KiwiRail are replacing its existing fleet of Interislander diesel driven ferries with two new larger diesel-electric ferries. The ferries will require a significant source of power from the shore to recharge their batteries. In conjunction with the new ferries the Picton port area is being redeveloped, with a new ferry terminal being the main centre piece. The total increase in load is anticipated to be in the vicinity of 9MVA in late 2025, early 2026.

A new 33/11kV zone substation will be required for this, with dual transformers and associated 33kV and 11kV switchgear. The substation is planned to be supplied by two 33kV cables connected in a loop between the Spring Creek and Picton substations. Modifications will be required at the Picton substation to create the loop.

Funding has been allocated in RY2024 for substation design work and the procurement of long-lead equipment (e.g. transformers and switchgear). Construction of the substation is then anticipated to take place across RY2025 and RY2026 with funding allocated accordingly.

8.5.1.1.2 Spring Creek Substation Upgrade

In order to operate the Springlands – Spring Creek – Waitohi – Picton – Spring Creek – Springlands loop noted above reliably and safely, the Spring Creek substation 33kV switches need to be upgraded to a circuit breaker switchboard with electrical protection systems. A new 33kV switchboard is therefore planned for Spring Creek. It was previously intended to replace the Spring Creek 33kV switches with a switchboard in RY2029, however the increased load and reliability required at Picton has moved this project forward. The expenditure forecast in RY2024 relates to design work and the procurement of long-lead equipment. Physical works at Spring Creek would then proceed in RY2025.

8.5.1.1.3 Picton 33kV Overhead Sub-Transmission – Line 2 Upgrade

To provide the capacity required at the new Waitohi Zone Substation, MLL also needs to upgrade and rebuild sections along each of the two 33kV sub-transmission lines currently supplying Picton. The upgrade on the Picton No.2 line involves pole replacement and conductor upgrade on the final section of line on the approach to MLL's existing Picton substation on Scotland St. (1.3km approximately). This project is scheduled to be complete by the end of RY2024 and expenditure has been included the forecast accordingly.

8.5.1.1.4 Kaituna Substation

As it stands currently, the electricity supply in the Kaituna area is limited due to the voltage restrictions that arise from supplying large loads through radial sections of the 11kV network from Tapp substation. Additionally, security of supply to the area could be reduced due to the impractical nature of supplying load of this magnitude from other alternate supplies.

To supply the main customer in this area, MLL is planning to construct a small zone substation near the existing 33kV sub-transmission network in the area. By constructing the substation, the customer's load could be supplied directly which could assist with further growth and development of industry in the area. The new substation will also increase the quality of supply by removing voltage constraints, increasing reliability, and providing improved security to the primary customer in Kaituna.

MLL is currently negotiating with key stakeholders and, should agreement be reached, the new zone substation is expected to be complete within RY2026.

8.5.1.2 Years two to five (RY2025 to RY2028)

8.5.1.2.1 Picton Ferry Terminal (Waitohi Zone Substation)

As noted above, construction and commissioning of the new Waitohi Zone Substation is anticipated to be in progress through RY2025 and into RY2026. At this stage, MLL anticipates that the substation will be operational by the end of June 2025 (Q1, RY2026).

8.5.1.2.2 Picton Substation - Waitohi Substation 33kV Cabling

As outlined above, to supply the new Waitohi Zone Substation two new 33kV cables will be installed between MLL's existing Picton substation (on Scotland Street) and the new substation located within the ferry precinct development area. The underground cable route is approximately 1.5km long and expenditure has been included in the forecast to complete this project by the end of RY2025.

8.5.1.2.3 Picton 33kV Overhead Sub-Transmission – Line 1 Upgrade

As noted above, to provide the capacity required at the new Waitohi Zone Substation, MLL also needs to upgrade and rebuild sections along each of the two 33kV lines currently supplying Picton. The upgrade on the Picton No.1 line involves pole replacement and conductor upgrade on a section of line approx. 10km in length. This project is scheduled to be complete by the end of RY2025 and expenditure has been included in the forecast accordingly.

8.5.1.2.4 Nelson Street Substation

The transformers at Nelson Street Substation are forecast to approach their N-1 capacity within this planning period. Provision has been made on these transformers to fit forced cooling which will increase the rating from 16.5MVA to 20 MVA. This work is scheduled to be complete in RY2025.

8.5.1.2.5 Potential growth-related projects

MLL has received a number of enquiries for increased load at a variety of locations across the Marlborough region. However, there is still some uncertainty regarding exact requirements and in many cases no firm commitment from stakeholders regarding investment funding. The following section therefore provides a summary of what MLL considers could be possible growth-related projects in this period.

- <u>Wairau Valley - Capacity Upgrade</u>

  MLL is considering a new substation west of Wairau Valley township. In recent years, vineyards have continued to spread further up the valley, with very little capacity now remaining. Planning to build a new 33kV/11kV zone substation to supply anticipated future demand is a major investment decision and MLL is actively engaging with the stakeholders who will benefit the most from increased capacity regarding investment funding. When complete, a new zone substation in the Wairau Valley will significantly improve network capacity in that area and will allow a number of vineyards to either avoid installing diesel pumps for irrigation, or to replace already existing diesel-powered equipment.

  At this stage, no expenditure is included in the forecast for this project however should MLL reach agreement with stakeholders regarding investment funding, it is anticipated that construction of a new 33kV/11kV zone substation west of Wairau Valley township would be completed by the end of RY2028. To supply the new zone substation, MLL will also need to commit significant expenditure to construct a new 33kV feeder within the same timeframe.

- Hammerichs Road Zone Substation
  MLL owns a small land parcel on Hammerichs Road, Rapaura over which the 33kV line traverses. MLL has received enquiries from major vineyards operating in this area regarding the possibility of increased load. At this stage, no expenditure is included in the forecast for this project, however should investment funding be agreed, it is likely that construction and commissioning of the new zone substation would take place in this planning period.

- Fairhall Zone Substation
  MLL has an easement over a land parcel in Fairhall, where a zone substation could be constructed to provide capacity for further development (and resulting load growth) in this area. Other options include an additional 11kV feeder originating from Woodbourne zone substation or developing an alternative site east of Fairhall in an area that has recently been rezoned for development by the local council. At this stage, no expenditure is included in the forecast, however MLL will keep abreast of this situation and will contact large consumers in the Fairhall area to better understand the likelihood (and timing) of potential further growth, before considering its options.

- CentrePort, Riverlands
  MLL is aware that proposals are currently being developed for a major new inland cargo hub situated south of Blenheim. The new facility would be located between the Riverlands Industrial Estate and Cloudy Bay Business Park. Supply requirements for the new development are unknown at this stage, however MLL anticipates that further information will become available in RY2024. At this stage, no expenditure is included in the forecast but this may need to change as further information becomes available

8.5.1.3 Years six to ten (RY2029 to RY2031)

System growth is difficult to anticipate for years six to ten due to a number of uncertainties (for example local economic conditions, market demand, etc.) and a lack of information. The following provides a summary of what MLL considers could be possible growth-related projects over this time.

- Blenheim East – Capacity Upgrade
  Approximately 10 years ago, MLL acquired a residential property in Budge Street, which was a strategic investment to provide additional supply capacity for eastern Blenheim. Load growth has not met earlier forecasts in this area (largely a result of engineering investigations revealing unsuitability for dense development following the Christchurch Earthquake Sequence), and, as such, a zone substation has not been developed at the site. At this stage, there are no firm intentions from MLL to develop a zone substation at the site, however this may need to be revisited should further development in this area proceed.

- Blenheim South – Capacity Upgrade
  Dependent on future growth, a zone substation may be required to supplement growth in the southern parts of Blenheim. The Taylor Pass subdivision area, for example, is currently supplied by the Redwoodtown zone substation. Should future growth continue in this area, then additional zone substation capacity may be required. At this stage however, there are no firm development proposals, and no expenditure has been included in the forecast at this stage.

8.5.2 Reliability and safety

8.5.2.1 Year one (RY2024)

The reliability- and/or safety-related projects (i.e. those projects that meet the primary driver definitions of quality of supply and/or other reliability, safety, environment) forecast for RY2024 are set out in the following sub-sections.

8.5.2.1.1 Woodbourne Zone Substation Upgrade

This project is one of a suite of projects which MLL has been implementing since RY2022 to strengthen the 33kV sub-transmission network by allowing it to operate in a closed mesh. This particular project involves constructing a new 33kV switchroom, installing new 33kV switchgear and removing an outdoor overhead bus. New 33kV circuits will then be run from the two existing lines to create an "in-out" arrangement for each circuit as part of the meshing. Detailed planning and design for this project was completed in RY2023 and MLL anticipates that the new switchroom will be constructed and commissioned within RY2024.

8.5.2.1.2 Tapp Substation "T" removal and line rebuild

This is another project in the programme to mesh part of the 33kV sub-transmission network. It involves the installation of 1.3km of cable and the rebuild of 5km of overhead line to remove a "T" connection near Tapp substation and to create discrete circuits from Tapp Substation to Woodbourne, and from Tapp Substation to Long Valley. Detailed planning and design for this project was completed in RY2023 and the project is due for completion within RY2024.

8.5.2.1.3 Advanced Distribution Management System (ADMS)

MLL commenced work on this project in RY2023 and work will continue in RY2024 and further years with expenditure included in the forecast accordingly. MLL's current SCADA system is constrained and a new system is required to allow future SCADA enabled equipment to be managed, as well as providing increased functionality and additional support to manage the greater quantity of data being generated. The new system will provide more flexibility and support live replications of operations for safety.

8.5.2.1.4 Other less material projects

A number of less material projects are also planned under the year one reliability and safety projects. These include:

- Battys Road Fibre Installation

  Several differential protection systems have now been installed as part of the 33kV sub-transmission network upgrade projects – and these protection systems require fibre optic cables to allow relays at each end of the circuits to communicate quickly and reliably. This project will greatly increase MLL's fibre optic capacity between substations in Blenheim and will provide an alternate/shorter path for several protection circuits and SCADA traffic. The project is scheduled for completion in RY2024.

- Two-pole substation - Overhead to Underground Conversions

  MLL has a considerable number of two-pole substations in urban areas which vary in their construction type and environmental surroundings. Although these are now aging, the primary driver is to replace a small number of these each year for reliability, safety and environmental reasons. Under each project the transformer is ground mounted and the structure is usually converted to a single pole. In addition to the improvement in aesthetics, the installation is made safer and more reliable through better LV protection and improved access. While the structures themselves are still generally sound, placing the transformer on the ground will lessen environmental risk from future major earthquakes. In some cases, clearance to ground is compromised due to changes in ground levels over the years. Sites selected for conversion are done so on a priority basis.

- Distribution pillars

  A number of distribution pillars have been identified that present hazards due to their design where there are issues around the clearances between live components and earthed metal. These pillars are typically in the CBD area and as such require careful planning to minimise disruption to businesses supplied through them. MLL is planning to replace several of these distribution pillars in RY2024.

- Remote device installations

  Where appropriate, MLL intends to install remote controlled switches on the network to improve operation of the network remotely, thereby potentially reducing outage times. MLL is planning to install four remote controlled switches in RY2024.

8.5.2.2 Years two to five (RY2025 to RY2028)

8.5.2.2.1 Other non-material projects

The following non-material projects and programmes are proposed to be undertaken within the two-to five-year period (RY2025 to RY2028) of this AMP.

- Backup ripple control plant

  MLL currently has two ripple plants at System Control in Springlands, a 217Hz and 1050Hz plant. It is intended that the 1050Hz plant will be phased out in RY2025 and work is on-going towards this target. Due to its criticality, MLL is also investigating options to provide backup to the 217Hz plant so that there is redundancy in the event of a fault or major event.

- Park Terrace tie line

  This project involves installing an underground cable to replace aged overhead lines down Park Terrace and tying the 11kV network. The project would replace existing end of life assets and increase reliability in the area by providing an alternative 11kV feed. The area is largely occupied by commercial businesses and the project will provide greater capacity and improve reliability.

- Remote device installations

  Continuation of the remote device installation programme which involves the installation of remotely controlled reclosers and automated switches. It may also include replacing and/or automating ground mount switches at strategic points on feeders to allow for faster back-feeding when unplanned outages occur.

- Two-pole substation - Overhead to Underground Conversions

  Continuation of the 2-pole substation overhead to ground mount conversion programme.

8.5.2.3 Years six to 10 (RY2029 to RY2033)

8.5.2.3.1 Murphys Road 11kV and LV cable undergrounding

This project involves undergrounding the overhead 11kV and low voltage cabling along Murphys Road into spare ducts which have already been installed. Overhead lines will be reconfigured and redundant conductors removed.

8.5.2.3.2 Other non-material system reliability or safety projects

For years six to ten of the planning period, the following reliability or safety related projects are proposed. Note that due to these projects being forecast at least five years from now there is greater uncertainty regarding their implementation.

- Waikawa Road alternative 11kV supply

  Approximately 2,000 consumers along Waikawa road and beyond are largely supplied by a single 11kV feed. In the event of an outage on the 11kV feeder, there is no alternative to supply these consumers (other than bringing in mobile generation although the loading is significantly more than the capacity of any one of MLL's mobile generators). MLL therefore plans to investigate options to provide an alternative supply to increase network resilience and reliability in this area. Options may include an underground supply along Waikawa Road, or a second 11kV overhead circuit on poles other than those that the existing circuit is located on.

- DeCastro subdivision tie line

  This area is also supplied by a single 11kV feed. MLL will evaluate options to provide an alternative supply to this area to increase resilience and reliability. In the interim, the line, which services close to 200 ICPs has been converted to swan construction (centre phase conductor raised above the two outside conductors) due to the recurrence of faults through bird strike.

8.5.3 Non-system growth projects

No other non-system growth projects are allowed for in the planning period covered by this AMP.

9. Customer works

9.1 New connections

This chapter outlines MLL's approach to connecting new customers and how expenditure is forecast relating to the connection of new customers. The process used to connect new customers is tailored to ensure the fast, efficient and cost-effective connection of new electricity customers to the MLL network.

9.1.1 Overview of consumer connections

Every year, MLL connects approximately 200 new residential, commercial and industrial electricity consumers to the distribution network. Depending on the size or number of the new connections, the ability to supply the new connections may demand investment to extend the distribution network to the desired point of supply, or to upgrade assets to meet the required capacity.

On occasions, the new consumer connection may require the upgrade of near end-of-life MLL assets to accommodate new equipment and/or an upgrade in capacity. When this occurs, MLL gives consideration to the assets being replaced, and may cover the costs (at least in part) of the new equipment.

9.1.2 Overview of generation connections

The Marlborough area rates in the top ten NZ EDBs for the number of installed small scale rooftop solar DGs per number of ICPs. MLL receives 200 to 300 applications for DG connections each year.

Distributed Generation (DG) refers to any device, such as a photovoltaic solar array, micro-hydro, diesel generator or a storage device (e.g. electric vehicle battery or standalone battery) which injects power into MLL's network.

MLL's website provides MLL's DG Connection Policy and DG Congestion Management Standard. Sections 3, and 4.3 further discuss attributes and impacts relevant to DG.

As per Section 3, MLL has relied heavily on international standards such as AS/NZS 4777 and the EEA Guide for Connection of Small-Scale Inverter-Based Distributed Generation in MLL's distributed generation requirements. If these standards are followed, high penetration of distributed generation can generally occur. In order to enable a high proportion of DG to be connected to its network, MLL is giving customer compliance with these standards more attention, through more stringent records and information requirements.

9.1.3 Connection process

Residential consumers requiring a new connection in developed areas, such as new builds or subdivision development, will often contact an electrician who will make an application to MLL on their behalf. The electrician will submit the proposed connection specifications and design and notify MLL of any special requirements, such as the need for an easement. This will then be reviewed and approved provided the distribution assets have sufficient capacity. Upon approval, the installation will be planned and performed by MLL's contracting division or one of MLL's approved contractors.

Larger commercial consumers, subdivision developers, and others will often contact MLL directly to discuss connection requirements or work with engineering consultancies to develop suitably sized distribution systems for their proposed works. Installations of this size will often involve relatively significant infrastructure development, network extension or asset renewal. MLL works with these larger entities to facilitate the connection of large loads in a standardised and efficient manner.

Large scale distributed generation developers typically approach MLL directly when they have identified a potential generation site. MLL follows the prescribed regulatory requirements with its processes. MLL provides a high-level response to initial enquiries to indicate the ratings of equipment in the area that the potential generator may wish to connect, any significant issues, the likely type of connection required, and the formal application process and policies as described on MLL's website. This initial discussion tends to be relatively informal with iterations while the developer firms up their proposal. The generation developer then works through the formal Initial Application and Final Application Process as detailed on MLL's website.

The addition of new load or DG may require the provision of additional network capacity. This is particularly true where sections of network could exceed their maximum rated current capacity or where voltages will exceed the upper or lower regulatory limits.

Marlborough Lines manages network congestion by:

- Prescribing connection standards and network power quality requirements for loads and distributed generation.
- Modelling of HV and LV power flows
- For substantial developments, detailed modelling the development to ensure MLL's connection and power quality standards are met
- Ensuring DG operates with power quality control modes enabled.
- Export limiting DG where network capacity does not exist.
- Network upgrades or demand response systems.

Primarily MLL models the impact of new connections on the utilisation of its assets and compares this against its planning standards, and also models the potential impact on MLL customers power quality. If these standards are not met, then asset investment may be required.

Where asset replacement is required, MLL will review this on a case-by-case basis to determine the level of contribution, if any, that MLL will provide. It is beneficial for MLL to work with developers during the connection process as it provides an opportunity to upgrade assets that may be approaching end of life or its capacity rating. Based on the level of enquiries, MLL considers the long-term needs of its customers in network areas as discussed in Section 0, and influences its replacement and renewal plans based on the most likely forecast scenarios. It is important to note however, that some remote areas of MLL's network are uneconomic and unlikely to be economic in the future. In these remote areas, further network development tends to be reliant on tailored customer funding.

If power quality requirements are not met by a generation development, then MLL requires that development to fund appropriate augmentations to the network. The number and scale of generation enquiries does not currently place pressure on the existing distribution network and offtake customers' needs. Very large-scale generation (and load) developers are directed to Transpower for potential connections to Transpower's transmission grid. MLL plans to develop its network to satisfy generation needs as they become evident and appropriate.

MLL's Network Development Strategy is discussed further in Section 7.8.

MLL's connection processes and capital contributions policy is set out in further detail on the MLL website.

MLL's planning criteria provide assistance with managing the timing and scale uncertainty of new connections. Where a development may have significant impacts on the network and/or capital contributions are required, MLL typically indicates in its responses to potential developer's queries that MLL may need to restudy and reconfirm details six months following MLL's responses due to potential other developments. MLL generally does not commit to major physical investment in the network when required by major new connections, until a contract for the new investment has been entered into.

9.1.4 Expenditure forecast

The ability to forecast works relating to new consumer connections is relatively limited. Currently, forecasting strategy is reliant on trending expenditure information from recent years, residential development forecasting from major developers and MDC planning, having an understanding of the current economy driving local commercial development, and other environmental factors.

Over the planning period, capital expenditure forecasting will be based on the following assumptions:

- Residential development in the Blenheim and Renwick areas will continue at an approximate rate as seen over recent years. Approximately 1% per annum ICP growth.
- Commercial development, especially in the viticulture industry, to continue at or around current rates.
- A general steadying in load through the installation of energy efficient lighting and heating in residential applications slows the need to increase capacity of distribution assets. It is noted though that, if the widespread uptake of electric vehicles occurs, this may increase demand in some localised areas.

As discussed above, augmentation of the network to support generation development, tends to be driven by generators' appetite for investment in the network, however MLL does consider the aggregation of generation enquiries in its network equipment replacement plans.

9.2 Asset relocations

This section reviews MLL's approach to the relocation of distribution assets when required by external stakeholders, such as landowners or Marlborough Roads/NZTA. It includes an overview of typical drivers of asset relocation, managing the relocation works and how they are funded.

9.2.1 Overview of asset relocations

Electricity distribution assets often require relocation due to the development of the surrounding environment or infrastructure where they are installed. This is typically due to the activities of other utility owners operating in Marlborough, e.g. the replacement of water pipes, telecommunications circuits, roading activities, or through the development of land for farming activities such as the installation of new vineyards.

Working with the stakeholder undertaking the project that has requested asset relocations provides an opportunity to upgrade segments of the network, or replace aged assets, at reduced cost. MLL considers undertaking asset relocations during major works because of this.

In most circumstances MLL receives contributions from the external stakeholder requesting the relocation of assets, reducing the amount of MLL investment in these projects. In most asset relocations resulting from road works, MLL bears costs, often in the form of materials in accordance with required legislation. For other projects, MLL considers these on a "case by case" basis. MLL's capital contributions policy is set out in further detail on the MLL website.

Expenditure is capitalised where assets are in poor condition or approaching end-of-life and are able to be renewed or upgraded during the performance of the asset relocation process. Otherwise, relocations of the same individual asset, or replacement of like-for-like is considered operational expenditure. Where major works are required for asset relocation, such as major roading and other infrastructure projects, MLL will build this into the capital expenditure plan to resource the project. Asset relocation projects proposed for the planning period are set out in the following sub-section.

9.2.2 Asset relocation projects

Asset relocation projects are typically driven by external stakeholders, such as utility owners, requirements. As MLL is not always aware of their capital expenditure plans, particularly further into the planning period, it is difficult for MLL to forecast its capital expenditure where asset relocation is the primary driver. MLL regularly meets with representatives from MDC and Marlborough Roads to discuss the more certain upcoming capital expenditure plans, and where possible, seeks to optimise opportunities as and when they arise.

MLL is aware of the following asset relocation projects at the date of this AMP:

- Colemans Road Roundabout, at the intersection with Old Renwick Road. This requires relocation of assets to accommodate a roundabout and entrance way to a new housing development. MLL is considering undergrounding the short section (350 metres) of line between this intersection and the Transpower GXP, given that undergrounding of old Renwick Road is proposed in stages for latter in the planning period, and that efficiencies are likely to result from combining this work with the roundabout project.
- 33kV Overhead Line Reconfiguration for Marlborough District Council south of Havelock in conjunction with water infrastructure modifications.
- Horton Park, Redwood Street undergrounding. HV and LV lines constructed in the late 1950s run adjacent to the western side of Horton Park along Redwood Street. Regular trimming of the adjacent large mature trees is required to prevent interference with the lines. The timing of this project is subject to MDC requirements.

As MLL is made aware of external stakeholders' plans which may impact on assets MLL will consider options to relocate, and possibly renew, its equipment to meet external stakeholders' requirements.

10. Fleet management

10.1 Fleet management overview

This fleet management section provides a summary of key MLL asset classes, their populations, condition and specifics of their preventive maintenance regimes and renewal. Good fleet management enables prudent and efficient outcomes in the management of the network assets and allows the drawing out of specific Capex and Opex programmes for more focused resourcing and cost control.

The fleet strategies are implemented in the field through MLL's policies and procedures which are documented and disseminated in its IMS system.

Many of MLL's asset management objectives are common across the different fleets. These include public safety as the top priority, maximising asset utility while minimising total cost (life cycle strategy) and meeting the network service level targets that have been set.

10.2 Overhead structures (poles)

10.2.1 Asset management objectives

Apart from the fleet-wide asset management objectives (safety, lifecycle, reliability, etc.), pole renewals may be undertaken coincident with conductor or pole component renewal/replacement works where it is deemed economically beneficial to do so.

10.2.2 Fleet overview

10.2.2.1 Sub-Transmission

Based on condition assessments[22], MLL's sub-transmission network is in good condition. Due to the criticality of the sub-transmission network for bulk power transfer around the network, more regular monitoring is undertaken and therefore defects are more promptly identified and corrected. Approximately 70% of the sub-transmission network is built upon concrete poles, most with hardwood crossarms. New builds are predominantly built on steel poles with steel cross arms as standard.

A number of steel lattice towers date back to the 1920s when the network was first being established. These original steel lattice towers are mostly located alongside Waihopai Valley Road. Many of these have been recently replaced, while the balance may be targeted for replacement over the planning period subject to their next condition assessment.

10.2.2.2 Distribution

The distribution network is generally in good condition. Approximately 60% of the distribution lines are supported by concrete poles (a mixture of reinforced and pre-stressed), and most of the balance on treated pine (TP) poles. New builds are typically constructed using either pre-stressed concrete, treated pine or steel poles. TPs and steel are typically

[22] MLL targets annual visual inspections of 33kV poles, with full condition assessments being undertaken at less than five-year intervals.

considered where the installation of concrete poles is precluded by technical factors.

A large amount of the Marlborough Sounds reticulation was constructed on TP poles between 1968 and 1975. Age-based AHI indicate that this population will likely begin requiring increased replacements during the planning period.

There are also approximately 1,600 iron rail poles on the network. The condition assessment of these poles is difficult. MLL has a "no-climb" policy in place on iron rail poles because of the difficulty of assessing their structural integrity. MLL has not experienced unassisted failure of iron rails but, given their age and former use, their mechanical strength is uncertain. During the 10-year planning period, MLL has a replacement programme for iron rail poles.

The population of reinforced concrete poles within the network is relatively unaffected by age. Evidence of spalling is beginning to appear in some areas of the network. For the most part, condition trends do not seem to have a significant age component.

Most of the network uses flat construction hardwood crossarms, although some limited areas have been altered to delta construction (where faults have occurred from bird strikes) to improve network reliability.

10.2.3 Populations and ages

The AHIs presented for overhead structures are based on pole type and age. MLL is in the process of implementing a more robust condition-based AHI system for overhead structures that encapsulates the condition assessment data captured from field inspections.

The age and condition profiles of MLL's poles (separated into sub-transmission and distribution) are presented in the following sub-sections. The "do nothing" forecasts have been prepared by extrapolating MLL's existing populations and do not consider any new build or replacement activities.

10.2.3.1 Sub-transmission

Figure 38 presents a summary of MLL's sub-transmission poles by age and type. The majority of the younger poles are steel and pre-stressed concrete, with the older poles typically being reinforced concrete. A number of older 33kV poles remaining on the network earmarked for renewal during the 10-year planning period.

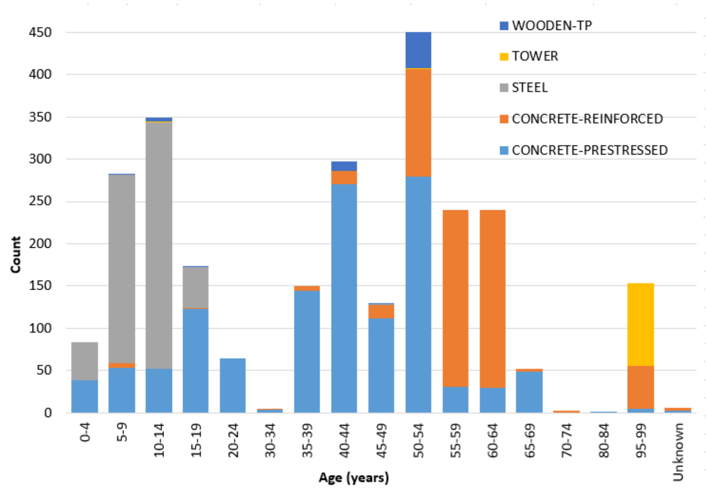


Figure 38: Sub-transmission overhead structures by age and type

Figure 39 presents a summary of the AHI condition values derived for the sub-transmission pole fleet, based on assessed condition of the poles. Definitions for each AHI category are provided in Section 7.5.1.3. The "Do Nothing" column published in previous AMPs were removed as MLL no longer follow the age-based replacement program.

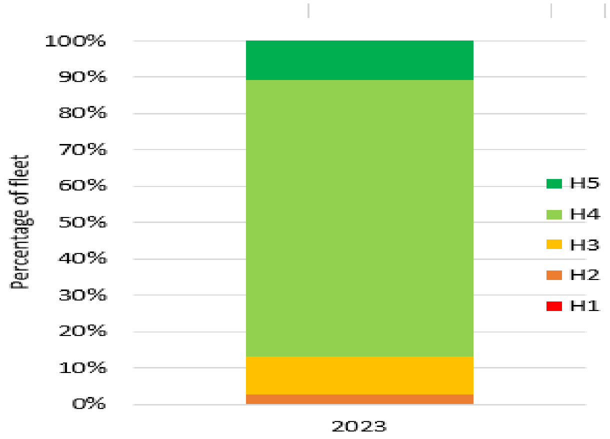


Figure 39: Sub-transmission poles age-based AHI scores

10.2.3.2 Distribution

Figure 40 presents a summary of MLL's distribution pole fleet (including LV poles) by age and type. It illustrates the more even spread across the pole types for the distribution pole fleet, compared with that of sub-transmission poles (along with the larger quantities of distribution and LV poles).

The AHI condition values derived for the distribution pole fleet, based on the assessed condition of the pole, are presented in Figure 41. Similar to Sub-Transmission the "Do Nothing" column has been removed.

As stated in preceding sections, a large amount of the Marlborough Sounds reticulation was constructed on TP poles between 1968 and 1975. In spite of the age of these poles the recent condition assessment done has shown that the poles are in better condition than what was indicated by the age-based condition.

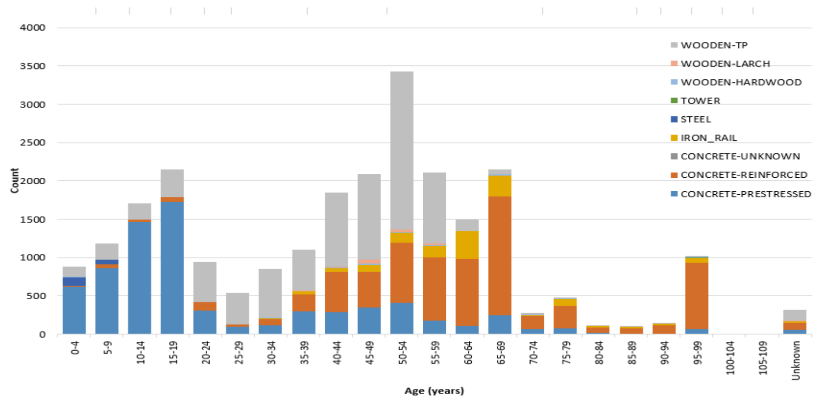


Figure 40: Distribution overhead structures by age and type

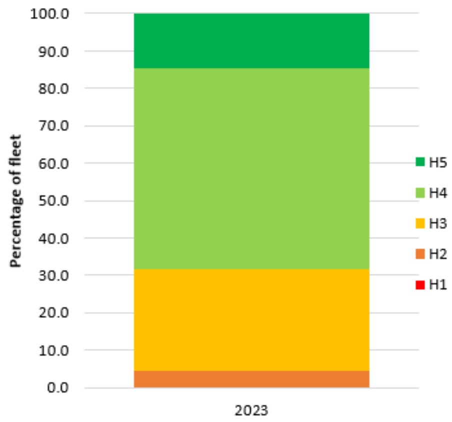


Figure 41: Distribution overhead structures by AHI score

MLL have commenced with the pole condition assessment programme in the Marlborough Sounds in RY2021 and the aim was to complete the area mid RY2022. Although we have made significant progress with the assessments in the Marlborough Sounds, the floods in June 2021 and August 2022 have delayed the completion of the assessments to end of 2023. The condition data collected to data shows the poles in far better condition than what was indicated by the age-based condition.

10.2.4 Condition, performance and risks

Condition assessments of poles has identified end of life indicators for some of the older hardwood crossarms – primarily through evidence of "flogging" or splitting. Where possible, crossarms exhibiting these conditions are grouped together for replacement, with the insulators renewed at the same time.

The heightened risks of SWER lines, particularly for faults that could lead to conductor on the ground, is considered in the prioritisation of renewal works despite the generally low consumer density associated with these lines and the lessened reliability impacts.

10.2.5 Design and construct

The 11kV line projects within the MLL network have the following main drivers:

- New connections – growth.
- The block replacement of poles that are reaching end of life - i.e. complete line rebuilds.
- Conductor upgrade for capacity increase – growth.
- Conductor upgrade for capacity increase - supply security.
- Reliability hot-spotting.

The general scope of a new line is:

- Poles:
  - Primarily pre-stressed concrete poles.
  - TPs where access and transport prevents the use of pre-stressed concrete.
  - Steel for sub-transmission structures or when required for structural loading, and/or more difficult to access areas (similar to TPs).

- Pole top hardware:
  - Sub-transmission
    - Constructed at 66kV for both reliability and allowance for future capacity upgrade.
    - Use of steel crossarms.
  - Distribution:
    - Constructed to 22kV outside of the townships of Blenheim, Picton, Havelock and Seddon.
    - Hardwood crossarms or steel if on a steel structure.

10.2.6 Operate and maintain

Poles are inspected and condition assessed on at least a five-yearly basis. Other than the possible recoating of steel structures (which has not been necessary to date), poles are durable and do not require electrical or mechanical preventative maintenance work for the duration of their lives.

Crossarms are considered a component of the structure. A hardwood crossarm is likely to have a shorter life than the pre-stressed concrete pole to which it is attached. Crossarm replacements are preferred to be undertaken as block replacement projects due to the economies of scale - particularly when working in rural or remote areas. Replacement of associated pole structures at the same time is subject to condition assessment of each structure.

Table 30 summarises the maintenance schedule for overhead structures.

Table 30: Maintenance schedule for overhead structure

Item	Action	Period	Maintenance level
33kV Poles	Visual inspection	1 Year	SHI
	Condition assessment	5 Years	ISCA
11kV Poles	Condition assessment	5 Years	ISCA

10.2.7 Renew or dispose

10.2.7.1 Line rebuilds

There are often economies of scale in replacing entire sections of line at the same time, particularly in remote areas where crew transport and set-up costs are significant. MLL considers "block" replacing an entire section of line when end-of-life indicators begin appearing across multiple assets along the section. Generally, the structures within the sections will be of similar age and construction. The scope of "block" replacement projects usually includes new conductor. Drivers for overhead structure replacement are assessed alongside conductor replacement.

Renewal of individual structures is subject to condition assessment and is typically expensed rather than capitalised.

10.2.7.2 Off the grid supply as an alternative solution to renewal

MLL has kept abreast of alternative methodologies of electricity supply to remote and uneconomic connections on its network. RAPS provides one potential alternative to a conventional grid supply and are included in further detail under Section 7.9.2. Where renewal of assets is required in these areas, MLL will consider alternative supplies (see Section 7.9).

10.2.8 Overhead structures renewal forecast

The renewal component of this AMP's capital expenditure forecast is based on a combination of those poles identified in poor condition for renewal, an expectation of how pole condition will deteriorate over the planning period years, and policy-based replacement due to known type defects or safety concerns.

Iron rail poles will be progressively replaced due to concerns around the inability to determine their strength. However, many of these pole's support either copper or galvanised steel conductor and will be replaced co-incident with the replacement of that conductor as further detailed in the conductor fleet strategy. This situation also applies to a number of older reinforced concrete poles.

MLL has a small population of larch poles, mainly on D'Urville Island, which condition assessment has identified as being in poor condition. MLL is intending to address these poles during the planning period; at this stage, RY2023 to RY2025 is being targeted.

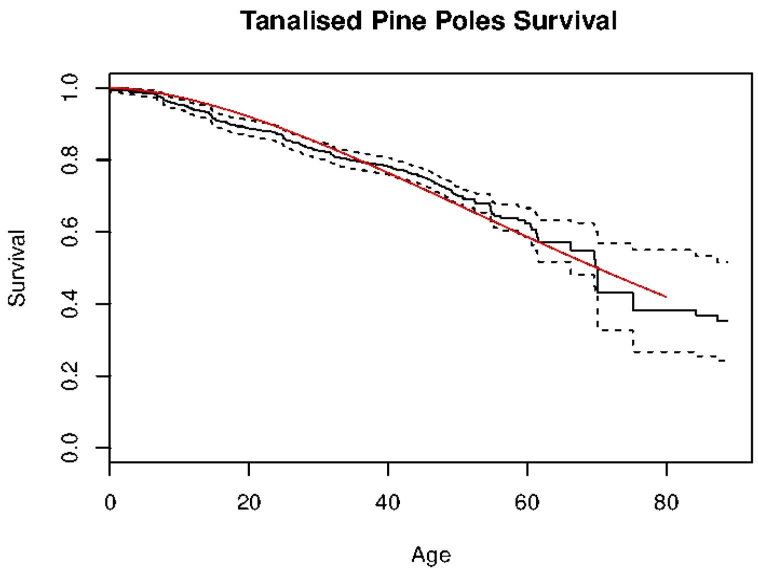


Figure 42: TP pole survival profile

MLL's expectation for the manner in which the remaining pole population will deteriorate is based on survival analysis from past replacements applied to the current pole population by type.[23] An example of the calculation is illustrated in Figure 42 for TP poles where the red line fits a probability distribution to the observed survival. The fitted distribution is then used as a prediction tool when applied to the pole age profile by type.

Based on this analysis, MLL expects the TP pole replacements to rise to approximately 100 per annum. which represents approximately 1% of the roughly 10,000 TP poles installed.

The lives of concrete poles are more difficult to forecast as they are more affected by environment than age. The expected life of pre-stressed concrete poles is not yet known as any acceleration in the deterioration of the older poles has yet to be detected. Renewal is forecast at the historic rate.

Forecast renewal costs for the concrete pole fleets are provided in the expenditure sections 10.12 and 11.2 of this AMP.

10.3 Overhead conductor

10.3.1 Asset management objectives

Apart from the fleet-wide asset management objectives of safety, lifecycle, reliability, etc., conductor renewal is often undertaken coincident with other works (such as pole replacements) where it is deemed economically beneficial to do so.

[23] Survival analysis is a statistical method for determining the likelihood an asset will fail (in this sense deteriorate to a state requiring renewal), given characteristics such as type, location, age, etc. but where age and type are the main drivers.

10.3.2 Fleet overview

Overhead conductors have been summarised by voltage in the following subsections. The disclosure schedule on asset condition data presents a summary of the conductors by AHI grade. The AHI grading that MLL has applied is based on asset age, given the difficulty in assessing the condition of conductor.

10.3.2.1 Sub-Transmission

MLL's sub-transmission overhead conductor was historically built using aluminium conductor steel reinforced (ACSR) conductor. However, all aluminium alloy conductor (AAAC) has been the preference over the last approximately 12 years. ACSR may still be used when additional strength is required (e.g. for long spans). New sub-transmission circuits are constructed at 66kV but will continue to be operated at 33kV.

MLL operates a sub-transmission line which runs between Leefield zone substation and the Waihopai hydroelectric power scheme. This line is over 90 years old. However, it is principally dedicated to the power scheme and not as supply to consumers. The line is subject to ongoing assessment.

10.3.2.2 Distribution

The backbone of the distribution system is constructed at three-phase 11kV with some spur lines and lines at the extremities of the network being single-phase 11kV. There are also 32 separate areas of single wire earth return (SWER) overhead lines. The distribution system currently operates at 11kV. However, new rural construction is generally insulated at 22kV, mainly for reliability but also for providing future options for network growth.

Most of the central area of the 11kV network is capable of being ring-fed with supply available from at least two zone substations. This arrangement provides flexibility in the operation of the system and enables supply to be maintained to most consumers in urban areas during planned or unplanned outages. However, a significant portion of MLL's network is supplied by way of long radial spur lines, which have no alternative supply options (other than mobile generation that may be brought in, or fixed generation at selected locations such as Kenepuru Heads in the Marlborough Sounds).

Most conductors are aluminium, although some copper, copper weld and galvanised steel conductor remains in use on older lines and spur lines. These are generally in parts of the network where demand is relatively low and static. Programmatic renewal is generally driven by risk assessment (including safety and fire ignition considerations).

10.3.2.3 11kV SWER

SWER lines have been used extensively throughout the more remote sections of MLL's network. In total, there is approximately 540km of 11kV SWER lines on MLL's network, a significant percentage of total line length. These lines were constructed at significantly lower cost than the more traditional two-wire and three-wire systems, due to the ability to span longer distances without the possibility of mid-span wire clashing. This type of construction is ideally suited to areas of low population density, such as parts of the Marlborough Sounds and the upper Awatere Valley and especially where the terrain is undulating and where pole numbers can be minimised.

The trade-off for the reduced construction costs is that the earthing systems at each transformer must be constructed as an operating rather than just a safety earth and require more rigid monitoring than with standard construction.

10.3.3 Populations and ages

For this AMP, the AHIs presented for overhead conductor are summarised by voltage and have been built on the conductor type and age criteria. The "do nothing" forecasts have been prepared by extrapolating MLL's existing overhead conductor population data and do not consider any new build or replacement activities.

In sub-transmission, the older conductor is the earlier ACSR which remains in reasonable condition despite its age. In distribution, the older conductor is the weaker copper and galvanised steel types, which is now subject to programmed replacement.

10.3.3.1 Sub-transmission

The change from ACSR to AAAC conductor is evident. presents a summary of the sub-transmission conductor AHI values. The sub-transmission conductor population is generally in good condition with no obvious increase in H1 classified conductor even under the "do nothing" scenario.

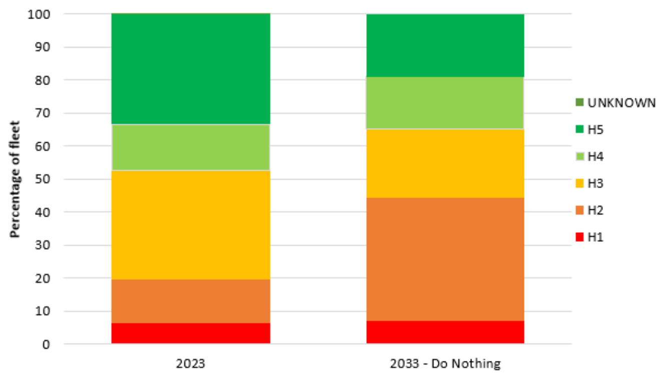


Figure 43: Sub-transmission conductor age-based AHI

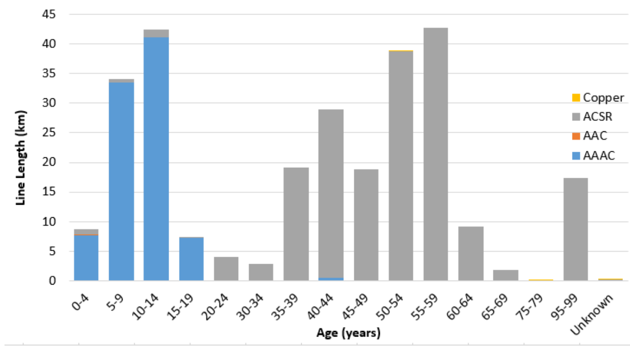


Figure 44: Sub-transmission conductor age profile by conductor type

MLL's sub-transmission conductor age by length is plotted in Figure 44.

10.3.3.2 Distribution

MLL's distribution conductor age profile is presented in Figure 45. This shows the bulk of the distribution conductor fleet is made up of ACSR, with significant quantities of copper and galvanised steel conductor making up the bulk of the aged fleet. Much of the newer conductor fleet is comprised of AAAC.

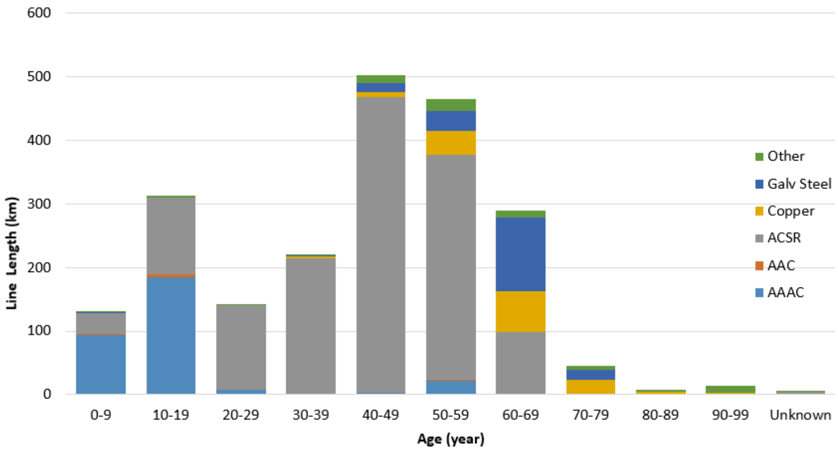


Figure 45: Distribution conductor age profile by conductor type

Figure 46 presents a summary of the distribution conductor fleets AHI values today and values projected out 10 years if no renewals are undertaken. It shows that 39% of distribution conductor would be scored either H1 or H2 under the "do nothing" scenario.

10.3.4 Condition, performance and risks

The condition of MLL's aluminium and ACSR conductor is considered good. The older part of MLL's distribution conductor is predominantly copper and galvanised steel. Galvanised steel in particular is low capacity which provides further justification for replacement. Conductor failures are predominantly caused by contact from foreign objects like trees or birds, or from corrosion or fatigue.

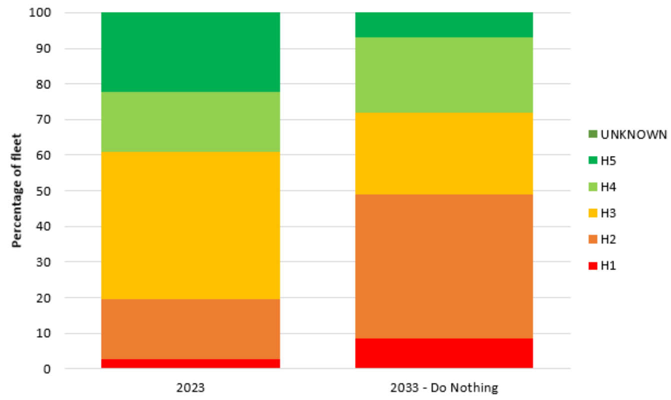


Figure 46: Distribution conductor age-based AHI

MLL's vegetation programme, reported elsewhere, has decreased (but not eliminated) the occurrences of these faults. However, the effects of corrosion and/or fatiguing can only be remedied by renewal. While inland Marlborough is generally benign for steel corrosion, corrosion still progresses, albeit at a slower rate, than where the conductor is exposed to coastal wind. Conductor vibration and wind also contribute to metal fatigue. The effects of this are cumulative over time.

MLL has noticed signs of deterioration on some of the oldest copper and galvanised steel conductors. It is anticipated that a large part of MLL's pole and overhead line replacement budget will be focused on the renewal of lines that fit into this category. There is approximately 400km of this older style line within the network.

MLL takes a precautionary approach to line renewal in consideration of:

- the public safety issues of line faults where conductors have the potential to fail;
- the difficulty of testing conductor strength;
- it is more cost effective to take a proactive approach rather than react to failure;
- coincident renewal of overhead support structures (poles) and pole top equipment; and
- fire ignition risk from fallen conductor.

SWER lines present an increased operational risk as spans are typically longer than single-phase or three-phase lines, and because faults on SWER lines have been traditionally harder to detect because of the limits of protection equipment in an earth return system. As mitigation, and with advances in technology, MLL is:

- installing smarter, remote controllable reclosers at the beginning of SWER networks; and
- retrofitting SWER lines with a new insulator bracket.

10.3.5 Design and construct

As a general guide, MLL's standard line conductor specifications are:

- Primarily AAAC conductor – some AAC used on LV; and
- ACSR where required (typically based on mechanical loading).
- Special consideration will be given to unique circumstances, if and when appropriate, such as the crossing of Tory Channel which has a span of 2,029 metres.

Periodic reviews identify those areas where changes in demand may require upgrades to the capacity of the network, generally by way of increases in the conductor size.

10.3.6 Operate and maintain

Conductors are generally long-life assets, with little maintenance required. Corrosion from sea spray or fatigue from wind driven vibration can age the conductor.

Visual inspections are undertaken on the conductor heights at the same time as pole structure inspections. Intrusive testing on conductors is only used on a case-by-case basis generally to support replacement decisions.

Where foreign object damage is a common failure mode, the conductor configuration may be redesigned or modified to mitigate the consequence of further contacts. Examples of this include utilisation of delta configurations, the application of bark guards, and insulated conductor systems.

Table 31 provides a summary of the maintenance regime for conductor.

Table 31: Maintenance schedule for overhead conductor

Item	Action	Period	Maintenance level
33kV Lines	Visual inspection	1 Year	SHI
11kV (and LV) Lines	Visual inspection	5 Years	SHI

10.3.7 Renew or dispose

MLL uses a condition and risk-based strategy to determine the priority for conductor replacements.

Drivers for conductor renewal are analysed alongside structure (pole and crossarm) renewal as these will often be actioned at the same time. However, conductor renewal usually requires renewal of the supporting structures (poles) and their components, as:

- older conductor is generally strung on older poles;
- the replacement conductor is invariably heavier necessitating a line redesign to current code requirements; and
- remnant pole strengths of older poles are often unknown and so cannot be reutilised under the new line construction codes regardless of their condition.

10.3.8 Overhead conductor renewals forecast

MLL's renewal forecast is based on the replacement of 20km of line in RY2022, then increasing to 40km p.a. by RY2025 for the balance of this AMP's planning period. This rate of renewal will replace all at-risk conductor (old copper and galvanised steel) over a 15-year period and, at 40km per year (from RY2025), represents a replacement rate of approximately 1.4% per annum against the total high voltage distribution conductor.

MLL's distribution conductor age profile in relation to an EDB combined average profile is illustrated in Figure 47. The red line is MLL's distribution overhead conductor age profile and the blue dotted line is the EDB combined age profile (based on RY2019 disclosure data).

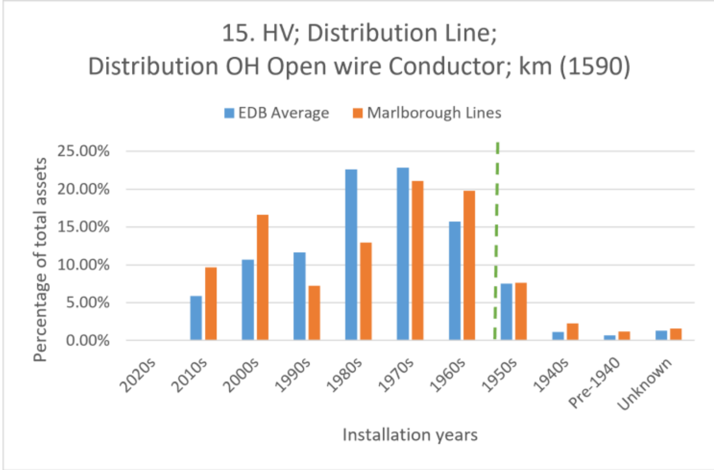


Figure 47: MLL's distribution conductor age profile

As shown, the MLL conductor age profile is now advanced past the 'all EDB' profile indicating that an increase in renewal should be anticipated. However, the inland Marlborough area provides a more benign environment than other parts of New Zealand and over the life of the assets they have been properly maintained. Further, analysis of the manner in which the 'all NZ' age profile advances leads to a gross expectation on the rate at which conductor will be renewed as it ages. Figure 48 applies this rate expectation to MLL's copper and galvanised steel conductor and compares it with the planned renewal rate. This shows the conductor renewal proposed in this AMP is in keeping with that indicated by the 'all EDB' conductor ageing model.

The renewal projects will be directed to replace conductor using a priority scoring system that includes conductor age, condition, and avoided risk (e.g. lines crossing vineyards, fire risk areas, public places).

The forecast replacement will renew a significant amount of the approximately 1,600 iron rail structures on the network as well as a number of the older reinforced concrete poles, which generally support the copper and galvanised steel conductor targeted under the conductor renewal programme. MLL has adjusted its replacement forecasts for these pole types to ensure these over-lapping works are not double counted.

Forecast expenditure in this category is provided in Section 11 of this AMP.

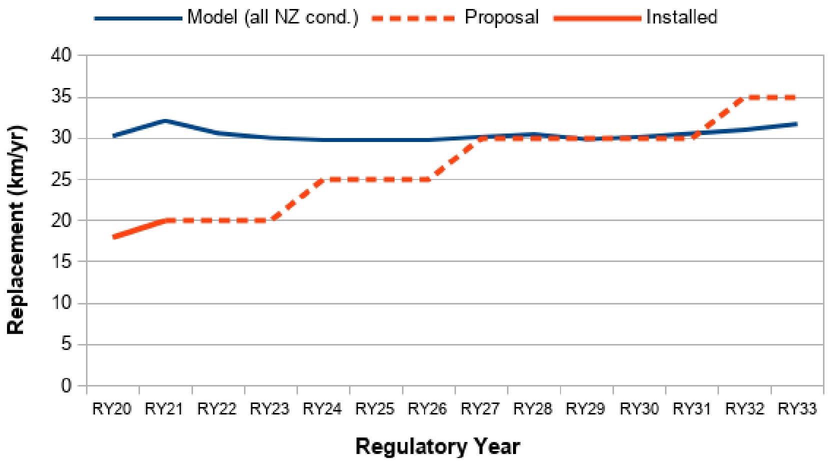


Figure 48: Proposed distribution conductor renewal rate

10.4 Cables

10.4.1 Asset management objectives

Being an underground asset, public safety is less of an issue with the key focus being on achieving lifecycle and reliability objectives.

10.4.2 Sub-transmission cables

10.4.2.1 Fleet overview

The MLL sub-transmission network consists of approximately 25km of paper insulated lead alloy sheathed (PILC) and cross-linked polyethylene (XLPE) cables energised at 33kV, including all ancillary components such as joints and cable termination structures.

10.4.2.2 Populations and ages

The majority of MLL's sub-transmission cables have been installed within the last 20 years. Figure 49 provides a summary of MLL's sub-transmission cable age profile, noting the predominance of XLPE versus PILC cable type.

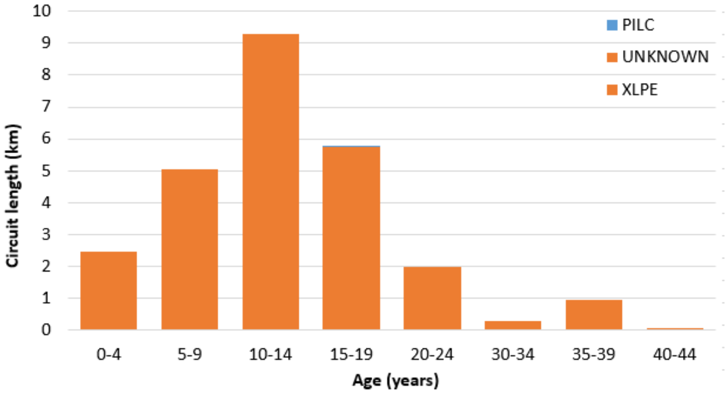


Figure 49: Sub-transmission cable age profile

10.4.2.3 Condition, performance and risks

Given its age and the manner in which it has been installed, the sub-transmission cable network is in good condition. Furthermore, sub-transmission cables typically have a greater capacity than the loading required, reducing aging effects from heating etc., that would otherwise be experienced.

The Wairau River Bridge 33kV crossing, built in 1985, is a bridge suspended PILC cable that is a component of the sub-transmission network which supplies the Havelock and Linkwater zone substations. Although alternate supplies to these substations are available, a failure on this cable would result in a short duration outage for more than 2,000 consumers.

An issue has been identified with certain types of 33kV heat shrink terminations due to the environmental conditions when installing the terminations, possibly resulting in future premature failure of the termination. To counter this, MLL has moved to a cold-applied alternative installation method.

10.4.2.4 Design and construct

New sub-transmission cable circuits that MLL installs are constructed to 33kV, utilise the most recent XLPE insulating materials, and are standardised on size, either being single core 300mm^2 or 630mm^2. Standardisation of size assists in ongoing cable management by reducing spares holdings, reducing cost and simplifying installation and repair practices. The capacity of cables of this size is expected to be sufficient for the foreseeable future.

10.4.2.5 Operate and maintain

Generally, PILC and XLPE cables are maintenance-free. Oil filled or gas filled cables require regular maintenance due to pressurised components, but MLL does not own or operate any oil-filled or gas-filled cables. On occasion, inspections and diagnostic testing is performed, especially when cables are being removed from service for other works. However, this is typically performed on an infrequent basis and as the opportunity arises.

10.4.2.6 Renew or dispose

MLL has no plans to renew any of its existing sub-transmission cables during the 10-year planning period. However, MLL will be adding new cable to its fleet as part of the various sub-transmission reliability projects detailed in Section 8.5.2.

10.4.3 Distribution cables

10.4.3.1 Fleet overview

MLL operates its fleet of distribution cables at 11kV. However, there are also a few instances of 11kV SWER cabling. The network comprises approximately 190km of distribution cables, most of which are located within the major townships of Blenheim, Picton, Renwick and Havelock.

10.4.3.2 Populations and ages

As with the sub-transmission components, the underground distribution network is relatively young, with the bulk of this asset installed within the last 20 years, as represented in Figure 50.

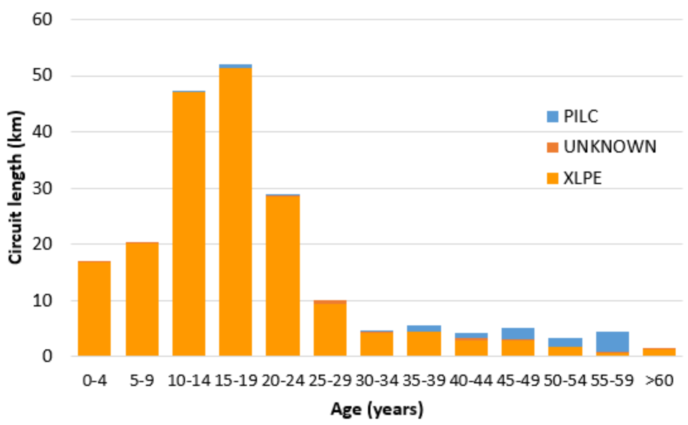


Figure 50: Distribution cable age profile

The key driver for installation of significant amounts of distribution cable in urban areas has been to increase network reliability and aesthetics in built up areas.

As work is performed on the urban distribution network within the Blenheim CBD area, such as planned cable renewals, circuit capacity upgrades, or ring main unit replacements, replacement of older generation distribution cable is performed simultaneously where achievable. This has gradually seen a decline in first generation XLPE cables and PILC cables within the Blenheim CBD. However, there are still sections of cable that are approaching end of life that will demand replacement over the planning period to avoid unreliability.

10.4.3.3 Condition, performance and risks

Cable degradation is impacted by the combination of various factors, including:

- Design and manufacture including insulation material;
- Installation type and environment;
- Electrical loading;
- Cable exposure;
- Cable age; and
- External factors (third party damage, ground movement, etc.).

Given the relatively young age of the distribution cable fleet, the majority utilises modern XLPE plastic insulation technologies including water blocking and water-tree retardant properties. This newer cable poses minimal risk to network reliability until well beyond the current planning period. Overall, the distribution cable fleet is assessed as being in good condition, as depicted in Figure 51.

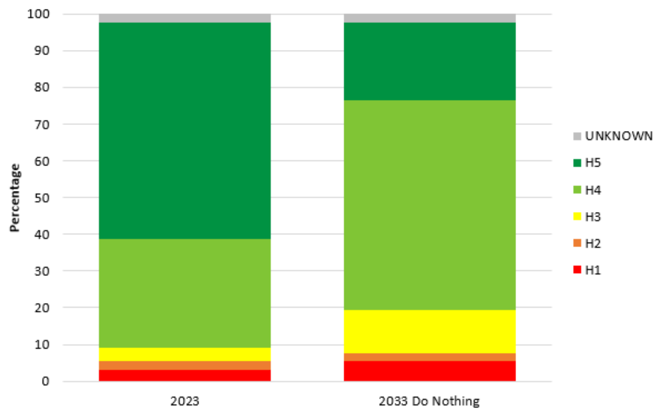


Figure 51: Distribution cable AHI summary

As noted above, a number of sections of cable, typically PILC, may be approaching or beyond their estimated onset of unreliability although this has yet to be experienced. MLL has a continuous programme in action to replace aged, at risk, underground distribution assets where no alternatives exist.

10.4.3.4 Design and construct

When installing new sections of underground distribution network during new-builds or cable replacement, MLL has a standardised set of cable sizes. MLL utilises 50mm^2, 95mm^2 and 300mm^2 multicore aluminium cables with XLPE insulation. Single core cables and other conductor sizes may be utilised for specific applications, such as when increased current ratings are demanded. Standardisation of cable size allows for the reduction in the requirements for critical spares, such as jointing kits, etc., as well as ensuring staff are competent in handling and working with regular sizes.

Where cable installation is required in rural areas of the distribution network, MLL installs 22kV insulated cable to be energised at 11kV, in preparation for a potential 22kV operational voltage upgrade. These are standardised to the same sizes mentioned above, although single core cables are utilised for larger sized 22kV cables. The marginal cost difference in doing so is minimal. Higher voltage cables have a greater life expectancy when energised below their rated voltage, and, in conjunction with overhead reconstruction projects, places the distribution network in a position where a voltage upgrade is feasible.

10.4.3.5 Operate and maintain

Cables are generally maintenance free as they are typically buried, with the only exposed sections being at the overhead to underground transitions, or at termination onto switchgear and other plant.

MLL regularly performs asset inspections which include visual inspection of cable termination poles and ground-mounted switchgear for obvious signs of wear or damage and condition degradation due to exposure to UV. Thermovision imaging inspections of cable and switchgear terminations is also performed. Inspections and testing regimes are summarised in Table 32.

Table 32: Maintenance schedule for distribution cables

Maintenance/inspection task	Frequency
Visual inspection of cable termination poles.	5 yearly
Switchgear cable termination box partial discharge testing.	6 yearly
Thermographic imaging of cable terminations. Tan Delta diagnostic testing and VLF testing of cables.	Irregular, when need arises

Cable faults most commonly occur due to interference from third parties during activities such as excavation or underground thrusting. Where distribution cables have been damaged, resulting in increased risk of failure, corrective action is immediately taken by MLL to avoid a fault developing. Actions include:

- Replacement of mechanical protection on cable termination pole;
- Replacement of the cable termination due to degradation; or
- Removal of failed/damaged section and cable replaced or jointed.

10.4.3.6 Renew or dispose

MLL's renewal approach for distribution cables is to replace on condition (when and where known) and/or age. Assessing cables' condition through testing can be difficult (largely due to the time and cost involved, and the nature of the testing – some tests can prematurely age cables). The AHI guide provides end-of-life drivers for cables based on known issues, loading history, partial discharge and failure history which can be used to deduce condition. Another of the key determinants of the life of a cable can be the manner of installation and the ground conditions within which it is installed.

MLL will consider renewal of cables based on the condition values deduced based on the AHI guide.

10.4.4 Low voltage cables

10.4.4.1 Fleet overview

This fleet includes low voltage cables, link boxes, cabinets and pillars.

The LV distribution network provides the typical interface between the distribution system and consumer installations. The typical consumer installation is supplied from either an overhead service line or from a service cable connected to an LV underground distribution box.

MLL's LV cable fleet operates at 230V/400V. The main assets within this voltage range are cables and LV boxes (which include link boxes, LV cabinets, service fuse boxes and pillar boxes).

10.4.4.2 Populations and ages

MLL's LV underground cable network consists of nearly 430km of circuit length, including streetlight circuits. The bulk of the LV cable population has been installed within the last 20 years, during new subdivision installations or overhead to underground conversions. There are portions of the LV cable network that employ early types of XLPE or PILC insulated cables that are approaching end of life.

Figure 52 illustrates the age profile of MLL's LV cables.

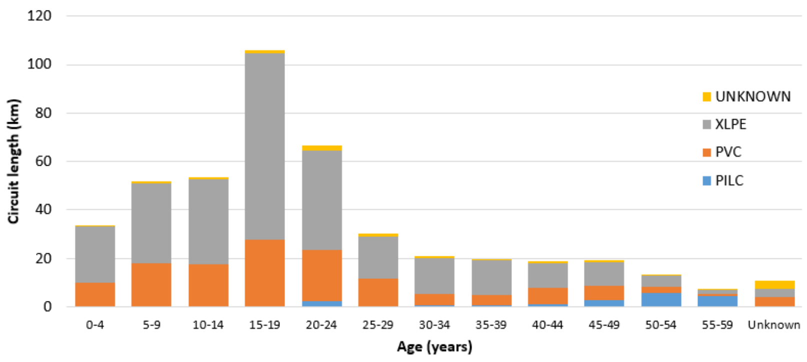


Figure 52: Low voltage cable age profile

10.4.4.3 Condition, performance and risks

Consumer service lines connect to the LV cable network from an LV service fuse box (usually located on the property boundary or on the street frontage near the property).

MLL is aware of a design flaw of an older type of link box where there are uncovered energised terminals within the box, and the exterior metal door is not physically earthed. This could pose a potential health and safety risk to staff working on these link boxes. This is being mitigated through a clear work instruction for staff working on these boxes, and an ongoing replacement programme to eliminate the risk.

When a portion of the LV network is approaching the end of its useful life and is supplying numerous consumers of importance, such as in the CBD area, MLL will consider results of a condition assessment based on the AHI guide before renewing/replacing it.

LV cables are typically buried or surrounded by mechanical protection where the cable transitions above ground to overhead connections on a cable termination pole. As a result, excluding damage from third parties, LV cable failures are relatively rare. A large number of LV outages might typically be caused by failure at the transformer LV box from causes such as external interference including vehicle contact and vandalism, or failure of terminations and joints. To overcome this, LV boxes are typically installed in protected areas, sheltered from external influences, and regular inspections are performed.

10.4.4.4 Design and construct

MLL carries stock of numerous sizes of aluminium and copper cables for use on the LV cable network or to perform consumer work. Due to the simplicity of performing cable terminations on LV cables over that of distribution or sub-transmission, there is less need to standardise on a reduced selection of cable sizes. Irrespective, it is necessary to utilise the right size cable for the application required, considering voltage drop, continuous loading, fault current capacity and mechanical performance when selecting LV cable.

LV box types are scrutinised before being approved for use on the MLL LV network. Considerations include the ability to cover metallic bus sections, ability to accept approved fuse carriers, mechanical performance, locking ability, etc.

10.4.4.5 Operate and maintain

Maintenance of the LV cable network focuses on the inspection of LV boxes. The frequency of inspections is based on safety factors and the criticality of the asset, with boxes in high traffic public areas or high-risk exercises being inspected more frequently.

The occurrences of detailed visual inspections of LV boxes is summarised in Table 33.

Table 33: Maintenance schedule for LV boxes

Area	Frequency
All Locations	Risk based, at least 5 yearly

10.4.4.6 Renew or dispose

Renewal of LV cables is generally managed using a run-to failure strategy unless the cable supplies critical consumers where alternative supply options are limited or non-existent. LV cable renewal is expected to remain relatively minor, and constant given the age and quantity of the existing LV cable population.

The older LV link boxes with uncovered energised terminals will be replaced. The order of replacement is based on a series of criteria including public and worker safety.

10.5 Zone substations

Zone substations are the link between the sub-transmission and the distribution networks by transforming the voltage, generally from 33kV to 11kV, and allowing for bulk supply of electricity to end users over a number of distribution feeders radiating out from the zone substation. The supply of electricity to thousands of consumers sometimes depends on a few critical assets within the zone substation.

Section 10.5 describes MLL's portfolio of assets within its zone substations. The portfolio includes:

- Power transformers;
- Switchgear;
- Impedance support; and
- Site and buildings.

Across the Marlborough region, MLL operates 16 zone substations set in both urban and rural environments.

10.5.1 Asset management objectives

The primary objectives are supply security, voltage quality and lifecycle outcomes. Safety objectives generally derive from ensuring adequate site security and electrical clearances, particularly from the fence lines, and in maintaining an adequate earth to control earth potential rise on internal faults.

10.5.2 33/11kV transformers

10.5.2.1 Fleet overview

Within MLL's 16 zone substations, 31 power transformers are in operation, ranging from 3MVA to 16.5MVA capacity. All but one (Leefield) of MLL's zone substations have N-1 security at the transformer level, allowing for the removal from service of any one transformer without impacting end users.

10.5.2.2 Populations and ages

The age and oil natural air natural (ONAN) rating details of MLL's zone substation power transformer fleet are shown in Figure 53.

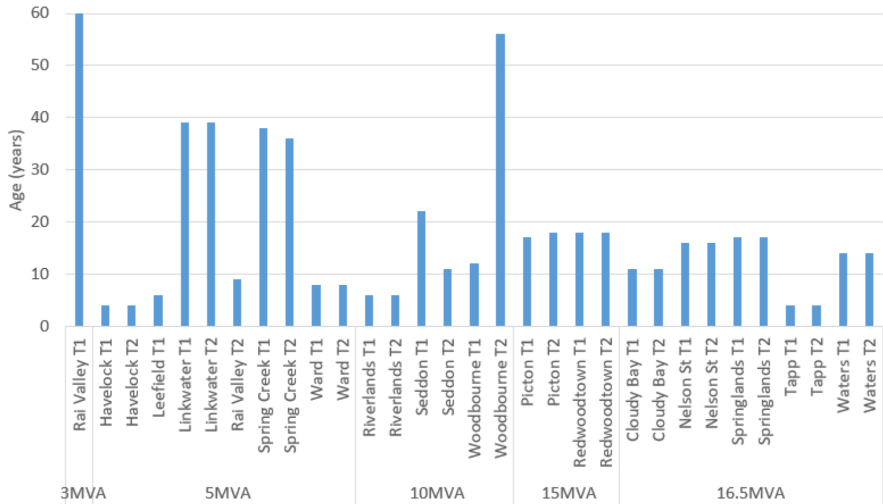


Figure 53: Zone substation power transformer age and rating profile

The majority of the transformer fleet is relatively new due to a number of recent out-door to in-door upgrades within urban areas of the network over the last 10 to 15 years. However, there are a further two power transformers approaching the end of their anticipated 65-year life span. These have been targeted for renewal within the 10-year planning period covered by this AMP. The power transformers are regularly inspected and maintained, most have not been heavily loaded and none are therefore considered to be at the point of imminent failure.

The average age of the MLL power transformer fleet is approximately 16 years.

10.5.2.3 Condition, performance, and risks

Power transformer failures are rare, with the main causes generally arising from wear on moving parts within on-load tap changers or insulation failures of the bushings. However, failures can have a major impact on network outages, result in fire or oil discharge or reduced levels of security until repair or replacement is completed.

Given that MLL has achieved N-1 at nearly all zone substations, transformers almost never operate above half their ONAN rating. This helps mitigate the risk of accelerated ageing through overloading.

Using the EEA Guide to Asset Health Indicators, MLL has ranked the condition of its fleet, and this is shown in Figure 54. From this, two transformers at the Woodbourne and Rai Valley zone substations are budgeted for replacement within the 10-year planning period.

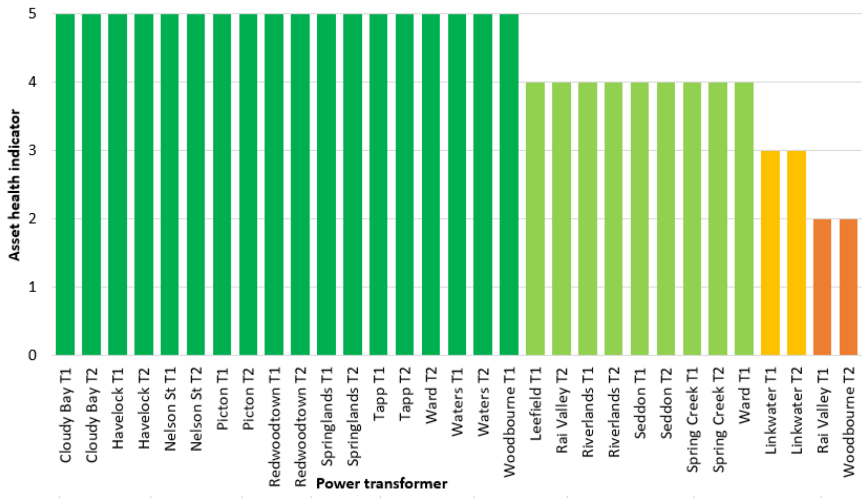


Figure 54: Summary of power transformer AHI profile

10.5.2.4 Design and construct

Where practicable, MLL has standardised its transformer size and configuration across the transformer fleet, allowing for flexibility, interchangeability and reduction of spares inventory. This includes transformer components as well as tap changing hardware.

The indoor 16.5MVA transformers (which are installed at most of the major zone substations) can be further uprated to 20MVA with the addition of cooling fans.

Where new zone substation transformers are purchased for upgrade of existing substations, or construction of new substations, MLL takes advantage of technological improvements for the transformer and ancillary components to ensure continual improvement across the MLL transformer fleet. The benefits include:

- Nitrogen seals;
- Reduced losses;
- Seismic performance;
- Reduced noise emissions; and
- Improved condition and performance monitoring.

All power transformers are purchased in accord with industry standards.

10.5.2.5 Operate and maintain

The MLL power transformer fleet undergoes regular routine inspections and maintenance to ensure continued reliable and safe operation. The details of routine maintenance tasks are summarised in Table 34.

Table 34: Maintenance schedule for power transformer fleet

Maintenance/inspection task	Frequency
Visual inspection of foundations, main tank, OLTC and cooling system. Recording of operational temperatures and oil levels, and, tap changer activity.	3 monthly
Transformer and OLTC dissolved gas analysis.	1 yearly
Transformer condition assessment. In depth visual inspection, insulation and winding resistance tests.	3 yearly
Tap changer service.	6 yearly

Given the ability to remove individual transformers from service at all but one of MLL's zone substations (Leefield) without the need for planned customer outages, the ability to maintain the existing transformer fleet is straightforward.

10.5.2.6 Renew or dispose

Since the majority of MLL's zone substation transformer fleet has rarely operated above half its ONAN rating, it is not exposed to significant long-term stresses and, as such, over its useful life, transformers rarely need to be removed from service for major refurbishment activities.

When transformers approach end-of-life, MLL often initiates a transformer replacement project rather than refurbishing the existing transformer. This is due to the cost of refurbishment relative to that of replacement given the relatively small transformer sizes that make up the power transformer fleet. This also allows MLL to sustain a modern transformer fleet.

Subject to condition assessments of existing transformers MLL plans the following renewal and re-use of existing transformers in the period 2025-2028:

- Replace Woodbourne T1 & T2 with new 16.5MVA transformers, to satisfy T2 age issues, and substation increased loading
- Move Woodbourne T1 to Leefield to provide (n-1) security
- Refurbish depot spare 5MVA transformer and replace aged Rai Valley 3MVA T1
- Refurbish decommissioned Renwick T1 and T2 10 MVA transformers, for use at Spring Creek, or a customer driven project depending on timing criticality.
- Refurbish depot 10 MVA emergency spare.

Further detail is provided in Section 10.12.

10.5.3 Zone substation switchgear

10.5.3.1 Fleet overview

Zone substation switchgear provides for the connection/disconnection of the sub-transmission and distribution network. Depending on the locality and criticality of the zone substation, the 33kV and/or 11kV switchgear may be individually pole-mounted or contained within indoor switchboards.

10.5.3.2 Populations and ages

MLL currently has 232 zone substation circuit breakers in service across the network, including circuit breakers installed in the 33kV switching stations but excluding field reclosing devices installed within the distribution network. Of this total, 193 can be remotely controlled. The majority of these circuit breakers are 11kV, due to the multiple radial 11kV feeders emanating from each of MLL's zone substations.

As with the transformer fleet, MLL's zone substation switchgear fleet is relatively new due to conversions from outdoor to indoor of urban-based zone substations undertaken in the last 10-15 years.

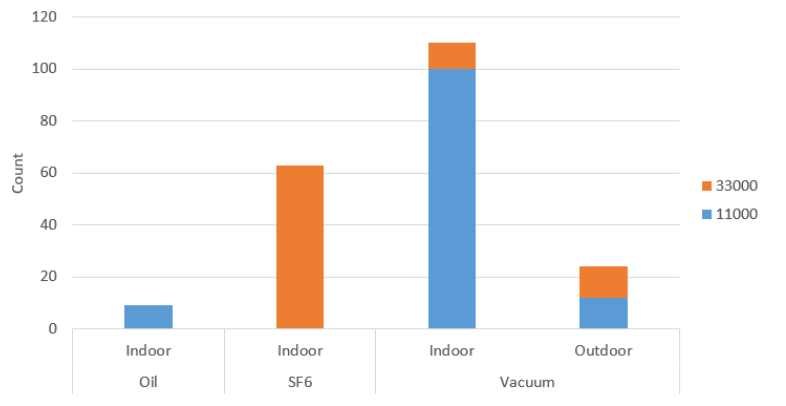


Figure 56: Zone substation switchgear age profile by voltage

There are two sites where the 11kV indoor switchboards are approaching the end of their useful life and pose a risk to reliability. These are proposed for replacement in the 10-year planning period.

Switchgear technology has changed over time. Prior to the 1990s, switchgear typically used mineral oil as the insulation and arc-extinguishing medium. In modern designs, this function has been replaced by insulating gasses such as sulphur-hexafluoride (SF_6) or by vacuum systems. Where practical, MLL utilises vacuum based switchgear due to its environmental benefits over SF_6. However, the majority of recent replacements at sub-transmission (33kV) level have required the use of SF_6 switchgear due to its compact design, demanding less floor space in indoor applications. MLL has also found that there is less familiarity and support of non-SF_6 alternatives in NZ.

Figure 56 provides a breakdown of both indoor and outdoor zone substation switchgear by voltage and insulation type.

10.5.3.3 Condition, performance and risks

Given recent investment into urban zone substations, including the replacement of switchgear, the bulk of MLL's zone substation switchgear fleet is in good condition.

Older switchgear is typically pole-mounted reclosers or 11kV indoor switchboards. Pole-mounted reclosers can pose an operational risk due to the fact that they are exposed to the elements over their lifetime and are more difficult to maintain. MLL has standardised the type of pole-mounted switchgear across the outdoor zone substation fleet and carries sufficient spares to replace switchgear and/or control cubicles readily in the event of component failure.

Arc-flash risk is a serious safety concern. Modern switchgear is rated to contain arc-flash or to deflect arc-gas into external venting in the event of an electrical explosion to prevent or limit harm to the operator during switchgear failures. However, older styles of switchgear do not provide the same levels of arc-flash protection as do modern types. Older indoor switchgear, especially oil-filled switchgear, can also be more challenging to maintain. MLL prefers to replace this type of switchgear with new arc-flash rated equipment as part of its commitment to continuous improvement. Over the AMP period, MLL intends to replace 11kV switchboards at two zone substations to remove aged switchgear.

In past years, MLL has implemented a programme to remotely control zone substation switchgear which has improved network reliability especially where significant travel time is eliminated. All 11kV switchgear, and approximately 85% of the 33kV switchgear across the MLL zone substation fleet is auto-enabled (remotely controllable). The remaining 15% of the 33kV fleet is automation ready. MLL intends to implement automation at these sites (Waters and Springlands) over the planning period however they are a relatively low priority due to them being close to MLL's Blenheim depot and control room.

10.5.3.4 Design and construct

Given the importance of zone substation switchgear, reliability and safety considerations are paramount. Accordingly, all switchgear has been reviewed to ensure adequate arc fault containment ratings, mechanical longevity and other safety considerations.

MLL currently has both withdrawable and non-withdrawable type switchgear installed within its network. Withdrawable type circuit breakers allow for critical parts to be maintained, allowing for a longer useful life. This is important for oil-filled circuit breakers, where regular maintenance of moving components is required.

Medium voltage breakers utilising vacuum or SF_6 often do not require servicing over their useful life and thus can be made in a non-withdrawable arrangement, removing the risk of failures from connecting or disconnecting as with withdrawable types. However, in the event of failure of non-withdrawable type switchgear, an outage on the complete enclosure or board may be required.

Another function that is desirable with new switchgear is the ability to operate the disconnector and earthing mechanism remotely. Most switchboards now allow for the remote operation of the circuit breaking mechanism to isolate supply together with the ability to remote earth. This provides an immediate safety measure and reduces the need for manual switching in the field when isolating the network to perform works.

10.5.3.5 Operate and maintain

Zone substation switchgear undergoes routine inspections and maintenance to ensure its continued safe and reliable operation. These preventative tasks are summarised in Table 35.

Table 35: Maintenance schedule for zone substation switchgear

Maintenance/inspection task	Frequency
Visual inspection of foundations, main compartments, rear covers, cyclometer reading, oil/gas levels (where applicable).	3 monthly
Functional test.	1 yearly
Partial discharge survey of board and cable compartments.	1 yearly
General service. Removal of trucks (where applicable), and overhaul.	5 yearly

MLL performs all routine maintenance tasks, including major overhauls, of zone substation switchgear with its own trained in-house staff.

10.5.3.6 Renew or dispose

Decisions regarding switchgear renewal are based on the age and condition of the switchgear, as well as reliability and safety metrics relative to what could be achieved through renewal. These factors include:

- General condition (including number of operations);
- Insulating medium;
- Current make/break capacity;
- Arc-flash risk; and
- Reliability issues (parts, type, etc).

In the current planning period, MLL intends to replace two 11kV switchboards from the existing zone substation switchgear fleet. These will be at Riverlands, targeted for RY2026/27, and Woodbourne whose timing is dependent on continued condition assessment but is budgeted for 2028.

10.5.4 Ground fault neutralisers and neutral earthing resistors

10.5.4.1 Fleet overview

Zone substation impedance support is the general term for electrical devices used to alter the power system impedance at the zone substation for fault reduction or voltage control. This includes items such as ground fault limiters, neutral earthing resistors, capacitors and other reactive compensation schemes. The fleet of impedance support hardware on the MLL network is relatively minimal, with all alternate grounding systems other than direct earthing being installed only within the last ten years.

Due to the relatively recent adoption and commissioning of these assets, no renewals are anticipated within the planning period.

10.5.4.2 Populations and ages

10.5.4.2.1 Neutral earthing resistors

MLL generally has low fault levels due to the nature of operating a radial network, supplied from a single Transpower GXP. However, a low fault level can be troublesome at the farthest reaches of the network where high impedance faults may not allow sufficient fault current to flow to operate upstream protection devices.

At some locations of MLL's network, due to the proximity to Transpower's GXP, or the capacity of the sub-transmission network between the GXP, fault levels need to be reduced.

Accordingly, MLL has installed neutral earthing resistors on the two paralleled zone substation transformers at the Springlands zone substation and plans to do the same at the Nelson Street zone substation.

Fault levels are reviewed as part of MLL's design and review when considering changes to the network.

10.5.4.2.2 Inductive ground fault limiters

In recent years, devices have become available to reduce the impact of earth faults both in terms of network reliability and reduction of fire risk.

10.5.4.2.3 Reactive Compensation

MLL has an obligation to minimize its reactive power demands at the single GXP to maintain a near unity power factor. This is so that transmission assets are utilised to their full capacity for the conveyance of real power, and to reduce voltage disturbances on the transmission network.

At the Ward zone substation, two wind farms are connected to the 11kV distribution network. Due to their construction, the wind farms demand significant amounts of reactive power from the distribution network. Given the above requirements, MLL installed reactive compensation at the Ward zone substation instead of supplying this from the GXP. This static compensation var consists of two 500kvar low voltage STATCOMs, connected to the 11kV via a ground-mounted 1MVA transformer.

10.5.5 Zone substation buildings and earth grids

10.5.5.1 Fleet overview

MLL's 16 zone substations comprise both outdoor and indoor zone substations. Typically, this reflects their surrounding environment (e.g. urban vs rural). The zone substations comprise critical electrical assets which are often located inside buildings. Earthing systems (grids) are also installed at zone substations. These earthing systems are an essential part of the network and ensure the grounding of the voltage source to enhance supply, facilitate operation of protection and provide a safe environment within the substation and its vicinity.

10.5.5.2 Populations and ages

MLL's zone substation fleet varies in age, from the early days of MLL's network (circa late 1920s initial commissioning) through to most recently commissioned Tapp zone substation in 2019.

10.5.5.3 Condition, performance and risks

The primary risk of buildings is their failure in a significant seismic event, which could damage the critical infrastructure housed within them. To address this risk, MLL recently undertook a programme of seismic strengthening (outlined in the following subsection).

Another risk which is addressed at zone substations is electrical hazards which result from the return of earth fault current to the zone substation in the event of faults on the distribution network. This includes a possible rise of earth potential, or possible risks to personnel through step and touch potential.

10.5.5.4 Design and construct

New zone substations are constructed to integrate with their surrounding environments. As Tapp zone substation is located in a residential area, the building is designed to look like a residential dwelling. Other, relatively recent examples of this nature are the Springlands and Waters zone substations.

MLL commissioned seismic strengthening programme of works involving structural assessments of the zone substation buildings, and strengthening works to the buildings that were deemed earthquake prone (i.e. <34% of the New Building Standard). This work has increased the resilience of MLL's critical network infrastructure to a large seismic event.

10.5.5.5 Operate and maintain

MLL undertakes monthly inspections of its zone substations' grounds and buildings. This reflects the critical nature of the assets at these locations. Inspections are undertaken of the assets at the zone substations, as well as the security of the sites.

10.5.5.6 Renew or dispose

MLL is not forecasting any renewal of zone substation buildings or zone substation earth grids during the planning period.

10.6 Distribution transformers

10.6.1 Asset management objectives

Distribution transformers convert electrical energy from the reticulated voltage of 11kV to low voltage 400/230V. Their effective performance is essential for maintaining a safe and reliable network at an appropriate voltage.

Transformers come in a variety of sizes, single-or three-phase, and ground-or pole-mounted. MLL's transformers are oil-filled which carries inherent environmental and fire risks. Managing the lifecycle and risks of distribution transformers assets, including correctly disposing of these assets when they are retired, is the key objective of this asset management strategy.

10.6.2 Pole mount transformers

10.6.2.1 Fleet overview

There are approximately 3,500 pole-mounted transformers on the network. These are located in rural or suburban areas where the distribution network is overhead. The pole mount transformer fleet ranges in sizes from 1kVA up to 300kVA (being the largest pole mount transformer).

Larger pole-mounted transformers, particularly those serving urban areas, may be mounted in a 2-pole or pole-and-a half configuration. MLL is undertaking a programme of replacing those pole-mounted transformers where there is considered to be a risk of structural or mechanical failure, or where age or condition demands renewal. These transformers will be replaced with a ground-mounted equivalent.

In rural areas, 11kV lines are generally built with 80m to 100m pole spacings on the flat and greater distances depending on terrain. These distances make the installation of LV impractical in many situations and, combined with a low density of consumers, necessitate many rural consumers being supplied from dedicated transformers. This results in a lower coefficient of utilisation than would be achieved in an urban area which has greater ICP density, fewer transformers, closer pole spacing, and more LV conductor run. However, it is the most cost-effective solution to supply voltage at regulatory levels.

There are approximately 310 distribution transformers operating on the 11kV SWER network.

Reactive replacement of pole-mounted transformers can usually be undertaken quickly, affecting a relatively low number of consumers. Suitable spare transformers are held in stock at MLL's depot. This ensures a fast response time to return the supply service.

In remote areas, the most practical method of transformer installation can be by helicopter.

10.6.2.2 Populations and ages

Table 36 summarises the population of pole-mounted distribution transformers by kVA rating. Many are very small, around 40% are 15kVA or smaller. A transformer of this size typically supplies one or two houses in a rural area.

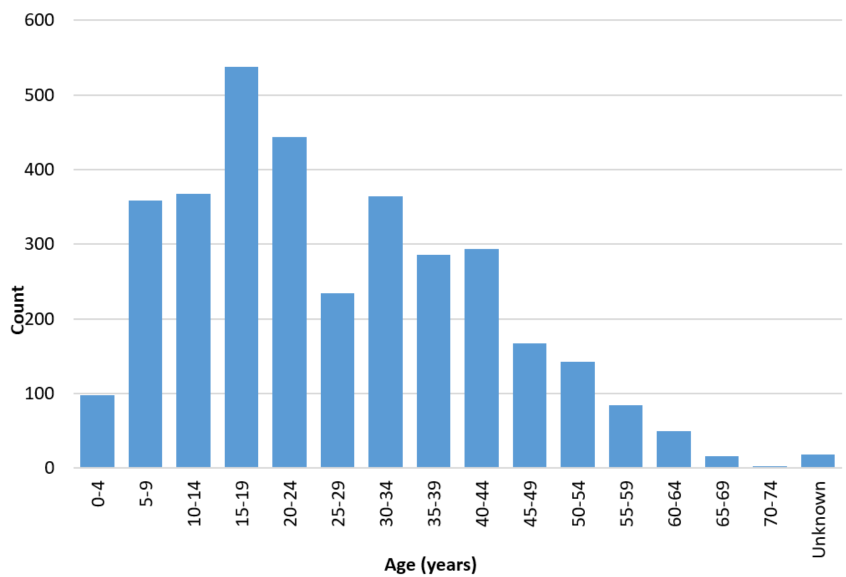


Figure 57: Pole mounted distribution transformer age profile

Table 36: Pole-mounted distribution transformer population by kVA rating

Rating	Numbers of transformers	% of total
≤ 15kVA	1385	40%
> 15 and ≤ 30kVA	1003	29%
>30 and ≤ 100kVA	834	24%
>100kVA	238	7%
Total	**3460**	

Table 37 shows MLL's pole-mounted distribution transformer age profile. This is depicted also in Figure 57. The expected life of these units ranges from 45 to 60 years. Approximately 10% of MLL's fleet is within this age group and is due for replacement based on age.

Table 37: Pole-mounted distribution transformer population by age

Age	Numbers of transformers	% of total
≤ 10 years	516	15%
> 10 and ≤ 20 years	962	28%
> 20 and ≤ 45 years	1536	44%
> 45 and ≤ 70 years	426	12%
> 70 years	2	0%
Unknown age	18	1%
Total	**3460**	

10.6.2.3 Condition, performance and risks

The main reasons for replacing pole-mounted transformers are equipment degradation and unexpected failures, usually caused by third parties (e.g. vehicle accidents) or lightning strikes. The predominant causes of equipment degradation are:

- Deterioration of the insulation, windings and/or bushings;
- Moisture and contaminant concentrations in insulating oil;
- Thermal failure because of overloads;
- Mechanical loosening of internal components, including winding and core;
- Oil leaks through faulty seals;
- External tank/enclosure damage and corrosion; and
- Lightning strikes.

Distribution transformers are generally reliable. Although the risks of oil fires and oil leakage are ever present, the incidence of such events is low especially with properly installed quality transformers. MLL has oil spillage mitigations and MLL staff are trained in their use.

Figure 58 presents a summary of the pole-mounted transformer fleet condition scores, based on age.

Figure 58: Pole mounted distribution transformers age-based AHI

10.6.2.4 Design and construct

To improve resilience to major seismic events, pole-mounted transformers 200kVA and above are, where practical, replaced with a ground-mounted transformer of equivalent or greater size. Smaller pole-mounted transformers are replaced like-for-like.

10.6.2.5 Operate and maintain

Pole-mounted transformers are reasonably robust and do not require intrusive maintenance. Maintenance is generally limited to visual inspections. Small pole-mounted distribution transformers are less critical than ground-mounted equivalents. It is often cost effective to replace them when they are close to failure, rather than carry out rigorous maintenance to extend their life particularly if they have to be removed and taken to a workshop.

MLL's preventive inspection schedule for both pole-mounted and ground mounted distribution transformers is summarised in Table 38.

Table 38: Maintenance schedule for distribution transformers

Item	Action	Period	Maintenance level
All other distribution transformers	Distribution transformer visual inspection	6 Year	SHI

10.6.2.6 Renew or dispose

Pole-mounted transformer renewal is primarily based on condition. The renewal need is often only identified when the transformer is close to failure and sometimes after they fail. Some in-service failure of smaller units is accepted because the consumer impact is limited, the cost of obtaining better condition information is high, and their maximum asset life is typically realised. Renewals are often combined with pole replacements or increases in consumer capacity.

10.6.3 Ground-mounted transformers

10.6.3.1 Fleet overview

There are approximately 500 ground-mounted distribution transformers on MLL's network. These are usually located in suburban areas and CBDs with underground networks. Ground-mounted transformers are generally more expensive and serve larger and more critical loads compared with pole-mounted transformers.

Ground-mounted transformers may be enclosed in a consumer's building, housed in a concrete block town substation, or berm mounted in a variety of enclosures. Ground-mounted transformers require seismically designed separate foundations (if not housed in a building), along with earthing and a LV panel.

Their capacity depends on load density but is generally 50kVA or 100kVA in lifestyle areas, 200kVA or 300kVA in newer suburban areas, and 500kVA to 1MVA in CBD areas. The most important substations within the CBD have dual 1MVA transformers for reliability.

This fleet includes the kiosks and LV distribution panel (i.e. ground-mounted-substation).

10.6.3.2 Populations and ages

Table 39 summarises the population of ground-mounted distribution transformers by kVA rating. The smallest units have a size of approximately 50kVA, with larger units used for higher capacity installations.

Table 39: Ground-mounted distribution transformer by kVA rating

Rating	Numbers of Transformers	% of Total
≤ 50kVA	59	11%
> 50 and ≤ 100kVA	84	16%
>100 and ≤ 200kVA	93	18%
>200 and ≤ 500kVA	173	33%
>500kVA	108	21%
Total	**517**	

Table 40 and Figure 59 show MLL's ground-mounted distribution transformer age profile. The expected life of these units ranges from 45 to 60 years. Only 2% of the fleet is within this age group and candidates for age-based replacement.

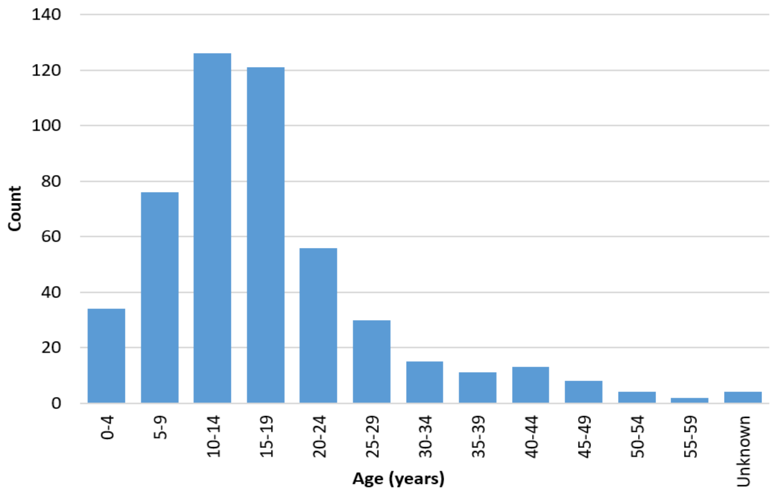


Figure 59: Ground-mounted distribution transformer age profile

Table 40: Ground-mounted distribution transformer by age

Rating	Numbers of transformers	% of total
≤ 10 years	115	22%
> 10 and ≤ 20 years	246	48%
> 20 and ≤ 45 years	139	27%
> 45 and ≤ 70 years	13	3%
> 70 years	0	0%
Unknown	4	1%
Total	**517**	

10.6.3.3 Condition, performance and risks

The main reasons for replacing ground-mounted transformers are equipment degradation and unexpected failures, sometimes caused by third parties (e.g. vehicle accidents) or through faults. The predominant causes of equipment degradation are:

- Deterioration of the insulation, windings and/or bushings;
- Moisture and contaminant concentrations in insulating oil;
- Thermal failure because of overloads;
- Mechanical loosening of components, including winding and core;
- Oil leaks through faulty seals;
- External tank/enclosure damage and corrosion; and
- Lightning strike.

Figure 60 summarises the age-based condition for MLL's ground-mounted distribution transformers.

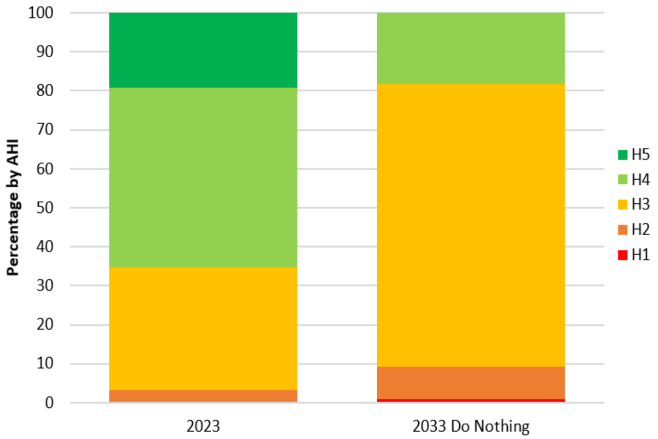


Figure 60: Ground-mounted distribution transformer AHIs

10.6.3.4 Operate and maintain

Transformers used for large industrial loads can be exposed to more onerous load conditions than residential transformers, making critical that they are regularly visited and tested.

MLL's preventive inspection schedule for both pole-mounted and ground mounted distribution transformers is summarised in Table 38. MLL's routine inspections involve visual checks and data capture, as well as oil testing for transformers greater than 500kVA. This information assists in assessing internal health of transformer for remedial action.

10.6.3.5 Renew or dispose

Inspections have revealed the population of large transformers to be in relatively good condition. The oil within a few transformers has failed crackle tests indicating the ingress of water, and some have had oil leaks which ultimately (if left) could have had significant consequences. These transformers have been replaced or subject to corrective maintenance.

10.6.4 SWER isolation transformers and voltage regulators

10.6.4.1 Fleet overview

Other types of distribution transformers include three-phase isolation and single wire earth return (SWER) isolation transformers, capacitors and voltage regulators. The population of this sub-fleet is a small part of the distribution transformer portfolio and is varied.

A three-phase isolation transformer provides isolation of supply between two earthing systems, preventing transferred earth potential rise (EPR) between the sites and has a specific use within a substation.

SWER isolating transformers are only installed in rural areas and convert from 11kV phase to phase, to a single wire earth return system at 11kV phase to ground. SWER is a cost-effective form of reticulation in remote rural areas to supply light loads over long distances. SWER transformers are generally mounted on a two-pole structure with a recloser.

Voltage regulators are typically a set of 2-3 pole-mounted single phase 11kV transformers fitted with controls, used to lower or increase the voltage in response to load conditions. There are several three-phase configured units used where the reticulation suffers from excessive voltage fluctuation, long lines where voltage rises with light load and drops with heavier load.

10.6.4.2 Populations and ages

Table 41 summarises the population of other distribution transformers by type. SWER isolation transformers make up the largest portion of the fleet installed over a number of small SWER networks.

Table 41: SWER isolation transformers and voltage regulators by type

Type	Number of assets	% of total
Voltage regulator	31	50%
SWER isolation transformer	31	50%
Total	**62**	

Table 42 summarises the SWER transformer fleet by age.

Table 42: SWER isolation transformers and voltage regulators by age

Rating	No. of assets	% of total
≤ 10 years	15	24%
> 10 and ≤ 20 years	25	40%
> 20 and ≤ 45 years	17	27%
> 45 and ≤ 70 years	5	8%
Total	**62**	

Figure 61 shows “other” distribution transformers’ age profile. The voltage regulator population is relatively young, with an average age of 14 years. In recent years, a number of SWER isolation transformers have been replaced, leading to a wide variation in age. Approximately 8% of the fleet within this age group is a candidate for replacement. SWER transformers are typically installed in remote areas and the cost of accessing and replacing a transformer can be greater than the cost of the transformer itself.

10.6.4.3 Condition, performance and risks

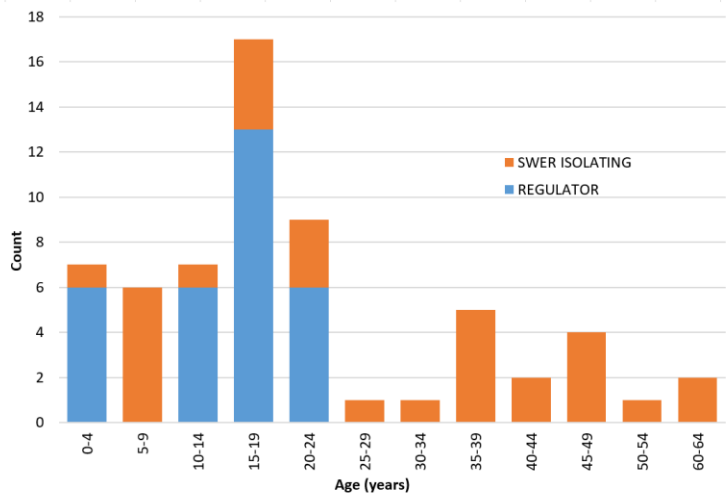


Figure 61: SWER isolation transformer and voltage regulators age profile

These transformers are of similar construction to pole-mounted distribution transformers and so their failure modes are similar. Many of the SWER transformers are installed in relatively lightning prone areas and as such they are at increased risk of failure from this.

MLL has two distribution capacitors in service in remote parts of its network associated with 1050 Hz ripple integrity. Both capacitors are assessed as H2 condition-based on age, and as such are approaching their end of life. The transformers are no longer needed due to the 1050Hz ripple plant decommissioning and will be removed when convenient or necessary.

The condition of the regulator fleet is relatively good with no known type issues. MLL does not anticipate a need for a significant renewals programme for the transformers. The Grasmere regulator was replaced in RY2022 and the Wairau Regulator in RY2021.

10.6.4.4 Design and construct

MLL has a replacement programme in place for all SWER isolation transformers supplying more than 8 consumers. This involves a new structure and electronic circuit breaker for improved reliability.

10.6.4.5 Operate and maintain

SWER isolation transformer maintenance is similar to ground-mounted or pole-mounted transformers. They share the same physical attributes and failure modes.

Voltage regulators require more frequent inspections and maintenance. Currently, each site is visited once a month for visual inspection.

10.6.4.6 Renew or dispose

MLL's renewal strategy for this fleet is condition-based replacement. Units are generally replaced as part of the defect management process when a significant defect is identified. Some units fail and they are immediately replaced to minimise the impact on consumers.

It is expected renewals for this fleet will remain fairly constant over the 10-year planning period and in line with historical quantities.

10.6.5 Distribution transformers renewal forecast

Aside from the inspection and maintenance regime, transformers are generally run to failure unless potential problems or poor condition are detected from network surveillance. Failure rates are also monitored to look for any systemic problems with the transformer stock.

Renewal forecasts are based on:

- historic renewal rates;
- Weibull survival analysis (using rates reported from other networks) with pole-mounted and ground-mounted considered separately; and
- an age-based replacement model derived from observed shifts in the all-NZ reported age profile for this asset class.

These three renewal forecasts report similar outcomes, being 30 to 35 pole mount transformers p.a. and approximately five ground-mounted transformers p.a. This represents a renewal rate of approximately 1% p.a. on the installed base. The age-based models indicate that a slowly increasing replacement rate should be anticipated.

Renewals will also focus on the older two-pole-mounted distribution transformers in public places.

10.7 Distribution switchgear

10.7.1 Asset management objectives

The key asset management objectives for the distribution switchgear fleet are safety and lifecycle.

10.7.2 Ground-mounted switchgear

10.7.2.1 Fleet overview

MLL's fleet of ring main unit (RMU) switches is deployed within the cable distribution network. Almost all the RMUs are located in the urban, newer residential and the industrial areas and as such they have significant public exposure.

MLL primarily operates two types of ring main units, the ABB SD style oil switch and the ABB Safelink2 SF_6 gas switches. A programme to remove orphaned models from the network is now mostly completed with only one remaining.

MLL also has a small population of station style switchgear banks installed predominantly at the larger distribution substations in Blenheim's CBD. Due to being installed within secure substation buildings, any risk of public exposure to these assets is mitigated.

10.7.2.2 Populations and ages

Figure 62 summarises the RMUs age profile by insulation type. The fleet is relatively young, but a small number of older oil filled ring main units are still in sevice.

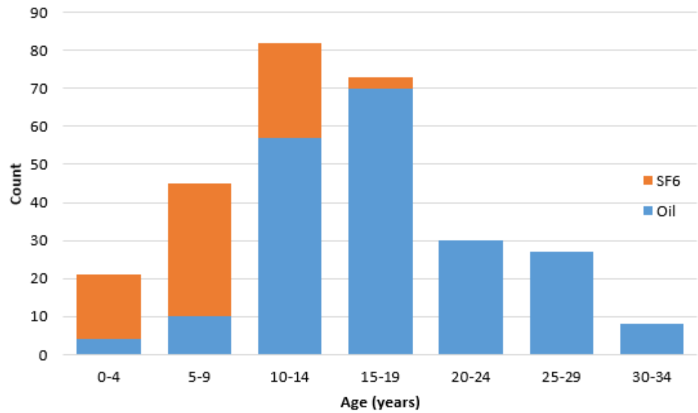


Figure 62: RMU age profile by insulation type

10.7.2.3 Condition, performance and risks

As part of its commitment to continuous improvement, MLL has lifted its benchmark for operator and public safety for new RMUs to require an internal arc classification (IAC) of AB (operator and public). For this reason, very few of MLL's existing fleet achieve an AHI score of H5 (noting that this doesn't correspond with age-based scoring as seen in Figure 63).

National and international safety bulletins indicate that there has been a small number of recent failures of oil ring main units. As a result, the industry as a whole is trending towards a more cautious approach to oil RMU operation. While MLL has not had any failures of the type reported within its own population, MLL has changed its switching procedures for its oil RMU fleet to include remotely operated motorised actuators. This change has and will continue to minimise risk during switching operations.

Figure 63 summarises age-based AHI scores for MLL's RMU fleet.

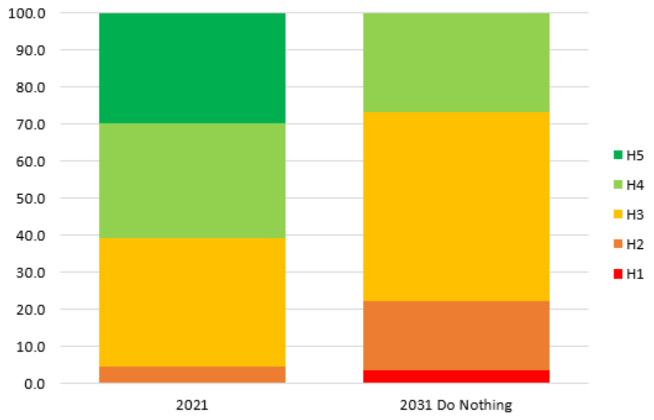


Figure 63: RMU aged based AHI

10.7.2.4 Design and construct

In keeping with public safety standards, MLL has recently updated its purchase specification for ring main units to require an internal arc classification for both operator and public safety.

MLL orders many new RMUs with switching motors installed, ready to be made for remote control when a suitable communications link to the RMU is available.

10.7.2.5 Operate and maintain

Visual inspections of RMUs are undertaken on a three-yearly basis. For efficiency, these inspections are combined with the inspection of any associated transformer and testing of earth grids at the same site.

MLL also undertakes partial discharge testing, with focus on discharge in cable compartments.

Table 43 summarises the maintenance schedule for MLL's RMU fleet.

Table 43: Maintenance schedule for ring main units

Item	Action	Period	Maintenance level
Oil switches	Oil switch visual inspection	3 Years	SHI
Gas switches	Gas switch visual inspection	3 Years	SHI
Switches with batteries	Battery test	3 Years	OSCA
All switches	Partial discharge survey	6 Years	SS

10.7.2.6 Renew or dispose

MLL has a programmed budget for the gradual replacement of its oil RMU fleet with gas switches.

MLL prioritises replacement of RMUs based on a combination of the AHI calculation, public exposure, criticality and the operational configuration of the RMU.

This plan calls for the replacement of the one remaining orphan RMU in RY2022, plus the gradual replacement of 3-4 oil RMU per annum over the planning period.

Where possible, MLL looks to remove single switch units with bus connected cables. These are generally replaced with a three-switch unit, with consideration given to a four-switch unit for either future extension or generator connection.

10.7.3 Pole mount switches

10.7.3.1 Fleet overview

MLL has a population of just over 1,000 pole-mounted air break switches (ABS's) within its network.

On the sub-transmission network, ABS's have been historically utilised for circuit isolation and circuit changeover points between feeders. The latter application has been superseded by smaller 33kV switching stations which offer remote controllability, more precise protection and enable the creation of "self-healing" restoration schemes.

Within the distribution network, ABS's are used for circuit isolation and reducing the impact of outages.

MLL now uses solid insulated pole-mounted switches with vacuum interruption on the network at locations where automation is desirable.

10.7.3.2 Populations and ages

Figure 64 illustrates MLL's pole-mount switch age profile by operating voltage (sub-transmission vs distribution).

10.7.3.3 Condition, performance, and risks

MLL has experienced a small number of failures of ABSs over recent years.

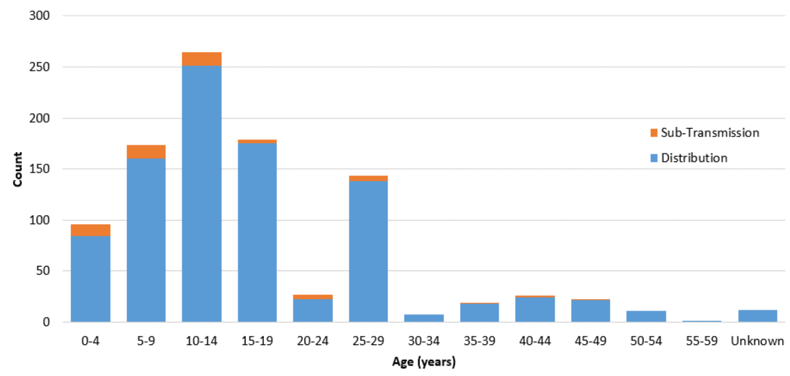


Figure 64: Pole mount switch age profile by operational voltage

This is typically due to cracking and subsequent failure of the porcelain insulators.

Some of the ABS fleet has an alignment issue with the flickers, which can require the operator to reset the flicker after a closing operation. These issues are relatively low risk and rectified when other maintenance is undertaken in the same area.

10.7.3.4 Design and construct

MLL will generally use ABSs on distribution lines for:

- Sectionalising feeders to reduce outage impacts for construction, maintenance, and fault work.
- Preventing ferro-resonance when installed at the overhead to underground interface.
- Normally open tie points within or between feeders.
- Bypass connections to facilitate maintenance of reclosers.

Like other standard pole top equipment, new ABSs in rural areas are specified as 22kV for distribution and 66kV for sub-transmission.

When in public places, operating handles are mounted above standing reach to reduce the exposure of touch potential to the public and minimise opportunities for vandalism. New ABSs are typically installed with a stick operated handle at a minimum height of 4m.

10.7.3.5 Operate and maintain

MLL does not undertake regular maintenance on the ABSs but the associated earthing systems are tested on a periodic basis.

Maintenance on ABSs occurs on condition when reported by field staff. Maintenance work may include greasing or component replacement – typically insulators. Depending on the work required, complete renewal is considered as an alternative.

In response to a small number of failures (refer to 10.7.3.3), MLL has undertaken a programme of inspections of its fleet of ABSs utilising an unmanned aerial vehicle (UAV), or drone, to photograph insulators in attempt to detect hairline cracks in porcelain insulators, which could lead to failures. Where hairline cracks are detected, operational measures are put in place and the switch is replaced.

10.7.3.6 Renew or dispose

ABSs are generally disposed of during the process of a line rebuild. The new line will generally be specified with new ABS's located in positions appropriate to the new route configuration.

A small number of ABSs are renewed reactively if failure occurs. The ABSs identified through the UAV inspections will continue to be replaced during RY2022. These ABSs will be replaced with a new ABS fitted with polymer insulators.

10.7.4 Reclosers and sectionalisers

10.7.4.1 Fleet overview

As part of MLL's programme to increase the reliability of the distribution network, MLL has made substantial investment in remote controllable reclosers over the last 15 years. The distribution fleet consists of mostly vacuum type reclosers. There are a small number of older mechanical oil reclosers and sectionalisers located in the extremities of the network.

There are a number of SF_6 33kV reclosers utilised on the sub-transmission network used as line reclosers. These are occasionally utilised in auto changeover between lines.

Reclosers also feature as protection for power transformers and feeders at outdoor substations – refer to Section 10.5.3 for details on these units.

10.7.4.2 Populations and ages

Figure 65 and Figure 66 summarise MLL's reclosers and sectionalisers age profiles by breaking medium and voltage, respectively.

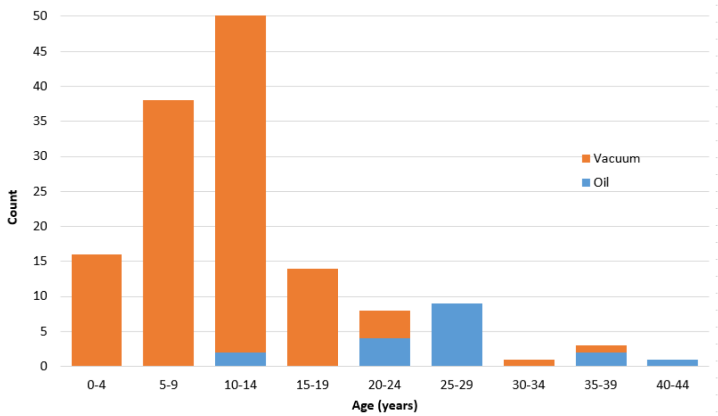


Figure 65: Recloser and sectionaliser age profile by breaking medium

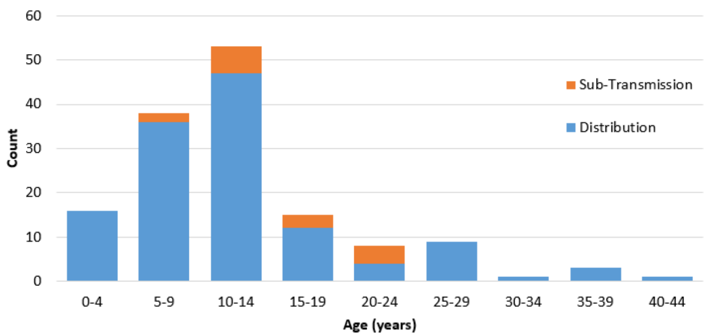


Figure 66: Recloser and sectionaliser age profile by voltage

10.7.4.3 Condition, performance and risks

Most of ther recloser and sectionaliser fleet is in good condition with few known design or maintainability issues. The oil breakers are beginning to age. This can be reflected in minor leaks around seals which result in higher maintenance costs or replacement to eliminate the risk of failure.

A summary of the age-based condition profile for sectionalisers and reclosers is summarised in Figure 67. Note that the 100% H5 assessment for sub-transmission is directly related to there being only a limited number of these assets, all of which are relatively young.

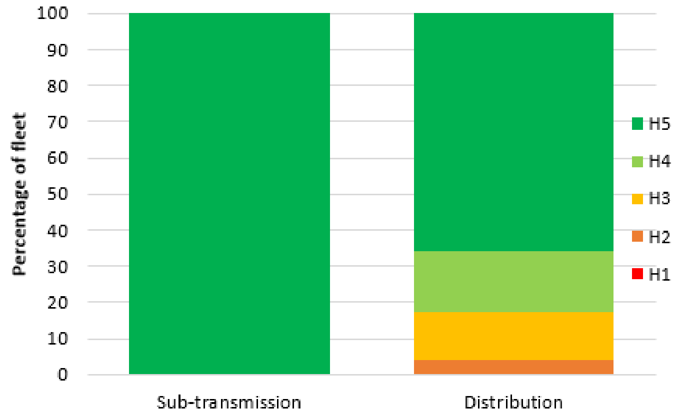


Figure 67: Recloser and sectionaliser age-based AHI

10.7.4.4 Design and construct

The reclosers MLL has installed operate primarily with overcurrent and earth fault protection. Due to the high penetration of reclosers installed within the distribution network, there are very few remaining locations where new reclosers can be installed and still achieve effective protection discrimination with upstream devices. Continuation of distribution automation will therefore shift to the installation of remote-controlled line sectionalisers (switches).

Communications connectivity is a critical feature for new recloser and sectionaliser sites because remote monitoring and control are important benefits gained from the installation of the recloser or sectionaliser.

Reclosers are also fitted with a backup battery system designed to provide eight hours of operability after loss of mains supply.

Reclosers are installed with isolating links and bypass switches to facilitate maintenance.

10.7.4.5 Operate and maintain

Modern reclosers have online monitoring systems which reduces the requirement for site visits. Visual inspections are undertaken with testing of the associated earth.

Table 44 presents a summary of the maintenance schedule for MLL's reclosers and sectionalisers.

Table 44: Maintenance schedule for reclosers and sectionalisers

Item	Action	Period	Maintenance level
SWER recloser/sectionaliser	Recloser visual inspection	5 Years	SHI
General recloser/sectionaliser	Recloser visual inspection	5 Years	SHI
Reclosers with batteries	Battery test	5 Years	ISCA

10.7.4.6 Renew or dispose

MLL is gradually replacing the oil recloser fleet with new vacuum reclosers. Replacement with a new recloser with the benefits of better protection functionality, monitoring and remote controllability is preferred to the mechanical maintenance and overhaul required on older oil reclosers.

Other replacement is done on condition, with consideration given to asset refurbishment and other relevant criteria.

The ability to remotely alter protection settings of reclosers is of particular benefit at times of high fire risk.

Many of the existing oil reclosers are utilised to protect SWER networks and are prioritised over those protecting more remote standard construction.

Occasionally vacuum and SF_6 reclosers are removed from service as part of overhead to underground conversions. These units are returned to stock for use in other projects.

10.7.5 Distribution switchgear renewal forecast

The forecast amount for distribution switchgear included in the overall system renewal budget forecasts is largely based on the following renewal programmes:

- Oil insulated RMUs;
- 11kV switchgear at zone substations; and
- Pole-mounted reclosers.

10.8 Earthing systems

10.8.1 Fleet overview

Earthing systems provide three main functions:

- A voltage reference to earth for the power system.
- An effective fault return path, enabling protection to trip quickly.
- Reduce earth potential rise (EPR)[24];
- in the event of an earth fault on conventional circuits; and
- during normal operation of a SWER network.

Every metal clad piece of network equipment that is installed at ground level or designed to be operated from the ground using uninsulated tools should be bonded to earth to protect both the public and MLL staff from the risk of EPR.

As earthing systems may be shared between different assets at the same site and assets like transformers and switches may be replaced without affecting the earthing system, MLL treats earthing systems as a separate asset class.

MLL operates one of the largest SWER networks in New Zealand by combined length. A significant amount of this network was constructed with a subsidy from the Rural Electric Reticulation Council and located in rural and/or remote areas and largely in the Marlborough Sounds. Because EPR is ever present at SWER transformer sites, the integrity of the earthing systems must always be such that EPR across the ground is kept to a level which is not injurious to human life or livestock.

10.8.2 Populations and ages

The distribution of ages of MLL’s earthing systems population is summarised in Figure 68.

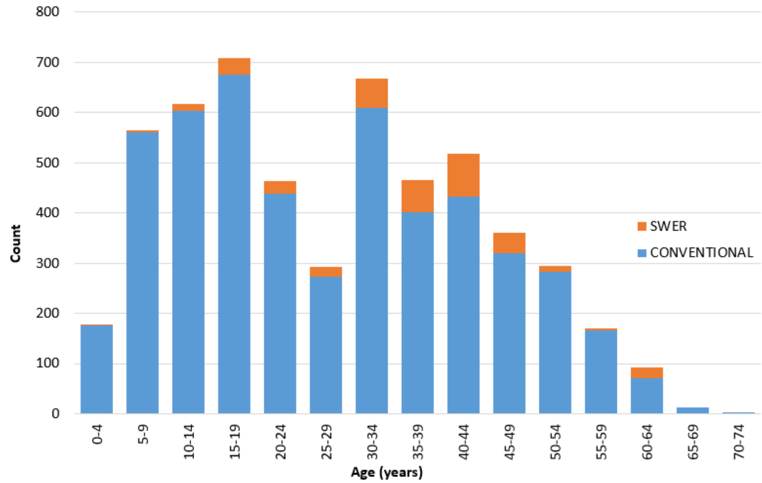


Figure 68: Distribution earthing systems age profile

[24] EPR occurs when current returns via the earth rather than through a conductor. On conventional networks, this only occurs as intended through the earthing system at times of fault or when a conductor’s insulation has failed. However, in a SWER network, conductors for the return circuit run from the transformer down the pole and into the ground where there is extensive bare conductor which makes contact with the earth. All current flows through the earthing system as part of normal operation. This means that, while loaded, EPR of some magnitude is always present on SWER earthing system.

10.8.3 Condition, performance, and risks

Historically, MLL has taken a conservative approach to the electrical requirements of earth grids and has ensured minimum regulatory requirements are met. Earthing systems are regularly checked. Overall, MLL believes its earthing systems are in a very good condition.

From a materials perspective, the soils around Marlborough are benign, and corrosion of earth grids is not an issue that has been observed to date. This also indicates that age-based renewal is not an effective strategy for this asset class.

The most common cause of earthing system defects is from civil or horticultural conversion works on the land causing damage where the earthing system is located.

The risk associated with an earthing systems EPR is assessed with a probabilistic methodology based off the EEA's Guide to Power System Earthing. This takes into account:

- the probability of human exposure to an EPR hazard at the site; and
- the probability of an EPR event occurring.

10.8.3.1 SWER earth grids risks

The EEA probabilistic method presents SWER earthing systems as a higher risk because the probability of EPR occurring is virtually constant for SWER sites. A more deterministic method must be used to either ensure the EPR at the site does not reach harmful levels or reduce the public (and livestock) exposure to the site.

The trade-off is that, due to their configuration, SWER networks are only used in low loaded and usually remote areas, meaning they are generally installed in areas with low public exposure.

Design and installation practices of SWER earthing has changed significantly since the original installation of the SWER network. Original earthing conductors were often mole-ploughed into the ground at relatively low depths where there was optimum conductivity within the ground. As a consequence, if there were earthworks in the vicinity, buried earthing systems would be at risk. MLL mitigates this risk by:

- improving the data on where the SWER earthing systems run;
- running an education campaign targeting the owners of the land where SWER earthing systems are present (this has been done in the last two years and MLL will look to undertake this again; and/or
- prioritising the rebuild of high risk SWER sites.

10.8.4 Design and construct

MLL has a series of standard earthing designs for various asset classes which have been externally reviewed with some changes arising from the review. These changes include improved control of the EPR contours as a mitigation strategy. There are areas in Marlborough where the soil resistivity is not ideal for the construction of earthing systems. MLL mitigates this risk by:

- increasing the size of the earthing system installed and/or
- increasing the depth of the earth rods using a new driving rig MLL has purchased. Aiming for 10-15m deep rods.
- installing conductivity enhancers around the earthing conductors; and/or

- importing and placing soil of greater conductivity around the conductors.

Consideration is also given to where an HV earthing system may potentially transfer EPR onto a LV multiple earthed neutral system (the standard LV system in New Zealand utilised for the provision of ICP supply) and mitigating measures are effected as required.

Due to their configuration, SWER networks can only be safely used in low load scenarios. Supply via SWER imposes limitations for any future growth. MLL avoids the construction of new SWER networks where possible due to the lack of future capacity as well as the operational risks and maintenance costs associated with SWER installations.

10.8.5 Operate and maintain

The resistance of earthing systems is periodically tested at frequencies based on the risk profile of the site. The inspection periods applied are summarised in Table 45. For efficiency, earth tests are also combined with visual inspections of the transformers or switches at the same site.

Table 45: Maintenance schedule for distribution earthing systems

Item	Action	Period	Maintenance level
SWER earthing systems	Inspection/earth test	3 Years	ISCA
Conventional earthing Systems	Inspection/earth test	6 Years	ISCA

The need for corrective maintenance is driven by the earth test results and is evaluated recognising the risks described in Section 12.

Emergency repairs are also made after damage by external parties.

10.8.6 Renew or dispose

Earthing systems are not generally renewed on the basis of age but are improved or added to if the performance of the earth is subject to deterioration. The latter is determined by testing. In some cases, SWER in particular, there may be a safety reason to rebuild the earthing system to improve the EPR exposure at the site.

Disposal of an earthing system may occur when an entire site is decommissioned – generally due to asset relocation.

10.8.7 Distribution earthing systems renewal forecast

Earthing systems are incrementally maintained rather than renewed. No capital expenditure is allocated against this fleet strategy.

10.9 Mobile generators

10.9.1 Fleet overview

Diesel generators are used within MLL's network to:

- provide supply to areas when planned or unplanned works would require an area to have no mains supply;
- reinforce supply lines where an alternate temporary feed does not have the capacity to maintain voltage;
- provide security of supply during network maintenance; and
- reduce MLL's contribution to regional power consumption peaks.

MLL has several generators used for operational support, split into a mixture of mobile units and fixed sites, with a cumulative capacity of approximately 3.7MW.

Mobile units are used to minimise outages when work is required on radial lines and/or during emergencies (e.g. earthquakes) when supply from upstream lines is not available. MLL has installed generation connection points at strategic locations of the 11kV network to provide safe and efficient deployment of mobile generators into the network.

There are two remotely controlled fixed generation sites in the Marlborough Sounds at Elaine Bay and Kenepuru Heads. These sites are embedded midway along two of MLL's longest and most remote feeders. In fault situations, these sites often enable supply to be restored to the remote ends before fault response staff can be deployed into the area.

MLL has a range of generator sizes to enable matching of capacity and load. A summary of MLL's mobile generator fleet is provided in Table 46. The capabilities of the current mobile generator fleet meets requirements. There are no plans to expand this fleet further.

Table 46: Mobile diesel generator fleet

Generator	Standby Rating @ 0.8 pf (kW)	Output Voltages	Mounting type
Gen 1	832	11kV, 400V	Flatbed Trailer
Gen 2	440	11kV, 400V	Curtain Sider Truck
Gen 3	440	11kV, 400V	Fixed (Elaine Bay)
Gen 4	440	11kV, 400V	Fixed (Kenepuru Heads)
Gen 5	440	11kV, 400V	Fixed (Kenepuru Heads)
Gen 6	440	11kV, 400V	Fixed (Kenepuru Heads)
Gen 7	160	400V	Skid
Gen 8	132	400V	Fixed (Taylor Pass)
Gen 9	264	11kV, 400V	Curtain Sider Truck
Gen 10	90	11kV, 400V	Folding Sided Truck

10.9.2 Populations and ages

The age profile of MLL's generator fleet, including both fixed and mobile, is summarised in Figure 69.

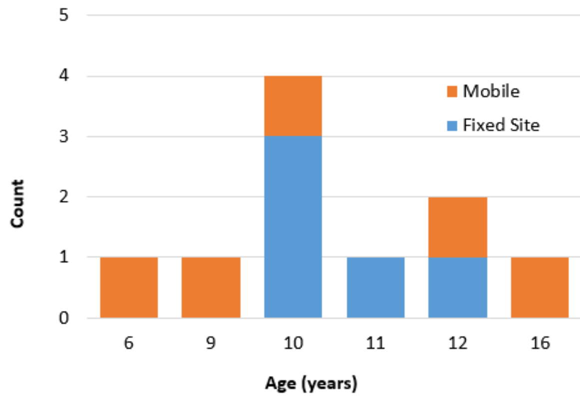


Figure 69: Diesel generator age profile

10.9.3 Condition, performance, and risks

Due to the small size of the mobile generator fleet, its relatively young age, and the scheduled maintenance undertaken, MLL has a good understanding of the health of the mobile generator fleet and considers it to be in good condition.

The generator/engine controller has recently been standardised amongst the fleet to facilitate ease of operation.

The electrical protection configured with a diesel generator is typically more sensitive than what would be installed within the standard line recloser or feeder protection due to the need to protect the generators themselves. This makes the generators inherently less robust than the mains supply, so the mains supply is restored as soon as this is viable. At all times, diesel generators are operated in a manner to minimise fuel costs.

Figure 70 summarises the AHI scores of the mobile generator fleet.

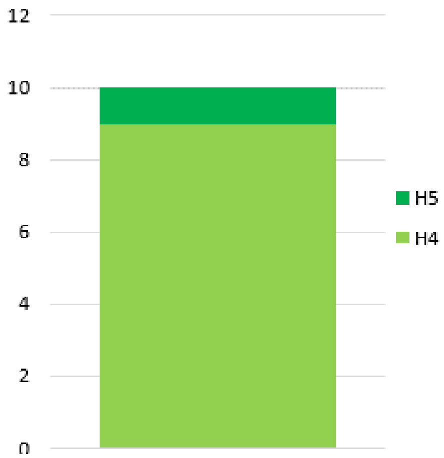


Figure 70: Diesel generator condition-based AHI

10.9.4 Design and construct

Demand for generators is driven by reliability improvement to provide enhanced service and improve network reliability. The key performance indicator is the amount of SAIDI minutes saved.

MLL's mobile generators are typically mounted on the back of a "curtain sided" or folding side style truck, along with a step-up transformer, isolating switches and protection and control modules. The mobile generators are relatively easy to use and operate and have proven to be of significant benefit to the network.

10.9.5 Operate and maintain

MLL's intention is to service the generators' diesel engines in accord with manufacturer requirements for both hours run or periods between service.

The vehicle mounted generators have flexible 11kV cables used to connect to the network. These cables are regularly moved as part of connection and disconnected activities and will suffer wear as part of these procedures. The cables are electrically tested every three months and visually inspected before each use.

Table 47 summarises MLL's maintenance schedule for the mobile generator fleet.

Table 47: Maintenance schedule for MLL's generator fleet

Item	Action	Period	Maintenance
All generators	Visual Inspection and run loaded.	1 Month	ISCA
Mobile generators	Cable test	3 Months	OSCA
All applicable generators	250 Hour service	6 Months or 250 running hours	NIM
All generators	Electrical inspection	1 Year	OSCA
All generators	500-hour service	1 Year or 500 running hours	NIM
All generators	2,000-hour service	2 Year or 2,000 running hours	NIM

All generators	3,000-hour service	3 Years or 3,000 running hours	NIM
All generators	4,500-hour service	4,500 running hours	NIM
All generators	12,000-hour service	6 Years or 12,000 running hours	NIM
All generators	Overhaul	Based off condition assessment	OSIM

10.9.6 Renew or dispose

The diesel generator life expectancy is placed at 20 to 30 years. Due to its maintenance practices, MLL is not expecting to have to renew or dispose of any of its fleet during this AMP due to asset health, although changes in operational requirements may affect these plans.

10.9.7 Diesel generator systems renewal forecast

No capital renewal is expected within this AMP. Inspection and routine maintenance is minor and is included in the routine opex budget.

10.10 Secondary systems (assets)

10.10.1 Asset management objectives

Secondary systems (such as protection and SCADA systems) are a critical part of operating a safe and reliable electricity network. Their useful lives can be shorter than assets in other areas due to ongoing improvements in technology and a commitment to continually improve the performance of the network. Assets in this class are growing in complexity due to the uptake in "smart grid" applications and typically have to be considered in conjunction with the operation of a number of network components.

Protection assets ensure the safe and correct operation of the electrical network. They detect network faults and operate circuit breakers to prevent harm to the public and staff, or damage within consumer installations or to network assets. The SCADA and communications assets provide network visibility, alerts for abnormal conditions, and remote control, allowing MLL's operators to operate the network with a greater level of efficiency.

10.10.2 SCADA and communications

10.10.2.1 Fleet overview

MLL operates the iFix Open Database Connectivity (ODBC) based SCADA system. The system has been designed to allow monitoring and remote control of devices in the network, including circuit breakers, transformer tap changers, line reclosers, voltage regulators and the load management system.

A central server communicates with remote terminal units (RTUs) over a wide range of communications mediums. The RTUs then interface with network equipment such as transformer control units and circuit breaker control systems. DNP3.0 is MLL's standard communications protocol for RTUs.

The communications network carries MLL's SCADA system traffic as well as protection and voice (DMR) systems. MLL's communications network consists of different data systems and physical infrastructure, including fibre optic circuits, UHF point-to-point digital radios, microwave point-to-point digital radios, point-to-multipoint UHF repeaters and cellular/ADSL circuits. Protection circuits are typically direct inter-relay fibre circuits between substations. All communication operates over TCP/IP Ethernet protocol.

The communications fleet also covers the infrastructure that houses communication systems, including masts, huts, cabinets, and RF equipment.

The SCADA system has been operating for approximately 15 years. During this time, it has had new servers and software upgrades to ensure stability and reliable operation.

There has been significant expansion of the SCADA communications network to provide coverage to the remote parts of MLLs network in the Marlborough Sounds and the east coast. Consequently, most of the communications equipment is at a young age and is not due for replacement within this planning period.

The expansion of the SCADA coverage area has enabled the connection of a number of three phase and SWER reclosers to MLL's SCADA system. Table 48 depicts the devices connected and the methodology.

Table 48: SCADA equipment population by communication method

Type	Fibre optic	Licensed radio	Unlicensed radio (WiFi)	Cellular/ ADSL	Not connected (but capable)
33/11kV circuit breakers	96	30	35	8	44
33kV reclosers	2	6	5	2	-
11kV reclosers	1	54	6	11	3
SWER reclosers	-	9	2	1	-
Voltage regulators	-	-	3	17	0
Zone substation transformers	16	7	6	2	-
RMUs	4	8	6	4	13
Enclosed switches	-	6	-	1	-

10.10.2.2 Condition, performance, and risks

Some aspects of the SCADA system are becoming limited in terms of compatibility with the latest available technology and could inhibit further development of the network unless upgraded.

The majority of MLL's communication network is in new condition and is at little risk of failure due to old components. During the 2016 earthquake, some damage to an analogue voice repeater site was sustained but the rest of the network performed well.

The key perceived risk from the SCADA system is the loss of network visibility and control. MLL prefers to operate equipment remotely for several reasons, including safety, speed of operation and improved operator feedback. Enhanced status information from the field using SCADA minimises outage durations and requires less staff on the ground and achieves faster response times.

A significant risk is a cyber-attack on the SCADA system where an internal or external arty gains control of devices or servers or denies MLL from controlling them. The increasing risk of a cyber-attack on MLL's network requires ongoing vigilance and improvement to the security levels of MLL's SCADA system. The potential safety, reliability, and cost consequences from an attack on the system is increasingly serious.

10.10.2.3 Design and construct

All new SCADA-connected equipment must be capable of TCP/IP communications with DNP3.0 protocol, where possible.

The latest standard RTU and protection relays that are being installed provide remote engineering access. This allows technicians and engineers to access information remotely removing the need to download the data at the site. This reduces the time required to understand and react to a fault.

Communications systems have Ethernet IP based technology, often Open Systems Interconnection model (OSI) layer 3 capable, allowing for network layer routing of packets such that any device or site can fail and not impact a wide area.

10.10.2.4 Operate and maintain

The SCADA system is continuously monitored through self-checking systems and a third-party monitoring system. The communications network is part of this monitoring system and alerts operators to communication failures or overloaded networks. Further staff resource will be required to monitor the network as it develops.

MLL's preventive maintenance schedule is outlined in Table 49.

Table 49: Maintenance schedule for SCADA and communications equipment

Asset type	Maintenance description	Frequency
Communications equipment	Visual inspection of radios, switches, antennas at zone substations and radio sites.	Yearly
SCADA master station	Software upgrades, database checks	3 monthly
SCADA master station	Hardware upgrades follows IT server replacements	5 Yearly

Figure 71: Communication mast at Takorika with various antenna

10.10.2.5 Renew or dispose

MLL plans to replace the current SCADA master station with an ADMS platform within the next five years to provide more functionality and add additional support for managing the greater quantity of data being generated. Furthermore, network security will be enhanced while also aligning and utilising business systems into the ADMS such as, geospatial connectivity model, customer connection data, outage management system and asset information. This integration will allow improved switching safety decisions, better outage reporting, improved fault response, and greater data visualisation. Other advanced applications will aid in fault restoration, network load forecasting, and distributed generation management.

Other communications assets, such as radio links and their associated hardware, are typically replaced due to obsolescence. The opportunity is taken to replace legacy communication assets with modern more functional assets.

10.10.3 Protection relays

10.10.3.1 Fleet overview

Protection assets ensure the safe and correct operation of our electrical network. They detect network faults and operate circuit breakers to prevent harm to the public and staff or damage to network assets.

Protection relays or integrated controllers are installed to detect and measure faults on the HV electricity network. They directly trip circuit breakers or operate switches to clear and isolate faults. They provide significant benefit to the network reliability through auto reclosing features for transient faults.

Protection systems include all associated equipment such as CTs and VTs, communication interfaces, auxiliary relays, and interconnecting wiring.

The MLL network has predominately numerical relays installed. There are now less than five remaining electromechanical relays installed. MLL intends to replace these electromechanical relays over the 10-year planning period.

The expected life of a numerical relay is approximately 20 years. Obsolescence is the main driver for replacement, and this is typically dictated by functions available, network standardisation and communication protocols. In all cases relays are purchased from suppliers of quality equipment to recognised standards.

10.10.3.2 Populations and ages

Simple phase over-current and earth fault (OC/EF) relays are generally used on zone substation feeders. 21 of the 31 zone substation transformers have dedicated differential protection. Figure 72 shows the protection relay age profile by type, with Table 50 providing the population breakdown by relay type.

MLL installed its first numerical relay in 2002. These first-generation relays will require renewal during the next five years as they near end of life.

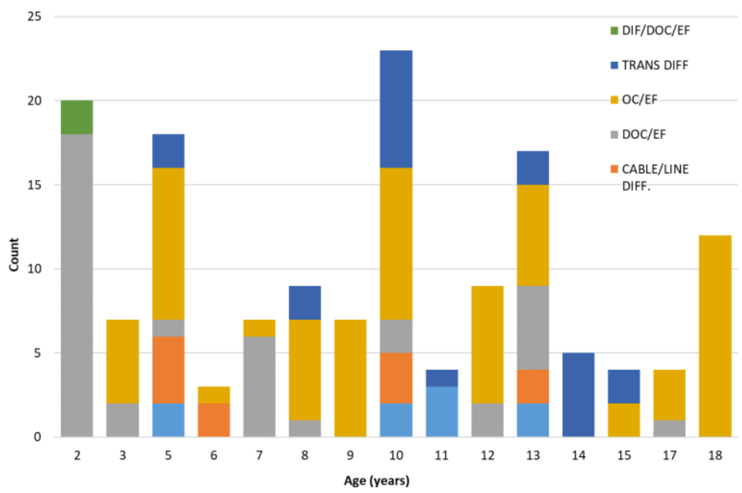


Figure 72: Protection relay age profile by type

Table 50: Quantities of protection relays by type

Relay type	Quantity
Bus differential	9
Cable/line differential	11
OC/EF with directional	41
OC/EF	67
Transformer differential	21
Total	**149**

10.10.3.3 Condition, performance and risks

The primary safety risk for a protection device is that it fails to clear a fault. This can put the public or staff at risk, impact on ICP installations, cause network equipment failure, overload, high or low voltage, etc.

Backup protection is a requirement for all circuits, but these inherently take longer to clear a fault to ensure protection discrimination. Longer fault clearance times are a considerable risk to the network.

10.10.3.4 Design and construct

Protection system design must balance many competing requirements to ensure the overall system is effective.

The protection equipment must operate correctly when required, despite sometimes not operating for long periods. It must operate with speed and precision as part of an overall protection system. It must provide safety to the public and staff, as well as minimise damage to network equipment. Correct operation is fundamental to providing reliable supply.

MLL recently reviewed all protection relays and selected a single supplier's relays as the standard.

10.10.3.5 Operate and maintain

Numerical relays require less detailed and less frequent checks. They are also able to provide alerts regarding their condition, prompting a maintenance callout if necessary.

The preventive maintenance schedule for protection relays is outlined in Table 51.

Table 51: Maintenance schedule for protection relays

Maintenance description	Frequency
Visual inspection of protection relays at zone substations, checking any alarm flags and resetting them.	Monthly
Detailed secondary testing and operational checks for numerical relays. Perform diagnostic tests relevant to relay function (e.g. overcurrent, distance).	6 yearly
Relay battery replacement (storage battery)	10 yearly

10.10.3.6 Renew or dispose

The strategy is to replace relays on the basis of functionality and age. MLL's costs and the risk of having odd spares increase with age. First generation numerical relays can increasingly be expected to diminish in functionality and as such MLL typically deems that replacement of these is required at 20 years of age. Some flexibility on the timing of these replacements is permitted where major projects have been planned at the site where the relays in question are located.

10.10.4 Load control system

10.10.4.1 Fleet overview

Metering in consumer installations is owned by metering equipment owners, including ripple relays. MLL operates a ripple control system for peak lopping of system load at certain periods of the year.

MLL operates both 217Hz and 1050Hz ripple injection systems. These inject at 33kV with the injection equipment installed at the Springlands zone substation site. The first 1050Hz relays were originally installed in 1967. All new ripple relays are 217Hz and the 1050Hz relays are being phased out.

10.10.4.2 Populations and ages

The 1050Hz plant was commissioned in 1967, although its rotary generator has been changed to solid state. The 217Hz plant was commissioned in late 2009. The ages of the plants are therefore 56 years and 14 years.

10.10.4.3 Condition, performance, and risks

There is currently only one 217Hz ripple controller available for service. Should this fail, control signals could not be provided and may put MLL at risk of exceeding the load target during shedding periods. There is a second 217Hz system out of service that can be used for parts. The maintenance contract with the supplier should enable major faults to be rectified within 48 hours provided the failure was not catastrophic.

The plant is not currently essential for maintaining services to consumers, however streetlight control Is reliant on the 217Hz plant. Cloud based smart appliance and smart home controls are now common and aggregation services for their control are now available. In the longer term the ripple plant could therefore become redundant. MLL is therefore keeping a close watch on cloud-based customer load control technologies to influence its load control investment decisions.

10.10.4.4 Design and construct

MLL plans to replace the ageing 1050Hz plant with a second 217Hz plant to operate as backup and to complement the other system within the 10-year planning period.

10.10.4.5 Operate and maintain

Regular inspection and testing of the ripple injection system assets is undertaken to ensure their continued and reliable operation. The controllers have several check alarms programmed to provide the early identification of any problems. The preventive maintenance schedule is outlined in Table 52.

Table 52: Maintenance schedule for load control relays

Maintenance description	Frequency
Visual inspection of ripple plant, checking any alarm flags and resetting them.	Monthly
Onsite testing and physical inspection of ripple plant.	Yearly

10.10.4.6 Renew or dispose

MLL plans to dispose of the 1050Hz system within the next two to five years. Metering equipment owners and retailers were notified to transfer their consumers to 217Hz relays by 1 April 2021. MLL will continue to renew the existing 217Hz plant and plans to install a second 217Hz system, once the 1050Hz plant is decommissioned, to improve operability and reliability.

10.10.5 Secondary systems renewal forecast

MLL is considering replacement of its existing SCADA management system within the first five years of the planning period, a project that is expected to take approximately 18 to 24 months to complete.

Protection relay replacement work is, as far as practical, coordinated with zone substation works – typically power transformer or switchboard replacements. At these times the protection systems may also be replaced depending on the technology and condition of the existing relay assets.

A new 217Hz ripple control system is forecast to be installed within five years. Refer to the network development section for project details.

10.11 Non-Network assets

10.11.1 Information systems

MLL has extensive IT systems which are critical to supporting the everyday business needs. IT systems cover all aspects of the business - payroll for staff, asset data management, monthly billing, GIS viewers, financial information, purchasing and stock, scheduling and estimating of work, storage of electronic files, and running engineering analysis of capacities and loads on the network for example – all related directly or indirectly to achieving MLL's asset management objectives.

MLL's IT infrastructure is generally managed by the ICT team which comprises six full time staff members. External consultants are engaged at times to assist the IT team as and when specific advice and input is required.

IT-related assets such as computer hardware and software have relatively short lifespans as new and improved technologies become readily available.

MLL's forecast IT related capital expenditure is summarised in the regulatory schedule (11a) which can be found in Appendix 12. The amounts forecast are relatively constant across the planning period.

10.11.2 Vehicle fleet

10.11.2.1 Description

MLL owns and manages a significant vehicle fleet across the business (including the contracting division). Vehicles are an essential asset to enable and facilitate MLL's activities and to meet MLL's asset management objectives. MLL's vehicle fleet as at February 2023 includes:

- 62 utility vehicles (utes);
- 26 trucks (including crane and bucket trucks, mobile generators);
- 23 light vehicles (cars and SUV);
- 3 forklifts; and
- 57 other (ATVs/quad bikes, chippers, trailers etc).

When procuring vehicles, MLL considers safety (largely based on the Australasian New Car Assessment Programme (ANCAP) rating), environmental impacts (including fuel efficiency) and operational requirements (i.e. suitability for intended use).

MLL's vehicle procurement policy is reviewed and updated when deemed necessary. It is envisaged that the policy will develop to include greater focus on procuring vehicles, where appropriate, that are fully electric, or electric hybrid. MLL currently has three fully electric vehicles and two hybrid vehicles under the "light vehicle" section and one full electric vehicle under the "other" section.

10.11.2.2 Management

Records of MLL's vehicles are maintained in the asset management system, Infor EAM. Vehicles are split into various classes and categories, and relevant attributes are recorded against each vehicle. The records allow easy visibility and tracking of when maintenance activities are required against each vehicle.

MLL's vehicles are regularly maintained to ensure operational effectiveness and to minimise the potential for componentry failure which could contribute to an accident or lessen reliability.

MLL's utility vehicles travel the greatest distances often on gravel and/or rough roads. These vehicles are typically replaced between three to six years depending on the make and models, distance travelled and performance. Other vehicles are replaced on a case - by - case basis.

10.11.2.3 Forecast costs

MLL's capital expenditure on vehicles has averaged approximately $800,000 over the past three years. The expenditure on vehicles is forecast to increase over the planning period. This increase is partly driven by MLL developing its own Traffic Management and Earthwork capability, rather than a sole reliance on external contractors, in an attempt to gain cost and process efficiencies. The expenditure forecast has also been updated to reflect the recent increases in vehicle prices, and in particular, the heavy crane and bucket trucks where costs have increased significantly. The annual expenditure on vehicles will be reviewed and any adjustments to forward forecasts will be made as appropriate, i.e. reflecting any changes in MLL's vehicle requirements to support asset management objectives.

10.11.3 Buildings and land

10.11.3.1 Description

MLL owns and maintains a number of non-network properties and buildings, including:

- The main office building/property at 1 Alfred Street, Blenheim.
- The Taylor Pass depot which comprises land and a series of buildings – offices, workshops and sheds/warehouses to store electrical and non-electrical goods.
- Residential property (including a dwelling) at 34 Budge Street, Blenheim. This was purchased several years ago for a possible future zone substation development site.
- The D'Urville Island depot building/property at Kapowai Bay. This is used to store materials and equipment to assist work that is undertaken on D'Urville Island and provides limited accommodation for staff.
- A 60-hectare eucalypt plantation in the Wakamarina Valley, Marlborough.
- A vacant lot at 287 Hammerichs Road, Rapaura. Site of a potential future zone substation development.
- The property/building on the corner of Old Renwick and Thomsons Ford Road housing the historic (out of service) diesel generators.
- The System Control building adjacent to the Springlands zone substation on Murphys Road. The System Control building currently houses MLL's ripple plant (i.e. it is a system asset). The building has historically served as a backup network Control Room.
- The Picton depot building/property at 15 Market Street, Picton. In past years this was utilised by field staff based in Picton to respond to faults and carry out work in the Picton area. It is now used for adhoc projects and available for emergency purposes.
- The Havelock depot building/property at 24 Lawrence Street, Havelock. This was also used as the base for field staff carrying out work in the Havelock area. It is now used for Ad hoc projects and is available for emergency purposes.
- Renwick Zone Substation on the corner of Hawkesbury Road and SH63. The zone substation was decommissioned after Tapp substation was commissioned in 2019 however the building is still part of the routine inspections.

MLL's main office building is located at Alfred Street, Blenheim. The main office houses engineering, network, financial, commercial and corporate services staff. The property also includes an adjacent building housing MLL vehicles as well as the network control room where MLL's network controllers work. Adjoined to this building is the former workshop which is currently leased out.

MLL's contracting business is located at Taylor Pass Road, and it comprises an office building, electrical workshop, stores warehouse, plant and vehicle sheds and other buildings housing materials and/or equipment. The Taylor Pass office houses contracting staff, including management, supervisors, design estimators, fault men and administrative support staff.

10.11.3.2 Management

MLL aims to provide staff with secure, safe and functional office environments that facilitate efficient work and allow for future growth. Security of critical non-network services and infrastructure, such as IT servers and the Network Control Room are also considered, including contingency in the unlikely event of failure.

Maintenance of the properties outlined is undertaken as and when required with painting occurring at appropriate intervals. The grounds of all properties are maintained, and care taken to ensure they integrate with the environment.

10.11.3.3 Forecast costs

A review of the second building on the Alfred Street site, which accommodates the Control Room, tearoom, vehicle garage and tenanted workshop has been undertaken, including a seismic assessment. This building is below earthquake code and has a number of structural issues including water-tightness. A preliminary decision has been made to end the commercial tenancy agreement, demolish the existing building, and build a fit for purpose building on the same site that will provide additional office space along with commercial rental potential. The network control room is to be permanently relocated to the Taylor Pass depot site and house in a purpose-built building that meets Importance Level 4 building standards. A provisional capital expenditure amount has been included in the expenditure profile for RY24 to complete the network control room build and RY25 and RY26 to complete this demolish and rebuild project.

A review will be undertaken of the System Control building following the completion of the network control building as discussed above. This building is currently used as a back-up control room and also houses back up IT servers that will be relocated to the new network control room, therefore the functions that this building performs will be significantly reduced. The System Control building will continue to house MLL’s Ripple Control equipment.

MLL incurs expenditure as required for maintenance of non-network buildings but overall, this is not material relative to other expenditure.

10.11.4 Other non-network renewal forecast

Other non-network asset capital expenditure will cover plant, tools and equipment, and office and IT equipment. Expenditure for these assets is expected to be relatively constant over the planning period and is presented within the regulatory schedules in Appendix 12.2.

10.12 Major renewal projects

10.12.1 Network (system) renewal projects

The following sub-sections provide a breakdown of the more significant renewal projects and programmes identified at the time of preparing this AMP.

10.12.1.1 Year one (RY2024)

10.12.1.1.1 Wynen Street Substation Switchgear Replacement

Wynen Street substation will be, along with Arthur Street substation, one of the last town substations to be renewed by MLL. Both substations have transformers nearing the end of their serviceable life, aged switchgear which is difficult to maintain and operate, and which does not have arc-flash rating. The project will involve the replacement of this equipment with new and modern equivalents. Benefits will include greater network resilience, increased reliability (less likelihood of equipment defects), and easier and safer maintenance and operation of the equipment.

10.12.1.1.2 Cloudy Bay Industrial Estate Substation Upgrade

The switchgear at this substation is aged and has limitations including an inability to be operated remotely. MLL intends to replace the switchgear with new and modern equivalents in RY2024.

10.12.1.1.3 Redwood Pass 33kV (No. 1 circuit to Seddon)

The No. 1 circuit between Riverlands and Seddon was constructed over 80 years ago, largely supported on steel lattice tower poles. This circuit has been rebuilt progressively over several years and, after the completion of a section near the Seddon end of the line in 2019, there now remains a relatively small section (13 poles) to complete the rebuild of the entire circuit to Seddon. The lattice towers and reinforced concrete poles will be replaced with new steel poles, with new pole hardware/components and conductor. The work is scheduled to be completed early in the RY2024 year.

10.12.1.1.4 33kV rebuild Caseys Road to Marfells Beach Road section

The 33kV power poles between Seddon and Ward were installed over 55 years ago and are showing signs of deterioration. The section between Caseys Road and Marfells Beach Road is adjacent to Dominion Salt Works salt ponds and is in relatively poor condition. Spalling is evident on a number of the power poles, and pole components are in relatively poor condition (a number of defects have been recorded from condition assessments). Landowner consultation and design work are now almost complete and physical works are scheduled in RY2024. The rebuild will consist of new steel poles, new conductor and an overhead earth wire.

10.12.1.1.5 Kaituna River SH6 – 33kV Line Rebuild

A section of MLL's 33kV line adjacent the Kaituna River is under threat due to river erosion. MLL has assessed various options to relocate the line away from the riverbank and physical works to implement the preferred solution have been scheduled in RY2024.

10.12.1.1.6 11kV Line Rebuild Programme

MLL has over 400km of 11kV and LV copper and steel conductor throughout its network. Much of this conductor is aged (some is over 60 to 70 years old), has capacity limits, and is in many cases supported by old iron rail poles which themselves are aged and in condition largely unknown as it is difficult to assess their structural capacity. MLL therefore intends to phase much of the 400km out over the course of the planning period by continuing a line rebuild programme that in most cases replaces both the poles and the conductor. These rebuilds typically position the structures in the same locations however where there is an advantage to MLL and the landowner the new line may be relocated. Sections for replacement will be determined by criteria such as age, condition, consumers affected, access, land use etc. In RY2024, the following projects have been identified:

- <u>Bluegums to Rarangi Line</u>
  This is a project to replace selected poles and/or pole top hardware and insulators over a section of line consisting of around 50 poles. The project is a result of a detailed condition assessment and due to widely varying conditions along the line, it has been determined that a complete rebuild is not warranted.

- Okaramio Feeder
  This project is the first stage/section of the 9km rebuild of aged & constrained 7/14copper conductor from Kenningtons Road through to Prices Road on SH6. Larger conductors are required to strengthen this backbone line due to the large customer numbers and resupply options it gives the network. Pole replacements are required to accommodate the heavier conductors, although some existing will be reused.

- 5402 SH1 - Trolove Spur Line
  Iron-rail pole replacement project off State Highway 1 on Marlborough's east-coast.

10.12.1.1.7 Treated pine pole replacement programme

As described more fully in earlier sections of this AMP, MLL has an aging population of this pole type which, based on condition data, will reach end of life in 15 to 20 years. To avoid this occurring concurrently, MLL intends to continue with this pole replacement programme. Individual projects will be developed based on the need to replace poles within specific geographical areas. Condition data will be used to determine priorities.

10.12.1.1.8 Distribution pillar (DP) replacement programme

This programme intends to replace a number of aged (some over 50 years) DP boxes, many of which are in the urban environment. The DP box replacement programme has been determined from a risk assessment which is based on criteria such as safety, age, number of consumers, type and location. Significant planning is required for each box to enable the work to be carried out with minimal disruption to customers (which may include businesses), which may mean carrying out the work outside normal hours.

10.12.1.1.9 Oil RMU replacement programme

MLL has several older oil insulated RMUs in service on the network. Some of these have an enclosed bus extension which have a known susceptibility to moisture ingress (an inspection programme was completed in 2018 to identify the at risk RMUs and remedial action has been taken which involves filling the bus extensions with resin for insulation purposes). While these measures have mitigated the risk of failure due to moisture ingress, a replacement programme is considered appropriate for selected units. This is based on the age, condition and location of the asset. As part of the planning for replacement, consideration will be given to the required isolation of the RMUs which can impact in some instances hundreds of consumers. Five RMU replacements are programmed for RY2024.

10.12.1.1.10 Protection Relay Replacement Programme

A number of protection relays in the MLL fleet are nearing the typical replacement age and accordingly a programme has been developed for the staged replacement of the relays in zone substations and switching stations. This programme is based primarily on age but also takes into account criticality and in some cases rationalises the replacements to ensure sites are upgraded completely in one visit. In RY2024, five relays are planned for replacement across four sites. This programme will also extend right throughout the planning period.

10.12.1.2 Years two to five (RY2025 to RY2028)

10.12.1.2.1 Arthur Street Substation Switchgear Replacement:

Arthur Street substation will be, along with Wynen Street substation, one of the last town substations to be renewed. Both substations have transformers nearing the end of their serviceable life, aged switchgear which is difficult to maintain and operate, and which does not have arc-flash rating. The project will involve the replacement of this equipment with new and modern equivalents. Benefits will include greater network resilience, increased reliability (less likelihood of equipment defects), and easier and safer maintenance and operation of the equipment.

10.12.1.2.2 Rai Valley Substation - Transformer Replacement

Rai Valley power transformer T1 is nearing end of life and needs to be replaced. Subject to condition assessment and testing, MLL is proposing to replace the 3MVA Rai Valley T1 power transformer with an existing spare 5MVA power transformer.

10.12.1.2.3 Woodbourne Zone Substation - Transformer Replacements

One of the two power transformers (T2) at Woodbourne substation is in poor condition and over 50 years old. The other (10MVA) transformer (T1) is still in good condition and can remain in service on the network. With growth anticipated in the Woodbourne area, MLL intends to replace both Woodbourne transformers with new 16.5MVA models. Woodbourne T1 (10MVA) will be retained and installed at MLL's Leefield substation to provide N-1 security (currently Leefield is the only MLL substation with a single transformer). The aged Woodbourne T2 will be decommissioned.

10.12.1.2.4 Leefield Substation – Transformer Installation

As noted above, MLL intends to relocate an existing 10MVA transformer from MLL's Woodbourne substation to its Leefield substation.

10.12.1.2.5 11kV Line Rebuild programme:

Between RY2025 and RY2028, MLL intends to continue this line rebuild programme where the complete replacement of both poles and conductor is required. Projects are selected based on criteria such as condition, age and criticality and these rebuilds typically position the structures in the same locations. However, where there is an advantage to MLL and the landowner the new line may be relocated.

10.12.1.2.6 Pole Replacement Programme:

As detailed in the fleet management section, there are significant volumes of TP poles, primarily in the Marlborough Sounds, that are approaching or exceed 50 years of age. MLL has recognised that a systematic programme of renewal of these poles will be required over a number of years. Included under this programme is the replacement of iron rail poles. These poles are aged and present difficulties for faults and maintenance. All poles selected for replacement under these programmes will be prioritised based on a number of factors including condition (risk of failure), age, customers affected and location.

10.12.1.2.7 Distribution pillar (DP) replacement programme:

This will be a continuation of the programme described above in year one. Several DP boxes are to be replaced each year in the planning period, with priority based on a criteria driven assessment, including condition.

10.12.1.2.8 Distribution transformer replacement programme

As noted in the fleet management section, MLL has several distribution transformers which are at or nearing end of life. This programme will involve replacing those transformers. A prioritised list will be developed (based on factors such as condition, environment, number of consumers supplied, size and loading).

10.12.1.2.9 11kV town cable replacement programme

Many of Blenheim's 11kV cables will be approximately 60 years in age within the planning period. MLL intends to phase out the older cables (subject to testing results and in a staged manner) and replace them with new equivalents. This work will be complex due to the confined and developed nature of many parts of Blenheim.

10.12.1.2.10 11kV recloser renewal programme

The aged 11kV reclosers on the network are beginning to show signs of deterioration. This programme will see a gradual replacement of the fleet, with one to two reclosers targeted for replacement each year.

10.12.1.3 Years six to ten (RY2029 to RY2033)

Years six to ten of the planning period are more difficult to forecast with certainty. At this time, MLL intends to continue with the programmes and projects noted below:

- Continuation of the line rebuild programme which includes copper and steel conductor, oil RMU replacement programme, town cable replacement programme, 11kV recloser renewal programme, TP pole (Marlborough Sounds) and iron rail pole replacement programmes and the protection relay replacement programme.
- Picton 11kV and LV network renewal programme: Much of the Picton HV and LV overhead assets are showing signs of deteriorated condition (based on recent asset inspections) and a number of defects (such as split cross arms). Subject to further inspections in future, MLL proposes to systematically renew these assets to improve network reliability and resilience. The work will be split across multiple years.

10.12.2 Non-Network (non-system) renewal projects

There is no significant non-network capital expenditure planned within the next five years for vehicles and land, however MLL is planning a new control building at Taylor Pass depot and considering long term options for a new GXP.

10.12.2.1 Buildings

As discussed above, a preliminary decision has been made to end the commercial tenancy agreement and demolish the existing Alfred St commercial building, and build a fit for purpose building on the same site that will provide additional office space along with commercial rental potential. The existing Alfred St office building is likely to be retained. The network control room is to be permanently relocated to the Taylor Pass depot site and house in a purpose-built building that meets Importance Level 4 building standards. A provisional capital expenditure amount has been included in the expenditure profile for RY24 to complete the network control room build and RY25 and RY26 to complete this demolish and rebuild project.

A review will be undertaken of the Springlands System Control building following the completion of the network control building as discussed above.

10.12.2.2 IT systems

MLL has no committed material IT capital expenditure at the time of writing. MLL is planning a ADMS system to replace its SCADA and OMS systems. The full ADMS capability has not been committed to. It may replace further business systems or it may be efficient to consolidate some other business systems following the ADMS project. This will be reviewed over the next few years as the ADMS project progresses.

MLL will renew and replace IT equipment at the end of the useful life of those assets.

10.13 Operational expenditure

10.13.1 Overview

Operational expenditure (opex) is essential in meeting asset management objectives. Opex is a very broad category – it includes work on the network such as restoration of network outages, inspections of assets, and vegetation management as well as non-network support activities, corporate and administrative costs, and vehicle operation costs for example.

Generally, opex activities on the network are more broadly termed as "maintenance". Maintenance work on the network is split into maintenance portfolios. These are reactive (reacting to network outages and incidents, repair to assets, or to make sites safe) and scheduled or planned maintenance (preventative and corrective).

MLL's opex is outlined in the following subsections. Further detail on the planned maintenance regimes can be found in Sections 7.5 to 7.7.

10.13.2 Routine and corrective maintenance and inspection (network)

This section of expenditure covers asset patrols, inspections and testing, rectification work from faults (excluding initial fault restoration work undertaken), maintenance of zone and distribution substation sites and maintenance (such as vegetation clearance) of access tracks. Within MLL this is referred to as preventive maintenance – inspections of equipment to identify defects and the rectification of defects identified when and where appropriate (differentiated from faults which result in power outages).

When defects are identified, they are recorded in the asset and works management system. Each defect is assigned a priority, urgent, high, medium or low. The priority assigned is based on the nature of the defect, the criticality of the asset, and the safety implications (potential consequences) which may arise from the defect worsening or resulting in a more substantial failure.

The inspection of the assets to identify any defects is undertaken on a scheduled basis or as a result of changed circumstances. The regularity of inspections varies across different asset classes, and for different voltages. For example, a pole carrying dual sub-transmission circuits would be subject to more regular inspections than a pole carrying low voltage conductor only.

The amount forecast for the 10-year planning period is typically between $4.0m and $4.2m per annum. This has been based on analysis of the trend of the last four years of actual expenditure, along with known step changes in MLL's inspection regime. MLL is forecasting a reduction in this category of expenditure as measured in constant dollars and efficiencies are found in its inspection regimes, and new technologies, such as inspection by drone are implemented.

10.13.3 Service interruptions and emergencies (network)

This section of expenditure covers works undertaken during or immediately following unplanned events which interrupt the normal operation of network assets (i.e. fault work). The drivers of this expenditure include earthquakes, weather events, human interaction (car vs pole, cable strike, machinery), animal interaction (possums, swans, geese) and asset failure.

The amount forecast for the planning period is approximately $1.2m per annum increasing with inflation. This has been based on historic levels of expenditure after removing non-routine expenditure such as from the November 2016 earthquake and the July 2021 and August 2022 storm events. MLL has seen improving levels of underlying network reliability over the last 10 years through a number of initiatives including remote system control, introduction of long run possum guards and bird spikes, vegetation management, relocating at risk assets, and general asset upgrades.

MLL is cognisant that while consumers want a reliable network, they also want it to be cost effective. Accordingly, any improvements to network reliability need to be measured against the cost of achieving them. MLL intends to maintain or ideally improve on current target levels of network reliability although it is inevitable the need for fault expenditure will continue and so is forecast to remain flat in constant dollars.

There will always be the potential for events such as weather, human and animal interaction with the network and asset failure. During the last two years, MLL has had to respond to two significant storm events that have had pro-longed restoration times, hampered by a lack of road access. These events have had a significant impact on costs incurred, as helicopters and barges have been required to be utilised to restore power supply. It appears that the frequency of these events is increasing, however, MLL has not incorporated within its expenditure forecast provision for a major storm event every year. The additional cost associated with the recent storms has been approximately $0.4m per event. MLL may look to incorporate a provision within its Service interruption and emergencies expenditure forecast for major storm response, if current event frequency continues.

10.13.4 Vegetation management (network)

This section of expenditure covers the felling, removal or trimming of vegetation (and associated costs) in the proximity of electrical assets. This includes:

- inspection of electrical assets for the purposes of identifying vegetation in the vicinity of the assets;
- liaising with landowners;
- physical work involved with felling or trimming vegetation including operational support (such as mobile generation); and
- use of helicopters for spraying.

Details on MLL's vegetation management strategy is presented in Section 7.6.

MLL faces high costs in relation to vegetation management largely because of the extent of indigenous and native forested areas coupled with difficult to access terrain that exists in the Marlborough Sounds.

The amount forecast for the planning period is $2.3m for RY2024 and remaining flat in nominal terms across the planning period. This has been based on two criteria:

- The first is that MLL is now moving into the second trim phase of tree management under the Electricity (Hazards from Trees) Regulations 2003. This requires that the tree owners pay for the second trim rather than the network owner.
- The second reason for decreased spend is that MLL works with tree owners to, where possible, remove trees under the line before they encroach within the growth limit zone and create clearance zones wider than the statutory limits. Once these clearances have been created there will be less ongoing cost to maintain them.

There will always be cyclical tree inspections and costs to manage the trees outside the statutory clearance zones.

MBIE is currently considering a review of the tree regulations (Electricity (Hazards from Trees) Regulations 2003). The outcome of any review and introduction of new regulations may impact on the forecast amounts proposed in this AMP for the planning period. At this time, it is too early to comment on potential impacts given the uncertainty with any regulatory change, if any.

10.13.5 Asset replacement and renewal (network)

This section of expenditure covers mainly cross arm replacement, single structure replacements and replacement of network consumables such as recloser batteries.

The amount forecast for the 10-year planning period is typically between $0.8m and $0.9m per annum based upon an average level of historic expenditure and current information on assets from available attribute data and condition assessments undertaken.

There are no drivers to suggest that the replacement and renewal opex activities on MLL's network will step away from historic trends as assets continue to age.

10.13.6 Systems operation and network support (non-network)

This section of expenditure covers a range of management activities of the network. Some of the more significant activities falling under this section include:

- Policy, standard and manuals development and management;
- Outage recording and data management;
- Data recording and management, support (administration) and management of IT systems (including GIS, Milsoft, EAM and others);
- Asset management planning, load forecasting, network modelling, engineering design, technical advice, procurement, contract and inventory management, (excluding project costs capitalised);
- Training;
- Easements (creation of new and management of existing);
- Vehicle operation and management (maintenance);
- Consumer enquiries, records and other activities; and
- Other office - based and control room system operations.

The amount forecast for the planning period is $5.2m for RY2024 increasing to approximately $6.5m for RY2033. This has been based on recent levels of historical expenditure and forecast requirements. All expenditure is subject to regular review to maximise benefits relative to costs in all aspects of MLL's operations.

10.13.7 Business support (non-network)

This section of expenditure covers corporate activities including:

- CEO and director costs, legal services, non-engineering/technical consulting services;
- commercial activities including pricing, billing, revenue collection and marketing;
- compliance - related activities (finance and regulation);
- HR and training (non-operational);
- property management; and
- support services such as IT, secretarial, etc.

The amount forecast for the planning period is $5.4m for RY2024 increasing to approximately $6.5m for RY2033. This has been based on the historical level of expenditure and is held flat in constant dollar terms. No structural changes to this support function are forecast.

11. Expenditure forecasts

11.1 Overview

This section collects together the forecast costs of the network development, fleet strategy actions and other business-related costs required to meet the asset management objectives, risk mitigations and network performance targets set out in this AMP.

11.1.1 Assumptions on cost inflators

MLL faces cost pressures from a number of sources, including labour, fuel, construction costs, and international commodities such as copper and aluminium. Exchange rates will also impact on the final prices MLL pays for many inputs that are utilised into its business. Escalation in these cost drivers affects MLL's estimation of the nominal values of its cost forecasts over the planning period.

Rather than taking an overly complex approach to escalate expenditure forecasts from constant to nominal dollars given there are large inherent uncertainties, MLL has instead applied an index based upon the RBNZ's CPI forecast and its long run CPI rate of 2%, consistent with the RBNZs mid-point target.

This is a relatively straightforward approach and is considered unlikely to be materially different from an approach using a combination of Labour Cost, Producer Price and Capital Goods Price indices.

11.2 Capex

MLL's capex is charted in Figure 73 over the period RY2018 to RY2023 (actual) and RY2024 to RY2033(forecast). Values are expressed in nominal dollars.

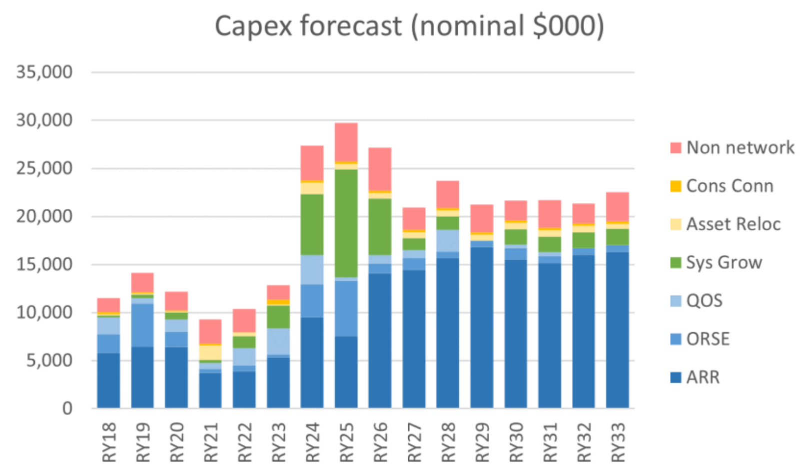


Figure 73: Summary of actual and forecast Capex ($000) by primary driver

This shows the network capex forecast increasing significantly from its recent historical levels of approximately $10m to $12m per annum, to above $20m per annum. This reflects the major customer driven growth projects as discussed in this document and in the later years, MLL's intention on focusing more expenditure towards distribution asset replacement and renewal as outlined in this AMP.

The more significant increases in RY2024 through to RY2028 reflect the material "one off" projects for 33kV network improvements, the proposed Waitohi/Picton zone substation and the Kaituna zone substation.

Note, the low capex outcomes evident in RY2021 and RY2022 were impacted by COVID 19 and storm events delaying MLL's capital works programme.

The largest component of forecast capex expenditure is for asset replacement and renewal. This component of capex expenditure is forecast to trend up in average over the planning period, reflecting the renewal programmes outlined in this AMP.

11.2.1 Contribution to drivers

For accounting and regulatory disclosure, system capex projects and programmes are allocated over the following eight categories:

- growth and security;
- replacement and renewal;
- asset relocations;
- quality of supply;
- legislative and regulatory;
- reliability, safety and other;
- overhead to underground conversion; and
- consumer connections

Accounting allocation is against the category most applicable to the works expenditure. However, in most cases any particular project will impact across multiple objective drivers. For example, a line renewal may be driven by the age and condition of the line and therefore be allocated to replacement and renewal, but renewal will also impact the line reliability and safety implications from avoided faults. In order to show the effect of the forecast expenditure against its asset management objectives, MLL has also allocated to the works costs against multiple asset management driver categories in proportion to their assessed benefit.

This benefit return to MLL and its stakeholders is reflective of the general themes in this AMP; that network capacity is adequate and not expected to be challenged by growth over the forecast period; the expenditure focus is shifting towards renewal with its benefits in ensuring network continuance, improved supply quality and safety; and the addressing of MLL's risk evaluations for liability from fire risk and the network's resilience to major events like earthquakes.

Line breakdowns of the capital expenditure are provided in the regulatory schedules included in Appendix 12.2.

11.3 Opex

MLL's opex forecast is discussed in 11.3 and charted in Figure 74 for the period RY2018 to RY2023 (actual) and RY2024 to RY2033 (forecast). Note

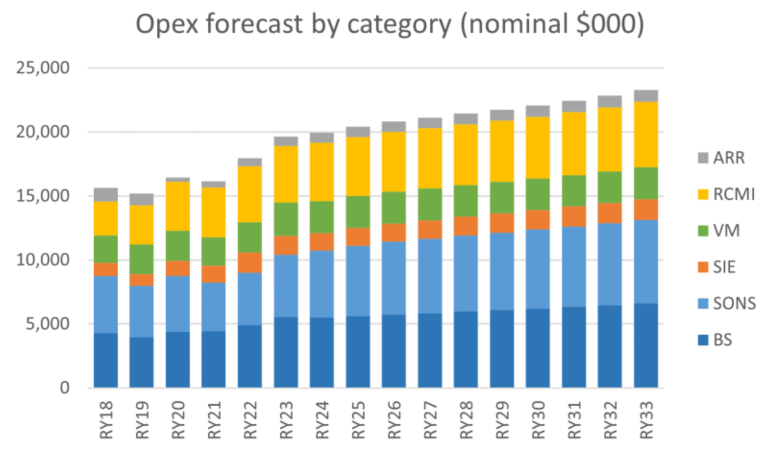


Figure 74: Summary of actual and forecast opex (nominal $000)

that RY2023 is extrapolated through to 31 March 2023 from data through to 31 December 2022.

MLL's opex forecast slightly increases over the forecast period, relatively in line with the trend seen over the previous six years (including current year), noting the high inflationary environment that has been in place during RY2022 and RY2023

The basis for the expenditure categories in this forecast is discussed in section 10.13 where forward forecasts are based off historic averages where there is an expectation of continuance at the past levels and after adjustment for any one-off factors.

At a high level, MLL is seeking to hold non-network expenditure increases to a minimum where possible. Making do with existing resources and looking to offset cost pressures by making efficiency improvements. MLL will be seeking to advance its asset management capability to make the best use of existing systems and processes.

MLL is forecasting a small reduction in vegetation management expenditure (for reasons discussed previously), but forecasting the other maintenance expenditure categories to be held to modestly increasing levels in real terms. Unforeseen events such as storms or seismic events and individual projects arising from circumstances as yet unknown will cause actual results to vary. However, MLL believes this to be a reasonable long-term view.

11.4 Capex/opex trade-off and overlapping works

MLL's capital investment is directed at network restoration, load growth, utility enhancement and improvement or holding of the service reliability. While some works, such as remote-controlled network switches, will reduce the need for manual switching, by and large, the capital programme set out in this AMP does not encompass productivity improvement projects of any significance that would see an offset in opex costs.

The exception to this is the ADMS project, which when implemented, will provide efficiencies around activities such as switch writing and fault response. The associated data cleanse will also provide many benefits across the businesses in both Capex and Opex. Although it is expected that the ADMS will provide operational efficiencies it is recognised that ongoing support of the ADMS will be required that is higher than the level of operational support required by the systems that it will replace, and therefore MLL does not expect to see an overall productivity improvement, but instead an improvement in the quality of its service.

11.5 Capacity to deliver

Whilst the expenditure levels forecast in this AMP are higher than those forecast by MLL in previous years, MLL foresees no issue in managing and achieving the outcome expenditures set out in this plan.

With a large proportion of the increased expenditure attributed to MLL's programme of work with KiwiRail, MLL has planned to utilise external contractors for much of this work – thus leaving MLL's own in-house contracting team to focus on more routine replacements and upgrade work on the network.

In previous years, MLL has utilised external resources and contractors successfully where needed and MLL believes this approach can be deployed successfully again particularly in the peak expenditure years forecast (RY2024 -RY2026).

Recent examples where MLL have used external resources previously include:

- following the July 2021 and August 2021 storm events MLL brought in a number of crews from neighbouring electricity distribution businesses to assist with earthquake repairs;

- In order to manage increased workload MLL has had a major line re-build projects resourced by external contractors;

- MLL has recently engaged external contractors in a design, build contract for the construction of its new Waitohi Zone Substation project; and

- on a regular basis, MLL contracts vegetation companies to complete work on the network to take the peak off heavy workload.

Additionally, the nature of the work planned does not represent any significant change from MLL skills base. Again, MLL does not hold any reservation about its ability to achieve the works it has planned.

Additionally, MLL believes that by maintaining its own Contracting division it has the staff and resources required to maintain standards and complete work to the highest level of workmanship. The approach also means it has control of the size of the workforce available to it and ensures the AMP can be delivered.

12. Appendices

12.1 Glossary

Term	Meaning
AAAC	All aluminium alloy conductor.
AAC	All aluminium conductor.
ABS	Air Break Switch – used in the 33kV and 11kV networks.
ACR	Asset Critically Ranking, a measure of important of asset for providing service.
ACSR	Aluminium conductor steel reinforced
AHI	Asset Health Index – a measure of an assets remaining life. Defined in the EEA guide to this measure.
ALARP	As Low as Reasonably Practicable – a principle of risk management.
AMMAT	Asset Management Maturity Assessment Tool.
AMP	Asset Management Plan.
ArcGIS	Geographic Information System from ESRI used by MLL.
CAIDI	For the Total of All Interruptions (Consumer Average Interruption Duration Index). CAIDI is the average duration of an interruption of supply for consumers who experienced an interruption of supply in the period. The CAIDI for the total of all interruptions is the sum obtained by adding together the interruption duration factors for all interruptions *divided by* the sum obtained by adding together the number of electricity consumers affected by each of those interruptions.
Capex	Capital expenditure.
CBD	Central Business District.
CDMA	Data system provided by Spark, uses Cell network, MLL uses this for some SCADA communications.
CPI	Consumer Price Index.
DGA	Dissolved Gas Analysis.
DNP3	Distributed Network Protocol (version 3) – a communications protocol.
DOC	Department of Conservation.
DP	Degrees of Polymerisation.
EAM	Info's enterprise asset management software for managing assets and works.

Term	Meaning
EDB	Electricity Distribution Business.
EEA	Electricity Engineers Association.
ENA	Electricity Networks Association.
EPV	Elevating Platform Vehicle – Used in Live Line work and for ease of maintenance on various assets.
GAAP	Generally Accepted Accounting Principles.
GIS	Geographic Information System – a way of storing information in a computer such that the location of the equipment is also stored and various maps/views can be produced.
GPS	Global Positioning System. Receivers utilise satellites to accurately locate themselves on the earth's surface. This information is then used to locate items such as power poles.
GXP	Grid Exit Point, connection between Distribution Network and National Grid.
Hiab	Trade Name for truck mounted hydraulic crane.
HV	High Voltage – voltage equal or above 1,000 volts.
ICP	Installation Control Point – point of connection of a consumer to the network.
IntraMaps	Map viewer of electrical assets and other map features.
kVA	10^3 VA. Measure of apparent power.
kWh	10^3 Wh measure of energy.
Live Line	Various techniques for working on the network with the power on. Procedures range from connection of transformers to complete pole replacement.
LV	Low Voltage – voltage below 1,000 volts.
Mango	Document repository and control software that holds MLL's policies and procedures.
MangoLive	Web access into Mango documents.
MDC	Marlborough District Council.
Milsoft	Network analysis software; records and manages network outage data.
MLL	Marlborough Lines Limited.
MVA	10^6 VA. Measure of apparent power.
N-1	A security level whereby the loss of any 1 device or circuit will not lose supply. N level security, any one failure causes loss of supply.

Term	Meaning
Number of Faults per 100km of Prescribed Voltage Line	This is a measure of the number of faults in relation to the total length of the network 6.6kV and above
NZTA	New Zealand Transport Agency.
ODV	Optimised Deprival Value, a method of valuing assets laid down in regulations.
Opex	Operational expenditure
PILC	Paper Insulated Lead Covered – a type of cable
PSTN	Public Switched Telephone Network, i.e. standard telephone system.
RAPS	Remote Area Power Supply
Ripple Control	System which uses frequencies >50Hz to transmit information across power system. Mainly used to control water heating/night store loads and street lighting.
RTU	Remote Terminal Unit.
RY	Regulatory Year (as year ending 31 March)
SAIDI	For Total of Interruptions (System Average Interruption Duration Index). SAIDI is the average total duration of interruptions of supply that a consumer experiences in the period. The SAIDI for the total of interruptions is the sum obtained by adding together the interruption duration factors for all interruptions *divided by* the total consumers.
SAIFI	For the Total Number of Interruptions (System Average Interruption Frequency Index). SAIFI is the average number of interruptions of supply that a consumer experiences in the period. The SAIFI for the total number of interruptions is the sum obtained by adding together the number of electricity consumers affected by each of those interruptions *divided by* the total consumers.
SCADA	Supervisory Control and Data Acquisition**,** computer and communications system to monitor and control equipment in the network, e.g. circuit breakers.
SCI	Statement of Corporate Intent.
SF_6	Sulphur hexafluoride – an electrical insulating gas
SHI	Security and Hazard Inspection.
SWER	Single Wire Earth Return. A system which uses a single wire (compared with two for convectional single phase or three for three phase) to transmit power. MLL uses this system at 11kV.
Thermovision	Using infra-red technologies to locate hot spots/faults in network Assets.
VHF	Very High Frequency, radio frequency used by MLL primarily for voice communications.
XLPE	Cross-Linked Poly Ethylene – a type of cable insulation

12.2 Regulatory schedules

Regulatory schedules have been completed to complement this AMP. The regulatory schedules have been disclosed as a separate document and include:

- S11a. Capex Forecast;
- S11b. Opex Forecast;
- S12a. Asset Condition;
- S12b. Capacity Forecast;
- S12c. Demand Forecast;
- S12d. Reliability Forecast;
- S13. AMMAT; and
- S14a Mandatory Explanatory Notes on Forecast Information.

12.3 Regulatory requirements look-up

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
3.1 A summary that provides a brief overview of the contents and highlights information that the EDB considers significant;	1. Summary
3.2 Details of the background and objectives of the EDB's asset management and planning processes;	7 Asset management strategy
3.3 A purpose statement which- 3.3.1 makes clear the purpose and status of the AMP in the EDB's asset management practices. The purpose statement must also include a statement of the objectives of the asset management and planning processes; 3.3.2 states the corporate mission or vision as it relates to asset management; 3.3.3 identifies the documented plans produced as outputs of the annual business planning process adopted by the EDB; 3.3.4 states how the different documented plans relate to one another, with particular reference to any plans specifically dealing with asset management; and 3.3.5 includes a description of the interaction between the objectives of the AMP and other corporate goals, business planning processes, and plans;	2.1 Purpose of this AMP 2.2 Basis of AMP 5.3.1 Strategic Planning Documents 5.3.1.4 Interaction between Planning Documents
3.4 Details of the AMP planning period, which must cover at least a projected period of 10 years commencing with the disclosure year following the date on which the AMP is disclosed;	2.5 Period covered
3.5 The date that it was approved by the directors;	2.5 Period covered
3.6 A description of stakeholder interests (owners, consumers etc) which identifies important stakeholders and indicates- 3.6.1 how the interests of stakeholders are identified 3.6.2 what these interests are; 3.6.3 how these interests are accommodated in asset management practices; and 3.6.4 how conflicting interests are managed;	5 Stakeholder interests and objectives alignment
3.7 A description of the accountabilities and responsibilities for asset management on at least 3 levels, including- 3.7.1 governance—a description of the extent of director approval required for key asset management decisions and the extent to which asset management outcomes are regularly reported to directors; 3.7.2 executive—an indication of how the in-house asset management and planning organisation is structured; and 3.7.3 field operations—an overview of how field operations are managed, including a description of the extent to which field work is undertaken in-house and the areas where outsourced contractors are used;	5.3.3 Accountabilities and responsibilities for asset management
3.8 All significant assumptions- 3.8.1 quantified where possible; 3.8.2 clearly identified in a manner that makes their significance understandable to interested persons, including-	1.1 Highlights of this AMP

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
3.8.3 a description of changes proposed where the information is not based on the EDB's existing business; 3.8.4 the sources of uncertainty and the potential effect of the uncertainty on the prospective information; and 3.8.5 the price inflator assumptions used to prepare the financial information disclosed in nominal New Zealand dollars in the Report on Forecast Capital Expenditure set out in Schedule 11a and the Report on Forecast Operational Expenditure set out in Schedule 11b;	
3.9 A description of the factors that may lead to a material difference between the prospective information disclosed and the corresponding actual information recorded in future disclosures;	1.1 Highlights of this AMP
3.10 An overview of asset management strategy and delivery; To support the Report on Asset Management Maturity disclosure and assist interested persons to assess the maturity of asset management strategy and delivery, the AMP should identify- • how the asset management strategy is consistent with the EDB's other strategy and policies; • how the asset strategy takes into account the life cycle of the assets; • the link between the asset management strategy and the AMP; and • processes that ensure costs, risks and system performance will be effectively controlled when the AMP is implemented.	7 Asset management strategy
3.11 An overview of systems and information management data; To support the Report on Asset Management Maturity disclosure and assist interested persons to assess the maturity of systems and information management, the AMP should describe- • the processes used to identify asset management data requirements that cover the whole of life cycle of the assets; • the systems used to manage asset data and where the data is used, including an overview of the systems to record asset conditions and operation capacity and to monitor the performance of assets; • the systems and controls to ensure the quality and accuracy of asset management information; • the extent to which these systems, processes and controls are integrated; • how asset management data informs the models that an EDB develops and uses to assess asset health; and • how the outputs of these models are used in developing capital expenditure projections.	7.2 Systems and information management New requirements 2023
3.12 A statement covering any limitations in the availability or completeness of asset management data and disclose any initiatives intended to improve the quality of this data;	7.2.4.2 Data limitations
3.13 A description of the processes used within the EDB for- 3.13.1 managing routine asset inspections and network maintenance; 3.13.2 planning and implementing network development projects; and 3.13.3 measuring network performance;	7.5 Lifecycle management 7.8 Network development strategy

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
	6 Network performance and service levels
3.14 An overview of asset management documentation, controls and review processes.	7 Asset management strategy and 5.3.3 Accountabilities and responsibilities for asset management
3.15 An overview of communication and participation processes;	5 Stakeholder interests and objectives alignment, and 7 Asset management strategy, and 5.3.3 Accountabilities and responsibilities for asset management
3.16 The **AMP** must present all financial values in **constant price** New Zealand dollars except where specified otherwise; and 3.17 The **AMP** must be structured and presented in a way that the **EDB** considers will support the purposes of **AMP** disclosure set out in clause 2.6.2 of the determination.	11 Expenditure forecasts; and throughout
The **AMP** must provide details of the assets covered, including- 4.1 a high-level description of the service areas covered by the **EDB** and the degree to which these are interlinked, including- 4.1.1 the region(s) covered; 4.1.2 identification of large **consumers** that have a significant impact on **network** operations or asset management priorities; 4.1.3 description of the load characteristics for different parts of the **network**; 4.1.4 peak demand and total energy delivered in the previous year, broken down by **sub-network**, if any.	4 Network overview
4.2 a description of the **network** configuration, including- 4.2.1 identifying bulk electricity supply points and any **distributed generation** with a capacity greater than 1MW. State the existing firm supply capacity and current peak load of each bulk electricity supply point; 4.2.2 a description of the **subtransmission** system fed from the bulk electricity supply points, including the capacity of **zone substations** and the voltage(s) of the **subtransmission**	4.3 Supply within Marlborough

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
network(s). The **AMP** must identify the supply security provided at individual **zone substations**, by describing the extent to which each has N-x **subtransmission** security or by providing alternative security class ratings; 4.2.3 a description of the distribution system, including the extent to which it is underground; 4.2.4 a brief description of the **network**'s distribution substation arrangements; 4.2.5 a description of the **low voltage network** including the extent to which it is underground; and 4.2.6 an overview of **secondary assets** such as protection relays, ripple injection systems, SCADA and telecommunications systems. *To help clarify the **network** descriptions, **network** maps and a single line diagram of the **subtransmission network** should be made available to interested **persons**. These may be provided in the **AMP** or, alternatively, made available upon request with a statement to this effect made in the **AMP**.*	
4.3 If **sub-networks** exist, the **network** configuration information referred to in clause 4.2 must be disclosed for each **sub-network**.	N/A
Network assets by category 4.4 The **AMP** must describe the **network** assets by providing the following information for each asset category- 4.4.1 voltage levels; 4.4.2 description and quantity of assets; 4.4.3 age profiles; and 4.4.4 a discussion of the condition of the assets, further broken down into more detailed categories as considered appropriate. Systemic issues leading to the premature replacement of assets or parts of assets should be discussed.	10 Fleet management
4.5 The asset categories discussed in clause 4.4 should include at least the following- 4.5.1 the categories listed in the Report on Forecast Capital Expenditure in Schedule 11a(iii); 4.5.2 assets owned by the **EDB** but installed at bulk electricity supply points owned by others; 4.5.3 **EDB** owned mobile substations and generators whose function is to increase supply reliability or reduce peak demand; and 4.5.4 other generation plant owned by the **EDB**.	10 Fleet management
Service Levels 5. The **AMP** must clearly identify or define a set of performance indicators for which annual performance targets have been defined. The annual performance targets must be consistent with business strategies and asset management objectives and be provided for each year of the **AMP planning period**. The targets should reflect what is practically achievable given the current **network** configuration, condition and planned expenditure levels. The targets should be disclosed for each year of the **AMP planning period**.	6 Network performance and service levels

Regulatory Requirement (Attachment A)	**Corresponding AMP Section(s)**
6. Performance indicators for which targets have been defined in clause 5 must include **SAIDI values** and **SAIFI values** for the next 5 **disclosure years**.	6 Network performance and service levels
7. Performance indicators for which targets have been defined in clause 5 should also include- 7.1 **Consumer** oriented indicators that preferably differentiate between different consumer types; and 7.2 Indicators of asset performance, asset efficiency and effectiveness, and service efficiency, such as technical and financial performance indicators related to the efficiency of asset utilisation and operation.	6 Network performance and service levels
8. The **AMP** must describe the basis on which the target level for each performance indicator was determined. Justification for target levels of service includes **consumer** expectations or demands, legislative, regulatory, and other stakeholders' requirements or considerations. The **AMP** should demonstrate how stakeholder needs were ascertained and translated into service level targets. 9. Targets should be compared to historic values where available to provide context and scale to the reader. 10. Where forecast expenditure is expected to materially affect performance against a target defined in clause 5, the target should be consistent with the expected change in the level of performance.	6 Network performance and service levels and 5 Stakeholder interests and objectives alignment
Network Development Planning 11. **AMP**s must provide a detailed description of **network** development plans, including— 11.1 A description of the planning criteria and assumptions for **network** development; 11.2 Planning criteria for **network** developments should be described logically and succinctly. Where probabilistic or scenario-based planning techniques are used, this should be indicated and the methodology briefly described;	7.8 Network development strategy and 8 Network development
11.3 A description of strategies or processes (if any) used by the EDB that promote cost efficiency including through the use of standardised assets and designs; 11.4 The use of standardised designs may lead to improved cost efficiencies. This section should discuss- 11.4.1 the categories of assets and designs that are standardised; and 11.4.2 the approach used to identify standard designs;	7.8.2 Standardising assets and designs
11.5 A description of strategies or processes (if any) used by the **EDB** that promote the energy efficient operation of the **network**;	7.8.3 Strategies for asset efficiency
11.6 A description of the criteria used to determine the capacity of equipment for different types of assets or different parts of the **network**.	7.8.4 Setting asset capacity
11.7 A description of the process and criteria used to prioritise **network** development projects and how these processes and criteria align with the overall corporate goals and vision;	7.8.5 Prioritisation of development projects
11.8 Details of demand forecasts, the basis on which they are derived, and the specific **network** locations where constraints are expected due to forecast increases in demand; 11.8.1 explain the load forecasting methodology and indicate all the factors used in preparing the load estimates;	8.2 Growth/demand projections

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
11.8.2 provide separate forecasts to at least the **zone substation** level covering at least a minimum five year forecast period. Discuss how uncertain but substantial individual projects/developments that affect load are taken into account in the forecasts, making clear the extent to which these uncertain increases in demand are reflected in the forecasts; 11.8.3 identify any **network** or equipment constraints that may arise due to the anticipated growth in demand during the **AMP planning period**; and 11.8.4 discuss the impact on the load forecasts of any anticipated levels of **distributed generation** in a **network**, and the projected impact of any demand management initiatives;	8.4.2 Embedded generation
11.9 Analysis of the significant **network** level development options identified and details of the decisions made to satisfy and meet target levels of service, including- 11.9.1 the reasons for choosing a selected option for projects where decisions have been made; 11.9.2 the alternative options considered for projects that are planned to start in the next five years and the potential for non-network solutions described; and 11.9.3 consideration of planned innovations that improve efficiencies within the **network**, such as improved utilisation, extended asset lives, and deferred investment;	8 Network development
11.10 A description and identification of the **network** development programme including **distributed generation** and non-network solutions and actions to be taken, including associated expenditure projections. The **network** development plan must include- 11.10.1 a detailed description of the material projects and a summary description of the non-material projects currently underway or planned to start within the next 12 months; 11.10.2 a summary description of the programmes and projects planned for the following four years (where known); and 11.10.3 an overview of the material projects being considered for the remainder of the **AMP planning period**; *For projects included in the **AMP** where decisions have been made, the reasons for choosing the selected option should be stated which should include how target levels of service will be impacted. For other projects planned to start in the next five years, alternative options should be discussed, including the potential for non-network approaches to be more cost effective than **network** augmentations.*	8.5 Major network development projects 10.12 Major renewal projects
11.11 A description of the **EDB**'s policies on **distributed generation**, including the policies for connecting **distributed generation**. The impact of such generation on **network** development plans must also be stated; and	4.3 Supply within Marlborough 7.9 Non-network solutions
11.12 A description of the **EDB**'s policies on non-network solutions, including- 11.12.1 economically feasible and practical alternatives to conventional **network** augmentation. These are typically approaches that would reduce **network** demand and/or improve asset utilisation; and 11.12.2 the potential for non-network solutions to address **network** problems or constraints.	7.9 Non-network solutions 8.4.2 Embedded generation
Lifecycle Asset Management Planning (Maintenance and Renewal)	7.5 Lifecycle management

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
12. The **AMP** must provide a detailed description of the lifecycle asset management processes, including— 12.1 The key drivers for maintenance planning and assumptions;	
12.2 Identification of **routine and corrective maintenance and inspection** policies and programmes and actions to be taken for each asset category, including associated expenditure projections. This must include- 12.2.1 the approach to inspecting and maintaining each category of assets, including a description of the types of inspections, tests and condition monitoring carried out and the intervals at which this is done; 12.2.2 any systemic problems identified with any particular asset types and the proposed actions to address these problems; and 12.2.3 budgets for maintenance activities broken down by asset category for the **AMP planning period**;	7.5 Lifecycle management and 10.13.2 Routine and corrective maintenance and inspection (network)
12.3 Identification of **asset replacement and renewal** policies and programmes and actions to be taken for each asset category, including associated expenditure projections. This must include- 12.3.1 the processes used to decide when and whether an asset is replaced or refurbished, including a description of the factors on which decisions are based, and consideration of future demands on the **network** and the optimum use of existing **network** assets; 12.3.2 a description of innovations that have deferred asset replacements; 12.3.3 a description of the projects currently underway or planned for the next 12 months; 12.3.4 a summary of the projects planned for the following four years (where known); and 12.3.5 an overview of other work being considered for the remainder of the **AMP planning period**; and 12.4 The asset categories discussed in clauses 12.2 and 12.3 should include at least the categories in clause 4.5. 12.5 Identification of the approach used for developing capital expenditure projections for lifecycle asset management. This must include an explanation of: 12.5.1 the approach that the EDB uses to inform its capital expenditure projections for lifecycle asset management; and 12.5.2 the rationale for using the approach for each asset category. 12.6 Identification of vegetation management related maintenance. This must include an explanation of the approach and assumptions that the EDB uses to inform its vegetation management related maintenance. 12.7 The EDB's consideration of non-network solutions to inform its capital and operational expenditure projections for lifecycle asset management. This must include an explanation of the approach and assumptions the EDB used to inform these expenditure projections;	7.5 Lifecycle management throughout 10 Fleet management and 10.12 Major renewal projects New requirements 2023 required by 31 March 2024
Non-Network Development, Maintenance and Renewal 13. **AMP**s must provide a summary description of material non-network development, maintenance and renewal plans, including— 13.1 a description of **non-network assets**;	10.11 Non-Network assets
13.2 development, maintenance and renewal policies that cover them; 13.3 a description of material **capital expenditure** projects (where known) planned for the next five years; and	10.11 Non-Network assets and

Regulatory Requirement (Attachment A)	**Corresponding AMP Section(s)**
13.4 a description of material maintenance and renewal projects (where known) planned for the next five years.	10.12.2 Non-Network (non-system) renewal projects
Risk Management 14. **AMP**s must provide details of risk policies, assessment, and mitigation, including— 14.1 Methods, details and conclusions of risk analysis; 14.2 Strategies used to identify areas of the **network** that are vulnerable to high impact low probability events and a description of the resilience of the **network** and asset management systems to such events; 14.3 A description of the policies to mitigate or manage the risks of events identified in clause 14.2; and 14.4 Details of emergency response and contingency plans.	7.4 Risk management 12.9 Risk matrix
Evaluation of performance 15. **AMP**s must provide details of performance measurement, evaluation, and improvement, including— 15.1 A review of progress against plan, both physical and financial; 15.2 An evaluation and comparison of actual service level performance against targeted performance; 15.3 An evaluation and comparison of the results of the asset management maturity assessment disclosed in the Report on Asset Management Maturity set out in Schedule 13 against relevant objectives of the **EDB**'s asset management and planning processes; 15.4 An analysis of gaps identified in clauses 15.2 and 15.3. Where significant gaps exist (not caused by one-off factors), the **AMP** must describe any planned initiatives to address the situation.	6 Network performance and service levels and 12.6 Performance analysis of reliability
Capability to deliver 16. **AMPs** must describe the processes used by the **EDB** to ensure that-	11.5 Capacity to deliver
16.1 The **AMP** is realistic and the objectives set out in the plan can be achieved; and	11.5 Capacity to deliver
16.2 The organisation structure and the processes for authorisation and business capabilities will support the implementation of the **AMP** plans.	11.5 Capacity to deliver
Notice of planned and unplanned interruptions *17.1 a description of how the EDB provides notice to and communicates with consumers regarding planned interruptions and unplanned interruptions, including any changes to the EDB's processes and communications in respect of planned interruptions and unplanned interruptions;*	*New requirements 2023*
Voltage quality 17.2 a description of the EDB's practices for monitoring voltage, including: 17.2.1 the EDB's practices for monitoring voltage quality on its low voltage network; 17.2.2 work the EDB is doing on its low voltage network to address any known non-compliance with the applicable voltage requirements of the Electricity (Safety) Regulations 2010;	New requirements 2023 6.1.4 Voltage Quality

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
17.2.3 how the EDB responds to and reports on voltage quality issues when the EDB identifies them, or when they are raised by a stakeholder; 17.2.4 how the EDB communicates with affected consumers regarding the voltage quality work it is carrying out on its low voltage network; and 17.2.5 any plans for improvements to any of the practices outlined at clauses 17.2.1-17.2.4 above	
Customer service practices *[There may be a degree of overlap between the information required under this clause and the information required in respect of customer charters under clause 2.5.3. For the avoidance of doubt, if there is overlap, EDBs should disclose the information in both places.]* *17.3 a description of the EDB's customer service practices, including:* *17.3.1 the EDB's customer engagement protocols and customer service measures – including customer satisfaction with the EDB's supply of electricity distribution services;* *17.3.2 the EDB's approach to planning and managing customer complaint resolution;*	*New requirements 2023*
Practices for connecting new consumers and altering existing connections *17.4 a description of the EDB's practices for connecting consumers, including:* *17.4.1 the EDB's approach to planning and management of-* *(a) connecting new consumers (offtake and injection connections), and overcoming commonly encountered issues; and* *(b) alterations to existing connections (offtake and injection connections);* *17.4.2 how the EDB is seeking to minimise the cost to consumers of new or altered connections;* *17.4.3 the EDB's approach to planning and managing communication with consumers about new or altered connections; and* *17.4.4 commonly encountered delays and potential timeframes for different connections.*	*New requirements 2023*
New connections likely to have a significant impact on network operations or asset management priorities The following requirements focus on the EDB's capability and risk management regarding demand, generation, or storage capacity that the EDB considers are likely to have a significant impact on its network operations or asset management priorities. The EDB may consider voltage, network location, or other factors in making this assessment. 17.5 A description of the following: 17.5.1 how the EDB assesses the impact that new demand, generation, or storage capacity will have on the EDB's network, including: (a) how the EDB measures the scale and impact of new demand, generation, or storage capacity; (b) how the EDB takes the timing and uncertainty of new demand, generation, or storage capacity into account; (c) how the EDB takes other factors into account, e.g., the network location of new demand, generation, or storage capacity; and 17.5.2 how the EDB assesses and manages the risk to the network posed by uncertainty regarding new demand, generation, or storage capacity;	New requirements 2023 9 Customer works

Regulatory Requirement (Attachment A)	Corresponding AMP Section(s)
Innovation practices 17.6 a description of the following: 17.6.1 any innovation practices the EDB has planned or undertaken since the last AMP or AMP update was publicly disclosed, including case studies and trials; 17.6.2 the EDB's desired outcomes of any innovation practices, and how they may improve outcomes for consumers; 17.6.3 how the EDB measures success and makes decisions regarding any innovation practices, including how the EDB decides whether to commence, commercially adopt, or discontinue these practices; 17.6.4 how the EDB's decision-making and innovation practices depend on the work of other companies, including other EDBs and providers of non-network solutions; and 17.6.5 the types of information the EDB uses to inform or enable any innovation practices, and the EDB's approach to seeking that information. 17.7 For the purpose of disclosing the information required under clauses 17.6.1-17.6.5 above, an EDB is not required to include commercially sensitive or confidential information.	New requirements 2023 3.3 Innovation and Tools for Managing Change 3.3 Innovation and Tools for Managing Change 7.8.5 Prioritisation of development projects 7.8.4 Setting asset capacity 3.3 Innovation and Tools for Managing Change 3.3 Innovation and Tools for Managing Change

12.4 Single line diagram of 33kV Network

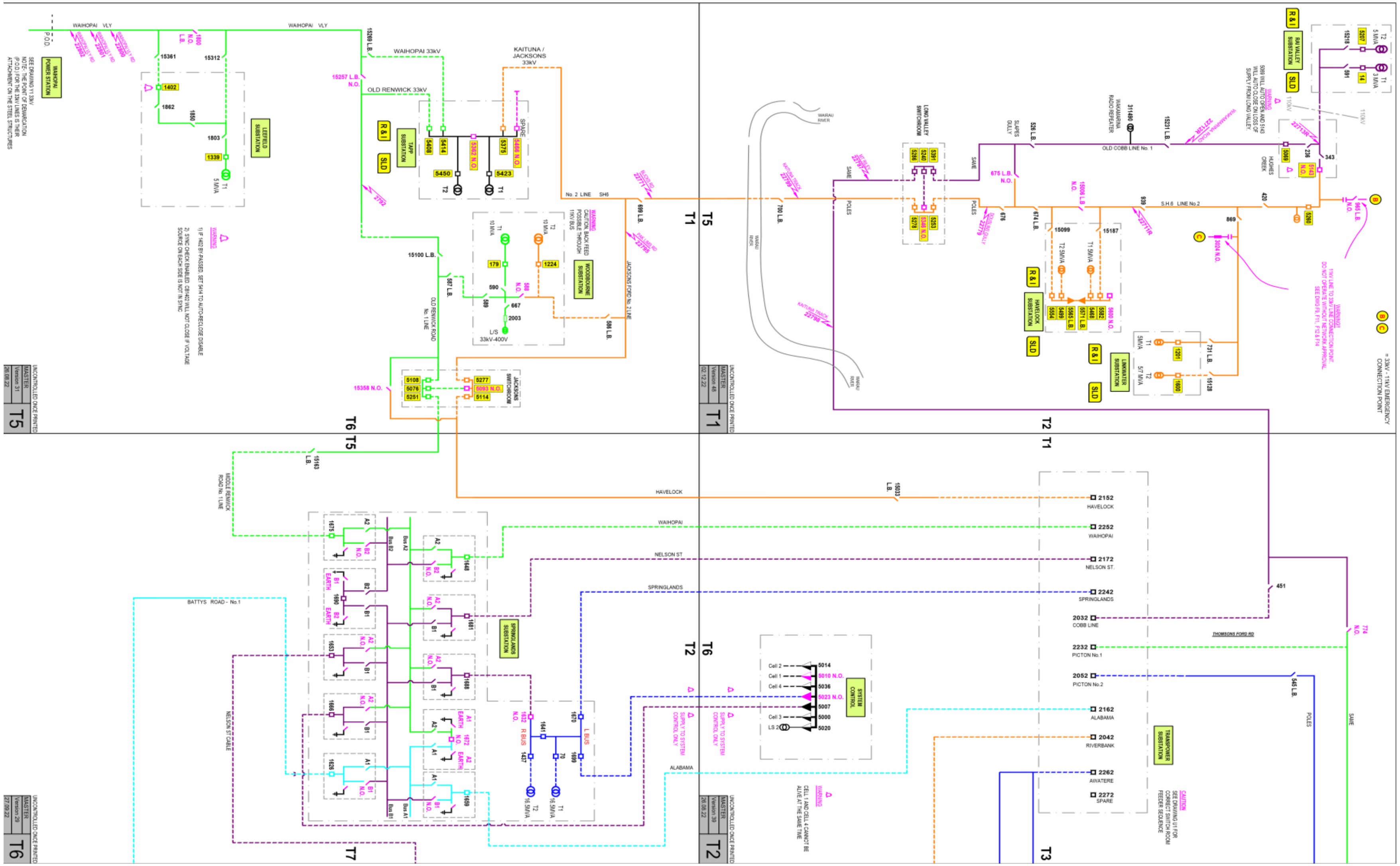


Figure 75: Single line diagram of 33kV network (A)

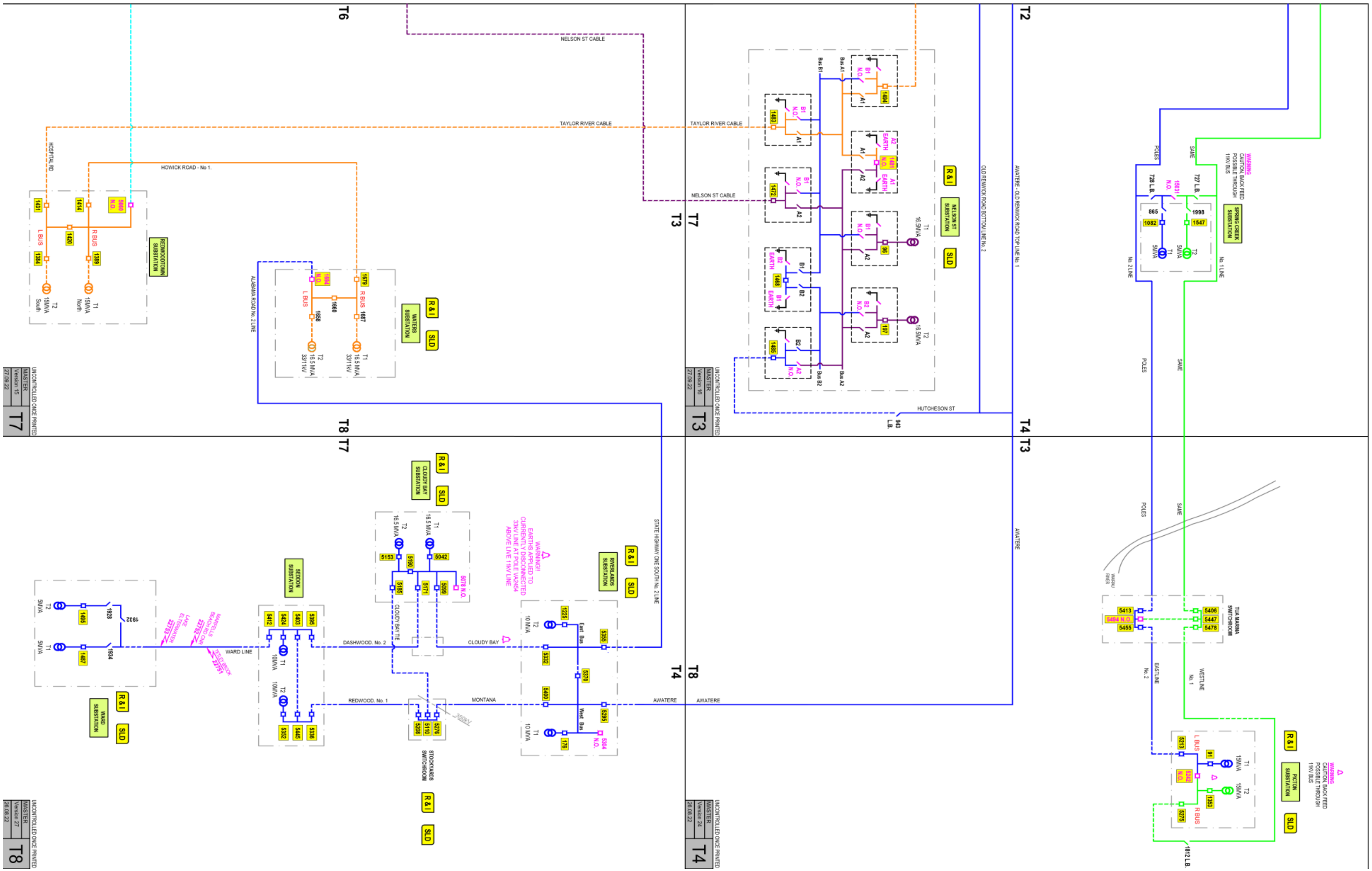


Figure 76: Single line diagram of 33kV network (B)

12.5 SCADA coverage map

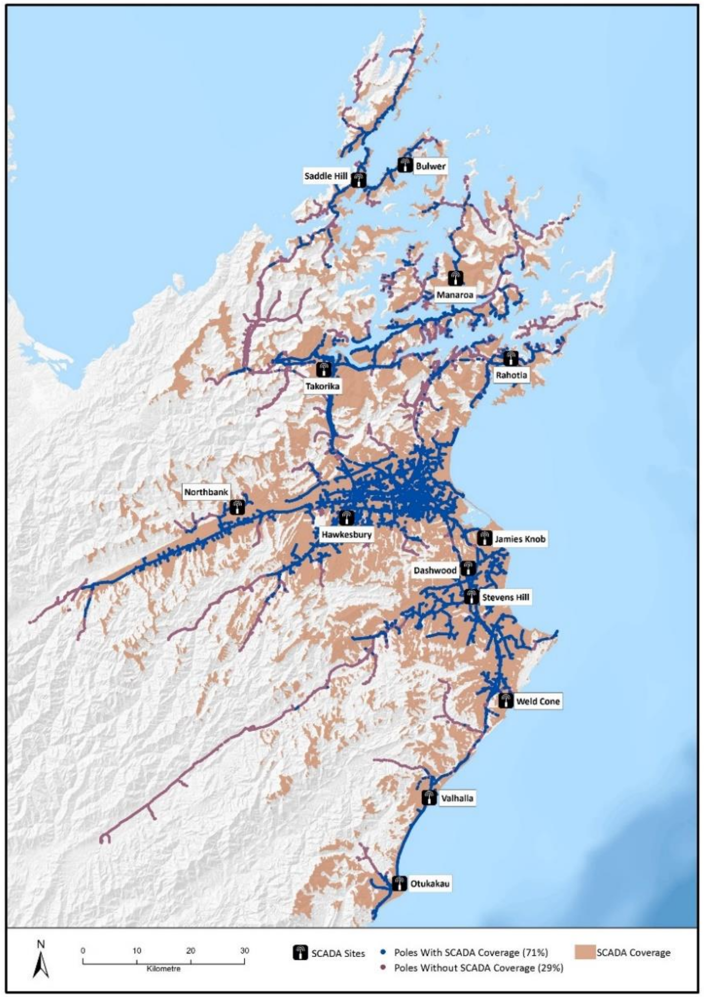


Figure 77: SCADA coverage map

12.6 Performance analysis of reliability

This appendix extends the comparative assessments on reliability presented in section 6 of this AMP.

12.6.1 Comparative SAIFI

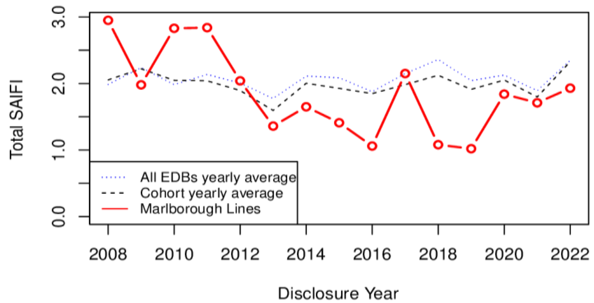


Figure 78: MLL's SAIFI trend (red line)

The trend in overall (planned + unplanned) SAIFI has been stable for MLL compared to a relatively flat trend for all other EDBs combined, as illustrated in Figure 78 (MLL=red line; includes the effect of the 2016 Kaikoura earthquake; cohort is for medium sized EDBs with mixed urban and rural networks). This, together with the comparatively low unplanned interruption frequency, shows the MLL network is responding to the reliability improvement strategies being applied.

12.6.2 Comparative CAIDI

MLL sets a fault CAIDI target of 120 minutes, which is generally achieved in years without major storms or system events (e.g. earthquakes). This target is therefore retained for this planning period given it remains a stretch target for the business and is at a reasonable level for a Network with MLL's characteristics.

12.6.3 Fault causes and response

Figure 79 shows the total consumer minutes lost to 11kV faults by fault cause over the period RY2018 to RY2022 (5 years) together with the average number of incidents per annum. This directs attention to the following:

- The major fault cause on the network remains failure of line components from a variety of causes followed by the effects of weather.
- Most vegetation related faults occur from vegetation outside the legal growth limit cutting zones (GLZ) indicating that MLL's vegetation management on the Network is working.
- Whilst conductor failure is rare and the reliability impact small, it is nevertheless an issue requiring active management due to the potential for public hazard and liability risk arising from such failures.

12.6.4 Network performance: planned outages

For the RY2022 year, MLL has continued a service target of planned outages being less than 65 SAIDI minutes and with less than 260 planned interruptions over the network. The recent performance for planned outages (RY2012 to RY2022) is illustrated in the six charts of Figure 80.

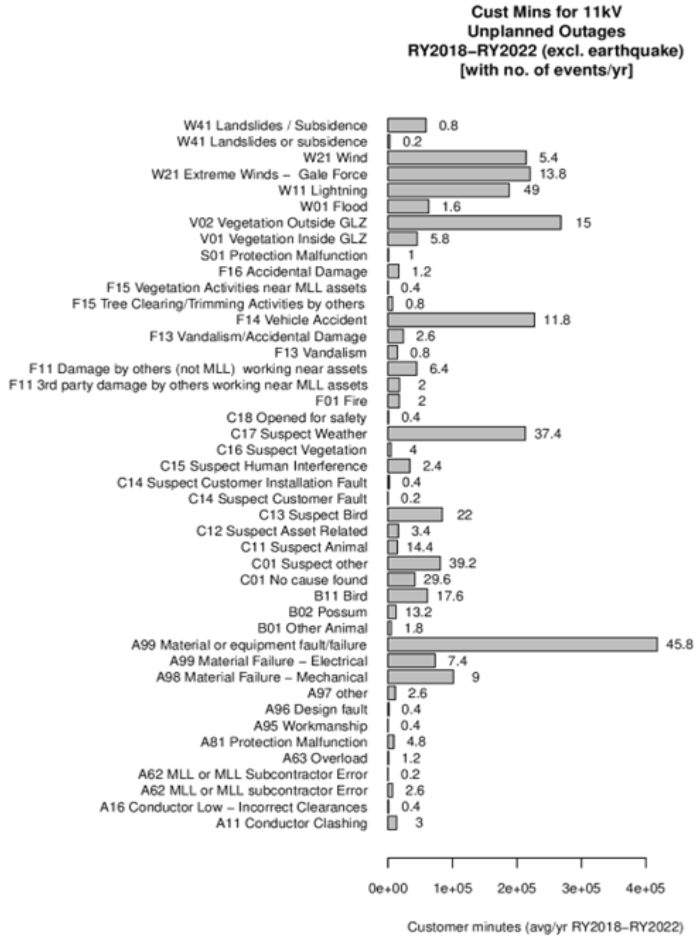


Figure 79: MLL's 11kV cumulative outage minutes vs cause

The top left chart shows the performance and trend in planned SAIDI and shows MLL outperformed its target in this area. The trend developing in the most recent part of the graph (2-3 years) is reflective of the increase in planned work and shutdowns on the network and the increasing tendency not to deploy generators for shutdowns that in the past may likely have used them.

The top middle chart plots the distribution of planned outage times and compares year RY2012 to year RY2022. Marlborough Lines is increasingly striving to complete all work that may be needed during any particular outage which may include work at other sites other than the primary site within the outage area, such as outstanding maintenance defects. This will over time increase planned outage times but minimise the number of outages needed.

The top right chart demonstrates the improvement from RY2010 to RY2020 where a greater proportion of the outages are of shorter duration achieved through better work planning. As discussed above, ML is now in some cases scheduling longer planned outages to maximise the work that can be achieved during the outage. The bottom left chart shows the distribution of consumers affected per outage and indicates that most outages affect relatively small numbers of consumers. This can be expected to increase slightly as MLL reduces its use of generators for planned outages due to cost and extra complexity and time added when they are used. The bottom middle chart shows the performance and trend in number of planned outages per year and compares the total number of outages to the service target of less than 260 outages. Following a lull over the period where Covid-19 effected the number of planned shutdowns the number is now trending upwards again. The bottom right chart plots the number of planned outages per ICP (viz planned SAIFI). This is indicative of the increasing volume of customer, Maintenance and Capital planned work with the most significant increase in remote outages per ICP reflective of lines rebuilds and pole replacements in those areas

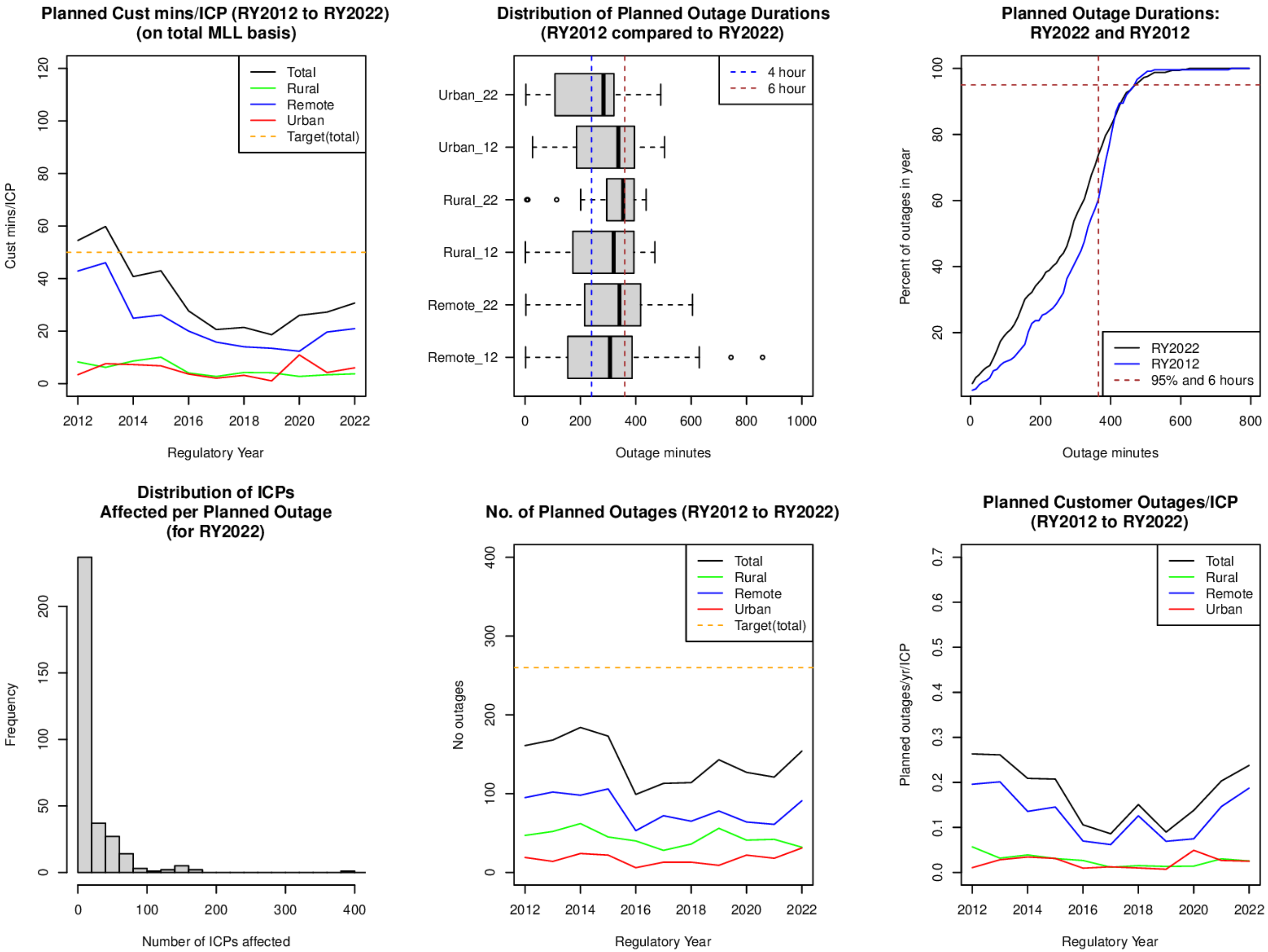


Figure 80: Planned outage analysis charts

12.6.5 Network performance – forced outages

For the RY2022 year, MLL set service targets for unplanned (forced) outages of:

1. Unplanned SAIDI <=85 comprised of SAIFI <=0.71 and CAIDI <=120 minutes
2. Fault response times of less than or equal to:
   a. Blenheim Urban 1.0 hours
   b. Urban Other 1.5 hours
   c. Rural 4.0 hours
   d. Remote Rural 8.0 hours
2. Total number of fault interruptions < 340

The performance and trends in forced outages are set out in the 6 following charts that also identify the relevant targets. Note that these charts exclude the earthquake events but include any storm events.

The top left chart illustrates an increase in unplanned SAIDI which is attributable to the July 2021 storm in which a State of Emergency was declared in Marlborough. The blue line indicates the remote areas were the worst affected. The top middle chart shows the distribution of outage duration times (the boxes represent the 50 percentile bounds) and compares year RY2022 performance to year RY2012 and shows improving performance in urban areas although overall the outage durations have remained consistent. The outliers in the remote areas are again attributable to the storm in 2021.

The top right chart shows the distribution of all outage times and compares year RY2012 to year RY2022 noting consistent performance and that approximately 95% of all unplanned outages are restored within six hours. The bottom left chart shows the distribution in number of consumers affected per outage and shows the majority are small consumer numbers. This reveals the benefit being returned from the automatic sectionalisers and re-closers that have been installed within the distribution network.

The bottom middle chart shows the number of unplanned outages per annum. Faults in the Remote/Sounds areas are now believed to be increasing and the management of this continues as a key focus for MLL. However, analysis of the fault categorisations shows that many faults are caused by weather and/or wind-blown materials, which is a result of the "natural" environment that the overhead network exists within. These types of faults are difficult to deal with without resorting to expensive network re-design, which is not economically viable in these low-density areas.

The bottom right-hand chart illustrates the trend in the average number of outages per consumer, which shows large variability from year to year, but a large increase to RY2022 Taken together with the trend seen in the total number of outages, this reveals that the effect of the reliability measures implemented has been more to reduce the numbers of consumers affected by the outages that are occurring rather than the number of outages that are occurring. This is largely due to the operation of the automatic re-closing switches that have been strategically placed within the network.

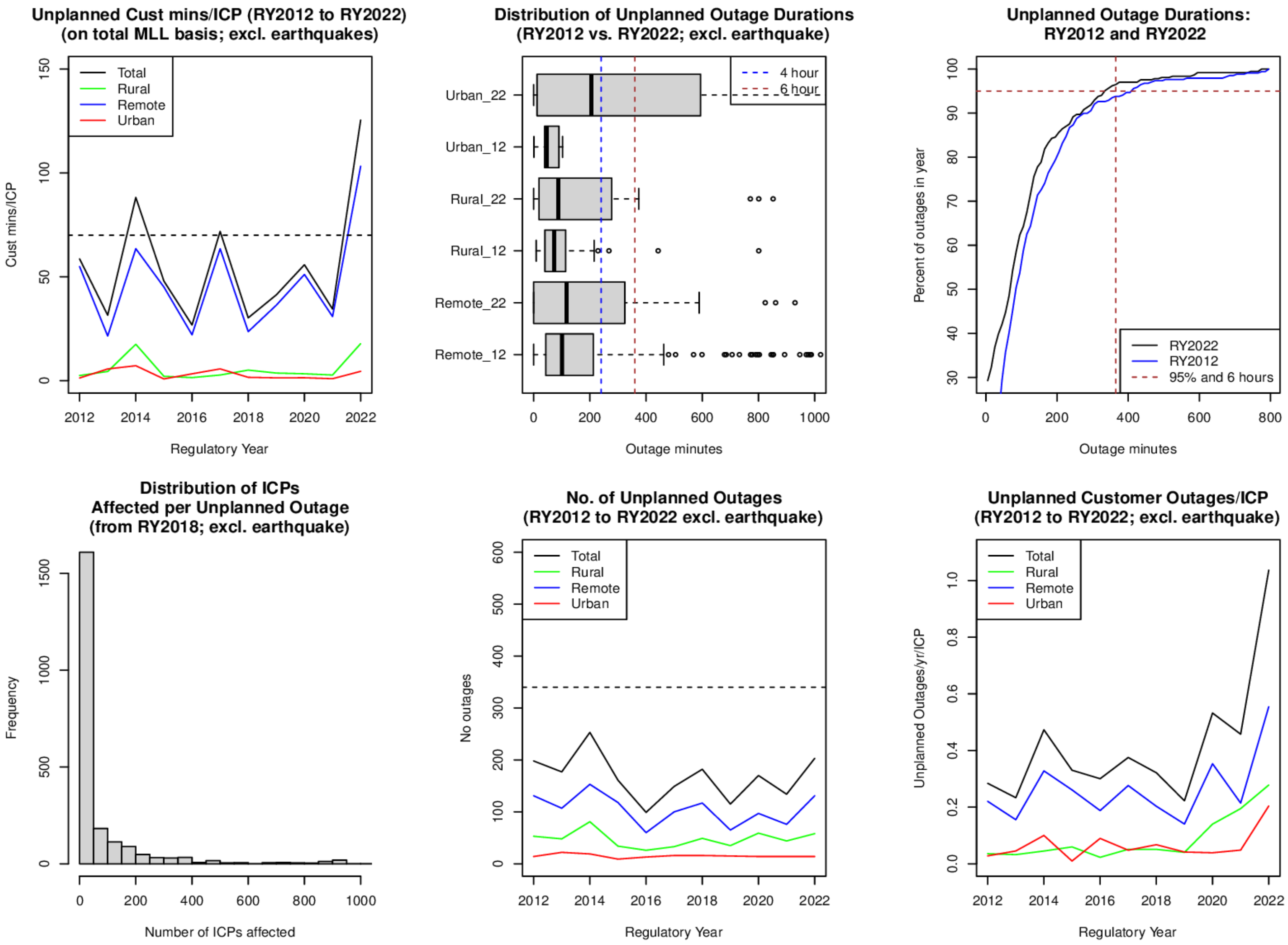
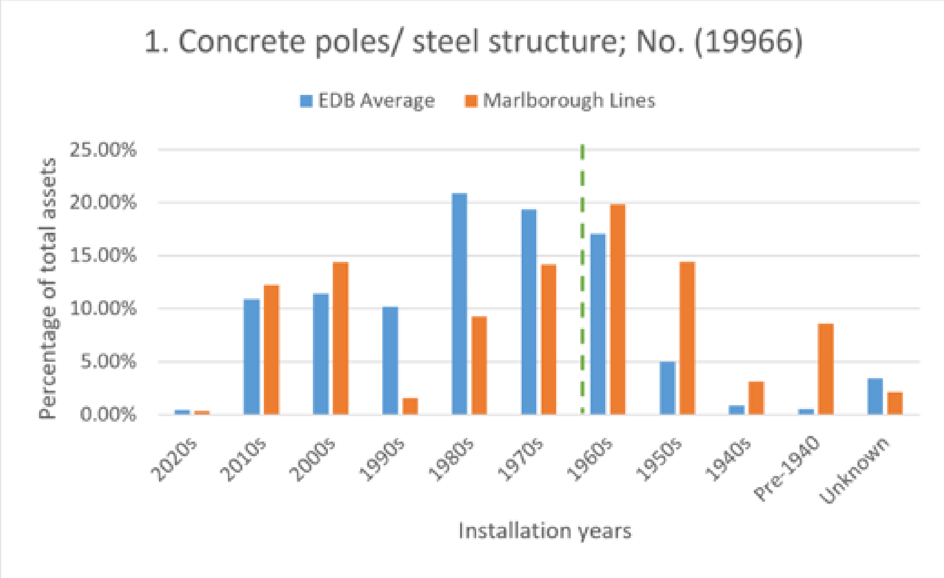


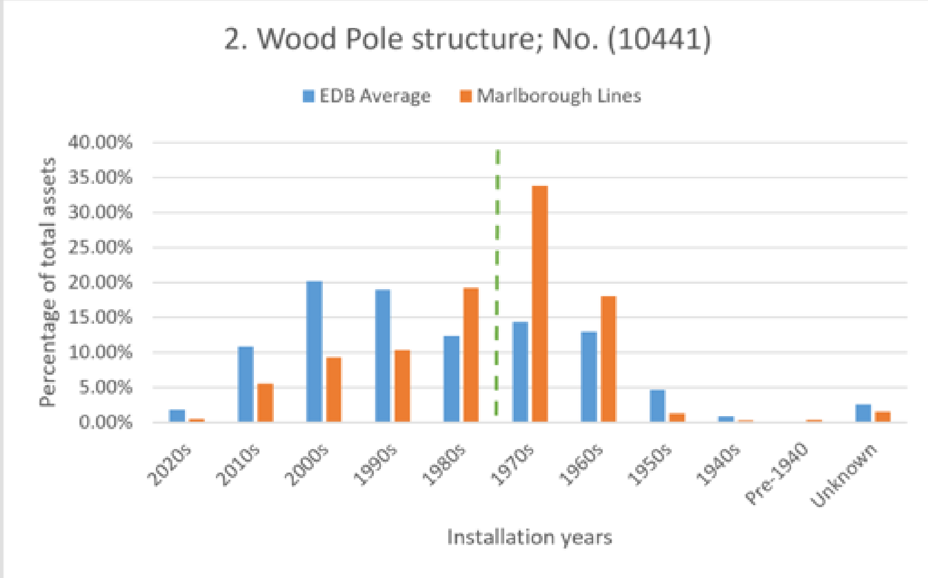
Figure 81: Unplanned outage analysis charts

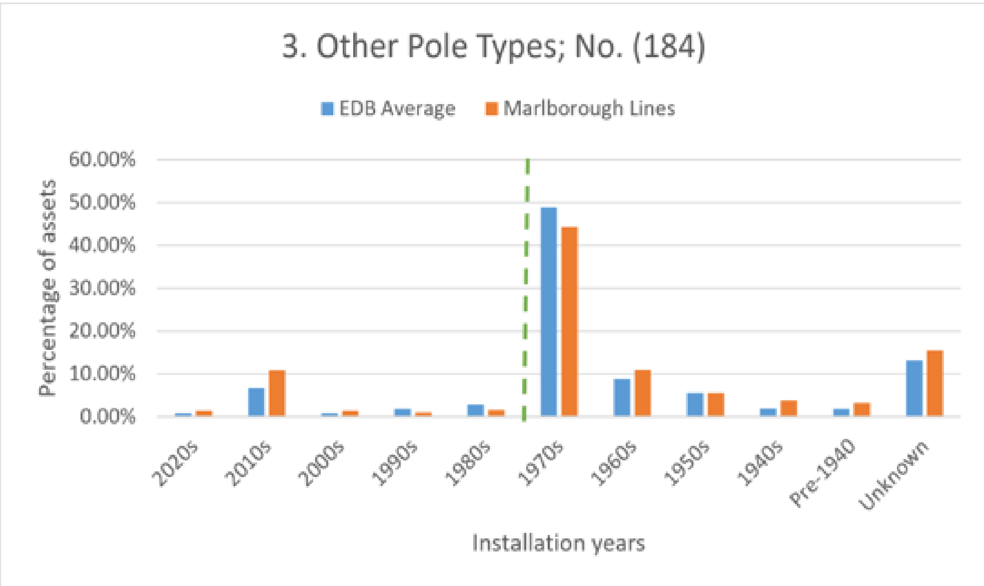
12.7 Comparative age profiles

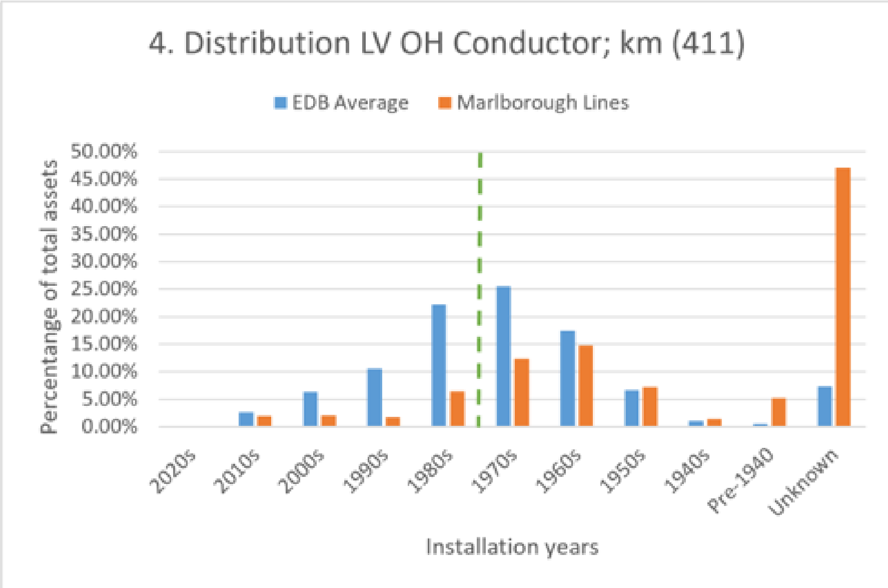
This appendix sets out charts that compare the MLL asset age profiles against age profiles for comparable assets averaged over all New Zealand distribution businesses using 2021 Commerce Commission datasets. The asset classes used are from the 51 asset types listed in the Commerce Commission Disclosure reports for RY2021, except for where MLL has no assets of a class type on its network, in which case there is no chart provided below.

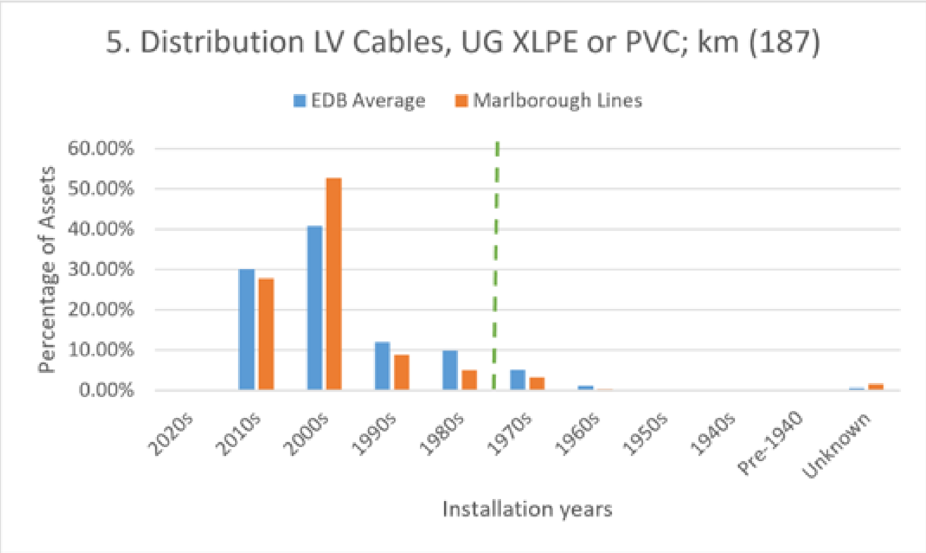
The charts titles record the asset class, the total quantity (on the MLL network) is noted in the chart title, and percentages of the total noted as having age uncertainty. The green dashed vertical line marks the regulatory expected life for that asset class as used in historic ODV calculations

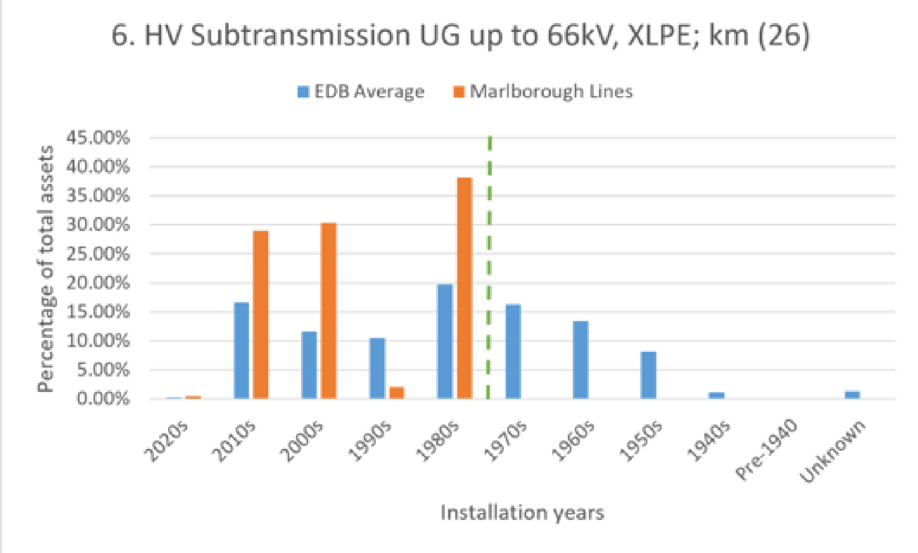

1. Concrete poles/ steel structure; No. (19966)
EDB Average
Marlborough Lines
Percentage of total assets
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

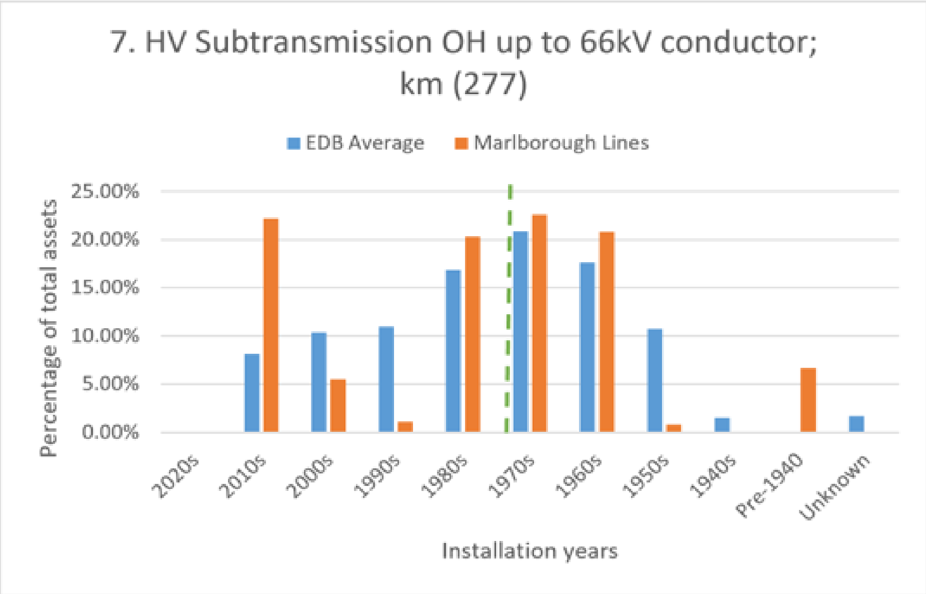

2. Wood Pole structure; No. (10441)
EDB Average
Marlborough Lines
Percentage of total assets
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

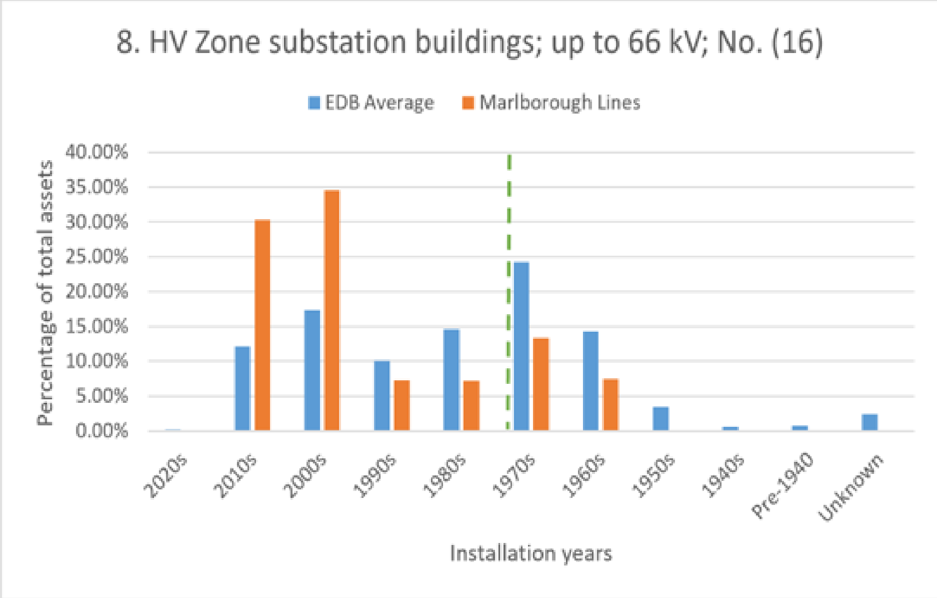

3. Other Pole Types; No. (184)
EDB Average
Marlborough Lines
Percentage of assets
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

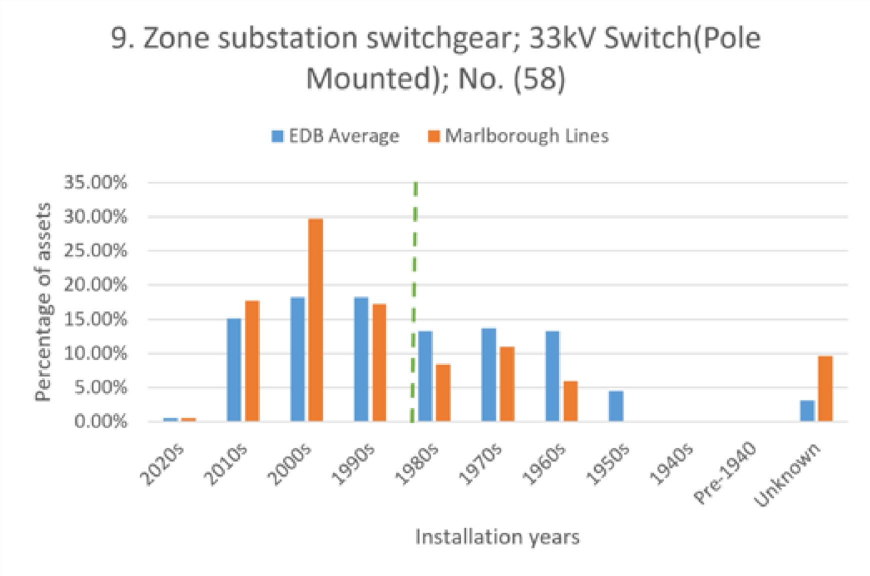

4. Distribution LV OH Conductor; km (411)
EDB Average
Marlborough Lines
Percentange of total assets
50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

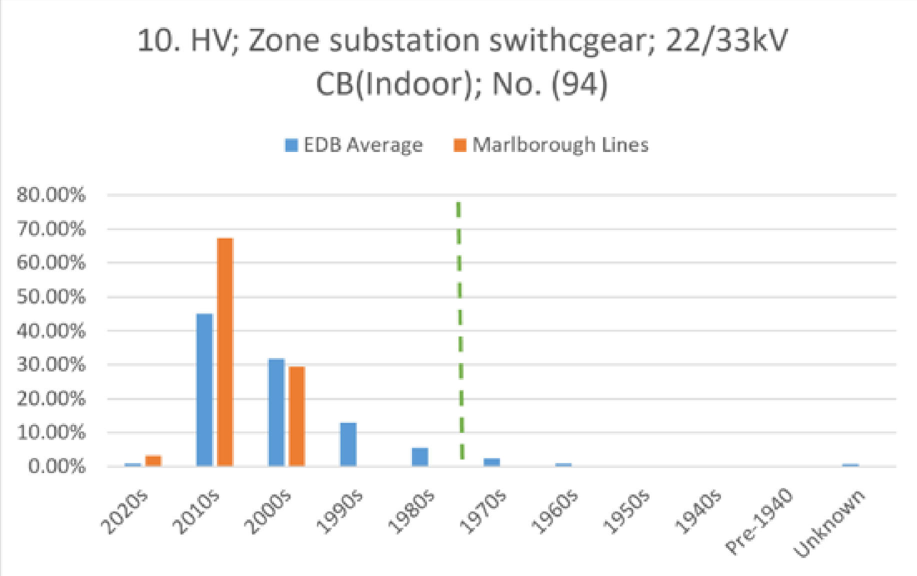

5. Distribution LV Cables, UG XLPE or PVC; km (187)
EDB Average
Marlborough Lines
Percentage of Assets
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

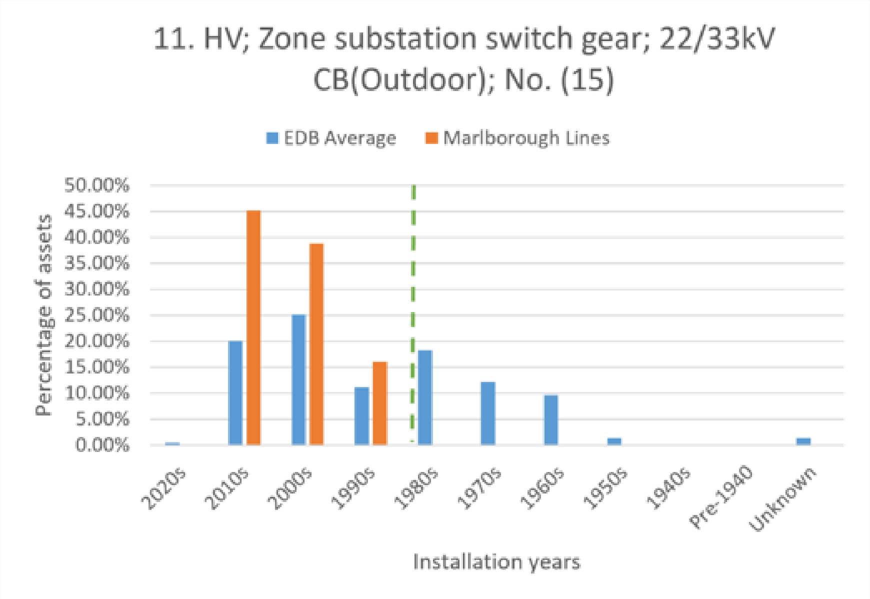

6. HV Subtransmission UG up to 66kV, XLPE; km (26)
EDB Average
Marlborough Lines
Percentage of total assets
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

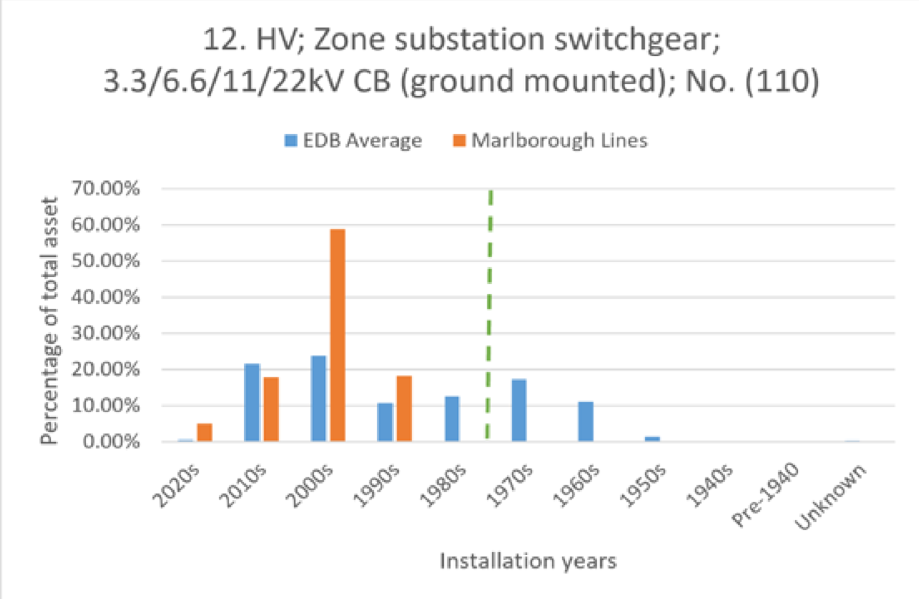

7. HV Subtransmission OH up to 66kV conductor; km (277)
EDB Average
Marlborough Lines
Percentage of total assets
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

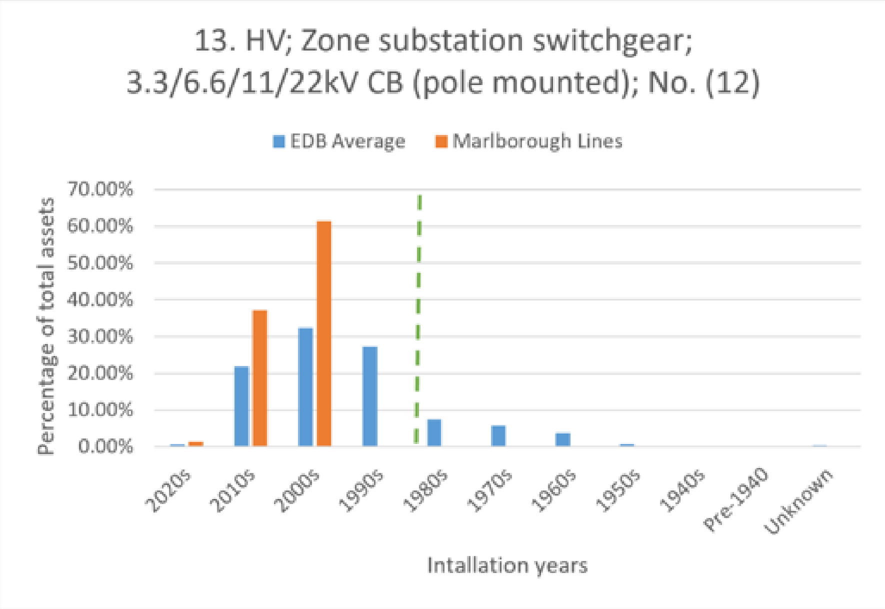

8. HV Zone substation buildings; up to 66 kV; No. (16)
EDB Average
Marlborough Lines
Percentage of total assets
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

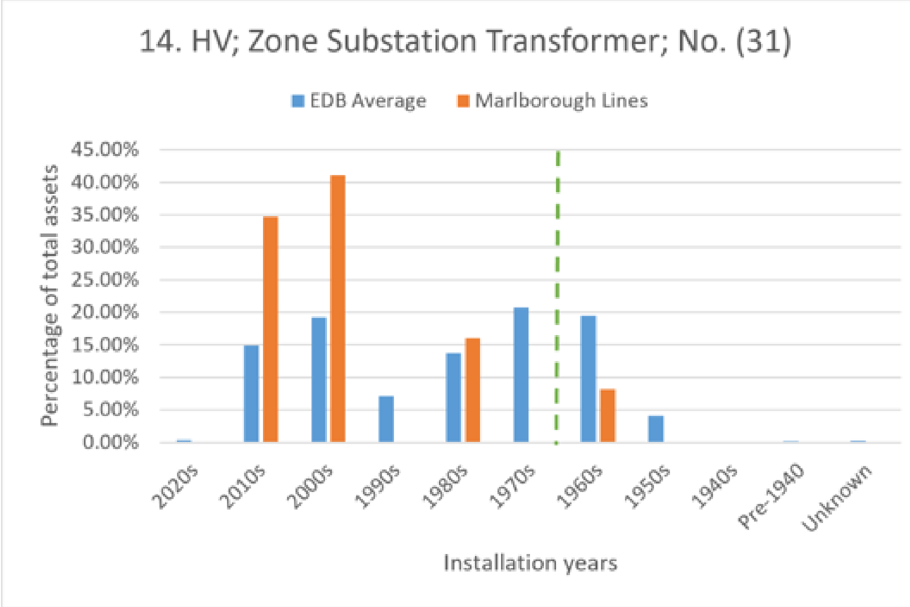

9. Zone substation switchgear; 33kV Switch(Pole Mounted); No. (58)
EDB Average
Marlborough Lines
Percentage of assets
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

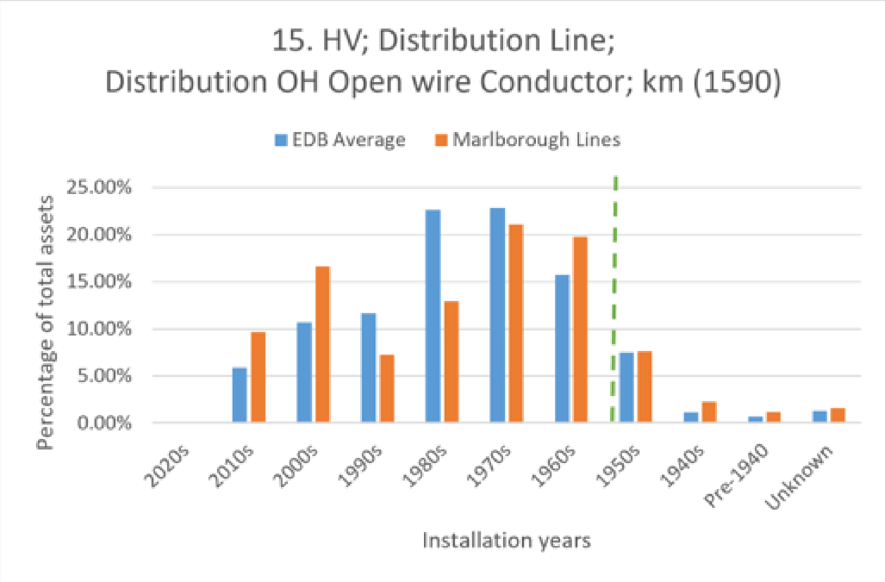

10. HV; Zone substation swithcgear; 22/33kV CB(Indoor); No. (94)
EDB Average
Marlborough Lines
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown

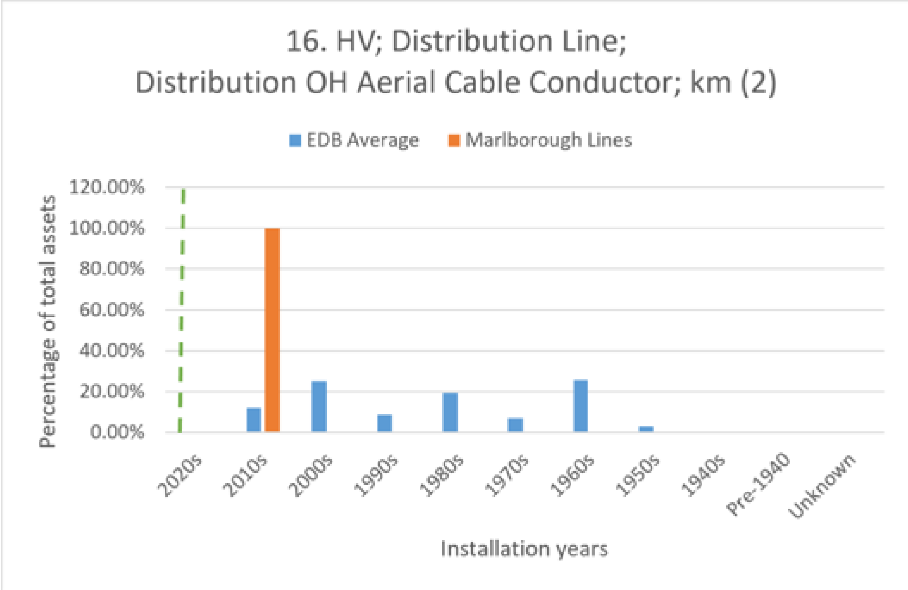

11. HV; Zone substation switch gear; 22/33kV CB(Outdoor); No. (15)
EDB Average
Marlborough Lines
Percentage of assets
50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

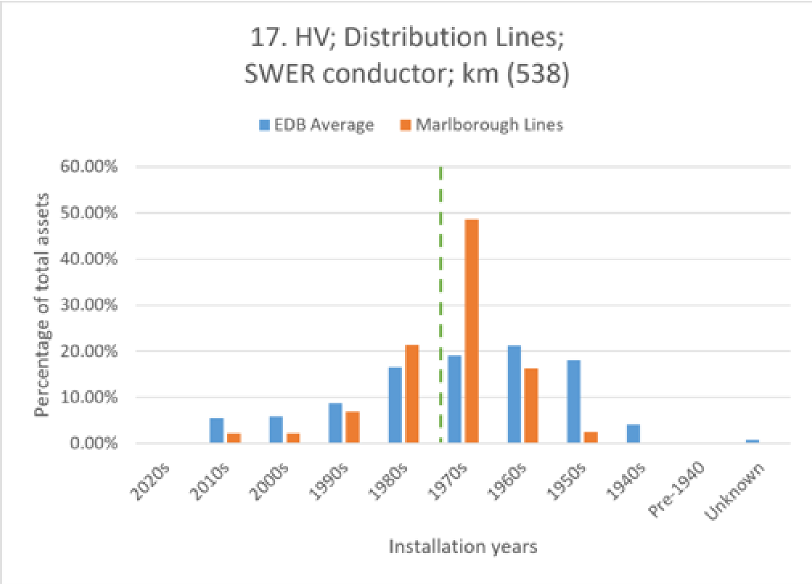

12. HV; Zone substation switchgear; 3.3/6.6/11/22kV CB (ground mounted); No. (110)
EDB Average
Marlborough Lines
Percentage of total asset
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

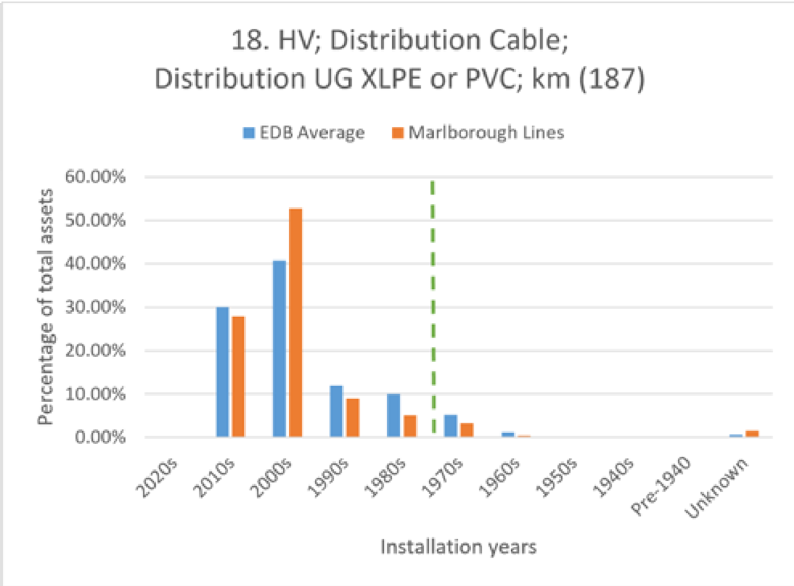

13. HV; Zone substation switchgear;
3.3/6.6/11/22kV CB (pole mounted); No. (12)
EDB Average
Marlborough Lines
Percentage of total assets
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Intallation years

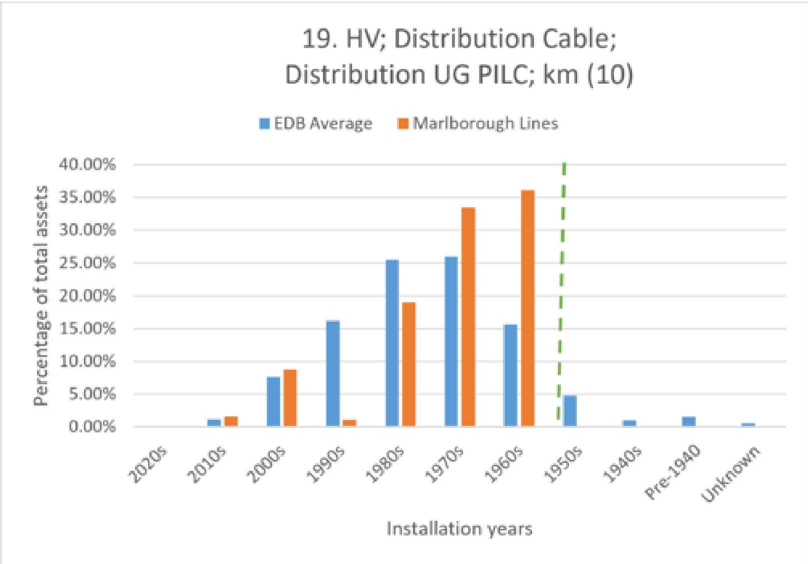

14. HV; Zone Substation Transformer; No. (31)
EDB Average
Marlborough Lines
Percentage of total assets
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

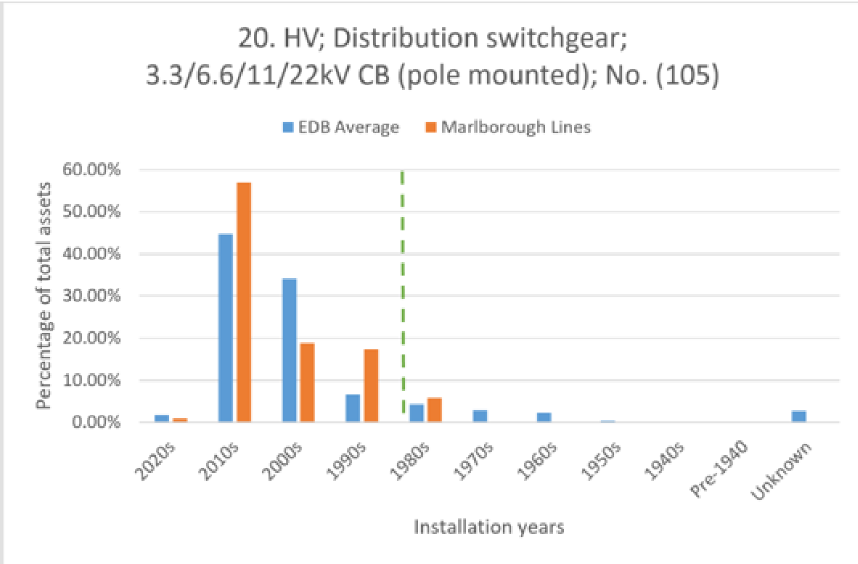

15. HV; Distribution Line;
Distribution OH Open wire Conductor; km (1590)
EDB Average
Marlborough Lines
Percentage of total assets
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

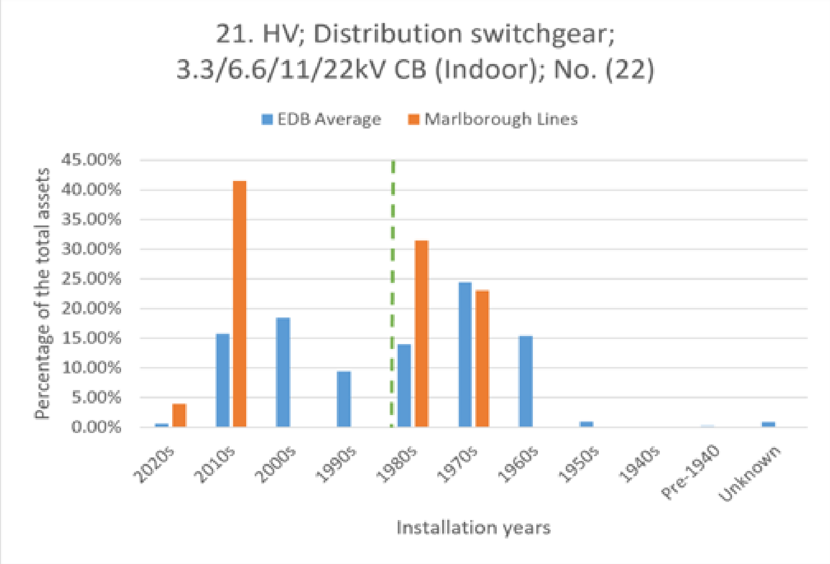

16. HV; Distribution Line;
Distribution OH Aerial Cable Conductor; km (2)
EDB Average
Marlborough Lines
Percentage of total assets
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years


17. HV; Distribution Lines;
SWER conductor; km (538)
EDB Average
Marlborough Lines
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of total assets
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

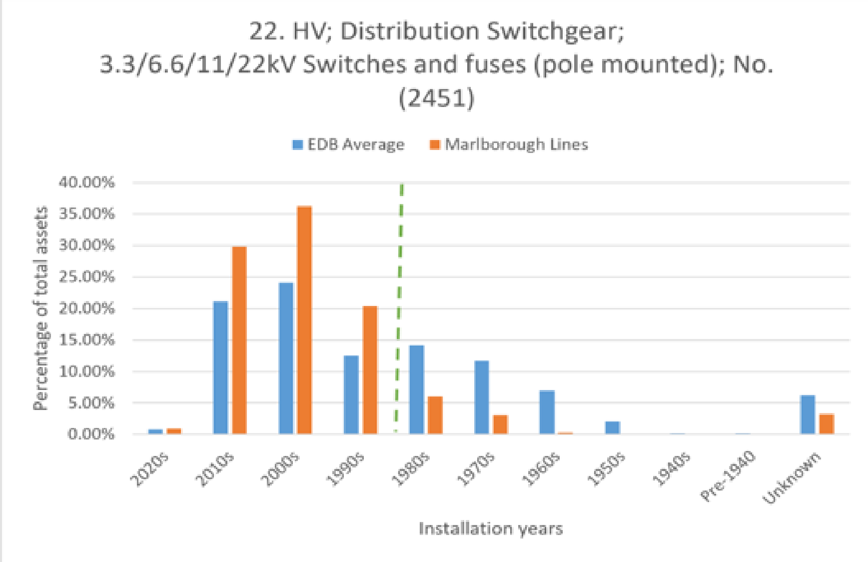

18. HV; Distribution Cable;
Distribution UG XLPE or PVC; km (187)
EDB Average
Marlborough Lines
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of total assets
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years


19. HV; Distribution Cable;
Distribution UG PILC; km (10)
EDB Average
Marlborough Lines
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Percentage of total assets
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

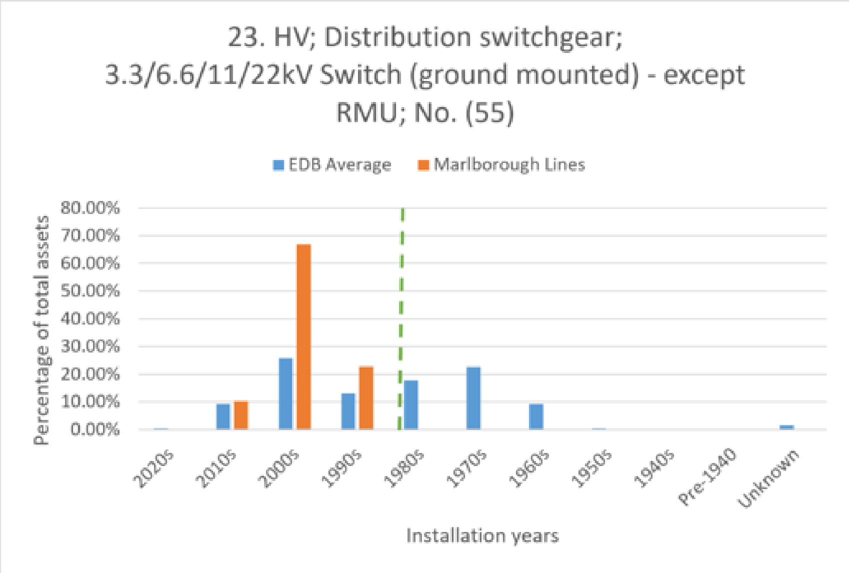

20. HV; Distribution switchgear;
3.3/6.6/11/22kV CB (pole mounted); No. (105)
EDB Average
Marlborough Lines
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of total assets
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years



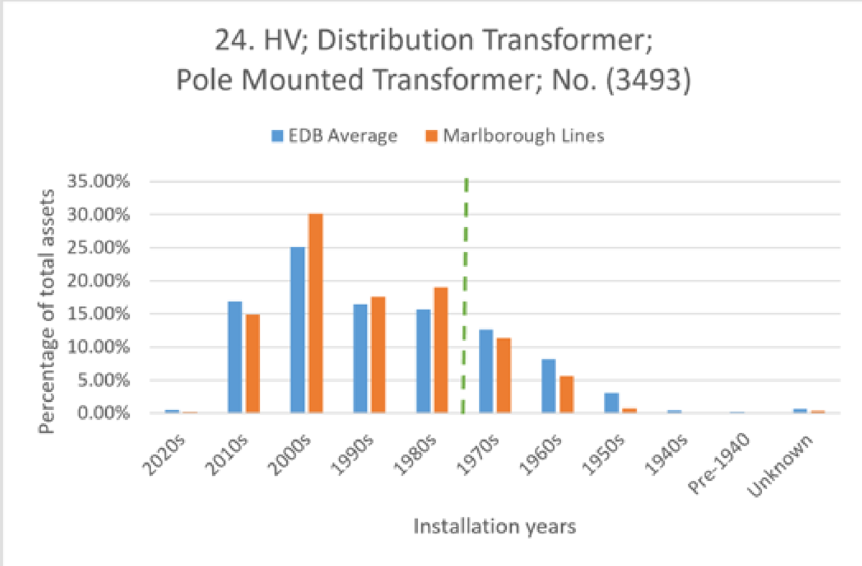
21. HV; Distribution switchgear;
3.3/6.6/11/22kV CB (Indoor); No. (22)
EDB Average
Marlborough Lines
Percentage of the total assets
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years



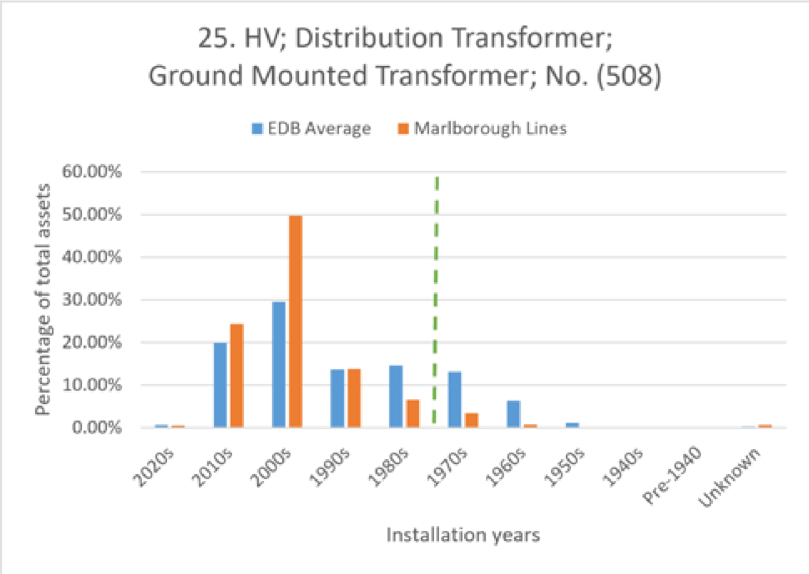
22. HV; Distribution Switchgear;
3.3/6.6/11/22kV Switches and fuses (pole mounted); No. (2451)
EDB Average
Marlborough Lines
Percentage of total assets
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

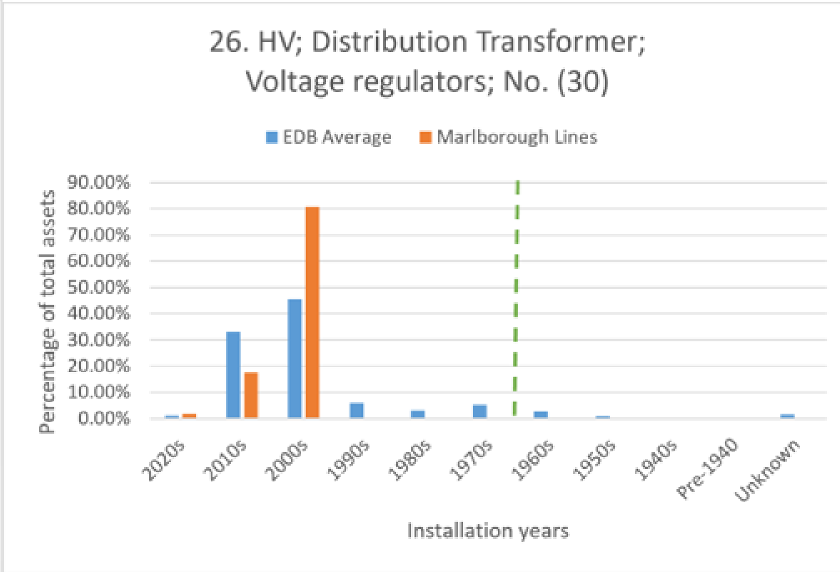


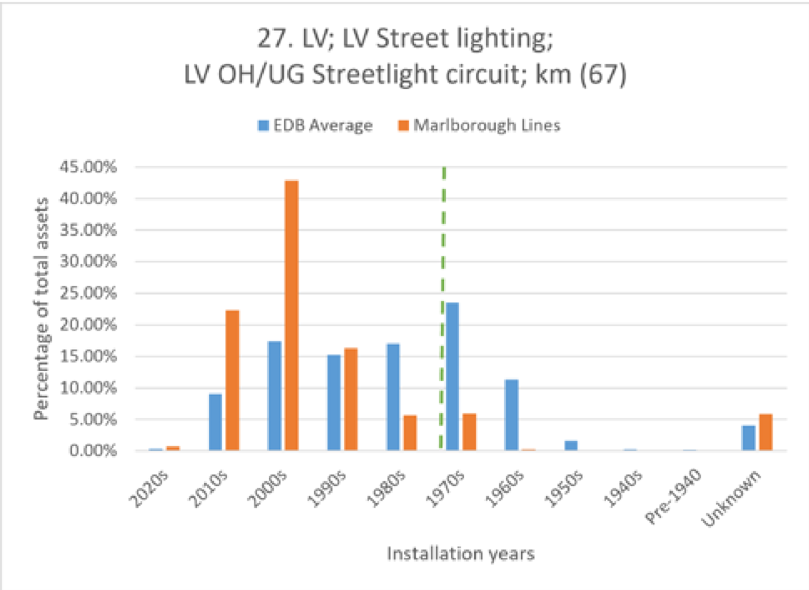
23. HV; Distribution switchgear;
3.3/6.6/11/22kV Switch (ground mounted) - except RMU; No. (55)
EDB Average
Marlborough Lines
Percentage of total assets
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

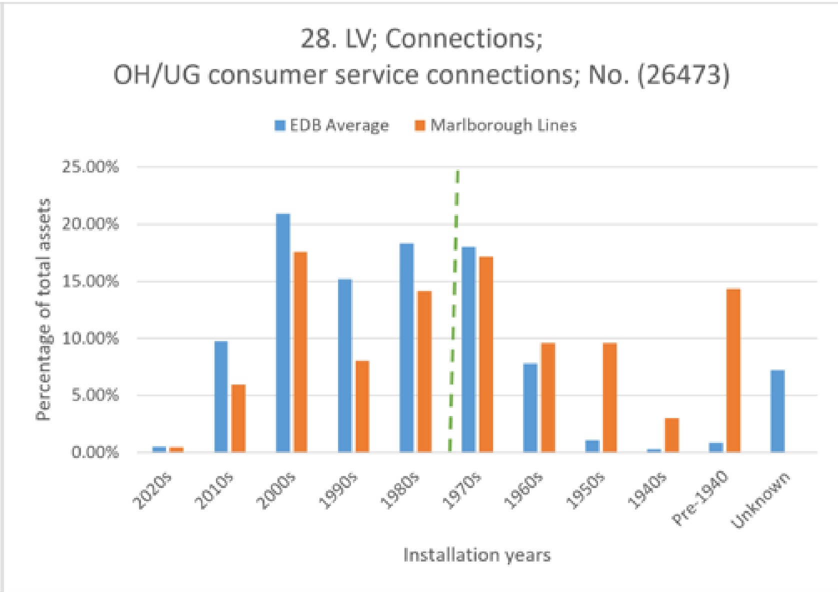


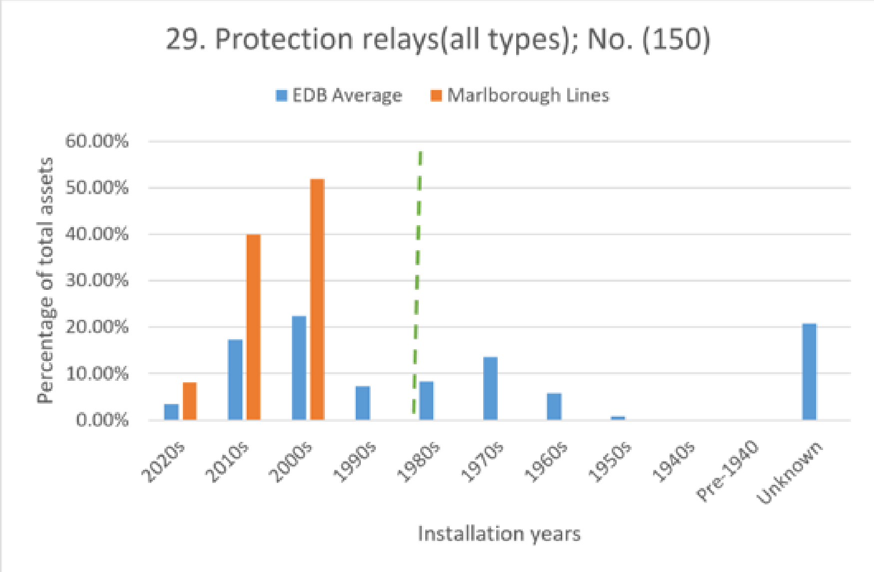
24. HV; Distribution Transformer;
Pole Mounted Transformer; No. (3493)
EDB Average
Marlborough Lines
Percentage of total assets
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years


25. HV; Distribution Transformer;
Ground Mounted Transformer; No. (508)
EDB Average
Marlborough Lines
Percentage of total assets
Installation years
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown

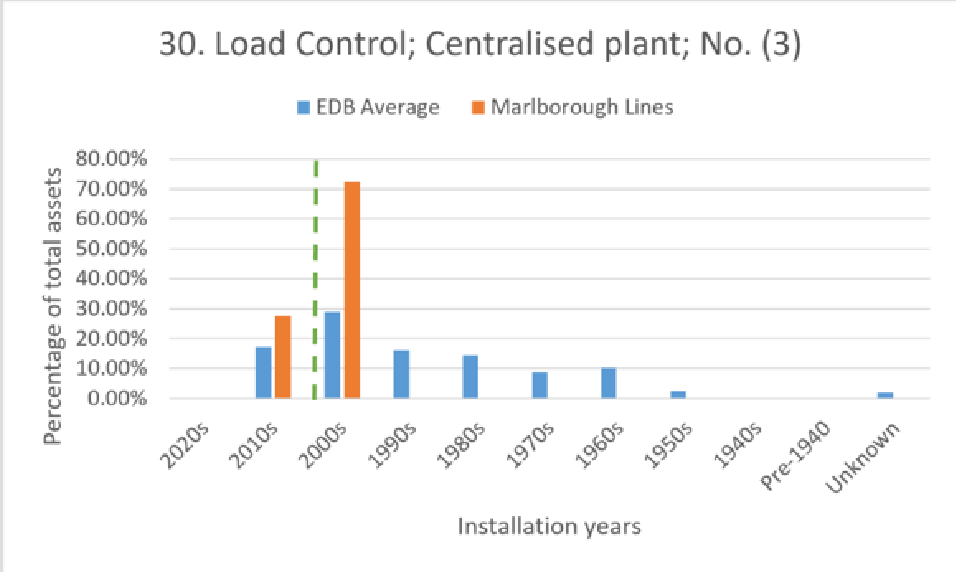

26. HV; Distribution Transformer;
Voltage regulators; No. (30)
EDB Average
Marlborough Lines
Percentage of total assets
Installation years


27. LV; LV Street lighting;
LV OH/UG Streetlight circuit; km (67)
EDB Average
Marlborough Lines
Percentage of total assets
Installation years


28. LV; Connections;
OH/UG consumer service connections; No. (26473)
EDB Average
Marlborough Lines
Percentage of total assets
Installation years



29. Protection relays(all types); No. (150)
EDB Average
Marlborough Lines
Percentage of total assets
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years



30. Load Control; Centralised plant; No. (3)
EDB Average
Marlborough Lines
Percentage of total assets
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2020s
2010s
2000s
1990s
1980s
1970s
1960s
1950s
1940s
Pre-1940
Unknown
Installation years

12.8 Data locations

The following table provides a summary of the key information held at MLL and where it is held.

Table 53: Information repositories

Repository	Information	Key users	Notes
Infor's EAM	• Network and non-Network equipment records (i.e. assets) • Location • Technical specifications • History • Test records • Network outages • Financial data • Asset Condition • Structural dependencies • Project and works records, including corrective and preventative maintenance regimes • Easement records	Most staff	Main asset data repository, also used for maintenance and capital works programs. Displays on the GIS and electrical equipment records also mostly replicated in Milsoft for connectivity and engineering analysis purposes.
GIS (ESRI)	• Line asset type • Line connectivity • Survey 123 (asset inspection data)	Most staff, especially GIS and Engineering	A map-based view of electrical asset data, as well as views of maps, and data relating to the environment such as roads, archaeological sites, DoC sites etc
Network folders	• Design records and project files Calculations, analysis of options, protection reviews. Includes drawings and drawing register.	Engineering, Project Management and Operations staff	
SCADA	• Network status e.g., loads, switch positions, tapchanger positions Faults and outages Inspection data	Engineering, operations and development staff	Current status as well as historical logs and graphs of loading etc.

The following table provides a summary of the key information held at MLL and where it is held.

Table 53: Information repositories

Repository	Information	Key users	Notes
Repository	**Information**	**Key users**	**Notes**
Milsoft	• Outage management system • Engineering Analysis	Operations, engineering and administration staff	Network status/electrical connectivity. Hold outage performance data.
Fault record sheets	• Description and duration • Likely cause	Operations manager, network management and staff	Reviewed regularly to look for systemic issues and ways to improve service.
Technology One's Financials	• Financial data • Inventory • Payroll	Administration, Stores, Finance and Project Management staff	Keeps financial records.
Velocity (Gentrack)	• Connection data • Billing data • ICP management • Load control relays not owned by MLL	Operations and administration staff Commercial Manager and billing team	ICP based data, Milsoft also displays some of this data.
Mango	Policies and procedures (Integrated Management System documentation)	All staff	Procedures, policies and guidelines related to design, operation, health and safety, public safety and environmental practice.
Network Standards	Design and policy information for design and construction of network assets	Contractors, MLL design staff, operators	
Emergency Response Plan	Information for use in civil emergencies, e.g. earthquake, major storms	Engineering, operations, contracting and administration staff during severe events	

12.9 Risk matrix

The risk matrix used for risk categorisation and ranking is set out following together with the consequence assessment table and likelihood assessment table used to map risks onto the risk matrix.

Consequence Severity

Likelihood	Insignfiant	Minor	Moderate	Major	Catastrophic
Almost Certain	Priority 2	Priority 2	Priority 1	Priority 1	Priority 1
Likely	Priority 3	Priority 2	Priority 2	Priority 1	Priority 1
Possible	Priority 4	Priority 3	Priority 2	Priority 1	Priority 1
Unlikely	Priority 4	Priority 4	Priority 3	Priority 2	Priority 1
Rare	Priority 4	Priority 4	Priority 3	Priority 2	Priority 2

Priority 1	Immediate action required to actively manage risk and limit exposure.
Priority 2	Attention required to ensure risk exposure is managed effectively, disruptions minimised and outcomes monitored.
Priority 3	Cost/benefit analysis to assess extent to which risk should be mitigated. Monitor to ensure risk does not increase over time.
Priority 4	Effectively manage through routine procedures and appropriate internal controls.

	Consequence				
Risk Theme	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Health	*No illness or disease*	*Illness only*	*Illness with a possibility of leading to a disease*	*A disease, manageable*	*A disease, leading to fatality (terminal)*
Safety (incl. Public)	*No injury*	*First aid required*	*External medical treatment required*	*Extensive injuries, possibility of a fatality*	*Multiple fatalities*
Quality	*No quality incident*	*Less than $10,000*	*Less than $100,000*	*Less than $1m*	*Above $1m Extensive reputational damage*
Environmental	*Minor transient environmental harm*	*Transient environmental harm*	*Significant release of pollutants with midterm recovery*	*Significant long term envrionmental harm*	*Catatstrophic, long term environmental harm*
Financial	*Loss of assets or unbedgeted revenue loss or increased costs to NZ$2m*	*Loss of assets or unbudgeted revenue or loss or increased costs NZ$2m to NZ $5m.*	*Loss of assets or unbudgeted revenue loss or increased costs NZ$5m to NZ$50m.*	*Loss of assets or unbudgeted revenue loss or increased costs NZ$50m to NZ$100m.*	*Loss of assets or unbudgeted revenue loss or increased costs exceeding NZ$100m.*
Reputational	*Limited media attention - no impact on public memory*	*Local media attention - short-term impact on public memory.*	*Local media attention (not front page) and / or regular inquiry.*	*Local / national media news and / or regular investigation - medium term impact on public memory.*	*International media news headlines and / or government investigation / enquiry - long term impact on public memory.*
Business interruption	*Minor service disruption for up to 2 hours for major industrial/commercial customers; up to 3 hours for residential; up to 12 hours for rural.*	*Business interruption/service delivery failure between 2 and 6 hours fo rmajor industrial/ commercial customers; between 3 hours and 24 hours for residential; between 12 hours and 2 days for rural.*	*Total service cessation between 6 hours and 1 day for major industrial / commercial clients; between 1 to 2 days for residential; between 2 to 7 days for rural.*	*Total service cessation between 1 to 2 days for major industrial / commercial clients; between 2 and 7 days for residential; between 1 and 2 weeks for rural.*	*Disruption to supply (point of supply outage) exceeding 2 days for major industrial / commercial customers; exceeding a week for residential; exceeding 2 weeks for rural.*
Regulatory	*Verbal written concern.*	*Prosecution / improvement notice.*	*Prosecution of business / prohibition notice.*	*Prosecution and fines for Director and employee.*	*Imprisonment of Director or employee.*

Likelihood	Description	Likelihood Criteria
Almost Certain	Is expected to Occur in most circumstances	Likely to occur more than once per year
Likely	The event will probably occur in most circumstances	Likely to occur once per year
Possible	The event might occur at some time (would not be surprised either way: whether it happens or not)	Likely to occur once in 5 years
Unlikely	The event could occur at some time (would be surprised if it happens)	Likely to occur once in 10 years
Rare	The event may occur only in exceptional circumstances	Will occur less than once in 30 years

12.10 Directors certificate

Certification for Year-Beginning Disclosures

Asset Management Plan 2023 - 2033

Pursuant to Electricity Distribution Information Disclosure Determination 2012, Schedule 17, Clause 2.9.1

We, Philip Ian Robinson and Christopher Jonathan Ross, being directors of Marlborough Lines Limited certify that, having made all reasonable enquiry, to the best of our knowledge:

a) the following attached information of Marlborough Lines Limited prepared for the purposes of clauses 2.4.1, 2.6.1, 2.6.3, 2.6.6 and 2.7.2 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.

c) The forecasts in Schedules 11a, 11b, 12a, 12b, 12c and 12d are based on objective and reasonable assumptions which both align with Marlborough Lines Limited's corporate vision and strategy and are documented in retained records.

Signed by:

PI Robinson	29/03/2023 Date
CJ Ross	29.03.2023 Date

COMMERCE COMMISSION NEW ZEALAND

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

Company Name	Marlborough Lines Limited
Disclosure Date	31 March 2023
AMP Planning Period Start Date (first day)	1 April 2023

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

Table of Contents

Information disclosure asset management plan schedules

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

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

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

This information is not part of audited disclosure information.

sch ref

			Current Year CY	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8		for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**	**31 Mar 31**	**31 Mar 32**	**31 Mar 33**
9	**11a(i): Expenditure on Assets Forecast**		**$000 (in nominal dollars)**										
10		Consumer connection	527	294	232	236	241	246	251	256	261	266	271
11		System growth	2,383	6,321	11,245	5,866	1,264	1,383	-	1,599	1,631	1,664	1,697
12		Asset replacement and renewal	5,611	9,523	7,549	14,103	12,931	15,668	16,828	15,550	15,176	15,978	16,299
13		Asset relocations	100	1,194	556	591	603	615	627	640	652	665	498
14		Reliability, safety and environment:											
15		Quality of supply	2,743	3,051	348	872	807	2,305	-	400	408	-	-
16		Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
17		Other reliability, safety and environment	317	3,410	5,779	1,004	2,757	661	674	1,143	701	715	730
18		**Total reliability, safety and environment**	3,060	6,461	6,126	1,876	3,563	2,966	674	1,543	1,109	715	730
19		**Expenditure on network assets**	11,681	23,794	25,709	22,672	18,602	20,878	18,380	19,587	18,829	19,289	19,495
20		Expenditure on non-network assets	1,462	3,602	4,052	4,509	2,315	2,858	2,884	2,061	2,870	2,062	3,035
21		**Expenditure on assets**	13,143	27,395	29,760	27,181	20,916	23,737	21,264	21,648	21,700	21,351	22,530
22													
23	*plus*	Cost of financing	-	-	-	-	-	-	-	-	-	-	-
24	*less*	Value of capital contributions	299	-	-	-	-	-	-	-	-	-	-
25	*plus*	Value of vested assets	-	-	-	-	-	-	-	-	-	-	-
26													
27		**Capital expenditure forecast**	12,844	27,395	29,760	27,181	20,916	23,737	21,264	21,648	21,700	21,351	22,530
28													
29		Assets commissioned	13,701	27,280	21,185	30,616	25,850	23,669	21,196	21,578	21,628	21,278	22,456

			Current Year CY	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
31		for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**	**31 Mar 31**	**31 Mar 32**	**31 Mar 33**
32			**$000 (in constant prices)**										
33		Consumer connection	527	283	218	218	218	218	218	218	218	218	218
34		System growth	2,383	6,090	10,580	5,411	1,143	1,226	-	1,363	1,363	1,363	1,363
35		Asset replacement and renewal	5,611	9,174	7,102	13,008	13,055	13,891	14,626	13,250	12,678	13,087	13,088
36		Asset relocations	100	1,151	523	545	545	545	545	545	545	545	400
37		Reliability, safety and environment:											
38		Quality of supply	2,743	2,939	327	804	729	2,044	-	341	341	-	-
39		Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
40		Other reliability, safety and environment	317	3,285	5,437	926	1,130	586	586	974	586	586	586
41		**Total reliability, safety and environment**	3,060	6,224	5,764	1,730	1,860	2,630	586	1,315	927	586	586
42		**Expenditure on network assets**	11,681	22,923	24,187	20,911	16,821	18,510	15,975	16,691	15,730	15,798	15,654
43		Expenditure on non-network assets	1,462	3,470	3,812	4,159	2,093	2,534	2,507	1,756	2,398	1,689	2,437
44		**Expenditure on assets**	13,143	26,393	27,999	25,070	18,914	21,044	18,482	18,447	18,128	17,487	18,091
45													
46	**Subcomponents of expenditure on assets (where known)**												
47		Energy efficiency and demand side management, reduction of energy losses	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
48		Overhead to underground conversion	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
49		Research and development	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

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

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

This information is not part of audited disclosure information.

sch ref		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
50												
52	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**	**31 Mar 31**	**31 Mar 32**	**31 Mar 33**
53	**Difference between nominal and constant price forecasts**	**$000**										
54	Consumer connection	-	11	14	18	23	28	33	38	43	48	53
55	System growth	-	231	666	455	121	157	-	236	268	301	334
56	Asset replacement and renewal	-	349	447	1,095	(125)	1,778	2,202	2,299	2,498	2,891	3,211
57	Asset relocations	-	44	33	46	58	70	82	95	107	120	98
58	Reliability, safety and environment:											
59	Quality of supply	-	112	21	68	77	262	-	59	67	-	-
60	Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
61	Other reliability, safety and environment	-	125	342	78	1,626	75	88	169	115	129	144
62	**Total reliability, safety and environment**	-	237	363	146	1,704	336	88	228	183	129	144
63	**Expenditure on network assets**	-	871	1,522	1,760	1,781	2,369	2,405	2,897	3,099	3,491	3,841
64	Expenditure on non-network assets	-	132	240	350	222	324	377	305	472	373	598
65	**Expenditure on assets**	-	1,003	1,761	2,110	2,002	2,693	2,782	3,201	3,571	3,864	4,439
66												

67		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
68	**11a(ii): Consumer Connection**						
69	*Consumer types defined by EDB**	**$000 (in constant prices)**					
70	Residential	211	128	83	83	83	83
71	General	132	85	65	65	65	65
72	Commercial and Industrial	184	70	70	70	70	70
73	Irrigation	-	-	-	-	-	-
74	Other	-	-	-	-	-	-
75	**include additional rows if needed*						
76	**Consumer connection expenditure**	527	283	218	218	218	218
77	*less* Capital contributions funding consumer connection	-	-	-	-	-	-
78	**Consumer connection less capital contributions**	527	283	218	218	218	218

sch ref		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
79	**11a(iii): System Growth**						
80	Subtransmission	1,698	2,641	3,425	-	-	-
81	Zone substations	556	3,449	7,155	5,411	1,143	-
82	Distribution and LV lines	-	-	-	-	-	-
83	Distribution and LV cables	-	-	-	-	-	-
84	Distribution substations and transformers	119	-	-	-	-	-
85	Distribution switchgear		-	-	-	-	-
86	Other network assets	10	-	-	-	-	1,226
87	**System growth expenditure**	2,383	6,090	10,580	5,411	1,143	1,226
88	*less* Capital contributions funding system growth	-	-	-	-	-	-
89	**System growth less capital contributions**	2,383	6,090	10,580	5,411	1,143	1,226
90							

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

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

sch ref

sch ref			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
92		for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
93	**11a(iv): Asset Replacement and Renewal**		**$000 (in constant prices)**					
94		Subtransmission	1,117	1,363	-	-	1,363	-
95		Zone substations	1,159	2,487	837	1,726	469	1,376
96		Distribution and LV lines	2,378	3,230	4,154	8,339	9,129	10,355
97		Distribution and LV cables	50	196	196	341	518	518
98		Distribution substations and transformers	510	-	-	777	842	906
99		Distribution switchgear	378	1,898	1,915	1,635	545	545
100		Other network assets	19	-	-	191	191	191
101		**Asset replacement and renewal expenditure**	5,611	9,174	7,102	13,008	13,055	13,891
102	*less*	Capital contributions funding asset replacement and renewal	299	-	-	-	-	-
103		**Asset replacement and renewal less capital contributions**	5,312	9,174	7,102	13,008	13,055	13,891
104								

sch ref			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
106		for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
107	**11a(v): Asset Relocations**							
108		*Project or programme**	**$000 (in constant prices)**					
109		Roading	5	798	523	545	545	545
110		Transpower		300	-	-	-	-
111								
112								
113								
114		**include additional rows if needed*						
115		All other project or programmes - asset relocations	95	53				
116		**Asset relocations expenditure**	100	1,151	523	545	545	545
117	*less*	Capital contributions funding asset relocations	-	-	-	-	-	-
118		**Asset relocations less capital contributions**	100	1,151	523	545	545	545
119								

sch ref			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
121		for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
122	**11a(vi): Quality of Supply**							
123		*Project or programme**	**$000 (in constant prices)**					
124		33kV network development and enhancement	2,494	2,680	-	477	388	2,044
125		Network Automation	6	259	327	327	341	-
126		Digitial Radio Network	224	-		-	-	-
127				-		-	-	-
128				-		-	-	-
129		**include additional rows if needed*						
130		All other projects or programmes - quality of supply	19					
131		**Quality of supply expenditure**	2,743	2,939	327	804	729	2,044
132	*less*	Capital contributions funding quality of supply	-	-	-	-	-	-
133		**Quality of supply less capital contributions**	2,743	2,939	327	804	729	2,044
134								

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

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

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

This information is not part of audited disclosure information.

sch ref

sch ref		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
135							
136	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
137	**11a(vii): Legislative and Regulatory**						
138	*Project or programme**	**$000 (in constant prices)**					
139							
140							
144	**include additional rows if needed*						
145	All other projects or programmes - legislative and regulatory						
146	**Legislative and regulatory expenditure**	-	-	-	-	-	-
147	*less* Capital contributions funding legislative and regulatory						
148	**Legislative and regulatory less capital contributions**	-	-	-	-	-	-
149							

sch ref		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
150	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
151	**11a(viii): Other Reliability, Safety and Environment**						
152	*Project or programme**	**$000 (in constant prices)**					
153	ADMS Project		1,140	981			
154	Spring Creek Switchgear		770	2,310			
155	Distribution pillar replacement		196	392	409	204	204
	Transformer OH to UG conversion	141	260	520	381	381	382
156	Tee joint removals		131	131	136		
158	**include additional rows if needed*						
159	All other projects or programmes - other reliability, safety and environment	176	788	1,103	-	545	-
160	**Other reliability, safety and environment expenditure**	317	3,285	5,437	926	1,130	586
161	*less* Capital contributions funding other reliability, safety and environment	-	-	-	-	-	-
162	**Other reliability, safety and environment less capital contributions**	317	3,285	5,437	926	1,130	586
163							

sch ref		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
164							
165	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
166	**11a(ix): Non-Network Assets**						
167	**Routine expenditure**						
168	*Project or programme**	**$000 (in constant prices)**					
169	Test Equipment	79	50	50	50	50	50
170	Plant and Tools	154	350	350	350	350	350
	Vehicles	874	1,595	1,512	784	1,218	1,659
	Radio Equipment	13	5	5	5	5	5
	Office Furniture & Equipment	90	25	25	25	25	25
171	Land and buildings	58	125	125	125	125	125
172	IT Hardware	164	500	225	300	300	300
173	Software	30	20	20	20	20	20
174	**include additional rows if needed*						
175	All other projects or programmes - routine expenditure						
176	**Routine expenditure**	1,462	2,670	2,312	1,659	2,093	2,534
177	**Atypical expenditure**						
178	*Project or programme**						
179	NOC Building	-	800	1,500	2,500	-	-
184	**include additional rows if needed*						
185	All other projects or programmes - atypical expenditure						
186	**Atypical expenditure**	-	800	1,500	2,500	-	-
187							
188	**Expenditure on non-network assets**	1,462	3,470	3,812	4,159	2,093	2,534

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 11b: REPORT ON FORECAST OPERATIONAL EXPENDITURE

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

sch ref		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**	**31 Mar 31**	**31 Mar 32**	**31 Mar 33**
9	**Operational Expenditure Forecast**	**$000 (in nominal dollars)**										
10	Service interruptions and emergencies	1,472	1,349	1,382	1,409	1,438	1,466	1,496	1,526	1,556	1,587	1,619
11	Vegetation management	2,607	2,491	2,498	2,494	2,488	2,482	2,474	2,464	2,454	2,442	2,491
12	Routine and corrective maintenance and inspection	4,440	4,567	4,624	4,662	4,700	4,737	4,775	4,812	4,908	5,006	5,106
13	Asset replacement and renewal	733	779	797	813	829	846	863	880	898	916	934
14	**Network Opex**	9,252	9,186	9,300	9,378	9,455	9,531	9,607	9,682	9,815	9,951	10,150
15	System operations and network support	4,857	5,242	5,474	5,692	5,806	5,922	6,040	6,161	6,284	6,410	6,538
16	Business support	5,543	5,501	5,633	5,746	5,861	5,978	6,098	6,220	6,344	6,471	6,600
17	**Non-network opex**	10,400	10,743	11,107	11,438	11,667	11,900	12,138	12,381	12,628	12,881	13,139
18	**Operational expenditure**	19,652	19,930	20,408	20,816	21,122	21,431	21,745	22,063	22,444	22,832	23,288

19		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
20	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**	**31 Mar 31**	**31 Mar 32**	**31 Mar 33**
21		**$000 (in constant prices)**										
22	Service interruptions and emergencies	1,472	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
23	Vegetation management	2,607	2,400	2,350	2,300	2,250	2,200	2,150	2,100	2,050	2,000	2,000
24	Routine and corrective maintenance and inspection	4,440	4,400	4,350	4,300	4,250	4,200	4,150	4,100	4,100	4,100	4,100
25	Asset replacement and renewal	733	750	750	750	750	750	750	750	750	750	750
26	**Network Opex**	9,252	8,850	8,750	8,650	8,550	8,450	8,350	8,250	8,200	8,150	8,150
27	System operations and network support	4,857	5,050	5,150	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
28	Business support	5,543	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300
29	**Non-network opex**	10,400	10,350	10,450	10,550	10,550	10,550	10,550	10,550	10,550	10,550	10,550
30	**Operational expenditure**	19,652	19,200	19,200	19,200	19,100	19,000	18,900	18,800	18,750	18,700	18,700

31	**Subcomponents of operational expenditure (where known)**											
32–33	Energy efficiency and demand side management, reduction of energy losses	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
34	Direct billing*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
35	Research and Development	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
36	Insurance	446	460	460	460	460	460	460	460	460	460	460

37 ** Direct billing expenditure by suppliers that direct bill the majority of their consumers*

39		*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
40	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**	**31 Mar 29**	**31 Mar 30**	**31 Mar 31**	**31 Mar 32**	**31 Mar 33**
41	**Difference between nominal and real forecasts**	**$000**										
42	Service interruptions and emergencies	-	49	82	109	138	166	196	226	256	287	319
43	Vegetation management	-	91	148	194	238	282	324	364	404	442	491
44	Routine and corrective maintenance and inspection	-	167	274	362	450	537	625	712	808	906	1,006
45	Asset replacement and renewal	-	29	47	63	79	96	113	130	148	166	184
46	**Network Opex**	-	336	550	728	905	1,081	1,257	1,432	1,615	1,801	2,000
47	System operations and network support	-	192	324	442	556	672	790	911	1,034	1,160	1,288
48	Business support	-	201	333	446	561	678	798	920	1,044	1,171	1,300
49	**Non-network opex**	-	393	657	888	1,117	1,350	1,588	1,831	2,078	2,331	2,589
50	**Operational expenditure**	-	730	1,208	1,616	2,022	2,431	2,845	3,263	3,694	4,132	4,588

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 12a: REPORT ON ASSET CONDITION

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

sch ref

					Asset condition at start of planning period (percentage of units by grade)							
7												
8												
9	**Voltage**	**Asset category**	**Asset class**	**Units**	**H1**	**H2**	**H3**	**H4**	**H5**	**Grade unknown**	**Data accuracy (1–4)**	**% of asset forecast to be replaced in next 5 years**
10	All	Overhead Line	Concrete poles / steel structure	No.	0.26%	5.82%	17.37%	57.01%	19.54%		3	3.00%
11	All	Overhead Line	Wood poles	No.	0.52%	2.36%	45.13%	47.89%	4.10%		3	5.00%
12	All	Overhead Line	Other pole types	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	HV	Subtransmission Line	Subtransmission OH up to 66kV conductor	km	6.50%	13.46%	34.35%	14.29%	31.40%	0.09%	3	4.00%
14	HV	Subtransmission Line	Subtransmission OH 110kV+ conductor	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15	HV	Subtransmission Cable	Subtransmission UG up to 66kV (XLPE)	km	-	0.23%	-	12.44%	87.33%	-	3	-
16	HV	Subtransmission Cable	Subtransmission UG up to 66kV (Oil pressurised)	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17	HV	Subtransmission Cable	Subtransmission UG up to 66kV (Gas pressurised)	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18	HV	Subtransmission Cable	Subtransmission UG up to 66kV (PILC)	km	-	-	-	-	100.00%	-	3	-
19	HV	Subtransmission Cable	Subtransmission UG 110kV+ (XLPE)	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20	HV	Subtransmission Cable	Subtransmission UG 110kV+ (Oil pressurised)	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
21	HV	Subtransmission Cable	Subtransmission UG 110kV+ (Gas Pressurised)	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22	HV	Subtransmission Cable	Subtransmission UG 110kV+ (PILC)	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23	HV	Subtransmission Cable	Subtransmission submarine cable	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24	HV	Zone substation Buildings	Zone substations up to 66kV	No.	-	-	-	50.00%	50.00%	-	4	-
25	HV	Zone substation Buildings	Zone substations 110kV+	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26	HV	Zone substation switchgear	22/33kV CB (Indoor)	No.	-	-	-	-	100.00%	-	4	-
27	HV	Zone substation switchgear	22/33kV CB (Outdoor)	No.	-	-	-	50.00%	50.00%	-	4	-
28	HV	Zone substation switchgear	33kV Switch (Ground Mounted)	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29	HV	Zone substation switchgear	33kV Switch (Pole Mounted)	No.	-	-	4.55%	45.45%	50.00%	-	3	6.00%
30	HV	Zone substation switchgear	33kV RMU	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
31	HV	Zone substation switchgear	50/66/110kV CB (Indoor)	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
32	HV	Zone substation switchgear	50/66/110kV CB (Outdoor)	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
33	HV	Zone substation switchgear	3.3/6.6/11/22kV CB (ground mounted)	No.	-	-	-	20.00%	80.00%	-	3	-
34	HV	Zone substation switchgear	3.3/6.6/11/22kV CB (pole mounted)	No.	-	-	-	33.33%	66.67%	-	3	-
35												

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 12a: REPORT ON ASSET CONDITION

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

sch ref

36					**Asset condition at start of planning period (percentage of units by grade)**							
37												
38	**Voltage**	**Asset category**	**Asset class**	**Units**	**H1**	**H2**	**H3**	**H4**	**H5**	**Grade unknown**	**Data accuracy (1–4)**	**% of asset forecast to be replaced in next 5 years**
39	HV	Zone Substation Transformer	Zone Substation Transformers	No.	-	6.45%	12.90%	12.90%	67.75%	-	4	9.60%
40	HV	Distribution Line	Distribution OH Open Wire Conductor	km	4.03%	18.45%	30.71%	15.05%	31.76%	0.34%	3	7.00%
41	HV	Distribution Line	Distribution OH Aerial Cable Conductor	km	-	-	-	-	100.00%	-	4	-
42	HV	Distribution Line	SWER conductor	km	0.66%	16.19%	45.17%	29.08%	8.90%	0.01%	3	1.00%
43	HV	Distribution Cable	Distribution UG XLPE or PVC	km	2.44%	1.55%	0.02%	20.40%	75.59%	0.70%	3	1.00%
44	HV	Distribution Cable	Distribution UG PILC	km	-	-	-	90.40%	9.60%		3	-
45	HV	Distribution Cable	Distribution Submarine Cable	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
46	HV	Distribution switchgear	3.3/6.6/11/22kV CB (pole mounted) - reclosers and sectionalisers	No.	-	0.86%	3.42%	15.38%	80.34%	-	3	3.00%
47	HV	Distribution switchgear	3.3/6.6/11/22kV CB (Indoor)	No.	-	13.64%	22.73%	-	63.63%	-	3	20.00%
48	HV	Distribution switchgear	3.3/6.6/11/22kV Switches and fuses (pole mounted)	No.	1.31%	3.16%	7.82%	36.44%	51.27%	3.20%	3	2.00%
49	HV	Distribution switchgear	3.3/6.6/11/22kV Switch (ground mounted) - except RMU	No.	-	3.80%	58.50%	30.20%	7.50%	-	3	4.00%
50	HV	Distribution switchgear	3.3/6.6/11/22kV RMU	No.	-	4.70%	34.60%	31.40%	29.30%		3	4.00%
51	HV	Distribution Transformer	Pole Mounted Transformer	No.	0.06%	13.34%	47.09%	26.26%	13.25%	0.52%	3	2.00%
52	HV	Distribution Transformer	Ground Mounted Transformer	No.	-	3.12%	31.58%	46.20%	19.10%	0.77%	3	2.00%
53	HV	Distribution Transformer	Voltage regulators	No.	-	-	19.35%	61.30%	19.35%	-	3	3.00%
54	HV	Distribution Substations	Ground Mounted Substation Housing	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
55	LV	LV Line	LV OH Conductor	km	7.86%	19.74%	48.71%	11.21%	12.48%	29.80%	2	6.50%
56	LV	LV Cable	LV UG Cable	km	3.14%	2.74%	3.25%	28.33%	62.54%	2.52%	3	1.00%
57	LV	LV Streetlighting	LV OH/UG Streetlight circuit	km	-	0.32%	8.29%	22.83%	68.56%	2.84%	2	1.00%
58	LV	Connections	OH/UG consumer service connections	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
59	All	Protection	Protection relays (electromechanical, solid state and numeric)	No.	-	7.38%	55.70%	28.20%	8.72%		4	20.00%
60	All	SCADA and communications	SCADA and communications equipment operating as a single system	Lot	-	-	100.00%	-	-	-	3	100.00%
61	All	Capacitor Banks	Capacitors including controls	No.	-	100.00%	-	-	-	-	2	-
62	All	Load Control	Centralised plant	Lot	-	-	33.00%	-	67.00%	-	4	-
63	All	Load Control	Relays	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
64	All	Civils	Cable Tunnels	km	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 12b: REPORT ON FORECAST CAPACITY

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

sch ref

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

sch ref	*Existing Zone Substations*	Current Peak Load (MVA)	Installed Firm Capacity (MVA)	Security of Supply Classification (type)	Transfer Capacity (MVA)	Utilisation of Installed Firm Capacity %	Installed Firm Capacity +5 years (MVA)	Utilisation of Installed Firm Capacity + 5yrs %	Installed Firm Capacity Constraint +5 years (cause)	Explanation
8										
9	Cloudy Bay	6	17	N - 1	8	35%	17	59%	No constraint within +5 years	Load shift from Riverlands Substation
10	Havelock	3	5	N - 1	2	51%	5	52%	No constraint within +5 years	
11	Leefield	3	5	N	1	70%	5	70%	No constraint within +5 years	
12	Linkwater	2	5	N	1	36%	5	40%	No constraint within +5 years	
13	Nelson St	14	17	N - 1	10	83%	20	73%	No constraint within +5 years	Planned installation of fans to increase TX rating to 20MVA ONAF
14	Picton	7	15	N - 1	-	49%	15	49%	No constraint within +5 years	
15	Rai Valley	2	3	N	1	74%	5	45%	No constraint within +5 years	Planned TX replacement, T1 increases from 3MVA to 5MVA
16	Redwoodtown	11	15	N - 1	8	70%	15	74%	No constraint within +5 years	
17	Riverlands	10	10	N - 1	8	97%	10	76%	No constraint within +5 years	Load shift to Cloudy Bay Substation
18	Seddon	7	10	N - 1	1	65%	10	70%	No constraint within +5 years	
19	Spring Creek	4	5	N - 1	4	75%	5	40%	No constraint within +5 years	Planned TX replacement, T1 & T2 replaced with10 MVA TXs
20	Springlands	9	17	N - 1	10	54%	17	58%	No constraint within +5 years	
21	Tapp	10	17	N - 1	5	63%	17	70%	No constraint within +5 years	
22	Ward	1	5	N	1	18%	5	18%	No constraint within +5 years	
23	Waters	8	17	N - 1	10	49%	17	52%	No constraint within +5 years	
24	Woodbourne	9	10	N - 1	5	86%	10	57%	No constraint within +5 years	Planned TX replacement, T1 & T2 replaced with 16.5 MVA TXs
25	Waitohi	-		N-1	3	-	17	55%	No constraint within +5 years	New zone substation. Little load transfer.
26						-				
27						-				
28						-				

29 [1] *Extend forecast capacity table as necessary to disclose all capacity by each zone substation*

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**

SCHEDULE 12C: REPORT ON FORECAST NETWORK DEMAND

This schedule requires a forecast of new connections (by consumer type), peak demand and energy volumes for the disclosure year and a 5 year planning period. The forecasts should be consistent with the supporting information set out in the AMP as well as the assumptions used in developing the expenditure forecasts in Schedule 11a and Schedule 11b and the capacity and utilisation forecasts in Schedule 12b.

sch ref								
7	**12c(i): Consumer Connections**							
8	*Number of ICPs connected in year by consumer type*				**Number of connections**			
9			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
10		for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
11	*Consumer types defined by EDB**							
12	Residential		80	100	100	120	120	140
13	General		35	20	20	20	20	20
14	Commercial and Industrial		9	5	5	5	5	5
15	Irrigation		8	8	8	7	7	7
16	Other (MLL, unmetered, Street lights etc)		2	1	1	1	1	1
17	**Connections total**		134	134	134	153	153	173
18	**include additional rows if needed*							
19	**Distributed generation**							
20	Number of connections		173	200	220	240	260	280
21	Capacity of distributed generation installed in year (MVA)		4	4	4	18	8	17
22	**12c(ii) System Demand**							
23			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
24	**Maximum coincident system demand (MW)**	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
25	GXP demand		75	77	78	79	79	79
26	*plus* Distributed generation output at HV and above		3	3	3	3	3	3
27	**Maximum coincident system demand**		78	80	81	82	82	82
28	*less* Net transfers to (from) other EDBs at HV and above		-	-	-	-	-	-
29	**Demand on system for supply to consumers' connection points**		78	80	81	82	82	82
30	**Electricity volumes carried (GWh)**							
31	Electricity supplied from GXPs		390	398	399	394	395	397
32	*less* Electricity exports to GXPs		-	-	-	-	-	-
33	*plus* Electricity supplied from distributed generation		19	23	25	46	47	47
34	*less* Net electricity supplied to (from) other EDBs		-	-	-	-	-	-
35	**Electricity entering system for supply to ICPs**		409	421	424	440	441	444
36	*less* Total energy delivered to ICPs		397	404	407	422	423	426
37	**Losses**		12	17	18	18	18	18
38								
39	**Load factor**		60%	60%	60%	62%	61%	62%
40	**Loss ratio**		3.0%	4.1%	4.1%	4.1%	4.1%	4.1%

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 – 31 March 2033**
Network / Sub-network Name	

SCHEDULE 12d: REPORT FORECAST INTERRUPTIONS AND DURATION

This schedule requires a forecast of SAIFI and SAIDI for disclosure and a 5 year planning period. The forecasts should be consistent with the supporting information set out in the AMP as well as the assumed impact of planned and unplanned SAIFI and SAIDI on the expenditures forecast provided in Schedule 11a and Schedule 11b.

sch ref

		Current Year CY	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
8							
9	for year ended	**31 Mar 23**	**31 Mar 24**	**31 Mar 25**	**31 Mar 26**	**31 Mar 27**	**31 Mar 28**
10	**SAIDI**						
11	Class B (planned interruptions on the network)	45.0	72.0	72.0	72.0	72.0	72.0
12	Class C (unplanned interruptions on the network)	259.0	93.0	93.0	85.0	85.0	85.0
13	**SAIFI**						
14	Class B (planned interruptions on the network)	0.38	0.50	0.50	0.50	0.50	0.50
15	Class C (unplanned interruptions on the network)	1.25	1.20	1.20	1.10	1.10	1.10

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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?	3	MLL's Asset Management Policy is in Section 7.1 of the AMP, which is fully endorsed by the board, senior level managers and supervisors and managers with asset management responsibilities.The policy is stored in MLL's public safety, H&S, environmental, quality management (IMS) system. Key people involved in development of IMS system. Also see SCI and other relevant corporate documents and linkages in section 5.3 of the		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	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?	3	The AMP contains an AM Strategy (section 7) which expands on the AM Policy. This AM Strategy was deliberately written in conjunction with the AM Policy to ensure consistency. A review of this AM Strategy indicates that it is aligned to Marlborough Lines overall corporate direction. The strategy has been reviewed/updated for the 2023 AMP. See SCI and other relevant corporate documents and linkages in section 5.3 of the AMP.	MLL has a number of strategies, policies and stakeholders. The AMP provides a summary of these.	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?	3	MLL's AMP covers asset classes and lifecycle maintenance approach to assets (i.e. is effectively MLL's asset strategy). The lifecycle strategies are heavily dependent on the asset class. Strategy drivers include economic, public safety, asset criticality etc. Each aset class has its own unique life cycle which is considered and appropriate strategies for monitoring and repairing/replacing noted in the AMP for each class. For example some	MLL owns and operates a large volume of assets, many of which serve very different purposes. Even within the same asset classes, some assets are highly critical while others are not (e.g. 33kV poles vs low voltage poles).	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?	2.5	MLL has an AMP which is compiled by a number of key staff. The AMP firstly breaks down the network by asset class, and then secondly considers activities that are required as an assets' life progresses (principally through testing and inspections, minor mainteance and renewals). MLL acknowledges that further focus/planning could be placed around decommissioning and disposal of assets		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	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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	Marlborough Lines Limited
AMP Planning Period	1 April 2023 - 31 March 2033
Asset Management Standard Applied	

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?	2.5	Those who are responsible for delivery of the Asset Management Plan also draft the relevant sections of the AMP. MLL should consider formalising the communications through the development of a communications plan so that there is more structure around the dissemination of the AMP and comfirmation that it is being followed effectively.	MLL disseminates/communicates the plan to relevant parties in forms appropriate for those parties, however there is not a formalised method confirming that they are being used effectively	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	Key staff's job descriptions reference AMP activities and objectives. The AMP itself details repsonsiiblities for senior staff in the accountibilities and responsibilities for asset management section.		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)	2.5	Opex expenditure set out in the AMP is relatively consistent year on year. Capex varies year on year depending on customer requirements. As such, the resourcing currently in place is generally sufficient and variations are catered for by using contractors. Major unplanned events such as the November 2016 earthquake and 2021 and 2022 storms resulted in additional OPEX and a reallocation of resources to focus on that		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	The MLL AMP includes a high level risk register that identifies high level exposure to 'Electricity Network Risks'. Such risks have been used to compile the MLL Emergency Preparedness Plan, an in depth procedure for network recovery and operation following/during major events. The EPP is reviewed annually to ensure appropriateness and current relevance. MLL has been pleased with its response to	Emergency events can cause major interuptions to MLL's Network so appropriate plans need to be in place to minimise the effect of these.	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	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	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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	The AMP sets out the responsibilities and accountability of Management staff		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?	2.5	Because of the relatively consistent nature of work programmes and resulting expenditure (including forecasts), resourcing is largely a contium of what has gone before. However, asset management is generally one of many focuses for a limited number of key staff. To faciliate improvements in Asset Management, MLL recentlyappointed an engineer primarily to focus on delivery of asset management. This role involves formal review of the need for	Resources include finance, staff, plant and materials etc.	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?	2.5	Key AM targets and annual performance against those targets are published annually within the MLL Annual Report. The report includes several supply reliability measures that were achieved. AM requirements are also discussed during regular board meetings and management meetings.		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?	3	If works are outsourced then they are overseen/managed by an MLL staff member (engineer or project manager). Also, MLL Network Design and Construction Manuals are provided to all major contractors. Deviations from plans are limited through the control of components allocated to each task. Asset inspections are performed through the use of internal asset inspectors; data collection is controlled through the use of infield electronic	MLL occassionally sources external contractors to undertake asset inspections and/or maintenance and more rarely, asset renewal works.	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	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	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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)?	2.5	MLL AMP and position descriptions largely cover this off. MLL does not have a formal succession plan or assessment of human resource requirements which is a potential area for improvement.		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	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?	3	Fundamentally, the recruitment of people to fit job descriptions who already largely have required competencies. For graduates, training programmes/external courses are attended to develop competencies. MLL has a competency framework which is managed. Mango also houses training records for all staff. Annual professional development plans are also carried out by managers with their staff.		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	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of an established and applied competency requirements assessment process and plan(s) in place to deliver the required training. Evidence that the training programme is part of a wider, co-ordinated asset management activities training and competency programme. Evidence that training activities are recorded and that records are readily available (for both direct and contracted service provider staff) e.g. via organisation wide information system or local records database.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	3	Competency requirement registers for Network and Contracting staff are maintained though the ISO9001 system. This highlights regular training requirements, levels of staff competency, and required refresher training dates. A key focus of the organisation is continued training and professional development for all staff. Key staff attend various industry training and/or conference events such as EEA Asset		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	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.

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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.

Company Name	Marlborough Lines Limited
AMP Planning Period	1 April 2023 - 31 March 2033
Asset Management Standard Applied	

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	3	A number of artefacts here - Annual Report, quarterly newsletters, AMP, specifc letters to targetted stakeholders (e.g. vineyards and tradespeople working near overhead lines). In addition to what is disclosed annually through the MLL AMP, regular planning meetings between the BoD and exec staff, Network and Contracting management, and Network and Operations/Faults staff are held. Annual releases of the company report and		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?	3	MLL's AMP largely covers this off and outlines the asset management system and interactions between them. The ISO9001 system provides an overall process map of how these systems inter-relate with one another.		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?	3	Information systems are in place for the management of asset data. The primary system is the EAM asset database, as well as MLL's GIS. MLL SCADA also collects real time data on asset utilisation in the field. Primary users of asset data and asset management staff have been consulted to determine the level and type of data required for planning asset management related tasks.	MLL has a number of information systems which provide various functionalities for the recording and management of asset data. The data is used for various means - reporting purposes, asset management planning etc.	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	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Operations, maintenance and engineering managers	Details of the process the organisation has employed to determine what its asset information system should contain in order to support its asset management system. Evidence that this has been effectively implemented.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	3	Staff are employed to populate asset databases and the GIS when asset inspections, renewals or replacements occur. MLL has developped a mobile application for collecting asset information in the field and is currenlty expanding the use of the mobile applications. MLL could potentially improve in this area by		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.

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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.

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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?	3	The AMP discloses what information systems are in place within the company, what information they hold and the typical users of such systems. All systems used within MLL are typical to those used in other EDBs and have been selected based on their abilities to fulfil the identified needs of MLL through a detailed procurement process.		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	The AMP and Emergency Preparedness Plan develop a risk register and disclose risk mitigation strategies. Physical asset risks are implicitly considered when new assets are designed or when opportunities arise to renew assets arise. Asset failures are examined to identify any systematic issues. Executive staff are involved in regulatory working groups with the aim of minimising regulatory risk.		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 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	The risk chapter of the AMP develops a number of risk treatments, which in turn determines required activities and resources to mitigate risks. This is a key driver in determining training and competency needs of MLL staff		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	Regular contact is maintained with the Electricity Authority and the Commerce Commission to ensure currency with existing and emerging regulations, including the attendance of industry workshops. Executive Staff regularly receive bulletins, alerts and newsletters from consultants, regulators and government agencies.		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

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	The organisation has not considered the need to determine the relevance of its management information system. At present there are major gaps between what the information system provides and the organisations needs.	The organisation understands the need to ensure its asset management information system is relevant to its needs and is determining an appropriate means by which it will achieve this. At present there are significant gaps between what the information system provides and the organisations needs.	The organisation has developed and is implementing a process to ensure its asset management information system is relevant to its needs. Gaps between what the information system provides and the organisations needs have been identified and action is being taken to close them.	The organisation's asset management information system aligns with its asset management requirements. Users can confirm that it is relevant to their needs.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	The organisation has not considered the need to document process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle.	The organisation is aware of the need to document the management of asset related risk across the asset lifecycle. The organisation has plan(s) to formally document all relevant process(es) and procedure(s) or has already commenced this activity.	The organisation is in the process of documenting the identification and assessment of asset related risk across the asset lifecycle but it is incomplete or there are inconsistencies between approaches and a lack of integration.	Identification and assessment of asset related risk across the asset lifecycle is fully documented. The organisation can demonstrate that appropriate documented mechanisms are integrated across life cycle phases and are being consistently applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	The organisation has not considered the need to conduct risk assessments.	The organisation is aware of the need to consider the results of risk assessments and effects of risk control measures to provide input into reviews of resources, training and competency needs. Current input is typically ad-hoc and reactive.	The organisation is in the process ensuring that outputs of risk assessment are included in developing requirements for resources and training. The implementation is incomplete and there are gaps and inconsistencies.	Outputs from risk assessments are consistently and systematically used as inputs to develop resources, training and competency requirements. Examples and evidence is available.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	The organisation has not considered the need to identify its legal, regulatory, statutory and other asset management requirements.	The organisation identifies some its legal, regulatory, statutory and other asset management requirements, but this is done in an ad-hoc manner in the absence of a procedure.	The organisation has procedure(s) to identify its legal, regulatory, statutory and other asset management requirements, but the information is not kept up to date, inadequate or inconsistently managed.	Evidence exists to demonstrate that the organisation's legal, regulatory, statutory and other asset management requirements are identified and kept up to date. Systematic mechanisms for identifying relevant legal and statutory requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

		Company Name	Marlborough Lines Limited
		AMP Planning Period	1 April 2023 - 31 March 2033
		Asset Management Standard Applied	

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	The Network Design Standards manual are controlled documents, where changes must be approved by the Engineering Manager or Operations Manager. Most other processes affecting AM outcomes such as billing, payments, new connections etc are covered by ISO9001 document controls. Components are procured from specified sources only, and these are documented within the Standards. MLL is also accredited with ISO14001, 18001 and NZS7901		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?	2.5	All major maintenance tasks are performed by MLL Contracting after provision of an estimate to Network, which is then accepted dependant on cost. All work performed within the network is performed to the level demanded by the Design and Construction Standards. Asset inspections are performed by experienced individuals and information collected on inspections is controlled through the use of asset inspection templates.		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?	3	Asset condition and performance is firstly monitored by strict adherence to the Network Design and Construction Standards, with tight control of variations from the Standards. Failure of in-service assets is monitored, with serious failures or possible patterns being referred to Engineering for analysis. Regular field inspections are carried out and result trending provide ongoing condition assessment		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?	3	First response for asset failures impacting is to the Control Room who will dispatch staff to isolate and inspect faulted assets. Asset faults and failures are investigated to identify any systematic failures or recurring fault causes that can be corrected. Major incidents are investigated by engineering and management staff to identify point of failure and likely causes to prevent recurrences.		Widely used AM standards require that the organisation establishes implements and maintains process(es) for the handling and investigation of failures incidents and non-conformities for assets and sets down a number of expectations. Specifically this question examines the requirement to define clearly responsibilities and authorities for these activities, and communicate these unambiguously to relevant people including external stakeholders if appropriate.	The organisation's safety and environment management team. The team with overall responsibility for the management of the assets. People who have appointed roles within the asset-related investigation procedure, from those who carry out the investigations to senior management who review the recommendations. Operational controllers responsible for managing the asset base under fault conditions and maintaining services to consumers. Contractors and other third parties as appropriate.	Process(es) and procedure(s) for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances. Documentation of assigned responsibilities and authority to employees. Job Descriptions, Audit reports. Common communication systems i.e. all Job Descriptions on Internet etc.

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	The organisation does not have process(es) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning but currently do not have these in place (note: procedure(s) may exist but they are inconsistent/incomplete).	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning. Gaps and inconsistencies are being addressed.	Effective process(es) and procedure(s) are in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	The organisation does not have process(es)/procedure(s) in place to control or manage the implementation of asset management plan(s) during this life cycle phase.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during this life cycle phase but currently do not have these in place and/or there is no mechanism for confirming they are effective and where needed modifying them.	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process for confirming the process(es)/procedure(s) are effective and if necessary carrying out modifications.	The organisation has in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process, which is itself regularly reviewed to ensure it is effective, for confirming the process(es)/ procedure(s) are effective and if necessary carrying out modifications.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	The organisation has not considered how to monitor the performance and condition of its assets.	The organisation recognises the need for monitoring asset performance but has not developed a coherent approach. Measures are incomplete, predominantly reactive and lagging. There is no linkage to asset management objectives.	The organisation is developing coherent asset performance monitoring linked to asset management objectives. Reactive and proactive measures are in place. Use is being made of leading indicators and analysis. Gaps and inconsistencies remain.	Consistent asset performance monitoring linked to asset management objectives is in place and universally used including reactive and proactive measures. Data quality management and review process are appropriate. Evidence of leading indicators and analysis.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	The organisation has not considered the need to define the appropriate responsibilities and the authorities.	The organisation understands the requirements and is in the process of determining how to define them.	The organisation are in the process of defining the responsibilities and authorities with evidence. Alternatively there are some gaps or inconsistencies in the identified responsibilities/authorities.	The organisation have defined the appropriate responsibilities and authorities and evidence is available to show that these are applied across the business and kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

Company Name	Marlborough Lines Limited
AMP Planning Period	1 April 2023 - 31 March 2033
Asset Management Standard Applied	

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	MLL undergoes a formal audit procedure for all major compliance standards including ISO 9001, ISO 14001, ISO 18001 and NZS 7901 on an annual basis. Reports are provided with areas where potential improvements can be focussed upon.		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?	3	Faults or defects within the network discovered by maintenance or fault staff are reported to the control room if a safety or network integrity issue may arise and reported to Engineering for analysis and correction. Network fault reviews identify sections of the network where issues regularly arise and can be minimized by the installation of protective devices.		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	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?	2.5	Continual improvement is a core element of ISO9001. Risk is continually considered in ongoing engineering design. Network fault reviews occur to identify regular defects which are then remedied where possible. Annual customer surveys are performed with regard to electricity lines charges and quality of supply to ensure customer satisfaction.		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	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	Key staff involved with AM regularly attend industry conferences, courses and trade shows, such as those hosted by the EEA. MLL staff perform visits to other EDBs around the country and AM methods are discussed and reviewed. MLL moved to modern GIS and AM software packages in order to perform AM related activities at an increased level.		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	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. People who monitor the various items that require monitoring for 'change'. People that implement changes to the organisation's policy, strategy, etc. People within an organisation with responsibility for investigating, evaluating, recommending and implementing new tools and techniques, etc.	Research and development projects and records, benchmarking and participation knowledge exchange professional forums. Evidence of correspondence relating to knowledge acquisition. Examples of change implementation and evaluation of new tools, and techniques linked to asset management strategy and objectives.

Company Name	**Marlborough Lines Limited**
AMP Planning Period	**1 April 2023 - 31 March 2033**
Asset Management Standard Applied	

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.