Eastland
Network

2021
Asset Management Plan

31 March 2021

Letter from the Chief Executive

Welcome to our 2021 asset management plan ("**AMP**"). This AMP is a significant revision of our prior plans and is a key milestone in our programme to improve asset management performance. During 2019, we undertook a review of our asset management practices, policy, and strategy, and these were set out in the 2020 AMP Update, published last year. We have used the new asset management policy and strategy to guide the rewrite of this AMP.

The purpose of the rewrite was to better highlight:

- The key issues facing the network;
- Our strategy and plans to manage these issues; and,
- The evidence to support the decisions and judgements.

In this plan, we have included comprehensive asset fleet plans for our major assets, and these more clearly describe the risks associated with these assets. We have also included details of the specific projects and programmes that we are progressing to reduce or mitigate these risks.

We have included more detail on the performance of our network including areas where we have identified performance issues. Importantly, our lifecycle plans include better linkage to the performance issues.

Whilst this plan is the visible output of our planning work, what is not seen is the significant increase in governance and management oversight over our asset management activities. During the past 12 months, we have formed an asset management committee to oversee key planning and network performance matters, and the Board has increased their oversight of the key issues and focus areas in relation to asset management.

This plan, and the greater oversight by the Board, signals an increasing focus on asset management given the emergence of an ageing asset fleet, the accelerating rate of energy transformation due to climate change, and future constraints on step-change growth in the Gisborne region.

There is still much work to do, and we have noted areas where more detail will be provided in our 2022 AMP.

I invite you to read the executive summary to gain insights into how we are approaching the management of the electricity network assets. This may lead you to explore some of the more detailed content included in the main body of the plan.

Lastly, this rewrite has been a significant undertaking for our planning team and the Board and I thank them for their hard work in producing such a high-quality document.

Kind regards

Matt Todd
Chief Executive
Eastland Group Limited

Content

1 Executive summary

1.1 Introduction to Eastland Network and those responsible for asset management

Eastland Network is the electricity lines company that connects customers in Gisborne, Wairoa and the East Coast to the national electricity grid. We own and maintain the substations, poles, wires and underground cabling used by electricity retailers to supply customers with electricity.

Eastland Network is 100% owned by Eastland Group Limited and is an integral part of the Group's operations.

At the governance level, the objectives for Eastland Network are established through its statement of corporate intent (**SCI**). The Board and executive management team are responsible for governing and managing the business to achieve the objectives and performance criteria set out in the SCI.

The asset management strategy set out in Section 7 provides the key linkage to the SCI and Eastland Group's strategy. The General Manager Network is accountable to the Chief Executive and is responsible for the delivery of this AMP. This responsibility encompasses the safe, reliable, profitable, and compliant operation of the electricity network. The Chief Executive carries these accountabilities through to the Board. The Board monitors performance against the SCI and AMP.

Preparation of the AMP is a key accountability of the Asset and Planning Manager who reports to the General Manager Network.

1.2 New approach to communicating on asset management matters

1.2.1 How this plan is structured

This AMP is a new approach to communicating on asset management, where we now focus on highlighting the key issues, direction, and decisions. We have also sought to present greater evidence in support of our direction and judgements. We hope that stakeholders will benefit from a greater focus on key matters.

We have set out this AMP (and this executive summary) in three parts:

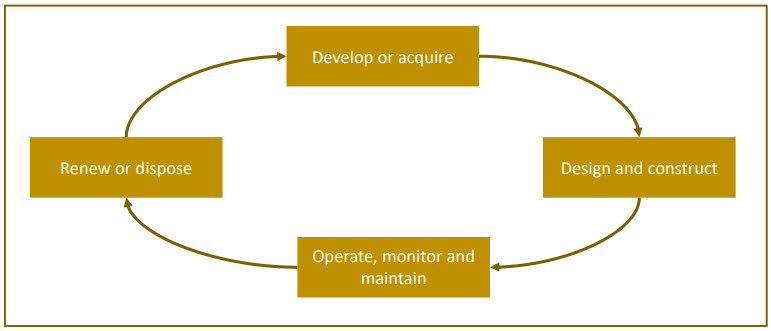
- Factors that are shaping our policy and strategy;
- Our asset management policy and strategy;
- How we are implementing our asset management policy and strategy.

We have set out the AMP in this manner to more clearly inform stakeholders of the material issues we have considered in developing our strategy for managing the network, and to more clearly explain our development and lifecycle plans that we will implement to achieve our strategy.

1.2.2 Our approach to asset lifecycle management

There are different ways in which the lifecycle of an asset can be described. We have presented our interpretation of the key phases of an asset's life in Figure 13 below.

Figure 1: Phases of the asset lifecycle



The four stages of the asset lifecycle are broadly:

- The *develop or acquire* phase covers the creation of an asset through development or acquisition, and includes the identification of the need, evaluating options, undertaking conceptual design work, and preparing the preliminary business case (if this is warranted by the scale of the project);
- The *design and construct* phase covers the detailed design, tendering, the project business case and approval, project management, construction, and commissioning of new assets. The design phase has taken on increasing importance over the last decade as it is the phase where material risks can be engineered out through good design;
- The *operate, monitor and maintain* phase covers the operation of the assets, ongoing inspection and testing, corrective and preventative maintenance, and any emergency response in relation to the assets. This is a key focus of our fleet lifecycle plans.
- The *renew or dispose* phase covers the process of deciding when to renew and/or dispose of assets. Typically, the decision to renew an asset is made in response to asset health, reliability, safety, obsolescence, and economic factors.

References to where each of these stages are covered in this AMP are included in Section 2.6.

1.2.3 Planning period

This plan covers the ten-year period from 1 April 2021 to 31 March 2031 (financial years 2022 to 2031).

1.3 Factors that are shaping our policy and strategy

There are a range of factors that are shaping our asset management policy and strategy. The most important of these are:

- The configuration of our network;
- An ageing asset fleet;
- A low socio-economic customer base;
- The economies of scale benefits from Eastland Group;
- The static long-term trend in reliability;
- An increasing impact of adverse weather events and vegetation outages;
- Catering for step-change industrial growth;
- An increasing pace of energy transformation.
- Developing pricing structures in consultation with our customers

We discuss these factors, and other issues in Sections 3, 4, 6.

1.3.1 The configuration of our network

Due to Eastland Network's low customer density, the network has relatively low levels of subtransmission N-1 security. Only 30% of customers are supplied by zone substations with N-1 security, however, a further 60% of customers are supplied by substations with N-1 generator and N-1 switched security. This means our network is more susceptible to the impacts of outages (i.e. outages are larger than would be the case for more secure networks).

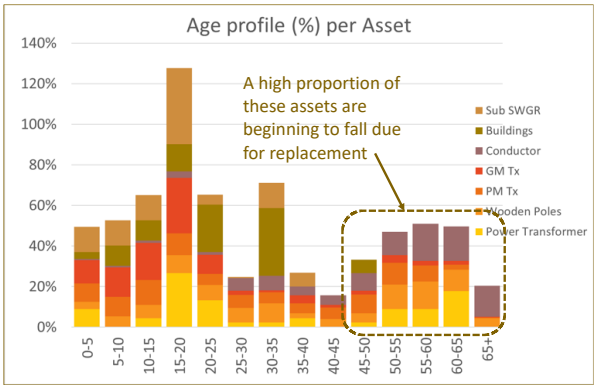
In addition to Gisborne and Wairoa, Eastland Network supplies a remotely populated region of the East Coast of the North Island. As a result, Eastland Network's customer density is amongst the lowest in New Zealand.

1.3.2 The ageing asset fleet

Eastland Network's assets are ageing. That is, large quantities of assets that were installed in the 1960's and 1970's are approaching their end-of-life and are at an increased risk of failure.

The average age of the assets is 40 years, with 19% of these within 10-years of their maximum practical life. The ageing asset fleet is more apparent across wood poles, conductor, zone substation transformers, distribution overhead switchgear, and distribution transformers (refer to Section 11.2). Presently, the ageing asset fleet is not resulting in high failure rates or materially impacting on reliability (refer to Section 6.4). However, managing our ageing asset fleet is an important focus for the business going forward.

Figure 2: Overall network asset age profile



1.3.3 Low socio-economic customer base

Eastland Network supplies one of the lowest socio-economic regions in New Zealand, which means that customers ability to pay high electricity prices is limited. At the same time, Eastland Network's customers face some of the highest retail electricity prices in New Zealand. This means that our asset management work needs to have a strong focus on efficiency to minimise opex and capex to every extent possible, whilst still investing sufficient capital to preserve the long-term sustainability of our operations.

1.3.4 Economies of scope of Eastland Group

Eastland Network and its customers enjoy significant benefits from the economies of scope that have resulted from the growth of Eastland Group. The Group owns and manages a diverse set of subsidiary assets including a port, property assets, geothermal power stations, the regional airport, and other associated asset companies. This creates a significant pool of shared resources at the executive and corporate level. This is detailed further in section 2.4. When compared to our closest neighbours, Eastland Network's customers benefit by between $14 and $32 per annum due to

being part of Eastland Group, and upwards of $100 per annum when compared to similar-sized companies.

1.3.5 The static long-term trend in reliability

Eastland Network's reliability performance has been generally good in the sense that we have performed better than our regulated targets for both SAIDI and SAIFI for the last ten years[1].

However, there is no trend showing an overall improvement in reliability. It is our view that because of our network configuration and susceptibility to high impact / low probability events, it is likely that the network reliability will remain around current levels, unless a significant level of investment (well above the current regulated allowances) is made into network security. This matter is discussed in detail in Section 6.4.

1.3.6 The increasing impact of adverse weather events and vegetation outages

The network is increasingly being impacted by adverse weather and vegetation related outages. These two causes of outages accounted for 22% of SAIDI, and 22% of SAIFI in 2020.

While the underlying level of vegetation outages has remained largely constant, the extent of vegetation outages is increasingly being impacted by adverse weather events. This situation is being exacerbated due to a reliance on generators to support subtransmission security (which means that while vegetation outages are restored quickly using generators, a short outage is recorded which has a negative impact on SAIFI).

A contributing factor to vegetation related outages is the exposure of the network to forestry plantations with around 7% of subtransmission lines and 10% of distribution lines passing through forestry areas.

Compounding the issue is the recent reset of the quality (unplanned outage) limits applicable to the network, reducing our headroom to the regulatory limits.

The combination of these factors has increased the risk of a quality path breach over the coming five years, which is a matter that requires a near-term focus.

1.3.7 The potential for step-change growth in industrial load

The existing 110kV lines supplying Gisborne are currently rated at 55.5MW, with the current peak demand close to 50MW. The current spare capacity is sufficient for organic growth over the medium term; however, the potential exists for new industrial loads to be well in excess of the remaining spare capacity. It is prudent for Eastland Network to be prepared for large scale industrial load growth to ensure it can support regional economic growth. This matter is discussed in detail in Section 10.6.3.

1.3.8 The increasing pace of energy transformation

The pace of energy transformation is increasing as a result of the improving economics of new technology, and in response to climate change. The energy transformation will involve an increase in the installation of small-scale distributed generation (e.g. solar PV and batteries) and an increasing uptake of electric vehicles across the network.

The direction outlined in the Climate Change Commission's draft report is more aggressive than what has been factored into our demand and consumption forecasts included in this AMP, and we will need to review our forecasts in the next iteration of this plan.

[1] The exception is in 2016/17 when a plane collided with both circuits between Tuai and Gisborne. Note: Unplanned 2017 data has excluded this event. Planned SAIDI was impacted due to the necessity to complete final repairs a week after the event.

In this plan, we have outlined our view of what the future could look like, and what the potential impacts and solutions could be. At this stage, we have not included any expenditure associated with the transformation, but we expect this will be included in subsequent iterations of the plan. This matter is discussed in detail in Section 10.9.

1.4 Our asset management policy and strategy

1.4.1 Supporting Eastland Group's strategy and stakeholder interests

To support Eastland Group's strategy, Eastland Network is committed to delivering sustainable returns for its shareholders, providing services that meet customers' needs, and supporting the growth and prosperity of the Tairāwhiti and Wairoa regions.

We set our asset management policy and strategy after considering the wide and varied interests of the many stakeholders. For the most part, our customers agree that the following three aspects of our network performance embody what is important to them:

- Keeping the power on;
- Keeping prices low;
- Increasing communication.

The key stakeholder themes were for Eastland Network to continue to provide a safe, reliable, and cost-effective electricity supply to customers and communities.

1.4.2 Asset management policy

We have revised our asset management policy to reflect the current context for Eastland Network. The policy was approved by the Board on 18th March 2020. It can be found in Section 7.2.

1.4.3 Asset management strategy

Our asset management strategy sets the direction for managing our electricity network assets. It has been developed with attention to addressing the factors that are influencing the business (as described above), addressing the needs of our stakeholders, and complying with our asset management policy.

Our asset management strategy consists of seven initiatives:

Initiative	
1.	Improve network resilience
2.	Enhance vegetation management activities
3.	Enhance asset fleet plans
4.	Increase the level of automation, protection, and distribution back-up
5.	Developing solutions to cater for step-change industrial growth
6.	Improve our asset management practices and asset information
7.	Be prepared to respond to technology change

The asset management strategy can be found in Section 7. The asset management roadmap and lifecycle plans contain programmes and projects that advance each of these initiatives. We have summarised some of the relevant work later in this executive summary.

1.4.4 Service levels

We have established service levels consistent with our asset management strategy, regulatory environment, and expected improvement. In general terms, our service levels cover:

- Safety – where our target is for no serious harm to people and no serious damage to property;
- Customer service – where we are targeting that greater than 80% of customers rate this good to excellent (which requires improvements in relation to pricing and communication);
- Network reliability – where the measures and targets are the same as those determined by the Commerce Commission under our default price-quality path. We have also set targets for vegetation outages, which require a 5% improvement p.a. over the coming five years;
- Asset utilisation and efficiency – complimentary to the network reliability targets, we have included measures in relation to asset performance. These measures are currently based on past performance; however, they should improve over time as a result of our asset management practices.
- Delivery – we experienced some capex delivery issues between 2016 and 2018 and have established targets that seek to lift capex work completion from 85% to 95% over the next three years. We have also set targets for the capture of condition information to support asset health assessments.
- Financial sustainability – we are seeking to achieve our regulated return on capital.

The full details of our service levels are included in Section 8.

1.5 How we are implementing our asset management policy and strategy

We are implementing our asset management policy and strategy through our:

- Asset management roadmap;
- Lifecycle (network development) plans;
- Lifecycle (network maintenance and renewal) plans.

These plans are supported by our risk management and delivery processes.

1.5.1 Asset management roadmap

In our 2020 AMP, we outlined our roadmap for improving our asset management practices. The objective of the roadmap is to transition Eastland Network to a fully proficient asset manager by the end of FY2023. On the AMMAT[2] scale, this equates to an improvement in our score from 2.3 (out of 4) as assessed in our 2020 AMP, to 3.0 by the time we publish our 2023 AMP.

We have made good progress in improving our asset management practices and asset information, including:

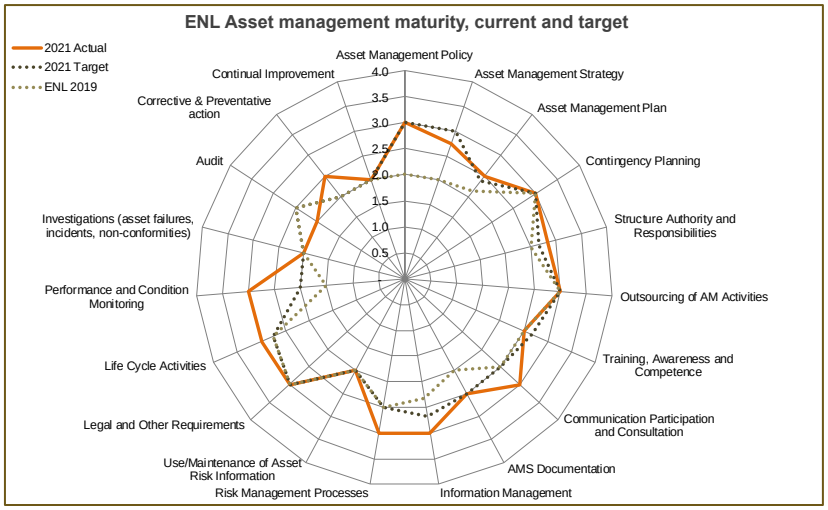
- Developing a well-defined asset management policy and strategy, preparing lifecycle fleet plans for key assets, and capturing quality condition information;
- Completing our core information system upgrades. ERP functionality is now provided by SAP, field mobility for data capture is progressively being delivered through Blueworx, and ESRI is now our geographical information system. Core asset health, age, and attribute information is retained in SAP, and is visible in the other systems;
- The data quality for our asset register, asset age, and asset health information disclosures has improved from 1 to an average above 2 (with an increasing number of key assets at 3)[3];

[2] AMMAT means asset management maturity assessment tool. This assessment is included as Schedule 14 attached to the AMP.

[3] A Data quality score of 1 means "that good quality data is not available for any of the assets in the category and estimates are likely to contain significant error", a data quality score of 3 means "that data is available for all assets but includes a level of estimation where there is understood to be some poor-quality data for some of the assets within the category", and a data quality score of 4 means "that good quality data is available for all of the assets in the category".

- Our AMMAT assessment has improved from 2.3 to 2.7.[4] The key areas of improvement were in asset management policy and strategy, information management, risk management, and performance and condition monitoring. These improvements can be seen in Figure 3.

Figure 3: 2021 AMMAT assessment



1.5.2 Lifecycle (network development) plans

Revisions to demand and consumption forecasts

We have updated our forecasts in relation to electric vehicles to reflect the assumption (around vehicle usage and efficiency) contained within Transpower's Whakamana i te Mauri Hiko report (moderated for our lower socio-economic situation). In all cases, we have assumed that there will be smart control of these devices that will minimise charging at peak times.

This translates into:

- Around 4,500 EVs in the Gisborne region by FY2031 that consume around 10,000 MWh and cause an increase in peak system demand of 1.5MW;
- A little under 500 EVs in the Wairoa region by FY2031 that consume around 900 MWh and cause an increase in peak system demand of 0.16MW;
- EV charging (as a percentage of peak demand) reaching 13% in Gisborne, and 8% in Wairoa in 2040.

Whilst our electric vehicle uptake has increased materially in this AMP, it is well below the level of adoption forecast by the draft Climate Change Commission report (refer section 4.10). We will be reviewing our forecasts during FY2022 and will be considering changes based on the final advice of the Climate Change Commission, and any policy responses proposed by Government.

We have also reviewed the adoption of small-scale distributed generation. Our forecasts were again based on Transpower's Whakamana i te Mauri Hiko report (which is similar to the forecasts included in the draft Climate Change Commission report), moderated for our socio-economic environment and tenant/landlord constraints. Our revised forecasts equate to small scale distributed generation penetration rates of 7.6% and 4.2% in the Gisborne and Wairoa regions by 2031. These are higher than we have previously forecast.

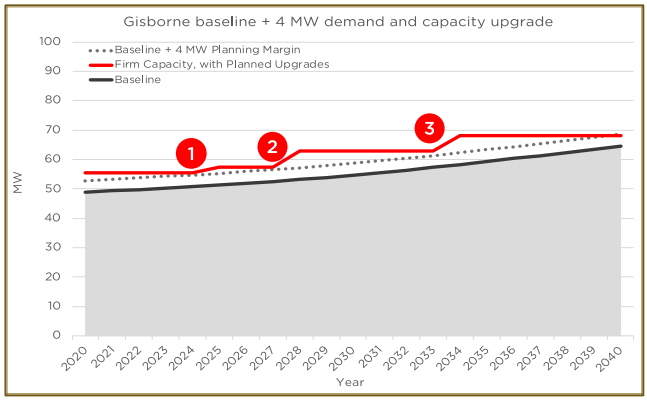
[4] THe assessment scale is from 1.0 to 4.0. An AMMAT score of 3.0 reflects the level of a fully competent asset management and a score of 4.0 reflects a level that surpasses that required in ISO 55000.

Significant development project to increase capacity

The most significant change in this AMP is the inclusion of the project to increase the capacity into the Gisborne region. The project will increase capacity from 55.5 MW to 68 MW, and is the first phase of our work to cater for step-change growth (refer Section 10.6.1) where the timing will respond to actual demand growth (refer Figure 4). The project has a total cost of $12.5m and consists of:

1. A capacity bank upgrade;
2. A thermal upgrade of GIS-TUI 110kV lines to operate at 75ºC;
3. A further capacity bank upgrade.

Figure 4: Gisborne region forecast demand and with planned capacity upgrades



The other significant projects, which are broadly consistent with prior years include:

- A new Gisborne 50/11kV substation to support demand growth and reliability for Kaiti, the Port, and Makaraka substations, all of which supply Gisborne;
- A 33kV line extension and substation to support growth and reliability for Mahia. There are several land and easement risks that could delay this work;
- An 11kV line extension to provide distribution backup to improve reliability to the Puha substation.

These projects total $4.1 million and are planned between FY2022 and FY2027. Refer to Section 10.6.1 for further details.

We have further work under consideration at Tokomaru Bay and Wairoa substations. Our plans for these substations will become clear in subsequent AMPs.

Automation, protection, and distribution back-up work

In addition to the work at Puha substation, we have included a number of smaller projects to improve feeder security by way of capacity upgraders and automation. These projects total $2.0m between FY2022 and FY2031. Refer Section 10.6.2 and 10.7 for further details.

Preparation for technology change and the energy transformation

Eastland Network will have a robust and viable future and will be an integral part of the energy transformation. Distribution businesses will provide the key linkage between customers with small scale distributed generation and energy markets, and they will continue to provide the energy security to those customers who continue to be dependent on grid-supplied electricity. However, over the long-term, we will need to be prepared for an increase in demand, and bi-directional power flows as customers increasingly adopt new technology.

The network will generally be able to cope with the expected electric vehicle and small-scale distributed generation uptake over the next 10 years. There may be some localised capacity upgrades, but these are not expected to be material. Hence, we have time to prepare for the eventual change. In this AMP, we have articulated our initial view of the "future state" model for electricity distribution businesses.

Our model would see Eastland Network operating as a distribution system operator, whereby we would control distributed energy resources for distribution network purposes and coordinate the dispatch of distributed energy resources for bidding into other markets (i.e. peer-to-peer energy market, wholesale energy market, or transmission interruptible load market).

In section 10.9 we have outlined our development pathway, with a number of low-cost, low-regret actions that are already in progress.

We haven't yet fully costed the required work, but it could amount to $3-6+ million over the coming 10-15 years. No allowances have been included in our forecast expenditure in Schedule 11a and 11b, however, we expect costs to be included in our 2023 or 2024 AMP.

1.5.3 Lifecycle (network maintenance and renewal) plans

Introduction of asset fleet plans using the DNO methodology

In this AMP, we have introduced a new asset fleet planning approach and defined fleet strategies based on the outcomes from the asset health model, and our overall asset management policy and strategies.

Historically, we forecast asset renewals based on age data and selected specific renewal projects based on an engineering assessment of the available condition and test data. We are now transitioning our asset renewal forecasting to an asset health-based approach that utilises both asset condition data and the DNO common network asset indices methodology. The DNO common network asset indices methodology is a framework of definitions, principles and calculation methodologies, for the assessment, and forecasting of asset health and asset risk. This methodology has been adopted by all distribution network operators across Great Britain.

For this AMP, we have focused on the following key asset fleets: structures (wooden and concrete); structures (steel); conductor/lines; power transformers; substation switchgear; ground mounted transformers; and ground mounted switchgear. These assets represent 92% of the total value of the network (in RAB terms).

The change in methodology has not materially altered our renewal forecasts (at this stage). This is because the new methodology requires us to collect observed and measured condition data. We have re-written our inspection standards to capture the necessary information, but we do not yet have a sufficiently complete dataset (hence it is premature to amend our forecasts). We have increased our inspection budget by $165k p.a. over the next three years to ensure we have a complete dataset.

We have established a 10-year fleet strategy for all key assets. These respond to the current health, risks, performance and criticality of the fleet, and typically focus on:

- Capturing condition information using the new DNO methodology by 2024 or earlier;
- Assessing the asset health based on condition information using the DNO methodology by 2025 or earlier;
- Ensuring that there are no H1 assets present over the forecast period, and that H2 assets are replaced before they deteriorate to H1;

- Identifying all priority areas (i.e. feeders or sections of feeders) using criticality, reliability, and asset health information, and ensuring that specified projects are identified for these areas.

Within our fleet plan, we have identified a number of specific risk issues that are being addressed. These include:

- Developing a strategy to deal with the ageing privately owned wood pole fleet;
- Undertaking a detailed risk assessment of the 110kV lines (including steel, concrete and wood structures) and remediating any high-risk areas;
- Regular maintenance programs on tap-changers and increasing our spares to minimise the impact of tap-changer failures on IMP power transformers (which are 32% of our fleet);
- Replacing all oil-filled zone substation switchgear with vacuum or SF6 type, and replacing all pole mount substation switchgear;
- Replacing ring-main switchgear that may have latent defect issues.

Improving vegetation management activities

Reducing vegetation related outages is a key strategy for the business. In response to the high number of vegetation related outages we have developed a vegetation management plan which outlines our issues, strategy and targets for the next three years (refer to Section 11.21).

Based on our analysis of recent reliability performance, and to achieve the level of improvement targeted, a six-point vegetation management strategy has been developed:

1. Resolve the performance of the worst performing feeders
2. Target inspection and remediation work in high priority areas, including widening the inspection to consider tree-fall hazards on critical sections of feeders.
3. Undertake intensive subtransmission vegetation management.
4. Engage with forestry owners to achieve acceptable plantation fall zone clearances and harvesting clearances.
5. Detect vegetation hazards early through SCADA monitoring of earth fault pick-up (pre-trip).
6. Improve vegetation maintenance of existing line corridors.

Our analysis also indicates that additional expenditure is required in the Wairoa region as two of the top three worst performing feeders for vegetation are in the Wairoa region.

In addition, we have created a feeder prioritisation schedule and three action plans (inspection, remediation and worst performing feeder plan) which support the strategy we have adopted. These plans are the operational link to the strategy and provide guidance to the newly appointed vegetation manager in issuing tasks and work orders for the next few years.

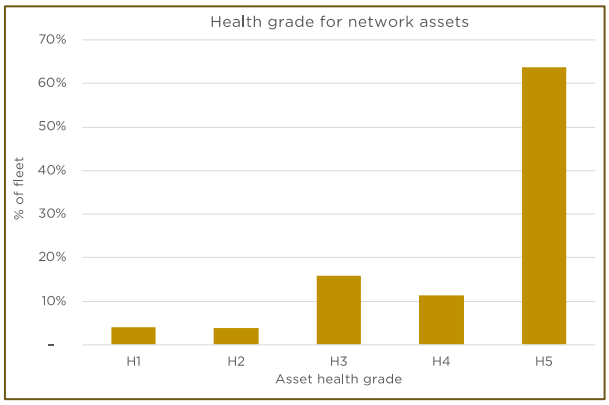
We are targeting a reduction in vegetation related outages by 5% each year for the next 5 years.

Overall asset health

Figure 5 provides a view of the network asset health. This includes 4% of assets at H1 (replacement recommended) and 4% at H2 (end-of-life drivers for replacement present). This is consistent with the 7% of assets that are forecast to be replaced over the next five years. The number of H1 and H2 assets has reduced materially from our 2020 AMP due to the reassessment of the health of wooden poles under the DNO methodology; however, we expect that wooden pole health will change as we capture more information on condition under the new methodology over the next three years.

The key drivers of the H1 and H2 assets are wooden poles, distribution pole mount switches and fuses, and pole mount transformers. The forecast wooden pole renewals are well ahead of the current view of wooden pole condition. The forecast renewals for distribution pole mount switches and fuses, and pole mount transformers reflect a run-to-fail approach based on historical failure rates. The fleet plans in Section 11.2 provide details on the health and forecast renewals for each key asset class.

Figure 5: Overall network asset health



1.5.4 Risk management

Risk oversight

At Eastland Network, risk management activities occur at an operational level, management level, and at a governance level:

- The Board defines Eastland Network's risk appetite and oversees the management of strategic and significant operational risks;
- Management identifies and manages strategic risks and oversees operational risks and associated risk management activities;
- Operational personnel identify and manage risks as part of normal asset management activities.

Risks are considered at two levels:

- Strategic risks – these are risks that could have a significant impact on Eastland Group's strategic purpose and direction;
- Operational risks – these are risks inherent in the routine operation of the business.

Strategic risks

There are six strategic risks associated with Eastland Network. These are summarised in Table 1 below:

Table 1: Strategic network risks

Risk title	Current controls
Climate change	We have implemented controls to manage climate risk, however, further treatments are likely to be introduced over the coming few years.
Death or injury resulting from activities under Eastland's control	Significant controls are in place through our safety systems and management of safety culture.
Vehicle accident injuries	Policy and training are in place.
Significant power outages	Our asset management activities and contingency plans are the key controls.

Risk title	Current controls
Significant reduction in electricity demand	Network revenue is protected through the revenue control regime of the default price path
Energy transformation	Work has commenced to enable the business to support the energy transformation, which has significant upside potential.

Operational risks

The asset fleet plan included in this AMP contains details of the general and specific operational risks associated with each asset class. The fleet plans also contain details on our programmes to manage or mitigate these risks. Overall, all high-risk issues identified have programmes in place to reduce the risk. Refer to the asset fleet plans in Section 11.2 for details.

Refer to Section 12 for additional details on our risk management activities and our key strategic and operational risks.

1.5.5 Deliverability

Over the past five years we have delivered 77% of our network capex budget and 85% of our opex budget, with most of the variance occurring between FY2016 and FY2018. The primary reason for the poor capex delivery was due to changes in our management of the 110kV lines acquired from Transpower at the end of FY2015, and delays in delivery of some major materials.

In relation to opex, the primary reason for poor delivery was resource constraints. However, pleasingly we have generally delivered on our vegetation management spend, and recent years have seen a modest over-spend.

Eastland has historically had problems with recruiting staff and local contractors to complete planned work. This is being addressed by an Eastland Group business plan including training and increasing our staff numbers. Five additional positions have been identified as part of the delivery improvement strategy.

The network capex forecast for the next five years averages $10.3 million, which is consistent with the amount of work we delivered in 2019. The makeup of the capex programme for the next 5 years is also similar to prior years, except for the increase in system growth associated with the GIS-TUI-A thermal upgrade work and the increase in zone substation work. These work components will be sourced externally (in the case of the line upgrade) or contain large materials components (in the case of zone substation work).

A detailed discussion on delivery and deliverability can be found in Section 13.

1.6 Changes in our forecast expenditure

As part of this AMP we have reviewed our asset fleet plans, network development plans, and changed our approach to asset health determination which has driven some changes in expenditure forecasts. A detailed explanation of the changes in expenditure can be found in Section 14.

Our commentary below references nominal dollars to make it easier to compare to prior AMPs.

1.6.1 Opex forecasts

Total network opex and non-network opex[5] for the forecast period is $54.7 million, and $72.1 million respectively. In total, opex is forecast to be $6.7 million lower than the 2020 AMP.

The comparison in expenditure is shown in Figure 116 and Figure 117.

The key changes from the 2020 AMP are:

- Asset replacement and renewal opex has reduced by $6.7 million, primarily due to a reduction in ACOD associated with the diesel gensets;
- Routine and corrective maintenance and inspection costs increased by $0.6 million in relation to additional inspections and maintenance associated with the diesel gensets;
- Service interruption and emergency opex has increased by $1.6 million, as it now includes operating costs (i.e. diesel) associated with the gensets;
- System operations and network support costs have increased by $2.8 million, which reflects the increase in personnel costs associated with implementing the asset management roadmap;
- Business support costs have reduced by $0.4 million due to the increasing economies of scope across Eastland Group.

Figure 6: Network opex

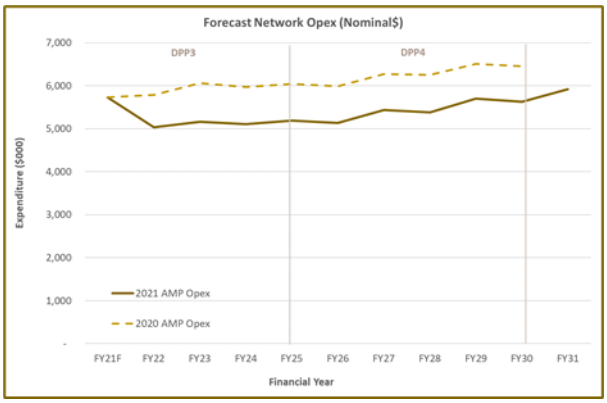
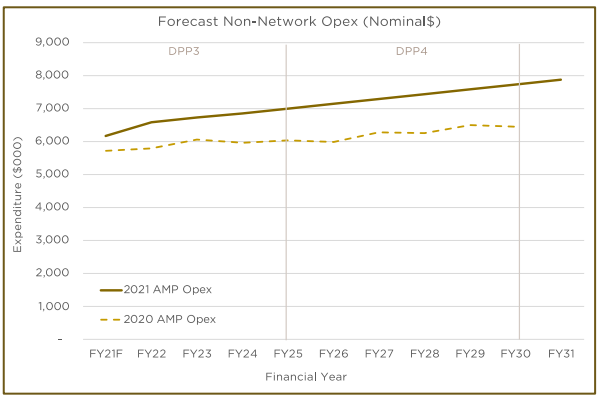


Figure 7: Non-network opex



1.6.2 Capex forecasts

Total capital expenditure for the forecast period is $112.2 million, which is $12.0 million higher than in the 2020 AMP.

The key driver for the increase in overall expenditure during the second half of the forecast period is in relation to the thermal upgrade on the GIS-TUI-A line.

Other more minor changes in capex included:

- A reduction in asset replacement and renewal capex due to the transfer of some expenditure in relation to the thermal upgrade on the GIS-TUI-A line (which was previously classified as renewal);
- An increase in reliability, safety and environment capex in FY2025 through FY2028 due to investment in a network outage manager and renewal of substation switchgear which has proven unreliable.
- Higher non-network capex in relation to provisions for building work and vehicle replacements.

[5] Non-network opex is system operations and network support, and business support costs

Figure 8: Capital Expenditure

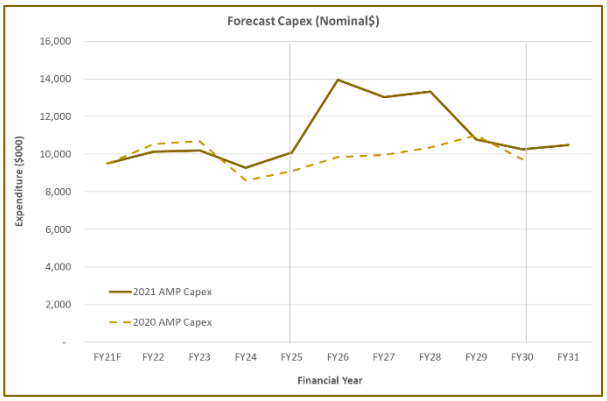
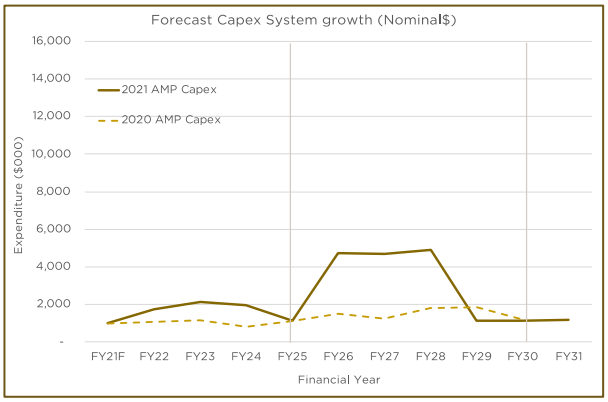


Figure 9: Capex – system growth



1.6.3 Stakeholder Feedback

At Eastland Network, we are striving to better our asset management activities and are on a continual improvement path. We therefore ask that any feedback, comments or suggestions in relation to this AMP be directed to our asset and planning manager, Mikaere Ngarimu - mikaere.ngarimu@eastland.nz. All other information can be found on our website at www.eastland.nz.

Part 1:

Factors that are shaping our asset management policy, strategy, and service levels

2 Introduction and background

This section provides an overview of Eastland Network, including ownership, governance, our customers, and stakeholders. This section sets the context that our asset management activities need to consider when setting our asset management strategy, policy, and service levels.

2.1 Introduction

2.1.1 Purpose of this AMP

During 2019, we commenced a review of our asset management performance and practices and completed a review of our asset management policy and strategy, which were set out in our 2020 AMP Update, published last year. We have used our new asset management policy and strategy to guide the revision that can be seen in this full AMP.

The purpose of this AMP is to communicate with our stakeholders by:

- Presenting the operating context and performance drivers for the network;
- Presenting our asset management policy and strategy, highlighting how this supports Eastland Group's corporate strategy and responds to the operating context for the business;
- Describing how the network is performing and how we are addressing any performance challenges;
- Outlining our roadmap for improvements to our asset management practices and information;
- Presenting our quality and other performance targets;
- Outlining our plans for how we intend to develop the network to meet our asset management strategy, and the needs of our customers;
- Describing our lifecycle asset management (maintenance and renewal) plans that will ensure that the network can continue to meet its quality and other performance targets;
- Providing details of our forecast expenditure on the network and related assets.

2.1.2 How this AMP is set out

This AMP presents a new approach to communicating on asset management, where we now focus on highlighting the key issues, direction, and decisions. We have also sought to present greater evidence in support of our direction and judgements. We hope that stakeholders will benefit from a greater focus on key matters.

We have set out this AMP in three parts:

- Part 1: Factors that are shaping our policy and strategy;
- Part 2: Our asset management policy and strategy;
- Part 3: How we are implementing our asset management policy and strategy.

We have set out the AMP in this manner to more clearly inform stakeholders of the material issues we considered when developing our strategy for managing the network, and to more clearly explain the development and lifecycle plans that we will implement to achieve this strategy.

2.1.3 Period covered by this plan

This plan covers a ten-year period from 1 April 2021 to 31 March 2031 (financial years 2022 to 2031 – the planning period). As with any long-term plan, the details tend to be more accurate in the earlier years as it is easier to predict the near-term state of our assets and required actions, plans and expenditure.

2.1.4 Approval of this plan

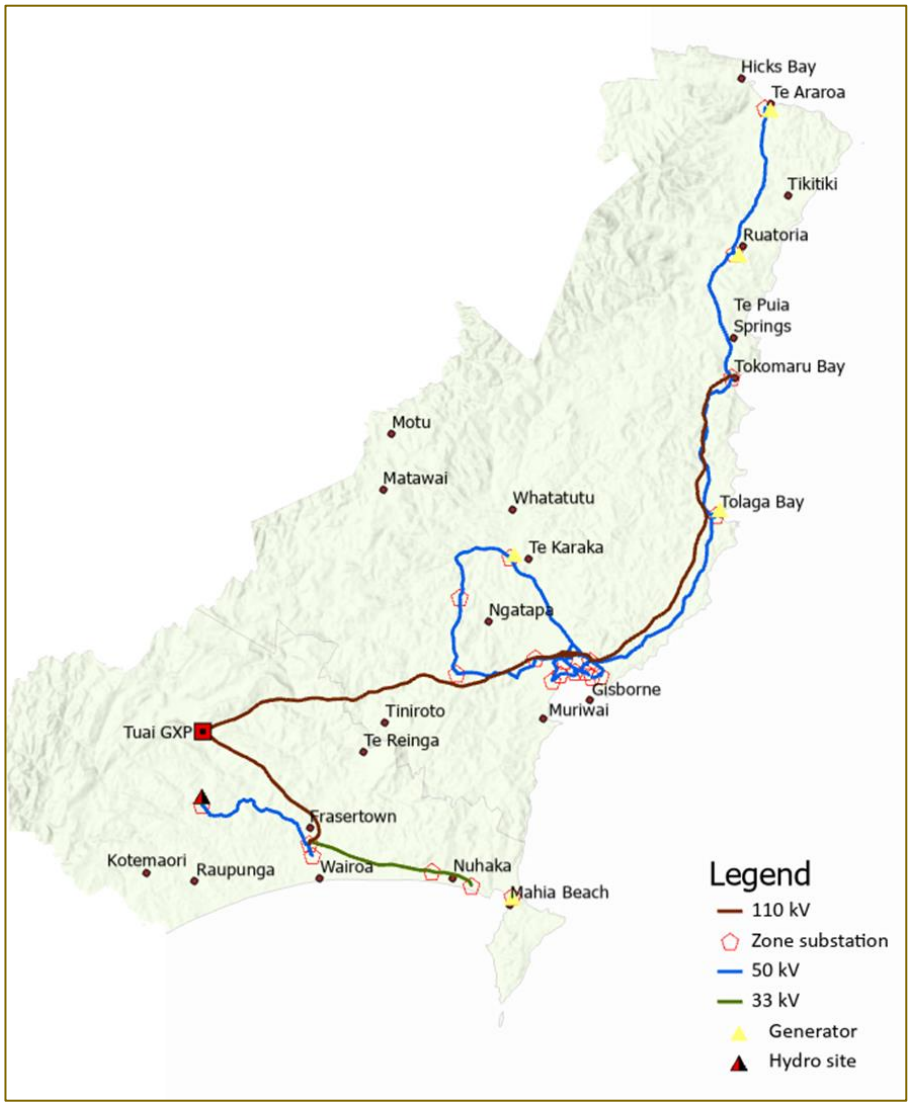
This Asset Management Plan was approved by the Eastland Network's Directors on 24 March 2021.

2.2 About Eastland Network

Eastland Network is the electricity lines company for Gisborne, Wairoa and the East Coast. We own and maintain the poles, wires, and underground cabling used by electricity retailers to supply customers with electricity.

Since 31 March 2015, we've also owned the region's high voltage electricity transmission network which comprises 110kV steel towers and poles. These assets now form part of our subtransmission system and connect our region to the national grid.

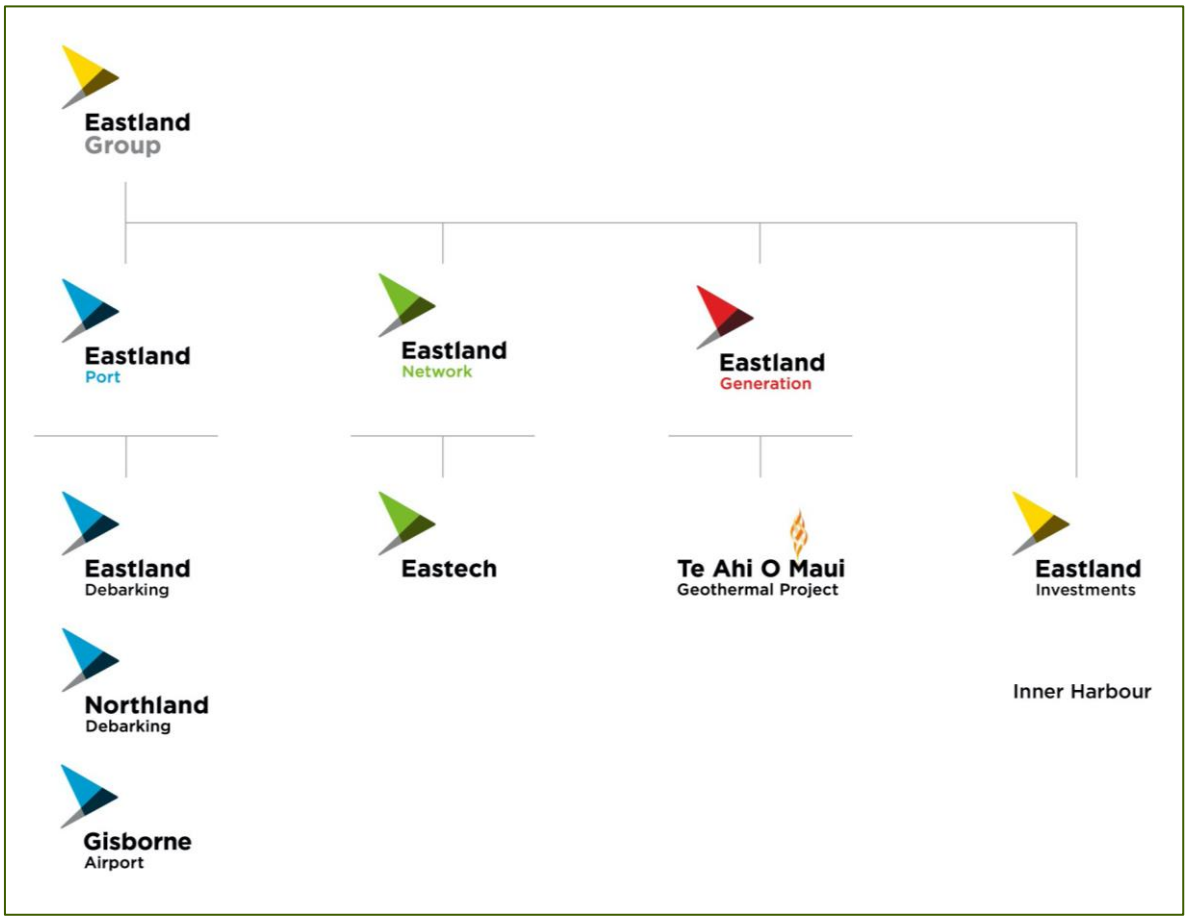
Figure 10: Eastland Network's region



2.3 Ownership and governance

Eastland Network is 100% owned by Eastland Group Limited and is an integral part of the Group's operations. Presently, Eastland Network represents around 27% of the Group's total assets, and around 33% of its total revenue.

Figure 11: Eastland Group Structure



Eastland Network and Eastland Group share the same Board. Governance of Eastland Group is provided by a Board of Directors appointed by the Eastland Consumer Trust.

2.4 Organisational structure

Eastland Group operates a shared services model for each of its subsidiary businesses. This provides capacity and capability within each of the subsidiaries that may not otherwise be available to stand-alone businesses. The shared services include accounting, human resource, information technology, and business development functions. The model also extends to financing and treasury functions which are managed and allocated from a Group perspective.

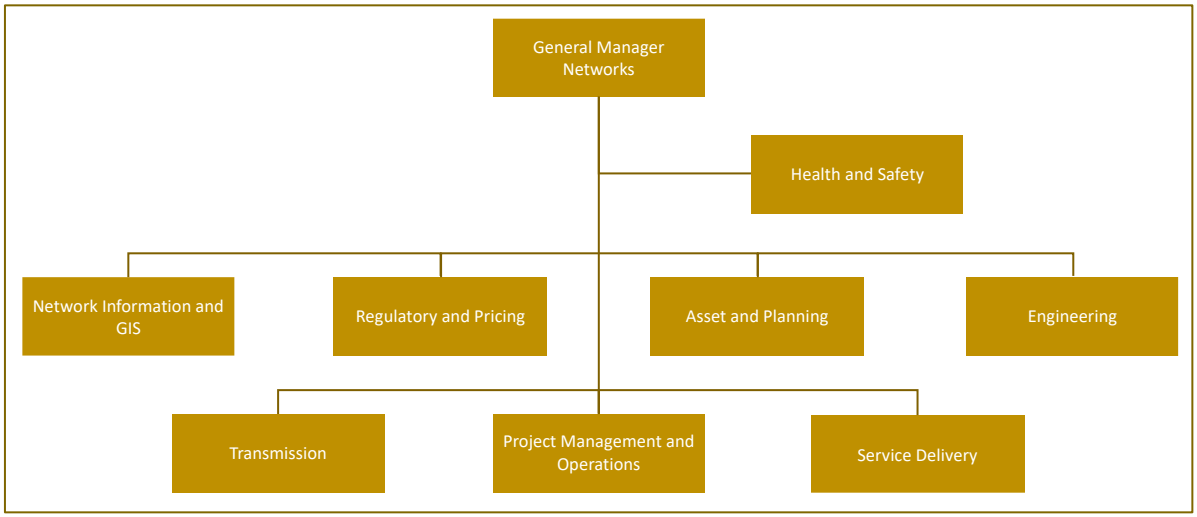
Eastland Group also provides the overarching policies and procedures to which its subsidiary businesses are subject to, however, specific asset management plans, policies, and procedures are the responsibility of each individual subsidiary.

The advantage of this model is that Eastland Network (and its customers) benefit from Eastland Group's economies of scope and scale.

Eastland Network's organisational structure comprises network planning, regulatory, and operational management roles needed to operate a distribution network.

During FY2020, we undertook an assessment of our capabilities, position descriptions, and planned work (which included SAP implementation and the asset management improvement roadmap) which resulted in a restructure of the business. The new structure was established in April 2020 and was progressively implemented during FY2021. We are currently in the process of advertising for five additional roles. These positions cover areas where we have added additional work as part of our strategy and also cover some historical deficiencies in our organisational structure.

Figure 12: Eastland Network's organisational structure



Built on a foundation of providing a service that is economically viable, Eastland Network strives to provide in-house engineering, planning and operational management functions. As part of the service delivery arm, Eastech provides and manages the fault response activities which are part of the network's day-to-day operations.

In terms of field services, Eastland Network engages external contractors to provide the additional resources and capabilities not held within the network's team. These activities include:

- Vegetation maintenance;
- Asset maintenance, capital replacements, and renewals;
- Technical services;
- Asset inspections and testing;
- Additional fault response resources;
- Supply of goods and materials;
- Communications installation and maintenance
- Mechanical maintenance;
- Civil construction and transportation.

External contractors undertake almost all condition monitoring, installation and maintenance work on the network assets.

Eastland Network also outsources its call centre function to 'Your Call' who operate a 24/7 service, logging and dispatching fault calls for the district.

2.5 Accountability for asset management

At the governance level, Eastland Network's objectives, performance targets are established through its Statement of Corporate Intent (SCI). This document includes the objectives for the

business, and performance targets covering safety, network quality and financial outcomes. The SCI enables the proper oversight of Eastland Network by its owners.

The Board and executive management team are responsible for governing and managing the business to achieve the objectives and performance targets set out in the SCI. Performance against SCI targets is reported regularly to the Shareholder.

Eastland Network's responsibilities, objectives, and performance targets are described in the SCI, Eastland Network's Business Plan, the AMP, the asset management improvement roadmap, and budgets. There is an increasing level of detail across these documents (for example; the SCI includes high-level objectives and targets, and the AMP and roadmap have very specific objectives and targets for asset management). These documents are approved by the Board, and the SCI is also approved by the shareholder. The Board monitors the performance against these plans, which typically occurs monthly. In addition, major projects and initiatives with a budget greater than $500k, require approval by the Board.

The General Manager Network is accountable to the Chief Executive and is responsible for the delivery of the Eastland Network Business Plan, AMP, roadmap, and budget. Their responsibility encompasses the safe, reliable, profitable and compliant operation of the electricity network, and is defined principally through the General Manager Network's employment contract and performance measures. The General Manager Network is responsible for achieving compliance with all corporate policies and procedures including: planning/reporting, human resource management, health & safety management, environmental management, contract tendering, contract management, regulatory disclosure management and financial/budgetary management. The Chief Executive carries these accountabilities through to the Board.

Preparation of the AMP is a key accountability of the Asset and Planning Manager who reports to the General Manager Network. The asset management team is responsible for the collection and processing of the field inspection data, gathering information for the asset management plan, strategic planning of current and future projects, as well as financial forecasts for the planning period. The team is also responsible for communicating future network plans to stakeholders.

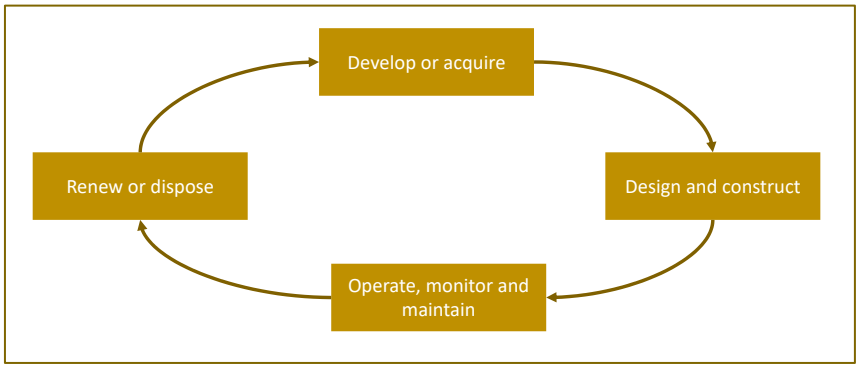
Responsibility for the delivery of the projects and field work is shared across a number of roles. The Transmission Manager is responsible for all activities relating to the 110kV assets. The Works Manager is responsible for managing external field work activities and processing and organising the new connection applications for the network. The Service Delivery Manager is responsible for managing Eastech, who provide fault and emergency management services, as well as defect repairs and various operational tasks.

The Network Information and GIS Manager is responsible for managing the GIS and associated network information. Their team covers all information requests such as cable location information, and is responsible for; processing service requests and adding/altering network GIS information in response to asset replacement work, and ensuring that all information regarding customer liaison and property information is stored and managed correctly.

2.6 Overview of Eastland Network's approach to asset lifecycle management

There are different ways in which the life cycle of an asset can be described. We have presented our interpretation of the key phases of an asset's life in Figure 13 below. At Eastland Network we are focused on the four key phases as shown. Some asset management practitioners include planning as the first phase, however, at Eastland Network we view planning as an overarching requirement for the entire lifecycle, and not a specific phase (while noting that most planning occurs early in the lifecycle).

Figure 13: Phases of the asset lifecycle



The four stages of the asset lifecycle and where they are addressed in our asset management processes, and AMP, are described below.

2.6.1 Develop or acquire

The *develop or acquire* phase covers the creation of an asset through development or acquisition, and includes the identification of the need, evaluating options, undertaking conceptual design work, and preparing the preliminary business case (if this is warranted by the scale of the project). The key purpose of this phase is to ensure the network is developed in an economically sustainable way, in response to the needs of the business, and in a timely manner.

Typically, new assets are developed or acquired in response to:

- Network growth and security (refer section 10.4);
- Network reliability enhancements (refer section 10.7);
- New customer connections and relocations of existing assets (refer section 10.5);
- Future network needs (refer section 10.9).

2.6.2 Design and construct

The *design and construct* phase covers detailed design, tendering, project business case and approval, project management, construction, and commissioning of new assets. The design and construct phase occurs in response to development needs (mentioned above), or renewal needs (mentioned below). The design phase has taken on increasing importance over the last decade as it is the phase where material risks (in relation to safety, reliability, longevity, serviceability) can be engineered out through good design and selection of materials.

The key purpose of this phase is to create an asset that is economically efficient (over its lifecycle), has appropriate inherent risks, is delivered at the appropriate time, and meets the original business need.

How this phase is carried out for our assets is discussed in Section 13.

2.6.3 Operate, monitor and maintain

The *operate, monitor and maintain* phase covers the operation of the assets, ongoing inspection and testing, corrective and preventative maintenance, and any emergency response in relation to the assets. The key purpose of this phase is to ensure the safe and reliable performance of our assets over their expected lives. This is discussed in detail in Section 11.

2.6.4 Renew or dispose

The *renew or dispose* phase covers the process to decide when to renew and/or dispose of assets. Typically, the decision to renew an asset is made in response to:

- Declining asset health (or increasing age in some cases). Assets are forecast for replacement when their asset health indicator reaches (or is forecast to reach) H1 or H2. The actual replacement of the assets is subject to a detailed assessment of the asset condition and criticality;
- Deteriorating reliability performance;
- Safety and integrity concerns;
- Technical or operational obsolescence;
- The economics of ongoing maintenance (compared to replacing with a modern equivalent asset);

How this is undertaken for our asset fleet is addressed in section 11.

In addition to the above-mentioned criteria, disposal of the asset happens when the asset is removed from service and cannot be redeployed or otherwise reused (which could be a result of the criteria mentioned above).

2.7 Asset management systems, processes and information

We have covered these matters in the asset management roadmap section of this AMP. Refer to Section 9.

2.8 Key plans and interactions

The key plans and interactions are shown in Figure 14, and explained below:

Eastland Group strategy: This document provides the overall guidance on the objectives for the subsidiary companies. It also provides the targets and direction the Group is looking to progress and is the overarching document driving the allocation of capital across the Group, including major acquisitions and divestments.

Statement of corporate intent: This document defines the objectives for Eastland Network and establishes the performance targets covering safety, network quality and financial outcomes. The SCI enables the proper oversight of Eastland Network by its owners. This document covers the next three financial years and is agreed with the owners.

Eastland Network business plan: This is the annual network business plan which defines the key initiatives supporting the achievement of performance targets. Because the AMP is a tactical plan and a repository for detailed asset information, these documents are closely coordinated during the business planning cycle.

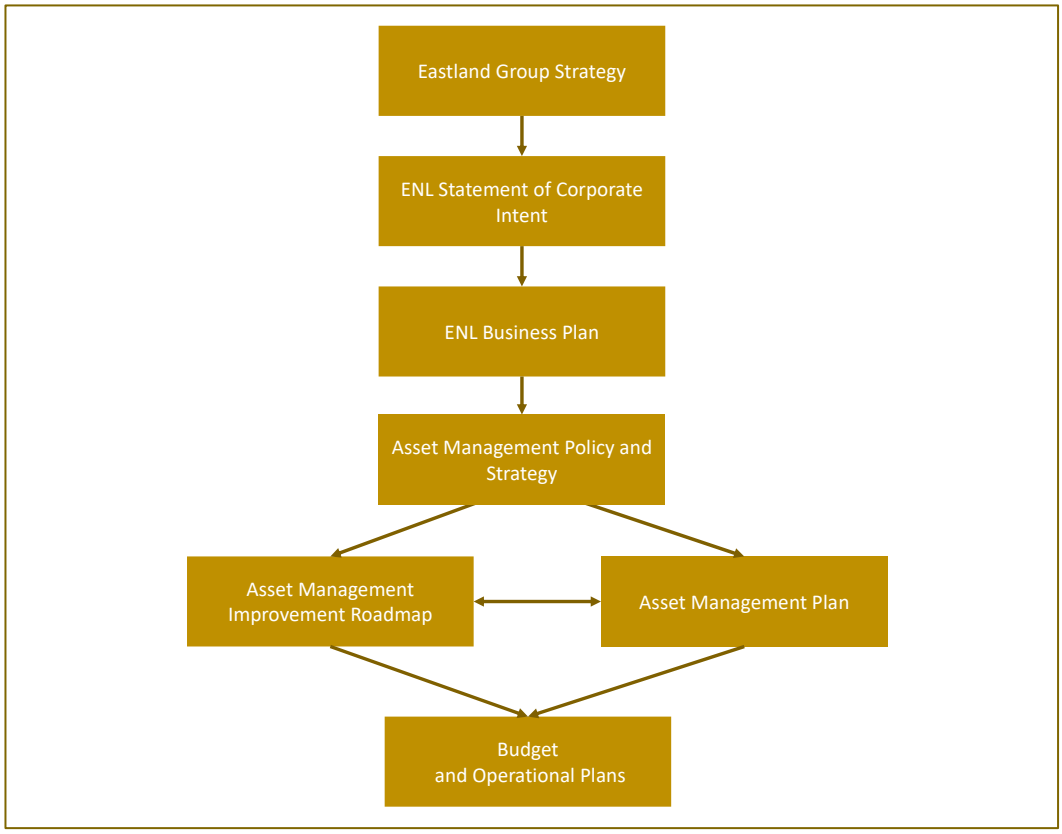
Asset management policy and strategy: These documents are aligned to the group's policy and strategy and describe Eastland Network's commitment to asset management, and the strategies it plans to follow. They also provide the guidelines and principles that shape the asset management plan. In addition, the strategy provides the foundation and drivers of the tasks created within the roadmap. The asset management policy and strategy are included in this AMP and are communicated to the business and stakeholders in various forums.

Asset management improvement roadmap: The roadmap was created in response to the need to improve Eastland Network's asset management maturity. It sets out a pathway for improving all areas of our asset management practices.

Asset management plan: The AMP is a tactical plan that sets out how Eastland Network will manage its network assets to deliver an agreed standard of services in line with its asset management policy and strategy.

Budget and operational plans: The budgets and operational plans guide the deployment of operational resources to undertake work on the assets and the business. These budgets and plans are aligned to the AMP (or the Eastland Network business plan for areas outside of the scope of the AMP).

Figure 14: Key Plans



2.9 Significant assumptions

Forecasting the future requires making assumptions and inherent in this is uncertainty. Considering recent events in relation to COVID-19, the following assumptions have been summarised below:

Table 2: Significant assumptions

Assumption	Basis	Uncertainty
Inflation	Inflation has been assumed at 2.0% which is the standard Eastland Group CPI assumption.	Due to the COVID-19 impact on the global and national economy, and the impact of government stimulus, the actual CPI could be different.
Connection, demand, and consumption growth	Controls development plans and timing for the region.	There is minimal uncertainty in relation to residential and commercial growth as land area for development is well known with good lead-times. However, there is significant uncertainty in relation to industrial growth. We are aware of the potential for large new industrial demand and hence this plan includes options for this eventuality (but

Assumption	Basis	Uncertainty
		expenditure in relation to this work is not included in the forecasts).
Climate change will increase the demand for electricity	Electrification of industry process heat and transport due to zero carbon emissions target and government incentives. Emissions targets are mandated by the Climate Change Response (Zero carbon) Amendment Act 2019 and these targets may change over time.	We have assumed that we will experience consumption and demand growth in response to climate change. This will principally be in relation to an increase in the uptake of EVs. There will also be growth in industrial consumption and demand due to the electrification of process heat. The rate of electricity demand and consumption growth may be greater or less than we currently predict.
Resource availability	We have assumed that resources will not constrain our ability to complete planned work.	There is the risk that resources will be pulled out of the Gisborne region to higher paying areas. This could lead to us not being able to complete our work as planned.
Availability of materials and equipment	We have assumed that materials and equipment will not constrain our ability to complete planned work.	COVID-19 has caused disruptions and delays in global supply chains. If these disruptions continue, materials and equipment may not be available in NZ, which could lead to delays in planned work.
Uptake of solar PV and batteries	We have assumed that the economics of PVs and batteries will improve and their penetration on the network will increase. PV installations can impact the low voltage network (by overloading transformers, LV circuits or creating voltage instability).	We have based our forecasts on Transpower's model, scaled for socio-economic conditions in Eastland Network's region. Uptake of solar PV and batteries could be faster than we predict which may increase the need for low voltage network reinforcement and controls.
Uptake of EVs	We have assumed that the economics of EVs will improve and their penetration on the network will increase. EVs directly impact the low voltage network (by overloading transformers and LV circuits).	We have based our forecasts on Transpower model, scaled for socio-economic conditions in Eastland Network's region. Uptake of EVs could be faster than we predict which may increase the need for low voltage network reinforcement and localised demand management.
Regulatory framework	DPP3 regulatory framework came into effect on 1st April 2020 for 5 years and we have assumed a continuation of the current regulatory settings.	The input methodologies are due for review in 2021. This could result in changes to DPP4 which may change the incentives for investment and/or quality targets. Our future plans may change as a result.

3 The network assets

This section provides an overview of the characteristics and configuration of the network, which shape our asset management policy and strategy.

3.1 Distribution area

Eastland Network's distribution area broadly encompasses the East Cape and Northern Hawkes Bay of New Zealand, covering a combined land area of 11,952Km^2. To supply its customers, Eastland Network owns and operates an electricity network which includes subtransmission assets (110kV, 50kV & 33kV), distribution assets (11kV), and reticulation assets (400V/230V).

Our supply area is separated into two geographical areas and corresponds to the jurisdictions of the Gisborne and Wairoa District Councils.

3.2 Overarching network characteristics

Gisborne is the only significant load centre within the network, where over 50% of customers are located. Because of the disbursed nature of nearly half of our customers, most of the network consists of overhead lines. The high proportion (90%) of overhead lines increases the exposure to outages caused by adverse weather events and vegetation.

Due to Eastland Network's low customer density, the network has relatively low levels of subtransmission N-1 security.

In addition to Gisborne and Wairoa, Eastland Network supplies a remotely populated region of the East Coast of the North Island. As a result, Eastland Network's customer density is among the lowest in New Zealand (refer to Figure 15). Low density networks typically require a higher level of assets per customer than would be the case for higher density networks (refer to Figure 18).

All of Eastland Network's 11kV distribution feeders are configured radially. As is often the case for a long rural network, reclosers and sectionalisers are installed to minimize the impact of outages. Presently, Eastland has not adopted the use of reclosers and sectionalisers to the same extent as other rural networks.

Not unlike most distribution businesses in New Zealand, Eastland Network's assets are aging. A large number of assets that were installed in the 1960s and 1970s are approaching their end of life and are at an increased risk of failure due to end-of-life issues. For Eastland Network, the ageing asset fleet is more apparent across wood poles, conductor, zone substation transformers, distribution overhead switchgear (fuses, links and ABS's), and distribution transformers (refer to Section 11.2). Presently, the ageing asset fleet is not resulting in high failure rates or materially impacting reliability (refer to Section 6.4). However, managing our ageing asset fleet is an important focus for the business going forward.

Figure 15: Customer density industry ranking (Source: 2020 IDs)

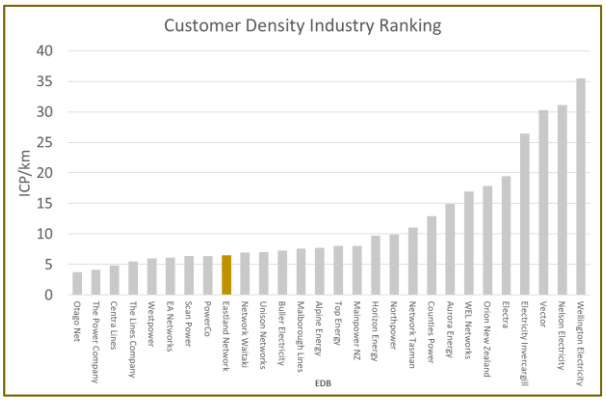


Figure 16: Distribution of Eastland Network's customers (Source: 2020 IDs)

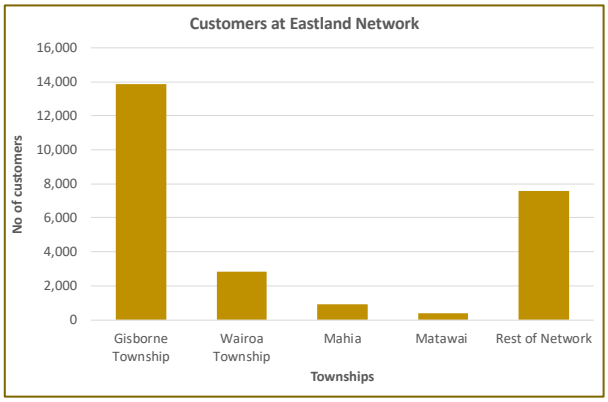


Figure 17: Overhead lines industry ranking (Source: 2020 IDs)

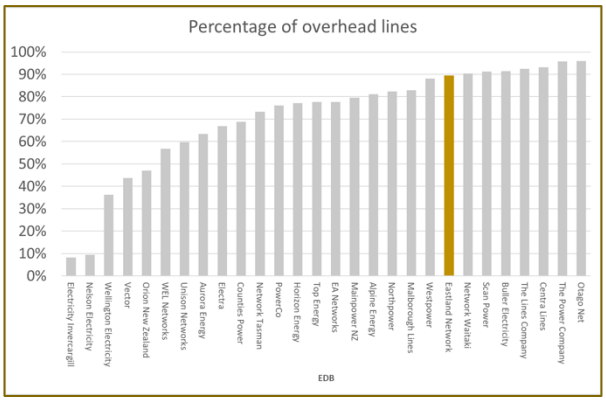
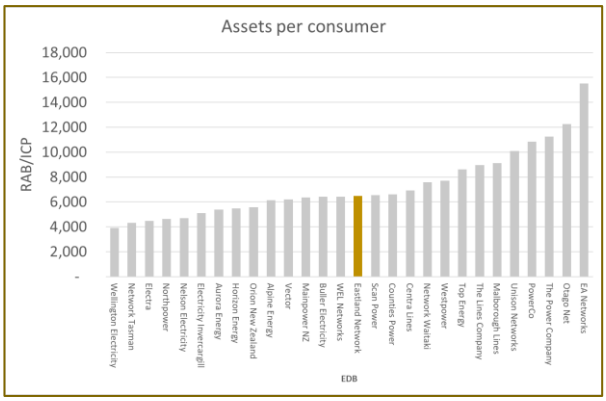


Figure 18: Industry assets per customer ranking (Source: 2020 IDs)



3.3 Connection to the national grid

In 2015, Eastland Network purchased Gisborne and Wairoa's 110kV assets from Transpower. This consolidated the Grid Exit Point (**"GXP"**) to the Tuai substation. The Tuai GXP is located near Lake Waikaremoana and now provides the connection of Eastland Network's electricity network to the North Island. Eastland Network is supplied from this GXP via four 110kV circuits. Two circuits run to Wairoa, and two to Gisborne.

3.4 Large scale distributed generation

Generation connected to Eastland Network's electricity network provides additional sources of energy to the region, and more importantly, it supports the security over supply to our zone substations. A summary of the generation assets is shown below:

Table 3: Distributed generation

Name	Owner	Generation type	Size
Te Araroa	Eastland Network	Diesel	1MW
Ruatoria	Eastland Network	Diesel	1MW
Tolaga Bay	Eastland Network	Diesel	1MW
Puha	Eastland Network	Diesel	1MW
Mahia	Eastland Network	Diesel	1MW
Raupunga	Eastland Network	Diesel	1MW
Waihi	Eastland Generation	Hydro	5MW

Name	Owner	Generation type	Size
Matawai	Clearwater Hydro	Hydro	2MW

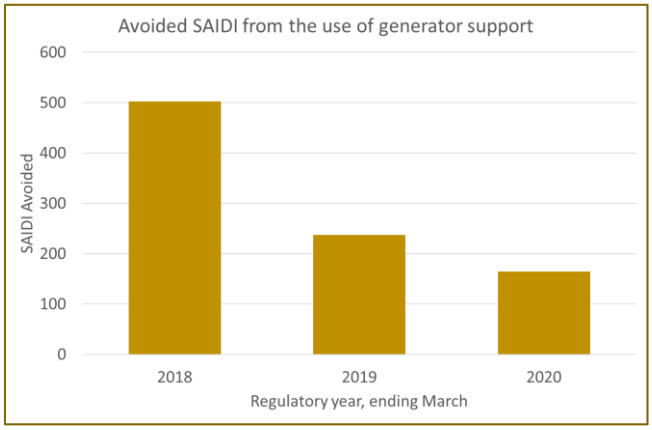
Benefits to Eastland Network from operating the generators include:

- The provision of alternative transmission to meet the requirements of grid emergency procedures;
- Providing localized continuity of supply during outages due to subtransmission and distribution faults, or during network maintenance;
- Reducing Eastland Network's maximum demand at the Tuai GXP and contribution to the Regional Coincident Peak Demand by up to 10MW;
- Easing of constraints on the subtransmission network (contributing to compliance with planning criteria), thereby avoiding and/or deferring subtransmission and distribution asset upgrades.

The effect of these benefits is a reduction in the overall assets required to supply customers, while maintaining reliability.

The use of generator support has avoided, on average, 300 SAIDI minutes over the past three years (refer to Figure 19 below). Eastland Network's reliability performance would have been significantly worse in the absence of the generators.

Figure 19: Eastland Network's generation usage (Source: Eastland analysis)



3.5 Subtransmission and zone substations

3.5.1 Level of security provided by the subtransmission and zone substation system

Due to Eastland Network's low customer density, the network is afforded relatively low levels of zone substation N-1 security.[6]. Only 30% of customers are supplied by zone substations with N-1 security, however, a further 60% of customers are supplied by substations with N-1 generator and N-1 switched security (refer Figure 20).[7] The adoption of these alternative approaches to subtransmission security (the use of generation and automated switching), and the use of lower cost overhead construction techniques has afforded the network a modest level of assets per

6 N-1 security is typical for substations on higher density networks.

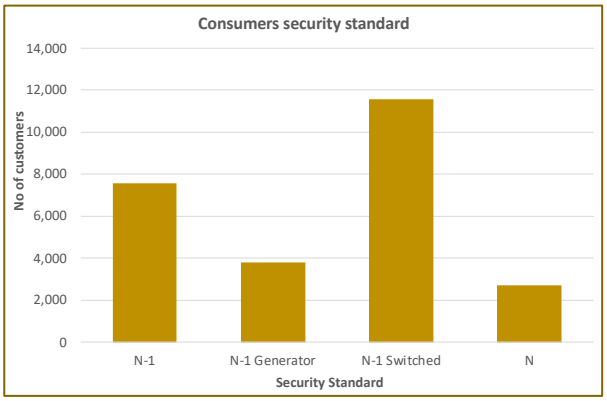
7 In terms of security standards, N-1 means that the loss of a single subtransmission line or zone substation transformer will not result in the interruption of supply. That is, there is redundancy within the supply system. N-1 Generator means that supply will be briefly interrupted while the generator starts and comes online. N-1 Switches means supply will be briefly interrupted while supply is switched to an alternative source (typically an adjacent substation). N security means supply will be interrupted and not restored until repairs are made.

customer when compared to other low density networks (refer to Figure 18).[8] This modest level of assets per customer is a key to minimising the impact of the low density on customer prices.

In terms of protection functions, the 110kV subtransmission protection schemes are all coordinated with Transpower to ensure they operate correctly.

For our 50kV and 33kV lines, the protection functions are all standard in terms of protection types (i.e. overcurrent, earth fault etc.), however, we are examining communications options and developments within the Gisborne Township to create a closed loop circuit for the Carnarvon – Kaiti line, which will assist in minimising outage times and areas.

Figure 20: Customer substation security ranking



3.5.2 Subtransmission system

Eastland Network operates a 110kV, 50kV and a 33kV subtransmission system.

The 110kV subtransmission system connects the Gisborne and Wairoa substations to the Tuai GXP via four 110kV circuits. Two 110kV circuits run to Wairoa and two to Gisborne. The lines are a mix of steel towers and poles. The 110kV double circuit lines are N-1 electrically, but not N-1 mechanically (i.e. the two circuits share some poles and towers).

The 50kV subtransmission line begins at the Gisborne substation and supplies all of the area's zone substations via four feeders (Carnarvon, Puha, Kaiti and Makaraka). The East-coast line (a spur of the Kaiti feeder) is the only spur line of the network and as such is an area of focus for our current maintenance and replacement programs. Due to low security, three 1MW diesel generators have been placed at key locations on the line to support the network during planned and unplanned outages.

Positioned between the Carnarvon and Port substation is the only section of subtransmission line which runs underwater. This cable was laid in 2005 and is a critical section of line providing subtransmission security to most of the Gisborne township. Regular thermal imaging inspections are performed on the terminations of the cable to ensure the integrity is not compromised at the joints. Other than this, there is very little undergrounding of the subtransmission line, which is attributable the high cost of subtransmission cabling and installation.

The Waihi line located in Wairoa also operates at 50kV. This line provides the link between the Waihi 5MW generating plant and the Wairoa network. Historically used to decrease the peaks in the Wairoa area (pre-110kV asset purchase), the plant is now functioning to support the Eastland

[8] The similarly low-density networks are OtagoNet, The Power Company, Centralines, The Lines Company, Westpower, EA Networks, Scanpower, Marlborough Lines, Mainpower, and Top Energy. Almost all of these companies have a higher level of assets employed per customer than Eastland Network.

Network's security within the Wairoa region. Control of the plant still lies within Eastland Network's control room.

The Wairoa subtransmission line operates at 33kV and runs from the Wairoa substation through to the Tahaenui substation and onto Blacks Pad substation, supplying the Nuhaka and Mahia areas. The 33kV line, originally operating at 50kV, was built in 1972 and runs over the hilltops between Wairoa and Nuhaka. This makes it very difficult to access in winter periods. Unplanned outages on this line are primarily caused by extreme weather events or insulator breakdown.

Blacks Pad which is at the end of the subtransmission line is located 20km from the main load centre for the area. This creates challenges for the network when it comes to the security and supply of the Mahia area. One diesel generator is located close to the township, which support the load during the summer demand peaks.

The average age of the 110kV subtransmission assets is 52 years, with 11% of these within 10-years of their maximum practical life[9].

The average age of the 50kV and 33kV subtransmission assets is 35 years, with 26% of these within 10-years of their maximum practical life.

3.5.3 Zone substations

Eastland Network's 22 zone substations have four main operational functions:

- Supplying the Gisborne and Wairoa regional 50kV and 33kV subtransmission system (converting the voltage from 110kV);
- Supplying the distribution network (converting the voltage from 50kV and 33kV to 11kV);
- Providing an injection point for local generation;
- Segregating the distribution network to supply customers.

The main assets associated with these zone substations include power transformers, switchgear (subtransmission and distribution) and the buildings used to house the switchgear, communications, and secondary assets associated with operating the primary equipment.

Zone substations are critical assets for the network as they are the central hubs of supply for urban suburbs, and rural townships, and large rural areas, and as such, they need to be maintained and replaced at a rate which will minimise unplanned failures.

The health of the assets indicates that replacements of some assets will be required within the planning period (See section 11).

Eastland Network uses mobile buildings (Portacom) as switch rooms for substations. This setup decreases the time required for switchgear replacement in that the whole unit is built prior to installation and replacement is an entire swap out. This considerably reduces the cost, risk and complexity of a project.

The average age of the zone substation assets is 25 years, with 9% of these within 10-years of their maximum practical life.

[9] Note: Steel structure MPL's have been removed due to insufficient information on this data (Reference – 2016 Asset Health Indicator guide)

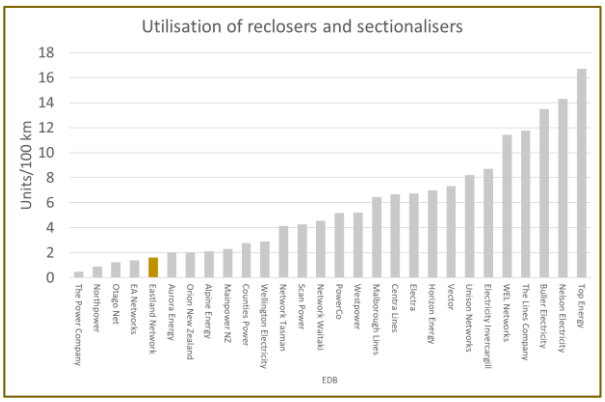
3.6 Distribution network

3.6.1 Configuration and security

All of Eastland Network's 11kV distribution feeders are configured radially. A range of switches are used along the feeders to sectionalize and/or reconfigure the line during fault situations or planned work. These switches are a mix of load breaking (air-break switches and ground mount switchgear), line reclosers, sectionalisers, or drop-out fuses. There are typically interconnecting switches between feeders, although these can be sparse on long rural feeders.

For long rural feeders, reclosers, sectionalisers, and drop-out fuses are installed to minimise the impact of outages. Presently, Eastland Network has not adopted the use of reclosers and sectionalisers to the same extent as other rural networks (refer to Figure 21).

Figure 21: Industry recloser and sectionaliser density ranking (Source: 2020 IDs)



Further installation of remote switchgear is planned to sectionalise the network further.

Eastland Network have two sets of fault locators. They are primarily used for faults which are difficult to locate such as insulator failures or intermittent faults. Our network loads on rural feeders are sometimes too small for detection by our existing locators due to the technology at the time being limited to a 5A supply. However, there are now more efficient locators which operate at much smaller current ratings. We will be looking to acquire several of these units in the coming years.

3.6.2 Overhead distribution system

The overhead distribution network transports electricity from the zone substation to distribution transformers in small townships, and rural and remote rural areas. The average overhead rural feeder is 62 km in length, supplying around 212 customers. However, we have 8 feeders that are over 100km in length, which extent to the remote areas of our network.

On the overhead system, switch density is around 1 switch for every 5 km of overhead line.

The average age of the poles and conductor is 31 years, with 22% of these within 10-years of their maximum practical life.

The average age of the switches (including air-break switches, reclosers, sectionalisers, and dropout fuses) is 31 years, with 44% of these within 10-years of their maximum practical life.

3.6.3 Underground distribution system

Eastland Network's underground distribution system transports electricity from the zone substation to distribution transformers in urban areas. The underground system is installed within urban areas where public safety is a factor, and to meet local council requirements. PILC and XLPE cable make up a significant proportion of the network's underground cabling.

The distribution switchgear associated with the underground distribution network is predominantly ground-mounted. The switchgear is used to sectionalise and/or reconfigure during fault situations and planned work. The underground system is typically well interconnected with adjacent feeders.

On the underground system, switch density is around 1 switch for every 0.5 km of overhead line.

The average age of the cables is 30 years, with 10% of these within 10-years of their maximum practical life.

The average age of the ground mount switchgear is 19 years, with 16% of these within 10-years of their maximum practical life.

3.6.4 Distribution transformers

Consistent with the density of our network, the distribution transformers are primarily pole mounted and classified as rural installations. Due to physical limitations, pole mounted transformers are typically 50kVA or less.

Table 4: Composition of distribution transformer fleet

Eastland Network owned	Pole mounted transformers		Ground mounted transformers	
Size	<= 100kVA	> 100kVA	<=100kVA	>100kVA
% overall transformer count	84%	0.5%	3.5%	12%
% Rural	81%	2.5%	1.5%	3%
%Urban	1.5%	0.25%	0.25%	10%

An increase in ground mounted transformer installation has occurred since the early 2000s, primarily to reduce public safety risk and to support load growth in urban areas. This also coincides with the red tag pole replacement program Eastland Network completed in the urban townships to comply with health and safety requirements at the time. Eastland Network's strategy was to take advantage of the replacements, converting large sections of the urban network to underground which provided benefits in the form of public safety, reliability, public image, and compliance. Renewal of some of the original township transformers, in response to enclosure condition is a focus for ground mounted transformer fleet plan.

The average age of pole mount transformers is 30 years, with 3% of these within 10-years of their maximum practical life.

The average age of ground mount transformers is 20 years, with 2% of these within 10-years of their maximum practical life.

3.6.5 Voltage Regulators

Voltage regulators are utilised on the rural network to assist with some of the voltage supply problems which have developed on our long feeders. Although Eastland Network's strategy is to build its network so that voltage regulator requirements are minimal, the existence of several of these units demonstrates the difficulty in supplying and interlinking some of the more remote rural areas of the network. In addition to voltage support on long feeders, voltage regulators provide the capability for our network to support minor substations via 11kV interlinking. This support assists the network when maintenance and replacements are programmed on the subtransmission line or the power transformer.

Voltage regulators are placed at the following areas:

Table 5: Voltage regulator locations

Feeder	Length (km)	Purpose	Install Date
Te Arai feeder	103	Assist voltage constraint on long line feeder	1964
Kanakanaia feeder	53	Assist voltage constraint on long line feeder	1964
Matawai feeder	271	Assist voltage constraint on long line feeder	1964
Muriwai feeder	98	Assist voltage constraint on long line feeder	1980
Inland feeder	119 [10]	Assist voltage constraint when connecting through to Ruatoria substation. Provides synchronous voltage to generator at Ruatoria Substation.	1984
Dalton feeder	130	Assist voltage constraint on long line feeder	1985
Ngatapa substation	n/a	Assist voltage constraint when Tx or sub out for maintenance or unplanned outage	2012
Pehiri substation	n/a	Assist voltage constraint when Tx or sub out for maintenance or unplanned outage	1965
Raupunga feeder	266	Assist voltage constraint on long line feeder	2001
Mahia feeder	139	Assist voltage constraint on long line feeder	1965
Mahia SWER line	n/a	Assist voltage constraint on long line feeder	2005

There are no voltage regulators within 10-years of their maximum practical life[11], however, five of the regulators are nearing this criterion.

3.6.6 Low voltage system

The low voltage network is supplied at 230V for single phase and 400V for two or three phases. Supply can be in the form of single, two, or three phases, and varies based on the requirements of the customer. Meshing of the low voltage network is only possible in the Gisborne and Wairoa townships and is generally only used to restore power during faults.

Eastland Network has had increased interaction with customers with privately owned poles. Historically, letters of ownership were handed to landowners (includes both HV and LV assets), however, land ownership changes have created problems when asset replacement is required. Eastland Network is currently considering how to address this issue.

The average age of overhead LV assets is 44 years, with 11% of these within 10-years of their maximum practical life.

The average age of underground LV assets is 30 years, with 9% of these within 10-years of their maximum practical life.

3.7 SCADA, communications and control

The SCADA system is used for monitoring and control of the network. Frequency, voltage, current, and temperature information is obtained from remote sites and displayed in real-time (to alert operations staff of abnormal conditions and assist with operational decision making).

Historical information is stored at 30-minute intervals and is used to communicate load trends for planning and reporting.

[10] Length used is when the Makarika and Inland feeders are joined
[11] Maximum practical life for ground mount transformers (Value of 70 years MPL) used as reference

An alternate control facility was established in FY2018 at the Gisborne substation. The facility has backup generator supply, communications, data storage, and control terminal.

Several different communications links (VHF radio, UHF radio, copper cable, fibre cable) and protocols are used to provide voice and data information for the operation of the network, including. Data communication is via IP and RS232/485 serial.

A substation management system was introduced in FY2015 and is complementary to the SCADA system, allowing access to intelligent devices to fine tune configurations and operating parameters, or retrieve detailed log event data. The system uses an IP-based communications network which has been established using a mix of in-house and third-party communication links.

To support the communication network, seven radio huts are used across the region which assist with communication to devices in rural areas. These sites all have backup generation via diesel generators as they are critical for the operation of the control room voice data.

4 The Operating Context

This section presents a view of the key operating and network issues which are drivers of our asset management policy and strategy.

4.1 Overview

The operating context and network issues are important matters that shape our asset management policy and strategy. Our policy and strategy need to respond to, and be consistent with, the context of Eastland Network. They also need to be aligned to Eastland Group.

In this section, we have covered these important contextual issues, including:

- Our historical focus on delivering a high level of service, in a cost-effective manner, to one of the lowest socio-economic regions of New Zealand;
- Our small industrial customer base;
- Our network characteristics, and how these reflect the low customer density typical of a large rural supply area;
- How the network business benefits from the economies of scope of Eastland Group;
- Our ageing subtransmission and distribution assets;
- The increasing impact of adverse weather events, vegetation outages, and the reduction in headroom in our regulatory quality targets;
- The potential for large new industrial load, which could exceed our current capacity;
- The relatively low quality of our network asset information;
- The increasing pace of energy transformation.

4.2 Eastland Network delivers a high level of service, at relatively low cost, to one of the lowest socio-economic regions of New Zealand

Eastland Network also supplies one of the lowest socio-economic regions[12] (refer to Figure 22), which means that customers' ability to pay high electricity prices is limited. At the same time, Eastland Network's customers face some of the highest retail electricity prices in New Zealand (refer to Figure 23).

The average consumption by Eastland Network customers is amongst the lowest in the country, reflecting the low socio-economic circumstances for customers, and the absence of a large industrial customer base. Large industrial customers typically carry a large proportion of subtransmission costs; in our case, the burden of subtransmission assets falls on small commercial and domestic customers.

Given these factors, historically Eastland Network has sought to minimise its investment in subtransmission assets that provide redundancy (i.e. network security); rather, we have provided subtransmission security through lower cost generation alternatives, which we discuss later in section 10.3.3. Investment in distribution security has also been kept as low as possible. The consequence of this practice is that Eastland has maintained reasonable line charges (refer to tFigure 24).

[12] This was measured based on the deprival index. The dark red areas in Figure 22 represent the most deprived areas.

Figure 22: NZ regional deprivation profile (Source: Department of Public Health, University of Otago, Wellington, 2018)

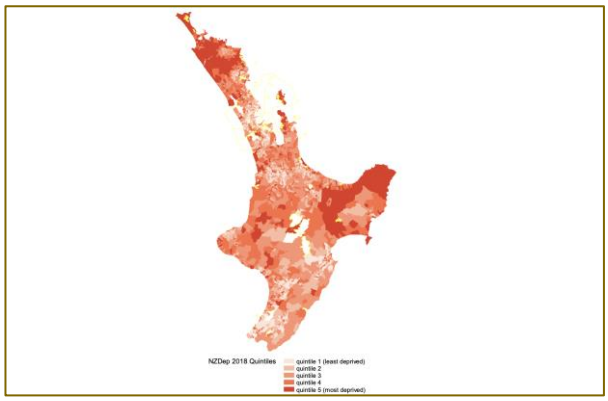
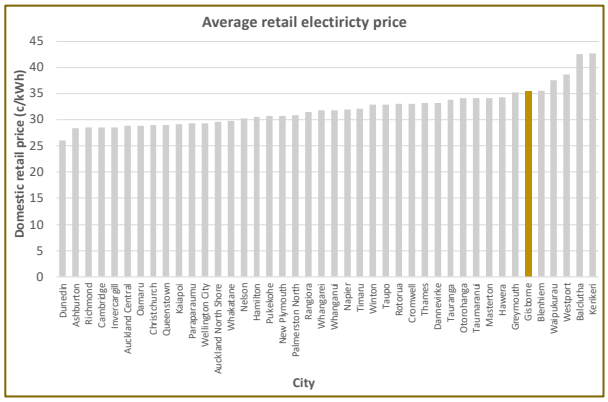


Figure 23: Electricity retail prices (Source: MBIE Electricity Price Monitoring, November 2019)



tFigure 24: Line charge industry ranking (Source: 2020 IDs)

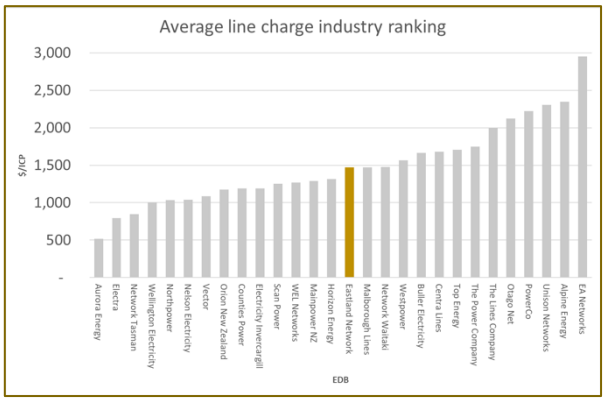


Figure 25: Eastland customer satisfaction (Source: Eastland)

Lastly, customers are generally happy with the level of service that they receive from us, with most customers rating service between good and excellent (refer to Figure 25). We discuss the results of our customer survey later in Section 8.3.1.

4.3 Eastland network has a small base of large industrial customers

Across Eastland Network the industries are linked to the primary produce value chain, including cultivation, harvesting, processing, storage and transportation of timber, root and leaf vegetables, pip and stone fruits, grapes, meat and fish. There are several significant processing and storage installations on the western outskirts of Gisborne, clustered in the Gisborne industrial estate, the Gisborne Port area, and in Wairoa.

The companies located in these areas which have a significant impact on the region's electricity consumption and demand, are listed in the table below.

Table 6: Eastland Network - Key Industries

Company	Industry	Region	Demand
Juken NZ Limited	Timber Processing	Gisborne	3.5 MW
Affco	Meat Processing	Wairoa	3.5 MW
Leaderbrand	Food Processing	Gisborne	2 MW
Ovation	Meat Processing	Gisborne	2 MW
Tairāwhiti Healthcare	Heath Care Provider	Gisborne	2 MW

Company	Industry	Region	Demand
Cedenco	Food Processing	Gisborne	2 MW
Far East Sawmill	Timber Processing	Gisborne	2 MW

The nature and size of the operations carried out by these industries does not significantly impact on the network at an individual level. However, the combined consumption of these companies on average is 15% of the total energy conveyed, and 25% of the total demand for the region. Direct contact is maintained with these companies to assess their needs and the adequacy of current service levels.

There are no issues associated with the operations of these companies, i.e. changes in demand are not expected to have a significant impact on the network over the planning period. However, an emerging issue is the increasing requirement for continuity of supply, improved restoration times and less flicker and sag.

Eastland Network regularly engages with customers on all manners of business and common interest. An external advisor formally consults with the 25 largest customers (by energy consumption) specifically on the issue of price and supply quality.

4.4 The network characteristics, and how these reflect the low customer density typical of a large rural supply area

Supply to rural (and sometimes remote rural) areas on our network means that significant investment and maintenance on infrastructure is required for a small number of customers. As a consequence, it is difficult to justify expenditure on network security where this will materially impact the cost of supply to customers. This is typical of a lot of networks around New Zealand and is now becoming an issue as the focus for performance is continually being driven by outage duration and frequency.

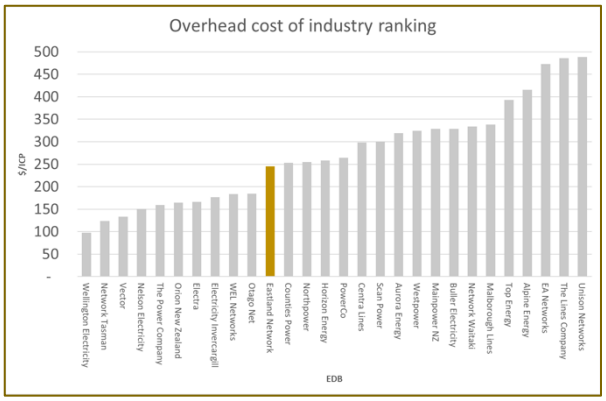
Eastland Network's approach to management network security is to utilise mobile generators with a maximum capacity of roughly 300kVA to support the network during any unplanned outage that cannot be restored within our service level periods. This is typical in long rural feeders where the load is minimal, making this approach a cost-effective solution and also assists our planned shutdowns should the area affected include a critical connection e.g. health support equipment and businesses.

4.5 The benefits of the economies of scope of Eastland Group

Eastland Network, and its customers, enjoy significant benefits from the economies of scope that have resulted from the growth of Eastland Group. Figure 26 illustrates that Eastland Network's overhead costs[13] are among the lowest when compared to similar-sized or larger companies[14]. When compared to our closest neighbours, Eastland Network's customers benefit by between $14 and $32 per annum due to being part of Eastland Group, and upwards of $100 per annum when compared to similar-sized companies.

[13] System Operations and Network Support and Business Support Costs.
[14] Those shaded in darker grey in Figure 26.

Figure 26: Overhead cost, industry rankings (Source: 2020 IDs)

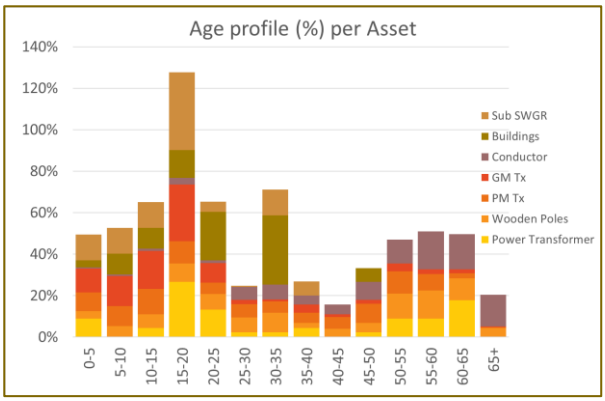


4.6 The increasing age of subtransmission and distribution assets

Not unlike most distribution businesses in New Zealand, Eastland Network's assets are ageing, with an increasing number of assets approaching their maximum practical life. That is, large quantities of assets that were installed in the 1960s and 1970s are approaching their maximum practical life and are at an increased risk of failure due to end-of-life issues.

For Eastland Network, the ageing asset fleet is more apparent across wood poles, conductor, zone substation transformers, and distribution overhead switchgear (refer to the asset fleet plans included in section 11). Presently, the ageing asset fleet is not resulting in high defective equipment failure rates (refer to section 8.5.2), however, managing our ageing asset fleet is an important focus for the business going forward.

Figure 27: Overall network asset age profile



4.7 The increasing impact of adverse weather events, vegetation outages, and the reduction in headroom in our regulatory quality targets

Eastland Network is increasingly being impacted by adverse weather and vegetation related outages (Refer to Figure 39 and Figure 40). These two causes of outages accounted for 44% of total SAIDI, and 21% of total SAIFI over the last year. Adverse weather events have been increasing and are an increasing source of major event days (**MEDs**)[15]. In FY2019 and FY2020 we experienced

[15] Major event days are days where the network experiences events that result in SAIDI and SAIFI above a set boundary limit. For Eastland Network this limit is 13.1 SAIDI and 0.177 SAIFI (from FY2021). The purpose of the MEDs is to limit the impact of these major events.

a total of six MEDs due to weather events. This is up from one weather related MED across FY2013 and FY2014.

While the underlying level of vegetation outages has remained largely constant, the extent of vegetation outages is increasingly being impacted by adverse weather events (refer to section 6.4). This situation is being exacerbated due to the reliance on generators to support subtransmission security (which means that while vegetation outages are restored quickly using generators, a short outage is recorded, which has a negative impact on SAIFI).

A contributing factor to the extent of vegetation related outages is the network's exposure to forestry plantations, with around 7% of subtransmission lines, and 10% of distribution lines, passing through forestry areas.

Compounding the issue, the 2020 default price path reset has recently been completed and the quality (reliability) limits applicable to the network have been reset. The consequence of the reset is that our headroom in relation to the regulatory limits has reduced for both SAIDI and SAIFI (refer to section 6.4.1).

The combination of these factors has increased the risk of a quality path breach over the coming five years.

4.8 Catering for a step-change growth in industrial load

The existing 110kV lines supplying Gisborne are currently rated at 55.5MW, with current peak demand close to 50MW.[16] The current spare capacity is sufficient for organic growth over the medium term, however, the potential exists for large new industrial load that would exceed the remaining spare capacity. It is prudent for Eastland Network to be prepared for large scale industrial load growth to ensure it can support regional economic growth.

4.9 The quality of network asset information, and its use in asset management

The 2019 information disclosure and the 2020 AMP (and prior disclosures) defined asset data accuracy as being poor (i.e. good quality data was not available). The 'poor' rating was assigned due to our conservative interpretation of the assessment criteria and didn't properly reflect the underlying quality of the data. Over FY2021 we have worked on accurately assessing the quality of our data to improve the assessment of asset health and to improve the capture of asset condition data. Although this work is ongoing, significant improvements have been made. We have focused heavily on the key asset classes[17] and will look to improve other classes in the coming years. Our goal is to have the majority of all the asset classes at a data quality rating of at least 3 by FY2023 (in relation to age, quantity and health).[18]

16 Winter line rating and winter peak demand.

17 Power transformers, substation switchgear, distribution (11kV) GM transformers and distribution switchgear, overhead structures. and conductor.

18 The data accuracy ratings defined by the Commerce Commission were:

1 – means that good quality data is not available for any of the assets in the category and estimates are likely to contain significant error;

2 – means that good quality data is available for some assets but not for others and the data provided includes estimates of uncounted assets within the category;

3 – means that data is available for all assets but includes a level of estimation where there is understood to be some poor-quality data for some of the assets within the category;

4 – means that good quality data is available for all the assets in the category.

4.9.1 Data Quality Assessment

In relation to assessing data accuracy, we have completed field surveys of the attributes, age, and health, of a sample of assets across our key asset classes[19]. These surveys found that data accuracy was significantly higher than had been previously disclosed. As a result of this work, we have disclosed higher data accuracy ratings for those assets in this AMP, and in the forthcoming information disclosures. These improvements are shown in Table 7 below.

Table 7: Changes in Data Quality

Asset class	2020 ID Data accuracy rating (schedule 9a, 9b, 12a)	2021 Data accuracy rating		
		Asset attributes and quantity (schedule 9a)	Asset age (schedule 9b)	Asset health (schedule 12a)
Concrete poles	1	3	2	2
Wood poles	1	3	2	2
3.3/6.6/11/22kV GM Circuit breakers	1	4	3	2
Zone Substation Transformers	1	4	4	2
3.3/6.6/11/22kV GM Switchgear	1	4	3	2
GM Transformer	1	4	2/3[20]	2
Voltage regulators	1	3	2	2
Protection relays	1	3	2	2

4.9.2 Improving the assessment of asset health

As part of our asset management roadmap, we have adopted the DNO Common Asset Indices Methodology to determine the health of our assets. This standard, which is used by all distribution businesses in the UK, is more comprehensive than the EEA Asset Health Indices, and is being adopted by an increasing number of distribution businesses in New Zealand. We are rolling out the DNO Methodology for key asset classes over the next two years. The improvements to asset health data accuracy reflect the application of the DNO Methodology, and the revised accuracy ratings of asset age data.

4.9.3 Development of the data issues register

We have developed a comprehensive register of all identified data issues (i.e. where the data accuracy score is below 3). The register identifies improvement projects and/or workarounds for the data issues, extending to FY2023. Data improvements are being prioritised for asset classes with high criticality (and for the time being, data issues associated with low criticality assets are being accepted).

4.9.4 Improvements in asset management systems

The implementation of ESRI, SAP and Blueworx will see key asset data retained within these systems, which will provide appropriate data security and quality processes. As it stands, asset attribute, age, and health data will be held within the GIS and SAP (with SAP being the single source of truth), and asset condition data will be held within Blueworx. We discuss asset information systems in more detail in Section 9.3.

[19] The asset classes surveyed represent c.70% of the network assets, excluding connection points and load control relays.
[20] 2 for Wairoa region. 3 for Gisborne.

4.10 The increasing pace of energy transformation

The pace of energy transformation is increasing as a result of the improving economics of new technology, and in response to climate change. On the network, the energy transformation will be seen by way of an increase in the installation of small scale distributed generation ("**SSDG**"), and an increasing uptake of electric vehicles ("**EVs**").

In Section 10.4.3, we have forecast the impact of SSDG and EVs on our demand and consumptions forecasts over the next 20-years. These forecasts are based on Transpower's Whakamana i te Mauri Hiko report[21] (moderated for Eastland Network's socio-economic circumstances) and pre-date the draft advice from the Climate Change Commission that was issued on 31 January 2021.[22]

The direction outlined in the Climate Change Commission's draft report is more aggressive than we have factored into our demand and consumption forecasts. The key areas of note from the report are:

- It is the Commission's assessment that current policy settings do not put Aotearoa on track to meet its net zero 2050 target. To do so, Aotearoa must accelerate action on climate change.
- Meeting the proposed emissions budgets and 2050 targets requires transformational change across all sectors of the economy.
- In relation to transport emissions, electric vehicles are key and need to be widely adopted. The Commission wants to see the majority of the vehicles coming into New Zealand for everyday use electric by 2035. The government will need to provide support and incentives to make this happen.
- Aotearoa will need to maximise the use of electricity. This means generating and using more low emissions electricity for vehicles and for process heat. Building more renewable generation such as wind, solar and geothermal will be required
- In the long-term, we will need to reduce how much natural gas we use in homes and businesses.

As an example of the potential implications, we have included the Climate Change Commission's view of EV penetration and SSDG (solar) generation growth in Figure 28 and Figure 29 below. The most significant difference is in relation to EVs, where the Climate Change Commission forecasts growth in EVs at roughly twice the rate that we have currently assumed. The projected growth in solar SSDG is broadly similar to our current forecasts.

Figure 28: Climate Change Commission's forecast for EVs

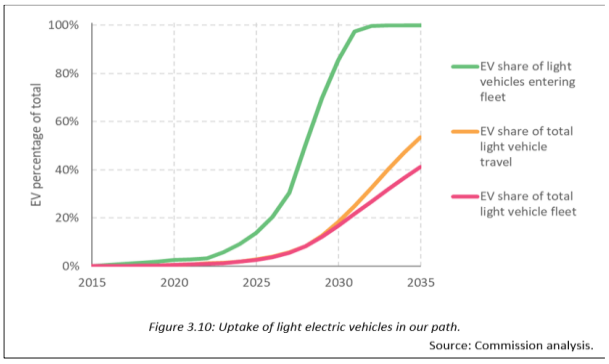


Figure 3.10: Uptake of light electric vehicles in our path.

Source: Commission analysis.

Figure 29: Climate Change Commission's forecast for generation mix

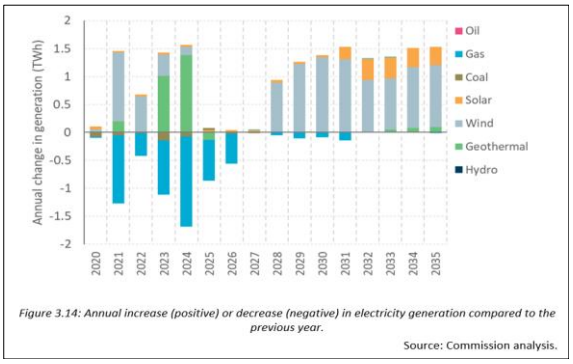


Figure 3.14: Annual increase (positive) or decrease (negative) in electricity generation compared to the previous year.

Source: Commission analysis.

21 https://www.transpower.co.nz/resources/whakamana-i-te-mauri-hiko-empowering-our-energy-future.
22 https://www.climatecommission.govt.nz/get-involved/our-advice-and-evidence/.

The implication of this direction is that electricity volume and demand growth is likely to be higher than we are currently forecasting. The implications of higher growth will likely be an increase in network development, and/or a faster adoption of non-network solutions. These will likely have opex and capex implications.

In Section 10.9 we have outlined the potential implication of the increasing pace of the energy transformation and how we are considering responding to these challenges. This work is still in the formation stage and will be further developed over the next two AMPs.

5 Eastland Group's strategy and stakeholders

This section describes Eastland Group's strategy and stakeholders which the asset management strategy needs to align with.

5.1 Eastland Group's strategy

Eastland Group's strategy is shown in Figure 30 below. To support Eastland Group's strategy, Eastland Network is committed to delivering sustainable returns for its shareholders, providing services that meet customers' needs, and supporting the growth and prosperity of the Tairāwhiti and Wairoa regions.

Figure 30: Eastland Group's strategy

5.2 Eastland Group's health and safety policy

Eastland Group has a range of policies that Eastland Network must comply with. Given the importance of health and safety, and the inherent risks associated with electricity, we considered it appropriate to make particular mention of the Group's health and safety policy.

Eastland Group is committed to providing and maintaining a safe and healthy environment for all its employees, contractors, customers, and the public.

Eastland Group's responsibilities for health and safety management are described in the Group's health and safety manual. This manual also sets out the subsidiary businesses' safety management procedures.

This year, the Group reviewed and updated their health and safety policy which ensures that all of Eastland Group's sites are safe, healthy and enjoyable places for everyone who works on them or visits them.

Table 8: Eastland Group - Health & Safety Policy

Together we achieve safe, healthy and enjoyable workplace environments through:

- Compliance with our obligations under all relevant legislation and regulations, as well as company operational policies, standards, plans and procedures;
- Development, communication and monitoring of measurable health and safety objectives and performance standards in all work areas;
- Resourcing health and safety activities and initiatives;
- Maintaining facilities, plants and equipment in safe condition;
- Ensuring hazardous substances and materials are safely managed across their lifecycle;
- Provision of appropriate health, safety and environmental training, supervision, and resources to workers;
- Ensuring our workers know their safety responsibilities and have the tools, capability, information and resources to maintain a safe and healthy environment;
- Identifying critical risks that exist in each business sector that arise as a result of our operations, environment, or equipment and taking appropriate steps to eliminate or minimise these;
- Monitoring and reporting on critical risks and the effectiveness of the relevant controls;
- Recognising additional hazards and managing the risks associated with operating major hazard facilities;
- Informing workers, third parties, visitors and the public of these hazards/risks and impacts that may cause potential harm to people, our business and/or our environment;
- Promoting safety reporting processes which support workers to raise safety concerns;
- Completion of accurate investigations into all reported incidents, injuries and near misses and sharing the learnings with all stakeholders to reduce the likelihood of reoccurrence;
- Ensuring that continual improvement occurs through ongoing engagement and participation opportunities with workers and communication, consultation and coordination with key stakeholders and third parties;
- Providing support to assist employees with a safe return to work following an illness or injury.

Recognising that health, safety and environmental performance contributes to overall organisational and business support.

5.3 Stakeholder interests

Stakeholder interests need to be considered and accounted for in our asset management policy and strategy. We have considered the wide and varied views of the many stakeholders who have

an interest in ensuring that our network continues to provide a safe, reliable and cost-effective electricity supply to our customers and community. Our key stakeholders and their principal interests are summarised below:

Table 9: Stakeholder interests

Key stakeholder	Main interests	Engagement
Customers	Public safety; service quality and reliability; price; new connections; communication	Social media, direct contact, annual service level survey, outage notifications, enquiries
Communities, Iwi, Landowners	Kaitiakitanga, mana whenua, land access and use; consultation; communication	Social media, direct contact
Regional and District Councils	Environmental performance and compliance;	Direct contact, engagement when projects align, monthly relationship meetings
Employees and Contractors	Safe and productive work environment; fair remuneration; training and development	Direct contact, staff surveys, meetings
Eastland Community Trust	Governance; financial performance; risk management	Direct contact, meetings (senior management EGL)
Commerce Commission	Default price path compliance; information disclosure; exercising good industry practice in asset management; risk management	Regulatory meetings and compliance reporting.
The Electricity Authority	Pricing methodology; distributed generator connection and pricing; market operation and access	Direct contact
Work-safe	Workplace safety; electrical compliance and notifications	Reports and direct contact
Electricity retailers	Pricing methodology, billing, customer service; use of systems agreements;	Annual relationship meetings, shutdown notifications.
Distributed generators	Access to the network; connection agreements, price, operations management	Engagement through network approved contractors, meetings with owners of larger installations
Transpower	Load forecasting; GXP planning, technical performance; technical compliance	Indirect/direct meetings, relationship meetings for outages and performance issues, coordination of operational / maintenance issues

Interests of different stakeholders do not always align. Where we have conflicts of interest, we seek to align our decisions with our asset management policies. Where conflict may impact on our strategy and performance, these are elevated to an executive and Board level for resolution.

5.4 Consumer engagement

Consumers are a unique class of stakeholder in Eastland Network as they pay for and receive line function services (our core service) from us. In this section, we provide details of our approach to communicating with our consumers.

Our commitment to providing these service levels to consumers is further reinforced by the strategy the Group (as a whole) has adopted "that we consistently provide exceptional services to customers in Gisborne, Wairoa and other regions around the country".

As a community owned company, we consider that the views of consumers should be properly considered in shaping our strategy and major investment decisions. As such, we employ multiple avenues to increase the awareness the public has of our services and to understand their needs. We do this by:

- Surveying customers on their expectations and preferences for our services;
- Hosting functions where stakeholders can engage with us;
- Using social media to communicate key initiatives and issues, including reviewing feedback posted on social media;
- Providing a 24/7 communication centre where faults and public safety concerns can be raised;
- Attending local functions (such as A&P shows) to enhance customer experience and interactions;
- Informing the public of planned and unplanned shutdown times, areas, and expected restoration times;
- Regularly communicating with landowners who are affected by our assets;
- Sponsoring local talent and providing assistance with tertiary education;
- Financing the Eastland Community Trust who support a wide range of community driven activities such as the ECT Rescue Helicopter.

As stated above, we undertake an annual customer survey. The topics in the survey are based on the "line function service" attributes such as reliability, pricing, demand management, flicker, and responsiveness to faults. The survey sample includes major consumers and a cross-section of other consumers in the Gisborne and Wairoa regions.

The results of our consumer engagement are presented in Section 6.3.

6 Review of prior performance

This section evaluates the operational performance of the network to determine if there are any systemic issues that need to be resolved.

6.1 Introduction

This section evaluates how the network has performed against the service level targets. It is important to note that most of the targets were established this year, following the restructure of the asset management team and our approach to asset management. The following performance indicators are standard for the industry.

A full description of the service levels and targets is provided in Section 8.

Please Note: this section includes the operational service levels. There are additional "work on the business" targets included in the Roadmap section, and an evaluation of performance against those targets is covered in that section.

6.2 Safety

Our overarching safety target is to have no serious harm to anybody working for, or on, our network, or from any equipment we own or operate.

Table 10: Safety performance[23]

Safety performance	2016	2017	2018	2019	2020
Serious harm to employees resulting in lost time[24]	2	-	-	1	1
Serious harm to any member of the public	-	-	-	-	-
Serious damage to company property and equipment	-	-	-	-	-
Serious damage to public property	1	-	-	1	3

Eastland Group has previously used staff incentives to increase awareness about health and safety but has since changed the culture to have a more proactive approach to health and safety. This has been achieved through an increased auditing program which staff carry out on our contractors, zero tolerance towards any issues found, and working with contractors and staff to determine alternative options to any occasions which may be putting our staff's safety at risk (e.g. fatigue management).

From a personnel (and contractor) safety perspective, there are no systemic issues that require addressing within this AMP. The ongoing drive for improvements to health and safety is being guided by other specific health and safety plans and programmes.

From a public safety perspective, the performance does not indicate any systemic issues. The asset fleet plans (Section 11.2) comment on asset related safety issues and include plans to resolve any current or emerging asset safety issues.

[23] Note: This is only for incidents which occurred as a direct result of network operations or assets.
[24] Only includes our internal fault contractors, not external.

6.3 Customer service

6.3.1 Results from the customer survey

During FY2021, we surveyed 24 large customers[25], 327 residential and small commercial customers in the Gisborne region, and 129 in the Wairoa region. The results on the survey were:

Table 11: Summary of customer survey results

Areas	Comments	Rating	Target	Target achieved
Reliability	• Large industrial and mass-market customers still regard keeping the power on as the most important aspect of electricity line services, however, these market segments have widely varying views on how well Eastland Network is doing that.	85% rated this good to excellent	>80%	Yes
Reliability (when outages occur)	• Getting the power back on quickly was regarded as the third most important aspect of electricity lines services. • Large customers would like specific advice on when an interrupted supply might be restored.	85% rated this good to excellent	>80%	Yes
Pricing	• Keeping line charges low was regarded as the second most important aspect of electricity lines services. • Large industrial customers in particular expressed the view that we are doing a poor-to-average job of keeping line charges low. • Taken as a whole, there is a sense that the Wairoa mass-market is more price sensitive than Gisborne. • Most customers across would prefer to pay about the same to have the power go off about the same. • Community understanding of the percentage of a monthly bill that is made up of Eastland Network charges is widely spread.	56% rated this good to excellent	>80%	No
Communication	• Preference for engagement by print media remains high for mass-market customers, whilst there is little or no interest in radio.	78% rated this good to excellent[26]	>80%	Close to achieving
Demand management	• There is some willingness to shift consumption to off-peak periods in both the Gisborne and Wairoa mass-markets.	n/a	n/a	n/a
Future expectations	• There is some Gisborne mass-market interest in installing rooftop solar. • Expected purchases of electric cars within the next 5 years appears low.	n/a	n/a	n/a

25 Consists of commercial and industrial customers
26 These questions related to answering the phone, advice on planned outages, and advice on technical matters.

6.3.2 How we are responding

For the most part, our customers agree that the following three aspects of our network performance are what are important to them:

- Keeping the power on;
- Keeping prices low;
- Communication.

The first two items overlap directly with the Commerce Commission's DPP regulatory regime of line function services; that is, the DPP sets the price-quality trade-off through its regulation of distribution revenue and network reliability. For Eastland Network to set a different trade-off it would need to apply for a customised price path (**CPP**) or a quality standard variation (where the latter only deals with changes to reliability standards).

Keeping the power on

We discuss keeping the power on in detail in the network reliability section below.

Keeping prices low

In general, customers are unwilling to pay for improved reliability performance. However, Eastland Network is facing a number of challenges to keeping prices low, and we are seeking to address these challenges in this AMP, and subsequent AMPs:

- Firstly, our network is ageing, with a significant number of assets nearing the end of their life; (refer to the business context and asset fleet plans, in Section 4 and Section 11.2);
- Secondly, there is the potential that investment needs will increase to meet operational and service level challenges posed by new technologies (i.e. SSDG and EV's). We discuss the scope of this issue in Section 10.4.3;
- Thirdly, the way we price needs to evolve to minimise the risk of customers making uneconomic investments in an attempt to bypass variable network prices. We discuss this issue below.

Evolution is required in prices

Consumers are changing how they use electricity by embracing new technologies, as the cost of these technologies reduce. Historical highly variable pricing structures are no longer relevant for the changing future of the industry. Consequently, we are developing cost-reflective/service-based pricing from 2021. This pricing will more appropriately signal the costs of using the network. It is believed that this step is critical for ensuring prices remain equitable across all classes of consumers, and to minimise the risk of customers making uneconomic investments in an attempt to bypass variable network prices.

While it would be helpful to introduce cost reflective pricing across all consumers, this is being constrained by the lack of advanced metering in the region, and the reluctance of many retailers (and their metering providers) to improve the current advanced meter rollout. Presently, only 50% of our consumers have access to advanced meters. Furthermore, where advanced metering is in place, we are experiencing that reasonable access to metering data.

Communication

We are continuing to increase our engagement with all our customers. We are developing our systems to widen our communication media and increase our understanding of customers' needs.

Key conclusions

The key conclusion is that there is a high likelihood of material upward pressure on prices over the long term, and that our pricing methodology will need to evolve relatively quickly, however, this is being constrained by the lack of advanced meters.

Minimising the extent of price rises through innovation and efficient network investment will be the focus for future AMPs.

6.4 Network reliability

6.4.1 Overall network reliability (long term performance trend)

The figures below show the trend in unplanned SAIDI and SAIFI performance over the past 10 years. Eastland Network's reliability performance has been good in the sense that we have performed better than our regulated targets for both SAIDI and SAIFI for the last ten years[27]. However, there is no trend showing an overall improvement in reliability. It is our view that because of our network configuration and susceptibility to high impact / low probability events, it is likely that network reliability will remain around current levels, unless significant investment (well above the current regulated allowances) is made into network security. Our network reliability analysis has indicated that we are within the lower quartile for performance when compared to other EDB's, but remain respectable when it comes to cost per customer[28]. We look with optimism at our change in asset management approach that should see more focused strategies, including incremental improvements to network resilience, and better targeting of asset renewals due to changes in health methodology.

Figure 31: ENL Unplanned SAIDI (2013-2020)

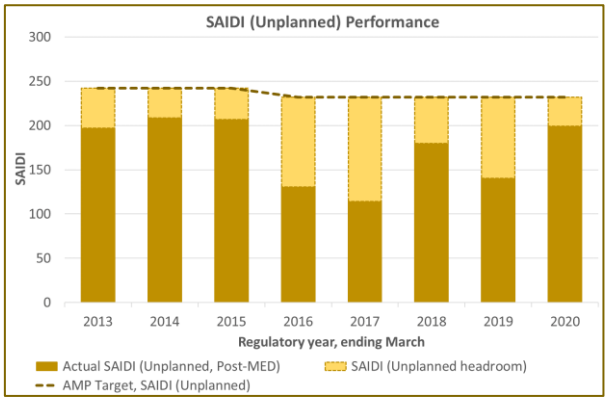
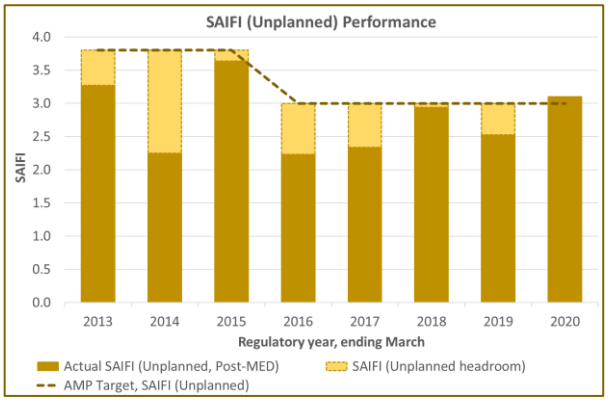


Figure 32: ENL Unplanned SAIFI (2013-2020)



Our planned network performance has varied since 2013 due to the mix of projects undertaken. From FY2021, the targets have increased materially to allow for an increase in planned work. There are no current or forecast performance issues in relation to planned outages.

27 Exception is in 2016/17 when a plane collided with both circuits between Tuai and Gisborne. Note: Unplanned 2017 data has excluded this event. Planned SAIDI was impacted due to the necessity to complete final repairs a week after the event.

28 See Commerce Commission network information disclosure reports, using RAW SAIDI data since 2013.

Figure 33: ENL Planned SAIDI (2013-2020)

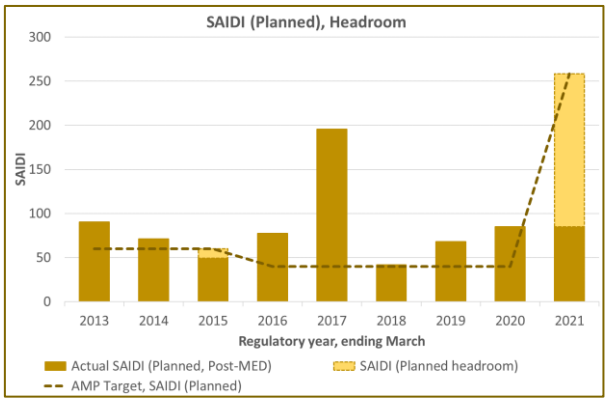
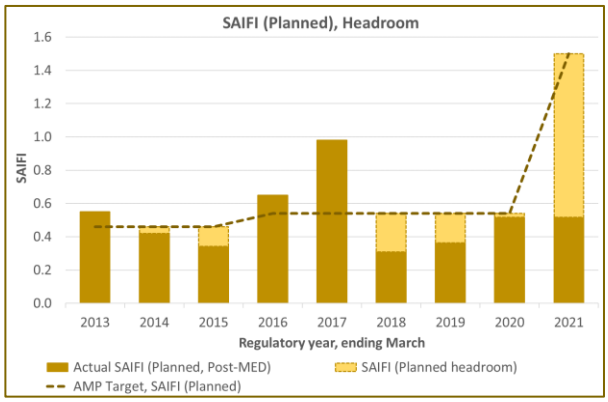


Figure 34: Planned SAIFI (2013-2020)



6.4.2 Overall network reliability (FY2020)

For FY2020 our performance met our AMP targets and the Commerce Commission's cap.

We recorded one major event day (**MED**) for the year which resulted in a pre-normalisation SAIDI and SAIFI value of 24.6 and 0.13 respectively.

Table 12: Overall SAIDI and SAIFI for the year ended 31 March 2020[29]

Reliability Measure	Actual	AMP target	Commerce Commission target	Target achieved
Unplanned SAIDI (RAW[30])	199.7	232.0	n/a	Yes
Unplanned SAIFI (RAW)	3.10	3.54	n/a	Yes
Total SAIDI (post-MED adjustment)	188.5	243.0	285.7	Yes
Total SAIFI (post-MED adjustment)	3.10	3.54	3.77	Yes

Note: These measures differ from the measures to be utilised from FY2021. We will be reverting to a separate planned and unplanned reliability analysis in the 2022 AMP.

6.4.3 Analysis of the cause of outages

In terms of outage types, the following graph summarises the trends and drivers of un-reliability in 2020. The graphs indicate a need to focus on defective equipment, vegetation, adverse weather events, and unknown cause outages.

29 Targets are based on DPP2 regulation limits.
30 Prior to adjustment for major event days

Figure 35: Unplanned SAIDI for FY2020

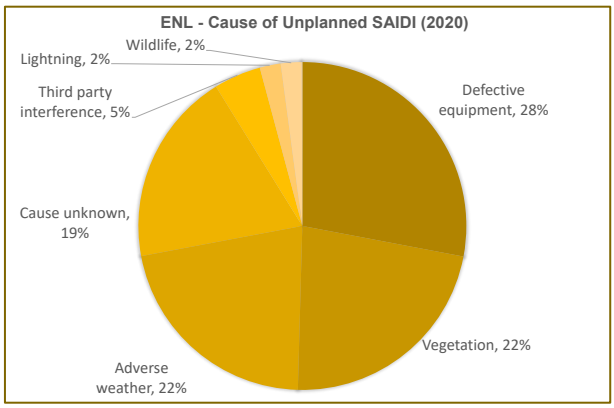
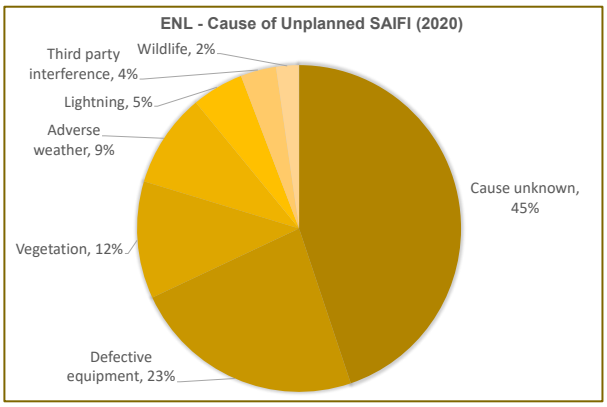


Figure 36: Unplanned SAIFI for FY2020



Our analysis of historical causes of unplanned outages also indicated that these outage types have been the major causes of outages over the last 7 years.

Figure 37: Unplanned SAIDI Trend[31]

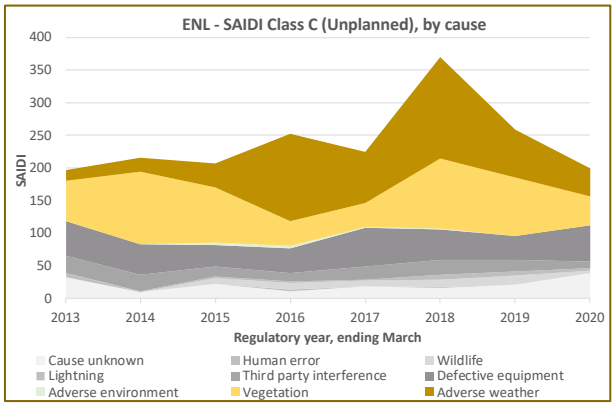
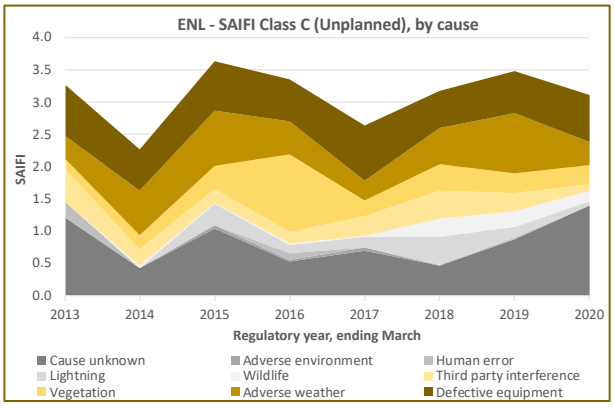


Figure 38: Unplanned SAIFI Trend[32]



6.4.4 In-depth review of adverse weather events

It is clear the network is vulnerable to adverse weather events, in particular, high impact events (refer to Figure 39). It is apparent that our local resources including faultmen, linesmen, and electrical tradespeople, are lacking in numbers[33]. Large events which cause damage in multiple areas are spreading our contractors and staff too thin to be able to attend faults within an acceptable time.

In addition, difficult access to some of the more rural areas during these storms prevents our staff from accessing faults to restore power.

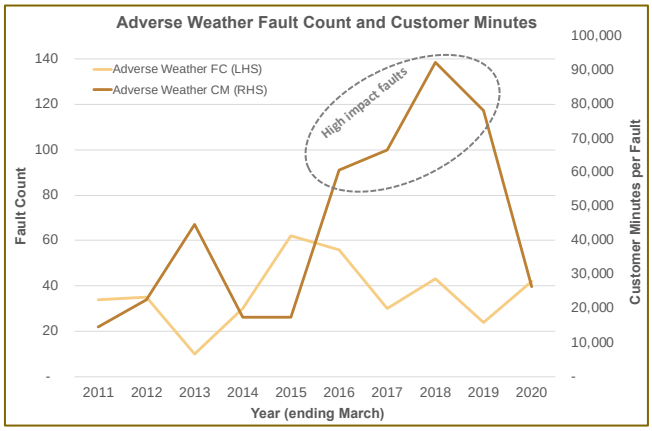
Eastland Network has tried multiple times to hire externally to bring talent to the region. Our current approach is to train from within and use local people to build our numbers to a point where our fault attendance times are more acceptable.

In FY2021, as a starting point towards this goal, we established a funding regime which supports local contractors to take on additional staff for these trades. We will continue this path to develop local skills and trainees to establish a local network support team for our poles and lines. In saying

31 The figures and tables exclude the 2017 110kV subtransmission outages (which were caused by a plane crash into the 100kV lines supplying Gisborne).
32 The figures and tables exclude the 2017 110kV subtransmission outages (which were caused by a plane crash into the 100kV lines supplying Gisborne).
33 Note: This is an industry wide issue.

this, we need to make sure that the right balance is achieved in maintaining steady work (including planned work) for any additional crews or resources we add to our existing staff/contractor levels.

Figure 39: Adverse weather fault count and impact



6.4.5 Vegetation outage performance

Review of long-term performance

The contribution from vegetation related SAIDI and SAIFI has been highly variable, and for much of the past seven years has contributed more to unplanned SAIDI and SAIFI then the industry average and similar-sized networks.

The average vegetation SAIDI (2013 to 2020) was 71.7 minutes per customer (raw), and on average contributed 30% of total SAIDI (raw).

The average vegetation SAIFI over the same period was 0.57 interruptions per customer, and on average contributed 19% of total SAIFI (raw).

Figure 40: Vegetation SAIDI Performance

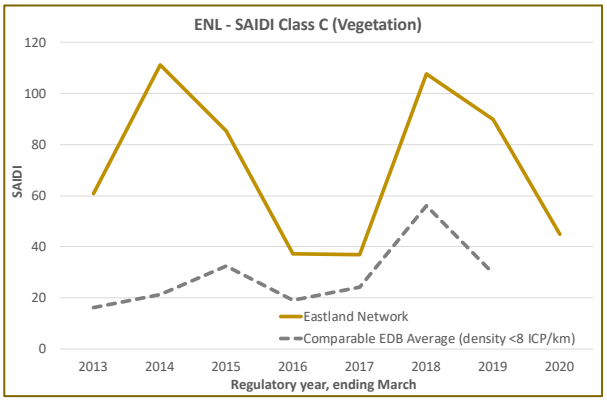


Figure 41: Vegetation SAIDI Contribution

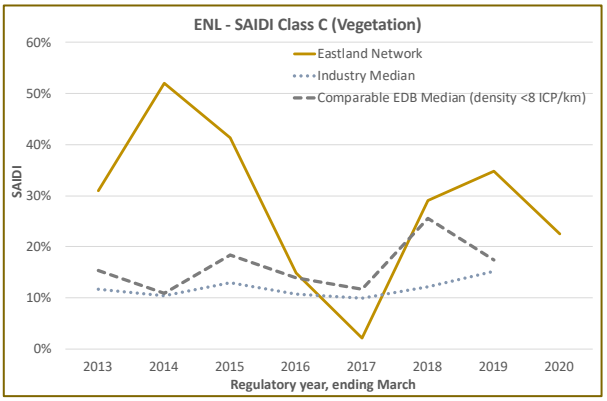


Figure 42: Vegetation SAIFI Performance

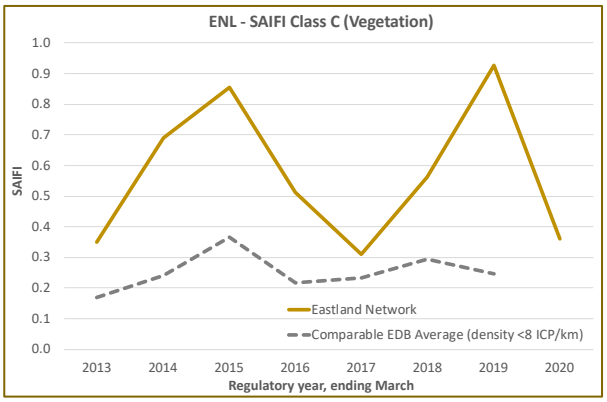
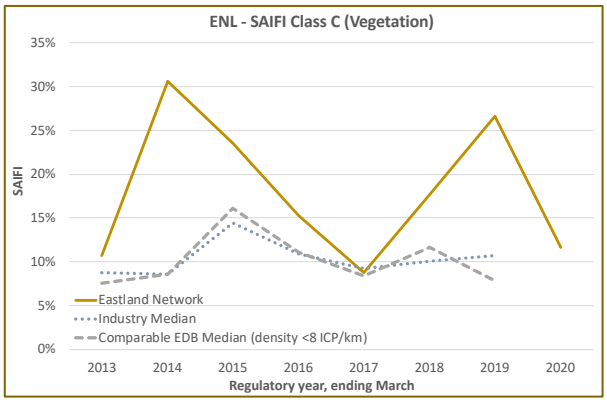


Figure 43: Vegetation SAIFI Contribution



Peer group comparison

In comparison to our peers[34], the contribution from vegetation outages to SAIDI and SAIFI performance is greater than the peer group average. Hence, there is scope for improvement.

Figure 44: Peer group vegetation SAIDI performance

SAIDI Vegetation	2013	2014	2015	2016	2017	2018	2019	2020	Average
Alpine Energy	2	14	5	9	11	1	5		7
MainPower NZ	2	7	10	3	7	5	20		8
Network Waitaki	7	7	10	25	1	15	4		10
Scanpower	34	10	8	11	6	10	34		16
The Power Company	11	15	18	34	10	10	22		17
Centralines	7	16	18	9	20	40	16		18
OtagoNet	8	15	26	54	25	6	23		22
The Lines Company	11	12	52	14	27	58	49		32
Buller Electricity	10	1	53	9	75	87	43		40
Westpower	26	27	71	4	48	278	21		68
Eastland Network	61	111	85	37	37	108	90	45	72
Average	**16**	**21**	**33**	**19**	**24**	**56**	**30**		**28**

Figure 45: Peer group vegetation SAIDI contribution

SAIDI Vegetation %	2013	2014	2015	2016	2017	2018	2019	2020	Average
Alpine Energy	1%	2%	6%	3%	11%	1%	4%		4%
MainPower NZ	1%	1%	10%	3%	2%	6%	18%		6%
OtagoNet	7%	5%	12%	19%	12%	5%	17%		11%
Buller Electricity	9%	3%	2%	7%	10%	17%	28%		11%
The Power Company	10%	14%	10%	13%	11%	6%	14%		11%
Network Waitaki	14%	8%	27%	17%	2%	26%	9%		14%
The Lines Company	10%	7%	25%	8%	13%	25%	20%		16%
Centralines	17%	19%	20%	23%	36%	36%	28%		25%
Scanpower	53%	23%	20%	29%	13%	22%	35%		28%
Eastland Network	31%	52%	41%	15%	2%	29%	35%	22%	28%
Westpower	17%	40%	13%	7%	48%	66%	18%		30%
Average	**15%**	**16%**	**17%**	**13%**	**15%**	**22%**	**21%**	**22%**	**17%**

Figure 46: Peer group vegetation SAIFI performance

SAIFI Vegetation	2013	2014	2015	2016	2017	2018	2019	2020	Average
Alpine Energy	0.02	0.09	0.04	0.10	0.19	0.01	0.04		0.07
MainPower NZ	0.02	0.11	0.14	0.06	0.09	0.07	0.14		0.09
Network Waitaki	0.10	0.13	0.26	0.34	0.04	0.14	0.06		0.15
OtagoNet	0.05	0.21	0.30	0.33	0.19	0.08	0.10		0.18
Scanpower	0.52	0.22	0.15	0.16	0.04	0.09	0.19		0.19
The Power Company	0.17	0.22	0.20	0.42	0.16	0.15	0.25		0.22
The Lines Company	0.09	0.13	0.59	0.21	0.18	0.47	0.23		0.27
Buller Electricity	0.11	0.02	0.63	0.09	0.69	0.60	0.14		0.33
Centralines	0.24	0.45	0.38	0.15	0.28	0.48	0.31		0.33
Westpower	0.20	0.38	0.49	0.04	0.39	0.57	0.32		0.34
Eastland Network	0.35	0.69	0.86	0.51	0.31	0.56	0.93	0.36	0.57
Average	**0.17**	**0.24**	**0.37**	**0.22**	**0.23**	**0.29**	**0.25**	**0.36**	**0.25**

Figure 47: Peer group vegetation SAIFI contribution

SAIFI Vegetation %	2013	2014	2015	2016	2017	2018	2019	2020	Average
Alpine Energy	2%	4%	4%	4%	18%	1%	5%		5%
OtagoNet	3%	9%	11%	11%	9%	3%	5%		7%
MainPower NZ	1%	4%	12%	8%	9%	6%	13%		8%
The Lines Company	5%	4%	16%	6%	6%	13%	6%		8%
The Power Company	7%	9%	7%	11%	8%	6%	10%		8%
Buller Electricity	9%	2%	22%	7%	16%	14%	11%		12%
Network Waitaki	8%	8%	25%	26%	6%	10%	5%		13%
Centralines	10%	16%	18%	12%	18%	23%	18%		17%
Westpower	7%	25%	15%	3%	29%	23%	20%		18%
Eastland Network	11%	31%	24%	15%	9%	18%	27%	12%	18%
Scanpower	40%	18%	21%	27%	8%	25%	29%		24%
Average	**9%**	**12%**	**16%**	**12%**	**12%**	**13%**	**14%**	**12%**	**12%**

6.4.6 Fault restoration time

The fault restoration measures are new for the 2021 AMP and were not measured in FY2020.

6.4.7 How we are responding

Our analysis of our faults has exposed several key weaknesses in our network, both operationally and configuratively.

Based on these issues, we have produced several recommendations which we have included within our fleet plans, asset replacement plans, network development plans, and human resource allocations. These are summarised in the table below.

[34] The peer group comprises: OtagoNet, The Power Company, Centralines, The Lines Company, Scanpower, Network Waitaki, Buller Electricity, Alpine Energy, Mainpower. These companies had density below 8 ICP/km, and a proportion of overhead lines above 80%. It excluded EA Network and Marlborough Lines as these companies have invested more in assets, at over $60,000/km, compared to the peer group average of just over $40,000/km.

Table 13: Network key Issues and recommendations

Issue	Recommendation	Potential improvement
Adverse weather events have a material impact on some feeders, with the eight worst performing feeders accounting for 47% of the customer minutes lost to adverse weather.	• Undertake detailed condition inspections on the worst performing feeders over the next 12 months (in particular Whatatutu, Raupunga, Frasertown, Mahia, Mata) and undertake geographical correlation analysis between asset health and adverse weather faults on these feeders. • Undertake a specific review of the adverse weather fault clusters on the Whatatutu and Mata feeders following their inspection (noting that work is already planned on the Frasertown feeder).	10 SAIDI Minutes
The average duration for adverse weather outages over the last 10 years is just under 15 hours, compared to an average of just under 5 hours across all other fault types.	• Review the control room storm escalation procedures to check that these are being effectively implemented. This will be undertaken as part of the debrief following the next storm event.	
For some feeders, there is a significant difference between the impact from adverse weather when compared to other fault types.	• Undertake a review of the automation location vs. fault location on the Mata, Tauwhareparae, Raupunga, Frasertown, and Mahia feeders to confirm whether the locations are optimal.	
The Raupunga feeder generator is not optimally placed to support the Frasertown feeder in the event of a fault.	• Relocate the generator on the Raupunga feeder to a position closer to the tie switch (between the Raupunga and Frasertown feeders) and update the operating procedures accordingly.	
The impact of cable faults on the Borough 1 feeder are material due to the number of customers on the feeder and the limited alternative supply options.	• For the Borough 1 feeder, options will be investigated to increase automation (to reduce restoration time), and increase the capacity of the adjacent Brickworks feeder (to improve restoration capability).	4 SAIDI minutes
The Aberdeen feeder has had an ongoing issue with cable faults, and due to it being heavily loaded, the faults have had a material impact on reliability.	• For the Aberdeen feeder, the solution is to reduce the number of customers on the feeder. Presently, options are being considered to install a new feeder at the Gisborne substation which will almost halve the consumer numbers on the Aberdeen feeder. • For the Aberdeen feeder, undertake further analysis on the location of the cable faults to determine whether there are sections of cable that have deteriorated and require replacement.	2 SAIDI minutes
Conductor and connector outages have been increasing on a small number of feeders.	• Undertake detailed condition inspections on the following feeders over the next 12 months, with a particular focus on conductor and connectors: Frasertown*, Mahia*, Waimata, Dalton, and Whatatutu* (*	3 SAIDI minutes (assuming issues are found and resolved)

Issue	Recommendation	Potential improvement
	indicates that these feeders have been identified for inspection by the adverse weather review).	
There has been an increasing trend in switch related faults; however, no clear causal link for the increase has yet been established.	• Undertake analysis of the switch faults by asset type to determine if there is a trend in faults that indicates a potential deterioration in a type of switch or switches.	1 SAIDI minute (assuming issues are found and resolved)
There has been a material increase in the number of unknown cause outages, and for FY2020 this was well above the target of 5-7% (by fault count).	• For FY2021, new detailed fault analysis codes have been added to the faults database and weekly checks on the coding of faults are being implemented. Follow-up training will be provided if required.	None
Vegetation related outages continue to be a significant contributor to unreliability: • A small number of large outages are a key driver of the poor SAIDI and SAIFI performance. This is typically the result of trees through lines, and anecdotal evidence suggests these are forestry plantation related; • A relatively small number of high consequence vegetation events are impacting Eastland Network's 50kV subtransmission network particularly on the 50kV East Coast spur line; • Significant weather events affecting mainline and 11kV back up lines are contributing to a major % of vegetation related outages; • Long line 11kV feeders with limited/no backup supply are having a major effect on service levels on the distribution network; • Raupunga, Matawai, TikiTiki, Te Arai, and Mahia were the worst performing feeders.	We have responded to issues by way of developing a dedicated vegetation management. The key initiatives within this plan are discussed in more detail in Section 11.21.	

6.5 Asset management, utilisation and efficiency

We have included measures in relation to asset performance.

6.5.1 Underlying asset fault rate

The underlying fault rate is a measure of the performance of the network in areas where Eastland Network has a reasonable level of influence. It includes faults from defective equipment, adverse weather, and human error (and excludes lightning strikes, wildlife, third-party interferences and adverse environment).

Table 14: Underlying asset fault rate performance

Underlying asset fault rate (faults per 100km)	Target FY2020	Actual FY2020	Comments on variance
110kV overhead lines	0.9	0.3	Single outage at Tuai Substation with the cause unknown.
33/50kV overhead lines	3.64	3.57	Fault on T3 Mahia tap-changer which decreased reliability of line. It took several trip/close events to determine the cause of the fault as it was intermittent.
11kV overhead lines	12.2	10.7	Good performance on the 11kV line. Fault rate in line with annual SAIDI/SAIFI figures.

6.5.2 Defective equipment fault rate

The defective equipment measures are new for the 2021 AMP and were not measured in FY2020.

6.5.3 Asset utilisation

Table 15: asset utilisation measures

Asset utilisation measures	Target FY2020	Actual FY2020	Comments on variance
Asset per ICP	n/a	n/a	Not measured in FY2020.
Load factor	54%	59.6%	Slight increase indicates an improved utilisation of existing assets.
Capacity utilisation	23%	22.1%	The decrease in utilisation has links to minimum transformer sizes of 15kVA now used. Previously 10kVA or 5kVA transformers were used.

6.5.4 Losses

Whilst our losses appear high, we see these targets as acceptable as a network with low losses is a potential sign of over-investment. Presently, we do not foresee any investments to reduce losses.

Table 16: Loss measure

Losses	Target FY2020	Actual FY2020	Comments on variance
Loss Ratio	9.5%	9.0%	The decrease indicates better control of peaks which can also be influenced by weather patterns and temperature. The power factor correction on the 110kV line and the promotion of power factor correction in industry has contributed to the improvement in losses.

6.5.5 How we are responding

Planned power transformer replacements for the next three years will see a minor decrease in losses. In the long term, the planned capacitor installs on the 50kV line (refer Section 10.6.1) will also have a minor effect on losses, however, this will be offset by the disestablishment of the existing 110kV capacitor bank.

Load factor may vary depending on the response to the introduction of time-of-use (TOU) pricing.

6.6 Delivery

6.6.1 Capturing condition information to support the new asset health assessment

This year we introduced a new method of assessing asset health using the DNO Methodology and have commenced capturing condition data to support the new methodology. We are now

measuring progress against our inspection work and although the measurements are new for the 2021 AMP, as at 31 January 2021, we are on track to meet the annual targets. We will provide a full report in our 2022 AMP.

6.6.2 Completion of planned work

We are looking to measure the progress we are making on completing planned work. Our measurements cover both financial and physical progress.

Table 17: Measures for the completion of planned work

Expenditure category	Target FY2020	Actual FY2020	Comments on variance
System growth (financial)	939	485	Underspent by 48% due to underspend in unplanned expenditure for 11kV and 400V cables. Also, the Makaraka – Awapuni 11kV link project came in under budget by $85K due to ground conditions being easier than predicted. Transformers used were from existing stock which also decreased the cost.
System growth (work order completion rate)	n/a	n/a	Not measured in FY2020.
Asset replacement and renewal (financial)	7,589	8,104	7% overspend due to slightly higher costs in relation to the transformer replacement projects at Tuai and Matawhero.
Asset replacement and renewal (work order completion rate)	n/a	n/a	Not measured in FY2020.
Reliability, safety and environment (financial)	463	131	Underspent by 72% due to Galvanised box project not being completed. The introduction of asbestos training and setup for the replacements has significantly reduced the replacement rate for this project. We have forecast replacements for the next three years at a significantly lower rate.
Reliability, safety and environment (work order completion rate)	n/a	n/a	Not measured in FY2020.

6.6.3 How we are responding

It is noted that system growth projects and projects in general have been underspent due to the nature of the projects allocated to this category. A large contributor to this is the Mahia upgrade project. This project has been deferred since 2014/15 due to its complexity. The reasons for not completing the project are listed below:

- It has been difficult to purchase and/or lease land in the area to extend our 33kV line towards the township;
- We have not allocated enough resources to the project;
- The triggers which have been driving the project have been offset by using a 1MW diesel generator, consequently reducing the importance of the project.

To assist with this project and with completing our forecast expenditure, we are beginning a campaign to strengthen our in-house capabilities by introducing several key positions/resources into our operations team to assist with the workload. We are also communicating with external contractors and beginning the process of granting them network approval so that our contractor capabilities can sustain the expenditure requirements/levels.

6.7 Financial sustainability

Table 18: Measures for financial sustainability

Expenditure category	Target FY2020	Actual FY2020	Comments on variance
ROI (post-tax nominal WACC equivalent)	6.44%[35]	8.67%	Earnings were higher than WACC due to the additional ACOT revenue associated with the acquisition of the transmission assets in FY2015. This additional revenue ceases in FY2021.

[35] The WACC for the DPP2 regulatory period.

Part 2:

Our asset management policy, strategy, and service levels

7 Asset Management policy and strategy

This section provides an overview of our objectives for managing our network assets. The asset management policy and strategy are a set of principles and objectives that respond to the issues raised in Sections 3 to 6.

7.1 Overview

In this section we have outlined our revised asset management policy and strategy.

The purpose of our asset management policy is to set out our principles that will guide the direction and approach for managing the electricity network to achieve Eastland Group's overall corporate strategy. The policy is also our pledge of stewardship for our assets.

In establishing this policy, we have considered and incorporated Eastland Group's strategy, our stakeholder interests; and, the operating context and material network issues.

The purpose of our asset management strategy[36] is to set out our initiatives that will enable us to meet our corporate strategy. Our strategy has been established in response to the operating context and network issues outlined in Section 2.2. These initiatives will guide the specific programmes and projects within our asset management plan.

7.2 Asset management policy

We have revised our asset management policy to reflect the current context for Eastland Network. The policy was approved by the Board on 18th March 2020.

Asset management policy

To support Eastland Group's strategy, Eastland Network is committed to delivering sustainable returns for its shareholders, providing services that meet customers' needs, and supporting the growth and prosperity of the Tairāwhiti and Wairoa regions.

Effective asset management is the foundation upon which we will meet this commitment, and at all levels of the organisation we will work to:

- Ensure the safety of the public, our staff, and contractors;
- Develop, renew, and maintain our network in a way that meets the current and evolving needs of our customers;
- Recognise the socio-economic diversity of our customers and deliver a cost-effective service;
- Ensure that our asset management decisions are based on an evaluation of options that consider life cycle costs, benefits, and risks;
- Report proactively and transparently on our investment plans, service performance, and risks, and consult with stakeholders where appropriate;
- Implement effective asset management systems and processes, including the capture and retention of information on our assets;
- Operate in an environmentally sustainable and ethical manner;

[36] In ISO 55001, these are referred to as objectives.

Asset management policy
• Meet all statutory and regulatory obligations; • Continually improve our asset management systems; • Develop our resources and capabilities, both internally and externally, to deliver our plans.

7.3 Asset management strategy

In light of the key issues facing the network, and the direction established by the asset management policy, we have developed a strategy to shape our asset management activities over the next decade.

Our asset management strategy sets the direction for managing our electricity network assets. It has been developed with attention to:

- Describing the key objectives and initiatives that will be pursued to achieve our asset management policy over time;
- Delivering a service that complies with our regulated quality thresholds;
- Driving our continuous improvement programme to ensure we continue to be an efficient and effective network business.

Our asset management strategy consists of seven initiatives:

Initiative	Description
1. Improve network resilience	The resilience of the network to adverse weather events will be enhanced through a combination of Eastland Network's vegetation management plan and its distribution network automation and security enhancements.
2. Enhance vegetation management activities	Implement Eastland Network's vegetation management plan, which includes: • Optimising expenditure in high priority areas. • Intensive subtransmission vegetation management; • Forestry owner engagement to achieve acceptable plantation fall zone clearances and harvesting clearances; • Early • detection of vegetation hazards through SCADA monitoring of earth fault pick-up (pre-trip); • Improving maintenance of existing line corridors.
3. Enhance asset fleet plans	We will maintain asset fleet plans using the DNO common asset indices for our key assets to ensure we effectively manage the performance of our ageing network assets.
4. Increase the level of automation, protection, and	We will pursue a range of initiatives to enhance the security of the network. These will include: • Increasing the use of network automation (sectionalisers and reclosers) to minimise the impact of outages.

Initiative	Description
distribution backup	• A review of distribution protection discrimination to ensure it is operating effectively. • Implementing extension may be feasible to enhance 11kV backup on key feeders.
5. Develop solutions to cater for step-change industrial growth	To prepare for step-change growth, we have developed a "base case" network solution to increase network capacity into Gisborne. Over the next 12 months, this solution will be further enhanced and optimised to support Eastland Group's development of non-network solutions to provide capacity within the region.
6. Improve our asset management practices and asset information	• We are targeting lifting our asset management maturity assessment score from 2.3 (out of 4) to 3.0 by the end of 2023. • Over the next 12 months, our focus is on ensuring quality condition information is captured through our inspection and testing programs. • For 2022, our focus will turn to making network performance improvements on the back of better analysis, continuing to build the quality of our AMP, and embedding a new structure and competencies. By 2023, we will be focusing on continuous improvement. • Bedding in the new SAP, ERP and Esri GIS which went live in November 2020. The SAP and ESRI projects provide information and functionality to support the improvements in our asset management processes. The functionality provided includes: asset management, works management, project management, field mobility, consolidated asset registers, and geospatial mapping and analysis.
7. Be prepared to respond to technology change	We are forecasting an increase in solar PV penetration, batteries, and electric vehicles. The increase in the use of these technologies will have an impact on the network, however, given the low starting point, and the modest growth rates (due to socio-economic constraints), we are not expecting any material issues before the mid-2030s. However, over the next 2-3 years, we need to commence preparatory work to minimise any network cost impacts and to ensure there are no constraints on customers' use of new technology.

8 Service levels

This section presents the service levels we have adopted to measure our performance over the coming years. We are seeking to measure factors that will enable us to determine whether our asset management strategy is effective over the long term.

8.1 Introduction

The service levels cover:

- Safety;
- Customer service;
- Network reliability;
- Asset utilisation and efficiency;
- Delivery;
- Financial sustainability.

These measures encompass all areas of stakeholder interests, and reflect the broad range of outcomes we are expecting as a result of good asset management.

8.2 Safety

Eastland Group is committed to providing and maintaining a safe and healthy environment for all its employees, contractors, customers and the public. Eastland Network shares this commitment.

Electricity businesses operate in high-risk areas which pose risks to our staff and contractors. The following safety targets have been established as a direct result of the policy and as a driver to improve health & safety performance. In saying that, Eastland Network's target of zero harm is the only target we should strive for, given the significance of the consequences should the target not be met.

Table 19: Eastland Network safety targets

Event / Incident Description[37]	FY2022 to FY2026 Target
Serious harm to employees resulting in lost time	0
Serious harm to any member of the public	0
Serious damage to company property and equipment	0
Serious damage to public property	0

8.3 Customer service

8.3.1 Customer survey

Our consumers' experience is ultimately the measure of how well we operate as a company in providing electricity to the region. Therefore, it is important to note the issues, performance levels, and expectations of our consumers.

[37] As a direct result of equipment owned or operated by Eastland Network

Each year we conduct a customer survey that contains qualitative and quantitative measures. The qualitative results help to inform our strategies and priorities, and the quantitative measures provide us a view of our customer service. Targets are only set for quantitative measures, and are shown below:

Table 20: Summary of customer survey targets

Areas	FY2022 to FY2026 Target
Reliability	Greater than 80% of customers rating this good to excellent
Reliability (when outages occur)	Greater than 80% of customers rating this good to excellent
Pricing	Greater than 80% of customers rating this good to excellent
Communication	Greater than 80% of customers rating this good to excellent[38]

8.4 Network reliability

To support our two customer service metrics in relation to reliability, we have set network reliability measures across three areas:

- Overall network reliability;
- Vegetation outage performance;
- Fault restoration time.

8.4.1 Overall network reliability

To measure network reliability, we have set targets for the next five years against the following key measures:

- **SAIDI (System average interruption duration index)** is the measure of how many system minutes of supply are interrupted per year;
- **SAIFI (System average interruption frequency index)** is the measure of how many systems interruptions occur per year.

These measures are consistent with industry standard practice, the information disclosure, and electricity distribution regulatory regimes.

In April 2020, Eastland were given a new set of reliability targets under the DPP regime. These targets were based on a review of our historical performance and are in place for the 5 years ending March 2025. These targets are linked to financial and future target incentives.

Figure 48: Planned SAIDI targets

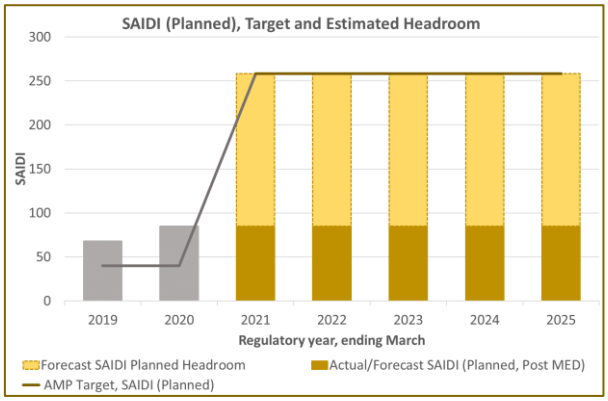
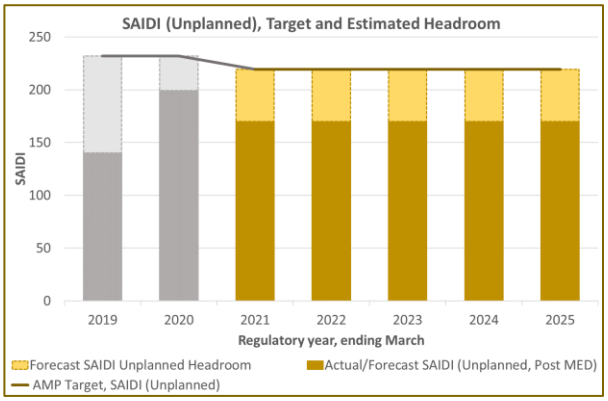


Figure 49: Unplanned SAIDI targets



[38] These questions related to answering the phone, advice on planned outages, and advice on technical matters.

Figure 50: Eastland Network's Planned SAIFI targets

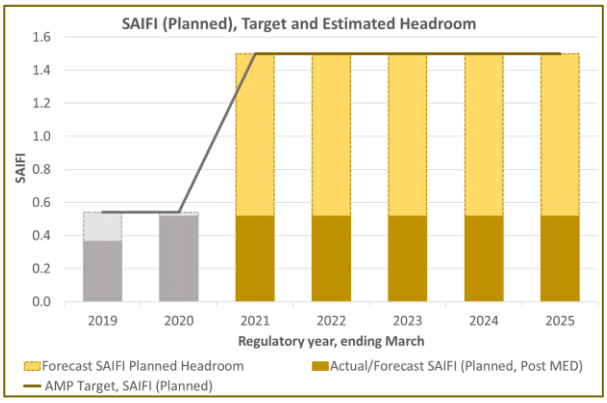
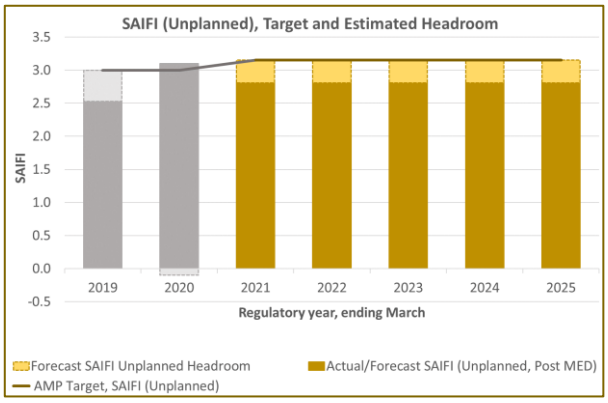


Figure 51: Eastland Network's unplanned SAIFI targets



8.4.2 Vegetation outage performance

The impact of vegetation on our network and the increasing effect it is having on network reliability has driven the need to monitor how we perform in this outage category. During FY2021, we included additional outage categories to capture more information on the types of vegetation faults we are having, to increase our understanding of where our vegetation expenditure is most effective (refer asset lifecycle plans, vegetation, Section 11.21). We have developed the following targets to measure our progress on vegetation management.

Figure 52: Vegetation SAIDI targets

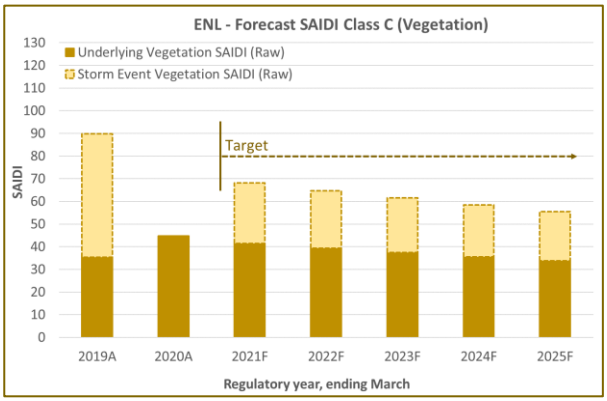
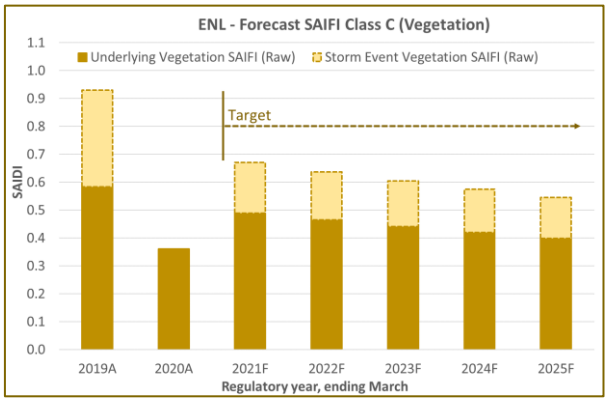


Figure 53: Vegetation SAIFI targets



8.4.3 Fault restoration time

We have developed the following measures to determine how well we are doing at restoring supply following a fault:

Table 21: Fault restoration targets

Category	FY2021	FY2022	FY2023	FY2024+
Percentage of urban customers restored within 3 hours.[39]	>78%	>FY21	>FY22	>FY23
Percentage of rural customers restored within 6 hours.[40]	>75%	>FY21	>FY22	>FY23

The target has been set based on achieving a year-on-year improvement in restoration times over the next 5-years.

39 The baseline is based on the 75th performance between FY2013 and FY2019.
40 The baseline is based on the 75th performance between FY2013 and FY2019.

8.5 Asset management, utilisation and efficiency

Complimentary to the network reliability targets, we have included measures in relation to asset performance. These measures should improve over time, as a result of our asset management practices.

8.5.1 Underlying asset fault rate

We have included a measure of the underlying asset fault rate. Inherent in operating a diverse and widespread distribution network are circumstances which are beyond our control (or where controls are uneconomic that they are not worth implementing). We have therefore removed some outages caused by lightning strikes, wildlife, third-party interferences and adverse environment. The resulting measure provides an indication of the asset performance in relation to areas that are generally under our control (e.g. defective equipment, adverse weather, human error).

Table 22: Underlying asset fault rate targets

Underlying asset fault rate (faults per 100km)	FY2021 to FY2026
110kV overhead lines	0.9
33/50kV overhead lines	3.64
11kV overhead lines	12.2

8.5.2 Defective equipment fault rate

To provide further measurement of the reliability of different types of assets, we have established a range of asset type performance measures.

Table 23: Underlying equipment fault rate targets

Faults per equipment type[41]	Unit of measure	FY2021 to FY2026
Zone substation equipment	No.	<2
Pole (wooden and concrete)	Per 10k units	<6
Pole (insulator, crossarm)	No.	<13
Conductor (incl. jumpers and joints)	Per 100km	<1.7
Underground cable (incl. termination)	Per 100km	<10.6
Ground mount transformer	No.	<2
Pole mount transformer	No.	<3

These asset class performance targets are based on historical performance and have not been compared to any industry standards or other similar businesses. However, we see it as important to set our own standards for individual assets which have a significant impact on our reliability.

8.5.3 Asset utilisation

Eastland Network's asset utilisation measures are defined by the following indicators:

- Asset per ICP = Value of RAB / No. of ICPs;
- Load factor = kWh's entering network during the year / (Max demand for the year x hours in the year);

[41] Based on historical average

- Capacity utilisation = Maximum demand for the year / installed distribution transformer capacity.

It should be noted that the asset utilisation measures are predominantly determined by the network configuration. Over the planning period, we expect to maintain a steady state position.

Table 24: Asset utilisation targets

Asset utilisation measures	FY2021 to FY2026
Asset per ICP	$6,472
Load factor	54%
Capacity utilisation	23%

8.5.4 Losses

The measurement of losses is a very broad measure of efficiency of the network. With that said, reducing losses requires additional investment in assets.

Eastland Network's losses are measured as follows:

- Loss ratio = kWh's lost in the network during the year / kWh entering the network during the year

Table 25: Loss targets

Losses	FY2021 to FY 2026
Loss Ratio	9.5%

8.6 Delivery

Our delivery measures cover two areas:

- The capturing of condition information to support asset health assessments;
- Completion of planned work.

8.6.1 Capturing of condition information to support the new asset health assessment

This year we introduced a new method of assessing asset health using the DNO Methodology. In our asset fleet plans, we have developed strategies and revised budgets to increase the level of inspection for the next three years, to complete the input data required of this methodology. By completing the inspections, the level of investment required to maintain our network and asset renewal rates will become clearer.

We have set the following targets for each major asset type based on the number of assets within the fleet:

Table 26: Targets for the capture of asset condition information

Asset class	Fleet quantity	Unit	Yearly inspection target	Projected year to complete all inspections
Wooden structures	17,921	No	6,000	2024
Concrete structures	16,747	No	5,700	2024
Conductor (110kV)	307	Km	Awaiting industry inspection methodology	TBA

Asset class	Fleet quantity	Unit	Yearly inspection target	Projected year to complete all inspections
Conductor (33/50kV)	336	Km	Awaiting industry inspection methodology	TBA
Conductor (11kV)	2,387	Km	Awaiting industry inspection methodology	TBA
Conductor (400V)	505	km	Awaiting industry inspection methodology	TBA
Zone Substations - Power Transformers	45	No	45	2021
Substation Switchgear (Subtransmission)	45	No	45	2021
Substation Switchgear (Distribution)	120	No	120	2021
Ground Mounted Transformers	548	No	280	2023
Distribution Switchgear (RMU)	262	No	140	2023
Distribution Switchgear (Except RMU)	77	No	40	2023

8.6.2 Completion of planned work

We are looking to measure the progress we are making on completing planned work. Our measurements cover both financial and physical progress.

Table 27: Targets for the completion of planned work

Expenditure category	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026
System growth (financial)	$1,002k	$1,741k	$2,091k	$1,891k	$1,091k	$4,366k
System growth (work order completion rate)	85%	90%	95%	95%	95%	95%
Asset replacement and renewal (financial)	$7,785k	$7,324k	$7,086k	$6,423k	$7,366k	$7,109k
Asset replacement and renewal (work order completion rate)	85%	90%	95%	95%	95%	95%
Reliability, safety and environment (financial)	$498k	$235k	$306k	$261k	$695k	$995k
Reliability, safety and environment (work order completion rate)	85%	90%	95%	95%	95%	95%

The work order completion rate is a new measure and the targets may alter following our first year of measurement to ensure our rate of improvement is reasonable.

8.7 Financial sustainability

Maintaining financial sustainability is essential to enable Eastland Network to retain sufficient earnings to fund future capital works. The target WACC has dropped materially from 6.44% to 4.23% (post-tax nominal WACC) due to material reductions in the risk-free rate.

Due to the indexation of the RAB being recognised as regulatory income, the cash returns to the business have materially reduced. Whilst cash funding is provided through the depreciation charge included in the building block revenue allowance, this is insufficient to fully fund capex as Eastland

Network's capex forecast is materially higher than depreciation. Due to indexation, there are limited retained earnings available to assist with the equity funding of capex.

The low WACC will require a higher debt funding of capex, which will increase the financial risk associated with the business. Over the long term, this may constrain capex.

Table 28: Targets for financial sustainability

Expenditure category	FY2021 to FY2025	FY2026 to FY2030
ROI (post-tax nominal WACC equivalent)	4.23%	TBC

The targets reflect the post-tax nominal WACC allowed in the DPP3.[42] The regulatory returns for the DPP4 have not been set.

[42] Commerce Commission, "[2019] NZCC12 Cost of capital determination for electricity distribution businesses' 2020-2025 default price-quality paths and Transpower New Zealand Limited's 2020-2025 individual price-quality path", 25 September 2019.

Part 3:

How we are implementing our asset management policy and strategy and achieving our service levels

9 Asset Management Roadmap

This section provides a summary of progress against the targets set out in our asset management roadmap (approved by the Board in FY20). The roadmap covers our asset management processes, systems, and information and maturity, and is a key driver of our non-network expenditure.

9.1 Introduction

In our 2020 AMP, we outlined our roadmap for improving our asset management practices. In this AMP, we have updated our progress against the roadmap.

We have incorporated an overview of our asset management processes, systems, and information.

This section includes details of our business support, system operations, network support opex and non-network capex. These expenditure categories are heavily influenced by the roadmap, and the increasing economies of scope within Eastland Group.

9.2 Improvements in asset management practices

9.2.1 Recap on our starting point

In FY2020, we developed an asset management roadmap to lift the quality of the management and stewardship of our electricity network assets. At the time, our asset management maturity assessment score was 2.3 (out of 4), meaning we were aware of good practices and had commenced work in applying those practices. When we established the roadmap, our maturity was below the industry average, and was well below the upper quartile.

9.2.2 Asset management improvement roadmap

The objective of the roadmap is to transition Eastland Network to a fully proficient asset manager over the next three years. We will measure our success through improvements in our asset management maturity that are disclosed as part of our AMP, and through the achievement of a series of measurable goals.

The objective of the asset management roadmap is to transition Eastland Network to a fully proficient asset manager by the end of FY2023

Table 29: Status of asset management roadmap goals

Goals	Due Date	Status
(a) To ensure that there is suitable information to support asset management decision making	October 2020* October 2021+	Complete In progress
(b) To prepare a comprehensive 2021 AMP that fully addresses the identified asset management issues and strategies	March 2021	Complete
(c) To have a robust system to provide assurance to the Board over the effectiveness of AM activities and compliance with regulations	March 2021	Complete

Goals	Due Date	Status
(d) To have a systematic, and evidence-based asset management process	March 2022	In progress, on track
(e) Develop the key elements of an asset management system consistent with ISO 55000, which are appropriate for Eastland Network	March 2022	Limited progress, but on track
(f) Achieve an overall assessment management maturity of 3, being a fully competent asset manager	March 2023	On track

* For key assets classes of wooden poles, concrete poles, steel structures, distribution lines, and subtransmission lines.
+ Other material asset classes.

We are targeting to achieve a score of 3.0 by the end of FY2023, which means we will have implemented the main elements of ISO 55000 in a coordinated manner. We consider that targeting a maturity level of 3 is appropriate and consistent with current regulatory expectations for the industry. We selected a three-year timeframe to allow sufficient time to build the necessary IT, information, and organisational capabilities that are required for level 3 maturity.

In the roadmap, our focus for FY2021 was on the following items:

Table 30: Status of FY2021 focus areas

Focus for FY2021	Status
Having a well-defined asset management policy and strategy	Complete. Refer to the asset management policy and strategy included in this AMP.
Having well defined life-cycle fleet plans for key asset classes	Complete. Refer to the fleet plans included in this AMP.
Improvements to asset information on the back of the SAP and GIS project	Complete. Project Highway went live on 01 November 2020.
Ensuring quality condition information is captured	Complete. New inspection standards have been developed aligned to the DNO Methodology, and inspections are underway.

For FY2022, our focus will turn to making network performance improvements on the back of better analysis, continuing to build the quality of our AMP, and embedding a new structure and competencies. By FY2023, we will be focusing on continuous improvement.

9.2.3 Targeted improvements in asset management maturity

Completion of the roadmap will support Eastland Network to realise value from its electricity network assets. Good asset management supports the realisation of value while balancing financial, environmental, social, risk, quality of service.[43] We believe that the benefits will materialise through a better understanding of our assets, more effective risk management, and a more optimal mix of expenditure and service levels. Importantly, we will be seen by the Commerce Commission as a competent asset manager, which is important given their increasing focus on asset management.

9.2.4 Progress over the past 12 months

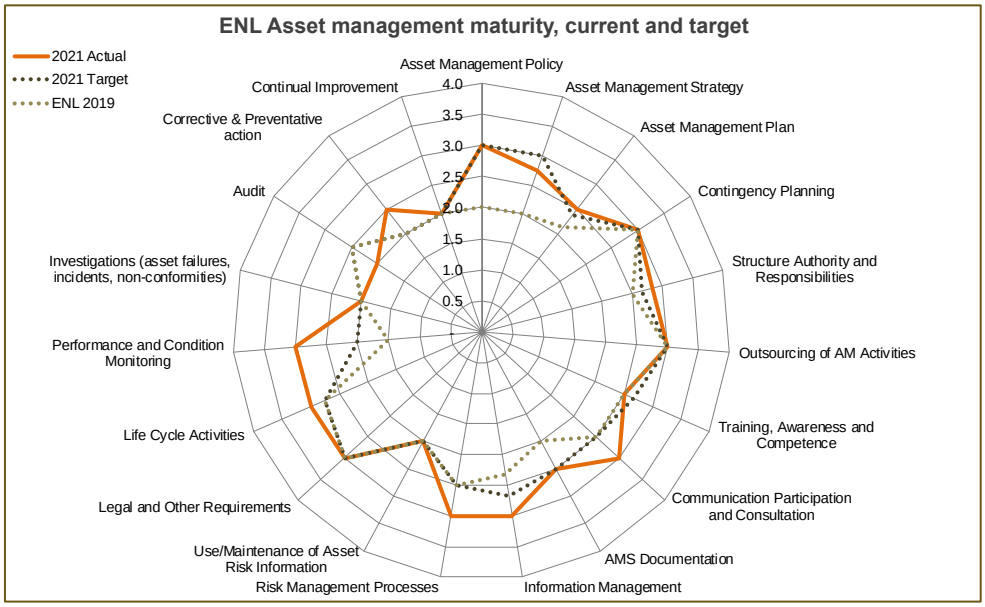
Figure 54 presents our asset management maturity (by key assessment areas) for FY2021. The score for FY2021 is 2.7, which is ahead of the target of 2.5 set in the asset management roadmap for FY2021, and well ahead of the last assessment in 2019 of 2.3. The key areas that have improved are:

[43] Refer ISO 55000, at Section 2.2.

- Our asset management policy, strategy and plans areas have improved due to better communication in relation to our policy and strategy, and due to the improvements made to our asset lifecycle plans;
- Our documentation in relation to asset management information systems and data has improved as a result of project highway and the work undertaken verify and improve asset data quality;
- Our risk management work has improved, in particular in relation to the identification of asset type risks within the asset fleet plan;
- Our communication in relation to asset management has improved through the introduction of the asset management committee and through improvements made to the content of other meetings (i.e. the monthly works meeting);
- Our performance and condition monitoring has improved materially. This is a result of the work we now do to review performance (particularly in relation to reliability) and the development of new condition monitoring standards and data capture (which has led to improved asset health data).

We are on track to achieve an AMMAT score of 3 by the end of FY2023.

Figure 54: Asset management maturity (2021)



9.3 Information systems

9.3.1 Core information systems

Eastland Group successfully implemented a new ERP and GIS system during FY2021 (known as project highway). Eastland Network information systems now comprise:

Table 31: Eastland Network's primary information systems

System	Provider	Functionality	Data held
Enterprise resource planning	SAP/ZAG	• Asset management • Works management • Project management • Materials management and purchasing • HR	• Asset health • Asset age • Asset attributes • Project costing • Asset financial information

System	Provider	Functionality	Data held
		• Finance • Business intelligence and reporting • Asset registers	
Field mobility	Blueworx	• Field mobility for contracting teams	• Asset condition
Geographical information system	ESRI	• Mapping and geospatial analysis	• Geospatial data • (visibility of asset data held in SAP)

These systems were implemented by Eastland Group, and Eastland Network (as well as other divisions e.g. Eastland Port etc.) is allocated the costs associated with these systems via charges from Eastland Group. These charges are included in the business support costs detailed below.

The new systems went live in November 2020. As with any major project, there is a number of post go-live activities to complete over the coming year to fully bed-in the new processes and systems.

9.3.2 Other information systems

In addition to the three core systems, Eastland Network also operates a number of other systems which directly support the network business. These include:

Table 32: Eastland Network's other information systems

System	Provider	Functionality	Data held
Risk Manager	Impac	• All aspects of risk management, H&S	• Risks, controls, incidents, etc.
Fault Database		• Recording of network HV outages	• Network outages • SAIDI and SAIFI
DNO asset health assessment	Excel	• Calculation of asset health as per the DNO Methodology	• Current asset health • Forecast asset health • Asset condition (copy from Blueworx)
Billing	Gentrack	• Billing	• ICP information (but no customer details) • Consumption • Demand (for demand customers)
Demand forecasting model	Excel	• Forecasting of connections, consumption and demand	• Forecasts of connections, consumption and demand
Network modelling	PSS SINCAL	• Power system simulation and utilisation modelling	• Network connectivity model
Network modelling	LV Drop	• Low voltage design	• n/a
Substation management system	Various providers	• Remote access to the major substations for download of log information and reconfiguration of equipment	• Log and event information and protection settings
Line design	CATAN	• Structural engineering/line design	• Existing line designs, pole structure and component library
CAD	Bentley Microstation	• Drafting for design drawings and schematics	• Schematics • Substation drawings

System	Provider	Functionality	Data held
Drawing files	Manual records	• Historic inspection records and as-built drawings	• Manual drawings for functionality
Filing system	Manual and electronic records	• Storage of data (i.e. property files)	• Historical asset condition and maintenance information

Eastland Network had previously budgeted for a new billing system, however, changes to the existing Gentrack management and business strategy (with a refocus on the New Zealand energy sector) have provided opportunities for productive discussions on operational performance and services provided by Gentrack. Product upgrades to align with regulations and better service provision has meant that the billing system now meets the operational needs of our business and there is no perceived need to upgrade to a new billing system.

Now Project Highway is completed, we will be reviewing the systems outlined in Table 32 for renewal and/or functionality enhancements. We expect to include an initial view on this in the 2022 AMP.

9.3.3 Cyber security

Cyber security is provided by Eastland Group as part of the provision of the core IT platform and system. Security measures include policies, audits, monitoring, and management of change procedures.

Eastland Group has partnered with an IT security consultancy and committed to a cyber security improvement program (CIP) for the next 3 years. The expectations are that the program will identify both critical and non-critical compliances that will lead to improvement opportunities.

9.4 Targeted improvement in information quality and asset management analytical support

A key outcome of the ERP and GIS projects is to improve the business processes, information quality, and analytical support for asset management. The key improvements being targeted, and their current status, are shown in Table 30 below.

Table 33: Status of data quality improvements

Data quality improvements	Status
All key asset management processes will be supported by the ERP and associated systems, including the field capture of information	Complete and operational
Improving data accuracy for the asset register, asset age, and asset condition[44] from 1 to above 3[45] for key asset classes	This is progressing to plan
Implementing advanced asset management and expenditure analysis across the ERP and GIS	Not yet commenced

9.5 System operations and network support costs

As we noted in our 2020 AMP, implementing the roadmap will increase system operations and network support (SONS) costs through a combination of an increase in personnel and a modest

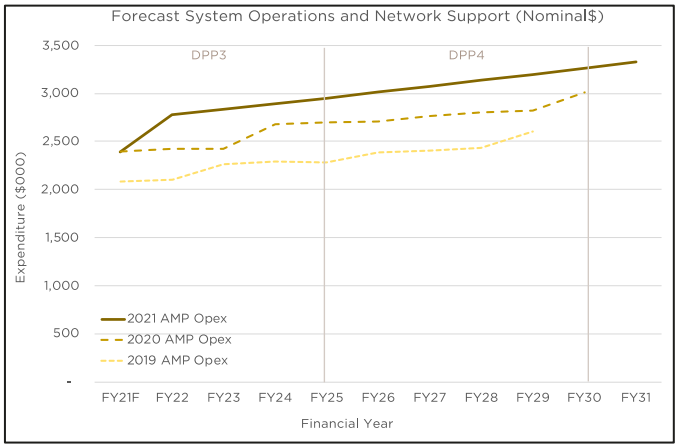
[44] These improvements will be observable in AMP schedule 12a, ID schedule 9a and 9b.
[45] A Data quality score of 1 means "that good quality data is not available for any of the assets in the category and estimates are likely to contain significant error", a data quality score of 3 means "that data is available for all assets but includes a level of estimation where there is understood to be some poor quality data for some of the assets within the category", and a data quality score of 4 means "that good quality data is available for all of the assets in the category.

increase in consultancy support. Whilst we have improved our systems (via project discovery), we have also needed to increase our resourcing to undertake more sophisticated asset management activities. These cost increases can be seen in Figure 55 below. Details of the current organisational structure are discussed in Section 2.4.

SONS costs are also increasing due to higher easement procurement costs and additional consultancy fees in relation to specialist engineering work (i.e. seismic assessments).

Overall, SONS costs are forecast to increase by $2.8m (over the comparable planning period).

Figure 55: Changes in system operations and network support forecasts



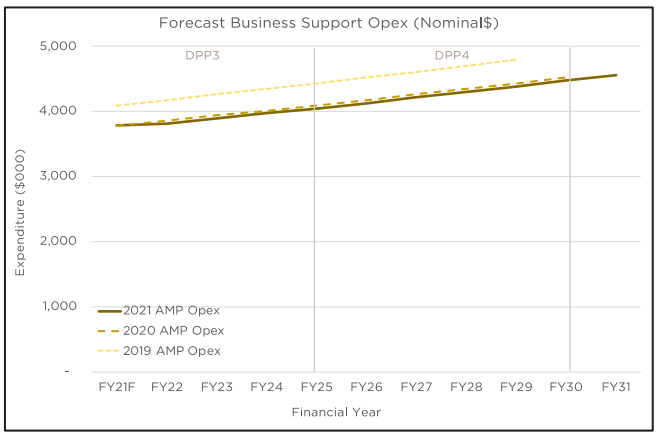
9.6 Business support costs

The scope and scale of Eastland Group continue to improve as a result of growth in its port, airport, and generation businesses. Eastland Group's corporate services (which also support Eastland Network) have not increased at the same rate, resulting in greater economies of scope (refer to Figure 56 below).

In the 2021 AMP, there was a reduction in corporate charges to Eastland Network of $0.4m over the comparable forecast period. This reduction was lower than forecast in the 2020 AMP due to the additional costs associated with the implementation of the new ERP and GIS.

Whilst the implementation of new systems has tempered the potential cost reductions, we now have access to the best-in-class IT systems that would not be economically feasible if Eastland Network was a small standalone EDB.

Figure 56: Changes in business support forecasts



9.7 Non-network capex

Non-network capex includes expenditure on items and assets such as vehicles, buildings, software etc. These items are used as part of the cost of maintaining the network support function. Other assets, such as corporate IT infrastructure, phone systems, and shared corporate software are managed by Eastland Group and are recognised under business support opex.

9.7.1 Earthquake strengthening and refurbishment work

The Eastland Network's team currently reside in outdated office areas that were originally part of the Power Board depots. The offices in Wairoa are due for refurbishment and earthquake strengthening, which has resulted in a $200k increase in non-network capex across FY2022 to FY2023. This increase was due to an increase in the scope of the works required to bring the Wairoa depot up to standard. It was decided that the best course of action is to demolish the existing building and develop new premises.

9.7.2 Vehicles, tools and safety equipment

Eastland Network operates a fleet of 16 cars/utility vehicles, 7 fault vehicles, and 1 generator truck. There is an ongoing program of replacement for these vehicles. This replacement program averages $124k p.a. over the next 10 years.

Eastland Network also has a substantial budget for various items of testing and safety equipment. This averages $26k p.a. over the next 10 years. This includes items such as relay test equipment, earthing sticks, and equipment that our engineers may require when attending site faults, testing relays, or completing other field operations.

Expenditure on both vehicles and test equipment has increased over the planning period to accommodate the renewal of several key pieces of test equipment including a fault locator, megger etc. Eastech's operations have been shifted into the network as part of the project highway (SAP) process, and vehicle replacement rates have been altered to accommodate these additions. There is also expenditure required on EWP vehicles.

9.7.3 Overall non-network capex

Overall, non-network capex has increased by $1.7m in this AMP (over the comparable forecast period in the 2020 AMP). The reasons for the change are the inclusion of an ongoing provision for vehicle replacements, and other asset replacements that were included in prior AMPs.

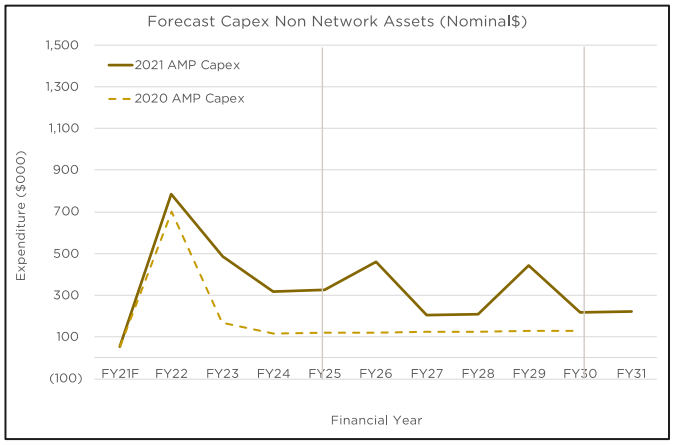
As noted in Section 9.3, IT systems are provided by Eastland Group and the associated charges are included in business support costs. Hence there is no non-network capex related to IT systems.

Table 34: Non-network capex forecasts

Projects	FY2022	FY2023	FY2024	FY2025	FY2026
Depot refurbishments and upgrades	350	170	-	-	-
General building capex	68	20	20	20	20
Vehicle replacement	160	120	120	120	180
General asset replacement (incl test equipment)	46	46	46	46	46

Values in March 2021 constant $(000's)

Figure 57: Changes in non-network capex forecasts



10 Asset lifecycle plans (network development)

This section describes our plans for the development of the network to meet forecast load growth, to improve the security and reliability of the network, and to respond to the energy transformation.

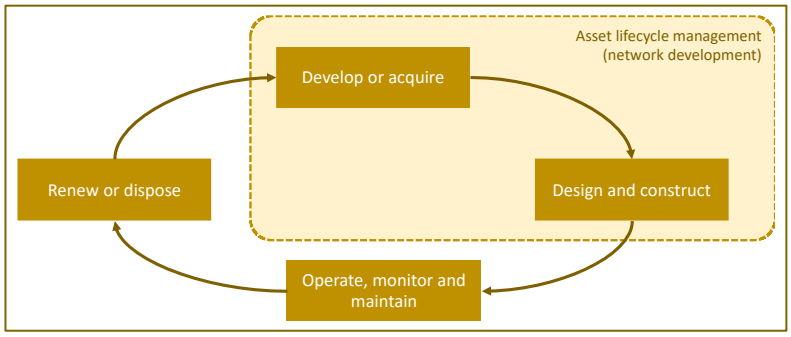
10.1 Introduction

This section identifies and discusses the *develop or acquire* phase of Eastland Network's asset lifecycle. This section also covers some aspects of the *design and construct* phase.[46]

Eastland Network's approach to network planning (i.e. whether to acquire or develop an asset) typically encompasses the following steps:

- Assessing the network (by network element) against the planning criteria to determine if there are indicators that development required. This also includes consideration of the initiatives and actions within the asset management strategy (that relate to step-change growth, and security and reliability enhancements);
- Where indicators are present, developing a concept solution, which considers alternatives, non-network solutions, energy efficiency, risk, and economic viability;
- Prioritisation of the concept solution against other projects;
- When the project makes it through the first three steps, it will be included in the AMP and progress through to the detailed design and construction phase.

Figure 58: Phases of the asset lifecycle



In this section, we cover the drivers for network development including:

- The linkage to the asset management strategy;
- An overview of our network planning criteria;
- Demand forecasts;

We then discuss the impact of the drivers on system development activities including:

- System developments to meet demand and security requirements;
- System developments to meet reliability requirements;
- Our preparation for, and responses to, the energy transformation;
- A summary of expenditure forecasts.

[46] A description of the phases of the asset lifecycle are provided in Section 2.6.

10.2 Asset management strategy drivers

Eastland Network's asset management strategy is a key driver of network development. In this section, we outline how we are giving effect to the following initiatives that form part of the asset management strategy:

- Developing solutions to cater for step-change industrial growth;
- Reviewing areas of the network where extension may be feasible to enhance 11kV back-up on key feeders;
- Improving the use of network automation (sectionalisers and reclosers) to minimise the impact of outages;
- Review of distribution protection discrimination to ensure it is operating effectively;
- Early detection of earth fault hazards (e.g. vegetation) through SCADA monitoring of earth fault pick-up (pre-trip).

10.3 Network planning criteria and standards

10.3.1 General development planning criteria

The consideration of the need for network development is triggered when one or more planning criteria is reached. The planning criteria include: capacity, security, reliability, voltage, and location, and are shown in Table 35 and Table 36 below.

The development of the solution requires an assessment of alternatives, an evaluation of risk, and the optimisation of timing. This typically involves engineering judgement to weigh-up the factors and trade-offs, both when the solution is being developed, and when the solution is being prioritised against competing projects. We have provided a high-level overview of these judgements in the discussion of the projects later in this section.

Table 35: General planning criteria

Network element	Capacity trigger	Security trigger	Reliability trigger	Voltage trigger	Location trigger
Subtransmission and transmission feeders	Load exceeds 66% of thermal rating more than 3,000 half-hours per year. Load exceeds 100% of thermal rating more than 10 consecutive half-hours per year.	Demand exceeds current security (refer Table 36).	Fault rate above industry standards and/or identified as a worst performing feeder.	Voltage depression that cannot be compensated for at substations.	Load cannot be reasonably supplied by distribution configuration therefore requires new subtransmission lines or cables and zone substation.
Zone substations	Max demand consistently exceeds 100% of nameplate rating.	Demand exceeds current security (refer Table 36).	Fault rate above industry standards.	Distribution voltage depression cannot be compensated for locally.	Substation is not efficiently located in relation to load.
Distribution feeders	Load exceeds 66% of thermal	Demand exceeds current	Fault rate above industry	Voltage at HV terminals of	Load cannot be reasonably

Network element	Capacity trigger	Security trigger	Reliability trigger	Voltage trigger	Location trigger
	rating more than 3,000 half-hours per year. Load exceeds 100% of thermal rating more than 10 consecutive half-hours per year.	security (refer Table 36).	standards and/or identified as a worst performing feeder.	transformer consistently drops below 10.5kV and cannot be compensated by local tap setting.	supplied by LV configuration therefore requires new distribution lines or cables and substations.
Distribution substations	MDI reading exceeds 80% of nameplate rating.	Not applicable.	Fault rate above industry standards.	Voltage at LV terminals consistently drops below 1.0pu.	Substation is not efficiently located in relation to load.
Low voltage system	LV is typically sized for voltage, hence constraints manifest as voltage drops.	Not applicable.	Fault rate above industry standards.	Voltage at consumers' premises consistently drops below 0.94pu.	Existing LV does not reach new customer.

10.3.2 Security of supply standards

The commonly adopted security standard in New Zealand is the EEA Guidelines which reflect the UK standard P2/5 that was developed by the Chief Engineer's Council in the late 1970s. P2/5 is a strictly deterministic standard as it states that "this amount and nature of load will have this level of security". A characteristic of deterministic standards such as P2/5 and the EEA Guidelines is that rigid adherence to the standards can results in some degree of over investment.

Whilst we have a deterministic security of supply standard, the application of the standard is subject to the consideration of the economics of the investment, given the probability of failure and cost of non-supply. Factors such as community need may also be considered where the project impacts the wider community e.g. supply to water/waste waterpumping stations, hospitals and schools.

Eastland Network's security standards are outlined in Table 36 below and these provide the base security criteria applicable to the network.

Table 36: Eastland Network's security of supply

Class	Range of group peak demand (GPD) MVA	No. Customers	Security level	Contingent capacity	Time to restore after 1st event	Time to restore after 2nd event
A	More than 25MVA i.e. transmission, or subtransmission rings.	> 15,000	n-1	100%	Maintain 100% GPD less 12MVA. Remaining 12MVA restored within 3 hours.	Repair time.
B	Between 12 and 25 MVA i.e. small GXP, primary CBD & urban substations	7,000 to 15,000	n-1	100%	Maintain 100% of GPD.	Restore 90% of GPD within 3 hours and remaining 10% in time to repair.

Class	Range of group peak demand (GPD) MVA	No. Customers	Security level	Contingent capacity	Time to restore after 1st event	Time to restore after 2nd event
C1	Between 6 and 12 MVA i.e. primary urban or industrial substations.	3,500 to 7,000	n	100%	Restore 75% of GPD within 15 minutes, restore 90% within 3 hours, and remaining 10% in time to repair.	Restore 90% of GPD within 3 hours., repair time 100%
C2	Between 3 and 6 MVA i.e. single Tx substations and urban meshed feeders	1,750 to 3,500	n	80%	Restore 75% of GPD within 30 minutes, 90% within 3 hours and remaining 10% in time to repair.	Restore 100% in time to repair.
C3	Between 1 and 3 MVA i.e. rural zone substation, meshed feeders.	500 to 1,750	n	67%	Restore 50% of GPD within 1 hour, 90% within 3 hours, and remaining 10% in time to repair.	Restore 100% in time to repair.
D	Less than 1MVA i.e. rural feeders, urban spurs, distribution transformers	< 500	n	Refer Note 1.	Restore 100% in time to repair.	Restore 100% in time to repair.

Note 1: Refer to Eastland Network's Customer Service Standards for LV Network backup, dual distribution transformer capacity, or temporary supply criteria. Temporary options include construction of prefabricated OH lines, HV or LV flexible surface jumpers or 300kVA generator supplies.

10.3.3 Distributed generation is an alternative to network assets

Distributed generation as an alternative to network assets to provide security has been widely used on the Eastland Network. Presently, there are eight large embedded generators, six of these are owned by Eastland Network and are deployed to provide security for zone substations and remote rural feeders.

During the planning phase, the use of generation is considered as an alternative to investment in network assets to meet security requirements.

10.3.4 Distributed generation (more generally)

Eastland Network recognises the value of distributed generation for its contribution towards demand reduction, reduction in losses and the potential benefits to the consumer-owners. We also recognise that distributed generation can have the undesirable effects on the network, including: increased fault levels, increased protection complexity, and new constraints and voltage issues (to name a few).

Eastland Network recognises the contribution from distributed generation and shares the benefits that arise from reducing Eastland Network's costs (such as transmission investment costs, or deferred investment in the network) provided the distributed generation is of sufficient size to provide real benefits. Specific performance-based contracts are agreed between the generator and Eastland Network.

Despite the potential for some undesirable effects, we actively encourage the development of distributed generation that will benefit both the generator and the network. As per the Electricity Industry Participation Code 2010 Part 6 (Connection of Distributed Generation), details on the necessary processes and information required to enable the connection of DG to Eastland

Network's assets are available in the Eastland Network section of the Eastland Group website (www.eastland.co.nz). Our evaluation criteria include:

- Generator technical standards and operational impacts on the network;
- Safety;
- Metering;
- Network benefits.

While case-by-case analysis is required, our planning criteria in respect of the maximum allowable injection into the network before voltage limits are exceeded are listed in Table 37.

Table 37: Eastland Network's distributed generation injection criteria

Location	Nominal maximum generator export
Urban 50kV subtransmission	8 - 20 MW
Rural 50kV subtransmission	2 - 8 MW
Urban 11kV distribution	3 - 6 MW
Rural 11kV distribution	50% of the typical feeder load 50 - 500kW
Rural 11kV distribution near major substations	1 - 2 MW
Urban 400V Reticulation	100 - 200kW
Rural 400V Reticulation	8 to 50kW

10.3.5 Demand-side management

Demand-side management plays an important role at Eastland Network and has been implemented within the business using traditional ripple control and generation technology.

We have considered (in concept) the development of a localised demand management market that would see Eastland seek market offers for firm demand reductions to defer capacity-driven investment. This could allow distributed battery or other technology to contribute to demand reduction. To date, this has not progressed beyond the concept phase due to the small number of capacity-related projects, our observations of the cost of available technologies, and the cost to dispatch market participants. We will continue to monitor our needs, and the costs of alternatives, and may progress to a formal market in future years.

However, Eastland Network encourages (by way of removing any barriers to connections or upgrades) consumer-based demand-side management.

10.3.6 Other non-network solutions

To date, Eastland Network has only utilised generation and traditional ripple control as alternatives to network assets. However, we continue to monitor the costs of new, alternative technology (e.g. large-scale batteries) and will consider issuing requests for information and proposals when we believe viable alternatives are available in the market.

10.3.7 Energy efficiency

Our current target is to maintain the network loss ratio consistent with the historical average, and given the rate of network demand growth, no specific loss reduction projects are planned,

From a planning perspective, our energy efficiency planning criteria (which are considered at the concept and/or detailed design phase) are:

Table 38: Eastland Network's planning criteria for losses

Network element	Design losses	Maximum operating losses
Transmission and subtransmission feeders	1%	2%
Zone substation transformers	1%	2%
Distribution feeders	3%	5%
Distribution transformers	2%	4%
LV distribution	3%	6%

In addition, our capacity and voltage triggers are also a proxy for energy efficiency as they seek to mitigate heavily loaded feeders which has the effect of managing losses to within acceptable levels. Encouraging distributed generation also contributes to loss reduction where the generation is connected close to the load.

10.3.8 Project prioritisation criteria

The prioritisation of projects (initially at the concept solution phase) occurs as the AMP is finalised. The prioritisation considers a range of factors, including:

- Elimination of risk (where priority is also given to projects that eliminate or minimise critical risks, or significant health and safety risks);
- Connection of customers (typically a customer makes a contribution that ensures the connection is economic for Eastland Network);
- Business benefits (where priority is given to improving reliability and security);
- Deliverability.

The extent to which projects are progressed within a financial year or regulatory period may be constrained by regulatory expenditure allowances (to the extent that these do not impact safety, or materially impact risk). However, in the event that the constraint was not manageable, alternatives would be considered, including exceeding regulatory expenditure allowances or applying for a customised price path.

10.4 Demand forecasts

10.4.1 Introduction

Network demand (not energy consumption) and consumer connections are the key drivers of network development as the network needs to be expanded to supply new customers and/or the existing assets need to be augmented to supply growing demand. In this section, we describe the drivers and forecasts for connections, consumption and demand. We have prepared a baseline forecast, which has been used as the basis for evaluating growth projects.

Our baseline forecasts include a "prudent planning margin" that we add to regional demand forecasts to ensure that the network is able to respond to a modest increase in industrial load.

10.4.2 Historical connection, consumption, and maximum demand trends

Since 2013, Eastland Network has experienced almost no growth, with compounding annual growth rates being 0.12% p.a. for the Gisborne region and 0% for the Wairoa region (refer to Figure 59).

The energy consumption[47] over the same period for the Gisborne and Wairoa regions is shown in Figure 60. The annual consumption growth rate has been 0.25% p.a. and 0.22% p.a. for Gisborne

[47] Used by consumers, net of any SSDG. Network losses need to be added to determine the energy imported into the network.

and Wairoa respectively over that period. Consumption per consumer has declined since 2013, sitting at (0.2%) p.a. and (0.5%) p.a. for Gisborne and Wairoa respectively.

The maximum demand[48] since 2013 for the Gisborne and Wairoa regions is shown in Figure 61 below. The maximum demand growth rate has been 0.9% p.a. and 0.3% p.a. for Gisborne and Wairoa respectively over that period. However, consumer ADMD has increased since 2013, sitting at 0.8% p.a. and 0.2% p.a. for Gisborne and Wairoa respectively. This indicates that consumer load is getting slightly more "peaky".

Eastland Network continues to be a winter peaking network, with the maximum demand typically occurring in June.

Figure 59: Eastland Network's historical consumer numbers

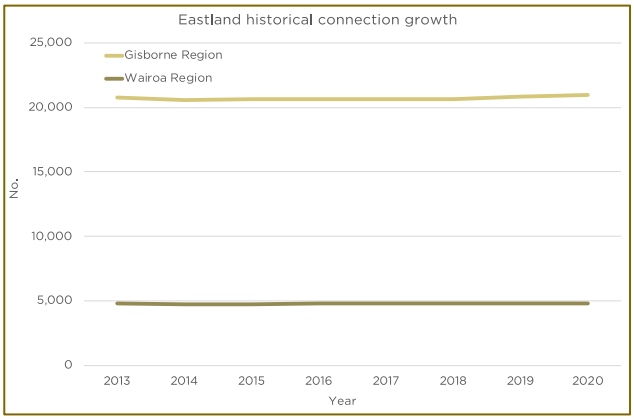


Figure 60: Eastland Network's historical consumption

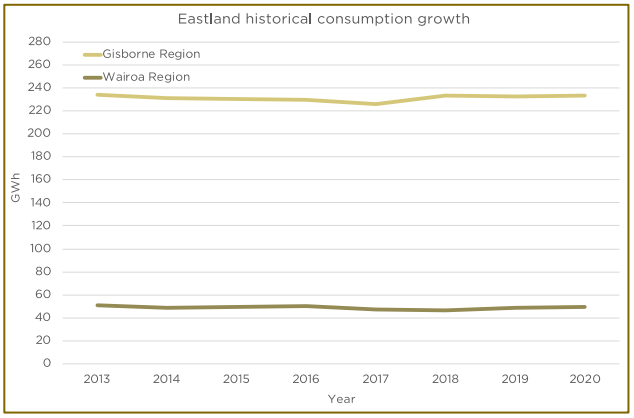
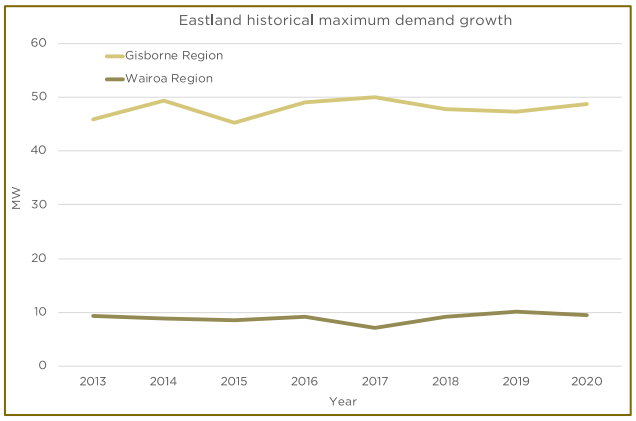


Figure 61: Eastland Network's historical maximum demand[49]



10.4.3 Drivers of demand growth

In preparing our baseline consumption and demand forecasts, we considered the following drivers which are discussed further in this section:

- Customer connection growth;
- Energy efficiency improvements;
- Wood processing;
- The uptake of electric vehicles;

48 This is the maximum half hour demand at GXPs plus embedded generation, and net of controlled load.
49 The maximum demand is based on a 2-hour rolling average, which is approximately 98% of the peak ½ hour period.

- The installation of solar PV and batteries;
- The impact of COVID-19.

Customer connection growth

For the Gisborne region, historical customer connection growth has been 0.05% for residential, 0.8% for commercial, and 2.8% for industrial customers. The higher industrial growth rate represents nine new connections.

For the Gisborne region, the connection growth forecasts for the planning period are 0.46% for residential, 0.23% for commercial, and 0% for industrial customers. The residential growth rate reflects a continuation of recent trends (where growth has been higher in the past five years). The higher commercial growth rate (compared to the historical trend) is more reflective of recent growth in that sector. The forecasts equate to 87 new customers each year. Schedule 12c(i) contains further details.

For the Wairoa region, historical customer connection growth has been 0.9% for residential, 1.9% for commercial, and 1.1% for industrial customers.

For the Wairoa region, the connection growth forecasts for the planning period are 0.12% for residential, 0.06% for commercial, and 0% for industrial customers. The residential growth rate reflects a continuation of recent trends, which have seen very modest growth. The commercial growth rate is more reflective of recent growth in that sector. The forecasts equate to 5 new customers each year. Schedule 12c(i) contains further details.

We discuss industrial wood processing demand below and address how we could cater for large industrial growth in Section 10.4.5 below.

Ongoing improvements in energy efficiency

There continues to be opportunities to improve energy efficiency and we have assumed that the current rate of improvement continues over the forecast period.

Wood processing

The predominant source of economic growth for the region is expected to be forest harvesting. The Ministry of Agriculture and Forestry's forecasts of the total recoverable volume of logs through to 2040 indicate current log volumes are expected to triple to around 2.5 million m^3 within 5 years, and increase to around 3.5 million m^3 approximately 10 years after that.

Given the difficulty in forecasting industrial growth, we have not included any new industrial consumers or expansion of existing industrial plants in our baseline forecasts.

However, we recognise that responding to industrial customer growth is an opportunity and challenge for Eastland Network. To cater for this, we have applied a prudent planning margin of 4MW to our Gisborne regional forecasts, and 1MW to our Wairoa regional demand forecasts.

Our "best guess" is that any expansion in wood processing would occur at the Matawhero substation, where the major wood processer is currently based.

Electric Vehicles

A key factor influencing future electricity consumption is the uptake of EVs. Recent literature is predicting parity between petrol/diesel and electric light vehicles over the coming few years.[50] EV

[50] UBS (2017) predict cost parity in 2018. Bloomberg (2017) predicts cost parity by 2025.

sales are also forecast to increase rapidly, with sales growth predictions sitting between 11% and 36% per annum.[51]

We have based our forecast for EV consumption on two factors:

- New Zealand's climate change policy settings (prior to the draft Climate Change Commission report released on 31 January 2021);
- Regional income factors.

There is a policy drive to decarbonise New Zealand, and we think that this direction will continue regardless of which party is in government. At a national level, we have utilised Transpower's Whakamana i te Mauri Hiko, "accelerated electrification" scenario as an appropriate forecast. This forecast suggests that by FY2031, EV consumption will be 2,207 TWh, which equates to around 5.3% of electricity usage.

We consider that the adoption of EVs will be consistent with regional income and GDP per capita. Eastland Network covers a region that has the second lowest income distribution (being the proportion of households with greater than $100k in income)[52]. Hence, it is likely that the adoption of EVs across the Eastland Network's region will lag behind national trends. We have estimated that for the Gisborne region, EV uptake will be around 70% of the accelerated electrification scenario, and around 35% for the Wairoa region.

Our estimate of consumption reflects the assumption (around vehicle usage and efficiency) contained within Transpower's Whakamana i te Mauri Hiko report. We have estimated the impact on peak demand based on our internal estimates of the extent of charging at home, work, and through commercial paid rapid charging stations (refer Figure 63). In all cases, we have assumed that there will be smart control of these devices that minimise charging at peak time.

This translates into:

- Around 4,500 EVs in the Gisborne region by FY2031, that consume around 10,000 MWh, and cause an increase in peak system demand of 1.5MW;
- A little under 500 EVs in the Wairoa region by FY2031, that consume around 900 MWh, and cause an increase in peak system demand of 0.16MW.

Figure 62: Eastland Network's estimate of EV consumption

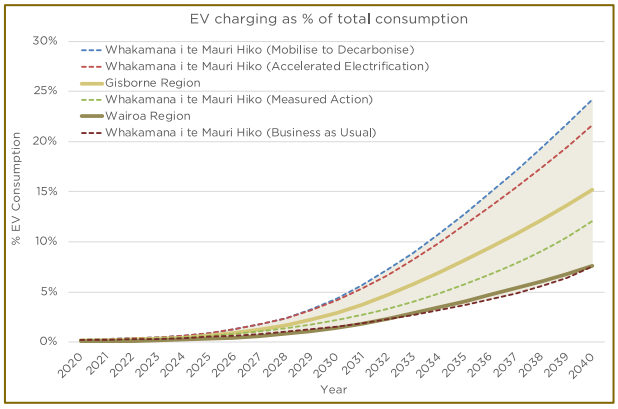
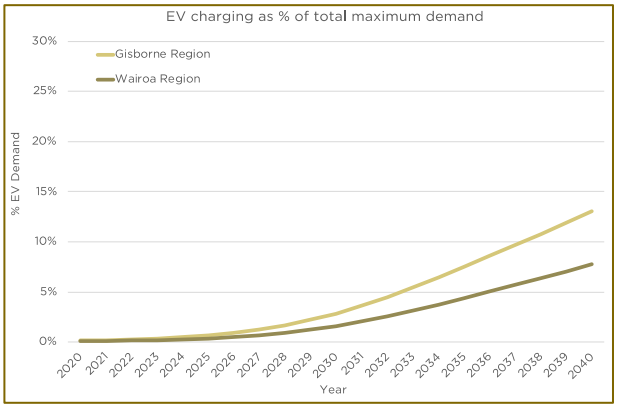


Figure 63: Eastland Network's estimate of EV demand



As noted in Section 4.10, our forecasts in this AMP are well below the level of adoption being forecast by the draft Climate Change Commission report. We will be reviewing our forecasts during

51 US EIA (2017) predicts EV growth of 11% p.a. to 2037. Bloomberg (2016) predicts EV growth of 16% p.a. to 2037. UBS (2017) predicts EV growth of 25% p.a. to 2025. The IEA (2-degree rise) target is for a 36% p.a. growth in EVs.

52 Source: MBIE regional economic activity tool.

FY2022 and will be considering changes based on the final advice for the Climate Change Commission, and any policy responses proposed by Government.

These forecasts represent a "system wide" view. EV charging may cause localised impacts and we discuss our response to these localised issues in Section 10.9 below.

Solar PV and batteries (small scale distributed generation, or SSDG)

We have previously modelled the economics of SSDG for Eastland Network's residential consumers. We applied solar radiation, consumption, and tariff data and the analysis indicates that, for those consumers that have the necessary real estate and funding, the economics will become:

- Generally viable within the next 2-3 years for PV SSDG;
- Generally viable within the next 7-8 years for PV and battery SSDG.

For our forecasts in this AMP we have utilised the forecasts prepared by Transpower in their Whakamana i te Mauri Hiko report. We adjusted Transpower's accelerated electrification forecasts for SSDG for factors relevant to Eastland Network's regions.

Notwithstanding the economics, SSDG will not be available to everyone over the coming 15 years across the region. Factors that could impact uptake include:

- The ability to fund the system's capital costs;
- Apartments and terraced housing;
- Roofing material, construction and age;
- Site specific issues (shading from neighbours and trees);
- Tenant/landlord barriers to technology uptake.

We consider that for Eastland Network, the application of the funding and tenant/landlord constraints will suppress uptake well below the high forecast. Our view is that these factors will result in a modest reduction in SSDG uptake in the Gisborne region, and a more significant reduction in the Wairoa region. We have reduced Transpower's accelerated electrification by 10% and 50% respectively for these regions. The impact of SSDG on consumption is shown in Figure 64 below. These forecasts equate to SSDG penetration rates of 7.6% and 4.2% in the Gisborne and Wairoa regions by 2031.

We have also forecast the impact that SSDG will have on maximum demand. These forecasts represent the impact of battery discharge at peak times (applicable to those installations that have batteries installed, which we estimate to be 33% by 2031). We would expect that the contribution to reduce peak demand will require demand or time-of-use tariffs to incentivise the use of stored energy at peak times. We consider our forecasts to be at the conservative end of possible outcomes.

As noted in Section 4.10, our forecasts for SSDG are similar to those in the Climate Change Commission's draft report. We will be reviewing our forecasts during FY2022 and will consider changes based on the final advice from the Climate Change Commission and any policy responses proposed by Government.

Figure 64: Eastland Network's SSDG forecast consumption

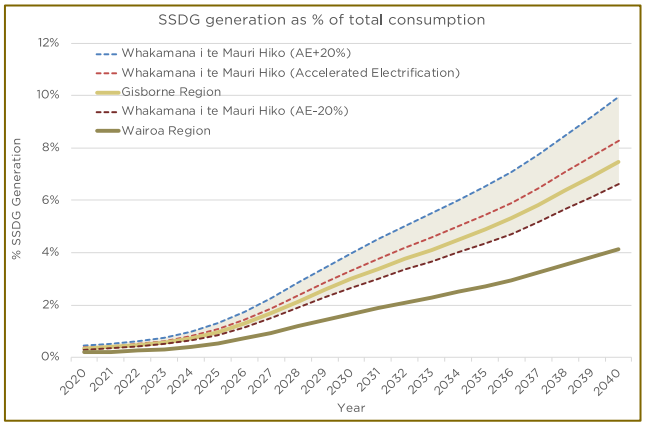
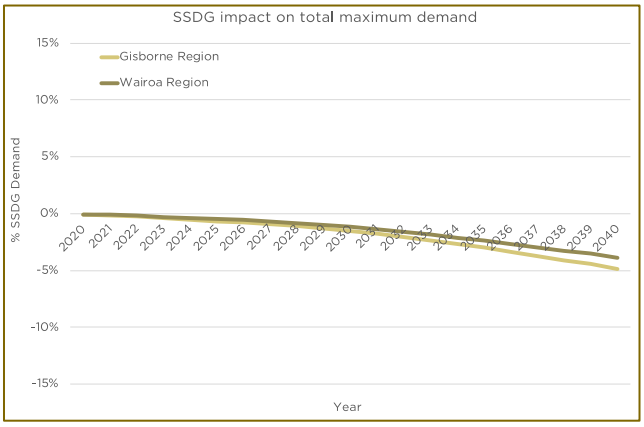


Figure 65: Eastland Network's SSDG impact on demand



Schedule 12c(i) contains further details on our forecast SSDG growth.

The impact of COVID-19

EDBs have generally seen little negative sustained impact from COVID-19. Whilst we saw material reductions in demand and consumption during the lockdown period, we have also seen a strong rebound. Consumption was down 7% in May 2020 and up 1% in June 2020 when compared to 2019, however, consumption and demand for August and September 2020 were up 1% and 4% respectively compared to 2019. The support packages implemented by Government and the quantitative easing implemented by the reserve bank have contributed to an increase in construction. At this stage, we have not factored in any long-term impacts on connections, consumption or demand from COVID-19, however, it is possible that higher connection growth may be an outcome.

From a GDP perspective, Gisborne and Wairoa's GDP have a strong linkage to horticulture, farming and forestry, and current information suggests that these sectors will be less impacted than others (e.g. tourism). We have also reflected on the underlying growth rates applied in our forecasts and do not consider that they incorporate a strong economic growth component. Given the likely resilience of the predominant sectors in the region, we are comfortable with the forecasts in this AMP.

10.4.4 Baseline growth forecasts

The baseline growth forecasts are shown in Figure 66 to Figure 71. These forecasts cover connections, consumption and demand for the Gisborne and Wairoa regions. Schedule 12c(ii) contains further details of our baseline forecasts.

Figure 66: Gisborne region's demand forecast

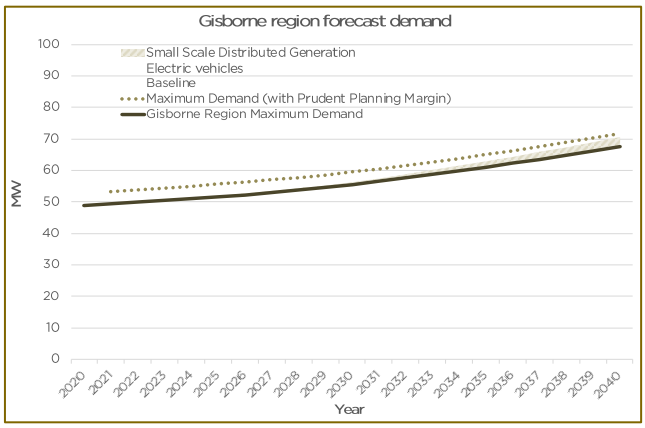


Figure 67: Gisborne region's consumption forecast

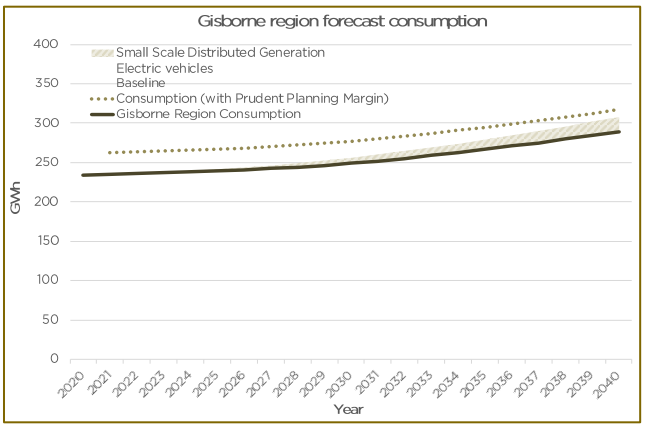


Figure 68: Gisborne region's consumer connection forecast

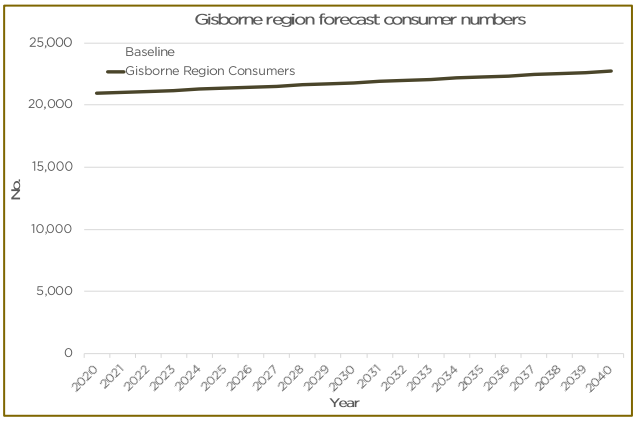


Figure 69: Wairoa region's demand forecast

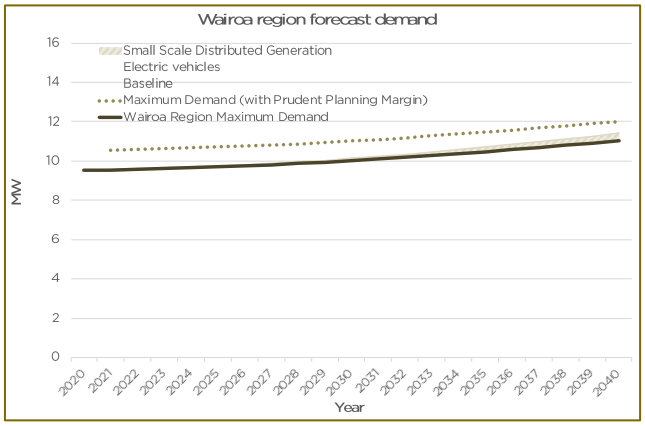


Figure 70: Wairoa region's consumption forecast

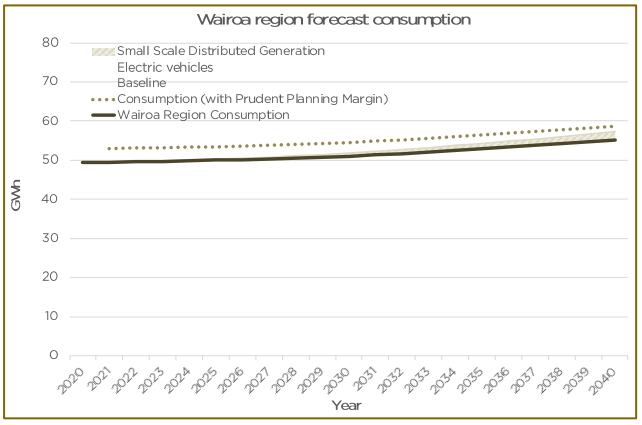
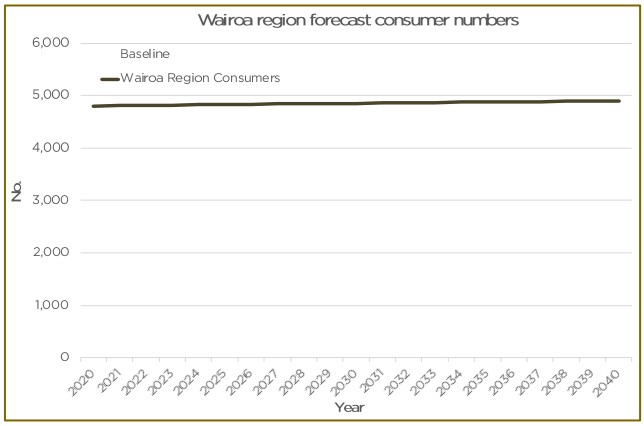


Figure 71: Wairoa region's consumer connection forecast



The growth rates applied to derive the above-mentioned forecasts are shown in Figure 72 to Figure 74 below. These reflect our consideration of the factors mentioned above.

In summary, the material drivers of growth were:

- For connections, a continuation of recent growth trends;
- For consumption, an increase in consumer connections and the growth in EVs, offset by an increase in SSDG and a minor reduction in consumption per connection;
- For demand, an increase in consumer connections, the underlying growth in consumer ADMD and the growth in EVs, offset by an increase in SSDG.

Figure 72: Maximum demand growth rates

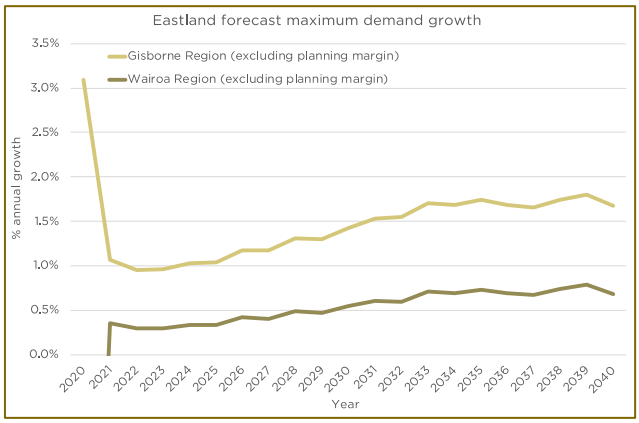


Figure 73: Consumption growth rates

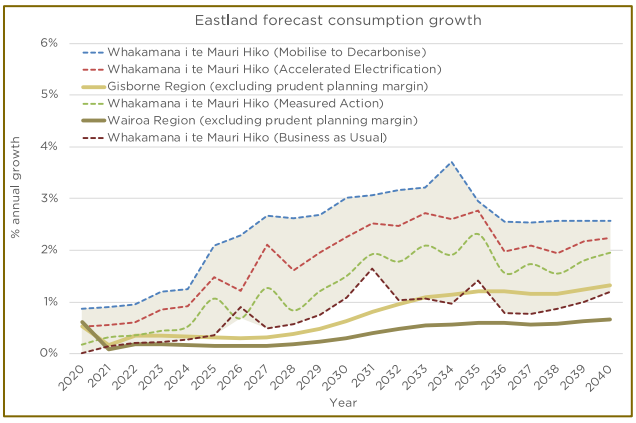
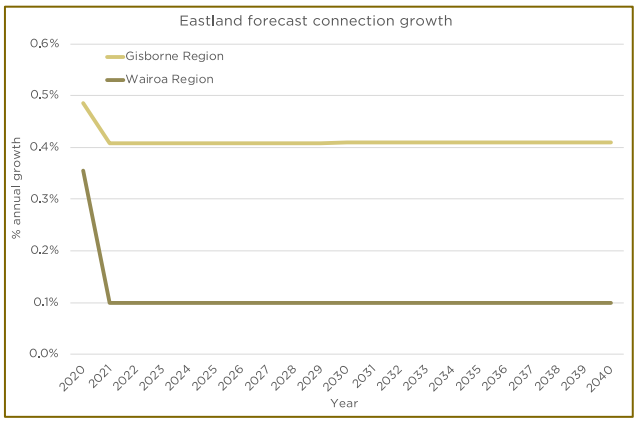


Figure 74: Consumer connection growth rates



10.4.5 Potential for industrial growth

The forecasts for consumption and demand include a prudent planning margin to ensure that Eastland Network's regional capacity planning considers the potential for growth in industrial demand. As mentioned above, we consider that this is likely to relate to wood processing. The prudent planning margins is 4MW for the Gisborne region, and 1MW for the Wairoa region.

Whilst there has been some discussion in relation to much larger industrial growth, we have not forecast increases beyond the prudent planning margin. However, in Section 10.6.3 we have discussed how we could respond should step-change growth occur at 10MW, 20MW or 30MW.

10.4.6 Application at a zone substation and feeder level

The forecasts in Figure 66 to Figure 71 have been prepared at a regional level, however, the demand growth drivers also need to be considered at a zone substation and distribution feeder level. For each zone substation and feeder, we have assessed and applied a demand growth rate having considered the factors that could influence growth. These have been prepared separately for Gisborne and Wairoa and are shown in the Tables below.

Table 39: Gisborne's zone substation and distribution feeder growth drivers

Growth rate type	Annual growth rate	Connection growth	EV penetration	SSDG penetration
Decline	(0.5%)	Declining	Below baseline	Below baseline
Flat	0.0%	Below baseline	Below baseline	Below baseline
Low	0.5%	Below baseline	At baseline	At baseline
Medium	1.0%	At baseline	At baseline	At baseline
High	2.0%	Above baseline	Above baseline	Above baseline

Table 40: Wairoa's zone substation and distribution feeder growth drivers

Growth rate type	Annual growth rate	Connection growth	EV penetration	SSDG penetration
Decline	(0.5%)	Declining	Below baseline	Below baseline
Flat	0.0%	Below baseline	Below baseline	Below baseline
Low	0.2%	Below baseline	At baseline	At baseline
Medium	0.5%	At baseline	At baseline	At baseline
High	1.0%	Above baseline	Above baseline	Above baseline

10.5 Customer connections

Where assets are required to be installed to facilitate a new, upgraded, or altered customer connection, it is Eastland Network's policy that the cost responsibility resides with the customer. Accordingly, the majority of customer connection expenditure is funded by customers who engage directly with our authorised contractors to carry out the required work, with the ownership of network type assets being vested to Eastland Network upon completion.

Our forecasts for customer connection capex, capital contributions, and vested assets is shown in Table 41 below. We have reforecast these expenditure categories to better reflect our forecast growth from historical levels. These forecasts are based on "averages", hence actual expenditure in any year could vary materially.

Table 41: Customer connection capex, capital contributions, and vested assets forecasts

Expenditure category	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027-31
Consumer connections	156	114	116	119	121	123[53]
Capital contributions	50	50	50	50	50	50
Vested assets	500	500	500	500	500	500

Values in March 2021 constant $(000's)

10.6 System developments to meet demand and security requirements

In this section we have determined the required system development projects to meet our forecast demand growth and system security requirements. We have undertaken this assessment across zone substation and distribution feeders.

The proposed developments are discussed in two parts:

- The *options being considered*, which discusses the potential solutions that are under consideration. The exact solution has not yet been determined and hence, these projects are not yet included in the forecasts;
- The *proposed solution*, which is the recommended solution to resolve the demand growth or security issue. The recommended solution is included in the expenditure forecasts.

10.6.1 Zone substation (including transmission and subtransmission feeders) security assessment and enhancements

Evaluation against security planning criteria

Table 42 evaluates whether the target security levels are being met at a substation level (including the upstream transmission and subtransmission feeders) for the forecast loads over the planning period.

Table 42: Substation security assessment

Substation	Required security	FY2031 Forecast security	Assessment of security based on forecast demand growth over the planning period	Additional provision for security
Gisborne Transmission Substation	A	A	Demand is projected to exceed the 110kV line supplying the Gisborne 110kV during shoulder periods. Transformer capacity is not forecast to be exceeded until 2023.	Refer to Section 10.6.1.
Carnarvon Substation	B	B	Forecast demand is expected to be only 57% of capacity.	None required

[53] Escalating by CPI

Substation	Required security	FY2031 Forecast security	Assessment of security based on forecast demand growth over the planning period	Additional provision for security
JNL Substation	C1	C1	Forecast demand is within 11kV support capacity from adjacent Matawhero and Parkinson Substations.	None required
Kaiti Substation	C1	C1	Forecast demand is expected to be about 65% of capacity.	Refer to Table 44
Makaraka Substation	C1	C1	Forecast demand just exceeds 60% of capacity.	Refer to Table 44
Matawhero Substation	B	B	Transformer capacity has been recently increased, Forecast demand is estimated to be 20% of capacity.	None required
Ngatapa Substation	C3	C3	Forecast demand is expected to be only 30% of capacity under existing normal conditions.	None required
Parkinson Substation	B	B	Forecast demand is expected to be only 65% of capacity.	None required
Patutahi Substation	C1	C1	Forecast demand is expected to be only 33% of capacity. Could take about 3MW of demand from Makaraka and Matawhero if necessary.	None required
Pehiri Substation	C3	C3	Forecast demand is expected to be only 30% of capacity.	None required
Port Substation	C1	B	Forecast demand is expected to be only 15% of capacity. There is scope to shift about 9MW of demand on to Port from Kaiti or Carnarvon.	None required
Puha Substation	C2	C2	Forecast demand is expected to be only 45% of capacity.	Refer to Table 44
Ruatoria Substation	C3	C3	Forecast demand is expected to be only 33% of capacity. Demand is well within capacity of diesel generator and 11kV back-feeding capability.	None required
Te Araroa Substation	C3	C3	Forecast demand is expected to be only 33% of capacity. Demand can be totally supplied by diesel generator.	None required
Tokomaru Substation	C3	C3	Forecast demand is expected to be only 45% of capacity. Expected demand is well within capacity of diesel generator and 11kV back-feeding capability.	None required
Tolaga Substation	C3	C3	Forecast demand is expected to be only 37% of capacity. Demand well within capacity of diesel generator and 11kV back-feeding capability.	None required
Blacks Pad Substation	C3	C3	One 1MWe diesel generator is used to support both load and voltage. Forecast demand is within the capacity of diesel generator and line capacity.	Refer to Table 44
Wairoa Substation	B	B	Maximum demand currently sitting around 10MW, which is equal to the transformer	Refer to Table 43

Substation	Required security	FY2031 Forecast security	Assessment of security based on forecast demand growth over the planning period	Additional provision for security
			capacity. With the additional of the prudent planning margin, forecast demand is above the capacity of the transformers.	
Kiwi Substation (Wairoa)	C2	C2	There are three 11kV feeders supplying Kiwi substation from Wairoa substation. There is sufficient capacity to supply this substation for the forecast period.	None Required
Tahaenui Substation	C3	C3	Forecast demand well within capacity.	None required
Waihi Substation	C2	C2	Forecast demand within capacity.	None required
Tuai Substation	D	D	Forecast demand will never merit any alternative supply other than the possibility of relocating a diesel generator in the event of a prolonged outage.	None required

Zone substation security development options under consideration

Table 43 summarises our current assessment of options to resolve forecast demand or security issues. This work is in progress, and our final solution has not yet been determined. Due to the potential scale of investment, we are including details in our AMP to keep stakeholders informed on potential expenditure.

Table 43: Substation development options being considered

Substation	Issue	Discussion on potential solutions
Tokomaru Bay	The East Coast transmission line is a spur line which supplies 4 zone substations. Tokomaru Bay substation is the only zone substation along the coast without a 1MWe diesel generator for backup. Contingency is supplied through two of the neighbouring substations. These 11kV lines are reaching their limit in terms of capacity. Summary of issue: contingent capacity for Tokomaru Bay substation reaching limits.	There are two options under consideration: • Tokomaru Bay substation is the only substation on the East Coast subtransmission line without a backup diesel generator. 11kV links from Ruatoria and Tolaga Bay are reaching capacity in supplying 100% of the Tokomaru Bay load. Utilisation of the existing 110kV line which runs from Gisborne to Tokomaru Bay (currently being used as a capacitor) and installation of a generator at the substation (potential residential noise issues) is the option currently being considered. • Possibility exists to convert the 110kV line to 50kV and use as a backup line (may be used temporarily as support for the East Coast line enable planned maintenance on the East Coast subtransmission line).
Wairoa Substation	The 10MVA transformer capacity is insufficient to meet forecast demand including the prudent planning margin. 2.5MW of firm distributed generation capacity is being used to provide the necessary capacity to meet forecast demand.	It is proposed that the current 110/11kV transformers will be replaced (due to age/health) with 110/33kV units around 2035 (which is beyond the current planning period). Concept plans for the Wairoa subtransmission network are being progressed in anticipation of this upgrade.

Proposed zone substation security development projects

Table 44 summarises the proposed substation security development projects that are included in our expenditure forecasts.

Table 44: Proposed substation development projects

Substation	Issue	Proposed solution	Alternatives considered
Gisborne Transmission Substation	This is our most significant development project. Refer to section 10.6.1 below.		
Kaiti, Port, and Makaraka Substations	These three substations are single transformer banks which supply a large area of the Gisborne township. Backup supply to all three substations is via 11kV links. Currently restoration time for 100% of consumers is > 1 hour and involves complex manual switching operations. This shows that there is limited contingent capacity at all three substations. Forecast contingent capacities of the substations show that all three substations are above 80% contingent capacity in FY2031. The level for Kaiti, Port and Makaraka are 101%, 84% and 109% respectively.	It is proposed that a 50/11kV zone substation be re-established at Gisborne substation to supply the area which will lighten the loads on the neighbouring substations (Port, Makaraka and Kaiti) and support the network's resilience by decreasing response times to zone substation outages. Project benefits include: • Existing infrastructure can support the loads from this substation (as some cabling already exists from prior work). • Sectionalisation of some of the larger urban feeders. • Reduction in response time. **Budget: $1.5m** **Schedule: FY2025-FY2027**	• Do Nothing (will still have the contingent capacity issues). • Install second transformer at the three substations to increase the security (considered too costly as the install and life cycle costs would make the project uneconomic).
Blacks Pad and Mahia substations	The two key issues are: • Peak period demand is above transformer capacity; • Voltage is approaching planning criteria limits. These issues are constraining growth in the area. Network load flow studies and SCADA show that the Mahia feeder's voltage is reaching planning criteria levels. The Mahia Peninsula is supplied from a 33kV line from the Wairoa substation which runs to Blacks Pad (located roughly 10km from the Mahia township). Blacks Pad consists of a 1.5MVA (non-tapped) IMP transformer which was	It is proposed that the 33kV line supplying Blacks Pad be extended 4-5km towards the Mahia township where a new zone substation will be built. The new substation will be composed of a 2.5MVA transformer with three feeders. The Mahanga load (150-200kVA) will be separated from the Mahia feeder. This project has historically been deferred due to land issues. We are currently looking at options for land leasing or over-building our existing 11kV line to determine the route which the new line will built upon. Project benefits include:	• Do nothing (will still have reliability, voltage and load issues). • Install capacitor bank at Mahia which is to be used for peak loads (not economically viable, doesn't enable additional load/ICP's which will be used to offset costs). • Replace existing 1.5MVA transformer with a 2.5/5MVA unit (but this doesn't solve the voltage problems)

Substation	Issue	Proposed solution	Alternatives considered
	installed in 2000. Since this installation, the load in the area has remained stagnant due to the limitations on the network. The peak loads in the area are infrequent but are approaching 1.6-1.7MVA. A 1MWe diesel generator located just outside of the Mahia township is used to offset the load during peak periods (which are less than 1% of the year).	• Increasing capacity for the Mahia area which will allow for development in the area. • Sectionalise the Mahia feeder (historically a large contributor to unplanned SAIDI and SAIFI) which will minimise the effect outages have on our network. • Increase the voltage in the area **Budget: $2.25m** **Schedule: FY2021-FY2023**	
Puha Substation	Puha substation is built to supply the Matawai/Te Karaka and surrounding rural settlements located south west of Gisborne. The substation is supplied from a ring-fed 50kV subtransmission line providing backup should one of the lines fail. A single transformer (single ph 5MVA, due to be replaced in 2022) supplies the area. A 1MVA generator is connected at the substation and provides most of the contingent capacity for first event situations. Peak loads for Puha substation are reaching 1.8-1.9MVA. 300-400kVA of this can be supplied from 11kV ties to the substation feeders but the entire load cannot be fully supported for the peak times. Summary of issue: Contingent capacity insufficient to supply loads at peak times.	It is proposed that an 11kV line from Ngatapa substation be constructed underneath the 50kV Ngatapa - Puha line and connect into the Matawai feeder. This will require an additional 3.5km of line to be constructed. The line will have a capacity of c.2MVA and will provide the additional contingent capacity required for full contingent capacity of the Puha substation. In addition to this benefit, it provides a second supply for the Matawai feeder which is currently supplied through a single critical line (> 400 connected ICP's). The Matawai line contributes an average of 9 unplanned SAIDI annually and this project has the potential to reduce this by at least a third. **Budget: $375k** Schedule: FY2025-FY2026	• Do nothing (maintain same levels of reliability for Matawai feeder and Puha contingent capacity below peak substation loads) • Install small 2.5MVA zone substation using existing 50kV (Ngatapa - Puha) line. Cost is uneconomic against the benefits of the project

10.6.1 Gisborne regional substation development

Issue

The entire Gisborne region is supplied by:

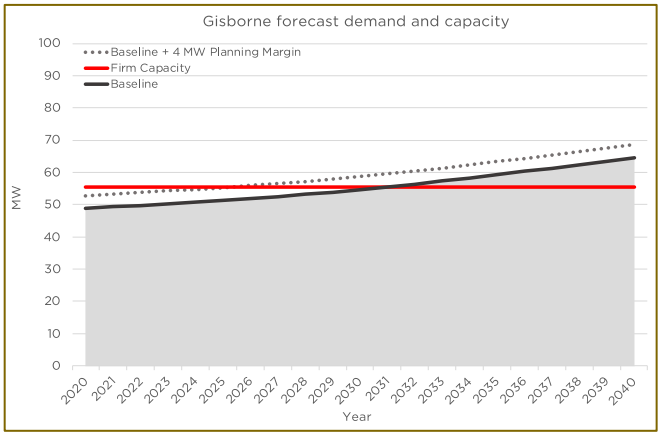
- The transmission grid to the Tuai GXP;
- The 110kV double circuit line from Tuai to Gisborne and a 2 x 60MVA 110/50kV substation located in Gisborne. These assets were acquired from Transpower in 2014;
- 5 x 1 MWe diesel generators owned and operated by Eastland Network.

The firm[54] capacity available into the region is 55.5 MW. There are constraints on the "firmness" of this capacity. That is, the current 110kV Tuai to Gisborne double circuit line is N-1 electrically, but not N-1 mechanically. We currently manage the lack of N-1 mechanical security through intensive risk management; but in 15-20 years, when reconductoring of the line is required, we will not be able to accept a high number of regional outages to allow this work to occur. Therefore firm capacity from these lines is only available until around FY2035-FY2040.

Referring to Figure 75, the current regional capacity is:

- Sufficient to meet current regional demand until 2032.
- Sufficient to meet current regional demand with a prudent planning margin of 4 MW until 2025.

Figure 75: Gisborne region's forecast demand and capacity



Proposed network solution (to meet organic growth)

The recommended network solution to meet Gisborne's regional baseline load growth involves a series of three incremental projects (refer Table 45).

Table 45: Proposed solution to the capacity/security upgrade

Stage	Solution FY2031 Firm Capacity	Year required (to meet forecast MD)	Solution description
1	57.5 MW	End FY2025	• Install 4 x 6 MVAr 50kV capacitor banks (exact bank sizing to be confirmed at the detailed design stage) and remove existing 110kV MVAr capacitors **Budget: $1.0m** **Schedule: FY2023**
2	~63 MW	End FY2028	• Thermal upgrade of GIS-TUI 110kV lines to 75ºC, which involves: o Clearing high points under the tower line; o Increasing the height of pi-pole structures; o Increasing the height of towers; o Tower strengthening, foundation strengthening, insulator replacement. • The total thermal upgrade cost is estimated at $14m, of which $3m has already been completed (leaving a total remaining budget of $11m).

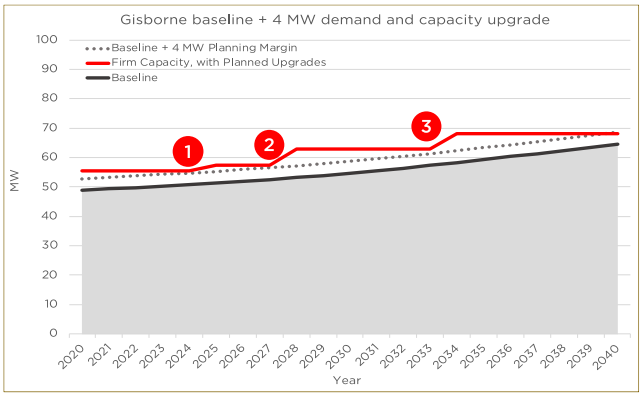
54 In this context, "firm" means at N-1-g security. N-1-g means the capacity with the largest network element out of service and the largest generator out of service.

Stage	Solution FY2031 Firm Capacity	Year required (to meet forecast MD)	Solution description
			• There is an overlap between this work and other tower and pole renewal work. A total of $2.5m of line renewal work will no longer be required as replacement of towers and pole structures is being completed as part of this project. **Budget: $11.0m** **Schedule: FY2022-FY2028**
3	68 MW	End FY2034	• Install additional 2 x 6 MVAr 50kV capacitor banks **Budget: $500k** **Schedule: FY2034**

The total cost of the projects is $12.5m (from FY2022). Of this total, $5.0m has been reallocated from the renewal budget[55], resulting in an increase in the forecast capex of $7.5m.

The figure below illustrates how the projects could be implemented to meet the demand growth.

Figure 76: Gisborne region's forecast demand with planned capacity upgrades



The solution increases the capacity but does not resolve the mechanical security risk associated with the double-circuit 110kV tower line. Hence, implementing this solution requires that particular attention is paid to the 110kV tower line risk mitigation, and can only be considered to provide capacity to FY2035-FY2040 (a separate risk study will be undertaken next year). Additional security and capacity enhancements will be required in the mid to late 2030s (for commissioning by FY2040).

We considered this solution against a range of alternatives as summarised in the table below.

Table 46: Alternatives considered

Description of alternative	Reason why discounted
Do nothing	Does not achieve the objectives
Generation alternatives within the Gisborne region	This alternative is being considered as part of a further study.
Full reconductoring of the GIS-TUI line. This provides 67 MW of firm capacity, which supports load growth to 2035.	Has a materially higher economic cost. This option does not provide any increase in security over the recommended option.

55 This reallocation is made as there is an overlap between the thermal upgrade work and pole renewals. We have classified the driver of work the replaces an existing pole with the taller pole as part of the thermal upgrade project.

Description of alternative	Reason why discounted
New FRA-GIS 110 kV line.	This option was not considered feasible as it is not economically practical to obtain a line route into the Gisborne substation.
New WRA-PAT 110kV line. This provides 88 MW of firm capacity, which supports load growth to FY2054 and improves security (full n-1).	Whilst this option provides firm capacity for growth for nearly the next three decades, and improvements in security, its economic cost is more than double the recommended solution.
New GIS-TUI 110kV line. This provides 67 MW of firm capacity, which supports load growth to 2038 and improves security (full n-1).	This option improves security, but its economic cost is significantly more than the recommended solution.

Further work is required

This "base case" solution is only stage one, and may not be the final solution adopted if step-change growth occurs; however, this solution represents a pathway for meeting regional demand until the late 2030s.

A further study in relation to network and non-network solutions to cater for a 10MW, 20MW and 30MW increase in demand will be prepared next year and will be included in the 2022 AMP.

10.6.2 Distribution network security and capacity enhancements

During the development of the asset management strategy, we identified that for some feeders there was the potential to improve the resilience of the network enhancements to the 11kV back-up supply from adjacent feeders, and through distributed generation.

Distribution security development options under consideration

Table 47 summarises the work in progress on enhancing 11kV feeder security. For these feeders, our final solution has not yet been determined. We expect that a number of these projects will move onto the proposed list of projects before the publication of the 2022 AMP.

Table 47: Distribution feeder security and capacity development options being considered

Feeder	Issue	Discussion on potential solutions
Hershell	No contingency backup. Feeder has no ties with neighbouring feeders	Feeder load is within our mobile generator capacity and is not projected to exceed this capacity within the forecast period
Cedenco	Cedenco is an industrial customer who is connected to the 'Cedenco' feeder on the Parkinson substation. They have indicated that future expansion is likely and are seeking an additional 2MW of capacity. This load is likely to increase the demand beyond the cable capacity of the feeder.	Consideration is being given to installing switchgear on a neighbouring feeder which has the capacity to supply this additional load. Although this is a good solution, a tactical disadvantage of this option is that if either of the feeders trip, half of the manufacturer's equipment will be without power. Advantages are that this option is considerably cheaper than the alternative. The alternative is to extend the Parkinson switchboard and connect an additional circuit breaker. This will allow construction of a new dedicated underground cable from the substation to the Cedenco site.
Frasertown and Raupunga	Both the Raupunga and Frasertown feeders are long (>40km) feeders which originate at the Wairoa	A 1MWe diesel generator is located on the Raupunga feeder and is used in the event of outages and to support voltage should the tie switch be closed.

Feeder	Issue	Discussion on potential solutions
	substation and loop around the rural townships located on the south side of Wairoa. The voltages are constrained at the far end of the feeders where the tie switch between the two feeders is located. Any significant growth on these feeders is likely to require network development.	Consideration is being given to shifting the generator as the optimal location is further towards the tie switch. This would increase the area that could be supplied should a fault occur at the beginning of either of these two feeders. Land agreements have prevented this project from progressing. Other options being considered include developing a link between the Tuai and Frasertown feeders or splitting the Frasertown feeder into two and running another feeder from the Wairoa substation.
Tikitiki and Awatere	Tikitiki and Awatere feeders provide the 11kV link between the Ruatoria and Te Araroa feeders. The feeders also provide the 11kV link for the generators located at each of these substations. Recent load growth on the two feeders has increased the voltage drop to 10.5-10.6kV at the end of the feeders. Reconductoring of the line will be of minimal assistance.	Two options are being considered for these two feeders: • A 3ph voltage regulator could be installed at the feeder tie switch which would help support operating voltages when a tie is needed. • A small substation could be built near the Tikitiki township using the 50kV subtransmission line which runs parallel to the Tikitiki feeder. Both options are considered uneconomical and non-urgent as no planning criteria triggers have been breached. It is likely that if growth continues, one of these options will be required.

Proposed distribution security development projects

Table 48 summarises the proposed distribution security projects that are included in our expenditure forecasts.

Table 48: Proposed distribution feeder security projects

Feeder	Issue	Proposed solution	Alternatives considered
Borough 1 & 2	Borough 1 and Borough 2 circuits supply the Wairoa township. These feeders are at security limits and any faults have a material impact on reliability. These two feeders supply 1,913 consumers and a combined load of 4.4MW (roughly 40% of the total Wairoa load). The cabling on each feeder is currently insufficient to provide full contingency to the other. Any fault at the beginning of each feeder is currently affecting the network's reliability due to our limitations in providing backup supply. Due to the number of consumers on the feeders, the average annual SAIDI from the	The Brickworks feeder is a third feeder connected to the Kiwi substation. The line runs around the township and has a tie switch connected on the end of the Borough 1 feeder. The line is currently limited in its ability to support Borough 1 & 2 due to conductor size and main line fusing. Reconductoring of the Brickworks feeder (6km of overhead conductor) and replacement of fuses with an ABS and a remote switch is proposed. This will increase the capacity of the line to 80A, which will be enough to supply either of Borough 1 & 2's load. Benefits of the project include: • Improvement in reliability;	• Do nothing (doesn't fix our reliability and security issues) . • Upgrading of the existing feeder cables and conductors to accommodate load (considered to be uneconomical).

Feeder	Issue	Proposed solution	Alternatives considered
	combined feeders is 4.6 minutes.	• Reduction in consumers on Borough 1 by about 150 consumers. **Budget: $80k** **Schedule: FY2021-FY2022** Note: Pole upgrades to accommodate the increase in conductor size have already been completed.	
Dunstan and Waipaoa	The Dunstan and Waipaoa feeders supply a rapidly growing industrial area. Demand growth indicates that the original 95mm cable at the end of the Dunstan feeder will constrain the contingent capacity in coming years. The 95mm cable loops into private property and back onto the feeder and is roughly 200m in length.	It is proposed that the 95mm cable running into private property be used as a spur line (using switchgear) and the remaining 80m of 95mm cable be upgraded to 185mm cable. Benefits of the project include: • Full contingent capacity in the event of a fault on either feeder; • Futureproofing the feeders for additional load growth; • Improvement in reliability. **Budget: $100k** **Schedule: FY2024-FY2025**	• Do nothing (100% contingent capacity not obtained) • Upgrade entire 95mm cable to 185mm (doesn't gain anything more than the proposed project but is more costly)
Matawai	See Puha substation development project.		
Rototahi and Dalton	There is currently an 11kV link between the Kaiti substation and the Tolaga Bay substation. The distance between the two substations is >40km. There is currently a voltage regulator located at Tatapouri which supplies the consumers on the Kaiti side and is used to support the 11kV link to Tolaga Bay as a reference voltage for the diesel generator located at Tolaga Bay. Additional load on either of the two feeders will drop voltages along this line to the point where a reference for the generator is not able to be made and the voltages along the line will be reaching minimum operating limits. A tie also exists to the Waimata feeder (Patutahi Substation), however, this link is already at its limit and cannot provide any additional support.	It is proposed to utilise the 50kV subtransmission line running alongside the 11kV line and install a 2.5 MVA zone substation at Whangara. This location is the tie point between the Rototahi, Dalton and Waimata feeders. The solution will also address the voltage constraints which will likely develop should load continue to be added to these feeders. Additional load from the Kaiti substation can be offloaded onto this new substation which will ease the contingency constraint projected for the substation. Budget: $1.5m Schedule: FY2029-FY2031	• Do nothing. • Conductor upgrade to reduce voltage drop (uneconomic). • Run a new feeder from Kaiti substation and reduce consumers on the Dalton feeder (uneconomic).

10.6.3 Developing solutions to cater for step-change industrial growth

Load growth on the network (particularly in Gisborne) is driving the need to consider both network and non-network solutions to cater for the potential for step-change growth.

To prepare for the potential for step-change growth, we are currently considering two options:

- Increasing the transmission capacity into Gisborne, and upgrading the Gisborne substation;
- The use of non-network solutions to provide capacity within the region.

As mentioned in Section 10.6.1, we will be undertaking a further study during FY2022 exploring options to cater for a 10MW, 20MW and 30MW demand increase. The outcome of this work will be included in the 2022 AMP.

10.6.4 Demand-side management

Eastland Network has implemented demand-side management using traditional ripple control and generation technology. The load control systems were initially designed to reduce domestic hot water cylinder demand at peak times. Their use continues to reduce peak demand across the transmission, subtransmission and distribution systems.

Presently around 13,600 customers in Gisborne, and 2,000 customers in Wairoa, have access to load control. In the Gisborne region. The application of load control is inherent in the historical system demand, and as such, its continued operation is assumed in the load forecasts presented in Section 10.4. The contribution from load control on historical system demand is estimated to be 3.0MW on the Gisborne network, and 0.6MW on the Wairoa network. This is well below the maximum available due to the increase in demand that occurs during restoration of the hot-water load.

The maximum available demand reduction is approximately 13.9MW on the Gisborne network and 2.5MW on the Wairoa network.

Table 49: Ripple control estimated interruptible load by area

Region	Estimate of maximum interruptible load (kW)
East Coast (Ruatoria, Te Araroa and Tokomaru Bay)	1,800
Gisborne North (Kaiti and Tamarau)	5,500
Gisborne South (Mangapapa, Riverdale and Te Hapara)	6,600
Wairoa	2,500

Eastland Network encourages (by way of removing any barriers to connections or upgrades) consumer-based demand-side management. Examples of two initiatives we are aware of are:

- Replacement of the compressor drives with variable speed drives on Eastland Group's cool store;
- The Mahia Sewage scheme (which was installed in 2013) uses small pumps on each installation to add diversity and avoid the peak loading often seen when large pumps are used.

Future demand initiatives targeting a shift in consumption from during the day to the period between 12:00am and 4:00am at night, will have the biggest impact on demand. Load shifting is being considered as part of our pricing strategy (refer to our pricing methodology and pricing roadmap).

Upgrading of the ripple control system

Eastland currently operates two ripple control plants located in Wairoa (11kV) and in Gisborne (50kV). The systems still operate the streetlight circuits for the two regions.

Health assessments of the existing plant has determined that the Makaraka plant (Gisborne region) is reaching end-of-life criteria and will need replacement.

Eastland Network has determined that investment in another plant is viable considering the infrastructure we have in place and the current cost of alternative options. To decrease the cost of replacement, we are currently studying the benefits of an 11kV system, and whether the ripple signal would reach enough receivers to still be a viable option.

We have budgeted a replacement cost of $500k to install an additional ripple control plant ($350k in FY2023 and $150k in FY2024).

10.6.5 Distribution generation

We are working with a range of distributed generation providers to facilitate the connection of medium and large-scale generation. Where these projects avoid the need to upgrade the network, we will consider paying the avoidable cost of distribution ("ACOD").

These projects are confidential between Eastland Network and the distributed generation provider. We will include details of any developments in future AMPs where the development is made public.

We are also considering developing a "statement of opportunity" to seek proposals from distributed generation providers where there are opportunities for non-network solutions to meet security or demand growth needs.

10.7 Network developments to meet reliability requirements

10.7.1 Improving the use of distribution automation (sectionalisers and reclosers) to minimise the impact of outages on the distribution network

The asset management strategy identifies that improving the use of network automation on some feeders can reduce the impact of outages and improve reliability. Following our review of reliability performance (refer to the performance review in Section 6.4) we identified that:

- There were a number of feeders where outages were not being mitigated by the existing distribution automation;
- For other feeders, distribution automation could be added to reduce the impact of outages.

In this section, we summarise the work being undertaken and the proposed projects to improve reliability through distribution automation.

Distribution automation development options under consideration

Table 47 summarises the work we have in progress to improve reliability through distribution automation. For the feeders identified in Table 47 and Table 48, our final solution has not yet been determined. We expect that a number of these projects will move onto the proposed list of projects before the publication of the 2022 AMP.

Table 50: Distribution automation development options being considered

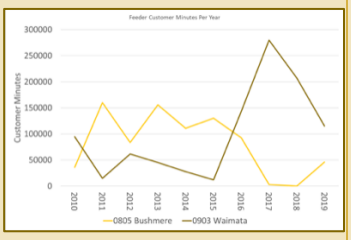
Feeder	Issue	Discussion on potential solutions
Gisborne Subtransmission feeders	There is currently a tie switch between the Carnarvon and Kaiti subtransmission lines and therefore	Create a fast communications link between all substations on the two subtransmission feeders and operate on a closed loop circuit.

Feeder	Issue	Discussion on potential solutions
(Carnarvon & Kaiti)	any trip on the lines has SAIFI implications.	

Proposed distribution automation development projects

Table 48 summarises the proposed distribution automation projects that are included in our expenditure forecasts[56].

Table 51: Proposed distribution feeder security projects

Feeder	Issue	Proposed solution	Alternatives considered
Hicks Bay	Feeder has not been sectionalised sufficiently, which has contributed to an annual average of 11 SAIDI minutes. The 3.5 hour travel time from the Gisborne depot is also contributing to SAIDI.	It is proposed that a recloser be installed on the Waikura Bay turn off to isolate the Waikura area from the rest of the Hicks bay feeder. Waikura valley is a spur line on the Hicks Bay feeder which accounts for just over a fifth of overall faults on the feeder. **Budget: $12k** **Schedule: FY 2022**	• No viable alternatives were identified. This project is part of a range of measures to improve reliability. • Line inspections and replacements have been prioritised for this area
Inland	This feeder has continually had a vegetation issue with an annual average of 63% of faults occurring on this feeder being attributed to vegetation. The remote switches on the feeder have not been setup optimally to minimise outage times.	It is proposed that a remote circuit breaker or load break switch be installed halfway along the main line. This has the potential to more than halve the SAIDI on this feeder. **Budget: $12k** **Schedule: FY 2022**	• Do nothing. • No viable alternatives were identified. This project is part of a range of measures to improve reliability. • This feeder has been added to the list of priority feeders for vegetation management
Waimata	The Waimata feeder previously did not include the Waimata Valley which was on the Bushmere feeder. Since the shift, the average annual SAIDI on the Waimata feeder has more than tripled. 	It is proposed that a remote switch be installed on the far side of the Waimata valley which will isolate the area of unreliability and minimise outages to consumers. Focus pole replacements and tree maintenance in this area. **Budget: $12k** **Schedule: FY 2022**	• Do nothing (not viable due to high SAIDI). • Shift existing circuit breakers to optimise location (will minimise coverage area and the cost to carry out is equal to the cost of new install)
Te Arai	Te Arai feeder is underperforming in terms of reliability. Currently sitting in the top 10 worst performers, it has an annual average SAIDI	It is proposed that a circuit breaker be installed for Taurau valley. This circuit breaker can be used to isolate this section of line should a fault occur in this area and be used	• Do nothing (not viable due to high SAIDI). • Shift the circuit breaker more towards the substation and

[56] Automation projects are budgeted as non-specific projects and forecast using a general budget

Feeder	Issue	Proposed solution	Alternatives considered
	contribution of 4.6. Two circuit breakers are located on the end spur line. There is room to improve the response times on this feeder with the end connections being >1.5hours away from the Gisborne depot.	as a connection point between the Te Arai feeder and the Muriwai feeder which will assist restoration times for both feeders. **Budget: $12k** **Schedule: FY 2023**	increase the coverage area. (Doesn't isolate a section of line and provide for feeder backup)
Te Karaka	Te Karaka feeder has an annual average of 1 SAIDI. Supplied by the Puha substation, the Te Karaka feeder supplies the rural township of Te Karaka and the rural farms of the settlement. The current configuration has a circuit breaker at the start of the feeder and one ¾ of the way along the main line. Faults halfway up the line trip out the substation circuit breaker and affect lots of consumers on the line.	It is proposed to install a remote circuit breaker just beyond the township. This will isolate the township from any faults in the rural area. This will halve the number of consumers affected by outages on this section of line (which are up to 75% of the existing SAIDI). **Budget: $20k** **Schedule: FY 2023**	• Do nothing (not viable due to high SAIDI). • No viable alternatives were identified
Matawai	The Matawai feeder has consistently been one of the worst performing feeders on our network. Its low security and length of line has had a major effect on its performance, and its existing automation setup is inefficient. The feeder is accountable for an annual average of 9 SAIDI. Backup supply is currently performed manually with travel time >45mins.	It is proposed that a recloser be installed at the Matawai township to sectionalise the spur line from the rest of the feeder (> 50 consumers). It is also proposed that remote ground mounted switchgear be installed next to the regulator to automate the switching. The benefits of this project will be: • Reduction in consumers affected during faults on the Otoko spur; • Reduction in response times; • Increasing the reliability of the Matawai feeder. Note: this project was completed in March 2021. Performance of the Matawai feeder is to be monitored closely to assess the effectiveness of this project. **Budget: $300k** **Schedule: FY2021**	• Do nothing (not viable due to high SAIDI). • Install protection switchgear (Reyrolle or similar equipment) to protect the multiple spur lines of the area (option considered too expensive). • Install recloser only for Otoko spur (doesn't provide security on feeder).

10.7.2 Early detection of earth-fault hazards through SCADA monitoring of earth fault pick-up (pre-trip)

Over the past two years, Eastland Network has been progressively adding earth fault pick-up alarms to SCADA. This information allows us to respond to indicators that something may be contacting conductors. Staff analyse this information and initiate line inspections to identify potential tree/clashing issues (or emerging insulator failure) early. This project was initiated in response to Eastland Network's vegetation issues (refer to the summary of Eastland Network's vegetation management strategy in Section 11.21), although it benefits a number of other outage

cause types through early fault pick-up. We have also purchased the Acselerator TEAM software which automates the collection of data from multiple remote devices. We will be using this software in addition to SCADA to actively monitor our remote relays, and graph/log any trends.

10.7.3 Review of distribution protection discrimination to ensure it is operating effectively

Eastland Network maintains a record of all the protection settings for protection relays installed on our network. Protection settings for all critical areas of the network, such as the subtransmission network and connection with Transpower, are all reviewed by external contractors.

On our 11kV network, we have only had one incident where the protection scheme was operating incorrectly and that was on a new installation. Settings were quickly changed and tested.

All new substation relay installations are tested prior to installation and protection curves are graphed to ensure correct timing with upstream and downstream protection elements.

10.8 Network developments to meet other planning criteria

We have considered the other planning criteria triggers (particularly location and voltage) and have identified the following development projects.

Eastland Network has a large number of long distance feeders. These long line feeders create voltage problems on our network, particularly in circumstance where one feeder has to back up another. We have used voltage regulators in areas where this situation is critical, and have determined that the existing voltage regulators are effective in their current positions.

Table 52: Other proposed network development projects

Location	Issue	Proposed solution	Alternatives considered
Grey St	16mm copper cable located in Gisborne CBD. The cable is used to supply commercial areas and is underrated for any additions to the network. Possible future location for township electric chargers	Upgrade the 11kV cable to a 3c 185 aluminium. While carrying out this upgrade, replace some of the H1 ground mounted transformers located in the CBD. **Budget: $120k** **Schedule: FY2022**	• Do nothing (not considered acceptable). • Use alternate route to supply Haisman Rd feeder (increased switching times and complexity).
Cameron Rd	There is a proposed residential development on the Cameron Rd/Haisman Rd feeder (>150 houses). Network infrastructure will be adequate to supply but the proposed location is on the mainline of the Nelson Rd feeder which is used as a backup supply for the Haisman Rd feeder, which is highly loaded. Maximum combined loads of the feeders reaching >160-180A which will reach the load limit for sections of 7/14Cu located along the line.	Upgrade the copper conductor (1.5km) to 'Dog' to increase feeder supply capacity and provide for future growth in the area **Budget $60k** **Schedule: FY2022**	• Do nothing (not possible due to pending load growth). • Use alternate route to supply Haisman Rd feeder (this increases switching times and complexity).

10.9 Preparation and response to the energy transformation

10.9.1 Will the energy transformation disrupt electricity distribution businesses?

From our analysis, we believe that Eastland Network will have a robust and viable future, and will be an integral part of the energy transformation. Distribution businesses will provide the key linkage between customers with SSDG and energy markets; and they will continue to provide the energy security to those customers who continue to be dependent on grid-supplied electricity. Our analysis indicates that the cost of grid-supplied electricity (for customers using SSDG) should remain materially cheaper than off-grid solutions over the next 20 years (circa 40% cheaper in 2038).[57]

However, the energy transformation will require Eastland Network to adopt a new business model that will:

- Allow all customers to adopt (and fully benefit from) new energy technology;
- Enable the business to control activities on the network to minimise capital expenditure on network upgrades.

That is, a new business model (the "future state" model) will need to be progressively adopted to avoid inefficient investment by Eastland Network and/or its customers.

10.9.2 Potential impacts of the energy transformation

As stated in Section 4.10 and Section 10.4.3; based on Transpower's Whakamana I te mauri Hiko report and our predictions on our region's uptake of the technology, SSDG and EVs will have an effect on the traditional load profile and on the load flows across the network.

We have assessed the potential impacts on the network, and this indicated that (in general):

SSDG impact

The increasing penetration rate for SSDG will result in bidirectional power flows on some parts of the LV and 11kV system.[58] The implications of the increase in SSDG penetration will be location specific, however, modelling suggests that in "typical" urban areas the issues involve:[2]

- Reverse power flows causing over-voltage on parts of the LV system (this may occur as solar SSDG penetration rates increase above 20%);
- Reverse power flows causing overloaded conductors/cables on parts of the LV system (this may occur when SSDG penetration rates increase above 20%);
- Reverse power flows on some distribution transformers as SSDG penetration levels increase above 40%.

These issues could result in the network operating outside of statutory voltage limits (creating liability issues) and could create protection coordination issues (creating safety issues).

We are currently forecasting SSDG penetration rates reaching 7.6% and 4.2% for Gisborne and Wairoa respectively by 2031, and 16% and 9% respectively by 2040. Hence, we do not expect to see any impact over the planning period, and we may experience modest issues in the 10-20 year horizon (noting that more specific modelling is needed to confirm this).

[57] This analysis was provided by Energia Limited in FY2019. We have reviewed the cost inputs used in this analysis in preparing this AMP and they remain consistent with the current view.

[58] As an example, there are suburbs in Australia where penetration rates are above 50%, whereas national penetration rates are below 20%. Refer KPMG, "Residential PV, Customer Experiences and Future Developments, A Report for Energy Consumers Australia", 2016.

The research indicates that the impact on business districts and rural areas will be minimal due to the higher network capacity of business district networks, and the lower customer density of rural networks.[59]

From an operational perspective, network isolation procedures will need to be modified to ensure that there is no unintended islanding of SSDG that could pose a risk to work crews and the public. There is also the risk of out-of-phase reclosing (post-fault), transient over-voltage, and increased restoration times after faults.

EV Impact

The impact on the LV system from EV charging will be location specific. Typical urban LV networks should be able to cope with EV charging for penetration rates up to 40%, provided:[60] [61]

- Consumer-level load control is used (to manage charging at peak times);
- "In-line" charging is used (as opposed to fast-charging).[62]

Our current forecasts suggest an EV penetration rate of 26% by 2031, reaching to 40% by 2033 for the Gisborne region (with lower rates for Wairoa). Hence, there should be minimal impact over this planning period. However, we expect penetration rates to accelerate in the 10-20 year horizon, causing issues to emerge.

In the short to medium term, LV networks in CBD areas are also unlikely to experience systemic issues as a result of EV charging and should be able to handle the installation of fast charging stations. However, some localised upgrades may be required where the new high-capacity fast chargers are installed.

Eastland Network's 11kV system will generally have the capacity to cater for expected EV charging over the planning period as the forecast demand increase (of less than 5% over the next 10 years) is not significant. However, issues may arise in the 10-20 year horizon when demand is forecast to increase by closer to 15%.

Preparation needs to commence to ensure that the network and systems can cater for the EV demand growth within 10-years. In the next section, we have outlined how we intend to respond to these issues. This preparation work may need to be advanced in response to the recent report by the Climate Change Commission.

10.9.3 Our view of the future state model in response to the energy transformation

Future business models for EDBs are being widely debated around the world. However, there is a reasonable level of consensus that EDBs need to evolve into distribution system integrators. There is also a view that EDBs may become distribution system operators (DSOs).[63]

A distribution system integrator:

[59] Watson et al, "Impact of solar photovoltaics on the low-voltage distribution network in New Zealand, IET Generation, Transmission and Distribution, 2015.

[60] Watson et al, "Impact of Electric Vehicle Chargers on a Low Voltage Distribution System", EEA Conference, 2015. The constraining issue is under-voltage.

[61] Our view is that Eastland's LV system is likely to be "typical" (and is comparable to the research cited) as no systemic loading or voltage issues are identified in this AMP. However, we note that it is inherently difficult to determine LV voltage and load limits without data on LV circuits, hence obtaining this information is a key response action.

[62] In-line chargers are the standard chargers fitted to EVs and are not "fast charging". Fast charging can draw six times the current of an in-line charger. Some new fast chargers have even larger current ratings.

[63] We have adapted our model from the work undertaken by Energy Networks Australia and Edison Electric Institute. Refer http://www.ena.asn.au/sites/default/files/roadmap_interim_report_final.pdf and www.eei.org.

- Operates the distribution network to connect consumers (with and without distributed energy resources ("**DERs**"))[64] to energy and related markets;
- Develops the distribution network to integrate DERs and support bidirectional power flow;
- Invests in the technology required to support open access to the distribution network for a wide range of users and DER providers.

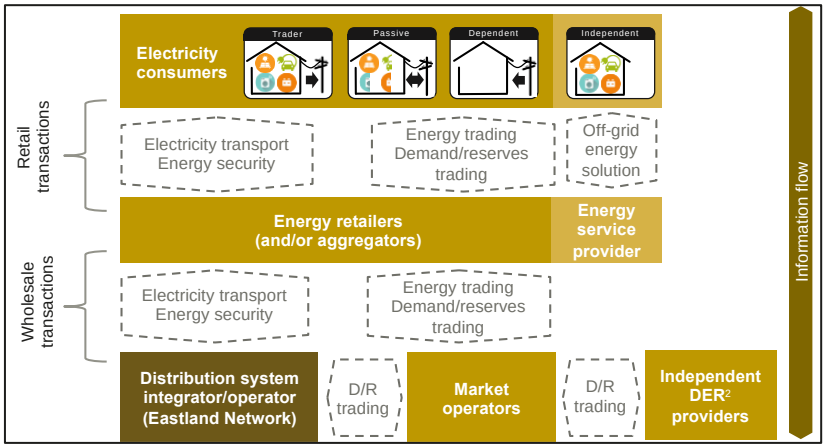
A distribution system operator:

- Monitors and controls consumer demand and DERs to optimise power flow on the distribution network.

There is an overlap between the control of DERs for distribution network purposes and the dispatch of DERs for bidding into other markets (i.e. peer-to-peer energy market, wholesale energy market, or transmission interruptible load market). How these activities will be coordinated is still evolving. In our model, we have defined the function of a DSO and have suggested that EDBs will undertake this function. We have time to monitor how the DSO function evolves and adjust our plans accordingly.

Forming a view of the future-state model allows Eastland Network to commence planning and staged implementation in a logical manner. The future-state model can be reviewed every few years and adjusted to reflect the latest information and trends. Our view of the future state model is shown in Figure 77 below.

Figure 77: Future-state model for Eastland Network



The key transactions in the model are:

- Customers (in particular, those with DERs) purchase distribution services via their energy retailer. These services are electricity transport services and energy security services. Eastland Network provides these services at a wholesale level to energy retailers who on-sell them to customers;
- Customers purchase electricity and/or sell their excess electricity (those with SSDG) via their energy retailer;
- Customers "bid" their interruptible demand (and/or energy reserves) and EDBs offer to purchase the interruptible demand (and/or energy reserves) via markets; the dispatch of these services is controlled by the DSO. It is likely that this "bidding" is procured annually, rather than real-time;

64 DERs include SSDG, EVs, standalone batteries, or a combination of them all.

- EDBs offer to purchase interruptible demand (and/or energy reserves) at a network level and independent DER providers bid to supply these services via markets.

10.9.4 Actions to progress the future state model to support the energy transformation

As already stated, the network will generally be able to cope with the expected EV and SSDG uptake over the next 10 years. There may need to be some localised capacity upgrades, but these are not expected to be material (subject to further modelling). Hence, we have time to prepare for the impacts of the energy transformation, and to prepare our future-state business model.

In general terms, our response strategy involves:

- Investigation and monitoring—this is in progress and will continue for the foreseeable future;
- Enhanced network monitoring—implementation of new systems and processes to monitor and control LV demand and two-way power flows;
- Enhanced operating procedures— implementation of new procedures to manage islanding of SSDG during planned outages, out-of-phase reclosing (post-fault), and transient over-voltage;
- DSO (Stage 1)—Implement systems to manage demand and two-way power flows to minimise the need for network augmentation;
- DSO (Stage 2)—Implement the use of new technology to manage new demand and power flows;
- Lastly, undertake network augmentation to cater for new demand and power flows.

This programme will be progressively rolled out to keep pace with the energy transformation.

In terms of timing, we need to undertake preparatory work to better monitor the LV network over the coming few years. We will need to implement an ADMS well before the end of this decade. We will also need to prepare for more sophisticated control to manage localised peak demands, and to manage system outages, which will need to be completed towards the end of the decade. Whether this is undertaken in-house or sourced from an external provider is yet to be determined.

Table 53 summarises the potential development pathway to cater for the energy transformation. This is our indicative view and we expect this to evolve and become more defined over the next two iterations of the AMP.

Table 53: Network development projects to support the energy transformation/future-state model

Phase	Activity	Indicative timing
Investigation and monitoring	• Introduction of smart metering systems by some energy retailers is in progress with 63% of households with a smart meter. We will be monitoring how the rollout progresses as smart meters are necessary to allow for SSDG.	• In progress by others
	• Eastland Network has implemented a distribution solar trial which will follow a number of typical installations and capture data in real-time that can be extrapolated to determine the future impact on the electricity assets	• In progress
	• Monitor the evolution of distribution business models and changes in technology	• In progress
Enhance network monitoring	• Installation of LV monitoring to understand the real-time demand on the low voltage system. • Undertake planning and modelling to ensure that the network is not a constraint on the uptake of	• Trial could occur in FY2023-FY2024 • Modelling work in FY2024-FY2025

Phase	Activity	Indicative timing
	SSDG and EVs. This planning and modelling will encompass the use of alternative technology (e.g. batteries) and markets (for demand control).	• System rollout in FY2026-FY2029
	• Implement sophisticated real-time SCADA and ADMS (including at a low voltage circuit level)	• System rollout in FY2024-FY2026
Enhance operating procedures	• Implement more sophisticated outage management systems (as part of ADMS) and adopt network isolation and live line practices to eliminate the risk of islanded SSDG operation	
DSO (Stage 1)—Manage demand and two-way power flows to minimise the need for network augmentation	• Develop services and tariffs that reflect the needs of different types of consumers. The tariffs will need to fairly recover the costs of providing services (i.e. cost-reflective service-based pricing), as well as being "economic" for the consumer (to minimise the risk that consumers seek to avoid charges)	• This is currently in progress.
	• Wide scale rollout of "controllable devices" at consumer premises. It is assumed that this will be by others.	• This will need to be advanced towards the end of this decade
	• Develop systems to be able to control "controllable devices" at consumers' premises (either directly or through demand aggregators).	
	• Develop processes and systems to procure "firm" demand management from the market (this could be as simple as running a tender process for non-network demand solutions, or "offering" to purchase interruptible load (or battery output) in a regional demand management market);	
	• Implement the next stage of ADMS to allow for consumer level demand control	
DSO (Stage 2)—Implement the use of new technology to manage new demand and power flows	• Contracting for (or installing as part of the network) network connected DERs to manage power flows and peak demand	• This will need to be advanced towards the end of this decade
	• Implement the next stage of ADMS to allow for control of network DERs	
Network augmentation to cater for new demand and power flows	• Upgrade the traditional network due to demand and two-way power flows (where it cannot be managed via demand control or network DERs)	• This may be required in the 10-20 year horizon.

10.9.5 What this could mean for opex and capex over the long term

We haven't yet fully costed the required work, but it could amount to $3-6+ million over the coming 10-15 years. No allowances have been included in our forecast expenditure in Schedule 11a and 11b, however, we expect costs to be included in our 2023 or 2024 AMP.

10.10 Summary of network development expenditure forecasts

Table 54: Zone Substation project expenditure

Projects	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Massey Rd Substation						750	750			
Mahia/Blacks Pad Substation	750	750	750							
Gisborne Project (Phase 1) – Cap Bank 1				500						
Gisborne Project (Phase 2) – Line upgrade	500	500	500	500	3,000	3,000	3,000	500	500	500
Gisborne Project (Phase 3) – Cap Bank 2					500					

Table 55:Feeder project expenditure

Projects	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Waipaoa/Dunstan				100						
Matawai					375					
Dalton / Rototahi								502	502	502
Borough 1 & 2[65]	80									

Table 56: Demand-side management project expenditure

Projects	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
11kV Ripple control plant		350	150							

Table 57: Automation expenditure

Projects	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Automation plan[66]	40	-	40	-	40	-	40	-	40	-

Table 58: Other development projects

Projects	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Grey St capacity upgrade	120									
Cameron Rd capacity upgrade	50									

[65] Project completed as part of the conductor renewal budget (Current conductor age >65Yrs old)
[66] This is in addition to the $40k budgeted for recloser renewals

11 Asset lifecycle plans (network maintenance and renewal)

This section describes how we manage the lifecycle of our key network assets.

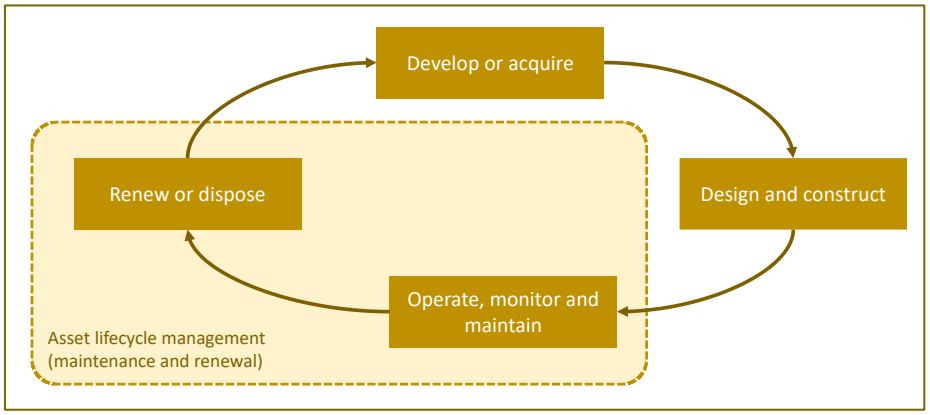
11.1 Introduction

This section identifies and discusses the factors which contribute to the *operate, monitor and maintain* and *renew or dispose* phases of Eastland Network's assets.[67] In this section we cover:

- An overview of our asset fleet plans;
- Our approach to assessing asset health;
- Our approach to assessing asset criticality;

Individual asset fleet plans have been developed for the major asset types on the network and identify the issues, strategies, and operational support Eastland Network employs to maintain assets over their entire life

Figure 78: Phases of the asset lifecycle



For this AMP, we have focused on the following key asset fleets:

- Structures (wooden and concrete);
- Structures (steel);
- Conductor/lines;
- Power transformers;
- Substation switchgear.
- Ground mounted transformers;
- Ground mounted switchgear.

[67] A description of the phases of the asset lifecycle are provided in Section 2.6.

The above asset fleets represent 92% of the total value of the network (in RAB terms). For other asset classes, we have provided a summary of any key issues, risks, projects, and expenditure forecasts.

Our focus for the 2022 AMP will be to enhance the plans for these assets and to incorporate fleet plans for the remaining material asset classes.

11.2 Asset Fleet Plans

We have introduced a new asset fleet planning approach and have defined fleet strategies based on our overall asset management policy and strategies. The fleet plans for each asset class include:

- An overview of the fleet;
- Our strategy for managing the fleet;
- How we operate, monitor and maintain the fleet;
- How we make renewal decisions on the fleet;
- Fleet performance and risk;
- Fleet population and age;
- Fleet asset health and forecast maintenance and renewal requirements;
- Forecast expenditure on the fleet.

In response to this new approach, we have fast tracked some asset inspections for the first half of the forecast period to populate the condition data in the asset health model.

At the time of preparing the fleet plans, we have not completed the inspections for all assets, hence asset replacement rates included in this AMP have remained largely the same as prior AMPs. We expect to revise asset replacement rates in the next iteration of the AMP when a greater proportion of assets have been inspected, providing sufficient evidence to support a change in forecast.

As part of this approach, new inspection standards and methodology procedures have been developed to accommodate the transition of inspection data into the format required by the DNO Methodology.

11.3 Approach to assessing asset health

11.3.1 A change in approach from age-based to condition-based asset health assessments

Historically Eastland Network has forecast asset renewals based on age data and has selected specific renewal projects based on an engineering assessment of available condition and test data. As part of our asset management roadmap[68], we are transitioning our asset renewal forecasting to an asset health-based approach that utilises asset condition data and the DNO common network asset indices methodology.

The health of an asset is the key determinant for when that asset needs to be maintained, renewed or disposed. How the asset is operated can also impact the health of the asset (i.e. how quickly the health is degraded, or how the life can be extended). How asset health is determined also influences the type and frequency of monitoring (e.g. inspections and testing).

[68] Refer Section 9.

The change was made as we did not have confidence that the historical age-based approach was adequately improving the performance of the asset fleets. We also considered that steady state renewal forecasting (driven by our age-based assessments) was no longer appropriate given the ageing of some asset fleets.

Eastland Network's change in focus works to identify problematic areas by using a data-based approach (health, criticality, and outage review) and also has the capability to forecast the future health of assets. Consequently, it is expected that the risk that we will not meet our reliability targets will reduce.

11.3.2 DNO Methodology to determine asset health

The DNO common network asset indices methodology ("**DNO Methodology**") is a common framework of definitions, principles and calculation methodologies, for the assessment and forecasting of asset health and asset risk. The DNO Methodology has been adopted by all distribution network operators across Great Britain.

Under the DNO Methodology, asset health is a measure of the condition of an asset and the proximity to the end of its useful life. The DNO Methodology includes a common methodology for the calculation of asset health for individual assets, which includes:

- The current asset health informed by the observed and measured condition; and
- Future asset health, using assumptions regarding the likely future deterioration in asset health.

To take account of future deterioration, the DNO Methodology includes some age-based elements within the calculation of asset health.

As the health of an asset deteriorates (i.e. its condition worsens), the likelihood that it will fail increases. The DNO Methodology relates asset health to the associated probability of condition-based failure (the probability of failure or **PoF**). For each asset class, the DNO Methodology specifies the exact relationship between the asset health score and the PoF. Therefore, under the DNO Methodology, the asset health can equally be expressed in terms of the PoF.

There are limitations with the DNO Methodology in that it does not cover the asset classes that are used in the Information Disclosure Schedule 12a reporting. For the asset classes not available within the DNO Methodology, we will continue with our age-based renewal forecasting.

11.3.3 Asset Health Indicators

The DNO Methodology reports asset health in a format of 0.5 -10, where 0.5 indicates an asset is "as new", and 10 indicates that replacement of the asset is required. We have translated the DNO asset health score to the H1-H5 standard NZ reporting format as follows:

Table 59: DNO Asset Health Score and Index translation to EEA Asset Indicators

EEA asset health Indicator	DNO Methodology health index band	DNO Methodology, health index banding criteria	
		Lower limit of health score	Upper limit of health score
H5	HI1	≥0.5	<4
H4	HI2	≥4	<5.5
H3	HI3	≥5.5	<6.5
H2	HI4	≥6.5	<8
H1	HI5	≥8	≤10

H1-H5 are defined in the EEA's asset health indicator guide as shown in the table below. The definitions in the EEA's guide correspond to the DNO Methodology for the respective health index band (albeit the numbering is in reverse order).

Table 60: Definition of EEA Asset Health Indicators

EEA Asset Health Indicator Guide	
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

11.4 Approach to assessing asset criticality

Asset criticality has been applied to individual assets using the methods identified in the EEA's "Asset criticality guide" which primarily ranks criticality according to five main categories: Public Safety, Workplace Safety, Direct Cost, Service Levels, and Environment.[69] Other factors which we have identified as significant to criticality determination are:

- Distance to an asset from the depot (some areas take upwards of 3 hours to get to);
- Types of consumers on a feeder (hospitals / emergency services).

We assign asset criticality within the range of C1-C4 to assets. C1 denotes assets which are most critical or have *no mitigating contextual factors* and C4 denotes assets with *no plausible consequence of failure* (CoF) or *plausible CoF completely mitigated*.

Whilst we have only recently assigned asset criticality, it is observable from our historical renewal expenditure patterns that Eastland Network has been focusing its expenditure on townships. Our past renewal practices considered the risks (and potential consequences) of failure on public safety and service levels, which are typically greatest in townships and urban areas.

We will be using asset criticality to enhance our renewal and maintenance forecasting and to guide the selection of specific projects. Combining asset health and asset criticality will produce a risk-based ranking order of asset renewal priorities that will more efficiently address the ageing of assets. We are currently enhancing our GIS capabilities to be able to visualize the risk matrix formulated through the combination of asset health and criticality. Expect to see risk reported in this manner in future iterations of our AMP.

11.5 Wood and concrete pole fleet plan

11.5.1 Fleet overview

The pole fleet is a significant focus for Eastland Network, as the fleet represents 34% of our total network assets (by value), and it also has a significant role in maintaining a reliable supply of electricity to customers.

Consistent with a low-density network, most customers are served through our overhead network. Our subtransmission system is 99% overhead, our distribution system is 94% overhead, and our LV system is 65% overhead.

[69] EEA, "Asset Criticality Guide", 2019.

The overhead network still utilizes a significant number of wooden poles. For the subtransmission, distribution, and LV network, the percentage of wooden poles is 41%, 50%, and 61% respectively. Historically the wooden poles were Australian hardwood, but more recently, NZ softwood poles have been used.

Over the period 1990 to 2005, a number of ultra-sound or other quantitative methods were used to identify at-risk wooden poles. This data was used at the time to schedule the replacement of poor condition and at-risk poles, and this work is largely complete. Any data on current poles is now considered to be obsolete.

During 2002, the mechanical strength requirements for all poles was calculated by Foley and recorded in the GIS. This work led to the replacement of poles that were carrying mechanical loads above their design rating. This data is currently used to confirm that any new pole installed in an existing location has the required design strength.

The urban distribution and LV pole fleet was subject to a large urban renewal program between 2000 and 2010. This renewal program responded to the detailed inspections and testing of the time and has materially reduced the risk of unassisted failure in urban areas. The older population of distribution and LV poles are now typically in the urban fringe and rural areas.

In terms of private LV poles, the low socio-economic nature of our network area is contributing to the failure of private poles (which were gifted in the 90's) as there is little proactive renewal.

Steel structures (in relation to the subtransmission network) are considered in a separate asset fleet plan. Refer to Section 11.6.

We have prepared a separate vegetation management plan. Refer to Section 11.21.

11.5.2 Fleet management strategy

Our 10-year pole fleet strategy is:

- Capture condition information on all poles using the new DNO methodology by 2024, and achieve 95% of all planned inspections going forward;
- Assess the asset health for all poles based on condition information using the DNO Methodology, and revise our long-term forecasts based on accurate asset health indices by 2025.
- Ensure that there are no H1 assets present over the forecast period, and ensure that H2 assets are replaced before they deteriorate to H1 (this is subject to the two preceding items);
- Ensure all defects (including red and blue tagged poles) are risk assessed and replaced prior to failure. Our target is to have no failures of any identified defective pole or pole-top;
- Identify all priority areas (i.e. feeders or sections of feeders) using criticality, reliability, and asset health information and ensure that specified projects are identified for these areas;
- Improve our pole and pole-top failure rate on the subtransmission system and "backbone" distribution system;
- Develop a strategy to deal with the ageing private wood pole fleet.

Note: Also refer to our vegetation management plan in Section 11.21.

At this stage, we have not set a fault rate improvement target. This is for two reasons: firstly, we have only recently improved our recording of asset failure modes and as such we do not yet have a good view of the underlying fault rate; and secondly, we are seeking to capture comparable industry fault rates upon which to set our long-term target.

The pole fleet strategy was developed based on the analysis presented below and is a shift from our historical age-based forecasting to a health-based and reliability-focused model. We consider that the pole fleet strategy is consistent with our asset management strategy.

11.5.3 How we operate, monitor, and maintain the assets

Operating the assets

Pole structures form part of our overhead line system (that also includes conductor and various line switchgear and fuses). The overhead line system is operated via the control room which monitors the voltage and load on the system, and respond to faults. Faults are typically identified from circuit breaker, recloser, and sectionaliser operations, and fault locators connected to the SCADA system; and are also reported by customers (via retailers and/or our call centre). Faultmen are dispatched to investigate and remediate the fault and further escalation to effect repairs is initiated as required to restore supply.

Monitoring (inspection and testing) the asset

Table 61 below summarises our current inspection and testing regimen for the pole fleet, excluding 110kV assets. The 110kV assets have more intensive inspection regimens). Refer to Table 69 for inspection programs in relation to these assets. The capturing of condition information is largely time-based, with more frequent inspections of more critical assets. Specific line patrols are initiated due to the unreliability of the line.

The pole inspection standards were updated during FY2021 to align with the DNO Methodology to ensure all the necessary observed condition inputs were captured. These inputs are used to calculate the health index (H1-H5) for each asset. To enable us to prepare accurate forecasts using the DNO Methodology, we have increased the pole inspection (testing) budget between $335k to $555k p.a. for different voltage. This will allow for the inspection of poles to be completed within three years. It is expected that expenditure will reduce to normal following the completion of this work.

Table 61: Wood/concrete pole inspection/test program

Voltage	Inspection Type	Scope of Inspection	Inspection Trigger
Subtransmission (excluding 110kV assets).	Visual – patrol	Line patrols are undertaken via helicopter or vehicle assisted ground patrols. The line patrols record any defective item (covering the observed condition inputs) and vegetation.	Unreliability of line. Following significant event.
	Visual – detailed	Capture of observed condition inputs in relation to overall visual pole condition, pole foundation, pole top, pole ground line, crossarm, insulators, stay wire, and other external factors (e.g. risk to the public). The observed condition inputs are consistent with the DNO Methodology for poles with the inclusion of additional factors in relation to pole-top hardware. Verification of asset attribute data. Vegetation data is also captured. For wooden poles, the visual inspection includes excavation and/or climbing as	Time-based, annually

Voltage	Inspection Type	Scope of Inspection	Inspection Trigger
		necessary to categorically determine the pole's below ground and/or head condition.	
	Wood pole testing	We currently use the judgement of experienced linesmen to test poles. Samples of the wood (below ground line) are taken and assessed based on standardidsed criteria,	Time-based. 3-yearly initially to populate DNO inputs, then 5-yearly
Distribution	Visual – patrol	Same as applied for subtransmission poles.	Unreliability of line. Following significant event
	Visual – detailed	Same as applied for subtransmission poles.	Time-based. 3 yearly initially to populate DNO inputs, then 5-yearly
	Wood pole testing	In conjunction with detailed visual inspection	As above
Low voltage	All types	LV poles are visually inspected in conjunction with the distribution pole inspection program, with the same inspection standard applied.	As above

Detailed pole inspections and patrols are qualitative assessments undertaken by suitably qualified and competent inspectors.

Maintaining the asset

Pole maintenance typically consists of defect repairs and scheduled pole-top hardware replacement as shown in Table 62.

Table 62: Pole maintenance

Type of Maintenance	Maintenance Trigger
Defect repair	Defects are repaired following identification of a fault, line patrol, or detailed line inspection. The assessment of the defect repair is made between the faultman and operator (in the case of a fault), and in coordination with the operations team in other cases. Defects are defined as remediation work on a pole that is required within 1 year. The scheduling of the repair is based on the risk of failure.
Crossarm, insulator replacement	Scheduled replacement of pole-top hardware (crossarms, insulator, binder, etc.) is made following review of the line patrol or detailed line inspection data.

How we make renewal decisions on the fleet

As mentioned in the introduction to this section, we are applying the DNO Methodology to determine asset health and are forecasting asset renewal based on this assessment. The specific drivers for asset renewal forecasting and the triggers for selecting specific asset renewal projects (within the overall asset renewal forecast) are shown in Table 63.

Table 63: Drivers and triggers for renewal forecasts and projects

Renewal item	Drivers/triggers
Renewal forecasts	Renewal forecasts are established to ensure that there are no H1 assets present over the forecast period, and that H2 assets are replaced before they deteriorate to H1.

Renewal item	Drivers/triggers
	Poles which have been identified as being poor (H2) are targeted to be replaced within 1-4 Years[70]. Poles which have been assigned H3, H4 or H5 are programmed into the future replacements based on the DNO modelling outcome. For the pole fleet, asset health is the primary driver for renewal forecasting; that is, there are no material type issues, latent safety issues, or obsolescence issues being considered at this time.
Renewal projects	Specific renewal projects are defined and selected based on one or more of the following: • The most current inspection and asset health information (with this information being verify during the project concept phase); • Evidence that the pole(s) have deteriorated to an extent that their inherent mechanical is deteriorating to a point where the risk of failure is unacceptable; • Deteriorating reliability performance in respect of a particular feeder, or section of feeder (where the underlying reasons for unreliability being attributable to deteriorating asset condition). The prioritisation of these projects is made after considering the criticality of the assets.
Defect replacement	Replacement of an asset under fault or defect conditions is typically driven by immediate safety concerns and/or where the risk of failure is assessed to be possible within the next 12 months. Poles which have been identified as EOL (H1) are identified with a red or blue tag which signifies that the pole can support normal loads but not ultimate design loads; The targeted replacement of red tagged poles is within 3 months. The targeted replacement of blue tagged poles is within 12 months.

11.5.4 Fleet performance and risks

Current fleet performance

As stated in Section 6.5.1, pole faults in 2020 were at a rate of 0.50 faults/100km, which is consistent with our historical average. This equates to an asset fault rate of 4.7 faults per 10,000 units. There is no published asset fault rate data available for New Zealand (and we will be attempting to obtain pole fault rates from other EDBs over the next 12 months), however, this our asset fault rate is higher than the unassisted pole failure rate in Australia (noting that the fault and failure rates are measurements of slightly different things). Given the potential consequence of a pole fault, reducing this fault rate is a worthwhile target.

Unplanned outages which are contributable to a pole being rotten, or falling due to age, are rare. It is usually an external interference such as a significant weather event, third party interference, or vegetation related incident which causes poles to fail. However, there are some feeders where the deterioration of a number of poles has progressed to the point where high winds (below design criteria) are causing faults. Pole replacement work on these feeders has been scheduled (refer to the feeders identified in Section 6.4.)

There were no specific performance issues with the pole fleet on the subtransmission network and LV network.

[70] Replacement programs are targeted at poles which have been assigned a health index value of H1 or H2. H2 poles are replaced in conjunction with planned shutdowns for H1 poles.

Key fleet risks

Our risk register has identified the following top risks in relation to poles (where the consequences are reliability or safety related):

- Poor condition;
- Vegetation interference;
- Third party interference;
- Insulator breakdown.

A key focus of this fleet plan is to ensure areas where risk levels are elevated are identified and remediated before the risk is crystalized (i.e. a consequence occurs).

There are some specific risk areas which are being actively addressed:

- Rural settlements such as Te Araroa, Ruatoria, and Tokomaru Bay, which will now be the focus for the 400V Pole fleet;
- Wooden poles above their maximum practical life (specifically on the subtransmission and distribution network);
- Private LV poles.

11.5.5 Fleet population and age

Details on the pole population and pole age profile are shown in Table 64. The asset management implications of the age and population are:

- 2,667 wooden poles (15%) have reached their maximum practical life (**MPL**). While this is not necessarily an indicator of poor condition, it does suggest that more intensive inspection and/or testing of these assets is required. Replacing over-aged wooden poles (subject to condition) remains a focus of our pole renewal program. These poles tend to be more concentrated on the rural feeders, and, in conjunction with reliability analysis, will be the focus of our efforts for the next couple of years.
- The current concrete pole population will not see any material percentage of poles reaching their MPL over the coming decade.

Table 64: Pole asset fleet quantity and age

Voltage	Pole Type	Population	Average age (years)	MPL[71] (years)	No. of poles within 5-years of MPL
Subtransmission	Concrete	1,496	29	100	-
	Wood	1,452	35	60	459
Distribution	Concrete	12,802	22	100	-
	Wood	12,683	39	60	4,214
Low Voltage	Concrete	2,449	17	100	-
	Wood	3,786	35	60	836
Total		**34,668**	**30**	**80**	**5,509**

Note: This includes the 110kV concrete and wood structures but excludes the 110kV steel towers and privately owned poles.

[71] MPL means maximum practical life. Based on the EEA health determination for concrete and timber structure MPL.

11.5.6 Fleet asset health and forecast maintenance and renewal requirements

Asset replacement and renewal forecasts (poles)

For this AMP, the asset health has been calculated using the DNO Methodology, with the results converted to the EEA's Asset Indices. The current asset health of the pole fleet is shown in Figure 79 and Figure 80. The change to the DNO Methodology is the reason for the change in health from the 2020 AMP. We expect that the asset health of the fleet will continue to change as inspections (under the new methodology) are completed. As noted in the introduction, we have not yet altered our forecast renewals, but will reconsider these before we publish the 2022 AMP.

Figure 79: Wood pole asset health

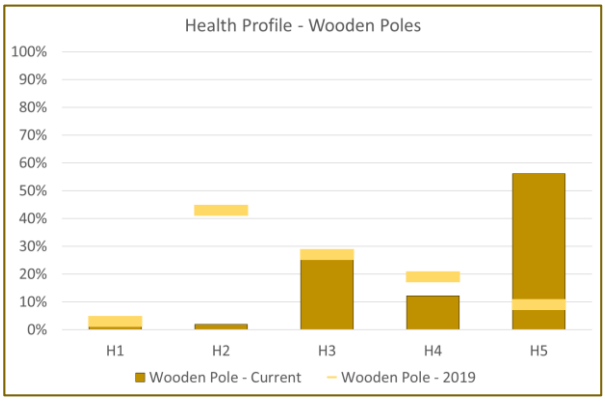
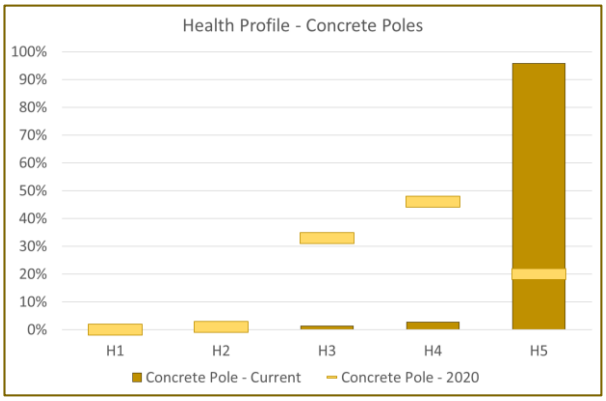


Figure 80: Concrete pole asset health



Note: This includes the 110kV concrete and wood structures, but excludes the 110kV steel towers & privately owned poles.

The forecast health of our wood/concrete pole fleet is shown in Figure 81 and Figure 82, based on no renewals taking place.

Table 65 shows the forecast pole asset health and replacements over the next five years. The pole renewals are forecast to keep pace with the forecast H1 and H2 poles over the period. The pole renewals are predominately focused on pole replacements. This is reinforced by our own observations that concrete poles are not failing prematurely and we are expecting them to achieve their MPL without impacting reliability.

Based on current information, we consider that these forecasts are appropriate to maintain the health of the fleet at an appropriate level to achieve our safety, service (reliability), and efficiency objectives.

Figure 81: Concrete pole forecast 5-year asset health forecast (no renewals)

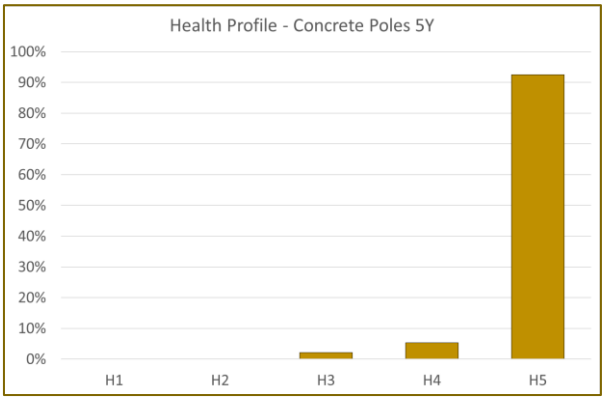
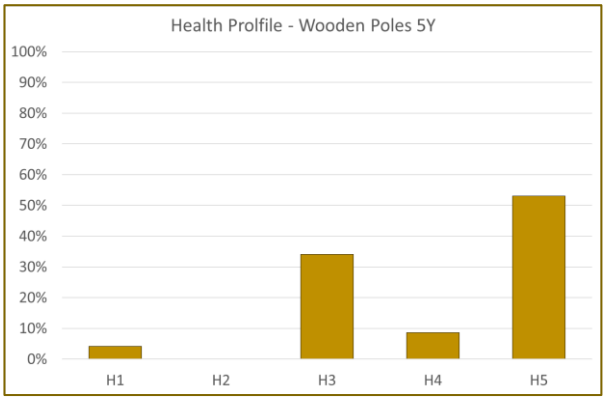


Figure 82: Wood pole forecast 5-year asset health forecast (no renewals)



Note: This includes the 110kV concrete and wood structures, but excludes the 110kV steel towers & privately owned poles.

Table 65: Forecast pole replacements

Voltage	Pole Type	Total population	Grade H1 & H2 assets (2020)	Forecast grade H1 & H2 assets (2026), before renewal[72]	Forecast pole renewals over next 5-years[73]
Subtransmission	Concrete	1,496	0	0	0
	Wood	1,452	50	50	300
Distribution	Concrete	12,802	0	0	0
	Wood	12,683	670	677	2,200
Low Voltage	Concrete	2.449	0	0	0
	Wood	3,786	42	43	430
Total		**34,668**	**762**	**770**	**2,930**

Note: This includes the 110kV concrete and wood structures, but excludes the 110kV steel towers & privately owned poles

Asset replacement and renewal forecasts (pole-top)

A key pole fleet activity is the renewal of pole-top hardware (i.e. crossarms and insulators). Mid-life renewal of pole-top hardware is typically required to enable the full economic life of the pole to be realized. We are capturing condition information in relation to pole-top hardware and developing our systems to report on this specific sub-asset with a view to including our improvements in the 2022 AMP. At Eastland Network, crossarm replacements is Opex.

Specific asset replacement and renewal projects

Our engineering analysis of the most recent condition data, reliability data, and asset criticality has identified the material projects shown in Table 66. Several minor projects have also been identified.

These specific projects align with the fleet strategy described above.

[72] Note: Inspection process based on DNO methodology not due to be completed until 2024. Inspections will alter H1 & H2 forecasts for future works

[73] This includes both planned and unplanned replacements.

Table 66: Specific asset replacement and renewal projects

Location	Description	Voltage	Driver	Quantity	Budget	Year	Comments
50kV Kiwi - Waihi Hydro line	Crossarm and insulator replacement	Subtrans.	Asset health	15 sets p.a.	32k p.a.	2022 to 2031	No practical alternatives
33kV Wairoa – Mahia Line	Pole replacement	Subtrans.	Asset health, criticality	At least 7 poles p.a.	70k p.a.	2022 to 2031	No practical alternatives. High criticality due to low line security.
50kV Massey – East Coast Line	Pole replacement	Subtrans.	Asset health, criticality	At least 10 poles p.a.	100k p.a.	2022 to 2031	No practical alternatives. High criticality due to low line security.
Ngatapa – Pehiri	Pole Replacement	Subtrans	Asset health	10 Poles	100k p.a.	2022 to 2024	Driven by pole condition
Hicks Bay Feeder (Main line)	Pole replacement	11kV	Asset Health, Criticality	At least 15 poles	75k p.a.	2022 to 2023	Feeder in top ten for pole defects and faults
Frasertown feeder (Ardkeen, main line, Titirangi, Patunamu)	Pole replacement	11kV	Asset Health, Criticality	At least 30 poles	150k p.a.	2022 to 2031	High fault rate, driven by pole condition.
Ruakituri	Pole replacement	11kV	Asset Health, Criticality	At least 15 Poles	75k p.a.	2022 to 2031	High criticality area due to location i.e. distance from depot
Mahia feeder (Waikokopu, Township, Eastcoast Rd)	Pole replacement	11kV	Asset Health, Criticality	At least 25 poles	125k p.a.	2022 to 2031	High corrosive area with high fault rate. Historically an area contributing to SAIDI and SAIFI
Dalton Feeder (Main line)	Pole Replacement	11kV	Asset Health, Criticality	30 Poles	150k	2022 to 2023	Recently inspected and requires pole replacements due to inspection outcomes
Waimata (Particularly Waimata Valley)	Pole replacement	11kV	Asset Health, Criticality	15 Poles	50k	2022 to 2023	High faults area
Te Araroa township	Pole replacement	LV	Reliability, asset health	8 Poles pea	$28k	2022 to 2024	No practical alternatives

Location	Description	Voltage	Driver	Quantity	Budget	Year	Comments
Ruatoria township	Pole replacement	LV	Reliability, asset health	10 Poles p.a	$35k	2022 to 2024	No practical alternatives
Mahia township	Pole replacement	LV	Reliability, asset health	20 poles p.a.	$70k	2022 to 2024	High corrosive area near sea, pole conditions driving replacement

Note: Values in March 2021 $000 (constant prices)

11.5.7 Expenditure forecasts

The forecast expenditure for the pole fleet is shown in Table 67 and Table 68 below.

Opex has been forecast on a "business as usual" basis (i.e. on a historical roll-forward basis), with the exception of an increase in inspection volumes in FY2021 and FY2024 to allow for the entire fleet to be inspected under the new standard. We have not included any material changes in inspection frequency or efficiency gains, nor have we forecast any material change in fault rate that would materially influence fault response and repair costs; however, we are expecting that this will be an area for improvement over the coming years. The constant price forecasts do not have growth rates applied to reflect the growth in network length as this is not considered to be material over the next five years.

Table 67: Forecast opex

Expenditure type	Opex cat.	2022	2023	2024	2025	2026	Average 2027-2031
Inspections, patrols & testing[74]	RCMI	54	54	54	54	54	54
Fault response and repair	SIE	33	33	33	33	33	33
Pole-top replacement (specified projects)[75]	ARR	32	32	32	32	32	32
Pole-top replacement (unspecified projects)	ARR	18	18	18	18	18	18
Inspections and patrols[76]	RCMI	400	400	400	280	280	280
Fault response and repair	SIE	480	480	480	480	480	480
Inspections and patrols[77]	RCMI	40	40	40	25	25	25
Fault response and repair	SIE	150	150	150	150	150	150
Total		**1,207**	**1,207**	**1,207**	**1,007**	**1,007**	**1,007**

Note: Values in March 2021 $000 (constant prices).

Note: This excludes the 110kV concrete and wood structures. Refer Table 73.

Capex has been forecast based on the level of pole replacements forecast in Table 66, for each voltage level. As noted in Table 63 above, actual project selection is based on our engineering analysis of the most current inspection and reliability data. Hence, for the first few years of our

74 This covers all overhead line assets (poles, conductor, pole-tops, pole mount switchgear, pole mount transformer)
75 This is expenditure in relation to the specified projects shown in Table 66.
76 This covers all overhead line assets (poles, conductor, pole-tops, pole mount switchgear, pole mount transformer)
77 This covers all overhead line assets (poles, conductor, pole-tops, pole mount switchgear, pole mount transformer)

forecasting, we have identified a high number of specific projects, with little specificity in the outer years. We expect to increase the level of identified projects over the coming years as our asset condition information improves.

We are expecting the capex forecasts to change in response to future revisions of our asset health assessments which will be progressively updated as inspections under the new DNO methodology are completed.

Table 68: Forecast capex

Expenditure type	Voltage	Capex cat.	2022	2023	2024	2025	2026	Average 2027-2031
Replacements (specific projects)[78]	Subtrans.	ARR	270	270	170	170	170	170
Replacements (unspecified and minor projects)	Subtrans.	ARR	320	320	420	420	490	490
Replacements (defect/emergency)	Subtrans.	ARR	45	45	45	45	45	45
Replacements (specific projects)[79]	11kV	ARR	650	350	350	350	350	350
Replacements (unspecified and minor projects)	11kV	ARR	1858	2158	2158	2158	2158	2158
Replacements (defect/emergency)	11kV	ARR	358	358	358	358	358	358
Replacements (specific projects)[80]	LV	ARR	133	133	133	-	-	-
Replacements (unspecified and minor projects)	LV	ARR	237	237	197	330	330	330
Replacements (defect/emergency)	LV	ARR	40	40	40	40	40	40
Total			**3911**	**3,911**	**3,871**	**3871**	**3941**	**3,941**

Note: Values in March 2021 $000 (constant prices)

Note: This excludes the 110kV concrete and wood structures. Refer Table 74.

11.6 110kV steel structures

11.6.1 Fleet overview

Originating from Tuai substation, Eastland Network operates five 110kV circuits on its network. Two of the circuits supply the Wairoa substation, two circuits supply the Gisborne substation and one circuit runs from Gisborne to Tokomaru Bay. The overhead conductor is supported by a combination of 477 steel towers, 64 concrete poles and 48 wooden poles. The concrete and wooden poles are predominantly located on the Gisborne plains as the mechanical loading and clearances are easier to obtain on level ground.

78 This is expenditure in relation to the specified projects shown in Table 66.
79 This is expenditure in relation to the specified projects shown in Table 66.
80 This is expenditure in relation to the specified projects shown in Table 66.

The circuits to Gisborne and Wairoa are N-1 electrically, but not N-1 mechanically (as there are some shared structures). This increases the risk of loss of supply due to environmental factors.

The 110kV lines are critical lines for Eastland Network, and as such, contracts have been set up with external specialist contractors to have crews ready in case of an emergency. In 2017, a plane hit both lines on the Gisborne – Tuai circuit. The line was repaired and reinstated within three days of the event occurring. The majority of the repair time was due to the location of the fault being in a remote gully.

In 2015, the 110kV lines was subject to a snow and ice storm which tripped both lines simultaneously. This was due to the extreme sag and weight that the line was subject to during this event. In response to this tripping, Eastland invested in 110kV line spacers for lines which have an exposure to these weather events. This project was completed in 2018.

11.6.2 Fleet management strategy

The 110kV steel structures are critical assets, and our 10-year fleet strategy is to:

- Convert the current condition data into the DNO methodology during FY2022, and achieve 100% of all planned inspections going forward;
- Assess the asset health for all steel structures based on condition information using the DNO Methodology (considering the differences from the current Transpower methodology), and revise our long-term forecasts based on accurate asset health indices in FY2022.
- Ensure that there are no H1 and H2 assets present over the forecast period, and that H3 assets are replaced well before they deteriorate to H1 or H2;
- Ensure all defects are risk assessed and replaced prior to failure. Our target is to have no failures of any identified defective item;
- Undertake a detailed risk assessment of the 110kV lines (including steel, concrete and wood structures) and remediate any high-risk areas;
- Intensively monitor;

11.6.3 How we operate, monitor and maintain the assets

All maintenance and inspections of the 110kV structures are contracted to external contractors. The inspections in Table 69 apply to the steel, concrete and wood structures that form part of the 110kV line.

Table 69: 110kV line inspection/test program

Inspection Type	Scope of Inspection	Inspection Trigger
Visual inspection	This is a visual inspection that is generally undertaken on foot by specialist inspectors. The inspections look for: • Conductor clearances; • Slips; • Structure integrity; • Access track conditions; • Bird nesting and animal damage; Bridge condition and access.	Annually
	Vegetation inspections are undertaken by foot and helicopter.	6-monthly.
Site monitoring	High risk sites have additional specific inspections and/or testing. (e.g. monitoring slow moving slips, movement in water courses)	As required, after weather events

Inspection Type	Scope of Inspection	Inspection Trigger
Unplanned (post storm and post tripping)	Inspections are undertaken after every fault to determine the cause and to determine the required remediation.	As required.
Condition Assessment	Detailed condition assessment which includes hardware, conductor, structures, insulators and foundations. This is undertaken by specialist contractors that remove line hardware for detailed inspection.	4 Yearly

Maintaining the asset

Steel structure maintenance occurs in response to visual inspections, condition monitoring and faults. This would typically require specialist personnel and is typically planned well in advance (depending on the assessed risk of failure). Table 62 contains details of the types of inspections undertaken.

Table 70: 110kV steel structure maintenance

Type of maintenance	Scope of maintenance
Access track maintenance	Maintain access to towers, cut trucks if necessary, clearing vegetation, slips and culverts. Maintain landowner relationships and communications.
Foundation repairs and maintenance	Inspect grillage/foundations and below ground level equipment and repair as required.
Structure maintenance	Inspect componentry and identify replacement attachment requirements. Carry out CA and identification of any defects. Improve line clearance issues.
Insulator cleaning and string replacement	Insulators are replaced as part of capex work along with associated attachments in line with pole replacement schedules.

11.6.4 How we make renewal decisions on the fleet

Steel structures have not yet been incorporated into the DNO Methodology, and this is planned for FY2022. The specific drivers for asset renewal forecasting and the triggers for specific asset renewal projects (within the overall asset renewal forecast) are shown in Table 63.

Structure replacements are driven by the intensive condition assessments which identify all condition drivers. For the 110kV structures, we have continued to use Transpower 's standards and processes for the condition assessments of steel towers.

Table 71: Drivers and triggers for renewal forecasts and projects

Renewal item	Drivers/triggers
Renewal forecasts	Renewal forecasts are established to ensure that there are no H1 assets present over the forecast period, and that H2 assets are replaced before they deteriorate to H1. The detailed condition assessment is the primary driver of this. Assets, or components of the assets (i.e. foundation, structure, insulators) which have been identified as being poor (H2) are targeted to be replaced within 1-4 Years (depending on the assessed risk)[81]. Assets (or components of the assets) which have been assigned H3, H4 or H5 are programmed into the future replacements based on assessed risk.

[81] Replacement programs are targeted at poles which have been assigned a health index value of H1 or H2. H2 poles are replaced in conjunction with planned shutdowns for H1 poles.

Renewal item	Drivers/triggers
Renewal and maintenance projects	Specific renewal or maintenance projects are defined and selected based on the current condition assessments, and/or specific site monitoring. The scheduling of these projects is made after considering the risk of failure.
Defect replacement	Replacement of an asset under fault or defect conditions is typically driven by immediate safety concerns and/or where the risk of failure is assessed to be possible within the next 12 months.

11.6.5 Fleet performance and risks

Current fleet performance

The 110kV lines are critical assets. The criticality of the line drives our continual inspection, maintenance, and replacement program to ensure that the structures remain in good operating condition. Since the purchase of the 110kV assets in 2015, we have not experienced a premature outage due to the condition of these assets.

Key fleet risks

Our risk register has identified the following top risks in relation to 110kV structures (where the consequences are reliability or safety related):

- Third party interference (planes);
- Wildlife (birds and animal damage);
- Environmental factors (snow, ice, land slips);
- Unobserved deterioration in condition.

Risk management

Risks are principally managed through the inspection and condition monitoring regimen. Known risk areas (e.g. structures exposed to slow moving slips or water cause movement) have specific monitoring regimens in place.

Given the criticality of these assets (in relation to the N mechanical security of some structures), a detailed risk study will be undertaken during FY2022. This study may lead to more intensive monitoring of some structures, and/or additional maintenance.

11.6.6 Fleet population, age and health

Details on the steel structure population and age are shown in Table 72.

Table 72: 110kV steel structure asset fleet quantity and age

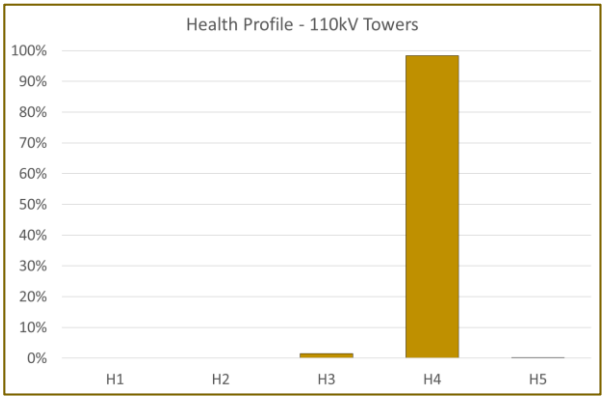
Line	Structure type	Population	Average age (years)	MPL[82] (years)	No. of structures within 5-years of MPL
GIS-TUI-A	Steel towers	211	58	90	0
GIS-TOKO	Steel towers	208	44	90	0
WRA-TUI-A	Steel towers	58	47	90	0
Total	-	**477**	**50**	**90**	**0**

[82] MPL means maximum practical life. Based on the EEA's health determination for iron rail. Note there is no definitive MPL for steel structures.

11.6.7 Fleet asset health and forecast maintenance and renewal requirements

The current asset health for steel structures is shown in Figure 83. There are presently no H1 or H2 assets, and no structure replacements are forecast over the planning period. This asset class has not yet been assessed using the DNO Methodology, hence current and forecast asset health may change in the 2022 AMP.

Figure 83: 110kV steel structure asset health[83]



An ongoing program of condition assessment, access track maintenance, foundation maintenance, structure maintenance, and insulator maintenance is planned, as set out in Table 70.

11.6.8 Expenditure forecasts

Expenditure forecasts for the 110kV structures are based on the levels of expenditure required after the condition assessments of the lines. We consider that this expenditure is appropriate to ensure that the health of the fleet is sufficient to maintain performance at least consistent with historical levels.

Table 73: Forecast opex

Expenditure type	2022	2023	2024	2025	2026	Average 2027-2031
110kV - Condition Assessment		150		150		75
110kV - Patrols	80	80	80	80	80	80
110kV – Access Road Maintenance	20	20	20	20	20	20
110kV – Foundations	40	40	40	40	40	40
110kV - Structures	15	15	15	15	15	15
110kV – Insulators	22	22	22	22	22	22
110kV – Unscheduled repairs	115	115	115	115	115	115
Total	**292**	**442**	**292**	**442**	**292**	**367**

Note: Values in March 2021 $000 (constant prices)

The capex forecast incorporates the following projects:

[83] Based on AHI iron rail age determination. Changes to the DNO methodology in 2022 will present a clearer view of tower health.

Table 74: Forecast capex

Expenditure type	2022	2023	2024	2025	2026	Average 2027-2031
Structure replacements	115	115	115	115	115	
Insulator replacements	110	110	110	110	110	
Grillage and foundation replacements	188	188	188	188	188	
Slips – Tower Relocation	100		100			
Bridge Replacement		160				
Total	**513**	**573**	**513**	**413**	**413**	

Note: Values in March 2021 $000 (constant prices)

More detail will be provided on the major maintenance and renewal projects in the 2022 AMP.

11.7 Conductor fleet plan

11.7.1 Fleet overview

The conductor fleet is just as significant and sophisticated as the pole fleet which supports it. Operating at five different voltage levels on our network, conductor provides the capability to transfer vast amounts of energy over long distances. The 110kV is 307km, the 50/33kV line is 346km, the 11kV is 2,387km and the 400V is 505km long.

The 110kV line is mainly "Dog" and "Hyena" and operates as the link between Tuai and the main regions. Criticality of this line means that line inspections and vegetation management are rigorous. The majority of these lines retain the original conductor which was run during construction. The inspections show that the line is still in good condition. In 2018, we completed the installation of inter-phasing spacers on 30% of the lines as a proactive measure against some of the snowy conditions that the lines are subject to within the Tiniroto hills in the middle of winter.

The subtransmission 50/33kV line is primarily built using ACSR conductor (e.g. "Mink" and "Dog") with some minor runs of 19/14 Cu. The lines operate as the links between the zone substations. Historically, substations used copper bar for the bus work as it provided a rigid connection and enough capacity at the time. Newer builds have changed out this construction type due to the expense of copper and availability of some of the machinery required to curve the copper.

The distribution network is built using many different types of conductor. Several different coastal areas were built using copper conductor. These lines are showing signs of significant corrosion. The land area that the network covers limits the number of ties we have between feeders and therefore security on the lines is limited.

The low voltage network (230/400V) is used to supply households and consumer connections throughout our region. The 400V circuits are usually quite short due to the voltage drop which occurs at this voltage level. This means that distribution transformers are located throughout the network to provide electricity within the operating margin of +/- 5%, and to ensure that consumers' electronics operate correctly.

11.7.2 Fleet management strategy

Our 10-year conductor fleet strategy is to:

- Capture condition information on all HV (11kV & above) conductors using the new DNO methodology by FY 2025, and achieve all planned inspections going forward;
- Assess the asset health for all conductor based on condition information using the DNO methodology, and revise our long-term forecasts based on accurate asset health indices by 2025, to ensure that there are no H1 assets present over the forecast period.
- Ensure all defects (fraying conductor, material type issues) are risk assessed and replaced prior to failure.;
- Identify areas where load growth is occurring and premeditate upgrades where capacity may become an issue.
- Focus on the reduction of external factors causing failure that are not related to asset health (e.g. vegetation)

The conductor fleet strategy was developed based on the analysis presented below and is a shift from our historical age-based forecasting to a health-based and reliability-focused model. We consider that the conductor fleet strategy is consistent with our overall asset management strategy for the network.

11.7.3 How we operate, monitor, and maintain the assets

Operating the assets

Conductors form part of our overhead line system (that also includes poles and various line switchgear and fuses). Monitoring equipment such as current transformers are placed in the circuit breakers located at the substations, and within certain recloser units, to ensure current capacities on the conductor isn't breached. Engineers have set the alarms in the control room to notify control room staff should load currents or voltage levels in the conductor reach levels beyond our operating limits.

Monitoring (inspection and testing) the asset

Table 75 below summarises our current inspection and testing regime for the conductor fleet. The conductor inspection program is heavily aligned to the pole inspection program in that they are done simultaneously while the inspector is on site.

The pole inspection standards were drafted during FY2021 to align to the DNO Methodology to ensure all the necessary observed condition inputs were captured. These inputs are used to calculate the health index (H1-H5) for each asset. Although health is a good indicator for replacement, for this fleet we see that the prime driver for replacement is when the reliability of the line begins to deteriorate. This is guided by the industry's uncertainty around the life expectancy of conductor and the methods used to determine asset health. We are awaiting an industry best practice recommendation or solution for this issue but are currently using the DNO model and will determine the accuracy through our own findings.

Table 75: Conductor inspection/test program

Voltage	Inspection type	Scope of inspection	Inspection trigger
Subtransmission	Visual – Patrol	Line patrols are undertaken via helicopter or vehicle assisted ground patrols. The line patrols record any defective item (covering the observed condition inputs) and vegetation.	Unreliability of line
	Visual – Detailed	Capture of observed condition inputs in relation to: overall visual conductor condition, conductor fraying, fatigue (due to wind movement),	In line with pole inspection program

Voltage	Inspection type	Scope of inspection	Inspection trigger
		chafing, corrosion (age and coastal factors), no of joints within the span. The observed condition inputs are consistent with the DNO Methodology. Verification of asset attribute data (mainly conductor type). Vegetation data is also captured.	
	Conductor testing	Reliability analysis will show where hotspots on the network are arising. Where necessary samples will be taken to determine the remaining strength within the conductor.	Unreliability of line
Distribution	Visual – Patrol	Same as applied for subtransmission conductor. Helicopter patrols are conducted when access to the site is limited via vehicles.	In line with pole inspection program
	Visual – Detailed	Same as applied for subtransmission conductor	In line with pole inspection program
	Conductor testing	Same as applied for subtransmission conductor	Unreliability of line
Low voltage	All types	LV conductor are visually inspected in conjunction with the distribution conductor inspection program. Testing is not and will not be performed on this conductor as spans are not usually too long due to volt drop.	In line with pole inspection program

Our GIS data for conductor is updated on a per span basis and therefore confirmation of conductor type is undertaken during inspection to ensure our load flow models for the network are up to date.

Maintaining the asset

Conductor maintenance typically consists of defect repairs.

Table 76: Conductor maintenance

Type of maintenance	Maintenance trigger
Defect repair	Defects are repaired following identification following a fault, line patrol or detailed line inspection. The assessment of the defect repair is made between the faultman and operator (in the case of a fault), and by between the faultman and senior project manager in other cases. Defects are defined as remediation work on the conductor that is required immediately.

11.7.4 How we make renewal decisions on the fleet

As mentioned above, we are applying the DNO Methodology to determine asset health and are forecasting asset renewal based on this determination. Testing and inspection of lines will be conducted prior to confirming specific renewal projects. The drivers for asset renewal forecasting and the triggers for specific asset renewal projects (within the overall asset renewal forecast) are shown in Table 77.

Table 77: Drivers and triggers for renewal forecasts and projects

Renewal item	Drivers/Triggers
Renewal forecasts	Renewal forecasts are established to ensure that there are no H1 assets present over the forecast period. For the conductor fleet, asset health and reliability are the primary drivers for renewal forecasting. There are several conductor types which have been identified as a material risk and are determining the criticality of the lines that they are on to determine if replacement is required.
Renewal projects	Specific renewal projects are defined and selected based on one of more of the following: • The most current inspection and asset health information (with this information being verify during the project concept phase); • Deteriorating reliability performance in respect of a particular feeder, or section of feeder (where the underlying reasons for unreliability being attributable to deteriorating asset condition). • Trend analysis shows that load growth is beyond our predictions and loads are approaching maximum current carrying capacity. • Material type issue or specific risk. The prioritization of these projects is made after considering the criticality of the assets.
Defect replacement	Replacement of an asset under fault or defect conditions is typically driven by immediate safety concerns and/or where the risk of failure is assessed to be possible within the next 12 months. Conductor which have been identified as EOL (H1) is noted in the defect register. Project managers and engineers will determine whether span or line segment replacement is required.

11.7.5 Fleet performance and risks

Current fleet performance

Analysis of our reliability data indicates that our network experiences 18 conductor related faults (on average) per annum which contributes 9 SAIDI minutes (on average) per annum. In 2020 our analysis shows that defective equipment contributed 28% of conductor SAIDI and 23% of SAIFI. Most outages related to conductor failure, with a much smaller contribution from connector (jumper) failure. We have altered our fault codes to include specific analysis of the types of failure modes, which will help us to better understand where our performance issues may lie.

An initial study of the fault types showed there was a mix of condition related failure and failure at joints in the line. Based on these failure modes, we are currently looking at areas where we can improve our performance, which includes; ensuring that the right crimps are used on the correct wire, increasing inspections, and working with faultmen / linemen to gather insight from their experiences on the network.

Refer to Section 6.4 for further details.

Key fleet risks

Our risk register has identified the following top risks in relation to conductor (where the consequences are reliability or safety related):

- Poor condition;
- Poor workmanship;
- Vegetation interference;
- Third party interference (high loads);

- Coastal erosion.

A key focus of this fleet plan is to ensure areas where risk levels are elevated are identified and remediated before the risk is crystallized (i.e. a consequence occurs).

In terms of specific risk areas which are being actively addressed:

- Conductor height clearance compliance with ECP 34 in relation to11kV and 400V road crossings;
- No.8 steel wire. This conductor type has been identified as a material network risk in that it is starting to rust and fail. We have replaced all of the No.8 wire on main line feeders and are currently monitoring the reliability of the spur line feeders.

11.7.6 Fleet population and age

Details on the conductor populations and conductor age profile are shown in Table 78. The asset management implications from the age and population are:

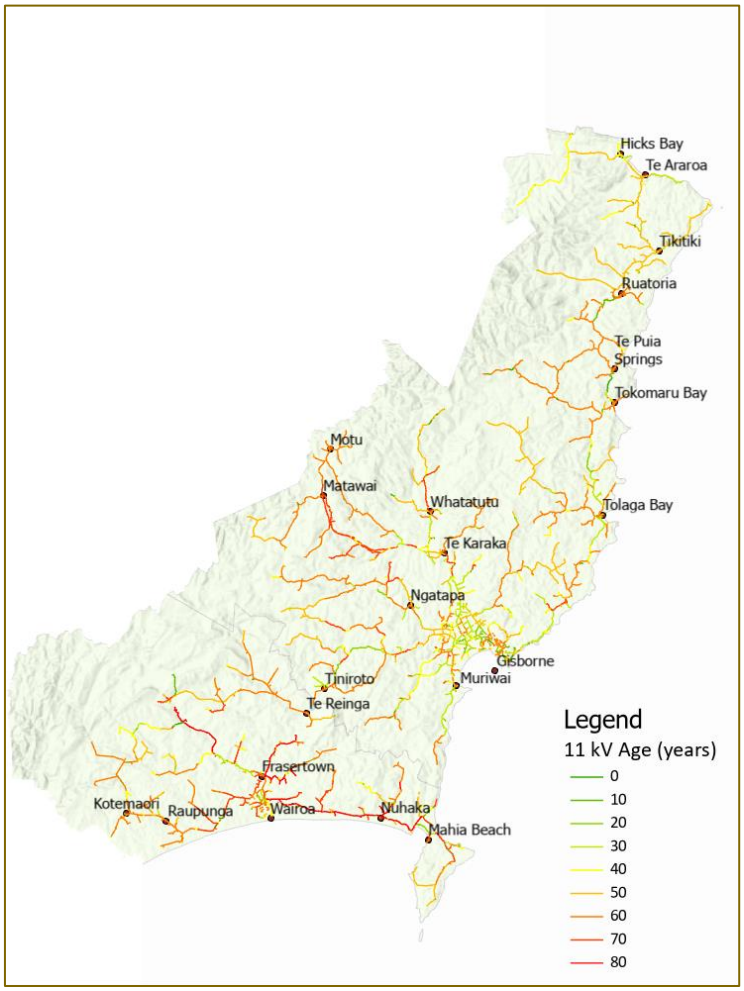
- Most of the original lines were built using copper. This is indicated in the average age profile for the different material types.
- Coastal regions with copper conductor will need to be monitored carefully for any signs of significant deterioration and/or trends in defective equipment failures.

Table 78: Conductor asset fleet quantity and age

Voltage	Conductor type	Length (km)	Average age (years)	MPL[84] (years)	Length within 5 years of MPL (km)
Subtransmission (110kV)	ACSR/AAC/AAAC	307	54	70	103
	Copper	-	-	80	-
Subtransmission (50/33kV)	ACSR/AAC/AAAC	332	43	70	1
	Copper	5	58	80	-
Distribution	ACSR/AAC/AAAC	1,290	47	70	200
	Copper	1,098	56	80	103
Low Voltage	ACSR/AAC/AAAC	123	46	70	11
	Copper	382	53	80	22
Total	-	**3,537**	-	-	**440**

[84] MPL means maximum practical life. Based on the DNO methodology for conductor.

Figure 84: Geographical map of the 11kV Network



11.7.7 Fleet asset health and forecast maintenance and renewal requirements

Asset replacement and renewal forecasts (conductor)

For this AMP, the asset health has been calculated using the DNO Methodology, with the results converted to the EEA Asset Indices. The current asset health for the conductor fleet is shown in Figure 85 to Figure 88. The change to the DNO Methodology is the reason for the change in health from the 2020 AMP. We expect that the asset health for the fleet will continue to change as inspections (under the new methodology) are completed. As noted in the introduction, we have not yet altered our forecast renewals, but will reconsider this before we publish the 2022 AMP.

Presently there are minimal (<1%) conductor assets with an asset health rating of H1 or H2. However, there is a significant portion (52%) of conductor with an H3 asset health rating.

Figure 85: Subtransmission (110kV) conductor asset health

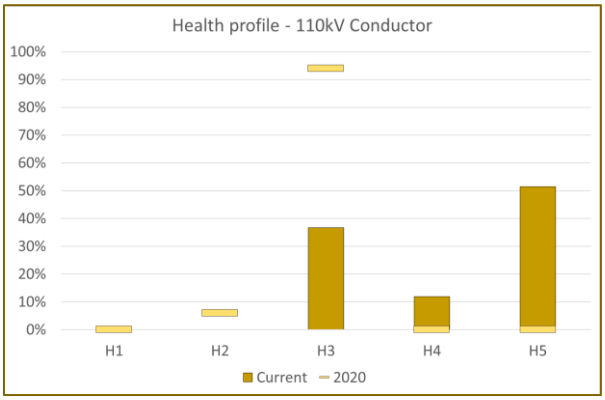


Figure 86: Subtransmission (50/33kV) conductor asset health

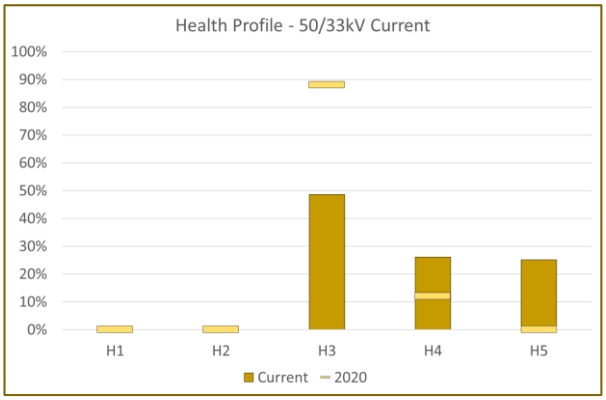


Figure 87: Distribution (11kV) conductor asset health

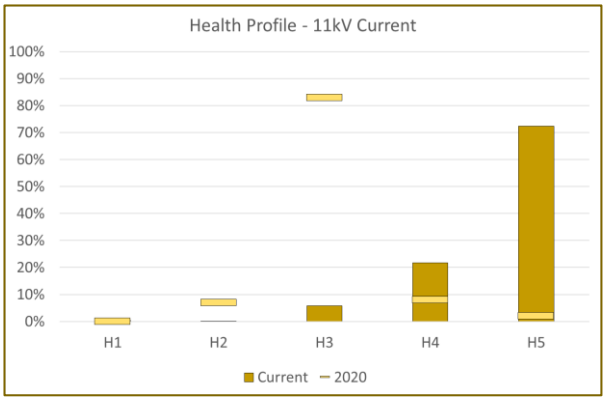
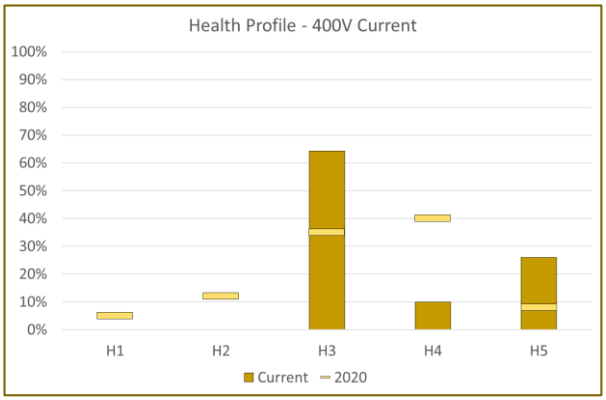


Figure 88: Low Voltage (400V) conductor asset health



The forecast health of our conductor fleet is shown in Figure 89 to Figure 92 based on no renewals taking place. This indicates that around 183km of conductor will transition from H3 to H1/H2 over the next 5-years.

Table 79 shows the forecast conductor asset health and replacements over the next 5-years. Presently we are forecasting renewals of 49km over the next 5-years. This is below the expected quantity of conductor that will transition to H1/H2 over the next 5-years (and below the expected quantity of conductor that will reach MPL over the next 5-years). Presently we consider that these forecasts are appropriate to maintain the health of the fleet at an appropriate level as our forecasts are consistent with prior years and failure rates are not indicative of systemic issues. However, we intend to review our conductor renewal forecasts as inspections are completed and asset health data updated.

Figure 89: Subtransmission (110kV) conductor 5-year forecast asset health (no renewals)

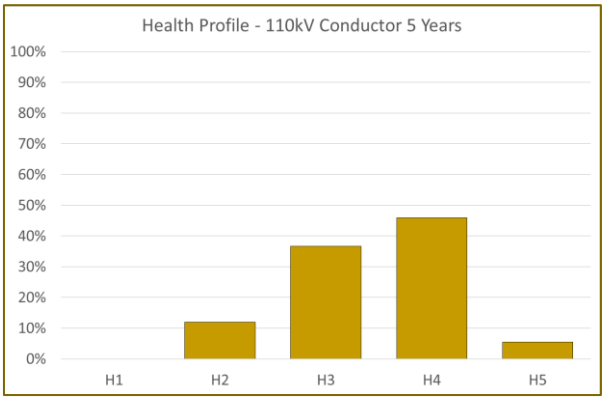


Figure 90: Subtransmission (50/33kV) conductor 5-year forecast asset health (no renewals)

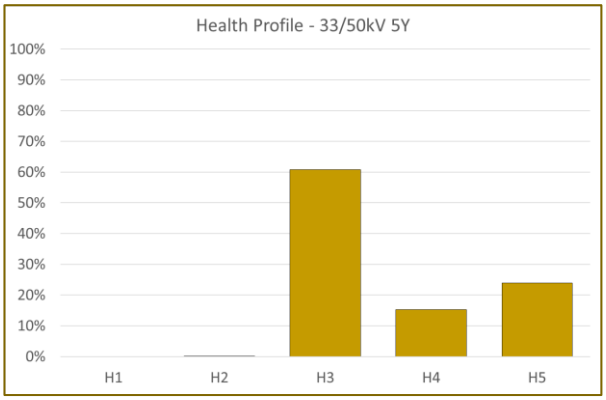


Figure 91: Distribution (11kV) conductor 5-year forecast asset health (no renewals)

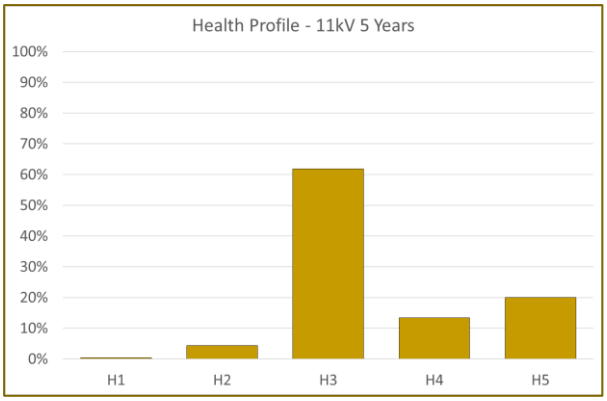


Figure 92: Low Voltage (400V) conductor 5-year forecast asset health (no renewals)

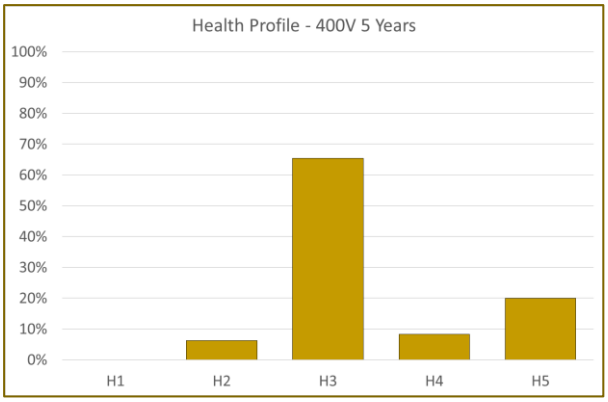


Table 79: Forecast conductor replacements

Voltage	Asset Category	Total Length (km)	Grade H1 & H2 assets (2020) (km)	Forecast grade H1 & H2 assets (2026), before renewal	Forecast conductor renewals (km) over next 5-years[85]
Subtransmission (110kV)	Overhead Lines	307	-	36	-
Subtransmission (50/33kV)	Overhead Lines	332	-	-	-
Distribution	Overhead Lines	2,387	10	95	67
Low Voltage	Overhead Lines	505	-	30	5
Total	-	**3,531**	**10**	**161**	**72**

Specific asset replacement and renewal projects

Our engineering analysis of the most recent condition data, reliability data, and asset criticality has identified the material projects shown in Table 80. Several minor projects have also been identified.

85 This includes both planned and unplanned replacements.

These specific projects align with the fleet strategy described in Table 77 above. We have only detailed a few of the projects beyond FY2023. Further specific projects will be defined in subsequent years.

Table 80: Specific asset replacement and renewal projects

Location	Description	Voltage	Driver	Quantity (km)	Budget	Year	Comments
Dalton Feeder	Replace corroded conductor near beach front	11kV	Asset health	2.0	60k	2022	High corrosive area and reports from lineman suggest the line is becoming brittle.
Tikitiki	Replace several spans which have been inspected and are fraying	11kV	Asset health	1.0	30k	2022	Condition driven
Haisman feeder	Upgrade ring section to accommodate growth in the Ormond Rd area	11kV	Growth	2.0	60k	2022	New developments around Ormond Rd will require infrastructure upgrade to enable supply.
Brickworks	Upgrade brickworks feeder line capacity	11kV	Reliability	2.0	60k	2022	Shift load & consumers from borough 1 & 2. As part of network development options.
East coast double circuit lines	Replace double circuit line Ruatoria – Tikitiki	11kV	Reliability	0.5	15k	2022	Completed most of this work in FY2021.
Bushmere Feeder	Upgrade 7/14cu to accommodate growth in the area	11kV	Growth	2.5	75k	2023	Significant load growth seen in this area in 2019-21. Several large pumps, farms and processing plants have connected recently.
Mahia Area	High corrosive environment.	11kV	Asset health, Reliability	2.0 p.a.	60k	2023-2026	Load growth in the area due to our Mahia development programme may also contribute to some conductor upgrades.
East-cape Rd	Replace copper line along beach front	11kV	Asset Health, Reliability	1.5	50k	2023	Erosion of line due to proximity to coast. Reliability becoming an issue. Replaced using EC conductor replacement budget

Location	Description	Voltage	Driver	Quantity (km)	Budget	Year	Comments
Frasertown	Township line replacement	11kV	Asset Health, reliability	0.5	15k	2023	Multiple failures of line & tension joints. Replaced as part of network replacement plan.
Ngatapa – Matawai Link	Under-build 50kV link between Ngatapa & Matawai	11kV	Reliability	3.5	370k	2026	As part of network development plan options

Note: Values in March 2021 $000 (constant prices)

11.7.8 Expenditure forecasts

The forecast expenditure for the conductor fleet is shown in Table 81 below.

There is no specific maintenance budget for conductor as the line is either replaced (in which case it is capitalized), or repaired during a shutdown (unplanned maintenance).

Capital expenditure allows for 9km of conductor replacement annually to FY2024. We predict that additional expenditure will be required in the Wairoa region in coming years and have doubled the budget in FY2025 to accommodate this. Health forecasts suggest additional asset replacements are required (at the distribution level). We are expecting the capex forecasts to change in response to the future revisions of our asset health assessments, which will be progressively updated as inspections under the new DNO methodology are completed.

Table 81: Forecast capex

Expenditure type	Capex cat.	2022	2023	2024	2025	2026	Average 2027-2031
Conductor Replacement (GIS)	ARR	135	135	135	175	175	175
Conductor Replacement (EC[86])	ARR	135	135	135	175	175	175
Conductor Replacement (WRA)	ARR	135	135	135	270	270	270
Ngatapa – Matawai Link	RSE					370[87]	-
Total		**405**	**405**	**405**	**620**	**620**	**620**

Note: Values in March 2021 $000 (constant prices)

11.8 Underground cables

11.8.1 Fleet overview

Eastland Network's underground cabling is primarily in the main CBD areas (Gisborne and Wairoa). Some of the smaller townships such as Ruatoria and Mahia have small sections where the overhead lines have been converted to underground. The primary driver for this is the increased public exposure to network assets in these locations which increases the risk of a safety incident occurring.

86 East coast region.
87 Specific project raised as it includes pole installs. Not included in total reconductor amount.

All but three substations have underground cables to the feeder circuit breakers, and, as identified in the feeder security tables (Table 47 and Table 48), several of these cables can be upgraded to accommodate urban growth.

The subtransmission network has one main underground section which runs under the Gisborne river and provides the ring connection between the Kaiti/Port Substations and Carnarvon. This cable was installed in 2005 and is in good condition. Regular thermal condition assessments are performed on this cable termination to ensure its integrity.

We are currently looking at options on whether to invest in cable testing equipment or continue to contract these services to external technical contractors. Based on our strategy, and the amount of subtransmission cable on our network, it is likely that we will continue to contract out these services.

The 11kV underground distribution network has been developed in the townships. A couple of projects have been identified on this network as the growth within certain areas has been beyond our predicted forecasts. Any new projects within the CBD are likely to be designed using a cable size that will accommodate natural growth and the emergence of electric vehicle charging stations.

The Aberdeen and Borough One feeders have been flagged as feeders where cable faults have been occurring. Our development projects have added these factors into the project rationalization and will look to both maintain security on the feeders, and decrease the feeder lengths and reliability.

The 400V cables are made up of single and three phase connections to consumers. LV links between distribution substations are only present in the urban townships.

Eastland Network's engineers are trained in using the cable fault locator and acoustic ground detection systems so that in the event of an unplanned cable fault, we have the necessary capabilities on hand to locate the fault.

11.8.2 How we operate, monitor and maintain the assets

Our SCADA and GIS systems hold the information for the underground network. CT's at the substations are used to live monitor the load currents on the feeders. Alarms are set within the control room to notify operators when loads are reaching cable capacity.

No maintenance on underground cabling is performed other than monitoring thermal connection points and inspections of switchgear cable terminations.

Table 82: Underground cable inspection/test program

Inspection type	Scope of inspection	Inspection trigger
Inspection	Inspect switchgear terminations in cases where discharge can be heard	Based on GM switchgear inspection program
Inspection	Thermal imaging of Subtransmission termination points	Time based – Annually

Table 83: Underground cable maintenance program

Inspection type	Scope of maintenance	Maintenance trigger
Maintenance	Remove and clean cable terminations. Scope of work dependent on condition of cable.	Based on GM switchgear inspection program

11.8.3 How we make renewal decisions on the fleet

Our underground network has an average age of 28 years with only 3.5% of cables due to reach their MPL over the next five years. Planned replacements are not forecast within this period due . Growth within the urban areas as well as health and safety are the main drivers for the conversion from overhead to underground.

Unreliability of a cable will also drive the replacement of a cable if the cable condition (following initial repair) is found to be deteriorated to a point where the health rating of the cable is H2 or H1.

11.8.4 Fleet performance and risks

Current fleet performance

The dominant failure mode for underground cables is insulation failure of the Reychem terminations. Post fault analysis indicates wet weather followed by hot humid weather is the main trigger. Open point terminations on switchgear appear to be more vulnerable than loaded terminations.

Inspections of terminations require shutdowns which, if undertaken, would cause the current regulated outage limits to be exceeded. Even with shutdowns and inspections, early identification of issues would often be unsuccessful as the onset of symptoms is quickly followed by failure, and time frames are shorter than practical inspection frequencies. Alternative heat-shrink products and terminations using rollup or cold boot insulation have been tried, with no apparent improvement in reliability. As improved products become available, they may reduce the issues over time, however, in the medium term, no performance improvement is expected. Some modern switchgear designs have increased the clearances around terminations that may improve performance. Potentially real-time discharge monitoring equipment and low-cost communications options could be developed to detect discharge. No suitable products have been identified to date.

Key fleet risks

Our risk register has identified the following top risks in relation to zone substations (where the consequences are reliability or safety related):

- Insulation failure of cable terminations;
- Thermal overloading;
- Cable installation methods;
- Ground conditions.

We are actively assessing and addressing cable terminations through our switchgear inspection and maintenance programme.

11.8.5 Fleet population, age and health

The health profile shows the health of the overall fleet population. Different health calculations were used for the life expectancy of PILC, XLPE, and PVC cables.

Table 84: Cable asset fleet quantity and age

Voltage	Cable type	Length (km)	Average age (years)	MPL[88] (years)	Length within 5 years of MPL (km)
All	PILC	105	32	100	0

[88] MPL means maximum practical life. Based on the EEA health determination for cables MPL.

Voltage	Cable type	Length (km)	Average age (years)	MPL[88] (years)	Length within 5 years of MPL (km)
All	XPLE	83	29	60	5
All	PVC	233	29	60	10
Total	-	**421**	**30**	-	**15**

Figure 93: Current health profile – cable

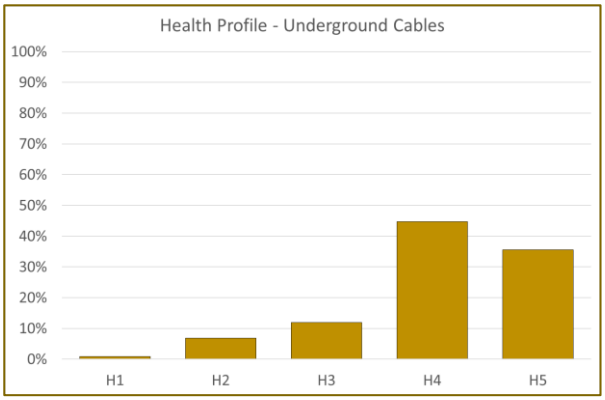
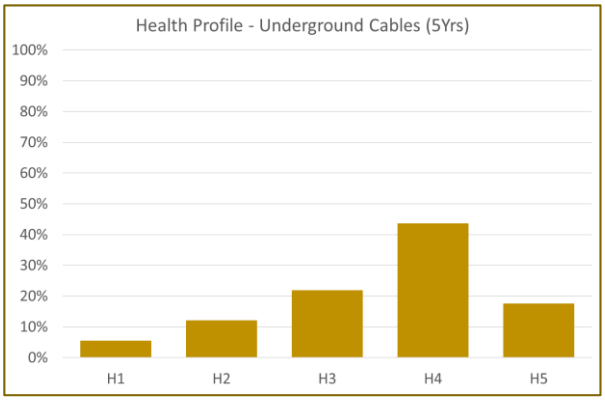


Table 85: Forecast cable renewals

Voltage	Asset category	Total Length (km)	Grade H1 & H2 assets (2020) (km)	Forecast grade H1 & H2 assets (2026), before renewal	Forecast cable renewals (km) over next 5-years
All	PILC	105	-	0	See note below
All	XLPE	83	13	17	See note below
All	PVC	233	20	37	See note below
Total	-	**422**	**33**	**54**	-

Note: We have allowed for 2.5km of HV and 5km of LV unplanned replacements over the next 5-years. We have not established any condition-based monitoring of UG cables. When critical lines start reaching OOU (i.e. subtransmission UG circuits or supplies to critical infrastructure), we will have them tested.

Figure 94: Cable forecast 5-year asset health (no renewals)



11.8.6 Expenditure forecasts

For this current planning period, cable replacement expenditure is in response to:

- Capacity upgrades and new work which is identified on a project-by-project basis. Therefore, targeted replacement due to asset health (or age) has not been budgeted;
- Overhead to underground conversions. As most the 11kV reticulation in both Wairoa and Gisborne's CBDs has been undergrounded, there is little undergrounding required during the planning period. However, we have allowed for a couple of additional 11/0.4kV underground projects which will tidy up the outer CBD areas and replace some of the older LV poles and conductor in the area. This is done at a rate of 1km per year;
- Asset failures. When multiple failures are experienced on sections of cable, the condition is reviewed and replacement is typically scheduled. Currently there are no projects specifically in this category, however, a general provision has been made.

Table 86: Forecast Opex

Expenditure type	Opex cat.	2022	2023	2024	2025	2026	Average 2027-2031
Cable termination maintenance	RCMI	30	30	30	30	30	30

Note: Values in March 2021 $000 (constant prices)

Table 87: Forecast Capex

Expenditure type	Capex cat.	2022	2023	2024	2025	2026	Average 2027-2031
Cable replacement – (unplanned)	ARR	200	200	200	200	200	200
Overhead to underground conversion	ARR	277	277	277	277	277	277
Allowance for growth	SSG	200	200	200	200	200	200

Note: Values in March 2021 $000 (constant prices)

11.9 Power Transformers

11.9.1 Fleet Overview

The power transformer fleet makes up approximately 4% of the overall assets by value. Individually, these are our most valuable assets. Power transformers have a heavy initial investment as well as high operational cost, therefore significant consideration and assessment are performed before any new transformers are purchased.

In the late 1990s/early 2000s, Eastland Network went through a renewal phase which saw the replacement of a significant portion of this asset fleet with IMP type transformers. It is our view that these transformers will not reach their MPL without an intervention of some description (i.e. refurbishment). Considering this, our maintenance programs incorporate regular painting and tap changer maintenance to prevent premature failure of the units. As part of this maintenance, customised manufacturing of parts (resistors, contacts, roller assemblies etc.) is required as parts cannot be sourced from the original manufacturer.

With respect to operations, we do not hold the capabilities within our current staff and local contractors to perform the detailed assessments (SFRA, PF, winding resistance etc.) required to commission a power transformer. We source external contractors to perform these tasks.

We are midway through a major overhaul of our power transformers where eight of our zone substation transformers are due for replacement with new or refurbished units. These projects are due to be completed in FY2024 and will significantly decrease the average age of the fleet. These projects will remove all but two single phase transformer banks from our network, which will remove a significant risk from the network as the units are ageing and no spare parts are available.

Considering this, the performance of our fleet has been acceptable, with only two unplanned outages over the last 5-years, which were attributable to tap changer mechanism malfunctions.

11.9.2 Fleet management strategy

Our 10-year power transformer fleet strategy is:

- Replace or remove all assets identified as a material type risk, within the planning period (see risk section and commentary above);
- Actively monitor the health of the asset fleet and prevent/minimise premature failures;
- Design foundations and mounts to create interchangeable pads for all new transformers;
- Develop and complete maintenance programs consistent with the manufacturer's guidelines, and Eastland Network's standards, to ensure assets are kept in a reliable condition;
- Ensure transformer sizes are consistent with forecast load growth.

11.9.3 How we operate, monitor, and maintain the assets

Operating the assets

Power transformers are one of the primary assets within a zone substation (which also includes switchgear, secondary assets, and measurement equipment). The operation of a power transformer is through its tap-changer, which is used to regulate the voltage output depending on the load it is supplying, and the settings provided within the controller. As the only moving part within a transformer, it is more susceptible to faults than other components. Faults for power transformers are identified through SCADA monitoring of the protection devices available on the transformer and the relay protection schemes. This usually includes buchholz relays, pressure relief valves (PRV), and tap changer overload relays. Faults on transformers can vary in criticality and

technicians are dispatched to the site to investigate the cause of a fault should monitoring equipment be unable to provide adequate information.

Monitoring (inspection and testing) the asset

Table 88 summarises our current inspection and testing regime for the power transformer fleet. The capturing of observed condition information occurs through four-monthly inspections of the zone substation sites, and measurement-based condition information (such as DGA's) is captured bi-annually.

The power transformer inspection standards were updated during FY2021 to align to the DNO Methodology to ensure all the necessary observed and measured condition inputs were captured. These inputs are used to calculate the health index (H1-H5) for each asset. As a critical asset, observed and measured data was available to input into the new health calculations. The results of this work indicate that the current level of opex should be maintained for the condition monitoring of the asset fleet.

Table 88: Power transformer inspection/test program

Asset	Inspection type	Scope of inspection	Inspection trigger
Power Transformer	Visual – Inspection	Routine inspection to check for oil leaks, rust and corrosion, Oil levels, correct tap changer operation and indication. Completed as part of the zone substation inspection program	4 monthly
	Measurement	Thermovision of connection points / Hot spots	Annually
	Measurement	DGA and Furan analysis	2 yearly

Visual inspections are performed by appropriately qualified technicians and because Eastland Network does not hold the relevant equipment, the tests and measurements are performed by external contractors.

Health information is updated based on the outcomes of the inspections.

Maintaining the asset

Power transformer maintenance typically consists of work associated with the tap changer. Planned maintenance is based on the manufacturer's recommendations for frequency as well as test types.

Table 89: Power Transformer maintenance

Type of maintenance	Maintenance trigger
Defect repair	Defects are repaired following identification following a fault or inspection. The assessment of the defect repair is made between the technician and substation engineer The scheduling of the defect repair is based on the risk of failure.
Tap-changer maintenance	Maintenance on tap-changers is completed every 5 years and includes oil replacement, cleaning of components, removal of arcing products, contact alignment and tap resistance.
Planned maintenance	Scheduled every 5 years and work includes detailed inspection of components, checking operation of secondary equipment, insulation resistance, Winding resistance etc. Usually worked in conjunction with the tap-changer maintenance. Usually completed as part of transformer commissioning. We have included a budget to sandblast and paint the IMP transformers to reduce the effects of the corrosion.

11.9.4 How we make renewal decisions on the fleet

As mentioned in the introduction to this section, we are applying the DNO Methodology to determine asset health and are forecasting asset renewal based on the asset health. The specific drivers for asset renewal forecasting and the triggers selecting specific asset renewal projects (within the overall asset renewal forecast) are shown in Table 90.

Table 90: Drivers and triggers for renewal forecasts and projects

Renewal item	Drivers/triggers
Renewal forecasts	Renewal forecasts are established to ensure that there are no H1 assets present over the forecast period and no unassisted overall failures. Factors which contribute to the renewal of power transformers include: • Aging transformers; • Material type issues; • Unreliability; • Condition monitoring. For the power transformer fleet, the renewals are based on the health and criticality of the assets.
Renewal projects	Specific renewal projects are defined and selected based on one of more of the following: • The most current inspection and asset health information (with this information being verified during the project concept phase); • Inspections and planned maintenance identify issues with the transformer suggesting that the material, structural integrity or performance of the power transformer has reached a point where the risk of failure has become unacceptable; • Deteriorating reliability performance (where the underlying reasons for unreliability being attributable to deteriorating asset condition). Because of the criticality and value of these assets, they are scheduled for replacement or refurbishment following a project feasibility study (which includes the same factors required for refurbishment study below).
Refurbishment projects	Refurbishment of power transformers is required on transformers when determination of the following factors has been considered: • Capacity still within required load growth forecasts; • Current value of transformer; • Age; • Performance or condition issue driving refurbishment; • Type.
Defect replacement	Replacement of an asset under fault or defect conditions is typically driven by immediate safety concerns and/or where the risk of failure is assessed to be possible within the next 24 months. It is identified in the strategy for the fleet that transformers should not reach a point where its performance and risk of failure is compromised, however ENL maintain strategic spares and rely on substation security (Back up supply or dual transformers) when and if a failure is to occur.

11.9.5 Fleet performance and risks

Current fleet performance

The power transformer fleet performance is generally good. We have not seen any issues with the main componentry such as the main tank, windings, or core. We have experienced some issues with the tap changers and secondary measurement components. We have identified that the tap

changers on the IMP transformers are at risk of failure and have ordered and stored strategic spares in case of a breakdown.

Key fleet risks

Our risk register has identified the following top risks in relation to power transformers (where the consequences are reliability or safety related):

- Tap changer breakdown;
- Rust and corrosion;
- Oil leaks / gasket breakdown;
- Transformer age;
- Component spares on some of the transformer types.

A key focus of this fleet plan is to ensure areas where risk levels are elevated are identified and remediated before the risk is crystallized (i.e. a consequence occurs).

In terms of specific risks which are being actively addressed:

Table 91: Specific power transformer risks

Active Risk	Actions taken to minimise or mitigate risk
Single Phase transformer banks (condition and spare parts)	All aging single-phase units are scheduled for replacement within the forecast period
Premature failure of IMP tap-changer components (Split pins, roller assemblies, resistors and contacts)	Regular maintenance program on tap-changers, procurement of spare parts. Upgrade of split pins during maintenance outages.

11.9.6 Fleet population and age

Details on the power transformer populations and age profile are shown in Table 92. The asset management implications from the age and population are:

- Three zone substations are operating power transformers reaching their MPL for the asset type. These are all single-phase banks, and while age is not necessarily an indicator of poor health, recent inspections and type issues have indicated that drivers for replacement are present. Replacing these three transformers will remove a significant risk to the network and will also decrease the average age of the fleet from 33 to 13 years, and decrease the overall number of transformers from 44 to 32[89];
- IMP transformers make up 32% of the asset fleet but have been identified as being a lot more susceptible to rust and corrosion. It is also a noticeable trend (discovered through maintenance and fault repairs) that the tap changers' split pins are failing prematurely. It is highly likely that refurbishment of these transformers will be required to achieve their MPL.

Table 92: Power transformer asset fleet quantity and age

Type	Type	Population	Average age	MPL[90]	No. of transformers within 5-years of MPL
Power Transformer	IMP	13	21	65	0
	Single Phase Units	22	48	65	16

89 Each single-phase transformer has been counted separately.
90 MPL means maximum practical life. Based on the EEA health determination for Power Transformers MPL.

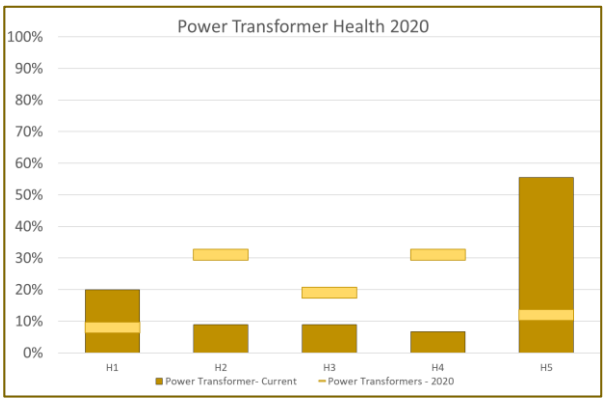
Type	Type	Population	Average age	MPL[90]	No. of transformers within 5-years of MPL
	Other	10	17	65	0

11.9.7 Fleet asset health and forecast maintenance and renewal requirements

Asset replacement and renewal forecasts (Power Transformers)

For this AMP, the asset health has been calculated using the DNO Methodology, with the results converted to the EEA Asset Indices. The current asset health for the power transformer fleet is shown in Figure 95. The change to the DNO Methodology is the reason for the change in health from the 2020 AMP.

Figure 95: Power Transformer asset health[91]



The forecast health of the power transformer fleet is shown in Figure 96, based on no renewals taking place.

Table 93 shows the forecast power transformer asset health and replacements over the next 5-years. The power transformer renewals are forecast to keep pace with the forecast H1 and H2 assets over the period.

Based on current information, we consider that these forecasts are appropriate to maintain the health of the fleet at an appropriate level to achieve our safety, service (reliability), and efficiency objectives. In terms of load growth and reliability (aligned with development plans), it is forecast that within the planning period, two additional transformers will be added to the fleet.

Table 93: Forecast power transformer renewals

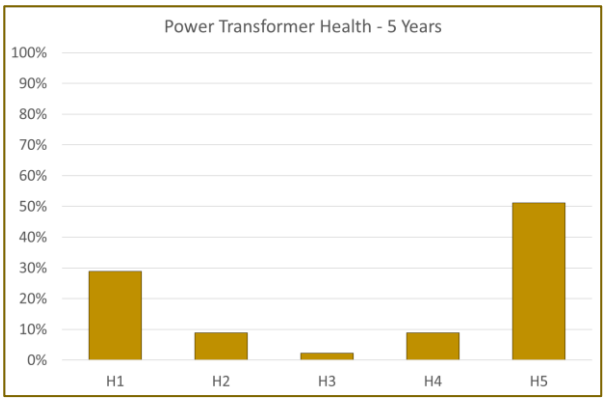
Asset category	Type	Quantity	Grade H1 & H2 assets (2020)	Forecast grade H1 & H2 assets (2026), before renewal	Forecast transformer renewals over next 5-years[92]
Power transformer	IMP	13	1	1	-
	Single Phase Units	22	12	16	16
	Other	10	-	-	-

91 Single phase transformers are reported on separately for quantity determination, however the health graphs relate to combined 3 phase units.

92 This includes both planned and unplanned replacements.

Asset category	Type	Quantity	Grade H1 & H2 assets (2020)	Forecast grade H1 & H2 assets (2026), before renewal	Forecast transformer renewals over next 5-years[92]
Total	-	45	13	17	16

Figure 96: Power transformer forecast 5-year asset health (no renewals)



Specific asset replacement and renewal projects

Our engineering analysis of the most recent condition data, reliability data, and asset criticality has identified the material projects shown in Table 94. Additional to this is the installation of two substations at Massey Rd and Whangara which require the addition of two extra transformers.

These specific projects align with the fleet strategy described in Section 11.9.2.

Table 94: Specific asset replacement and renewal projects

Location	Description	Driver	Budget	Year	Comments/alternatives
Patutahi Substation	Transformer Replacement	Asset health	$200k	2022 (commence in 2021)	No practical alternatives
Puha Substation	Transformer Replacement	Asset health, criticality	$400k	2023	No practical alternatives. High criticality due to low line security.
Tolaga Bay Substation	Transformer Replacement	Asset health, criticality	$400k	2022	No practical alternatives. High criticality due to low line security.
Te Araroa Substation	Transformer Refurbishment	Asset health, criticality	$160k	2025	Medium build up of rust on main tank. Multiple failures of tap-changer
Ngatapa Substation	Transformer Refurbishment	Asset health, criticality	$160k	2026	Oil leaks and build-up of rust, Gaskets requiring replacement

11.9.8 Expenditure forecasts

The forecast expenditure for the power transformer fleet is shown in Table 95 and Table 96.

Opex has been forecast on a "business as usual" basis (i.e. on a historical roll-forward basis), with the exception of an increase in the tap changer maintenance expenditure.

Capex has been forecast based on the level of replacements forecast in Table 94. As noted in Table 90, the actual project selection is based on our engineering analysis of the most current inspection, test and reliability data. Hence, for the first few years of our forecasting, we have identified a high number of specific projects, while there is little specificity in the outer years. We expect to increase the level of identified projects over the coming years as our asset condition information improves.

We are expecting the capex forecasts to change in response to the future revisions of our asset health assessments, which will be progressively updated as inspections under the new DNO methodology are completed.

Table 95: Forecast opex

Expenditure type	Opex cat.	2022	2023	2024	2025	2026	Average 2027-2031
Transformer paint	ARR	20	20	20	20	20	20
DGA analysis	RCMI	12	12	12	12	12	12
Tap-changer maintenance	ARR	24	24	24	24	24	24
Total[93]		**56**	**56**	**56**	**56**	**56**	**56**

Note: Values in March 2021 $000 (constant prices)

Table 96: Forecast capex

Expenditure type	Capex cat.	2022	2023	2024	2025	2026	Average 2027-2031
Replacements (specific projects)[94]	ARR	600	450	0	160	160	32

Note: Values in March 2021 $000 (constant prices)

11.10 Zone substation switchgear fleet plan

11.10.1 Fleet overview

The zone substation switchgear fleet provides the operational protection function for the power transformers, feeders, and bus connections. The fleet also provides the important function of protecting downline equipment and assets by isolating electricity before significant energy is transmitted through the fault causing significant damage.

Subtransmission circuit breakers are all mounted outdoors, and we are moving to replace all units which use oil insulation. In 2019, we replaced two of these oil units with the SF6 type and have one more unit to replace to complete the entire fleet. For the distribution network, we operate several different manufactured types. We have identified some performance issues with some of the horizontal racked units and elaborate on our plans to mitigate this in the key risk section.

The Pehiri substation is the only zone substation still operating pole mounted switchgear. 40% of the overhead switchgear has failed within the last three years which is driving the need for a significant overhaul of the site.

Testing of substation circuit breakers is carried out by external contractors, as we do not have the equipment, or suitably qualified personnel, to perform these tasks.

93 Additional expenditure on transformers such as inspections and minor works is included in zone substation maintenance.
94 This is expenditure in relation to the specified projects shown in Table 94. Additional transformers such as new substation work is included in network development plan budgets.

We have several areas where privately owned circuit breakers are operating on our 11kV network. Eastland Network holds agreements with these owners for access, and in some cases, we have remote operating capabilities. Communication with owners is carried out prior to any operation of this switchgear (unless in unplanned or health & safety related situations).

11.10.2 Fleet management strategy

Our 10-year switchgear fleet strategy is:

- Replace all assets deemed to be a material network risk within the planning period;
- Assess the asset health for all switchgear based on condition information using the DNO Methodology;
- Revise our long-term forecasts based on accurate asset health indices to ensure that there are no H1 assets present over the forecast period, and ensure no H2 assets reach the point where they become H1. We will typically replace H2 assets within 1-5 years of them becoming H2;
- Ensure critical spares or alternate supply is available for all in-service switchgear;
- Replace all oil-filled switchgear with vacuum or SF6 type;
- Replace all pole mounted substation switchgear.

The quantity of circuit breakers on our network is not substantial and regular maintenance and consistent replacement programs have led to a fleet which is performing well. Our forecast expenditure is based around asset health and reliability, which has been derived from the DNO methodology, using historical inspection data and analysis of the fault types experienced by this fleet.

We expect that the forecast replacements will mitigate the significant risk items in our risk register.

Note: Capital expenditure for switchgear required as part of a substation build is not part of this fleet plan.

11.10.3 How we operate, monitor, and maintain the assets

Operating the assets

Operation of these assets is performed via the control room or locally via manual switching. Some circuit breakers have trip coil monitoring that ensures that the trip coil circuit remains intact and operational. Live monitoring of the current and voltage flowing through the circuit breakers is achieved by the local CT's and VT's. Most of the circuit breakers also have the capability to be racked into both circuit earth and bus earth (RMU's excluded).

Tripping schemes provide a back-up circuit breaker (usually the incomer) if a malfunction of one of the feeder circuit breakers occurs.

Monitoring (inspection and testing) the asset

Table 97 summarises our current inspection and testing regime for the circuit breaker fleet. The capturing of condition information is largely time-based.

The circuit breaker inspection standards were updated during FY2021 to align to the DNO Methodology to ensure all the necessary observed condition inputs are captured. These inputs are used to calculate the health index (H1-H5) for each asset.

Historical inspection records have provided sufficient data to populate most of the input requirements for the DNO methodology. The maintenance budget has been increased by $10k p.a. to meet the requirements of the new inspection standard.

Table 97: Circuit Breaker inspection/test program

Asset Type	Inspection Type	Scope of Inspection	Inspection Trigger
Substation Circuit Breakers	Visual – Detailed	• As part of the zone substation inspection program the following works is completed. • Capture of observed condition inputs in relation to: Operation counts, oil leaks, SF6 gas levels (Subtransmission level), external condition. • The observed condition inputs are consistent the DNO Methodology for poles with the inclusion of additional factors in relation to pole-top hardware. • Verification of asset attribute data.	4 monthly
	Circuit Breaker testing	• Testing of units includes trip & close time testing and insulation level measurements.	7 Yearly
	Measuring	• Thermovision	Completed in conjunction with zone substation Thermovision schedule

Maintaining the asset

Circuit breaker maintenance is either time-based or in response to the number of fault operations. Frequent operation of the circuit breakers will accelerate some of the circuit breaker testing programs.

Table 98: Circuit Breaker maintenance

Type of Maintenance	Maintenance Trigger
Defect repair	• Defects are repaired following identification following a fault, following testing or following operation of the asset. The assessment of the defect repair is made between the technician and network engineer. Minor maintenance is performed on site whereas removal or replacement of the circuit breaker is required for more extensive work. • Defects are defined as remediation work on the CB that is required immediately. The scheduling of the repair is based on the risk of failure.
Planned Maintenance	Planned maintenance of these circuit breakers includes the following tasks: • Oil Replacement; • Adjustment of travel mechanisms; • Mechanism lubrication; • No of trip operations; • Contact replacement (If required); • Cleaning, painting. • Re-insulation, replacement of damaged or worn components

11.10.4 How we make renewal decisions on the fleet

As mentioned in the introduction to this section, we are applying the DNO Methodology to determine asset health, and are forecasting asset renewal based on asset health. The specific drivers for asset renewal forecasting, and the triggers of specific asset renewal projects (within the overall asset renewal forecast), are shown in Table 99.

Table 99: Drivers and triggers for renewal forecasts and projects

Renewal item	Drivers/Triggers
Renewal forecasts	Renewal forecasts are established to ensure that there are no premature failures of circuit breakers within the planning period and that the risks to health and safety of contractors is mitigated or managed SFARP. In particular • Circuit breakers identified as material network risks are targeted to be replaced within the forecast period; • Circuit breakers which have identified as being in H1 are targeted for replacement within 12 months and H2 within 5 years.
Renewal projects	Specific renewal projects are defined and selected based on one of more of the following: • The most current inspection and asset health information (with this information being verified during the project concept phase); • Evidence that the circuit breaker(s) have deteriorated to an extent that the risk of malfunction or failure is beyond the acceptable risk; • Deteriorating reliability where prime indicators are "failure to operate", "internal faults" or "mechanical failure". The prioritization of these projects is made after considering the criticality of the assets.
Defect replacement	• Replacement of an asset under fault or defect conditions is typically driven by immediate safety concerns and/or where the risk of failure is assessed to be possible within the next 36 months. • Circuit breakers which have been identified as being H1 are monitored and maintained at an increasing frequency above the time-based planned frequencies until replacement.

11.10.5 Fleet performance and risks

Current fleet performance

As stated in Section 11.10.1, all of our horizontal mounted switchgear has been shown to be less reliable than the vertically racked units. To date, we have only had one outage from these circuit breakers which was unplanned but there have been several occurrences where the horizontal units didn't operate remotely. We have had both internal staff and external contractors service these circuit breakers but have not produced a permanent solution for these issues. We are hoping to develop a solution in a timely manner, and we will alter our forecast replacements if a viable solution is not found.

We have had two premature failures of the pole mounted switchgear at Pehiri substation and have replaced the units with new Ghorit reclosers. We expect that the other three units are in a similar condition and will likely need replacement.

Reyrolle switchgear has proved to be a reliable manufacturer for both performance and quality. To reinforce this, the capability to retrofit the units has assisted us with our historical replacements.

Key fleet risks

Our risk register has identified the following top risks in relation to substation circuit breakers (where the consequences are reliability or safety related):

- Environment (dust and debris);
- Human interference (operating the wrong switchgear);
- Electrical and mechanical failure.

A key focus of this fleet plan is to reduce areas where risk levels are elevated.

Specific risk areas which are being actively addressed are:

- Oil circuit breakers at Tokomaru Bay substation (small leaks present)
- Trip/Close failure at Kaiti & Parkinson Substations (mechanisms are being filled with dust and debris).

11.10.6 Fleet population and age

Details on the circuit breaker populations and age profiles are shown in Table 100. The asset management implications from the age and population are that none of the circuit breakers have reached their MPL or are forecast to be replaced based on age.

However, there are other drivers for replacement (see risks above) which will see several substation switchboards and circuit breaker panels be replaced within the forecast period.

Table 100: Zone substation circuit breaker asset fleet quantity and age

Voltage	Insulation type	Population	Average age	MPL[95]	No. of circuit breakers older than MPL
Sub Transmission (110/50/33kV)	Oil	1	36	50	-
	SF6	43	17	50	-
	Vacuum	1	25	50	-
Distribution (11kV)	Oil	4	21	60	-
	SF6	38	24	60	-
	Vacuum	78	23	60	-
Total	-	**165**	**24**	**55**	-

11.10.7 Fleet asset health and forecast maintenance and renewal requirements

Asset replacement and renewal forecasts

For this AMP, the asset health has been calculated using the DNO Methodology, with the results converted to the EEA Asset Indices. The current asset health for the zone substation circuit breaker fleet is shown in Figure 97 and Figure 98 below. The change to the DNO Methodology is the reason for the change in health ratings from those included in the 2020 AMP. We expect that the asset health for the fleet will continue to change as inspections (under the new methodology) are completed. As noted in the introduction, we have not yet altered our forecast renewals, but will reconsider this before we publish the 2022 AMP.

[95] MPL means maximum practical life. Based on the EEA health determination for circuit breaker MPL. All our subtransmission circuit breakers are outdoor, whereas the distribution circuit breakers are primarily indoor.

Figure 97: 110/50/33kV Circuit breaker asset health

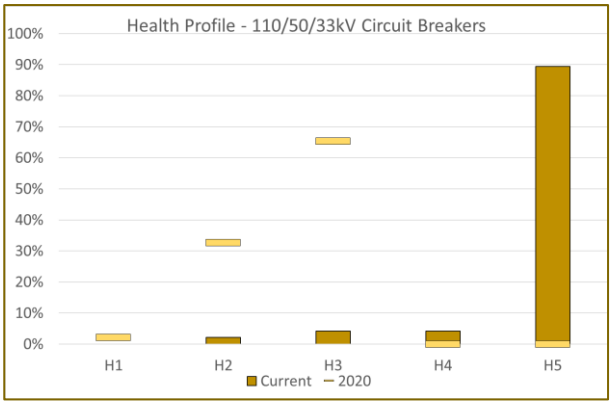
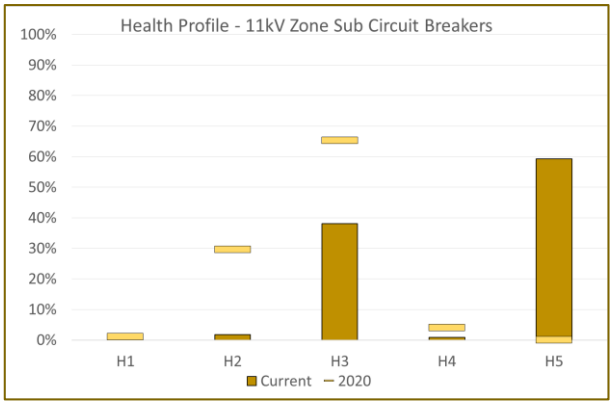


Figure 98: 11kV Circuit breaker asset health



The forecast health of our circuit breaker fleet is shown in Figure 99 and Figure 100, based on no renewals taking place. The forecast health indicates that some minor replacements will be required within the forecast period.

Table 101 shows the forecast asset health and replacements over the next 5-years. Circuit breaker renewals are forecast to replace the assets which are within the H1 and H2 health categories in the 10-year period. The replacements are primarily driven by the need to increase the reliability of the fleet and to operate the fleet in a safe manner.

Figure 99: 110/50/33kV circuit breaker forecast 5-year asset health

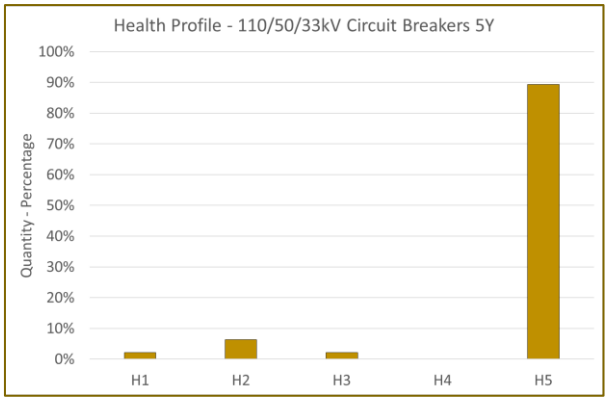


Figure 100: Distribution circuit breaker forecast 5-year asset health

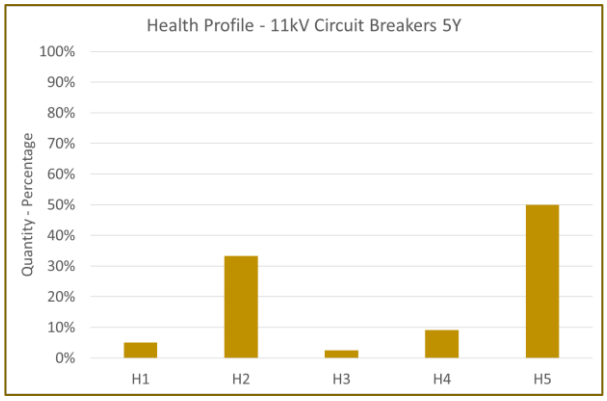


Table 101: Forecast circuit breaker replacements

Voltage	Total population	Grade H1 & H2 assets (2020)	Forecast grade H1 & H2 assets (2025), before renewal	Forecast circuit breaker renewals over next 5-years[96]
Sub Transmission	45	1	2	1
Distribution	120	2	46	20[97]
Total	**165**	**3**	**50**	**21[98]**

96 This includes both planned and unplanned replacements.
97 This includes both PM and GM zone substation circuit breakers
98 An additional 20 circuit breakers are forecast to be replaced in years 6 & 7.

Specific asset replacement and renewal projects

Our engineering analysis of the most recent condition data, reliability data, and asset criticality has identified the material projects shown in Table 102. These specific projects align with the fleet strategy described in Section 11.10.2 above.

Table 102: Specific asset replacement and renewal projects

Location	Description	Voltage	Driver	Qty	Budget	Year	Comments/ alternatives
Tokomaru Bay Substation	Replace oil circuit breaker trucks and connections	11kV	Asset health	4	$80k	2024	Currently leaking.
Makaraka Substation	Replace Oil filled unit with equivalent SF6 unit	50kV	Reliability, Asset health	1	$80k	2025	Currently looking at replacement options for the ripple plant that this unit is used for. Decision whether to move to an 11kV ripple pant will affect outcome of replacement.
Matawhero Substation	Motorpol units having some reliability issues. Replace with new SWBD and trucks	11kV	Reliability	7	$440k	2025	Motorpol control units operating @110VDC unreliable. Horizontal rack mounted units unreliable.
Kaiti Substation	Replace Merlin Gerin Units and SWBD	11kV	Reliability	9	$440k	2026	Having issues with mechanisms sticking. Replacement based on whether a permanent solution can be found. [Provisional]
Kiwi Substation	Replace older type LMT oil circuit breakers with new CB trucks.	11kV	Reliability, Asset health	10	$440k	2027	Old oil circuit breakers which have a few modifications, Reliability is becoming an issue
Parkinson Substation	Replace Merlin Gerin Units and SWBD	11kV	Reliability	10	$480k	2028	Having issues with mechanisms sticking. Replacement based on whether a permanent solution can be found. [Provisional]
Pehiri Substation	Currently overhead units with ABS units. Replace with Portacom units	11kV	Asset Health, Equipment upgrade	5	$450k	2029	Experienced two circuit breaker failures. Criticality not sufficient to drive immediate replacement. Includes

Location	Description	Voltage	Driver	Qty	Budget	Year	Comments/ alternatives
							new Portacom building and underground cabling

11.10.8 Expenditure forecasts

The forecast expenditure for the circuit breaker fleet is shown in Table 103 and Table 104.

Opex has been forecast based on historical expenditure as well as a $10k increase for the maintenance and testing of circuit breakers. This is to fit the total rotation of circuit breakers into the 5-year maintenance period. We expect that if new substations are built (refer Section 10.6.1) as per our inspection and maintenance methodology, we will not require significant additional maintenance expenditure within the forecast period except for the inspection of the units.

Capex has been forecast based on the issues identified in the specific projects table above. We consider that the issues identified are not immediate causes for concern as our maintenance program is sufficient to maintain the fleet in a safe and operating condition. We have programmed the majority of the replacements in the second half of the forecast period as we are currently examining alternative options for the identified issues (Tokomaru Bay substation being the exception).

Table 103: Forecast opex

Expenditure Category	Opex Category	2022	2023	2024	2025	2026	Average 2027-2031
Circuit Breaker Maintenance/testing[99]	RCMI	40	40	40	40	40	40

Note: $000 (in constant prices)

Table 104: Forecast capex

Expenditure type	Capex category	2022	2023	2024	2025	2026	Average 2027-2031
Replacements (specific projects)[100]	ARR	-	-	80	520	440	266

Note: $000 (in constant prices)

11.11 Ground mounted distribution transformers

11.11.1 Fleet overview

Distribution transformers convert the distribution voltage (11kV) to the consumer voltage level (400/230V) to supply the LV system that supplies most customers.

There are currently 640[101] ground mounted ("**GM**") distribution transformers in service on our network which range in size between 15kVA and 1,500 kVA. These are installed either outdoors or inside a building/kiosk attached to either precast or poured in-situ concrete pads. Installations of the GM transformers are typically located on private property for single customer installations, Eastland Network owned land adjacent to road reserves, or on grass berms in road reserves. In

[99] Circuit breaker inspections are included as part of the zone substation inspection program
[100] This is expenditure in relation to the specified projects shown in Table 102.
[101] This includes both Eastland Network owned and privately owned ground mounted distribution transformers

some cases, a secondary enclosure consisting of a mesh fence, concrete block wall or wooden fence is used to protect the asset from external interference. Current inspection programs are looking at the practicability of some of these installations as historical installations were placed in buildings which have since been renovated and altered making replacement and testing of the assets difficult.

11.11.2 Fleet management strategy

Our 10-year ground mounted distribution transformer fleet strategy is:

- Capture condition information on all ground mounted transformers using the new DNO methodology by 2022, and achieve 100% of all planned inspections going forward;
- Revise our long-term forecasts based on accurate asset health indices by 2022;
- Ensure that there are no H1 assets present over the forecast period, and that any H2 assets are replaced before they deteriorate to H1;
- Ensure all defects are risk assessed and replaced prior to failure. Our target is to have no failures of any identified defective ground mounted transformers;
- Maintain a high standard of security and safety on all publicly accessible equipment.
- Ensure contingency spares are readily available for the different sizes of ground mounted transformers.
- Develop a plan to deal with the ground mounted transformers located inside buildings, where the building structure does not meet the current building code standards.
- Develop a plan to deal with the ground mounted transformers whose ownership is in dispute.

At this stage, there is no set strategy for fault rate improvement of ground mounted distribution transformers as the failure rate of these assets is very low.

11.11.3 How we operate, monitor, and maintain the assets

Operating the assets

Operating the assets involves operating fuses and disconnectors on the LV and 11kV sides as required for planned and unplanned maintenance and fault finding. Transformers' load capacity and load balance is checked using power quality analysers.

The low voltage fuse racks inside the ground mounted transformers can be used for isolation during planned and unplanned work on the low voltage network. In some areas, the water heating pilot wire is controlled via a receiver located in the transformer. Eastland Network is slowly removing the pilot wire system and using ripple relays located on consumer switchboards.

Monitoring (inspection and testing) the asset

Table 105 below summarises our current inspection regime for the ground mounted distribution transformer fleet.

The ground mounted distribution transformer inspection standards were updated during FY2021 to align to the DNO Methodology to ensure all the necessary observed condition inputs were captured. These inputs are used to calculate the health index (H1-H5) for each asset. Eastland Network are not currently monitoring the oil within the ground mounted transformers.

Table 105: Ground Mounted Distribution Transformers Inspection/Test Program

Inspection Type	Scope of Inspection	Inspection Trigger
Visual	Capture of observed condition inputs in relation to transformers external condition, corrosion, signs of oil leakage, security (i.e. door locks/ equipment covers) and other external factors (e.g. risk to the public). Inspection and testing of ground mounted transformers earthing. Verification of asset attribute data.	2 yearly

Ground mounted transformer inspections are qualitative assessments undertaken by suitably qualified and competent inspectors.

Maintaining the asset

Ground mounted transformer maintenance typically consists of repairing defects identified through inspection as shown in Table 106.

Table 106: Ground Mounted Distribution Transformer Maintenance

Type of Maintenance	Maintenance Trigger
Defect repair	Defects are repaired following identification from a fault or asset inspection. The assessment of the defect repair is made between the faultman and operator (in the case of a fault), and by the project manager of the assets in other cases. In cases where urgent replacement is required, shutdowns are programmed immediately for replacement of the unit.
Minor maintenance	Minor maintenance consists of tasks such as painting, minor rust removal, vegetation/pest control, LV panel cleaning, warning/danger labels replacement.

11.11.4 How we make renewal decisions on the fleet

We are forecasting asset renewal based on the asset health determined by the DNO methodology. The specific drivers for asset renewal forecasting are shown in Table 107.

Table 107: Drivers and triggers for renewal forecasts

Renewal item	Drivers/Triggers
Renewal forecasts	Renewal forecasts are established to ensure that there are no H1 assets present over the forecast period, and that H2 assets are replaced before they deteriorate to H1. Ground mounted transformers which have been identified as being poor (H2) are targeted to be replaced within 24 months. Ground mounted transformers which have been assigned H3, H4 or H5 are programmed into the future replacements based on the DNO modelling outcome. Other drivers for renewal are capacity upgrade and customer driven upgrades. Customer driven upgrades or installations are primarily paid for by the customer, however instances may occur where ENL may contribute to the installation based on the book value of the existing asset. This is a case-by-case basis and is the responsibility of the senior project manager to assess these instances.
Defect replacement	Replacement of an asset under fault or defect conditions is typically driven by immediate safety concerns and/or consumer outages.
Refurbishment	Ground mounted transformers removed from service are evaluated to determine if its economic to refurbish the unit. This usually

11.11.5 Fleet performance and risks

Current fleet performance

Table 108 shows that the fleet is relatively young, with an average age of less than 20 years, which is the result a high replacement rate for the asset in the last 20 years. This has led to the current good performance of the fleet. Our plan is to maintain this rate of replacement to address some of the urban transformers which have historically been difficult to replace due to enclosure and site issues.

The inspection program has also shown that coastal proximity has a significant effect on corrosion of the transformer enclosures/tanks.

Key fleet risks

Failure analysis shows that the predominant causes of in-service failure are;

- Environmental factors;
- Overloading of 400V racks (unbalanced phases);
- Bushing failure (linked to cable terminations)

Other risks identified in relation to ground mounted transformers (where the consequences are reliability or safety related) are:

- Third party impact damage;
- Stability of the foundation and land;
- Public safety.

A key focus for this fleet plan is to ensure preventative maintenance triggers are identified during inspection and remediated before the risk is crystallized (i.e. a consequence occurs).

11.11.6 Fleet population and age

Details on the ground mounted distribution transformers' population and age profile are shown in Table 108. Around 10 ground mounted transformers will be reaching their MPL over the coming decade, and 2 units will reach their MPL over the next 5 years.

Table 108: Ground mounted distribution transformers asset fleet quantity and age

Transformer size (kVA)	Population	Average age	MPL[102]	No. of ground mounted transformers older that MPL
10	1	25	70	-
15	4	27	70	-
25	2	44	70	-
30	34	20	70	-
50	23	17	70	-
75	1	32	70	-
100	58	17	70	-
200	139	17	70	-

[102] MPL means maximum practical life. Based on the EEA health determination for ground mounted transformer MPL.

Transformer size (kVA)	Population	Average age	MPL[102]	No. of ground mounted transformers older that MPL
250	23	57	70	-
300	184	15	70	-
500	50	24	70	-
750	2	9	70	-
1000	25	23	70	-
1500	2	21	70	-

11.11.7 Fleet asset health and forecast maintenance and renewal requirements

Asset replacement and renewal forecasts

For this AMP, the asset health has been calculated using the DNO Methodology, with the results converted to the EEA Asset Indices. The current asset health for the ground mounted distribution transformer fleet is shown in Figure 101. The asset health previously assessed in 2020 (based on asset age) is included as a comparison. The forecast health of our ground mounted distribution transformer fleet is shown in Figure 102 and Figure 103, based on no renewals taking place.

Figure 101: Ground mounted distribution transformer asset health

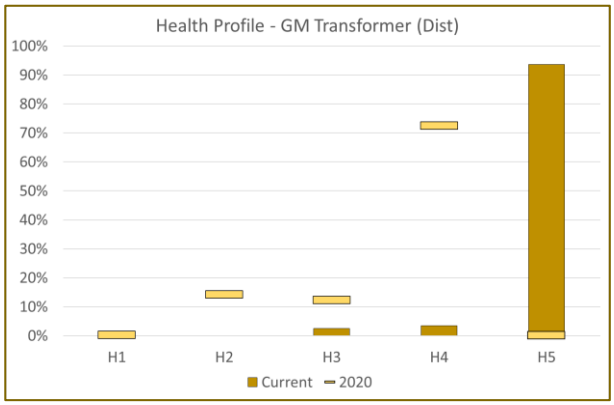


Figure 102: GM Distribution Transformer Forecast 5-year asset health

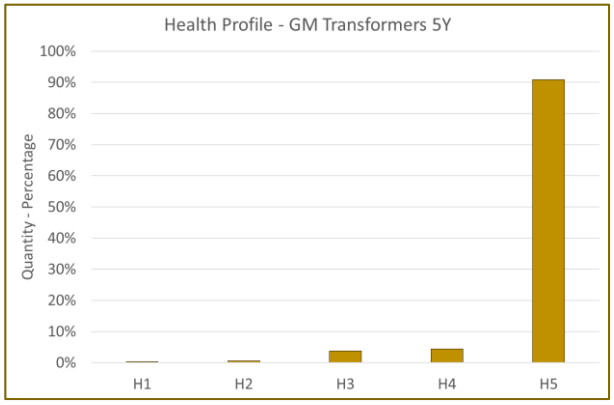
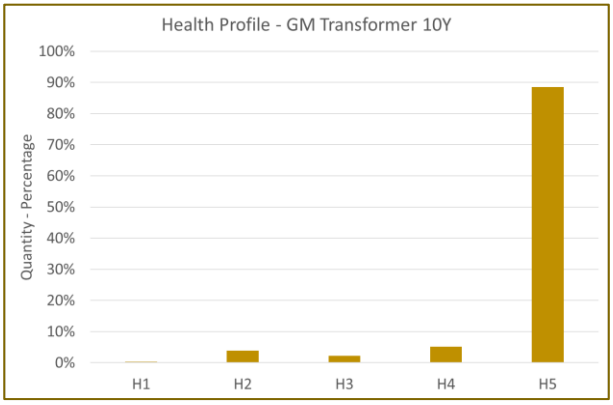


Figure 103: GM Distribution Transformer Forecast 10-year asset health



The forecast renewal of ground mounted transformers is shown in Table 109. Based on current information, we consider that these forecasts are appropriate to maintain the health of the fleet at an appropriate level to achieve our asset management strategy.

Table 109: Forecast ground mounted distribution transformer replacements

Total population (Eastland owned)	Grade H1 & H2 assets (2021)	Forecast grade H1 & H2 assets (2026), before renewal	Forecast ground mounted transformer renewals over next 5-years
548	2	5	40

It is noted that inspections are yet to be completed of the entire fleet. Asset health (and hence forecast renewals) may change following the inspection of all assets.

Specific asset replacement and renewal projects

In addition to normal forecasts, the following projects have been identified as specific projects due to the scale of the work required. These projects are mainly located in the CBD and the increase in expenditure (in comparison to normal replacements) is attributable to the transformers being in buildings where replacement will require significant upgrades to its enclosure, or where relocation is required.

Table 101: Specific asset replacement and renewal projects

Location	Description	Driver	Budget	Year	Comments/alternatives
Peel St[103]	Reconfiguration of the Peel St line to enable replacement of old equipment	Asset health Load Growth	$70k	2023	No practical alternative
Lowe St[104]	Replace transformer B377 in urban subdivision and relocate to Berm	Asset health Safety	$60k	2025	No practical alternative

11.11.8 Expenditure forecasts

The forecast expenditure for the distribution transformers[105] is shown in Table 110 and Table 111. As reflected in the budgets below, Eastland Network sees the refurbishment of transformers of this size and quantity as inefficient and prefers to replace transformers with new assets.

Table 110: Forecast opex

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
TX Refurbishment <100kVA	ARR	5	5	5	5	5	5
TX Refurbishment >100kVA	ARR	8	8	8	8	8	8
TX Inspection (incl minor	RCMI	40	40	40	40	40	40
TX Oil Analysis/Handling	ARR	10	10	10	10	10	10
TX Earth testing	RCMI	60	60	60	60	60	60

[103] Project to be done in conjunction with cable upgrade project (refer cable fleet plan)
[104] Project to be completed as part of the >100kVA transformer replacement program
[105] This includes both ground mounted and pole mounted distribution transformers

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
TX Earthing system repairs	ARR	45	45	45	45	45	45
TX Defect /Fault repairs	SIE	15	15	15	15	15	15
Total		**183**	**183**	**183**	**183**	**183**	**183**

Note: $000 (in constant prices)

Table 111: Forecast capex

Expenditure type	Capex category	2022	2023	2024	2025	2026	Average 2027-2031
Replace Transformers <100kVA	ARR	150	150	150	150	150	150
Replace Transformers >100kVA	ARR	270	270	270	270	270	270
Transformers Growth <100kVA	SG	87	87	87	87	87	87
Transformers Growth >100kVA	SG	50	50	50	50	50	50
Total		**589**	**589**	**589**	**589**	**589**	**589**

Note: $000 (in constant prices)

11.12 Ground mount switchgear and ring main units

11.12.1 Fleet overview

This asset fleet includes both ground mounted switchgear and ring main units.

The ground mounted distribution switchgear fleet is associated with the underground distribution network and provides protection, isolations, and earthing functions for the segment of line that they operate within.

Consistent with our operating context, ground mounted switchgear is primarily installed within the higher density areas of our network (where underground systems are more prevalent). Over the years, engineers have had their own personal preferences for manufacturer type and construction, however, a common feature is the insulation used within the units. Oil-filled units historically dominated the fleet. With the emergence of units with a smaller footprint (using SF6 insulation), replacement programs have now replaced almost half the of the oil-filled fleet with SF6 type units.

Due to the difference in footprints, Eastland Network hold critical spares for their oil insulated switchgear fleet. Replacements of oil-filled units with oil-filled units are typically done under fault situations where restoration of power to consumers is a priority. Under normal circumstances, where renewal of the asset has been identified, a planned outage is scheduled and the switchgear replaced with the preferred SF6 insulated switchgear.

With regards to the SF6 units, several post incident findings determined there was a manufacturing defect with switchgear manufactured between FY2000 and FY2005. A deficiency in the type of grease used resulted in the mechanical failure of units when operated. Switchgear that was installed during the between FY2000 and FY2005 has undergone corrective maintenance to remedy this fault, however, installations which occurred during between FY2005 and FY2010 may still be subject to this issue.

The fleet age profile shows a large portion of installations occurred during the early 2000s. This was a result of earlier designs not meeting the necessary performance, safety, and reliability

requirements. Future installations will primarily be gas-filled switchgear as manufacturers have phased out the production of oil-filled switchgear.

11.12.2 Fleet management strategy

Our 10-year ground mount switchgear fleet strategy is to:

- Capture condition information on all GM switchgear using the new DNO methodology by 2023, and achieve 100% of all planned inspections going forward;
- Assess the asset health of all GM switchgear based on condition information using the DNO Methodology;
- Revise the long-term forecasts based on accurate asset health indices by 2023 to ensure that there are no H1 assets present over the forecast period, and that H2 assets are replaced before they deteriorate to H1;
- Ensure all defects are risk assessed and replaced prior to failure. Our target is to have no failures of any identified defective GM switchgear;
- Identify locations of oil-filled switchgear where replacement by gas-filled switchgear is viable. The use of criticality, reliability, and asset health information is needed to ensure that specified projects are identified for these areas;
- Improve (i.e. reduce) our cable termination and fuse failure rates of GM switchgear through early detection and preventative maintenance;
- Ensure contingency spares are readily available for both oil and gas-filled switchgear;
- Keep up to date with relevant technology upgrades in order to benefit from the advancements that the industry provides.

Currently we are targeting to reduce our switchgear fault rate through preventative maintenance on the cable terminations of the switchgear. In general, mechancial breakdown is rare, however, premature deterioration of the cable terminations is the main cause of failure.

The GM switchgear strategy was developed based on the analysis presented below and is a shift from our historical age-based forecasting to a health-based and reliability-focused model. We consider that the ground mounted switchgear strategy is consistent with our overall asset management strategy for the network.

11.12.3 How we operate, monitor, and maintain the assets

Operating the assets

The switchgear is operated by Eastland Network's approved contractors for isolation of the planned and unplanned shutdowns on the network. We are installing remote operated ground mounted switchgear in areas that have long travel times to reduce response and restoration times. These units are operated via SCADA.

Switchgear faults are normally identified through the tripping of the upstream protection device, or through early detection of significant damage by inspectors.

Gas switches have the capability to phase out the two incoming circuits which is an additional benefit of the replacement program and strategy.

Monitoring (inspection and testing) the asset

Table 112 summarises our current inspection and testing regime for the ground mounted switchgear fleet. The capturing of condition information is largely time-based with more frequent inspections of older assets that are deemed more susceptible to failure due to their age.

The ground mounted switchgear inspection standards were drafted during FY2021 to align to the DNO Methodology to ensure all the necessary observed condition inputs were captured. These inputs are used to calculate the health index (H1-H5) for each asset. The information captured from inspections enables us to prepare accurate forecasts of asset health using the DNO Methodology. From this, decisions can be made to develop appropriate remedial and mitigating strategies for our ground mounted switchgear asset fleet.

Table 112: GM switchgear inspection/test program

Inspection Type	Scope of Inspection	Inspection Trigger
Visual – Detailed	Capture of observed condition inputs in relation to any signs of corrosion or rust, oil level, signs of oil leakage and any corona noise present. The observed condition inputs are consistent with the DNO Methodology for GM switchgear. Identification of any re-painting requirements and label replacements. Verification of asset attribute data. Inspection and testing of earthing connections. Inspection of terminations (where possible).	2 yearly

GM switchgear detailed inspections are qualitative assessments undertaken by suitably qualified and competent inspectors.

Maintaining the asset

GM switchgear maintenance typically consists of defect repairs identified through inspections as shown in Table 113.

Table 113: Switchgear maintenance

Type of Maintenance	Maintenance Trigger
Defect repair	Defects are repaired following identification of a fault or detailed switchgear inspection. The assessment of the defect repair is made between the faultman and operator (in the case of a fault), and by underground contractors in other cases. Defects are defined as remediation work on the switchgear that is required immediately. The scheduling of the repair is based on the risk of failure and the throughput time to perform the maintenance i.e. planned shutdown notification period.
Minor maintenance	Minor maintenance includes tasks such as painting, rust removal, warning label replacement and vegetation control. These tasks are typically done by the inspector.

5.4.6.4 How we make renewal decisions on the fleet

As mentioned in the introduction to this section, we are applying the DNO Methodology to determine asset health and are forecasting asset renewal based on the asset health. The specific drivers for asset renewal forecasting and selecting specific asset renewal projects (within the overall asset renewal forecast) are shown in Table 114.

Table 114: Drivers and triggers for renewal forecasts and projects

Renewal item	Drivers/Triggers
Renewal forecasts	Renewal forecasts are established to ensure that there are no H1 assets present over the forecast period, and that H2 assets are replaced before they deteriorate to H1. Switchgear that has been identified as being poor (H2) are targeted to be replaced within 1-4 Years. Switchgear that has been assigned H3, H4 or H5 are programmed into the future replacements based on the DNO modelling outcome. For switchgear, asset health is a primary driver for renewal forecasting; other drivers which may influence renewal decisions, include the ability to replace an oil filled switchgear with the preferred gas type, or site issues. We are aiming to have all rotary switch gear removed from the network in the next 5 years. We also try to inform consumers (typically non-domestic/commercial operations) of the state of their assets where possible.
Renewal projects	Specific renewal projects are defined and selected based on one of more of the following: • The most current inspection and asset health information (with this information being verified during the project concept phase); • Evidence that the switchgear has deteriorated to the extent that the mechanical design is susceptible to failure where the risk of failure is unacceptable; • Switchgear which has demonstrated a decline in reliability performance with the reasons for unreliability being attributed to deteriorating asset condition (including oil leaks and excessive corrosion). The prioritization of these projects is made after considering the criticality of the assets.
Defect replacement	Replacement of an asset under fault or defect conditions is typically driven by immediate safety concerns and/or where the risk of failure is assessed to be possible within the next 12 months. Switchgear that has been recognized as EOL (H1) is identified with a “do not operate” tag which implies that the switchgear is in-operable and will remain in its current state. The targeted replacement of switchgear identified as H1 or in-operable is within 3 months.

11.12.4 Fleet performance and risks

Current fleet performance

The performance of ground mounted switchgear in terms of reliability is currently acceptable. Fault events resulting from switchgear failure contributed to 0.07% of all faults associated with defective equipment and cable terminations over the past 10 years. As stated earlier, the causes for switchgear failure are often attributed to failure of the attachment, such as cable terminations, and not directly caused by the switchgear itself. Taking this into consideration, it is possible to state that the performance of the ground mounted switchgear is meeting the functional expectations of the asset.

One specific issue identified with ground mounted switchgear is the manufacturing defect stated at the beginning of this section. It refers to a defect in the type of grease used to lubricate the shaft of the pin which locks the switch in place. It was found that the grease had a high viscosity resulting in delayed transitions of the pin, and the switch being unable to lock into place. Mitigating actions were initiated and refurbishment of switchgear installed between FY2000 and FY2005 was undertaken. Switchgear that was installed between FY2005 and FY2010 period may still be subject to this defect.

Key fleet risks

Our risk register has identified the following top risks in relation to switchgear (where the consequences are reliability or safety related):

- Third party interference;
- Cable terminations.

A key focus for this fleet plan is to ensure that, where possible, preventative maintenance triggers are identified and remediated before the risk is crystallized (i.e. a consequence occurs).

Specific risk areas which are being actively addressed are:

- Limited oil contingency spares (to enable replacement under fault conditions);
- Manufacturer defects associated with specific switchgear;
- Rotary switches.

11.12.5 Fleet population and age

Details on the switchgear population and age profile are shown in Table 115. In general, the age profile of the GM switchgear fleet is relatively young with an average age of 17 years, and only 5.6% of the fleet due to reach MPL over the next five years,

Table 115: Ground mounted Switchgear asset fleet quantity and age

Voltage	Population[106]	Average age	MPL[107]	No. of units older that MPL
Distribution	339	17	40	57

11.12.6 Fleet asset health and forecast maintenance and renewal requirements

Asset replacement and renewal forecasts (ground mounted switchgear)

For this AMP, the asset health has been calculated using the DNO Methodology, with the results converted to the EEA Asset Indices. The current asset health for the ground mounted switchgear fleet is shown in Figure 104 and Figure 105 below. The change to the DNO Methodology explains the difference in health assessments from those included in the 2020 AMP. We expect that the asset health to change as inspections (using the new methodology) are completed.

[106] Population count includes GM Switchgear and RMU's
[107] MPL means maximum practical life. Based on the EEA health determination for ring main unit MPL

Figure 104: Health Profile – RMU (distribution)

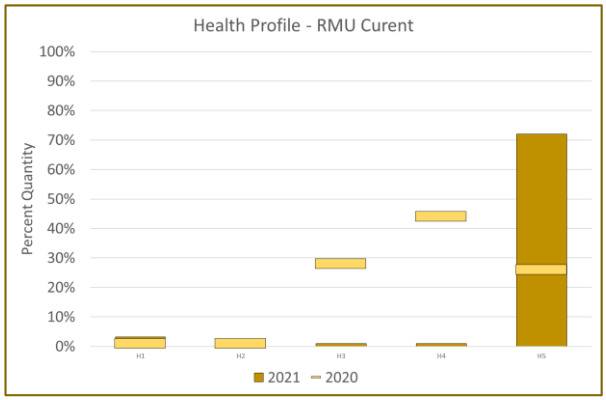
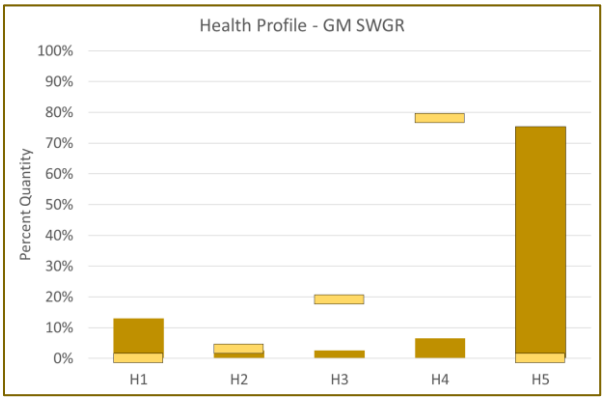


Figure 105: Health Profile – GM SWGR (distribution)



The forecast health of the ground mounted switchgear and RMU fleet is shown in Figure 106 and Figure 107 based on no renewals taking place.

Table 116 shows the future forecast health of the ground mounted switchgear fleet over the next 5 years. To align with the overall asset management strategy, switchgear units identified as H1 or H2 will be scheduled for renewal. The forecast is adequate to maintain the health of the fleet at an appropriate level to achieve the fleet asset management strategy.

Figure 106: RMU forecast 5-year asset health

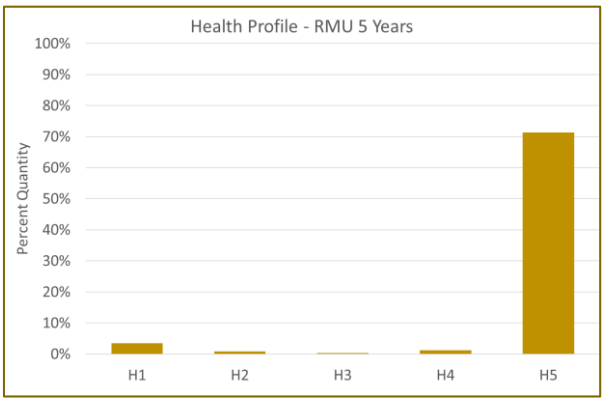


Figure 107: GM Switchgear forecast 5-year asset health

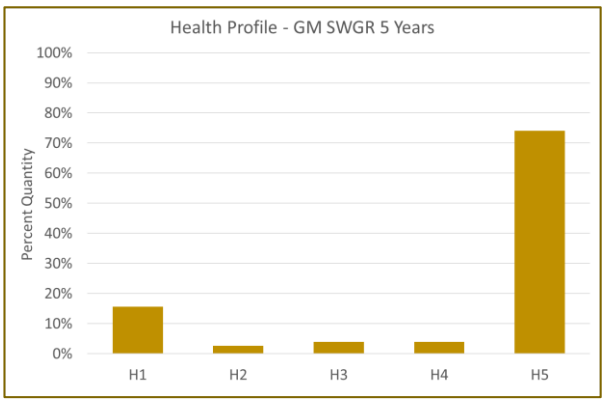


Table 116: Forecast Switchgear replacements

Asset class	Total population	Grade H1 & H2 assets (2021)	Forecast grade H1 & H2 assets (2026), before renewal	Forecast GM switchgear renewals over next 5-years[108]
RMU (distribution)	262[109]	14	18	20
SWGR (distribution)	77	10	12	6
Total	**339**	**24**	**30**	**26**

[108] This includes both planned and unplanned replacements.
[109] Note: Input error was made in information disclosure schedule 9a. Previously reported as 314.

Specific asset replacement and renewal projects

Our engineering analysis of the most recent condition data, reliability data, and asset criticality has identified the following projects which align with our reliability and efficiency targets.

These specific projects align with the fleet strategy described in Section 11.12.2.

Table 117: Specific asset replacement and renewal projects

Location	Description	Driver	Budget	Year	Comments/ alternatives
W283 (Apatu Corner)	SDAF3 switchgear replacement	Asset health	$35k	2022	
W286 (Apatu St)	SDAF3 switchgear replacement	Asset health	$35k	2022	
A96 (Douglas St)	SDAF3 switchgear replacement	Asset health	$30k	2022	
A560 (Rutene Rd)	SD2/SDAF2 switchgear replacement	Asset health	$40k	2022	Corona noise present
B1040 (Parkinson St)	SDAF2 switchgear replacement	Asset health	$70k	2022	
B273 (Lytton Rd)	SDAF3 switchgear replacement	Asset health	$30k	2022	Corona noise present
W1073 (Clyde/Kitchener corner)	SD2/SDAF2 switchgear replacement	Asset health	$45k	2022	
W1231 (Kitchener/Rutherford corner)	SD2/SDAF2 switchgear replacement	Asset health	$45k	2022	
B46 (Scott St)	SDAF3 switchgear replacement	Asset health	$30k	2022	
B678 (Carnarvon St)	SDAF3 switchgear replacement	Asset health	$30k	2022	Tank deterioration

11.12.7 Expenditure forecasts

The forecast expenditure for the ground mount switchgear is shown in Table 118 and Table 119.

Opex has been forecast to remain steady over the next planning period based on the historical spend and the low variability in switchgear maintenance. The asset replacement and renewal category has been budgeted to allow for the remediation of the manufacturing defect of switchgear installed between FY2005 and FY2010.

Capex has been forecast based on the growth rate of new connections to existing switchgear assets. The frequency at which new connections occur can be described as steady sate, however, allowances have been made to accommodate the increasing trend of growth within the region. Asset replacement and renewals are based on current engineering analysis which have identified specific projects which align with the overall asset management strategy and objectives. We expect more projects will be identified as inspections continue and asset condition information is updated.

Table 118: Forecast opex

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
Inspections and minor maintenance	RCMI	30	30	30	30	30	30
Average switch 5yr maint/mech changes	ARR	40	40	40	40	40	40
Defect and fault repairs	SIE	10	10	10	10	10	10
General Maintenance	RCMI	10	10	10	10	10	10
Total	-	**70**	**70**	**70**	**70**	**70**	**70**

Note: $000 (in March 2021 constant prices)

Table 119: Forecast capex

Expenditure type	Capex category	2022	2023	2024	2025	2026	Average 2027-2031
New connections	CC	100	55	55	55	55	55
Switchgear Replacement – (2x planned, 2x unplanned)	ARR	250	250	250	250	250	250
Total	-	**305**	**305**	**305**	**305**	**305**	**305**

Note: $000 (in March 2021 constant prices)

Note: the fleet plans beyond this point have not been materially updated from prior AMPs and have been presented in summary form. For some large asset fleets (e.g. pole mount transformers) we intend to increase the level of information in subsequent AMPs. For minor and ancillary assets, we will continue to present them in summary form.

11.13 Pole mount transformers

11.13.1 Fleet overview

Eastland Network has 3,050 pole mounted transformers which provide the link between the distribution and low voltage networks.

The same observational measures are used to qualify asset health as for ground mounted transformers, except for the mounting mechanism.

Isolation fuses are typically located on the same pole and failure of these units is rare. The criticality of failure of these units is low and so a “run to failure” strategy is adopted for this fleet. Older transformers which fall within a shutdown area for the planned replacement of other assets are replaced (to take advantage of the shutdown).

The cost of the asset is not considered significant and therefore refurbishment (replacement of broken components) of units is rare.

We have allowed for an annual average of 15 planned and 8 unplanned transformer replacements for this fleet. Unplanned installations include an allowance for new rural connections, and additional units that are replaced upon failure.

11.13.2 How we operate, monitor and maintain the assets

The pole mount transformers have 5-yearly inspections and testing as set out in Table 120.

Table 120: Pole mount transformer inspections

Inspection Type	Scope of Inspection	Inspection Trigger
Visual – Inspection	Inspection of pole mounted transformers is performed from the ground and observed conditions which affect the performance of the asset include: • Rust and corrosion; • Bushing condition; • Oil leaks; • Mounting stability.	5-yearly
Earth testing	Measure resistance of earthing connections	5-yearly

There is no specific planned maintenance program for this fleet. However, remediation (be it maintenance or replacement) is undertaken in response to the inspection results and/or in response to faults.

11.13.3 How we make renewal decisions on the fleet

As mentioned above, Eastland Network's strategy is to "run-to-failure", however, where an H2 transformer lies within a planned shutdown section, the unit is usually replaced (following a condition assessment). The low criticality of these asset and the current good performance of the fleet supports the replacement approach.

Pole mounted transformers usually range from 5 – 50kVA. Growth within a region above 50kVA will either drive an installation of a second pole mounted transformer or a change to a ground mounted transformer. The area of growth and land availability are factors that drive this decision.

11.13.4 Fleet performance and risks

Current fleet performance

Pole mount transformers are a static asset in that there are no moving parts[110]. This decreases the likelihood of failure and increases asset longevity.

Key fleet risks

Our risk register has identified the following top risks in relation to pole mounted transformers (where the consequences are reliability or safety related):

- Lightning;
- Environmental – causing accelerated rust and corrosion;
- Third party interference.

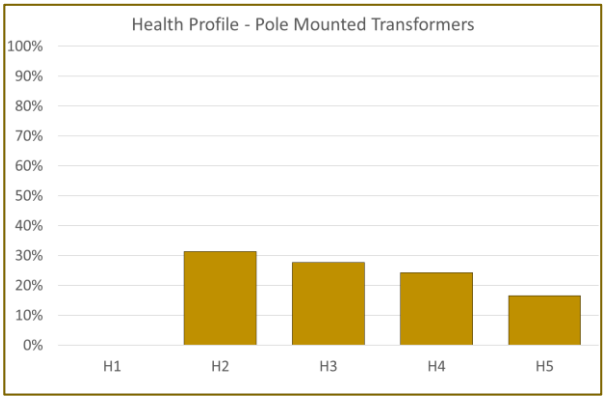
11.13.5 Fleet population, age and health

The EEA asset health indicator guide advises that the maximum practical life for a pole mounted transformer is 70 years. Our replacement program has maintained the fleet so that pole mounted transformers have not reached this age. To maintain this profile, increased replacements will be required beyond the forecast period.

[110] Can sometimes have manual tap-changer

Given the asset health data in Figure 108, we are forecasting the replacement of 153 (roughly 30 per annum) transformers over the next five years.

Figure 108: Health profile - pole mounted transformer



11.13.6 Expenditure forecasts

Forecast expenditure is based on our proposed replacement strategy. In terms of reliability and criticality, we deem this expenditure to be sufficient for this asset.

Table 121: Forecast opex

Expenditure type	Category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Inspections and testing	RCMI	Planned	30	30	30	30	30	30
Transformer refurbishment	ARR (opex)	Planned	5	5	5	5	5	5

Note: $000 (in March 2021 constant prices)

Table 122: Forecast capex

Expenditure type	Category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Transformer replacements	ARR	Planned	136	136	136	136	136	136
Allowance for growth	SG	Unplanned	78	78	78	78	78	78

Note: $000 (in March 2021 constant prices)

11.14 Pole mounted reclosers, sectionalisers, and load break switches

11.14.1 Fleet overview

Reclosers and sectionalisers work in conjunction with the substation protection equipment to provide a protection scheme which operates to minimise the extent of outages. Eastland Network's terrain and landscape increase the difficulty in providing communication signals to some areas of the network and can limit where this equipment is installed.

As part of our asset management strategy, we are analysing our unplanned outage areas to identify where additional sites may be best utilized. We are currently planning to install 8 new sites over the next two years (a mixture of reclosers and circuit breakers) which will further segment the network and decrease the effect of outages on the associated feeders.

Due to our terrain, communication links to remote sites and not always reliable. Manual operation capability is mounted on most of the units to ensure operation of the sites is possible both locally and remotely.

11.14.2 How we operate, monitor, and maintain the assets

Remote controlled switches are monitored via our control room. Communication modules attached to each control box allow for remote opening/closing functionality as a minimum (typically for remote load break switches). Reclosers typically have additional functions which assist control room operators with determining the type of fault or network disturbance.

Logic diagrams are typically the same for each type of recloser with trip settings based on the installation location and load characteristics.

These assets are subject to a time-based inspection regime (which is bi-annually for reclosers and sectionalisers, and 5-yearly for air-break switches). Functional testing is also performed when the assets are commissioned. Any earthing associated with the asset is tested every 5 years.

11.14.3 How we make renewal decisions on the fleet

There are three different criteria which drive replacements for this asset fleet which include:

- Renewal of existing assets based on health and age;
- Renewal of assets based on key fleet risks; and,
- Installation of new assets in line with Eastland Network's operating strategy.

11.14.4 Fleet performance and risks

We are seeing more faults due to communications, protection relays (contact burnout), and flat batteries than to the breakdown of the units themselves. We have used the EEA guidelines as a guide for age replacements and the bulk of the fleet still has upwards of 10 years of life remaining. In saying this, we are maintaining our forecast expenditure against historical expenditure to address the key fleet risks and increase the number of remote switches (based on our strategy).

Our risk register has identified the following top risks in relation to automation equipment (where the consequences are reliability or safety related):

- Asset damage due to faulty operation;
- Contact connection burnout causing phase unbalance;
- Mechanical breakdown (contact breakdown and insulation failure);
- Environmental factors (lightning, rust and corrosion);
- Wildlife and/or insects (interfering with the control box).

Our risk register has identified the following top risks in relation to this fleet (where the consequences are reliability or safety related):

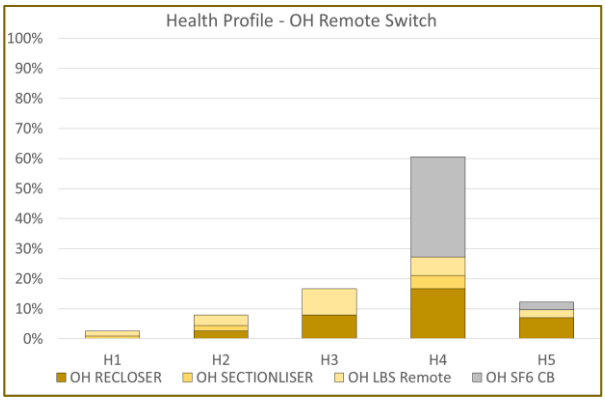
- KFE reclosers – these reclosers have been regularly failing on the network as a result of insulation chamber breakdown and failure of the contact coils. The production of the units has also ceased and Eastland Network doesn't hold system spares for this unit type. There are four remaining units operating on the network and these are programmed to be replaced in 2021 and 2022.

11.14.5 Fleet population, age and health

Our data register for this fleet is not 100% accurate. Remote load-break switches which have had new control boxes installed on the pole still have the manufacture date of the manual load-break switches. It is also very difficult to verify the ages of the assets as access to the switches requires a shutdown.

We use the EEA health guide to determine the health of the assets. The recommended life expectancy for reclosers and remote switches is 45 years. The associated hardware to operate the equipment (radios and RTU's) will typically be replaced once before the end-of-life period of the switch. Batteries used to supply the relay, switch and communication equipment are typically replaced every 4 years.

Figure 109: Health Profile - Pole Mounted Remote Switches



11.14.6 Expenditure forecasts

Expenditure on additions is infrequent due to the restrictions in being able to find sites. Capital expenditure on renewals will provide for a minimum of 2-3 replacements annually.

Table 123: Forecast Opex - Remote switches

Expenditure Category	Opex category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Rural automation Inspections	RCMI	Planned	14	14	14	14	14	14
Rural automation maintenance	RCMI	Planned	18	18	18	18	18	18
Fault response	SIE	Unplanned	20	20	20	20	20	20

Note: $000 (in March 2021 constant prices)

Table 124: Forecast Capex - Remote Switches

Expenditure type	Capex category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Field recloser automation plan – additions	QOS	Planned	40	-	40		40	20

Expenditure type	Capex category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Field recloser automation plan – renewals	ARR	Planned	40	40	40	40	40	40

Note: $000 (in March 2021 constant prices)

11.15 Overhead switchgear (fuses, links, air-break switches, earth switches)

11.15.1 Fleet overview

Overhead switchgear provides the operating mechanisms to sectionalise the network into small areas. Overhead fuses are used to form the protection function between consumers or privately owned assets and network assets. They also provide an inexpensive alternative to installing reclosers and more expensive protection devices.

Protection settings of reclosers must consider these fuses and work with them to provide a protection scheme which minimises outage areas.

These assets also provide the visible gap between a live network and de-energised network so that planned maintenance and replacements on a network can be completed.

The fleet consists of 3,885 protection fuses, 534 air/load break switches and 111 links.

11.15.2 Asset management strategy

From an asset strategy perspective, the objectives for the overhead switchgear are to:

- Installation in strategic locations to isolate faults without overpopulating;
- Achieve a high standard of operational reliability;
- Minimise maintenance costs, relying on a replacement response to keep costs low.

11.15.3 How we operate, monitor and maintain the assets

These assets are manually operated by qualified staff including linemen and faultmen. Protection fuses operate when they detect a fault and network staff are usually notified by our faults centre who take the calls from consumers on our network. There is no remote monitoring of this equipment, however, pole inspection programs will usually identify any obvious flaws with the equipment attached to the pole.

Switches installed within substations are maintained more frequently than field assets as they are more critical to the operation of the network.

Maintenance is carried out on air-break switches and earth switches within substations. Obvious issues found on field assets are treated as defects and a shutdown or replacement is planned. Maintenance includes:

- Contact alignment;
- Greasing of contacts and nipples;
- Earthing braid / conductor replacement.

Equipment found to be defective is maintained in accordance with the manufacturer's specifications. Maintenance costs for these assets are included within 'other asset' categories (i.e. zone substations, rural automation maintenance etc.).

11.15.4 How we make renewal decisions on the fleet

Renewals for this fleet are primarily based on asset type (see asset risk section) and health. It is difficult to determine the condition of these assets using visual inspections and the condition of these assets is often unknown until they are operated.

11.15.5 Fleet performance and risks

Current fleet performance

Over the past 5 years we have experienced an annual average of 26 outages attributable to faulty overhead switchgear. These outages resulted in minimal reliability impact (<1 SAIDI minute). The causes of the failures range from blown jumpers to the misalignment of contacts. This asset fleet is an area where improvement is required due to their impact on the operation of the network.

Key fleet risks

Our risk register has identified the following top risks in relation to overhead switchgear (where the consequences are reliability or safety related):

- Breakdown of fuse sleeves;
- Contacts burning;
- Mechanism wear and tear;
- Bearing stiffness or jamming;
- Insulator failure.

Table 125 describes the specific risk areas or type issues which are being actively addressed.

Table 125: Specific overhead switchgear risks

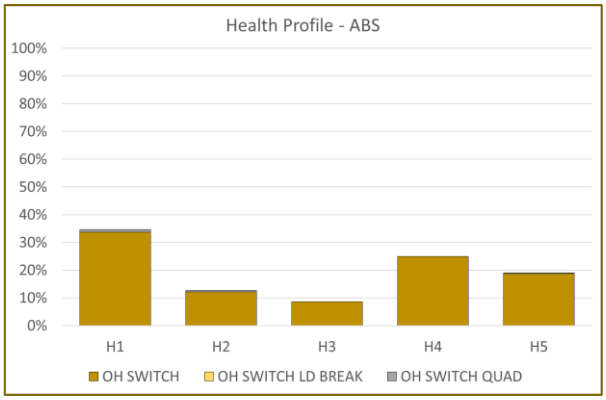
Risk	Mitigation
Quadrant ABS – Built with a wire operating system and has been identified as being problematic should the wires break during operation.	Replacement program of 10 units per annum.
ABS insulator failures – Eastland have noted a trend in insulator failures on ABS's purchased from our supplier in the early 2000's. Discussions with other EDB's have noted that this is an industry wide problem.	Stock sufficient replacement units.
Glass Type fuses – Operation requires high degree of skill and poor operation can lead to arcing. Fuse type and holders no longer in production and spares are currently being used from the replacement units.	Replacement program of 30units per annum.

11.15.6 Fleet population, age and health

The high percentage of H1 and H2 assets is due to quantity of quadrant air-break switches and glass fuses on the network (refer Table 125) . The percentage of H1 and H2 assets will significantly improve over the forecast period with 50 ABS and 150 fuses due for replacement in the next 5 years.

Table 126: Health profile - air break switches

Figure 110: Health Profile – OH Fuses



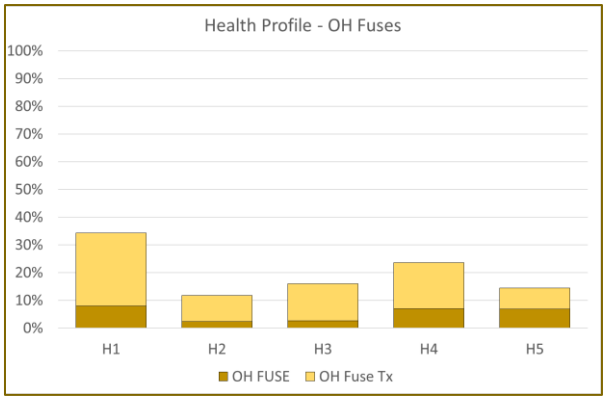
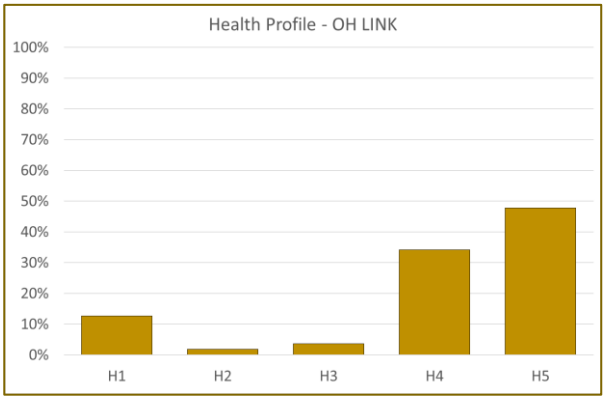


Figure 111: Health Profile – OH Links



11.15.7 Expenditure forecasts

Expenditure is based on our strategy and network risks. Based on our current performance, we expect this level of expenditure to be sufficient to increase our levels of service from these assets.

Table 127: Forecast opex

Expenditure type	Expenditure category	Type	2022	2023	2024	2025	2026	Average 2027-2031
11kV ABS and redundant equipment disposals	RCMI	Planned	40	40	40	40	40	40

Note: $000 (in March 2021 constant prices)

Table 10: Forecast capex

Expenditure type	Expenditure category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Age replacement of 11kV ABS's	ARR	Planned	112	112	112	112	112	112
Age replacement of 50kV ABS's	ARR	Planned	40	40	40	40	40	40
11kV fuse replacement	ARR	Planned	45	45	45	45	45	45

Note: $000 (in March 2021 constant prices)

11.16 Zone Substations

11.16.1 Fleet overview

We currently have 23 zone substations on our network with 70% located in the Gisborne region. This section (zone substations) includes the building, grounds, security and any other non-operational asset contained within the compound.

Due to the low demand growth over the last 10 years, there have been only one new substations built over that period. However, recent evaluation of network load and line voltage limitations is driving us to consider options to keep the current substations within their operational security levels. Within the forecast period, two new substations have been proposed to cater for network growth within the Gisborne township and assist with voltage levels in the Mahia township (these projects are discussed in the network development section).

Zone substations are positioned throughout the region and some are placed within residential and commercial areas. These substations require additional security and earthing to ensure that the safety of the public is not compromised. In addition to the regulatory requirements and best practice designs for substation safety, our sites are audited annually by an external auditor who surveys the sites and ensures that our safety equipment (safety fences, earthing straps etc.) is fit for purpose.

11.16.2 How we operate, monitor and maintain the assets

Inspection and maintenance of zone substations is a critical task for Eastland Network. As well as maintaining operational performance, it is essential that all public safety risks are mitigated so far as is reasonably practicable.

Regular (4 monthly) inspections of substations are performed (in the most part) to confirm the security of the substations i.e. the fencing is secure and access to the public is restricted. All of the substation equipment is inspected and any irregularities or issues are noted. 5-yearly earth testing is also undertaken.

External contractors are engaged to keep the sites clean and tidy.

11.16.3 How we make renewal decisions on the fleet

The renewal of zone substation buildings is based on the condition of the buildings and compliance requirements. Other equipment, such as fencing, is replaced when maintenance becomes uneconomic or in response to in increase in public safety risk. From an asset health perspective, the above-mentioned criteria typically results in no H1 assets being present, and H2 assets being replaced before they deteriorate to H1.

11.16.4 Fleet performance and risks

Current fleet performance

We take a proactive approach to maintaining our zone substations. All zone substation buildings are in reasonable condition (except for the Puha substation mentioned below).

Key fleet risks

Our risk register has identified the following top risks in relation to zone substations (where the consequences are reliability or safety related):

- Wildlife (sub fencing);

- Public access;
- Noise.

In terms of specific risk areas which are being actively addressed:

Table 128: Specific substation risks

Active Risk	Mitigation
Puha substation asbestos	Replace roof and dispose of existing roof as required.
Carnarvon substation earthquake rating	Carry out requirements noted in engineer's report
Gisborne substation earthquake rating	Carry out requirements noted in engineer's report
Wairoa substation earthquake rating	Carry out requirements noted in engineer's report

11.16.5 Fleet population, age and health

Zone substations were installed between 1971 and 2019. Presently there are two substations with a H2 rating. The remaining substations have asset health ratings between H3 and H5, with most being H3.

11.16.6 Expenditure forecasts

The opex forecast covers the routine inspection, maintenance, and corrective asset replacements as mentioned above. An allowance for unplanned work has been made based on historical expenditure levels. Routine and corrective maintenance include the expenditure for quarterly inspections of all zone substations, grounds maintenance of the yards which include weed spraying, lawn maintenance, and building upkeep, and also repairs or maintenance to the zone substation equipment (e.g. switch and transformer maintenance, oil sampling (DGA's) and thermal imaging of high voltage equipment to check for hotspots).

Table 129: Forecast opex

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
Zone substation inspections and minor maintenance (includes 110kV Substations)	RCMI	180	180	180	180	180	180
Grounds maintenance	RCMI	85	85	85	85	85	85
Zone substation major maintenance	RCMI	105	105	105	105	105	105
Zone substation defect and repairs	SIE	75	75	75	75	75	75
Health & Safety inspections	RCMI	5	5	5	5	5	5
Thermovision inspections	RCMI	12	12	12	12	12	12
Earth testing (Step/touch)	RCMI		36				36[111]
Building maintenance	RCMI	10	10	10	10	10	10
Total		**472**	**508**	**472**	**472**	**472**	**508**

Note: $000 (in March 2021 constant prices)

[111] Every 5-years.ARR

The capex forecast incorporates the following projects:

Table 130: Specific capex projects

Project	Driver	Capex category	Cost	Year
Puha substation roof replacement	Risk (asbestos removal)	ARR	30	2023

Note: $000 (in March 2021 constant prices)

Table 131: Forecast capex

Expenditure type	2022	2023	2024	2025	2026	Average 2027-2031
Specific capex projects	30		75	11		
Replace batteries and chargers	22	22	22	22		22

Note: $000 (in March 2021 constant prices)

11.17 Protection Relays

11.17.1 Fleet overview

Protection relays are used to detect disturbances in the voltage and current flowing through the circuits. When set parameters are breached, the relay signals the circuit breaker to trip, which subsequently breaks the flow of electricity. Newer digital relays now have the capability to calculate other parameters (kW, power factor, etc.) which operators and engineers use to assist them with loading and other technical measurements. Our communication network now directly links (via IP or fibre) to the relays remotely and provides engineers with live and historical data.

In terms of relay replacements, Eastland Network's strategy has been to replace protection devices which have internal faults, or to update the fleet to enable technology advances and functionality progression.

In 2018, we completed the removal of all the SR750/760 relays on our network, which were failing due to an identified internal battery issue. All system spares which we were holding as replacement units have been discarded, and the values have changed accordingly in the disclosure quantities.

There are still several substations and switchgear sites which have electromechanical or Mikrotrip relays which we have flagged as requiring replacement. Scheduled replacements of these units has been postponed until the development and replacement of the associated primary equipment (circuit breakers and substation layout) is required.

There is SCADA monitoring of some relays to enable alarming of relay process errors. This enables testing of a relay when required.

This fleet also includes the relay protection devices attached to pole mounted reclosers and sectionalisers, and remote switches.

11.17.2 How we operate, monitor and maintain the assets

Eastland Network holds in-house engineering capabilities to develop its own protection schemes and settings for devices on the distribution network, and most of the subtransmission network. Protection schemes which require extensive review and are critical to the network operation (such as the 110kV subtransmission network and interconnections with Transpower's Tuai switchboard)

are contracted to external engineering companies to review to ensure that critical protection schemes operate correctly.

These assets are inspected visually (as part of the substation or recloser inspection cycles) and functional testing is undertaken every 5 years for electromechanical relays, and 7 years for digital relays. Automatic under-frequency relays are tested every 4 years as required by the electricity industry participation code.

Battery replacement occurs as required.

11.17.3 How we make renewal decisions on the fleet

Replacements for this fleet are primarily driven by relay type issues, technological advances and age. Condition assessments are difficult, however, regular function testing of the relays ensures they are operating within their programmed settings.

Engineering access to most of the substation relays has been established with the remaining relays due to be replaced in line with a substation or associated primary equipment upgrade.

For our rural automated switchgear sites, the relays normally last longer than the associated pole mounted switches. In these situations, replacement of the relays is driven by an upgrade of the switch and to increase the network sensitivity to events such as earth fault and overcurrent pickups.

11.17.4 Fleet age and health

Replacements to date have kept the relay ages and health within acceptable limits. Kiwi substation is the only substation which has electromechanical relays (and identified as H1 assets). These relays were maintained and tested in 2018 and found to be operating efficiently. These relays will be tested every four years until replacement.

11.17.5 Fleet performance and risks

Current fleet performance

As a critical asset to our protection schemes, Eastland Network maintains and inspects these assets frequently. Performance of this fleet has been good, and in the last 5 years we have experienced 2 premature failures of the zone substation protection relays. One failure was due to a CT/VT module failure and was replaced quickly, and the other was due to an internal issue and was sent away for repairs. Both relays were over 15 years old.

We have recently purchased TEAMS which enables us to monitor relays remotely and graph/log events on the relays. This software forms part of our vegetation strategy to analyse earth fault and overcurrent pickups on our feeders. This will assist our vegetation team in targeting areas for vegetation inspection and cutting to minimise the affect vegetation is having on our network.

Key fleet risks

Our risk register has identified the following top risks in relation to protection relays (where the consequences are reliability or safety related):

- Age of electromechanical relays;
- Relay malfunction or setting error – extending the period where damage to the network can occur;
- Relay type;
- Lightning strikes (relays on pole mounted enclosures).

In terms of specific risk areas which are being actively addressed:

Table 132: Specific fleet risks

Active Risk	Mitigation
Electromechanical relays at Kiwi substation	Relays due to be replaced within the forecast period (in line with switchgear replacement)

11.17.6 Expenditure forecasts

Table 133: Forecast opex

Expenditure type	Opex category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Protection relay testing	RCMI	Planned	15	15	15	15	15	15
Underfrequency Testing	RCMI	Planned	-	12		-	-	-

Note: $000 (in March 2021 constant prices)

There are no specific projects for this asset type. Forecast expenditure is projected to be based on natural replacement frequencies, and Kiwi substation replacements will fall under the switchgear project budget (refer to the substation switchgear fleet plan, Section 11.10).

Table 134: Forecast capex

Expenditure type	Capex category	Type	2022	2023	2024	2025	2026	Average 2027-2031
Protection relay age replacement	ARR	Planned	30	30	30	30	30	30
AUFLS relay installation	SG	Planned						67
Allowance for failure	ARR	Unplanned	15	15	15	15	15	15

Note: $000 (in March 2021 constant prices)

11.18 SCADA (Supervisory control and data acquisition)

11.18.1 Fleet overview

Eastland Network's SCADA master station is located at the head office in Carnarvon St and comprises an abbey system dual master / backup configuration. The current master station was installed in 1999. The SCADA system is used for real time monitoring and control of the network. Frequency, voltage, current and temperature information is obtained from remote sites and stored at 30-minute intervals.

This information is used to report load trends for planning and to alert operations staff of abnormal conditions.

Since the initial installation, regular upgrades have been made to the master station and software has been updated to improve functionality.

There are 16 abbey system full RTUs located at each of Eastland Network's major substations and 168 abbey systems Topcat at remote control switches or monitoring and control sites.

11.18.2 Asset management strategy

From an asset strategy perspective, the objectives for the SCADA assets are to:

- Minimise operational delays by implementing systems that effectively pass on information in a timely manner;
- Provide systems designed with the flexibility to support emerging technology;
- Ensure contingency spares are maintained;
- Deal promptly with any known defect;
- Target asset renewals to maintain performance.

As part of our resilience drive, we installed a second master station at the Massey substation.

11.18.3 How we operate, monitor, and maintain the assets

The RTU input and output functions are tested in conjunction with maintenance of the associated equipment. During protection and switchgear testing, the digital indications, analogs, measurements and control functions are verified back to the master station. General indications such as door security and fire alarms are verified during zone substation visual inspections.

Monitoring of the assets and SCADA equipment is reliant on the communications network being functional. This dependency has been reflected in our investment in dual communication options described in the communications fleet plan.

Defects are repaired when these are identified.

11.18.4 How we make renewal decisions on the fleet

RTU renewals are based on technological advances and age. There is no set program to replace RTUs as the units are replaced after failure. Topcat (series 1) RTUs have been phased out by the supplier and any in-service units that break down are replaced with Topcat (series 2) RTUs.

The abbey system was purchased in 1999 and systems like this typically have an expected life of 15 years. As systems age, support becomes more expensive and replacement technology becomes more attractive.

The PCs used in the master station are targeted for renewal every 5 years.

11.18.5 Fleet performance and risks

Current fleet performance

The Topcat (series 1) units are progressively replaced as real time alarming indicates CPU and/or main board issues at around 16 years. Replacement units have IP or analog communications options and improved signal clarity.

All original substation communication units have been replaced to overcome lockup issues following master station communication restarts and to take advantage of new communications options.

Key fleet risks

Our risk registers have identified the following top risks in relation to the SCADA system (where the consequences are reliability or safety related):

- Communication failure;
- Lightning strikes (which account for a few in-service failures at rural automation sites);

- Pest infestation e.g. ants cause circuit board and socket interface failures;
- Ageing components on the circuit board.

Specific risk areas which are being actively addressed:

- SCADA's heavy reliance on communications creates a risk should the communications network fail. Where possible we provide two communication routes for key sites. Where possible we also provide both IP and radio communication pathways to substations.

11.18.6 Expenditure forecasts

Expenditure on the SCADA system is consistent with our strategy. We also hold in-house engineering capabilities to program, maintain and upgrade our systems. Rural development expenditure is in response to the new rural automation sites planned in the forecast period, and will be used to purchase the SCADA equipment associated with developing these sites.

Table 135: Forecast Opex

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
SCADA support fees	RCMI	5	5	5	5	5	5
SCADA maintenance allowance	ARR	5	5	5	5	5	5
SCADA defect/repairs	SIE	5	5	5	5	5	5

Note: $000 (in March 2021 constant prices)

Table 136: Forecast capex

Expenditure type	Capex category	2022	2023	2024	2025	2026	Average 2027-2031
SCADA master station development	QOS	11	11	11	11	11	11
Unscheduled RTU replacement	ARR	11	11	11	11	11	11
SCADA rural automation – development	QOS		34	34	34	34	-
SCADA long term development additional sites	QOS		56				

Note: $000 (in March 2021 constant prices)

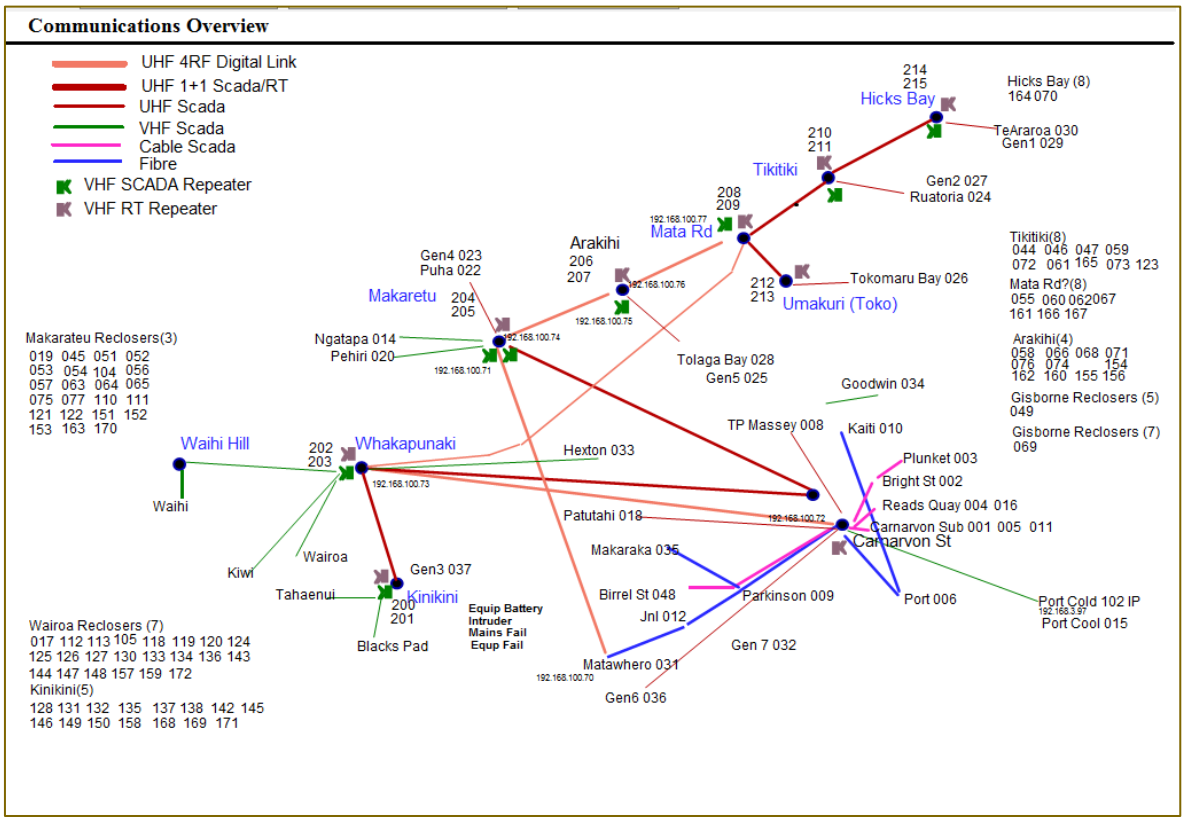
11.19 Communication system

11.19.1 Fleet overview

Multiple communications media and protocols are used to provide voice and data information for the operation of the network. Systems include VHF radio, UHF radio, copper cables, and fibre cables. Data communication is via IP, RS232/485/422 serial and audio. Protocols associated with data communication include Modbus, DNP3, and Abbey Systems (HTLC).

In 2015, we switched all our voice SCADA from analog to digital communications. This was due to the repeater technology becoming redundant. It also increased our capabilities and health and safety as it had the added benefits of GPS and signal clarity.

Figure 112: Eastland Network's communication overview



Diesel generators are situated at the radio huts and have automatic start up functionality in case of power outages.

We are planning to relocate the Arakihi radio site. The 11kV line supplying the site is 5km long and runs through a long forestry corridor, which is causing supply reliability issues to the site.

Eastland Network has 11 standby generators which are used to maintain network operability during power outages.

11.19.2 Asset management strategy

From an asset strategy perspective, the objectives for the communications assets are to:

- Minimise operational delays by implementing systems that effectively relay information in a timely manner;
- Provide systems designed with the flexibility to support emerging technology;
- Ensure the contingency spares are maintained;
- Deal promptly with any known defect;
- Target asset renewals to remove obsolete assets.

11.19.3 How we operate, monitor, and maintain the assets

The communications network allows us to monitor all our remote assets. We use Mikrotik routers to communicate via IP and 'The DUDE' software to monitor our network remotely. This software improves the management of our network environment and allows for real-time monitoring of all our IP and fibre sites. We have eight radio sites throughout the region which house our communications equipment.

Inspection of these huts is completed annually, and access tracks are maintained as some are located on hilltops to maximise coverage and signal clarity.

There is some monitoring of the radio systems in place to provide early warning of equipment malfunction. Annual testing and calibration is carried out to ensure the equipment's performance is within specification.

Defects with the voice radio are treated as critical as operational staff rely on clear communication with the control room for switching instructions.

11.19.4 How we make renewal decisions on the fleet

Renewal of equipment such as radios is based on technology advancements or asset failure.

11.19.5 Fleet performance and risks

Current fleet performance

Our SCADA system monitors the communications network performance to all our remote sites. Operations staff monitor the communication network performance and send technical staff to fix the issue.

Key fleet risks

Key risks associated with the communications network are loss of voice network while operating. The operating and maintenance regime exists to keep this risk as low as reasonably practicable.

11.19.6 Expenditure forecasts

Table 137: Forecast opex

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
Comms maintenance/calibration	ARR	40	40	40	40	40	40
Comms track inspection and maintenance	RCMI	8	8	8	8	8	8
Comms hut inspection and maintenance	RCMI	8	8	8	8	8	8
Comms radio licenses	RCMI	14	14	14	14	14	14
Comms defect/fault repairs	SIE	16	16	16	16	16	16

Note: $000 (in March 2021 constant prices)

Table 138: Forecast capex

Expenditure type	Capex category	2022	2023	2024	2025	2026	Average 2027-2031
Replace repeater equipment	ARR	11	11	11	11	11	11
Replace radio site generator	ARR	33		33		33	16.5
Unplanned comms equipment replacement	ARR	22	22	22	22	22	22
Replace vehicle voice radio	NNA	6	6	6	6	6	6

Note: $000 (in March 2021 constant prices)

11.20 Other network assets

Expenditure for other assets is shown below.

Table 139: Forecast opex

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
Service Connections							
Patrols/Inspections and minor maintenance	RCMI	5	5	5	5	5	5
Voltage checks/complaints	RCMI	10	10	10	10	10	10
Load Control							
Injection plant testing and maintenance	RCMI	8	8	8	8	8	8
Load control fault response	SIE	5	5	5	5	5	5
LV switchgear and pillar boxes							
Inspections and minor maintenance	RCMI	30	30	30	30	30	30
Defects and fault repairs	SIE	10	10	10	10	10	10
Galvanised box inspection and maintenance	RCMI	5	5	5	5	5	5
400V OH service fuse bases and carrier replacements	SIE	50	50	50	50	50	50
General							
Mobile and standby generator maintenance and costs	RCMI	26	26	26	26	26	26

Note: $000 (in March 2021 constant prices)

Table 140: Forecast capex

Expenditure type	Capex category	2022	2023	2024	2025	2026	Average 2027-2031
Service Connections							
Galvanised box replacement program	ARR	120	120	120	120	120	-
Service pillar replacement	ARR	22	22	22	22	22	22
Load Control							
Replace failed ripple relays	ARR	11	11	11	11	11	11
Provide ripple relays for new connections	SG	11	11	11	11	11	11
Install second injection point (Gisborne 11kV)	SG		600				
LV Switchgear and Pillar boxes							
LV link pillar replacement programme	ARR	45	45	45	45	45	45
LV switchgear allowance for new installations	SG	45	45	45	45	45	45

Note: $000 (in March 2021 constant prices)

11.21 Vegetation

11.21.1 Response to performance issues

In response to Eastland Network's high rate of vegetation related outages (refer to Section 6.4.5), we have developed a vegetation management plan which outlines our issues, strategy, and targets for the next three years in regards to minimizing vegetation outages on our network. Comparisons to similar lines companies indicate that our performance in this area is not satisfactory.

11.21.2 Actions to date

Eastland Network manages vegetation using a risk-based approach whereby the vegetation cutting program responds to high-risk areas, which are identified during line inspections (undertaken on a 12-18 month cycle).

Eastland Network's management of vegetation risk and engagement with vegetation owners comprises of four main programs:

1. **Private (typically rural) landowner vegetation management:** following the inspection and identification of hazardous trees, we identify tree owners and issue hazard notices or cut/trim notices. In some cases, the owners are difficult to identify (particularly in the case of multi-owner land). We engage accredited contractors to undertake Eastland Network's funded first cuts and/or the removal of "no interest" trees. Our process complies with the Electricity (Hazards from Trees) Regulations, including follow-up with non-complying landowners.
2. **Council owned vegetation management:** following the inspection and identification of hazardous trees, Eastland Network notifies the relevant Council, and requests that they trim or remove the vegetation hazard. Eastland Network monitors progress to ensure the Council's vegetation management is prioritised and progressed in a timely manner.
3. **Commercial forestry vegetation management**: We have adopted a specific program to target tree control associated with commercial forestry blocks, which comprises of:
    - Addressing high risk trees following line inspections: following the inspection and identification of hazardous trees (within the growth zone), we identify the forestry owner and request that the vegetation hazard is removed/trimmed. We follow up with non-complying forestry owners as required. In some situations, we undertake the cut/trim where the tree is outside of the growth zone.
    - **Increasing tree clearances to fall zone:** We have a long-term target to secure appropriate tree clearance and fall zones around key lines by 2024. However, the timing is subject to negotiations with forestry owners and to date the progress has been slow as there is limited economic incentive for forestry owners to create increased clearance zones.
    - **Managing tree hazards during forest harvest:** We engage with forestry owners to ensure the trees close to lines are felled in a safe manner during harvesting operations. Our ability to affect a safe harvest is dependent on the cooperation of the forestry owner and harvesting contractors. In many cases, we are required to remove residual tree hazards following harvest.[112]

[112] Eastland Network has experienced a number of situations where a forestry block has been harvested and trees close to lines have been left standing. These trees are well in the fall zone and Eastland Network has been left to engage its own tree contractor to remove the trees.

4. **Line corridor vegetation management:** Eastland Network has secured corridors around some lines in rural and forestry areas. Wild tree regrowth is required to be managed within these line corridors. Line corridor vegetation hazards are identified during inspections.

Additional outage categorisation details, including fault codes for vegetation outages, are now being captured. These details have been captured from 01 April 2020 and will allow us to get a better understanding of the causes of vegetation outages.

11.21.3 Vegetation Management Strategy

Based on our analysis of recent reliability performance (refer Section 6.4.5), and to achieve the targeted level of improvement, a six-point vegetation management strategy has been developed:

1. Resolve the performance of the worst performing feeders
2. Target inspection and remediation work in high priority areas, including widening the inspection to consider tree-fall hazards on critical sections of feeders.
3. Undertake intensive subtransmission vegetation management.
4. Engage with forestry owners to achieve acceptable plantation fall zone clearances and harvesting clearances.
5. Detect vegetation hazards early through SCADA monitoring of earth fault pick-up (pre-trip).
6. Improve vegetation maintenance of existing line corridors.

Our analysis also indicates that additional expenditure is required in the Wairoa region as two of the top three worst performing feeders for vegetation are in this area.

In addition, we have created a feeder prioritisation schedule and three action plans (inspection, remediation and worst performing feeder plan) which support the strategy we have adopted. These plans are the operational link to the strategy and provide guidance to the newly appointed vegetation manager in issuing tasks and work for the next few years.

Review of the vegetation management plan and our vegetation performance is carried out every 6 months to ensure it is being implemented correctly and that we are continually updating our data for our worst performing feeders.

11.21.4 Changes in approach

To complete the tasks within the strategy, we have upgraded several systems and changed our approach to tackling this issue including:

- The development of an electronic based inspection system which easily references tree locations against our assets;
- Shifting our approach to whole feeder inspection and remediation (based on feeder prioritization schedules);
- Reporting of vegetation outages as a separate classification to the reliability analysis;
- Purchasing of relay software which reports on trip activity within a relay;
- Increasing budgetary requirements in Wairoa to respond to increased unplanned activity in the area;
- Working with Ministry for Social Development to increase resource levels to maximise our coverage of the network, and targeting high priority areas;

- Increased notification and communication, and providing information to forestry companies to ensure they are aware of the significant impact their trees can have on our network.

11.21.5 Targeted performance

We are targeting to reduce vegetation related outages by 5% each year for the next 5 years. The forecast performance in relation to vegetation is included in Section 8.4.2.

11.21.6 Expenditure forecast

We have benchmarked our expenditure against other similar-sized lines companies and found that our vegetation expenditure is adequate. In FY2020, we increased the vegetation expenditure for the Wairoa region in response to an increase in vegetation related faults in the area. A review of our strategy will be performed annually to determine its effectiveness. It is likely that expenditure will change if a major overhaul of the strategy is required.

Table 141: Forecast opex

Expenditure type	Opex category	2022	2023	2024	2025	2026	Average 2027-2031
110kV vegetation control	VM	115	115	115	115	115	115
50/33kV vegetation control	VM	50	50	50	50	50	50
11kV tree control program (Gisborne)	VM	400	400	400	400	400	400
11kV tree control program (Wairoa)	VM	200	200	200	200	200	200
11kV forestry tree control program	VM	250	250	250	250	250	250
Unplanned tree cutting	VM	50	50	50	50	50	50

Note: $000 (in March 2021 constant prices)

12 Risk management

This section describes our approach to managing risk, and summarises the key risks associated with the network assets.

12.1 Introduction

Electricity is inherently dangerous and is exposed to a range of hazards. Effective risk management is key to managing the safety and health of people, delivering a reliable service to customers, and protecting the long-term viability of Eastland Network.

In this section, we provide details of our risk management policy, framework, key risks, and risk management activities. We also include details of our emergency response and contingency plans.

We also discuss our approach to managing high impact/low probability events, and how we are planning to address climate change risk.

12.2 Risk management policy

Eastland Network adheres to Eastland Group's risk management policy, which is shown below:

Eastland Group is committed to understanding and proactively managing the risks we face in our businesses in order to continue to deliver long term value to our stakeholders and meet our commitments to employees, customers, contractors, business partners and members of the communities in which we do business.

Our risk management system ensures that:

- Risk in all aspects of our business (asset, project, fraud and corruption, business continuity, health and safety) are identified and effectively managed
- Obligations under all relevant legislation and regulations are met
- Risk management is integrated throughout business processes and systems and is perceived as a component of day-to-day business activities
- Risk management is adequately resourced, and procedures are developed to guide our actions relating to risk management
- Our managers have an up to date and accurate understanding of the material risks relevant to their areas of responsibility and the strategies and controls in place to mitigate these risks
- Risk management education and training is provided to our employees and all employees are involved in risk identification as appropriate
- Monitoring and review of the effectiveness of controls
- Regular evaluation and improvement of our risk management approach and systems is undertaken
- Risks are reported and communicated to enable informed decision making
- Risks are escalated when required to the appropriate level

12.3 Risk management framework

At Eastland Network, risk management activities occur at an operational level, management level, and at a governance level:

- The Board defines Eastland Network's risk appetite and oversees the management of strategic and significant operational risks;
- Management identifies and manages strategic risks and oversees operational risks and associated risk management activities;
- Operational personnel identify and manage risks as part of the normal asset management activities.

Risks are periodically reviewed by management and reported to the Board. This includes a scan for new risks, an evaluation on whether existing risks have changed, a review of controls[113], and consideration of additional risk treatments[114].

Risks are considered at two levels:

- **Strategic risks** – these are risks that could have a significant impact on Eastland Group's strategic purpose and direction;
- **Operational risks** – these are risks inherent in the routine operation of the business. These risks largely expand on the corporate risk. From a network perspective, there are two types of operational risks:
    - Generic network risks – these are enduring risks that are present due to the nature of the business (e.g. use of mobile plant). The controls in place to manage these risks are typically well integrated into business operations;
    - Specific asset risks – these are specific risks associated with a particular asset type or site. These risks are identified separately from generic risks, and specific controls and treatments are established.

Defects on the network (e.g. a "red tagged" pole) are a particular type of "specific network risk". Defects are identified through a number of operational processes and undergo immediate evaluation (typically based on safety or reliability), and are then scheduled for remediation.

All strategic and operations' risks are managed by Risk Manager software. Defects are managed through the defect management process within SAP.

12.4 Risk Identification

12.4.1 Risk Analysis

Eastland Network uses the Risk Manager software as a database tool which rates risks based on the 5 x 5 risk matrix. When a risk is identified, it is entered into the Risk Manager database and analysed to identify the probability and consequence rating (both current and residual).

The 5 x 5 matrix is formed by analysing both the consequence and likelihood of a risk affecting the network. The following categories are used as measures:

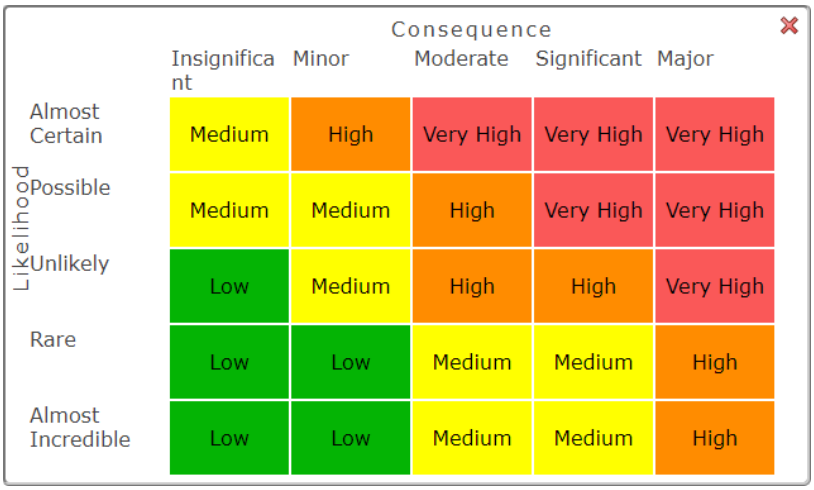
- Public, contractor and staff safety;

[113] Controls are existing measures that are modifying the inherent risk (in this context they are reducing the risk).
[114] A treatment is a planned action to further modify the risk.

- Environmental impact;
- Financial;
- Reputation or brand;
- Public property damage.

The 5 x 5 matrix is formed using the following measures:

Figure 113: Eastland Group's 5x5



Risks that have a residual risk (post controls) of 'high' are elevated to the Board level, where our current controls and treatments are discussed, and the Board gives feedback on how Eastland Network is addressing the risk.

All other risks are discussed in-house at our weekly works meetings where the appropriateness of existing risk ratings are assessed.

12.5 Network risks

12.5.1 Strategic network risks

Thirteen strategic risks have been identified across Eastland Group, with six applicable to Eastland Network:

Table 142: Strategic network risks

Risk title and description	Current controls	Rating [115]
Climate change: the effects of climate change, including rising sea levels and more frequent and intense extreme weather events, damaging assets increasing operational and maintenance costs.	Eastland Network has implemented controls to manage climate risk, however, further treatments are likely to be introduced over the coming few years. Current controls include: considering the impacts of climate change in the design of new assets, and reducing emissions via a commitment to the Climate Leaders Coalition.	Very High

[115] This is the risk rating post-controls. This reflects Eastland Group's perspective. The assessed risk may be lower for Eastland Network.

Risk title and description	Current controls	Rating [115]
Death or injury resulting from activities under Eastland Network's control: Eastland Group employee, contractor or member of the public fatally or permanently injured.	Significant controls are in place including: Health and safety systems, operating procedures, management of safety culture, the public safety management system, employee competency management, and the contractor management system.	High
Vehicle accident injuries: Eastland Group employee, contractor or member of the public fatally or permanently injured as a result of a vehicle accident.	Significant controls are in place including: driver licencing, training, vehicle policies, drug and alcohol policy, vehicle operating procedures, vehicle compliance, maintenance checks, warrant of fitness for vehicles, provision of hands free.	High
Significant power outage: a failure of the network that results in the loss of supply to more than 50% of customers for more than 8 hours.	Significant controls are in place, including: compliance with the asset management plan and good operational practise, emergency response and disaster recovery plans, participant outage plan.	High
Significant reduction in electricity demand: electricity demand decreases significantly as a result of changes in government policies, consumer preferences, and/or alternative energy sources.	In the short to medium term, network revenue is protected through the revenue control regime of the default price path. Maximise the network revenue derived from fixed lines charges to the extent permitted.	High
Energy transformation: failure to adopt a customer centric energy integrator future business model in order to address threats from technology change - i.e. EV's, SSDG & storage.	Strategic review undertaken to highlight evolving threats to the current distribution business and long-term future business model requirements identified. Initiatives to understand potential effects of new technology and associated changes in customer requirements commenced, (i.e. solar trial, electric Village).	Low

Health and safety risks are managed "so far as reasonably practicable" (SFARP). However, as permanent injury or fatal consequences (in many cases) cannot be eliminated, the residual risks remain high. The high residual risk ensures we remain focused on ensuring controls are effective, and that any treatments are implemented in a timely manner.

Implementing treatments for the strategic risks is an ongoing activity. At the time of writing:

- Consideration of climate change risks to the network assets has commenced. We have included further details on climate change risks in 12.5.5 below;
- Emergency response and disaster recovery plans are continually being reviewed to ensure completeness and relevance;
- Strategic review of the energy transformation risk is continuing with a focus on ensuring uninterrupted supply can be maintained and maintenance activities can continue to occur.

12.5.2 Generic operational network risks

We have identified, and manage, 150 generic operational risks. Of these, 42 are rated a high residual risk. The table below provides a high level summary of the typical risks and controls. In most cases, the residual risk has been accepted.

Table 143: Overview of generic operational network risks

Risk area[116]	Typical risks	Typical controls	Range of Rating[117]
Site and asset hazards	• Unauthorised access • Structure failure • Earth potential rise • Exposure to HV and LV conductor and equipment • Loss of containment of diesel fuel • Rugged and uneven terrain • Loss of supply	• Safe design of structure • Security fencing, signage and access control • Inspection, maintenance, asset health assessment and asset renewal • Employee competency requirements, training, and supervision by a competent worker • Fire suppression • Emergency response • Certification of compliance	Low to High
Hazardous activities	• Operating mobile plant • Worker impairment • Working near roadways • Working at night • Working alone • Multiple work parties • Exposure to HV and LV conductor and equipment • Working at heights • Lifting • Live line work	• Safe operating and maintenance procedures • Plant and equipment inspection, maintenance, and certification • Employee competency requirements, training, and supervision by a competent worker • Personal protective equipment • Safe work procedures, permit system, and earthing practices • Drug and alcohol management procedures • Fatigue management procedures • Traffic management procedures	Low to High
Plant and equipment	• Plant and equipment failure • Injury • Environmental damage	• Safe operating and maintenance procedures • Plant and equipment inspection, maintenance, and certification • Personal protective equipment	Low to High
Physical and environment	• Fire • Exposure to biological hazards • Allergic reactions • Exposure to noise • Confined space work • Oil spills • Rugged and uneven terrain	• Fire suppression • Employee competency requirements, training, and supervision by a competent worker • Personal protective equipment • Emergency response • Safe work procedures	Low to High
Incidents and events causing hazards	• Motor vehicle accidents • Unsecure loads on vehicles • Protection failures • Equipment failure • Loss of supply	• Employee competency requirements, training, and supervision by a competent worker • Network control procedures • Protection design and testing • Emergency response	Low to High

[116] Generic risks also cover public safety criteria and controls i.e. fencing, signage, access control
[117] This is the risk rating post-controls. This reflects Eastland Group's perspective. The assessed risk may be lower for Eastland Network.

Risk area[116]	Typical risks	Typical controls	Range of Rating[117]
Hazardous substances	• Exposure to hazardous substances • Incorrect storage of hazardous substances • Environmental damage • Exposure to asbestos	• Safe storage and use of hazardous substances • Employee competency requirements, training, and supervision by a competent worker • Hazardous substances register, asbestos register	Low to High

12.5.3 Specific assets risks

The asset lifecycle section identified 17 specific asset risks. We have summarised the four risks with a high residual rating in the table below.

Table 144: Specific asset risks

Risk and risk description	Controls	Treatments	Rating[118]
N mechanical security on the 110kV lines: Sections of the 110kV double circuit line from Tuai-Gisborne are constructed on a single tower. A failure of some towers could cause both circuits to trip and a total loss of supply to the Gisborne region and significant SAIDI and SAIFI impact. Safe reconductoring of the line (when due) will require outages on both lines, resulting in significant SAIDI and SAIFI impacts.	The existing controls are outlined in the asset fleet plans and include periodic inspection, detailed condition assessments and corrective and preventative maintenance.	During FY2022 we will be undertaking a hazard assessment over the entire length of the line that will consider all potential failure modes and potential solutions. The solution for future reconductoring has yet to be resolved.	High
Slips near 110kV towers: There are active slips near six towers (T31, T126, T132, T118, T44, T8) that could result in failure of the tower. A failure of a tower could result in a total outage of the Gisborne area and significant SAIDI and SAIFI impacts.	In addition to the existing controls outlined in the fleet plans: • Strengthening the ground and foundation at some sites; • Geotechnical assessment is undertaken where concerns are raised.	There are no further treatments planned, however, additional remediation will be undertaken based on geotechnical assessment, which may extend to relocation of the tower)	Medium (we have included this risk given its relevance to the above risk)
Lack of spares for ageing of single-phase power transformers: Single phase transformers are aging on our network. We currently don't hold any stock for the replacement of components. Knowledge of how they operate is also becoming scarce. Failure of a unit could result in significant SAIDI and SAIFI impacts.	The existing controls include: • Inspection and maintenance (as outlined in the fleet plans); • Additional budget for sandblasting and painting of the transformers	It is currently planned that 3 of the 4 units will be replaced over the next 5 years.	High

[118] This is the risk rating post-controls.

Risk and risk description	Controls	Treatments	Rating[118]
IMP transformers corrosion: IMP transformers are corroding faster than expected due to a poor manufacturing process and material. The life expectancy for these units is around 20 years. There is a risk of premature failure resulting in outage.	The existing controls include: • Transformer bunding; • Additional budget for sandblasting and painting of the transformers; • 4 monthly inspections;	There are no further treatments planned, however, additional maintenance will be undertaken based on asset condition	High

12.5.4 Managing high impact low probability events

High impact low probability (**HILP**) events can be defined as events that have a larger impact than what is allowed for in our normal system planning criteria. This includes extended contingency events (i.e. loss of two or more system components), common mode failure events, and domino effect failures (i.e. failures causing subsequent systems to fail). It is hard to predict how these events may eventuate because there are multiple failure modes for them. We experienced one of these events in December 2016 when a light plane crashed into the Tuai-Gisborne 110kV double circuit line, interrupting supply to 20,613 customers for 33 hours.

Since the failure modes of these events are unpredictable, we are focused on mitigations that are impact-reducing. Our asset management processes address a HILP risk through:

- Progressing asset management strategy initiative #1 to improve network resilience. This initiative is focused on vegetation management, automation, and security enhancements (refer to Section 0).
- Setting security of supply standards and incorporating a level of resilience appropriate for the number of customers, and implementing development plans to ensure our network meets the required level of security;
- Maintaining our assets to updated codes, e.g. NBS standards and AS7000, which results in assets being progressively upgraded to ensure resilience to earthquakes, and an improved response to storm events;
- Improving our operational response by having appropriate contingency plans in place for extended contingency scenarios;
- Taking an active role in Civil Defence and Emergency Management (CDEM) activities associated with any failure, to reduce vulnerability, e.g. establishing contingency plans to deal with the consequences of unknown modes of failure;
- Utilising standardised equipment on our network so that equipment can be reallocated/rebuilt easily in the event of failure. Standardised designs and components are easier to repair and reconfigure if necessary;
- Undertaking a detailed risk assessment on the Tuai-Gisborne 110kV line;
- Developing a solution to increase the diversity of supply on the Tuai-Gisborne 110kV line.

12.5.5 Assessing and managing the impact of climate change

Eastland Network is exposed to a range of climate-related risks. During FY2022 and FY2023 we will be undertaking work to improve our understanding of these risks and the potential impact on our business.

Our initial view is that there are likely to be two “themes” to climate change risks:

- Firstly, it is likely that climate-related changes will increase the energy transformation (which we discuss in Section 10.9). Planning and preparing for this transformation will be important in order to support New Zealand's climate-change response;
- Secondly, we consider that climate change will affect weather patterns which could impact our network. The result could be an increase in extreme weather events such as wind and snowstorms, or longer-term shifts such as a gradual temperature increase and sea level rise.

Our qualitative analysis of climate risk is based on a 15-year outlook with risks rated on a scale of low to high. Given our industry's unique regulatory environment, we have assessed the risks against our ability to meet our reliability and quality targets.

Preliminary analysis indicates our biggest network risk from climate change is likely to be from:

Table 145: Climate change network risks

Risk and risk description	Controls and treatments	Rating[119]
Vegetation contact and tree fall: Vegetation contact and treefall is one of our biggest challenges in maintaining network reliability. We expect vegetation issues to increase due to weather events and higher growth rates from warmer temperatures.	We have developed a vegetation management plan, and this will need to adapt to changes in growing conditions. As part of this plan we will be increasing our work with forestry plantation owners, Councils and our community, to explain the importance of controlling vegetation near power lines.	High
Extreme weather and storms: Overhead lines are more at risk from severe storms and high winds, which means our rural customers and coastal communities are exposed to this risk. Damage to our network due to severe storms and winds can also create a safety risk.	Over the coming years we will be progressing asset management strategy #1 to improve network resilience. This initiative is focused on vegetation management, automation, and security enhancements. All these areas will assist in mitigating the impact of extreme weather and storms.	High
Sea level rise: Sea level rise over the next 25 years may affect some parts of our network.	We intend to undertake further analysis of the potential impacts during FY2022 and FY2023.	Low

Whilst we have not completed our work in this area (this may take some years to complete), we are generally comfortable that the strategy we have established for the management of the network assets is consistent likely controls and treatments required. That is, our asset management strategy contains three key initiatives that will put us on the right path, which are:

- Initiative #1: Improve network resilience;
- Initiative #2: Enhance vegetation management activities;
- Initiative #7: Be prepared to respond to technology change.

These initiatives are described in more detail in Section 0.

We look forward to increasing our reporting on climate change risk and responses in our next full AMP.

[119] This is the risk rating post-controls. We have not yet completed our risk assessment, hence no rating has been applied for these individual risk areas.

12.6 Emergency response and contingency plans

12.6.1 Emergency response

The nature of our business is such that every unplanned supply outage invokes an emergency response of some degree.

A small scale emergency response typically involves part power or no power to one or more premises, and third-party damage to network assets. These types of events occur daily. In any one day, 5 to 20 events are typical. We have well developed processes to manage these events.

Large scale events that require an emergency response to a greater degree include extreme weather (e.g. wind, snow, lightning storms), earthquake, tsunami, and major flooding. Our large events typically relate to extreme weather and occur 4 or 5 times per year.

In these large scale events, the normal emergency response process becomes swamped hence additional resources and prioritisation are required for effective management. To manage this, we operate a workplace emergency response plan which involves:

- Assessment and notification that a major event has occurred: This may involve coordination with emergency services, civil defence, or the system operator;
- Escalation of resources: an emergency management team is established, and additional resources are called in as required. For very large events, this may involve mobilising additional external contractors;
- Response: the event is analysed, and work is prioritised, dispatched and actioned as required (in coordination with other agencies as required);
- Support: A support services team is established to ensure the needs of personnel are being met for long duration events.
- Coordination and communication: Personnel are assigned to coordinate Eastland Network's restoration activities with other agencies (typically Civil Defence) and to communicate the status of the network to stakeholders (e.g. directly to key customers, social media, media, local government, Iwi, etc.).

Prioritisation for restoration is event specific, but is generally focused on (in order or priority):

- Critical infrastructure, such as water supplies, sewage systems, hospital / medical facilities, and communications facilities;
- City areas where large customer numbers are disrupted;
- Commercial businesses involved in servicing emergency needs. e.g. fuel, food;
- Rural townships;
- Main line rural areas;
- Spur line rural areas.

12.6.2 Contingency planning

Our contingency preparedness is documented within our ENL16 Section 5 - network emergency response document.

Of relevance to the network:

- The network control room is in Carnarvon Street, Gisborne. If for any reason the control room is unavailable, the operational control falls to the backup facility at the Gisborne Substation

(where a backup control room has been established). In addition, operational facilities can be established at most of the network zone substations. Manual operation is also available for all assets if failure of the SCADA system or auxiliary supply system occurs;

- In the event of major disruption with respect to office access or communications, remote centres have been designated across the region to enable decentralized planning and continued operations at a localised level. Independent control will be delegated to a person based at each remote centre;
- We have multiple communication methods via our RT network, IP/fibre network, and mobile phone network.
- Paper management systems are available to cover for any failure of computer systems;

We have also prepared a participant outage plan in accordance with The Electricity Commission's requirements. This plan covers the methodology and processes for managing two types of events.

- Category A events - these events evolve over time and occur when a shortfall of energy available for supply is expected. In these events, we are required to provide a reduction in energy usage based on a comparison with typical/normal energy usage. This is achieved by operation of the standby diesel generation, shedding of hot-water load via load control for extended periods outside of normal service levels, and rolling outages in line with predetermined priorities.
- Immediate (Category B) events – These events occur with little or no warning, usually as a result of a transmission line or major generation failure. These types of events will generally result in a declaration of a grid emergency. In these events, we are required to provide a reduction in demand at our GXPs. Depending on the available time frame, this is achieved by operation of the standby diesel generation, shedding of load via load control, and interruption of load in line with predetermined priorities.

12.6.3 Vulnerable Customers

A process is in place to accommodate supply interruptions affecting customers with special medical needs.

Where we are notified of customers with special needs, the customers are advised to prepare an individual emergency plan to ensure their needs can be met should there be an interruption to their supply. Action plans covering short-term and long-term outages are necessary and battery backup systems or emergency transport plans are arranged between the customer and their healthcare provider.

13 Project delivery and deliverability

This section describes our approach to delivery and our assessment of our capabilities to deliver on this plan

13.1 Introduction

This section identifies and discusses the *design and construct* phase of Eastland Network's asset lifecycle.[120]

13.2 Design and construction standards and processes

Our design and construction standards have been developed to increase the efficiency and quality of the work and equipment on our network. These design and construction standards have evolved over the years due to changes in materials and engineering staff.

In terms of equipment specifications, we have standardised most equipment with exception given to large equipment purchases. In this case, equipment and manufacturers are chosen based on tender submissions and ranked based on criteria relevant to the project and our requirements stated in specifications.

Our quality systems manuals are updated when any changes are made to the equipment, procedures or processes on our network.

13.3 Inspection and maintenance standards

Over the last 12 months we have revised our inspection standards for key assets to align to the DNO Methodology. Our plan is to complete the review of inspection standards during FY2022.

Our maintenance standards for our primary equipment (i.e. power transformers, circuit breakers etc.) is typically in line with the manufacturer specifications and recommendations as these are very specific in terms of maintenance detail. For assets such as poles, structures and conductor where recommendations vary depending on the manufacturer, we have established our own maintenance documents to standardise the process.

For inspections, we typically vary the inspection frequency based on the criticality of the asset (refer Section 11). However, there are other drivers such as best practice guidelines and regulations which also set the frequency of inspections. Capability of our contractors and cost can sometimes limit the extent to which this work can be completed, but we aim to achieve targets within best practice guidelines.

In terms of the inspection type (e.g. visual/testing), this also depends on criticality. Our inspection programmes for the 110kV towers are more extensive than for the 11kV rural lines, as the consequences of failure differ substantially.

Our quality systems manuals were established in 2012 (specifically the maintenance manuals), with minor changes over the years based on best practice changes or regulatory requirements. We will be looking to review these standards during FY2022.

[120] A description of the phases of the asset lifecycle are provided in Section 2.6

13.4 Operating procedures

Eastland Network'ss operational procedures are located within our quality system manuals. Operational procedure manuals cover areas such as:

- Asset management.
- Works management;
- Purchasing;
- Customer complaints;
- Easements and leases;
- Risk management;
- Project management.

The network control rooms' operational procedures are separated from the main procedures, as the importance and significance of these operating procedures warrant their own section. For example, these procedures cover:

- Work applications;
- Switching;
- Permits and assurances;
- Reclose blocks;
- Close approach;
- High loads;
- Fault response;
- System controller responsibilities.

The introduction of SAP during FY2021 has changed the procedures for several of these areas. We will be aiming to update these in FY2022.

13.5 Deliverability Assessment and Improvement

13.5.1 Deliverability assessment

Figure 114 and Figure 115 show our delivery performance over the past 5 years. On average, we have delivered 77% of our network capex budget and 85% of our opex budget.

In relation to our capex performance:

- A reason for the underspend in 2016-2017 relates to the acquisition of the Transpower assets. The targets (i.e. budgets) were based on information received from Transpower which was subsequently found to be out-of-date. Since taking ownership of the assets in April 2015, we have been conducting condition assessments and developing updated plans regarding capital expenditure on these assets. Consequently, some of the original Transpower projects have been delayed or deferred indefinitely while other solutions are implemented;
- Some expenditure in 2018 was deferred to 2019 due to an unforeseen manufacturer delay in the delivery of three subtransmission transformers (estimated underspend of $1.7m);
- The Mahia line extension budget has been deferred since its original inclusion into the budgets in 2014, due to continual problems securing land easements and access.
- Our delivery has improved significantly over the last two years, due, in part, to an overspend on asset replacement and renewal.

In relation to our opex performance:

- We have generally delivered on our vegetation management spend, and recent years have seen a modest over-spend;
- Whilst our service interruption and emergency spend varied year-by-year due to environmental reasons, the 5-year average indicates that the forecast budget and resourcing are appropriate;
- There has been a historical underspend in our routine maintenance and inspection budgets, specifically on the routine patrolling and maintenance of our 11kV overhead lines. This was a direct result of a deficit in suitable field service resources and contractors;
- In 2018 and 2019, a $562k (ARR expenditure) underspend occurred as a direct result of ACOD being less than what was forecast, with minor underspends also occurring on the planned maintenance of assets.

Figure 114: Capex delivery

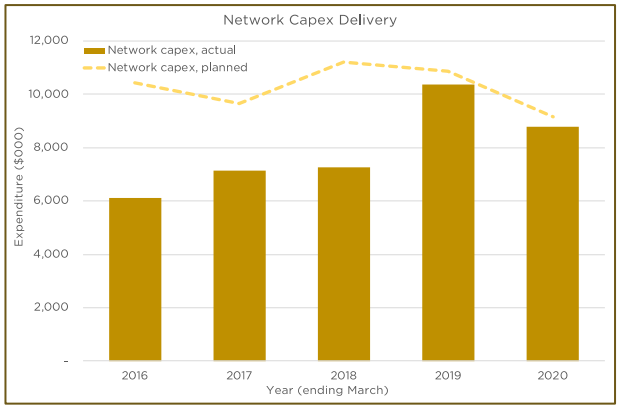
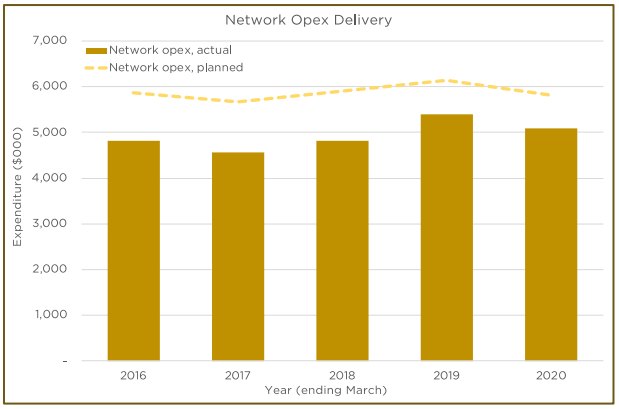


Figure 115: Opex delivery



13.5.2 Planned improvement in delivery

Projects in the development section have historically been hampered by delivery issues which have been identified above.

Historically, Eastland Network has had problems with the recruitment of staff and local contractors to complete planned work. This is being addressed by an Eastland Group business plan which includes training and increasing our staff numbers. Five additional positions have been identified as part of the delivery improvement strategy.

The areas where we are targeting an increase in resourcing is:

- Asset inspections;
- Engineering;
- Administration;
- Customer engagement/liaison;
- Vegetation.

We have also invested in several trainee line mechanics to increase the number of trained local contractors. We see this as critical to maintaining and servicing our assets. It is likely that additional contractors will be required in this field to keep up with the level of expenditure we are wanting to maintain (specifically in the area of fault response).

Acquistion of land easements has historically been carried out by external companies. The delays and ineffectiveness of this approach have required projects to be deferred. Eastland Network are hoping to bring this work in-house (i.e. customer liaison/relationships) and use external parties for the legal requirements of this work.

13.5.3 Delivery outlook

The network capex forecast for the next 5 years averages $10.3 million, which is consistent with the amount of work we delivered in 2019. The makeup of the capex programme for the next 5 years is also similar to prior years, except for the increase in system growth expenditure associated with the GIS-TUI-A thermal upgrade work, and the increase in zone substation work.

The resourcing for the GIS-TUI-A thermal upgrade work is sourced externally, and we are comfortable that we will be able to secure the necessary skills from outside the region.

The costs associated with the zone substation work have a large materials component, with the resource requirements being less significant.

14 Financial forecasts

This section summarises the expenditure forecasts included in the roadmap life cycle planning sections.

14.1 Introduction

This AMP highlights significant changes in our asset management practices. As part of this AMP, we have reviewed our asset fleet and network development plans, and changed our approach to asset health determination, which has driven the need to review our expenditure levels, forecasts and estimations. Review of our ACOD contributions and the shifting of assets between associated companies has seen changes in forecasts for the related expenditure categories.

In this section, we have explained the key changes for each expenditure category, with reference to our prior AMP.

We have not repeated detailed expenditure forecasts from prior sections, nor have we repeated the forecasts contained in Schedule 11a and 11b that are attached to this AMP.

Our commentary in this section relates to nominal dollars which makes it easier to compare to prior AMPs. The expenditure forecasts included in prior sections are typically presented in real (March 2021) dollars.

14.2 Operational expenditure

Total network opex and non-network opex for the forecast period is $54.7 million, and $72.1 million respectively. The comparison in expenditure is shown in Figure 116 and Figure 117.

Overall:

- Network opex has reduced by $6.7 million, primarily due to a reduction in ACOD associated with the diesel gensets;
- System operations and network support have increased by $2.8 million, which reflects the increase in personnel costs associated with implementing the asset management roadmap;
- Business support costs have reduced by $0.4 million due to the increasing economies of scope across Eastland Group.

Figure 116: Network opex forecsst

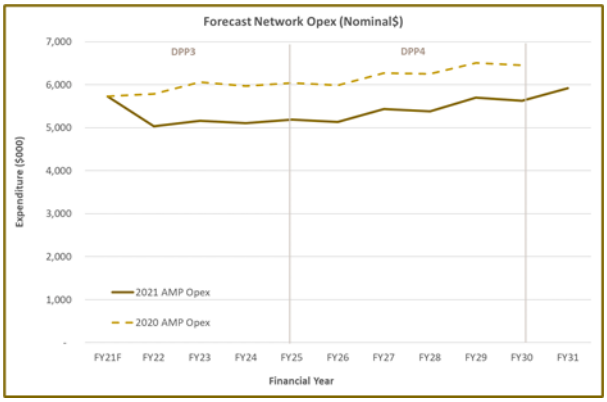
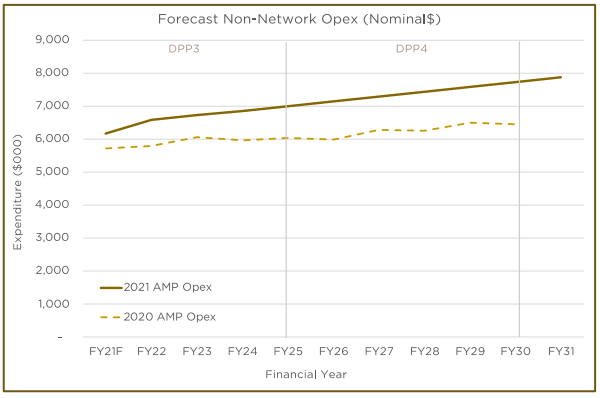


Figure 117: Non-network opex forecast



14.2.1 Vegetation management

Our expenditure on vegetation management is similar to other networks of similar size and demographics (see vegetation fleet plan in Section 11.21). There is further work to do to improve the efficiency and effectiveness of our vegetation management spend and we will be evaluating the performance outcomes over the next few years before we look to make material changes to expenditure levels.

14.2.2 Service interruptions and emergencies

Increases for this category are due to the acquisition of the diesel generators from Eastland Generation (offset by a reduction in ACOD). The expenditure includes all the fuel and service costs required to maintain this equipment. Expenditure on unplanned equipment failure and faults remains steady with our forecasts based on historical expenditure levels.

14.2.3 Routine corrective maintenance and inspections

As shown in Figure 120, the main changes are within the next three financial periods. This corresponds to the increase in expenditure required to accelerate our inspection program. We are also increasing our ground mount transformer inspections and monitoring to respond to the increasing demand for connections within the urban centres. Land developments and an increasing trend in subdividing land sections are starting to have an effect on our urban infrastructure.

14.2.4 Asset replacement and renewal

This expenditure includes work such as transformer refurbishments, tap-changer maintenance, and painting, With several of our substation sites located within 2km of the sea, we see this expenditure as vital to maintaining our assets in good operating order. ACOD expenditure associated with the diesel gensets is included in this category and is the main change from previous AMPs.

14.2.5 System operations and network support

Expenditure for the forecast period has increased by $2.8 million. The increase is due to the approval for some additional human resources, to assist our team with the new SAP processing, and to support a historically under resourced network which now requires additional people to fill the gaps we have identified in the engineering and vegetation areas.

14.2.6 Business support

Eastland Network, being a subsidiary of Eastland Group, is afforded several services which assist the network's operation such as IT, accounting and finance, software developments, and resources. For these services, Eastland Network pays an annual fee. Business support costs have reduced by $0.4 million due to the increasing economies of scope across Eastland Group.

Figure 118: Opex forecast – Vegetation

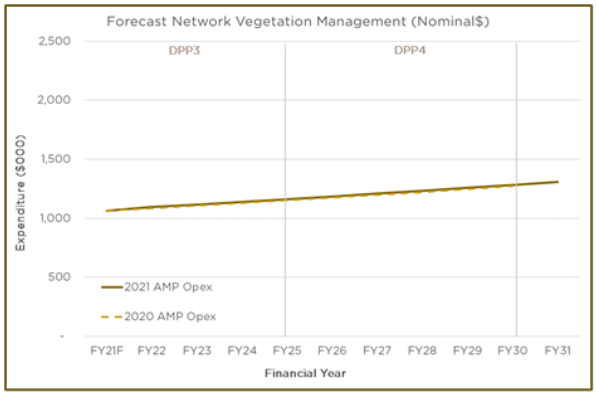


Figure 119: Opex forecast – SIE

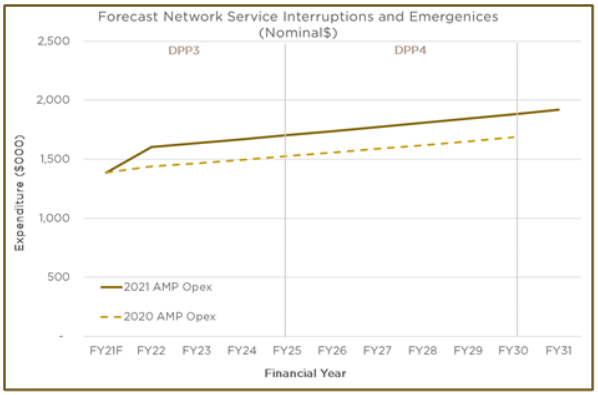


Figure 120: Opex forecast - RCMI

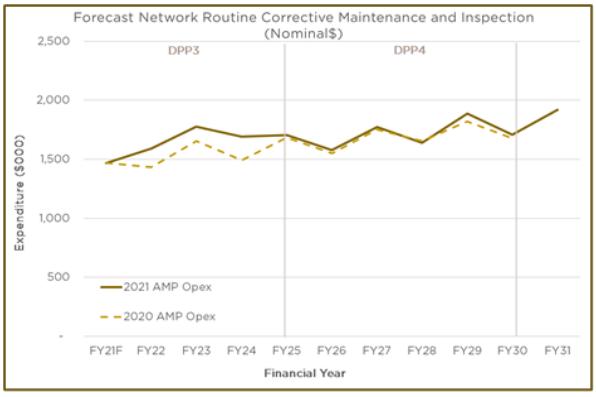
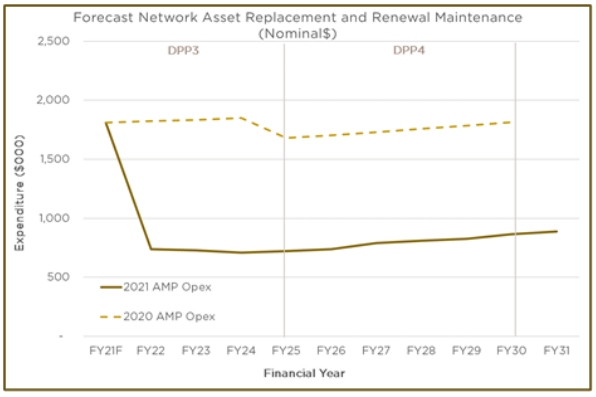


Figure 121: Opex forecast - ARR



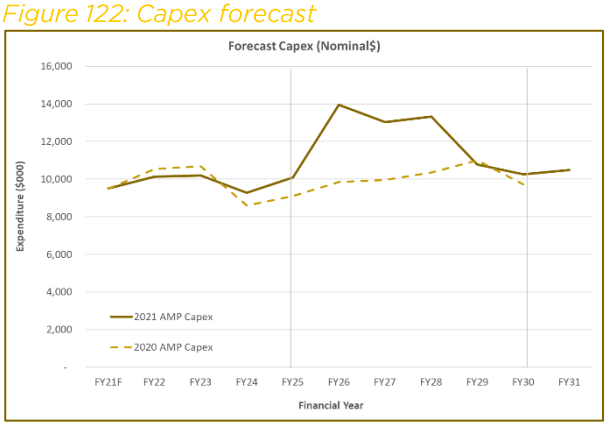
Comparisons for SONS and business support are shown in Figure 55 and Figure 56.

14.3 Capital Expenditure

Total capital expenditure for the forecast period is $112.2 million. This amount, when compared to the 2020 AMP, is an overall increase of $12.0 million.

The key driver for the increase in overall expenditure during the second half of the forecast period is in relation to the thermal upgrade on the GIS-TUI-A line.

Figure 122: Capex forecast



14.3.1 Customer connections

Other than the increase in capex in FY2022 in relation to an allowance for some additional switchgear for a known new connection, there is no material change in customer connection capex.

14.3.2 System growth

As mentioned above, the key driver for the increase in system growth capex during the second half of the forecast period is in relation to the thermal upgrade on the GIS-TUI-A line.

We have also committed to two development projects (being the new substation and line for the Mahia area and the Massey Rd substation installations). And two smaller projects have also been included into the system growth category as a result of load growth in the Matawai and Matawhero areas.

14.3.3 Asset replacement and renewal

There has been a reduction in asset replacement and renewal capex due to the transfer of some expenditure in relation to the thermal upgrade on the GIS-TUI-A line (which was previously classified as renewal). The primary driver for this work is the thermal upgrade, hence the reclassification.

We have added an additional $500k to upgrade the infrastructure in the Mahia township and surrounding areas (due to be completed in FY2024).

We have added three IMP power transformer refurbishment projects to maintain these assets to a good standard. These projects are expected to cost c.$160k each.

We are nearing the end of our single-phase power transformer replacement program but still have two banks to complete (programmed for 2022 and 2023) with an estimated cost of $400k each to complete this work.

14.3.4 Asset relocations

There has be no material change.

14.3.5 Reliability, safety, and environment

In response to some reliability issues (trip/close function) with several of our substation circuit breakers (namely the horizontally racked type) we have forecast for four substations to be overhauled, and switchgear as well as switchboards to be replaced. The risk to our network for such critical assets is such that this work needs to be completed if an alternative solution is not found.

Our galvanised box upgrade program is also continuing with a forecast expenditure of $480k over the next 5 years.

14.3.6 Non-network assets

The changes in non-network capex are not material. Commentary on the changes is provided in Section 9 and 11.20.

The control room software is forecast to be upgraded to enable it to integrate with SAP and ESRI.

Figure 123: Capex – system growth

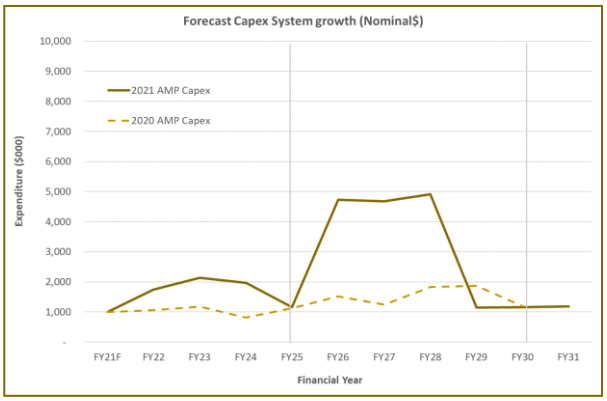


Figure 124: Capex – asset replacement & renewal

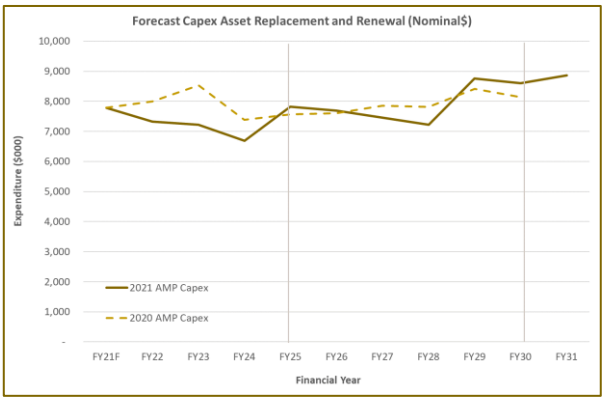


Figure 125: Capex – Reliability, safety, environ.

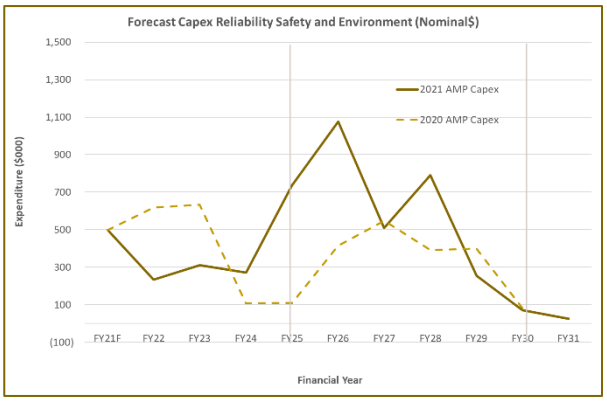


Figure 126: Capex - non-network assets

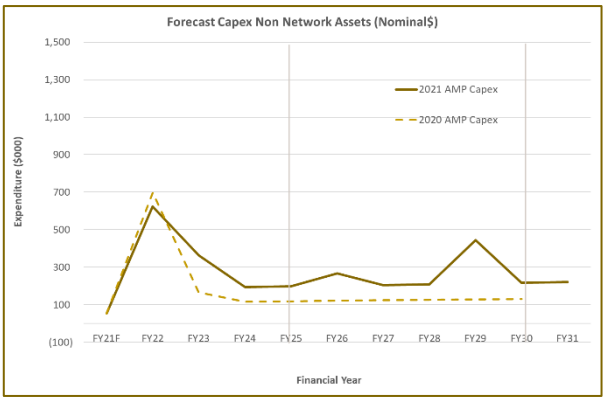


Figure 127: Capex - Customer connections

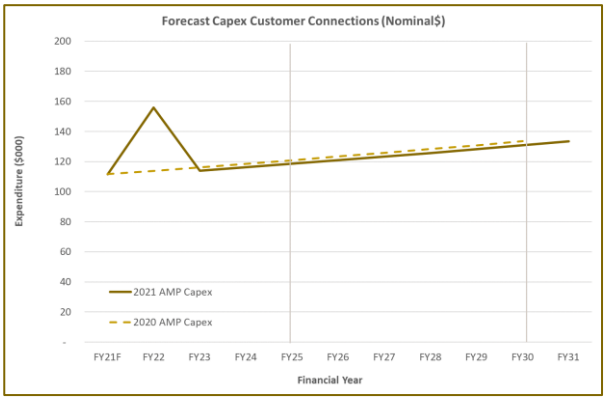
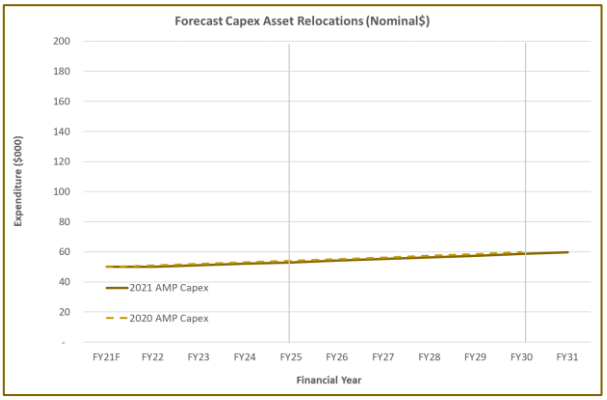


Figure 128: Capex - asset relocations



Appendix 1: Key terms and acronyms

AAAC	All Aluminium Alloy Conductor
AAC	All Aluminium Conductor
ABS	Air-Break Switch
AC	Alternating Current
ACSR	Aluminium Conductor Steel Reinforced
ACOD	Avoided Cost of Distribution
ADMS	Advanced Distribution Management System
AMMAT	Asset Management Maturity Assessment Tool
AMP	Asset Management Plan
ARR	Asset Replacement & Renewal
AUFLS	Automatic Underfrequency Load Shedding
CAPEX	Capital Expenditure
CB	Circuit Breaker
CPI	Consumer Price Index
CPU	Central Processing Unit
CT	Current Transformer
DER	Distributed Energy Resource
DGA	Dissolved Gas Analysis
DNO	Distribution Network Operators
DNP	Distributed Network Protocol
DPP	Default Price Path (Commerce Commission)
EDB	Electricity Distribution Business
EOL	End of Life
ENL	Eastland Network Limited
EV	Electric Vehicle
FY	Financial Year
GIS	Geo-Spatial Information System
GPD	Group Peak Demand
GM	Ground mount
GXP	Grid Exit Point
H&S	Health & Safety
HR	Human Resources
HV	High Voltage
IP	Internet Protocol
IT	Information Technology
KVA	Kilo-Volt Amps
LMT	RPS switchgear type
LV	Low voltage
m	Million
MD	Maximum Demand

MDI	Maximum Demand Indicator
MED	Major Event Day
MPL	Maximum Practical Life
MV	Medium Voltage
MVA	Megavolt-Amps
MVAr	Megavolt-Amps (reactive)
MWh	Megawatt Hour
NZ	New Zealand
OPEX	Operational Expenditure
OOU	Onset of Unreliability
PILC	Paper Insulated, Lead Covered
PLC	Programmable Logic Controller
PoF	Probability of Failure
POS	Point of Supply
PV	Photovoltaic (Solar)
PVC	Polyvinyl Chloride (Cable)
PM	Pole mount
RAB	Regulatory Asset Base
RMU	Ring Main Unit
RTU	Remote Terminal Unit
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SCI	Statement of Corporate Intent
SF6	Sulphur Hexafluoride
SG	System Growth
SWER	Single Wire Earth Return
SWGR	Switchgear
SSDG	Small Scale Distributed Generation
Tx	Transformer
UG	Underground
UHF	Ultra-High Frequency
VHF	Very High Frequency
VT	Voltage Transformer
WACC	Weighted Average Cost of Capital

Appendix 2: Network Security and Capacity Assessment

Substation	Required security level	Transformer Capacity (MVA)	Supply Capacity (MVA)	Generator capacity (MW)	11kV back-up capacity (MVA)	Contingent capacity (MVA)	FY2020 Maximum Demand (MW)	FY2020 % installed capacity	FY2020 % cont. capacity	FY2020 Security OK	FY2031 Maximum Demand (MW)[121]	FY2031 % installed capacity	FY2031 % cont. capacity	FY2031 Security OK
Gisborne	A	2 x 60	120	6	n/a	60	49.89	42%	83%	Yes	52.71	44%	88%[122]	Yes
Te Araroa	C3	1 x 2.5	2.5	1	0.25	1.25	0.81	32%	65%	Yes	0.83	33%	66%	Yes
Ruatoria	C3	1 x 5.0/7.5	5	1	1	2	1.38	28%	69%	Yes	1.42	28%	71%	Yes
Tokomaru	C3	1 x 2.5	2.5	0	1.2	1.2	1.01	40%	84%	Yes	1.03	41%	86%	Yes
Tolaga Bay	C3	1 x 1phase	5	1	0.8	1.8	1.23	25%	68%	Yes	1.26	25%	70%	Yes
Kaiti	C1	1 x 12.5	12.5	0	8	8	7.23	58%	90%	Yes	8.07	65%	101%[123]	No
Port	C1	1 x 12.5	12.5	0	8	8	6.38	51%	80%	Yes	6.74	54%	84% [13]	Yes
Carnarvon	B	2 x 12.5	25	0	11	23.5	13.53	54%	58%	Yes	14.29	57%	61%	Yes
Parkinson	B	2 x 12.5	25	0	11	23.5	10.16	41%	43%	Yes	10.73	43%	46%	Yes
Makaraka	C1	1 x 12.75	12.75	0	7	7	6.85	54%	98%	Yes	7.65	60%	109%[13]	No
Patutahi	C1	2 x 1phase	5	0	5	5	3.15	63%	63%	Yes	3.33	67%	67%	Yes
Pehiri	C3	1 x 2.5	2.5	0	1.25	1.25	0.54	22%	43%	Yes	0.54	22%	43%	Yes
Ngatapa	C3	1 x 2.5	2.5	0	1.5	1.5	0.47	19%	31%	Yes	0.47	19%	31%	Yes
Puha	C2	1 x 1phase	5	1	0.5	1.5	2.12	42%	141%	Yes	2.12	42%	141%[124]	No
JNL	C1	1 x 12.75	12.75	0	5	5	2.40	19%	48%	Yes	2.40	19%	48%	Yes
Matawhero	B	2 x 12.5	25	0	5	17.5	4.40	18%	25%	Yes	4.91	20%	28%	Yes
Tuai	D	1 x 1 ph 5	6	0	0	0	0.62	10%	0%	Yes	0.59	10%	0%	No
Wairoa	B	2 x 1 ph 10	20	5	n/a	12.5	9.60	48%	77%	Yes	9.81	49%	78%	Yes
Wairoa-		1 x 12.5	12.5	1	0	1	1.83	15%	183%	Yes	2.11	17%	211%	Yes
Kiwi	C2	1 x 6.5	6.5	0	0	0	4.53	70%	-	Yes	4.53	70%	-	Yes
Blacks Pad	C3	1 x 1.5 (33/11)	1.5	1	0.5	1.5	1.70	113%	113%	No	2.11	141%	141%[125]	No
Tahaenui	C3	1 x 1.5 (33/11)	1.5	0	2	2	0.72	48%	36%	Yes	0.72	48%	36%	Yes
Waihi	C2	1 x 6.5	6.5	0	0	0	4.53	70%	0%	Yes	4.53	70%	0%	Yes

121 Excluding the prudent planning margin
122 Capacity constraint solution – Tuai-Gis Line upgrade and 50kV capacitor bank installs
123 Capacity constraint solution – Installation of Massey substation
124 Capacity constraint solution – Ngatapa-Puha 11kV link project
125 Capacity constraint solution – Extension of the 33kV line and relocation of the Blacks Pad substation

Appendix 3: Reconciliation to information disclosure requirements

Determination Clause Reference	Requirement	AMP Reference	Commentary
Summary			
3.1	The AMP must include a summary that provides a brief overview of the AMP contents and highlights information that the EDB considers significant.	1	
Background and Objectives			
3.2	The AMP must include details of the background and objectives of the EDB's asset management and planning processes	2.6, 2.8, 7	
Purpose Statement			
3.3	The AMP must include a purpose statement that:		
3.3.1	Makes the status of the AMP clear.	2.1.1, 2.1.4	
3.3.2	States the corporate mission or vision as it relates to asset management	5	
3.3.3	Identifies the documented plans produced as outputs of the annual business planning process	2.8	
3.3.4	States how the different documented plans relate to one another with specific reference to any plans specifically dealing with asset management	2.8	
Planning Period			
3.4	The AMP must state that the period covered by the plan is 10 years or more from the commencement of the financial year.	2.1.3	
3.5	The AMP must state the date on which the AMP was approved by the Board of Directors.	2.1.4	
Stakeholder Interests			
3.6	The AMP must identify the EDB's important stakeholders and indicate:	5.3, 5.4	
3.6.1	How the interests of stakeholders are identified;	5.3, 5.4	
3.6.2	What these interests are;	5.3, 5.4	
3.6.3	How these interests are accommodated in the EDB's asset management practices: and	5.3, 5.4	
3.6.4	how conflicting interests are managed.	5.3, 5.4	
Accountabilities and Responsibilities for Asset Management			
3.7.1	The AMP must describe the extent of Board approval required for key asset management decisions and the extent to which asset management outcomes are regularly reported to the Board.	2.5	
3.7.2	At the executive level, the AMP must provide an indication of how the in-house asset management and planning organisation is structured.	2.4, 2.5	
3.7.3	At the field operations level, the AMP must comment on how field operations are managed, the extent to which field work is	2.4, 2.5, 13.5	

Determination Clause Reference	Requirement	AMP Reference	Commentary
	undertaken in-house and the areas where outsourced contractors are used.		
Significant Assumptions and Uncertainties			
3.8	The AMP must identify significant assumptions, which must:		
3.8.1	Be quantified where possible.	2.9, and throughout the document	
3.8.2	Be clearly identified in a manner that makes their significance understandable to interested persons including:	2.9, and throughout the document	
3.8.3	Include a description of the changes proposed where the information is not based on the EDB's existing business.	2.9	
3.8.4	Identify the sources of uncertainty and the potential effect of the uncertainty on the prospective information.	2.9, and throughout the document	
3.8.5	Include the price inflator assumptions used to prepare the information in Schedules 11a and 11b.	2.9	
3.9	Include a description of the uncertainties that may lead to changes in future disclosures.	2.9, and throughout the document	
Asset Management Strategy and Delivery			
3.10	To support the AMMAT disclosure, the AMP must include an overview of asset management strategy and delivery.	7, 1310	
Asset Management Data			
3.11	To support the AMMAT disclosure, the AMP must include an overview of the processes for managing asset management data; and	9.3, 9.4	
3.12	A statement covering any limitations on the availability and completeness of asset management data and disclosure of initiatives intended to improve the quality of this data.	4.9, 9.3, 9.4	
Asset Management Process			
3.13	The AMP must include a description of the processes used for:	-	
3.13.1	Managing routine asset inspections and network maintenance;	2.6, 11.5 to 11.20	
3.13.2	Planning and implementing network development projects; and;	2.6	
3.13.3	Measuring network performance.	8.4, 8.5, 8.6	
Asset Management Documentation, Controls and Review Processes			
3.14	To support the AMMAT disclosure, the AMP must include an overview of asset management documentation, controls and review processes.	2.8, 13.1, 13.3, 13.4	
Assets Covered			
4.1	High Level Description of the Distribution Area	3.1	
4.1.1	The high level description of the distribution area must include: - the regions covered;	3.1	

Determination Clause Reference	Requirement	AMP Reference	Commentary
4.1.2	Identification of large consumers that have a significant impact on network operations or asset management priorities;	3.1, 4.3	
4.1.3	Description of the load characteristics for different parts of the network; and	4.1 to 4.4	
4.1.4	The peak demand and total electricity delivered in the previous year, broken down by geographically non-contiguous network, if any.	10.4	
4.2	Description of the network configuration, including;		
4.2.1	Identification bulk electricity supply points and any distributed generation with a capacity greater than 1 MW;	3.4	
4.2.2	The existing firm supply capacity and current peak load at each bulk supply point, including the capacity of zone substations and the voltage(s) of the subtransmission 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;	10.6	
4.2.3	A description of the distribution system including the extent to which it is underground;	3.6, 11.8.1	
4.2.4	A brief description of the network's distribution substation arrangements;	3.6, 11.11.1	
4.2.5	A description of the low voltage network, including the extent to which it is underground; and	3.6.6, 11.20	
4.2.6	An overview of secondary assets such as ripple injection systems, SCADA and telecommunications systems.	3.7, 11.18.1, 11.19.1	
4.4	Description of network assets by category, which includes information for the following areas;		
4.4.1	Voltage levels	3.2, and 11.5 to 11.20 (part of the lifecycle plans)	
4.4.2	Description and quantity of assets;	11.5 to 11.20 (part of the lifecycle plans)	
4.4.3	Age profiles; and	4.6, 11.5 to 11.20 (part of the lifecycle plans)	
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.	11.5 to 11.20 (part of the lifecycle plans)	
4.5	The asset categories must at least include the following;		
4.5.1	Subtransmission	11.5, 11.6, 11.7	
4.5.2	Zone Substations	11.9, 11.10, 11.16	
4.5.3	Distribution and LV Lines	11.5, 11.7, 11.20	
4.5.4	Distribution and LV cables	11.5, 11.6, 11.20	
4.5.5	Distribution substations and transformers	11.11, 11.13	

Determination Clause Reference	Requirement	AMP Reference	Commentary
4.5.6	Distribution switchgear	11.12, 11.14, 11.15	
4.5.7	Other system fixed assets	11.17, 11.18, 11.19	
4.5.8	Other assets	11.20	
4.5.9	Assets installed at bulk supply points owned by others	3.3	
4.5.10	Mobile substations and generators whose function is to increase supply reliability or reduce demand	4.4, 11.20	
4.5.11	Other generation plants.	3.4	
Service Levels			
5.0	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.	8	
6.0	Performance indicators for which targets are defined must include SAIDI and SAIFI values for the next 5 disclosure years.	8.4	
7.0	Performance indicators for which targets are defined should also include:		
7.1	Consumer orientated service targets that preferably differentiate between different consumer types	8.4.3	
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.	8.5	
8.0	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 stakeholder's requirements or considerations. The AMP should demonstrate how stakeholder needs were ascertained and translated into service level targets.	8 (commented on throughout section)	
Network Development Planning			
11.1	The AMP must include a description of network development plans, including: A description of the planning criteria and assumptions for network development	10.3	
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	13.1	
11.5	A description of strategies or processes (If any) used by the EDB that promote the energy efficient operation of the network	10.3.7	
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	10.3	
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	10.3	

Determination Clause Reference	Requirement	AMP Reference	Commentary
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.	10.4	
11.8.1	Explain the load forecasting methodology and indicate all the factors used in preparing the load estimates;	10.4	
11.8.2	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;	10.4.5	
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	10.6	
11.8.4	Discuss the impact on the load forecast of any anticipated levels of distributed generation in a network, and the projected impact of any demand side management.	10.4.3	
Network Development Plan			
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;	10.6.1, 10.6.1, 10.6.2, 10.7.1, 10.7.2, 10.7.3, 10.8	
11.9.1	The reasons for choosing a selected option for projects where decisions have been made;	10.3.8, 10.6.1, 10.6.1, 10.6.2, 10.7.1, 10.7.2, 10.7.3, 10.8	
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	10.6.1, 10.6.1, 10.6.2, 10.7.1, 10.7.2, 10.7.3, 10.8	
11.9.3	Considerations of planned innovations that improve efficiencies within the network, such as improved utilisation, extended asset lives, and deferred investment.	10.3.5, 10.3.6, 10.3.7	
11.10.1	The network development plan must include: 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.	10.6.1, 10.6.1, 10.6.2, 10.7.1, 10.7.2, 10.7.3, 10.8	
11.10.2	A summary description of the programmes and projects planned for the following four years (where known); and	10.6.1, 10.6.1, 10.6.2, 10.7.1, 10.7.2, 10.7.3, 10.8	
11.10.3	An overview of the material projects being considered for the remainder of the AMP planning period.	10.6.1, 10.6.1, 10.6.2, 10.7.1, 10.7.2, 10.7.3, 10.8	
11.11	The AMP must include 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	10.3.3, 10.3.4	
11.12	A description of the EDB's policies on non-network solutions, including:	10.3.6, 10.3.5	

Determination Clause Reference	Requirement	AMP Reference	Commentary
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;	10.3.3, 10.3.4, 10.3.6, 10.3.5	
11.12.2	The potential for non-network solutions to address network problems or constraints.	10.3.3, 10.3.4, 10.3.6, 10.3.5, 10.9	
Lifecycle Asset Management Planning (Maintenance and Renewal)			
12.0	The AMP must provide a detailed description of the lifecycle assets management processes, including:		
12.1	The key drivers for maintenance planning and assumptions;	11.5 to 11.20 (part of the lifecycle plans)	
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;	11.5 to 11.20 (part of the lifecycle plans)	
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;	11.5 to 11.20 (part of the lifecycle plans)	
12.2.2	Any systemic problems identified with any particular asset types and the proposed actions to address these problems; and	11.5 to 11.20 (part of the lifecycle plans)	
12.2.3	Budgets for maintenance activities broken down by asset category for the AMP planning period;	11.5 to 11.20 (part of the lifecycle plans)	
12.3	Identification of the asset replacement and renewal policies and programmes and actions to be taken for each asset category, including associated expenditure projections. This must include:	11.5 to 11.20 (part of the lifecycle plans)	
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	11.5 to 11.20 (part of the lifecycle plans)	
12.3.2	A description of innovations that have deferred asset replacements;	11.5 to 11.20 (part of the lifecycle plans)	
12.3.3	A description of the projects currently underway or planned for the next 12 months;	11.5 to 11.20 (part of the lifecycle plans)	
12.3.4	A summary of the projects planned for the following four years (where known); and	11.5 to 11.20 (part of the lifecycle plans)	
12.3.5	An overview of other work being considered for the remainder of the AMP planning period; and	11.5 to 11.20 (part of the lifecycle plans)	
Non-Network Development, Maintenance and Renewal			
13.0	The AMP must provide a summary description of material non-network development, maintenance and renewal plans including:		
13.1	A description of non-network assets;	9.3, 9.7	

Determination Clause Reference	Requirement	AMP Reference	Commentary
13.2	Development, maintenance and renewal policies that cover them;	9.3, 9.7	
13.3	A description of material capital expenditure projects (where known) planned for the next five years; and	9.7	
13.4	A description of material maintenance and renewal projects (where known) planned for the next five years.	9.7	
Risk Management			
14.0	The AMP must provide details of risk policies and assessment and mitigation including:		
14.1	Methods, details and conclusions of risk analysis;	12	
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;	12.5.4	
14.3	A description of the policies to mitigate or manage the risks of events identified in clause 14.2; and	12.5.4	
14.4	Details of emergency response and contingency plans.	12.6	
Evaluation of Performance			
15.0	AMP's must provide details of performance measurement, evaluation, and improvement, Including:		
15.1	A review of progress against plan, both physical and financial;	6	
15.2	An evaluation and comparison of actual service level performance against targeted performance;	6.3, 6.4	
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.	9.2.3, 9.2.4	
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.	9, 9.2.3, 9.2.4	
Capability to Deliver			
16.0	The AMP must describe the processes used by the EDB to ensure that:		
16.1	The AMP is realistic and the objectives set out in the plan can be achieved; and	13.5	
16.2	The organisation structure and the processes for authorisation and business capabilities will support the implementation of the AMP plans.	2.4, 2.5	

Appendix 4: List of schedules included

Outlined below is a list of the attached schedules which complement the asset management plan.

Schedule 11a – Report on Forecast Capital Expenditure

Schedule 11b – Report on Forecast Operational Expenditure

Schedule 12a – Report on Asset Condition

Schedule 12b – Report on Forecast Capacity

Schedule 12c – Report on Forecast Network Demand

Schedule 12d – Report on Forecast Interruptions and Duration

Schedule 13 – Report on Asset Management Maturity

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Eastland Network

Eastland Network, 172 Carnarvon St
PO Box 1048, Gisborne 4040, New Zealand

Tel 06 869 0700 | Fax 06 867 8563 | info@eastland.nz | **eastland.nz**

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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	Asset Management policy was re-drafted and approved by the board on 18th March 2020. Section 7 of the AMP notes the AM policy. The policy has been communicated to Eastland Network's senior management, planning and service delivery staff, and the Board. It is also available for public viewing at Eastland Networks entrance. Communication to external contractors has yet to be covered.		Widely used AM practice standards require an organisation to document, authorise and communicate its asset management policy (eg, as required in PAS 55 para 4.2 i). A key pre-requisite of any robust policy is that the organisation's top management must be seen to endorse and fully support it. Also vital to the effective implementation of the policy, is to tell the appropriate people of its content and their obligations under it. Where an organisation outsources some of its asset-related activities, then these people and their organisations must equally be made aware of the policy's content. Also, there may be other stakeholders, such as regulatory authorities and shareholders who should be made aware of it.	Top management. The management team that has overall responsibility for asset management.	The organisation's asset management policy, its organisational strategic plan, documents indicating how the asset management policy was based upon the needs of the organisation and evidence of communication.
10	Asset management strategy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	2.5	The AM strategy and AM policy were prepared consistent with the Eastland Group strategy and after the considering stakeholder interests. See section 7 of the 2021 AMP for AM policy and AM strategy, and section 5.3 for a view on who our key stakeholders are and their main interests. Annual survey of stakeholders completed with results and how they relate to our AM direction is in 2021 AMP section 6.3.		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	Enhancing our asset fleet plans is one of the initiatives of the AM strategy. We have developed new asset fleet plans as a direct response of this inititive. Fleet plans have been created for most major fleet types. The fleet plans drive the operational, maintenance and replacement plans. See section 7 for a copy of the AM strategy (Initiative 3). Asset fleet plan are included in Section 11.		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.

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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?	**3**	Asset Fleet plans have been prepared for all major assets and they describe the lifecycle activities for all the assets. The strategies incorporated in the fleet plans have a direct link to the AM strategy and AM policy. Refer section 11 of the 2021 AMP.		The asset management strategy need to be translated into practical plan(s) so that all parties know how the objectives will be achieved. The development of plan(s) will need to identify the specific tasks and activities required to optimize costs, risks and performance of the assets and/or asset system(s), when they are to be carried out and the resources required.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers.	The organisation's asset management plan(s).

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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.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	The organisation does not have an identifiable asset management plan(s) covering asset systems and critical assets.	The organisation has asset management plan(s) but they are not aligned with the asset management strategy and objectives and do not take into consideration the full asset life cycle (including asset creation, acquisition, enhancement, utilisation, maintenance decommissioning and disposal).	The organisation is in the process of putting in place comprehensive, documented asset management plan(s) that cover all life cycle activities, clearly aligned to asset management objectives and the asset management strategy.	Asset management plan(s) are established, documented, implemented and maintained for asset systems and critical assets to achieve the asset management strategy and asset management objectives across all life cycle phases.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Evidence	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	Eastland Networks asset management plan is updated annually and is available for public viewing on our website. The asset management committee were presented with relevant sections of the plan as part of its preparation. Projects and maintenance requirements are communicated to operational staff and contractors. Relevant staff and contractors ares also notified planned capex that is included in the plan. During the year staff are informed on decisions and asked for feedback with relation to any areas where they may be impacted. Hard copies of the plan can also be made available upon request.		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?	2.5	Roles and responsibilities are highlighted in the AMP (refer section 2.5). Actions, projects, and budgets are asigned to the appropriate team/individual/manager. Monitoring of performance is delegated to relevant staff and reviewed quarterly or six monthly by the asset management commitee. Delegated authority is based on the position, and projects which sit above are monitored/approved by appropriate personnel.		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.

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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 .

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**	The work teams monitors the delivery of the plan and the asset management committee revews progress twice per year (which is a new initiative). Refer section 12.6.2 of 2021 AMP.		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**	Eastland Network have prepred documentation to startup standby generation in large scale outage events. Control room staff regularly practice the connection and disconnection of this equipment. Our quality systems ENL16 section 5 manual describes our procedures in the event of an outage and how to respond see section 12.6.2 of 2021 AMP.		Widely used AM practice standards require that an organisation has plan(s) to identify and respond to emergency situations. Emergency plan(s) should outline the actions to be taken to respond to specified emergency situations and ensure continuity of critical asset management activities including the communication to, and involvement of, external agencies. This question assesses if, and how well, these plan(s) triggered, implemented and resolved in the event of an incident. The plan(s) should be appropriate to the level of risk as determined by the organisation's risk assessment methodology. It is also a requirement that relevant personnel are competent and trained.	The manager with responsibility for developing emergency plan(s). The organisation's risk assessment team. People with designated duties within the plan(s) and procedure(s) for dealing with incidents and emergency situations.	The organisation's plan(s) and procedure(s) for dealing with emergencies. The organisation's risk assessments and risk registers.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
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.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)? (Note this is about resources and enabling support)	The organisation has not considered the arrangements needed for the effective implementation of plan(s).	The organisation recognises the need to ensure appropriate arrangements are in place for implementation of asset management plan(s) and is in the process of determining an appropriate approach for achieving this.	The organisation has arrangements in place for the implementation of asset management plan(s) but the arrangements are not yet adequately efficient and/or effective. The organisation is working to resolve existing weaknesses.	The organisation's arrangements fully cover all the requirements for the efficient and cost effective implementation of asset management plan(s) and realistically address the resources and timescales required, and any changes needed to functional policies, standards, processes and the asset management information system.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	The organisation has not considered the need to establish plan(s) and procedure(s) to identify and respond to incidents and emergency situations.	The organisation has some ad-hoc arrangements to deal with incidents and emergency situations, but these have been developed on a reactive basis in response to specific events that have occurred in the past.	Most credible incidents and emergency situations are identified. Either appropriate plan(s) and procedure(s) are incomplete for critical activities or they are inadequate. Training/ external alignment may be incomplete.	Appropriate emergency plan(s) and procedure(s) are in place to respond to credible incidents and manage continuity of critical asset management activities consistent with policies and asset management objectives. Training and external agency alignment is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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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 .

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Evidence	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**	Responsibilities are incorporated into position descriptions. Eastland has recently completed restructuring of the organisation to align employees with the current strategy. See AMP section 2.4. The asswet management committee reviews various asset management activities to ensure alignment with the AM strategy and policy.		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**	The expenditure forecasts included in the AMP are incorporated into the Goup's 10-year financial model to ensure that funding is allocated. This 10-year model is approved by the Board. The 2021 AMP includes a review of deliverability to ensure that there is sufficent resources available to deliver the plans (refer Section 13). The asset management committee also reviews progress on delivery twice each year (this is a new initiative). Measurements of our delivery included as part of our performance management frameword (refer Section 6 of the 2021 AMP).		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.

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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 .

42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	**3**	Performance targets are reviewed weekly to all staff at Eastland. Quarterly reviews of our asset management plan and status is undertaken to the asset management committee who review the asset teams work/progress. With the frequency increased when major decisions, papers or AMP sections are completed). Nine board papers were also presented this year as part of our strategy to increase the networks due diligence.		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**	Regular audits of external contractors are carried out in the event that they are used for project work. Project scopes/plans are also used as part of defining the work that needs to be completed. Copies of our installation/commissioning requirements are provided to contractors (Contractor specific forms are sometimes used as long as the information provided meets our requirements).		Where an organisation chooses to outsource some of its asset management activities, the organisation must ensure that these outsourced process(es) are under appropriate control to ensure that all the requirements of widely used AM standards (eg, PAS 55) are in place, and the asset management policy, strategy objectives and plan(s) are delivered. This includes ensuring capabilities and resources across a time span aligned to life cycle management. The organisation must put arrangements in place to control the outsourced activities, whether it be to external providers or to other in-house departments. This question explores what the organisation does in this regard.	Top management. The management team that has overall responsibility for asset management. The manager(s) responsible for the monitoring and management of the outsourced activities. People involved with the procurement of outsourced activities. The people within the organisations that are performing the outsourced activities. The people impacted by the outsourced activity.	The organisation's arrangements that detail the compliance required of the outsourced activities. For example, this this could form part of a contract or service level agreement between the organisation and the suppliers of its outsourced activities. Evidence that the organisation has demonstrated to itself that it has assurance of compliance of outsourced activities.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	Top management has not considered the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management understands the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management has appointed an appropriate people to ensure the assets deliver the requirements of the asset management strategy, objectives and plan(s) but their areas of responsibility are not fully defined and/or they have insufficient delegated authority to fully execute their responsibilities.	The appointed person or persons have full responsibility for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s). They have been given the necessary authority to achieve this.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	The organisation's top management has not considered the resources required to deliver asset management.	The organisations top management understands the need for sufficient resources but there are no effective mechanisms in place to ensure this is the case.	A process exists for determining what resources are required for its asset management activities and in most cases these are available but in some instances resources remain insufficient.	An effective process exists for determining the resources needed for asset management and sufficient resources are available. It can be demonstrated that resources are matched to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	The organisation's top management has not considered the need to communicate the importance of meeting asset management requirements.	The organisations top management understands the need to communicate the importance of meeting its asset management requirements but does not do so.	Top management communicates the importance of meeting its asset management requirements but only to parts of the organisation.	Top management communicates the importance of meeting its asset management requirements to all relevant parts of the organisation.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
45	Outsourcing of asset management activities	Where the organisation has outsourced some of its asset management activities, how has it ensured that appropriate controls are in place to ensure the compliant delivery of its organisational strategic plan, and its asset management policy and strategy?	The organisation has not considered the need to put controls in place.	The organisation controls its outsourced activities on an ad-hoc basis, with little regard for ensuring for the compliant delivery of the organisational strategic plan and/or its asset management policy and strategy.	Controls systematically considered but currently only provide for the compliant delivery of some, but not all, aspects of the organisational strategic plan and/or its asset management policy and strategy. Gaps exist.	Evidence exists to demonstrate that outsourced activities are appropriately controlled to provide for the compliant delivery of the organisational strategic plan, asset management policy and strategy, and that these controls are integrated into the asset management system	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Evidence	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	Eastland Network has both formal and informal discussions at top management level to determine our resource requirements, and to resolve any gaps or emerging issues. We also carry out human resource capability reviews to determine whether we have staff within our current structure with the necessary skills to undertake the required work (and plans to develop or procure skills are put in place when necessary). Management's quarterly reviews with staff forms part of this review process.		There is a need for an organisation to demonstrate that it has considered what resources are required to develop and implement its asset management system. There is also a need for the organisation to demonstrate that it has assessed what development plan(s) are required to provide its human resources with the skills and competencies to develop and implement its asset management systems. The timescales over which the plan(s) are relevant should be commensurate with the planning horizons within the asset management strategy considers e.g. if the asset management strategy considers 5, 10 and 15 year time scales then the human resources development plan(s) should align with these. Resources include both 'in house' and external resources who undertake asset management activities.	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of analysis of future work load plan(s) in terms of human resources. Document(s) containing analysis of the organisation's own direct resources and contractors resource capability over suitable timescales. Evidence, such as minutes of meetings, that suitable management forums are monitoring human resource development plan(s). Training plan(s), personal development plan(s), contract and service level agreements.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	2.5	Eastland Network have a compentency registers which it uses to hold information on all our staff and contractors (in relation to work that they carry out on the network). Authorisation cards are also provided to staff with the work that they are authorised to carry out. These are reviewed annually by managers and signed off by the general manager.		Widely used AM standards require that organisations to undertake a systematic identification of the asset management awareness and competencies required at each level and function within the organisation. Once identified the training required to provide the necessary competencies should be planned for delivery in a timely and systematic way. Any training provided must be recorded and maintained in a suitable format. Where an organisation has contracted service providers in place then it should have a means to demonstrate that this requirement is being met for their employees. (eg, PAS 55 refers to frameworks suitable for identifying competency requirements).	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of an established and applied competency requirements assessment process and plan(s) in place to deliver the required training. Evidence that the training programme is part of a wider, co-ordinated asset management activities training and competency programme. Evidence that training activities are recorded and that records are readily available (for both direct and contracted service provider staff) e.g. via organisation wide information system or local records database.

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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 .

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**	Eastland Network hold a register of employee and contractor competency. The register identifies personell levels of competency (i.e. permit holder, entry only etc). A register of any completed training is also held. Local records database maintains this information.		A critical success factor for the effective development and implementation of an asset management system is the competence of persons undertaking these activities. organisations should have effective means in place for ensuring the competence of employees to carry out their designated asset management function(s). Where an organisation has contracted service providers undertaking elements of its asset management system then the organisation shall assure itself that the outsourced service provider also has suitable arrangements in place to manage the competencies of its employees. The organisation should ensure that the individual and corporate competencies it requires are in place and actively monitor, develop and maintain an appropriate balance of these competencies.	Managers, supervisors, persons responsible for developing training programmes. Staff responsible for procurement and service agreements. HR staff and those responsible for recruitment.	Evidence of a competency assessment framework that aligns with established frameworks such as the asset management Competencies Requirements Framework (Version 2.0); National Occupational Standards for Management and Leadership; UK Standard for Professional Engineering Competence, Engineering Council, 2005.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	The organisation has not recognised the need for assessing human resources requirements to develop and implement its asset management system.	The organisation has recognised the need to assess its human resources requirements and to develop a plan(s). There is limited recognition of the need to align these with the development and implementation of its asset management system.	The organisation has developed a strategic approach to aligning competencies and human resources to the asset management system including the asset management plan but the work is incomplete or has not been consistently implemented.	The organisation can demonstrate that plan(s) are in place and effective in matching competencies and capabilities to the asset management system including the plan for both internal and contracted activities. Plans are reviewed integral to asset management system process(es).	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	The organisation does not have any means in place to identify competency requirements.	The organisation has recognised the need to identify competency requirements and then plan, provide and record the training necessary to achieve the competencies.	The organisation is the process of identifying competency requirements aligned to the asset management plan(s) and then plan, provide and record appropriate training. It is incomplete or inconsistently applied.	Competency requirements are in place and aligned with asset management plan(s). Plans are in place and effective in providing the training necessary to achieve the competencies. A structured means of recording the competencies achieved is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	The organization has not recognised the need to assess the competence of person(s) undertaking asset management related activities.	Competency of staff undertaking asset management related activities is not managed or assessed in a structured way, other than formal requirements for legal compliance and safety management.	The organization is in the process of putting in place a means for assessing the competence of person(s) involved in asset management activities including contractors. There are gaps and inconsistencies.	Competency requirements are identified and assessed for all persons carrying out asset management related activities - internal and contracted. Requirements are reviewed and staff reassessed at appropriate intervals aligned to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Evidence	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	Weekly meetings are held by/for staff members to communicate the AM issues that they have or work that they are undertaking. Works meetings are held with contractor monthly to ensure they have the relevent informtion for their work. Eastland Network standards are also made available to contractors and are available to key staff. The asset management is another forum where asset management information is communicated to relevant staff.		Widely used AM practice standards require that pertinent asset management information is effectively communicated to and from employees and other stakeholders including contracted service providers. Pertinent information refers to information required in order to effectively and efficiently comply with and deliver asset management strategy, plan(s) and objectives. This will include for example the communication of the asset management policy, asset performance information, and planning information as appropriate to contractors.	Top management and senior management representative(s), employee's representative(s), employee's trade union representative(s); contracted service provider management and employee representative(s); representative(s) from the organisation's Health, Safety and Environmental team. Key stakeholder representative(s).	Asset management policy statement prominently displayed on notice boards, intranet and internet; use of organisation's website for displaying asset performance data; evidence of formal briefings to employees, stakeholders and contracted service providers; evidence of inclusion of asset management issues in team meetings and contracted service provider contract meetings; newsletters, etc.
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	2.5	Eastland Network has quality systems manuals which describe the asset management systems and processes we have in place. Also refer to Section 2.8 of the 2021 AMP.		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	Eastland Group inplemented SAP, ESRI and Blueworx in FY2021 (known as project highway). The scoping phase of this project determined the information needs and they were documented as part of the project. Both internal and external experts were involved with this project to ensure the scope of the system and the information needs met our asset management requirements.		Effective asset management requires appropriate information to be available. Widely used AM standards therefore require the organisation to identify the asset management information it requires in order to support its asset management system. Some of the information required may be held by suppliers. The maintenance and development of asset management information systems is a poorly understood specialist activity that is akin to IT management but different from IT management. This group of questions provides some indications as to whether the capability is available and applied. Note: To be effective, an asset information management system requires the mobilisation of technology, people and process(es) that create, secure, make available and destroy the information required to support the asset management system.	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Operations, maintenance and engineering managers	Details of the process the organisation has employed to determine what its asset information system should contain in order to support its asset management system. Evidence that this has been effectively implemented.

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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**	Eastland Network perform reviews of its data quality and audit the information contained within the information systems. Data quality was a focus for ENL in FY2021 and we have improved significantly in this area, refer Section 4 and 9 of the 2021 AMP. Information is updated through as built data from contractors and confirmed by Eastland Network project manager before submission.		The response to the questions is progressive. A higher scale cannot be awarded without achieving the requirements of the lower scale. This question explores how the organisation ensures that information management meets widely used AM practice requirements (eg, s 4.4.6 (a), (c) and (d) of PAS 55).	The management team that has overall responsibility for asset management. Users of the organisational information systems.	The asset management information system, together with the policies, procedure(s), improvement initiatives and audits regarding information controls.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	The organisation has not recognised the need to formally communicate any asset management information.	There is evidence that the pertinent asset management information to be shared along with those to share it with is being determined.	The organisation has determined pertinent information and relevant parties. Some effective two way communication is in place but as yet not all relevant parties are clear on their roles and responsibilities with respect to asset management information.	Two way communication is in place between all relevant parties, ensuring that information is effectively communicated to match the requirements of asset management strategy, plan(s) and process(es). Pertinent asset information requirements are regularly reviewed.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	The organisation has not established documentation that describes the main elements of the asset management system.	The organisation is aware of the need to put documentation in place and is in the process of determining how to document the main elements of its asset management system.	The organisation in the process of documenting its asset management system and has documentation in place that describes some, but not all, of the main elements of its asset management system and their interaction.	The organisation has established documentation that comprehensively describes all the main elements of its asset management system and the interactions between them. The documentation is kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	The organisation has not considered what asset management information is required.	The organisation is aware of the need to determine in a structured manner what its asset information system should contain in order to support its asset management system and is in the process of deciding how to do this.	The organisation has developed a structured process to determine what its asset information system should contain in order to support its asset management system and has commenced implementation of the process.	The organisation has determined what its asset information system should contain in order to support its asset management system. The requirements relate to the whole life cycle and cover information originating from both internal and external sources.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	There are no formal controls in place or controls are extremely limited in scope and/or effectiveness.	The organisation is aware of the need for effective controls and is in the process of developing an appropriate control process(es).	The organisation has developed a controls that will ensure the data held is of the requisite quality and accuracy and is consistent and is in the process of implementing them.	The organisation has effective controls in place that ensure the data held is of the requisite quality and accuracy and is consistent. The controls are regularly reviewed and improved where necessary.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Evidence	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	Eastland Group inplemented SAP, ESRI and Blueworx in FY2021 (known as project highway). The scoping phase of this project determined the information system requirements. Both internal and external experts were involved with this project to ensure the system met our asset management requirements. Manuals for the SAP based asset management system are being updated following the SAP implementation.		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	Eastland Network uses Risk Manager as a platform for identifying, rating and documenting risks to and on our network. High level risk reviews are carried out by the asset team at quarterly meetings. Asset risk assessment is audited under regulation for public safety management system. Health/criticaility and asset risk are documented in the companies quality system, Asset health spreadsheet and the AMP. Specific asset risks are included in the asset fleet plans (refer Section 11 of the 2021 AMP).		Risk management is an important foundation for proactive asset management. Its overall purpose is to understand the cause, effect and likelihood of adverse events occurring, to optimally manage such risks to an acceptable level, and to provide an audit trail for the management of risks. Widely used standards require the organisation to have process(es) and/or procedure(s) in place that set out how the organisation identifies and assesses asset and asset management related risks. The risks have to be considered across the four phases of the asset lifecycle (eg, para 4.3.3 of PAS 55).	The top management team in conjunction with the organisation's senior risk management representatives. There may also be input from the organisation's Safety, Health and Environment team. Staff who carry out risk identification and assessment.	The organisation's risk management framework and/or evidence of specific process(es) and/ or procedure(s) that deal with risk control mechanisms. Evidence that the process(es) and/or procedure(s) are implemented across the business and maintained. Evidence of agendas and minutes from risk management meetings. Evidence of feedback in to process(es) and/or procedure(s) as a result of incident investigation(s). Risk registers and assessments.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	2	The results of asset risk assessments are formed into the ten year budgets and forecasts. On going weekly works meetings manage and coordinate resource needs. Contractor review procedures manage the adequacy of training and competency needs to achieve the work plans.		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.

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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 .

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**	Eastland hold a schedule of all relevant regulations/standards etc which affect our operations and is audited under the PSMS audit requirements. Access to standards library is provided to all staff members and updates to existing regulations are followed through using this platform. Eastland procedures reference the relevant regulations which they are bound by and relate to. Refer ENL4 section 3 page 7 as an example of references as well as ENL4 section 15 spreadsheet of applicable regulation and standards.		In order for an organisation to comply with its legal, regulatory, statutory and other asset management requirements, the organisation first needs to ensure that it knows what they are (eg, PAS 55 specifies this in s 4.4.8). It is necessary to have systematic and auditable mechanisms in place to identify new and changing requirements. Widely used AM standards also require that requirements are incorporated into the asset management system (e.g. procedure(s) and process(es))	Top management. The organisations regulatory team. The organisation's legal team or advisors. The management team with overall responsibility for the asset management system. The organisation's health and safety team or advisors. The organisation's policy making team.	The organisational processes and procedures for ensuring information of this type is identified, made accessible to those requiring the information and is incorporated into asset management strategy and objectives

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	The organisation has not considered the need to determine the relevance of its management information system. At present there are major gaps between what the information system provides and the organisations needs.	The organisation understands the need to ensure its asset management information system is relevant to its needs and is determining an appropriate means by which it will achieve this. At present there are significant gaps between what the information system provides and the organisations needs.	The organisation has developed and is implementing a process to ensure its asset management information system is relevant to its needs. Gaps between what the information system provides and the organisations needs have been identified and action is being taken to close them.	The organisation's asset management information system aligns with its asset management requirements. Users can confirm that it is relevant to their needs.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	The organisation has not considered the need to document process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle.	The organisation is aware of the need to document the management of asset related risk across the asset lifecycle. The organisation has plan(s) to formally document all relevant process(es) and procedure(s) or has already commenced this activity.	The organisation is in the process of documenting the identification and assessment of asset related risk across the asset lifecycle but it is incomplete or there are inconsistencies between approaches and a lack of integration.	Identification and assessment of asset related risk across the asset lifecycle is fully documented. The organisation can demonstrate that appropriate documented mechanisms are integrated across life cycle phases and are being consistently applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	The organisation has not considered the need to conduct risk assessments.	The organisation is aware of the need to consider the results of risk assessments and effects of risk control measures to provide input into reviews of resources, training and competency needs. Current input is typically ad-hoc and reactive.	The organisation is in the process ensuring that outputs of risk assessment are included in developing requirements for resources and training. The implementation is incomplete and there are gaps and inconsistencies.	Outputs from risk assessments are consistently and systematically used as inputs to develop resources, training and competency requirements. Examples and evidence is available.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	The organisation has not considered the need to identify its legal, regulatory, statutory and other asset management requirements.	The organisation identifies some its legal, regulatory, statutory and other asset management requirements, but this is done in an ad-hoc manner in the absence of a procedure.	The organisation has procedure(s) to identify its legal, regulatory, statutory and other asset management requirements, but the information is not kept up to date, inadequate or inconsistently managed.	Evidence exists to demonstrate that the organisation's legal, regulatory, statutory and other asset management requirements are identified and kept up to date. Systematic mechanisms for identifying relevant legal and statutory requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Evidence	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	Section 11 of the 2021 AMP demonstrate and describes ENL's interpretation of an assets lifecycle. Design standards, and commissioning requirements are all contained within the quality manuals ENL9 section 1, ENL8 (commissioning sheets). Procurement processes are currently under review to include the addition of the SAP system into the forms.		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?	3	The outputs of the AMP are put in the SAP asset management system. Reporting from the system allows review of the actual work undertaken compared with the AMP plans. Review is carried out by the asset team each quarter.		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 related failures are documented and recorded. Service levels for each asset type have been established which benchmark the performance of each asset type. For condition based monitoring, inspection standards for all major asset types have been prepared in line with the DNP Methodology. Inspection data is loaded into a health model which calculates the health level of the asset on H1-H5 scale.		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).

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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 .

99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	**2**	Job descriptions identify an employees area of responsibility and following that they are assigned authority to perform tasks through the ENL authorisation process. Notifiable event processes are documented and available for all staff to use/see. Signage is available on most HV assets (switchgear/transformers etc) and notification/processes for external stakeholders to take in an incident is available on our website www.eastland.nz.		Widely used AM standards require that the organisation establishes implements and maintains process(es) for the handling and investigation of failures incidents and non-conformities for assets and sets down a number of expectations. Specifically this question examines the requirement to define clearly responsibilities and authorities for these activities, and communicate these unambiguously to relevant people including external stakeholders if appropriate.	The organisation's safety and environment management team. The team with overall responsibility for the management of the assets. People who have appointed roles within the asset-related investigation procedure, from those who carry out the investigations to senior management who review the recommendations. Operational controllers responsible for managing the asset base under fault conditions and maintaining services to consumers. Contractors and other third parties as appropriate.	Process(es) and procedure(s) for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances. Documentation of assigned responsibilities and authority to employees. Job Descriptions, Audit reports. Common communication systems i.e. all Job Descriptions on Internet etc.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
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.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	The organisation has not considered the need to define the appropriate responsibilities and the authorities.	The organisation understands the requirements and is in the process of determining how to define them.	The organisation are in the process of defining the responsibilities and authorities with evidence. Alternatively there are some gaps or inconsistencies in the identified responsibilities/authorities.	The organisation have defined the appropriate responsibilities and authorities and evidence is available to show that these are applied across the business and kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Evidence	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))?	**2**	External audit results are provided in the form of reports with action lists. Action list points are assigned to relevant staff to complete, and included in performance objectives where appropriate.		This question seeks to explore what the organisation has done to comply with the standard practice AM audit requirements (eg, the associated requirements of PAS 55 s 4.6.4 and its linkages to s 4.7).	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit teams, together with key staff responsible for asset management. For example, Asset Management Director, Engineering Director. People with responsibility for carrying out risk assessments	The organisation's asset-related audit procedure(s). The organisation's methodology(s) by which it determined the scope and frequency of the audits and the criteria by which it identified the appropriate audit personnel. Audit schedules, reports etc. Evidence of the procedure(s) by which the audit results are presented, together with any subsequent communications. The risk assessment schedule or risk registers.
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	**2.5**	6 monthly review of the unplanned outages on the network which identifies where areas of poor performance may be occuring. Asset type failure is investigated on a feeder level and areas of concern are passed on to operations team who organise inspections and recommend work to be completed. Board review of network reliability performed annually.		Having investigated asset related failures, incidents and non-conformances, and taken action to mitigate their consequences, an organisation is required to implement preventative and corrective actions to address root causes. Incident and failure investigations are only useful if appropriate actions are taken as a result to assess changes to a businesses risk profile and ensure that appropriate arrangements are in place should a recurrence of the incident happen. Widely used AM standards also require that necessary changes arising from preventive or corrective action are made to the asset management system.	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit and incident investigation teams. Staff responsible for planning and managing corrective and preventive actions.	Analysis records, meeting notes and minutes, modification records. Asset management plan(s), investigation reports, audit reports, improvement programmes and projects. Recorded changes to asset management procedure(s) and process(es). Condition and performance reviews. Maintenance reviews
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	**1.5**	The AMP documents the strategies, development and performance of the assets and systems on an annual basis. Improvemnet oppurtunities and strategies are identified in each relevant section of the AMP. Improvements are achieved by review and analysis of key performance targets and identification of new development strategies to increase performance levels.		Widely used AM standards have requirements to establish, implement and maintain process(es)/procedure(s) for identifying, assessing, prioritising and implementing actions to achieve continual improvement. Specifically there is a requirement to demonstrate continual improvement in optimisation of cost risk and performance/condition of assets across the life cycle. This question explores an organisation's capabilities in this area—looking for systematic improvement mechanisms rather that reviews and audit (which are separately examined).	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. Managers responsible for policy development and implementation.	Records showing systematic exploration of improvement. Evidence of new techniques being explored and implemented. Changes in procedure(s) and process(es) reflecting improved use of optimisation tools/techniques and available information. Evidence of working parties and research.

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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 .

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?	**2.5**	Attending indutry related events such as the EEA/ENA events. Communicating and visiting other EDB's on how they are approaching tasks/asset management. Participating with other networks on EEA guides.		One important aspect of continual improvement is where an organisation looks beyond its existing boundaries and knowledge base to look at what 'new things are on the market'. These new things can include equipment, process(es), tools, etc. An organisation which does this (eg, by the PAS 55 s 4.6 standards) will be able to demonstrate that it continually seeks to expand its knowledge of all things affecting its asset management approach and capabilities. The organisation will be able to demonstrate that it identifies any such opportunities to improve, evaluates them for suitability to its own organisation and implements them as appropriate. This question explores an organisation's approach to this activity.	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. People who monitor the various items that require monitoring for 'change'. People that implement changes to the organisation's policy, strategy, etc. People within an organisation with responsibility for investigating, evaluating, recommending and implementing new tools and techniques, etc.	Research and development projects and records, benchmarking and participation knowledge exchange professional forums. Evidence of correspondence relating to knowledge acquisition. Examples of change implementation and evaluation of new tools, and techniques linked to asset management strategy and objectives.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
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.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

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.

CERTIFICATE FOR YEAR-BEGINNING DISCLOSURES

Asset Management Plan 2021

Clause 2.9.1

We, James Quinn and Candice Nicole Kinser, being directors of Eastland Network Limited certify that, having made all reasonable enquiry, to the best of our knowledge:

a) the following attached information of Eastland Network Limited prepared for the purposes of clause 2.6.1, 2.6.3, 2.6.6 and 2.7.2 of the Electricity Distribution Information 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 Eastland Network Limited's corporate vision and strategy and are documented in retained records.

Dated this 24th day of March 2021

JAMES Quinn
Director Name

Director Signature

Candace N. Kinser
Director Name

Director Signature