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# **Nelson Electricity Ltd Asset Management Plan**

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**April 2013 – March 2023**

**April 2013**



*Nelson Electricity Ltd central Nelson city view*



**In accordance with the Commerce Act  
Electricity Distribution Information Disclosure Determination 2012**

**SCHEDULE 17  
Certification of Year-beginning Disclosures**

Clause 2.9.1 of section 2.9

We, Ian Francis Kearney and Michael John McCliskie, being directors of Nelson Electricity Limited certify that, having made all reasonable inquiry, to the best of our knowledge-

- a) The following attached information of Nelson Electricity Limited, prepared for the purposes of clause 2.4.1, clause 2.6.1 and sub-clauses 2.6.3(4) and 2.6.5(3) of the Electricity Distribution Information Disclosure Determination 2012 in all material respects, complies with that determination.
- b) The prospective financial or non-financial information included in the attached information has been measured on a basis consistent with regulatory requirements or recognised industry standards.

  
9 April 2013

  
9 April 2013



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## Compliance Summary

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Nelson Electricity continually improves the Asset Management Plan where areas of weakness have been identified. A compliance review was not undertaken by the Commerce Commission on the 2012-2022 Asset Management Plan.

To maintain the Asset Management Plan at a high standard, Nelson Electricity reviews other lines companies Asset Management Plans and makes changes where improvements can be identified.

This Plan is also peer reviewed by qualified electrical engineers with all comments taken into account.





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## SECTION 1 - Summary of Asset Management Plan

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This Asset Management Plan is prepared as the key internal asset planning document for Nelson Electricity. It is also designed to meet Electricity Information Disclosure Requirements. The Plan contains sufficient information that will demonstrate to stakeholders that Nelson Electricity's asset management processes are in line with best practice.

This Plan was approved by the Board of Directors on 30 March 2013.

### 1.1 Background and Objectives

Nelson Electricity's goals are to:

- Have network reliability and performance consistent with other networks of similar kind in New Zealand;
- Manage and configure the assets efficiently, including responding to customers' requests for additional reliability where those customers are prepared to enter into appropriate contracts;
- Ensure commercial returns to its shareholders.

This Asset Management Plan is written in support of these goals and outlines:

- The current state of the assets;
- The role of risk modelling and Asset Performance Standards;
- The tools for planning and executing continuous improvement;
- Stakeholder interests;
- Service levels;
- Asset maintenance;
- Network development.

This Plan, which will be treated as a dynamic document, covers the 10 year period from 1 April 2013 to 31 March 2023, and will next be updated 1 April 2014. The Plan represents the best estimates, according to current criteria and known events, and this may be subject to change if different circumstances prevail. The main focus is on the current years projects and works identified are more certain. Beyond this the Plan is more indicative and subject to change as new requirements are identified.

### 1.2 Assets Covered

The Nelson Electricity network comprises approximately 9,100 connections in a concentrated area of 24 square kilometres in the central Nelson city area. The connections are largely CBD, industrial and dense urban. Nelson Electricity has a peak loading of 33.0MW, during winter months and distributes 153GWh annually through the network.

The distribution system has three 33kV feeders supplying one 33kV Zone Substation. Thirteen 11kV feeders radiate to ultimately supply 194 11kV/400V transformer sites that feed the 400V network.



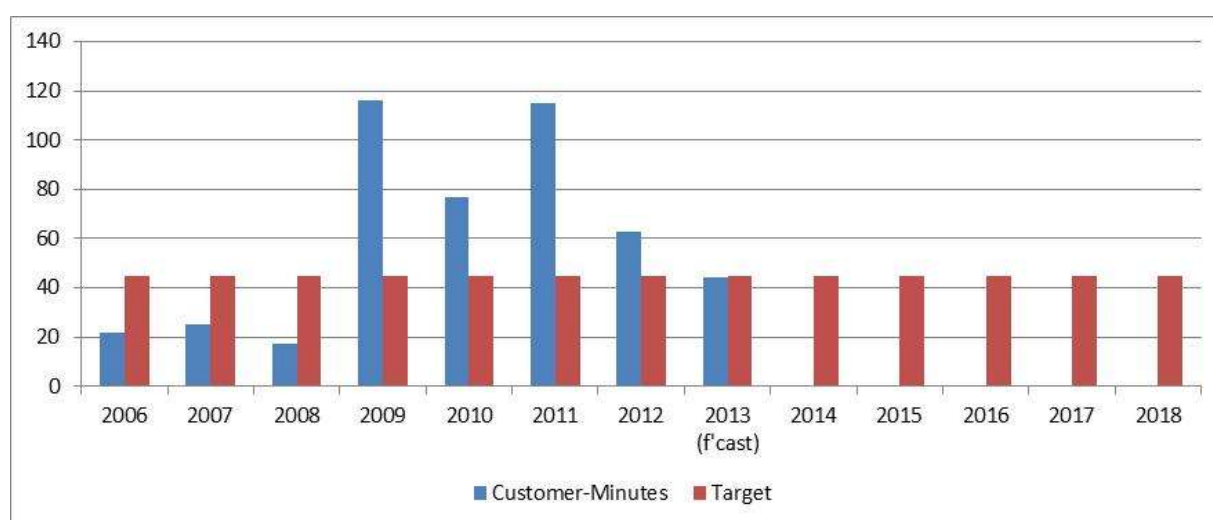
### 1.3 Service Levels

All assets are maintained in line with good industry practice and the results are reflected in Nelson Electricity's system reliability statistics. Nelson Electricity has the goal to seek reliability and performance statistics consistent with other networks of similar kind in New Zealand while also meeting consumer expectation.

NEL has long term targets of:

- SAIDI 45.0
- SAIFI 0.9
- CAIDI 50.0

#### ***Overall Nelson Electricity SAIDI Statistics (Class B & C)***



To achieve its goal, Nelson Electricity will continually improve its asset management and operational processes and carry out ongoing asset life cycle auditing.

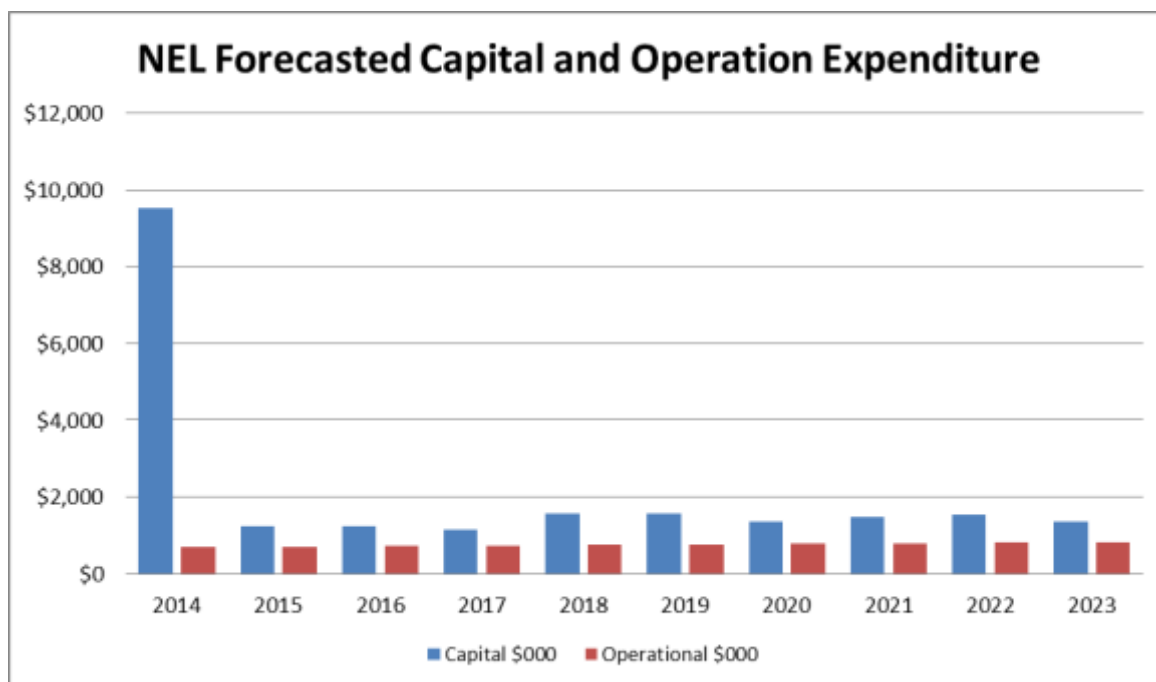
Although the performance statistics illustrate a reliable network, ongoing plans for continual improvement are in place.

### 1.4 Network Development and Lifecycle Asset Management Planning

Risk modelling and ongoing life cycle audits are the focus for asset management and development within constraints resulting from the regulated environment. Modelling assets against their performance standard defines areas of weakness and is the key driver for the Condition Driven Maintenance programme. Areas of risk are being continually identified and improvement/reinforcement scheduled.

Data obtained from planned preventative maintenance, load surveys, risk modelling and life cycle auditing will influence the direction of the Asset Management Plan.

The capital expenditure for 2013 is dominated by the expenditure for replacing Haven Road Zone Substation and installing a new 33kV feeder from Transpower's Stoke substation. If delays are encountered in the construction of these projects the expenditure may spread over into the 2013-2014 financial year. At the time of writing the expenditure forecast is accurate and achievable.



## 1.5 Asset Information Management

All asset and business information is contained in the Office Management System which provides computerised control of information and workflows. This system uses Microsoft Office products and manages all information crucial to the execution of Nelson Electricity's business. The main component for assets is the Access Database which provides storage, updating and retrieval of information. System forms and reporting facilities provide for continuous improvement and accountability for staff and contractors. The Office Management System is now being complemented by the ongoing development of a Geographic Information System.

## 1.6 Risk Assessment

Risk assessment is the risk of failure of assets causing non supply to consumers as well as consumer and worker safety. The assessment process is Nelson Electricity's key driver for maintenance and the continual improvement of the operation and development of the network. An asset risk model is utilised to assess the performance of an asset against a given Asset Performance Standard, this is used to determine the adequacy of the asset and whether replacement or upgrade is required.

The Asset Performance Standard takes into consideration the aspects of the impact and probability of asset failure. Asset condition audits provide accurate information on each individual asset and its life cycle performance. The audit results are input to the Office Management System and the asset modelled for its own asset performance ranking, compared to the appropriate standard.

Asset Performance Standards are also used for evaluating capital work and modelling corrective action contingencies for the most appropriate solution for non-complying assets.

## **1.7 Evaluation of Performance**

The Nelson Electricity Asset Management Plan is a dynamic document and can be changed at any stage during the year when issues are identified or changes needed. It is based on best industry practise and is peer reviewed prior to disclosure.

Nelson Electricity's costs are relatively stable even with pressures coming from areas such as compliance with regulation and local government conditions for digging in streets. It is expected Nelson Electricity can continue to maintain direct and indirect costs at current levels.

An area that has significantly over-run in the last three years has been the reliability statistics with SAIDI averaging 86 minutes compared to a forecast of 45 minutes. All significant outages have been different and not attributable to a degradation of the network. It does present Nelson Electricity with the challenge of eliminating or minimising the effects of the larger outages. However, the figures for 2011-2012 and the forecast for 2012-2013 show a marked improvement.

One key project that has seen some significant improvement in 33kV feeder related outages has been the 33kV feeder automation project. This has ensured that the Nelson Electricity network has not lost supply due to a feeder fault whereas in the past we would have expected one feeder fault every two years on average taking at least 40 minutes and often in excess of an hour to restore full supply.

The number of faults on the network for 2013 is calculated at 7.9 per 100 kilometres of line. Although this is lower than the industry average, it is higher than the Nelson Electricity target of four. Nelson Electricity has set this target given the high percentage of network being underground. Current initiatives in place to improve this are continuing to educate contractors on the risks associated with digging near or around cables and lowering of shallow at risk cables.

The declining peak demand and kWh consumption over the last two years has reduced the capacity utilisation and load factors to below target. The lowering of consumption has not meant a removal of transformer capacity as the reduction has been across the network rather than any large individual consumer disconnecting from the network. These factors will improve over time as consumer increase electricity consumption again.

Nelson Electricity does not have many issues with fluctuating voltage or with harmonics and interference. Any issues with these are investigated promptly and dealt with if an issue is identified.

The records of Nelson Electricity are continually being updated and input into the GIS. The area that needs to be addressed is the as-built cable records as these are still on hand drawn plans and field books. Nelson Electricity is still looking at options to convert these into the GIS.

The Office Management System and Risk Model are both flexible systems easily modified in accordance with Nelson Electricity's continual improvement philosophies.

All staff are involved in evaluating the performance of the Asset Management Plan and business in general. Regular meetings are held to review and discuss improvements to the Office Management System, Risk Model, Asset Management Plan and Business Plan. The Improvement Form is the tool for invoking improvements and solutions to the network and its management.

Gap analysis is the process of the Office Management System identifying the gaps in the system and reporting them to management. The results are then portrayed by the Improvement Form or scheduled on the Planner for corrective and, if necessary, preventive action.

## **1.8 Expenditure Forecasts and Reconciliations**

A review of progress against the financial portions of the Asset Management Plan 2011–2021 and the Asset Management Plan 2012–2022 shows Nelson Electricity has underspent the Capital Expenditure once again and Operational Expenditure, although in line with the 2011-2012 forecast, the 2012-2013 expenditure will exceed forecast.

The Capital Expenditure forecast is predominantly due to the replacement of the Haven Road Zone Substation and the installation of a fourth 33kV feeder being undertaken over the 2012-2013 and 2013-2014 years. The Operational Expenditure for 2012-2013 was due to additional costs in overhead line maintenance, protecting vulnerable cables and additional fault repair costs. The \$590,000 budget (set in January 2012) was increased to \$767,000 in November 2012 to allow for additional costs experienced through the year.



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## SECTION 2 - Background and Objectives

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Nelson Electricity Limited (NEL) is a limited liability company registered under the Companies Act 1993 and is jointly owned by Network Tasman Ltd (NTL) and Marlborough Lines (MLL). NEL owns and operates the electricity distribution network in the central Nelson city area.

Nelson Electricity's principal mission is to –

**“own and operate the electricity network within the central Nelson area commensurate with appropriate standards of maintenance and reliability of supply whilst maximising shareholder value and providing a return at least equal to weighted average cost of capital.”**

This Asset Management Plan is prepared as the key internal asset planning document for Nelson Electricity. It is also designed to meet Electricity Information Disclosure Requirements. The Plan contains sufficient information that will demonstrate to stakeholders that Nelson Electricity's asset management processes are in line with best practice.

### 2.1 Objectives

The objective of this Plan is to describe the strategies that will ensure Nelson Electricity meets the needs of its stakeholders through a reliable and compliant network. The Plan outlines methods of ensuring customer and response standards are met, that all maintenance and development of the network and its assets are carried out utilising resources efficiently and economically, that Asset Risk Management is the key to condition and performance of the network, and that customer requests for alternative combinations of supply, quality and price are adequately considered.

Nelson Electricity's business goals and objectives are the key drivers influencing this Asset Management Plan. These are listed below.

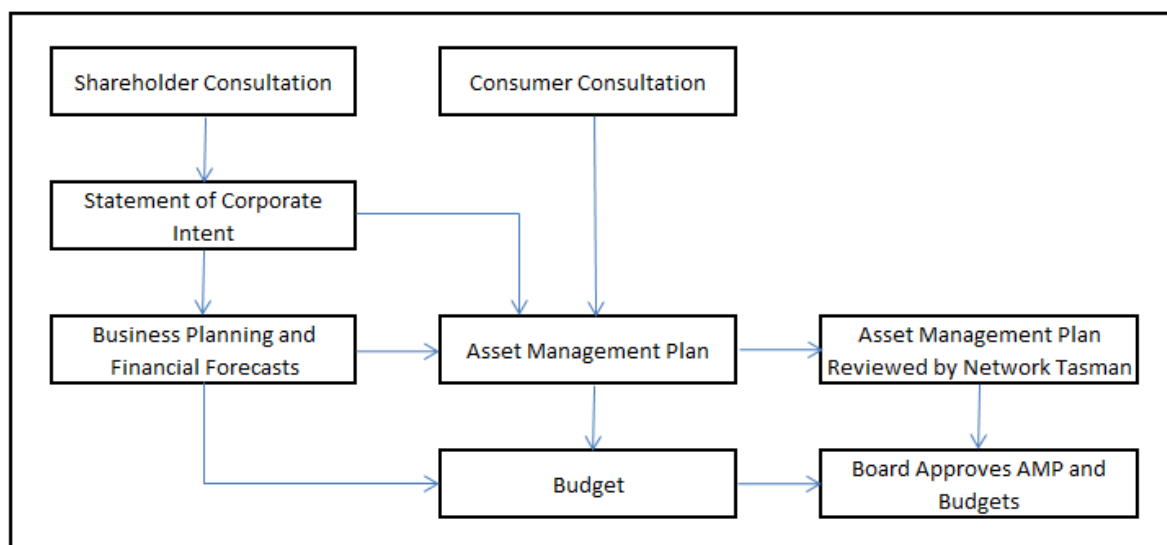
- **Statement of Corporate Intent**

In accordance with the Section 39 of the Energy Companies Act, Nelson Electricity submits a draft Statement of Corporate Intent to shareholders for the coming financial year. This gives a high level overview of the business and the direction it is heading. The principal objectives of the Statement of Corporate Intent are taken into account throughout the Asset Management Plan development process:

- To operate as a successful business in the distribution of electricity and other related activities;
- To have regard among other things the desirability of ensuring the efficient use of electricity;
- To ensure that all services and responses to maintenance and fault requirements are provided with an appropriate standard of customer service;
- To maintain existing reliability and efficiency levels;
- To adopt non-discriminatory pricing and network access policies for all users of the Nelson Electricity network;
- To ensure that all resources, financial, physical, and human are utilised efficiently and economically;
- To seek to provide an appropriate rate of return to shareholders not less than WACC and to seek to maximise the longer term value of shareholders' funds;
- To provide for future development of the network through investigation and the acquisition of land and physical assets as is appropriate;
- To ensure the company complies with all legislative requirements including health and safety legislation, and all industry initiatives in respect of safety in the workplace;
- To be a good employer providing;
  - ✦ Remuneration consistent with performance,
  - ✦ A safe, satisfying and stimulating work environment,

- ✦ Equal employment opportunities.
- Contracts such as:
  - Use Of System Agreements
  - 24 Hour Fault Service Contracts
- Design standards and policies such as:
  - NEL Network Extension and Design Standards 2010;
  - NEL Network Code 2000;
  - NEL Risk Management Policy;
  - NEL Asset Performance Standards.
- Legislation to ensure the company complies with all industry legislative requirements such as:
  - Electricity (Safety) Regulations 2010
  - Electricity Act 1992 and Amendments;
  - Commerce Act 1986
  - Injury Prevention, Rehabilitation and Compensation Act 2001;
  - Electricity Reform Act 1998;
  - Electricity (Hazards from Trees) Regulations 2003;
  - Health and Safety in Employment Act 1992, 1998 and 2002;
  - NZ Electrical Codes of Practice;
  - Resource Management Act 1991;
  - Building Act;
  - Local Government Act;
  - Public Bodies Act;
  - Public Works Act;
  - Human Rights Act 1993;
  - Employment Relations Act 2000;
  - Privacy Act 1993;
  - Electricity Information Disclosure Requirements 2008;
  - AS/NZS 3000 2007;
  - Civil Defence Emergency Act 2002.

## 2.2 Planning Process





Nelson Electricity engages various stakeholders when compiling the Asset Management Plan.

- **Shareholders**

Nelson Electricity's two shareholders, being Electricity Distribution Businesses, have some input into the asset management process. Both companies have significant expertise that can assist in the development of plans that are in accordance with the requirements. Network Tasman has an additional review role as part of their provision of engineering services agreement with NEL.

- **Retailer Feedback**

Nelson Electricity does engage electricity retailers on a regular basis as they have a direct contractual relationship with NEL electricity consumers and also hold their metering information. Retailers have a better grasp on the consumption trends of their customers which Nelson Electricity can leverage off and take into consideration in asset planning.

- **Consumer Consultation**

Nelson Electricity engages its consumers on a regular basis. The methods used are:

- Surveys included in Nelson Electricity newsletters;
- Phone survey of major consumers;
- Phone survey of mass market consumers;
- When applying for new/changed connection;
- Tariff options.

Feedback and survey results are taken into consideration in the asset management planning process.

- **Budgets**

The asset management process provides expenditure level requirements for both capital and operational. These budgets are approved by the Nelson Electricity Board as close to the beginning of the financial year as possible. The financial year is aligned with the Regulatory Disclosure year 1 April 2013 to 31 March 2014.

- **Business Plan**

The major focus for Nelson Electricity is the asset management planning process and the subsequent completion of the Asset Management Plan. The works programme and actions identified in the Plan are used as the basis of the Network Business Plan.

## **2.3 Planning Period**

This Plan covers the 10 year period from 1 April 2013 to 31 March 2023. The Asset Management Plan will be reviewed on an annual basis based on the financial year to incorporate up to date information and improvement. Given the Plan covers a 10 year period, there is greater accuracy in the first five years of the planning period compared to the last five as there is more uncertainty and potential for change into the future.

The date of Version 18 is 1 April 2013 and was approved by the Board of Directors on 5 April 2013. The next review date for the Asset Management Plan is 1 April 2014.

As this is a planning document, projects may be included but may alter significantly or not proceed at all due to a change in operational requirements. As such the document is dynamic, being subject to annual review. It can also be amended part way through the 2013-2014 year if circumstances make changes to the Asset Management Plan necessary.

## **2.4 Issues for Nelson Electricity Asset Management Consideration**

The Asset Management Plan is a comprehensive plan that encompasses the entire asset management process. While every attempt is made to ensure the performance of the network remains high and reliability is consistent with that of other similar networks whilst also meeting consumer expectation, there are issues that may conflict with this.

- Reliability of the network has recently been impaired by the inadequacy of the Transpower grid. The only issue currently remaining is the transmission capacity into Christchurch from the hydro generation further south. Transpower is putting plans in place to address this.
- Previously Nelson Electricity has sought to achieve best practice and to be the best network in the country for an adequate return but the potential for conflicting requirements arising from Use of System Agreements, Electricity Act, Energy Company's Act and the Commerce Commission requirements may create another outcome. Over time it can be expected that unless the company has the ability to invest within the network, reliability will diminish.
- Service forecast levels are set to be maintained at current levels into the foreseeable future rather than incremental improvements. The cost associated with improvement in reliability of an already efficient network is high. Nelson Electricity in 2011 increased line charges to assist in the funding of an additional 33kV feeder and a Zone Substation replacement. These projects are creating a one-off large step in capital expenditure for 2012-2013 and 2013-2014 financial years.
- The capital Asset Management Plan is based on a minimalist approach because of the uncertainties created by the price path requirements of the Commission. The changes from using the ODV criteria to actual cost has assisted with the capital expenditure planning although there are still some projects that have not proceeded with unless there is additional funding from other parties, eg; overhead to underground conversion projects typically only proceed if they have a significant portion paid by the Nelson City Council by way of road excavation and reinstatement. All safety projects are proceeding as per normal on an expedited basis.
- Network assets are long-term assets that require long-term planning. Long-term investment within the network is dependent upon the company having the flexibility to invest and receive an appropriate return.

## **2.5 Stakeholder Interests**

The main drivers of the principal mission, objectives, Statement of Corporate Intent and ultimately the Asset Management Plan are the interests of the key stakeholders, expressly the Nelson Electricity Board, electricity consumers and retailers. Feedback from all stakeholders through surveys, direct communication and the complaints process is used to establish objectives, plans and specifically target levels of service.

Nelson Electricity also enters into contracts with end use customers that determine level of service drivers for this Asset Management Plan. The Nelson Electricity Board agrees Nelson Electricity's overall intentions and objectives and on performance targets and other measures in relation to its objectives through the Statement of Corporate Intent process.

The Asset Management Plan recognises the following stakeholders with interests in Nelson Electricity's asset management:

Stakeholder	Interests
Contractors	Contractors have an interest in asset management to the extent that it sets out network policy, standards and criteria and impacts on physical work undertaken on the system.
Electricity Customers and Retailers	Delivery of a safe, reliable, efficient and sustainable supply of electricity at minimum cost.
Government (Ministry of Economic Development, Commerce Commission, Electricity Commission)	Legislate and control compliance of statutory requirements and economic efficiency.
Insurers	Nelson Electricity insures all substations on the network (except pole mounted substations), including the main Zone Substation at Haven Road. Nelson Electricity uses insurance brokers Marsh Ltd for all insurance requirements.
Landowners	Landowners with Nelson Electricity assets on their property have interests in safety, easements and access requirements.
Nelson Electricity Employees	Nelson Electricity employees have interests in health and safety and career opportunities.
Property Developers	Property developers wish to ensure that connection policies and costs are fair and that network expansion plans are timely.
Shareholders	Achievement of an adequate return on investment and good corporate citizenship.
Territorial Local Authorities	Territorial authorities have interests in minimising environmental impacts, development of underground power systems, local economic development and in the control of assets in road reserves.
Transit NZ	Transit NZ is interested in controlling assets in road reserves.
Transpower	Nelson Electricity relies on the Transpower grid to deliver electricity through to the Nelson Electricity network and Transpower relies on the Nelson Electricity network to deliver the electricity to end use customers.

Stakeholder interests have been identified and accommodated in the asset management practices of Nelson Electricity through the following processes:

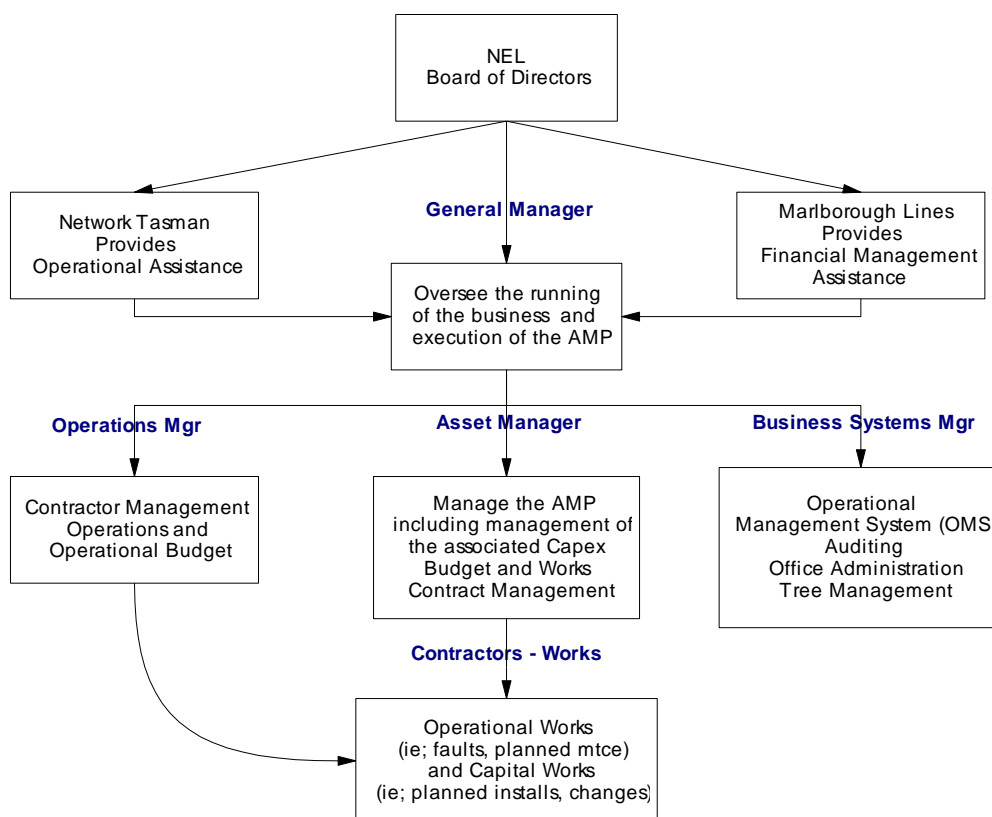
- The Nelson Electricity Board of Directors agrees to an annual Statement of Corporate Intent which details corporate strategy with respect to asset management planning.
- Corporate organisational goals and objectives support the establishment and completion of asset management projects consistent with corporate vision.
- Meetings and discussions with customers, developers and landowners help to establish asset management policy and practices in regards to levels of service, charging regimes and network planning including the price/quality trade-off.
- Regular surveys of residential, commercial and large user customers provide valuable feedback on security and reliability of supply which assists in network planning, and on the price-quality trade-off.
- Government and territorial authority legislation provides a key input into the way that asset management work is designed, planned and undertaken.
- Customer complaints provide valuable feedback on quality of supply and influence the development plan.
- Consultation with interested parties over specific projects ensures that they are included in the Asset Management Plan as early as possible to allow sufficient planning to be undertaken.

- Project performance reporting is provided to the Board of Directors on a monthly basis and includes contractor performance, project management performance and financial performance. This is used to establish future Asset Management Plan programmes and to compare progress against targets in each annual Asset Management Plan.

Any conflicting stakeholder interests are managed by systems that ensure that appropriate levels of separation, accountability and authority are in place. Decisions are normally made based on the asset management drivers detailed in the following section, in order of priority as listed below. If these criteria fail to provide a solution, a decision is made by the Board.

## 2.6 Responsibilities

Accountabilities and responsibilities in respect of network operations and management are summarised in the chart below.



### ***Nelson Electricity Board of Directors***

The Board consists of five Directors; two appointed by Network Tasman, two appointed by Marlborough Lines and one independent Chairman approved by both shareholders. The Directors have the overall governance role of the company and are legally accountable for the company. The Asset Management Plan and budgets are approved by the Board of Directors. Projects exceeding \$50,000 require separate Board approval.

The Board meet every two months as well as being provided with financial performance reports on a monthly basis. The Board meeting agenda includes:

- Financial Reports (performance versus budget);
- Operational Reports (including health and safety, outage statistics, capital project updates, retailer performance, kilowatt hours and network losses);

- Capital Expenditure Proposals.

### ***General Manager***

The General Manager is directly responsible for reporting to the Board and attending Board meetings. He has the responsibility for the day to day management of the company and its assets and for implementing company policy. The General Manager is permitted to approve projects up to \$50,000.

### ***Operations Manager***

The Operations Manager is directly responsible to the General Manager. He prepares the Operational Budget for inclusion in the Asset Management Plan as well as being involved in the Asset Management Plan development process. The Operations Manager is also responsible for the day to day operation and performance of the network including the management of electrical contractors working on the network. Nelson Electricity has contracts with electrical contracting companies to cover all physical work undertakings including electrical faults, planned maintenance, renewals and new works. The Operations Manager is responsible for administering these contracts.

### ***Asset Manager***

The Asset Manager is directly responsible to the General Manager. He is responsible for the preparation of the Capital Works Budget. The Asset Manager is also responsible for preparation of the Asset Management Plan in conjunction with other staff members. The key role in this position is ensuring the network can cater to the load requirements and ensuring that the network meets the appropriate security of supply standards. The Asset Manager also prepares and lets tender documents for all projects estimated to have a cost higher than a value fixed by the Board.

### ***Business Systems Manager***

The Business Systems Manager is directly responsible to the General Manager. She has the key responsibility of ensuring the IT requirements of the company are met as well as maintaining information systems and the associated data. The Business Systems Manager edits and ties together the individual inputs which go to form the final Asset Management Plan, then prepares the document for publication and listing on the website. The Business Systems Manager attends and provides editorial and logistical comment at Asset Management Plan meetings.

\* \* \* \* \*

### ***Provision of Additional Resources***

Nelson Electricity operates with a staffing of four to manage the operation of the network. To achieve this and to ensure that the network operates efficiently in terms of network performance and operational efficiency, there is a need to call upon additional resources and skills from time to time. Nelson Electricity has achieved this by having agreements in place with both shareholding companies for these requirements. The responsibilities of both shareholding companies is summarised below.

- **Network Tasman**  
Network Tasman provides engineering and other technical advice. The responsibilities include review of the Asset Management Plan, review of capital and operational budgets, policy development and review, advice on commercial and contractual issues, provide backup staffing resources and help with investigations into major projects from time to time. Network Tasman report to the General Manager and also to the Board on some issues.
- **Marlborough Lines**  
Marlborough Lines provide supervision and management of the financial and administrative functions of Nelson Electricity. The responsibilities include internal control, management of accounting requirements, payment of salaries, management of PAYE and GST, treasury function, relevant executive reporting to Board, assistance in setting budgets and provision of backup staffing resources. Marlborough Lines report to the General Manager and also to the Board.

## ***Electrical Contractors***

Nelson Electricity contracts out all network development, replacement and maintenance to electrical contractors. The main day to day contracts are a fault response and repair contract and planned preventative maintenance contract. All electrical contracting companies must hold an Authorisation Holder Contract with trained staff who have appropriate Class Approvals for the type of work they perform. The main contracts are negotiated with the General Manager and the day to day management of the contracts are managed by the Operations Manager.

## ***Delegations***

Document approvals and levels of expenditure delegation are in the following table:

<b>Document/Expenditure Level</b>	<b>Approval Authority</b>
Statement of Corporate Intent	Shareholders
Asset Management Plan	Board
Budgets	Board
Expenditure > \$150,000	Board
Expenditure > \$50,000	Chairman
Expenditure < \$50,000	General Manager

## ***2.7 Asset Management Justification***

The Asset Management Plan has a number of drivers and processes in place to enable Nelson Electricity to deliver a reliable supply of electricity and high quality service now and into the future.

## ***Audit and Maintenance Programme***

This programme exists to inspect, test and, if required, maintain all assets on a regular basis to ensure that the safety, reliability and risk assessment goals for the network are met.

## ***Network Development***

The development of the network is driven primarily by customer demand. Other significant drivers are the requirement for safety compliance, security of supply and minimal environmental impact.

## ***Performance Measurement***

Performance is based primarily on quality of service, which includes safety, power quality, reliability, efficiency and environmental impact. Examples of these are; lost time injury, harmonics, SAIDI statistics, fault response and oil spills, respectively. Financial performance is also significant.

## ***2.8 Information Management***

Nelson Electricity utilises an integrated Office Management System to provide the key drivers to achieve a safe, compliant and efficient network. This system uses Microsoft Office products which manage all electronic information and documents crucial to the execution of Nelson Electricity's business.

The implementation and continuing development of the Geographic Information System using the current version of ArcView, is amalgamating all asset information into a user-friendly data information and analysis tool. The data which is progressively being linked is:

- 400V Network Schematics;
- 11kV Network Schematics;
- 33kV Network Schematics;
- Connection point and consumer site information;
- Asset condition, location and history;
- Underground cable location plans and field books;

- Asset valuation and ODV;
- Ductline location plans.

## **2.9 Office Management System Key Drivers**

One of the main information systems used by Nelson Electricity is the Office Management System which controls the following aspects of the business by:

- Providing an interface between the company and its contractors;
- Providing the infrastructure to ensure the Health and Safety of staff, contractors and the public;
- Facilitating continuous improvement;
- Providing individual accountability;
- Reporting on processes, task scheduling, audit requirements, financial statistics;
- Managing stock control;
- Managing asset information;
- Detailing the Risk Model;
- Analysing network data;
- Encompassing the financial system;
- Providing fault history.

## **2.10 Office Management System Inputs**

The inputs to the Office Management System are provided by the following:

- Work Permits;
- Planned Maintenance forms;
- Audit Sheets;
- Fault Sheets;
- Commissioning Sheets.

A Microsoft Access Database is utilised for the Office Management System and records the asset type, location, condition, components, size, maintenance and auditing records which are acquired from the input data.

The computerised forms used for inputting data and been designed with built-in procedures to assist with the completion of each project.

An example of an Office Management System input is the Work Permit which is a form that is essential for tasks to be undertaken by contractors. The Work Permit, along with other forms, covers the following:

- Outlines parameters of a task;
- Responsibilities - who carries out the work, authorises the work, audits the work;
- Asset addition/change/removal information;
- Asset numbering;
- Timing - advises start and completion dates, date of auditing/payment date. Any task or work not completed by due date appears on the reports produced fortnightly and followed up by staff and management;
- Stock updates - records stock item used and updates stock system;
- Defect liability periods;
- Financial allocations and pricing - records quotes and pricing and budget allocation;
- Auditing - records date of works audited and any non-conformances. Non-conformance details are then recorded on the Improvement Form along with the suggested corrective/preventive action and issued to contractor for correction and sign off;
- Safety and hazard identification;
- Fault Forms also include: fault type; timing; fault cause.

## **2.11 Office Management System Outputs**

From the input data, reports are generated on a fortnightly basis or as required which advise staff and management of:

- Works completed for a set period;
- Works or tasks not completed by their due date;
- Asset information;
- Works for auditing;
- Fault history;
- Contractor works approved weekly report.

Staff and management then follow up these reports especially if deadlines have not been met.

The Task Planner specifies all tasks and works to be carried out by staff and contractors and is issued to staff on a monthly basis. The Planner contains details of the task, responsibility for the task and the proposed completion date. Individual monthly planners are issued to staff for execution of scheduled tasks.

The Audit Programme covers a 10 year period. A list of audits is issued to the Operations Manager with the monthly Planner. A copy of the current Audit Programme is in **Appendix A**.

The Improvement Form is the tool to achieve continuous improvement for the business as a whole. This form is utilised for:

- Recording non-conformances;
- Organising and recording corrective actions;
- Recording measures to prevent recurrences;
- Requests or recommendations for any improvements to any aspect of the business eg; improve a procedure.

Improvement forms are reported on fortnightly for completion date met and auditing of the improvement.

## **2.12 Geographic Information System**

The Geographic Information System provides valuable information to staff and contractors alike. The GIS plans were converted from Geo-Schematic AutoCad drawings and now reside on ArcView software. The plans consist of separate layers for the 33kV, 11kV and 400V networks overlaid on a DCDB map of Nelson city. Assets included in the system at present are substations, conductors, poles, link boxes and pillar boxes as well as customer connection point attributes. The asset information in the GIS is kept as up to date and as accurate as possible. The source for additions, deletions and modifications is from the work permits for the works from the office management system.

## **2.13 Geographic Information System Inputs**

The Asset Manager is responsible for all editing of the Geographic Information System. The inputs for the system come from field audits and network extension/alteration as-built data on a regular basis. Each new stage of implementation is set up as a separate project and, to date, the 33kV, 11kV, 400V, distribution substation, service box, pole and ICP attributes have been captured from the historical underground record plans. Recent projects included the graphical linking of customer connection points to pillar boxes.



In the last 24 months links have been established between the Asset Database, the ICP Database and the GIS to enable semi-automatic updates to be made to the GIS and for comparative checks to be made between the three systems to ensure that they are all synchronised. An aerial photographic layer of the city has also been added to improve asset location accuracy and operational efficiency. In more recent times, service mains in the road reserve have been identified and a pilot scheme to scan as-built photos on the GIS was successfully trialled.

**2.14 Geographic Information System Outputs**

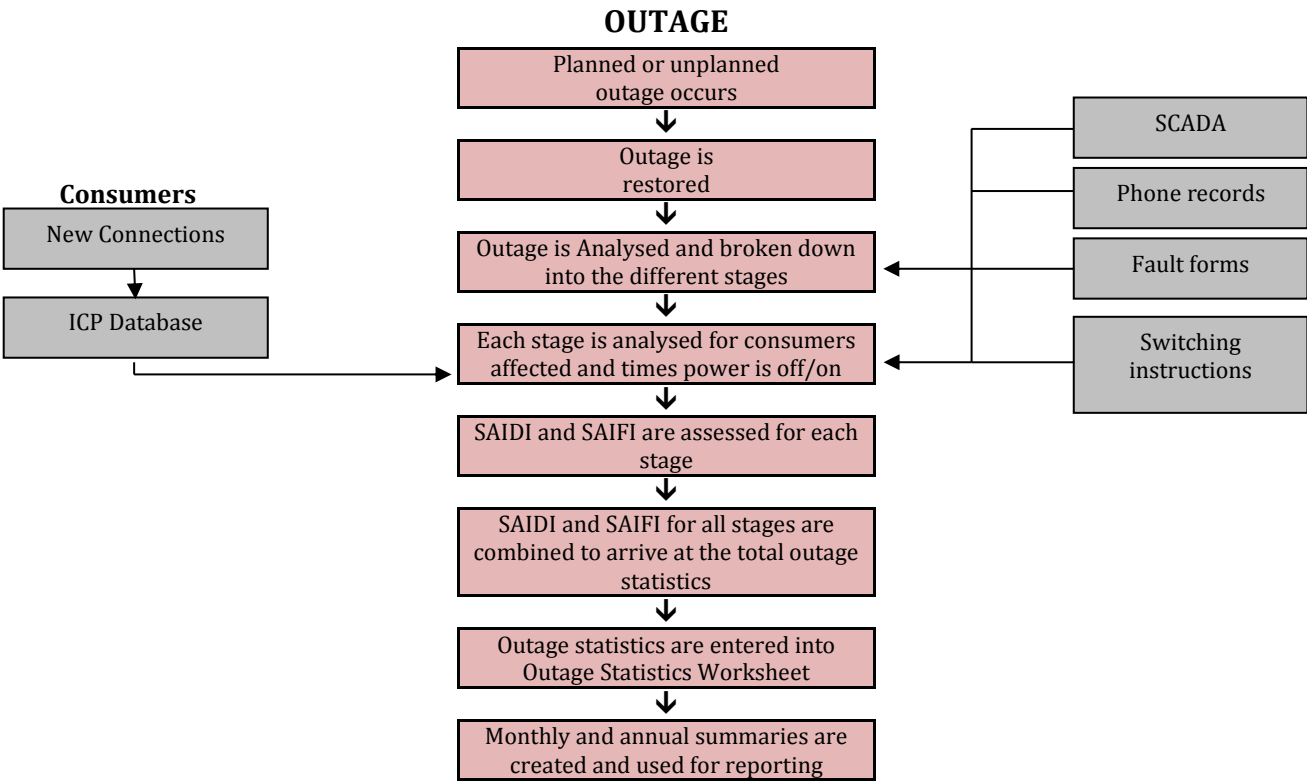
All staff members have access to the Geographic Information System via ArcReader software although only on a “read only” basis. On a monthly basis the latest version of the system is provided to contractors working on the network on disk. Hard copy drawings of the 33kV and 11kV System Schematic Diagram is provided to the Fault Service Contractor. Geo-schematic drawings of the 33kV, 11kv and 400V networks are printed in hardcopy and displayed on separate wall maps in the Zone Substation Control Room for operational purposes. These maps are updated on a monthly basis.

A computer containing ArcReader and an AutoCad reader resides in the Control Room so that Operators are able to access “live” 11kV and 400V network data for operational, fault and switching information.

**2.15 Outage Statistic Management**

Nelson Electricity is required to collect and record accurate information regarding all transmission, sub-transmission and 11kV outages. The methods and information used has to be robust as the information is used in the disclosure of both SAIDI and SAIFI statistics as part of the Quality Threshold disclosure. Overleaf is a flow chart on the collection and management of outage information.

**Outage Statistics Reporting Flow Chart**



## **2.16 Key Assumptions**

The Asset Management Plan is a document with a planning period of 10 years. The Plan is based on known information about the network and the environment but there are assumptions made about many aspects of the business. This section outlines some of the major assumptions made to complete this Plan.

This section is also written in a format that complies with the Electricity Distribution Information Disclosure Determination 2012.

The Electricity Distribution Information Disclosure Determination introduces new requirements in relation to Asset Management Plan information. In addition to the information to be included in the Asset Management Plan, each assumption combines the requirements where applicable:

- All significant assumptions, clearly identified in a manner that makes their significance understandable to electricity consumers, and quantified where possible;
- A description of changes proposed where the information is not based on the Distribution Business's existing business;
- The basis on which significant assumptions have been prepared, including the principal sources of information from which they have been derived;
- The factors that may lead to a material difference between the prospective information disclosed and the corresponding actual information recorded in future disclosures;
- The assumptions made in relation to these sources of uncertainty and the potential effect of the uncertainty on the prospective information.

## **Regulation and Legislative Requirements**

Existing external regulatory and legislative requirements are assumed to remain unchanged throughout the planning period. Thus the external drivers which influence reliability targets and design, environmental, health and safety standards and industry codes of practice are constant throughout the Asset Management Plan's period. It is expected there will be changes to the Asset Management Plan disclosures which will impact on the Asset Management Plan 2013-2023.

## **Network Growth**

Demand growth has not been as per forecast for the three previous Asset Management Plans. Network growth was assessed to match economic activity. Given that 2009 was when New Zealand was experiencing the worst of the economic downturn, growth rates went negative. Year 2010 and year 2011 did not show the growth forecasted. Only in mid to late 2011 has there been sign of recovery with increases in consumption and demand only to decline again during the last half of 2012.

There is considerable uncertainty for Nelson Electricity to determine an accurate growth forecast for this Asset Management Plan. Metering information is still showing a decline in consumption heading into the 2013 year. Peak demand has also declined over the corresponding timeframe. The uncertainty comes from the mix of variables that has an influence on this, being weather, economy, shift to more energy efficient appliances, more appliances in households, change to more efficient heating options, subsidies for retrospective insulation installation. The ongoing trend is uncertain and may well continue to decline. This complicates the Asset Management planning as growth has been a key part of the planning of the network.

Current consumption trends could change and it is prudent for Asset Management purposes that Nelson Electricity, until such time as more evidence suggests, should consider growth rates will return to positive and be used for the 10 year planning period.

Taking this approach, the capital plan will ensure projects will not be unnecessarily deferred then brought back forward again which would be the case by using the last three years as part of the longer term growth pattern. The effect of this approach has a minimal effect on the capital plan given that growth projects on an annual basis account for only \$150k - \$200k (excluding the Haven Road Zone Substation replacement and new 33kV feeder in 2012-13 and 2013-2014).

It has to be noted that growth related projects will not proceed unless it can be justified closer to the time through the usual load monitoring checks.

Assets are replaced or upgraded based on a number of factors. A key factor is growth. There are three types of growth for the network; **Connections**, **Demand** and **Consumption**. The key type is Demand. This is typically the deciding factor on whether to replace an asset based on growth. The timing of the maximum demand is typically mid-morning during the peak of winter.

- **Connections** are the number of consumers connected to the network. Historically the growth rate of connections has been between 0.5% and 1.0%. It is anticipated that this trend will continue for the entire planning period. The current number of connections is approximately 9,100 so the Plan will allow for the lower end of the scale at 50 new connections a year.
- **Demand** is the increase in peak demand on the network. This typically occurs during the peak of winter during weekday mornings. The long term growth rate has typically between 1.0 % and 1.5% per year. Historical increases have been due more to consumers using more electrical appliances and switching to cleaner more efficient heating options. Peak demand has decreased in the last few years and it is becoming apparent that on a per consumer basis they are using more efficient appliances and less energy is being used on heating as a result of improved insulation and more efficient heating options. Current maximum demand is 32.0MW, which is down from the previous year of 32.9MW. The Plan assumes the peak demand growth rate changing to positive as described earlier in this section and at the historical demand growth rates of approximately 1% or 300kW per year. The base demand for asset management forecasts Nelson Electricity will be using is the 2013 winter peak demand.
- **Consumption** is the number of kWh used. There is some connection between demand and consumption. The historical growth rate for consumption up to 2008 has been between 1.0% and 1.5%. Since then annual consumption has declined by 1.5% per year on average. For the purposes of asset management it is forecast for consumption to begin to grow again at 1% for the planning period.

If there is a fundamental change from forecast in **connections**, **demand** and/or **consumption**, then this could have a significant impact on the timing of the capital expenditure programme for growth either by advancing projects or deferment. The asset replacement programme will, however, continue mostly unchanged given the predominant justification is age and condition. Overall the financial impact will not be significant in the upcoming 10 years as only 10% of capital expenditure is for growth.

## ***Expenditure Projections***

All projections of expenditure are presented in real New Zealand dollar terms as at the disclosure date of this Asset Management Plan. This includes the effect of exchange rates for overseas sourced equipment.

The Operational Expenditure, on an annual basis, has been relatively stable. The main influences in the variability have been the availability of appropriate electrical or civil contractors to undertake the work. This Plan assumes there will be a smooth flow of work provided to electrical contractors who will have the appropriate staff to undertake the work in a timely manner.

It is also assumed that in the auditing process there will be 10% asset replacement from service box and link box audits. It is assumed this percentage will reduce over time given that Nelson Electricity is on the second cycle of audits meaning fewer assets should fail the condition assessment.

Any asset replacements due to growth are based on a 1.0% to 1.5% growth on the network unless there is a known specific development. This level is based on historical levels and also confirmation through consultation with local council. If, however, technology or consumer behaviour changes then this could result in a review and accelerate or delay some projects depending on the outcome.

The capital expenditure projections for this Plan have a significant amount allocated to the Haven Road Zone Substation replacement and the new 33kV feeder. These projects, totalling \$9.5 million, are to be completed during the 2013/2014 year. Financing has been arranged for this large bump in expenditure

for the year before returning back to stable historical levels of around \$1.5 million per year from 2014/2015 onwards.

### ***Asset Condition***

Another key assumption underpinning this Plan is the assumption of asset condition. Asset condition of overhead lines can be visually seen but 86% of the network is underground and so condition assessments are much more difficult and costly.

Given that Nelson Electricity cannot dig and check cable condition everywhere, Nelson Electricity has assumed that cable condition will be based on the age and type of cable unless it has been uncovered previously or there is a fault history that supports a change on condition assessment. To date any site cable condition assessment has shown condition to be better than assumed, but it can be expected that there will be areas where this may not be the case.

### ***Load Control***

Nelson Electricity primarily utilises load control to minimise network system peaks during the winter period. This is an important tool to maximise the efficiency and performance of the network. Nelson Electricity has a pricing structure that encourages the utilisation of controllable loads, the biggest being water heating. This Plan assumes that the consumer's utilisation of load control will continue for the planning period. Future developments in smart metering and more retailer control on load are issues which will be monitored. Currently the assessed benefit of load control is 3MW approximately 10% of total maximum demand. The ripple injection system will be replaced during 2013-2014. This will operate on the same frequency as the older plant and will provide an improved service.

### ***Load Profiles***

Grid Exit Point and 11kV feeder load profile patterns remain consistent with historical trends. The main time any change in pattern is an issue is during the coldest days of winter when Nelson Electricity has its highest electricity consumption peaks. If the historical load patterns were to shift, then this could bring forward asset replacement or network upgrade works. Any load changes outside the winter months of June, July and August will not have any significant effect at all.

### ***Embedded Generation***

It is assumed that increasing levels of embedded generation will be commissioned during the planning period. With the improved economic viability of photo voltaic panels it is expected there will be a greater number of embedded generation sites in residential areas than in the previous five years. This will have a material impact on the Asset Management Plan in the longer term.

If the cost of technology continues to decrease further and photo voltaic embedded generation becomes even more viable, there could be large changes which could impact on future planning for the network and administering these connections would also become important from a safety perspective. Currently there are 12 sites with embedded generation on the network of 4.6kW or less. Nelson Electricity has implemented systems and procedures for new embedded generation connections and the ongoing management of existing connections from a safety management, operational and quality of supply perspective.

Potential issues identified:

- Over voltage;
- Inverters shutting down due to high voltage;
- Harmonics;
- Quality of electricity injected into network;
- Safety of network during outages (prevention of embedded generation injecting into network during a network fault).

There are also limits to the level of photo voltaic saturation that the existing network can support. Nelson Electricity will monitor photo voltaic installations in its network and where network capital works

become necessary to support incremental photo voltaic installation, then capital contributions may become necessary from consumers installing photo voltaic in line with the capital contributions policy.

It is assumed that the introduction of more photo voltaic embedded generation will not have any significant impact on the network peak demand. The peak demand times are in the winter months when cloud cover would significantly limit the effectiveness of solar panels and, as such, there would still be a high reliance on the distribution network to supply electricity during those peak demand times.

Any larger installations will predominantly be installed for the benefit of the consumer in emergency situations but back-feeding into the network always needs to be considered. It is assumed there would not be any embedded generation installed for the sole purpose of selling of electricity in the central Nelson City area.

## ***Transmission***

Transpower continues to provide sufficient capacity to meet Nelson Electricity's requirements at the Stoke Grid Exit Point. This Plan assumes that Transpower will be undertaking its planned 33kV switchboard and transformer changes at Stoke during 2013. Nelson Electricity will be connecting a new 33kV feeder to Stoke around that time.

## ***Consumers***

Consumer expectation on reliability and quality of supply remains unchanged for the planning period. Most are happy with current quality and reliability and are unwilling to pay more for improvement.

## ***Natural Disaster and Climate Change***

It is assumed neither the Nelson Electricity network nor the local transmission grid is exposed to a major natural disaster during the planning period. Any significant event of this nature will require a complete review of the asset management process. Priority and type of works could change significantly as a result.

It is also assumed the Nelson Electricity network is exposed to normal climatic variation over the planning period including temperature, wind and rain variances consistent with experiences since 2000.

The Emergency Recovery Plan is being re-developed to cater to any major emergency event. This is taking into consideration additional important learning from the Christchurch earthquakes and recent Civil Emergency in the Nelson region during December 2011.

## ***Nelson Electricity Ownership***

Nelson Electricity ownership and management structure is maintained as is currently.

No changes are proposed to the existing business of Nelson Electricity and, thus, all prospective information has been prepared consistent with the existing Nelson Electricity business ownership and structure.

## ***Local Government***

Zoning for land use purposes remains unchanged during the planning period. Any changes could see future development plants requiring additional consents. It is unlikely this will be an issue for the planning period.

The Nelson City Council application of the National Code of Practice for Utilities Access to the Transport Corridors does not increase costs to work in the Nelson city area but can have a significant impact on costs of digging in streets. The Council application of the current draft code has already impacted on the costs of any road opening and reinstatement over the last two years.

## ***Inflation***

Inflation has been assumed based on Statistics New Zealand NZIER forecasts. This is about as accurate as Nelson Electricity can obtain from outside sources. It is forecast to be within the 2.0% to 3.0% range. The expenditure plans are based on today's monetary value and inflation is not taken into account.

## ***Interest Rates***

Interest rates will remain around 4.0% and lift to 6.0% over the next few years as New Zealand heads out of economic recession, allowing investment to continue at rates proposed in the Asset Management Plan. Nelson Electricity will be increasing debt levels over the next two years with two major capital expenditure projects. Any increases above forecast will have an influence on the debt servicing costs. Nelson Electricity will minimise this effect by entering into fixed interest rate arrangements where appropriate.

## ***2.17 Capability to Deliver***

### **Asset Management Plan Realistic and Achievable**

Nelson Electricity has developed the Asset Management Plan which is now reasonably stable in nature and the works deriving from this Plan are undertaken in a sustainable manner principally using the resources available.

The objectives set can be achieved in the timeframes unless there is a need to review based on changed assumptions. The key projects are the new 7 kilometre 33kV feeder from Haven Road Zone Substation to Transpower's Stoke Substation and the Have Road Zone Substation replacement. Both of these projects Nelson Electricity is committed to and will be completed during 2013. Additional resources outside of Nelson Electricity are being utilised to achieve this.

A complicating factor to delivering all objectives of the Plan is a key assumption on growth. If, during 2013, it is clear that Nelson Electricity will have continued decline in kWh consumption and decline in system peaks, then a full review on renewal projects and growth projects will need to be undertaken as they may not be warranted in the timeframe specified in the Asset Management Plan.

### **Organisation Structure and Process for Authorisation**

Refer to Section 2.6 which describes the organisational structure and responsibilities and decision making accountabilities for Nelson Electricity.

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## SECTION 3 - Assets Covered

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### 3.1 Introduction

Nelson Electricity has just over 9,100 connections in a concentrated area of 24 square kilometres. The area is of central Nelson city and includes most of the Port area, Port Hills, Victory Square, Hospital, Brook, Wood, Nelson East, Nelson South and the central business district. Refer to [Appendix B](#) for a map of the supply area.

There are approximately 318 kilometres of circuits and a total 11kV transformer capacity of 93MVA with a capacity utilisation of 36%.

Three feeders are installed from the Grid Exit Point to supply a single 33kV/11kV Zone Substation at Haven Road, Nelson. Part of the route to the Zone Substation is in aerial lines while the latter portion consists of underground cables (see [Appendix B](#)).

The three 33kV feeders are configured so that at any one time two of the feeders are supplying two separate banks of transformers, which consist of three single phase 33kV/11kV transformers per bank. These make up the main transforming capacity at the Zone Substation while a spare single phase transformer is available under the 33kV bus on standby for either bank (see [Appendix C](#)). The 11kV bus is split and normally operates with one bank of transformers feeding each side of the bus. However, the substation can be operated as a single 11kV bus if required.

In spite of the spare cable and transformer, Nelson Electricity recognises its vulnerability with all supplies to the city passing through the single substation. There are two 11kV interconnection points between Nelson Electricity's network and that of neighbouring Network Tasman Ltd at North Road and Vickerman Street. This enables approximately 4MW of load to be supplied from one network to the other when the necessity arises through extraordinary circumstances, depending on network demand at the time. Both existing interconnection points are connected to one Network Tasman Zone Substation which has a single 33kV supply.

Thirteen key 11kV feeders radiate from Nelson Electricity's Zone Substation to strategically placed major 11kV switching stations located at the city's load centres. Most of these stations have radio communication links with the SCADA system at the Zone Substation, for remote alarm purposes. The major switching stations are all located within a radius of two kilometres of the Zone Substation. From these stations, a primarily ring fed 11kV network reticulates the city via other 11kV switching stations and an extensively ring fed 400V network, providing supply at 400 and 230 volts (see [Appendix D](#)).

Load control is carried out automatically by SCADA via a ripple injection system. Nelson Electricity has two ripple generators, each injecting a signal into the opposite side of the 11kV bus. The SCADA system manages the system load.

Nelson Electricity supplies several major customers with capacities larger than 1MVA. The most notable are:

- Sealord's, fish processing factory with one connection;
- Port Nelson Limited, port facilities with many connections;
- Nelson Marlborough District Health Board, hospital with six connections;
- Nelson City Council, Local government with many connections.

Nelson Electricity owns a permanently mounted 20kVA generator on site to provide emergency power to the Zone Substation in the event of a total 33kV supply outage. Nelson Electricity does not own any mobile generating plant but has investigated the purchase of a mobile 500kVA unit in order to improve outage statistics but to date has made no purchase.

The Nelson Marlborough District Health Board (NMDHB) has increased the size of its existing emergency generators to two 1200kW diesel generators. These generators can be used in an emergency situation to operate and inject back into the Nelson Electricity network.

The Nelson City Council has a 400kVA generator at their central Trafalgar Street site and exporting onto the network would be possible if required, but this needs to be addressed further with the Council.

Nelson Electricity has a fibre link between its Zone Substation and Transpower's Grid Exit Point at Stoke for the purpose of monitoring load pulses and for 33kV feeder protection. The load pulse system is backed up by a radio communication link.

As previously mentioned, Nelson Electricity's pilot cable network has been superseded by simplex radio communication between the Zone Substation and major 11kV switching stations to communicate OCB status and bring up alarms on the SCADA. On receipt of an alarm signal from an out-station or from the 33kV/11kV system at the Zone Substation, an electronic message is generated by the SCADA and transmitted by modem to Nelson Electricity's call answering service, currently Call Care, or any other selected receiver. The radio link transmitters at the 11kV switching stations are being progressively upgraded to enable more technical status information to be transmitted to the SCADA.

## **3.2 Identification of Assets**

### ***Identification of Assets by Category***

The assets of Nelson Electricity have been grouped for ease of modelling by the Asset Performance Standard into:

- 33kV Network;
- 33kV/11kV Transformers;
- 11kV Network;
- 11/400V Transformers;
- 400V Network;
- Communications;
- SCADA.

### ***33kV Network***

This group addresses all assets attached to the three 33kV feeders between the Grid Exit Point at Stoke and the 33kV terminals on the 33kV/11kV transformers at NEL's Zone Substation.

### ***33kV/11kV Transformers***

This group covers the Zone Substation 33kV/11kV transformers and attachments between the 33kV bushings and the 11kV bushings.

### ***11kV Network***

The assets addressed in this group include all major assets between the 11kV bushings on the 33kV/11kV Zone Substation transformers and the 11kV bushings on the 11kV/400V distribution transformers.

### ***11kV/400V Transformers***

This group covers the 11kV/400V distribution transformers and attachments between the 11kV bushings and the 400V bushings.

### ***400V Network***

This group addresses the assets in the network contained between the 11kV/400V transformer 400V bushing and the customer network connection point.

### ***Communications***

This group addresses all types of Communications, from Fibre links to Simplex Radio links to modem and cellphone.



## SCADA

SCADA represents an integral part of the network control systems which monitors and links several information sources and as such forms a group of its own.

See **Appendix E** for a table presenting asset quantities, total replacement cost and total depreciated replacement cost.

### 3.3 Justification of Assets

#### Introduction

The selection of 33kV as the supply voltage into the Zone Substation is mainly an historical one which has been largely influenced by the availability of 33kV at the Stoke Grid Exit Point. Because of the density and small area covered by the Nelson Electricity network, 11kV has served as a more than adequate secondary transmission voltage for the network. The operation of the network at both of the above voltages has ensured that system losses have been kept to acceptable levels. The configuration of the 11kV network has maintained a high quality and reliability of supply to the end user. The use of a 400V ring feed network compliments the transmission voltages with enhanced reliability statistics. All assets are provided to meet regulatory voltage requirements under system peak loads while meeting security levels as mentioned in the next section.

#### Security

Nelson Electricity assets are in place to provide a reliable power supply to its consumers. In addition to this function Nelson Electricity has various emergency spares for the purpose of an enhanced security of supply. The key items are:

- One spare 33kV feeder;
- One spare Zone Substation sub single phase transformer.

There is also sufficient spare capacity within the 11kV network to provide N-1 security levels for a single event occurrence.

Nelson Electricity has strategic emergency spares available to support repair or replacement of failed assets on the network.

Current practice with the Nelson Electricity network is to plan to provide N-1 where practicable except for the rural and peripheral residential areas. However, this may be compromised in the future by the limitations on revenue as a result of price path regulation.

Nelson Electricity will also provide alternative levels of supply security and price for customers who are prepared to enter into appropriate contracts. These areas still meet the Asset Performance Standard and current security level outlined below.

#### Nelson Electricity - Current Security Level

Security Level	33kV Network	33kV Transformer	11kV Network	11kV/400V Transformer	400V Network
Urban large business and industrial	N-1*	N-1*	N-1*	N-1	N-1
Urban small business and residential	N-1*	N-1*	N-1*	N-1	N-1
Central business district	N-1*	N-1*	N-1*	N-1	N-1
Rural and peripheral urban residential	N-1*	N-1*	N*	N	N

\* **33kV Network** - Nelson Electricity considers that 33kV network meets a qualified N-1 criteria for the 33kV bus being supplied by one 33kV feeder. There is a small 50 second delay in the auto switching over of one of the paralleled feeders on the other bus.

**\* 33kV Transformer** - Nelson Electricity considers that 33kV/11kV transformers meet a qualified N-1 criteria because the spare can be connected to the 33kV bus within three hours. Alternatively Nelson Electricity can interconnect with Network Tasman's 11kV Network for additional capacity at short notice.

**\* 11kV Switchgear Bus Coupler Fault** – The only exception at the 11kV level is in the event of a bus coupler or bus fault at Haven Road Substation 11kV Switchboard or first out switching stations. Security of Supply level is N, where it will take repair time. Repair time could be extended beyond six hours depending on the severity of fault. A fault at Haven Road Substation would be the most serious given that there is only one 11kV Switchboard at the Zone Substation.

**N-1** means that supply to all consumers affected by a single failure event shall be restored by means of switching only (ie; no replacement of in-service equipment).

**N** means that supply may be restored to consumers affected by a failure event by either replacement or the repair of in-service equipment.

**Qualified N-1** means that currently Nelson Electricity does not comply strictly with the Security of Supply standards. At the 33kV level the standard is for N-1 No Break. Nelson Electricity cannot achieve this level until at least 2013/2014 for the 33kV network when a fourth 33kV feeder will be installed and 2013/2014 for 33kV Transformer when an additional 33kV Transformer capacity will be installed.

The criteria used to develop the Asset Performance Standards reflect asset performance levels that can be obtained by the N-1 methodology.

## ***Optimisation***

Nelson Electricity gathers data from the network by way of:

- Annual Load Survey;
- Network Asset Auditing;
- Planned Preventive Maintenance;
- Network Load and Temperature Logging.

This information is analysed for the purposes of optimisation and redundancy by:

- Asset Performance Modelling;
- Operational Management System;
- ODV Analysis.

Where Nelson Electricity identifies assets installed on the network that provide a security and capacity level higher than either the Asset Performance Standards required or customers have specifically contracted for and are deemed as unnecessary or excessive as opportunities arise, Nelson Electricity either removes these assets from service or downsizes the asset.

The 2004 ODV provides a list of assets that have been optimised out of the final asset value.

## ***Switchgear***

The equivalent of eight single way HV switches were found to be surplus to requirements and optimised out of the ODV.

## ***11kV Circuits***

A total of four lengths of HV cable, which represents 2.68 kilometres, were optimised out of the ODV.

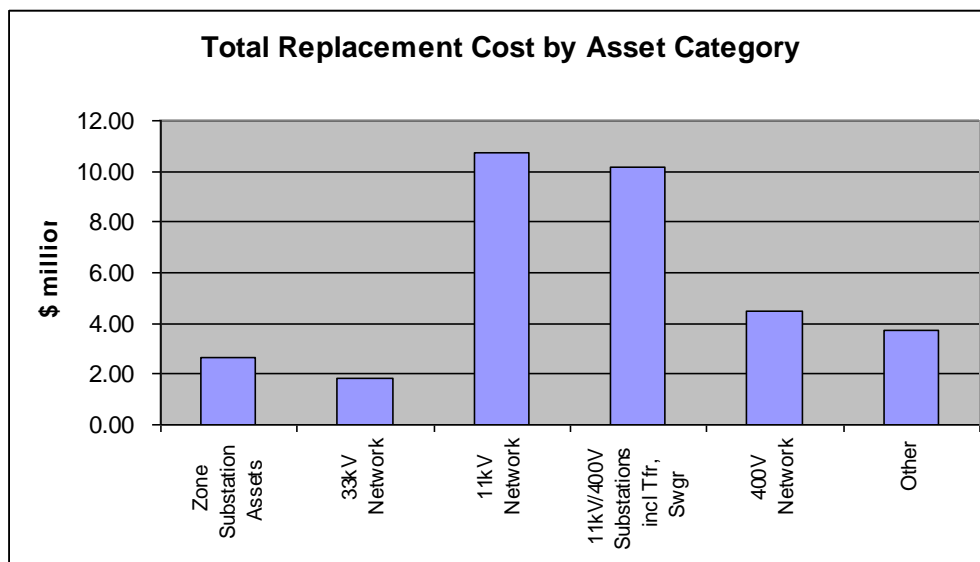
## ***Transformers***

No distribution transformers were optimised out of the ODV.

### 3.4 Location, Age and Condition of Assets

#### Categories

The graphs below give an indication as to the replacement cost per asset type and average ages.



The total replacement cost above is derived from the ODV process. The actual replacement cost, if based on historical cost, would be significantly higher. This demonstrates the inadequacy of the ODV process in reflecting the true costs of networks.

#### Assets by Age

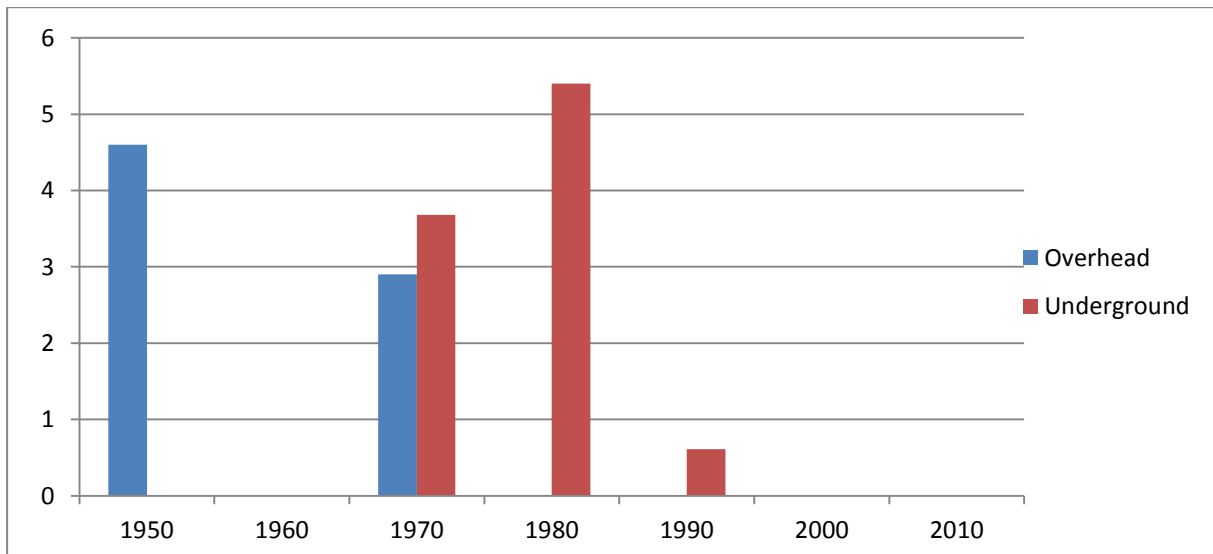
Asset Category	Average Install Date
Zone Substation Assets	1972
33kV Network	1982
11kV Network	1981
11kV/400V Substations	1980
Transformers	1978
400V Network	1979

#### Asset Age Profiles

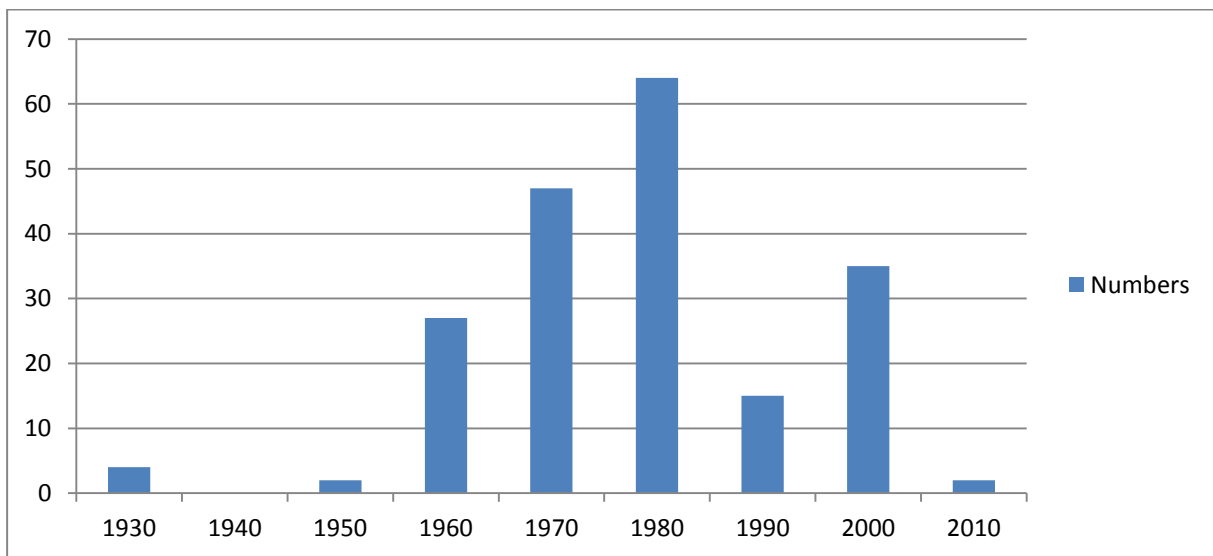
The profiles below are taken from data in the 2004 disclosed ODV valuation and 2010 FRS. The graphs show that the network is 86% underground and has an overall average age of approximately 29 years. The condition of these assets is detailed in the asset maintenance section. The age distribution graphs demonstrate that the majority of assets were installed in the 1960s–1980s. The 1990s was a period of minimal change without many new assets being installed on the network. During the 2000–2010 periods there were more asset replacements with some of the aged assets, especially 11kV switches and transformers, beginning to be replaced as well as investments due to growth.

The 2013–2023 periods will continue to see the increase in the rate of asset replacements as they reach the end of their useful life. Major projects scheduled are the replacement of the Haven Road Zone Substation and replacement of 11kV network that will provide a secure backup ring around the network. Both of these projects replace older assets with assets of higher capacity looking at the longer term.

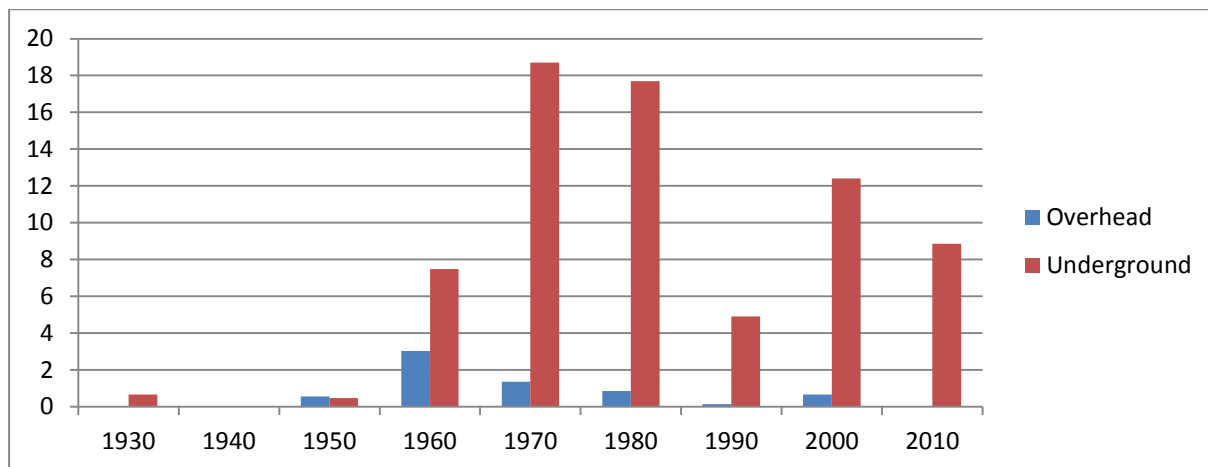
### 33kV Network Age Distribution



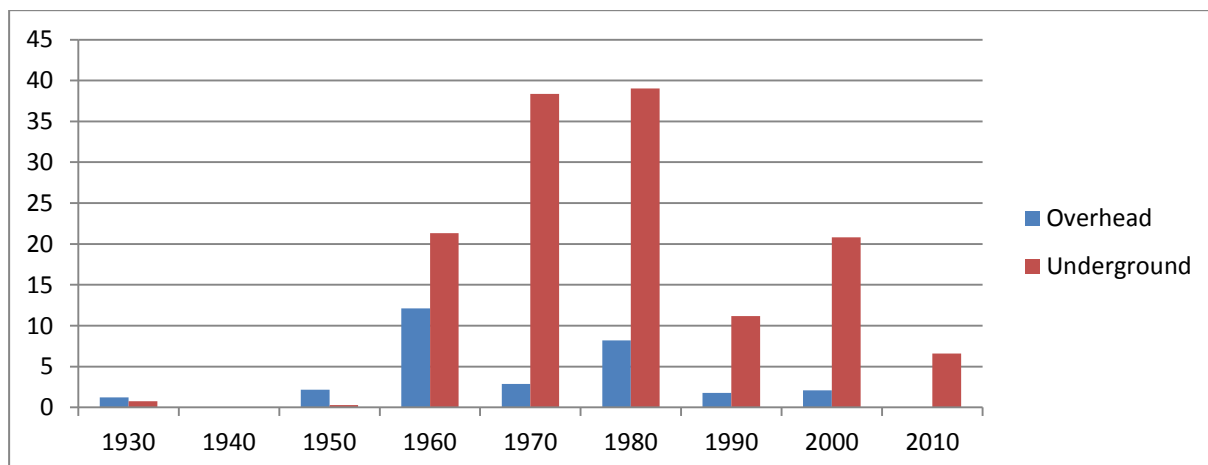
### 11kV/400V Substation Age Distribution



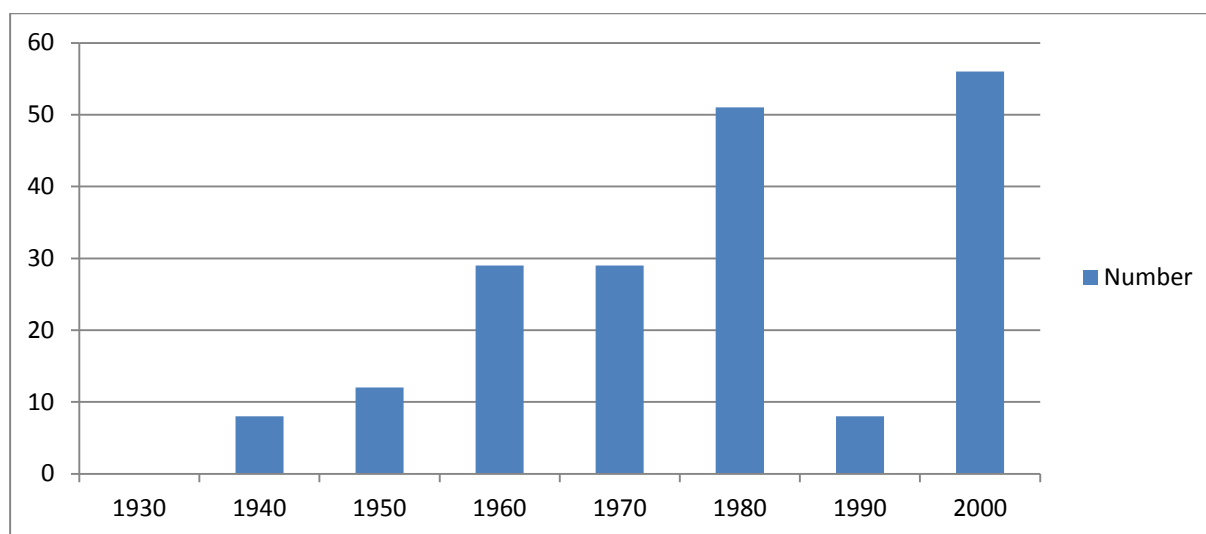
### 11kV Network Age Distribution



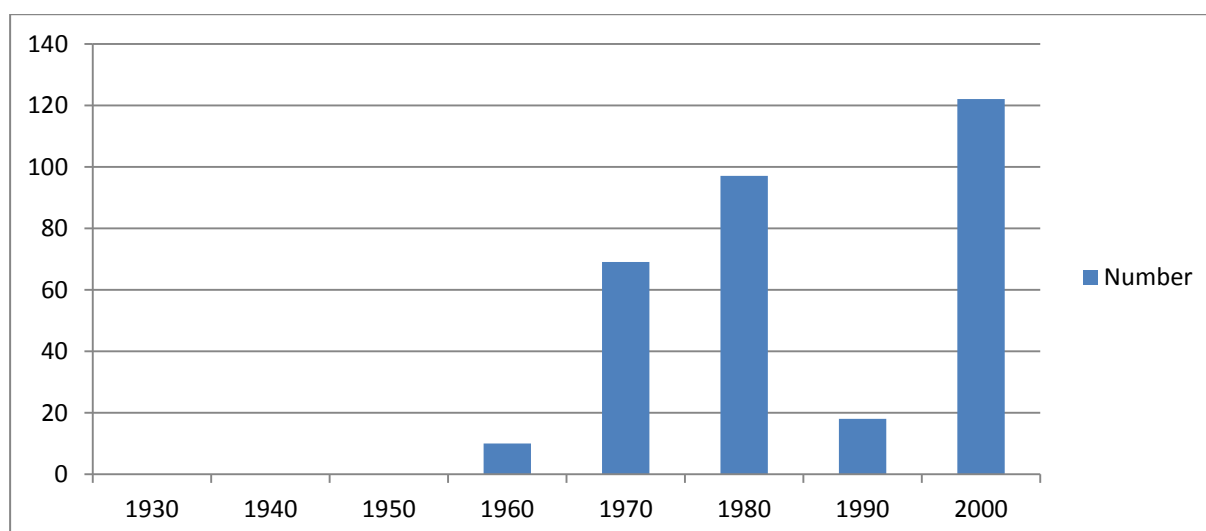
### 400V Network Age Distribution



### 11kV/400V Transformer Age Profile



### 11kV Switch Age Profile



The Auditing Programme and associated risk modelling results identify areas of the network that will require maintenance at various times in the future. The location and the age of assets are held in computer databases and AutoCad files. These files are supplemented by office plans, field books and on photographs. The Geographic Information System amalgamates all asset information into an easy use, information analysis and retrieval system.

## 3.5 Asset Replacement

Nelson Electricity has an Asset Replacement Guide to aide in the determination of the appropriate time to replace an asset. This guide covers all asset types on the network.

NELSON ELECTRICITY - ASSET REPLACEMENT GUIDE				
	Replacement Priority			
Asset Type	1 - Safety	2 - Technical	3 - Condition	4 - Age
<b>33kV Supply</b>				
Cables	Depth Public Risk	Load growth	Partial discharge tests Cable inspection Cable fault history	XLPE Cable - 50 years PI Cable - 77 years
Overhead Line	Public Risk	Load growth	Partial discharge tests Thermal imaging	Continually maintained
<b>Zone Substation</b>				
Transformers	Fault issue identified	Load growth Lack of spares Noise	Oil Test Thermal imaging Physical Inspection	66 years
33kV OCB	Fault issue identified	Lack of spares	Oil Test Thermal imaging Physical Inspection Partial discharge tests	44 years
11kV Switchboard	Fault Issue Identified	Lack of spares Load growth Potential fault levels	Oil test Physical Inspection Partial discharge tests	50 years
<b>11kV Network</b>				
Cables	Electromagnetic field Depth Public Risk	Load growth	Partial discharge tests Cable inspection Cable fault history	XLPE Cable - 50 years PI Cable - 77 years
Overhead Line	Electromagnetic field Public Risk	Load growth	Partial discharge tests Thermal imaging	Continually maintained
<b>Distribution Substations</b>				
Transformers	Fault issue identified	Load growth Lack of spares Noise	Oil Test Thermal imaging Physical Inspection	60 years
11kV switches	Fault issue identified	Lack of spares	Oil Test Thermal imaging Physical Inspection Partial discharge tests	44 years
400V Switchboard	Touchproof Fault issue identified	Load growth	Thermal imaging Physical Inspection	44 years
<b>400V Network</b>				
Cables	Depth Public Risk	Load growth	Cable inspection Cable fault history	XLPE/PVC Cable - 55 years PI Cable - 77 years
Overhead Line	Public Risk	Load growth	Thermal imaging	Continually maintained
<b>Service Box/Link Box</b>				
	Location Risk Touch Proof issue Earthing	Load growth Condition assessment	Physical inspection	50 years

## ***Primary Assets***

Nelson Electricity is at the beginning of a wave of asset replacements. The previous section demonstrated the age profile of assets. Some of these assets are now approaching the end of their life span. There will be an ongoing programme to replace these aged assets.

As indicated in this extrapolated graph, significant asset replacement costs are predicted over the next 70 years. The replacement periods are based on the standard physical asset lives as outlined in the Electricity Distribution Services Input Methodologies Determination 2012 and values are based on the Regulatory Asset Base valuation for the various types of network assets. This will require more investment into the network on top of the natural growth that is occurring. Because of an ongoing maintenance cycle and testing programme the standard service lives of assets such as transformers and details of the condition assessment of assets is detailed in Section 6.4 of this document. In broad terms, all asset types are audited or tested on a regular cycle and from the results of that audit a maintenance or replacement programme is formed.

As an example of this programme in action, all aged Long & Crawford HV oil switches on the network were replaced during 2005-2006. Similarly an aging HV cable into the central business district was replaced during 2005-2006 and other circuits will continue to be upgraded in the coming years. There are many other HV cables nearing the end of their service life in the coming years. These will be partial discharge tested and potholed on to determine whether they are in a condition that will last beyond the standard physical asset life.

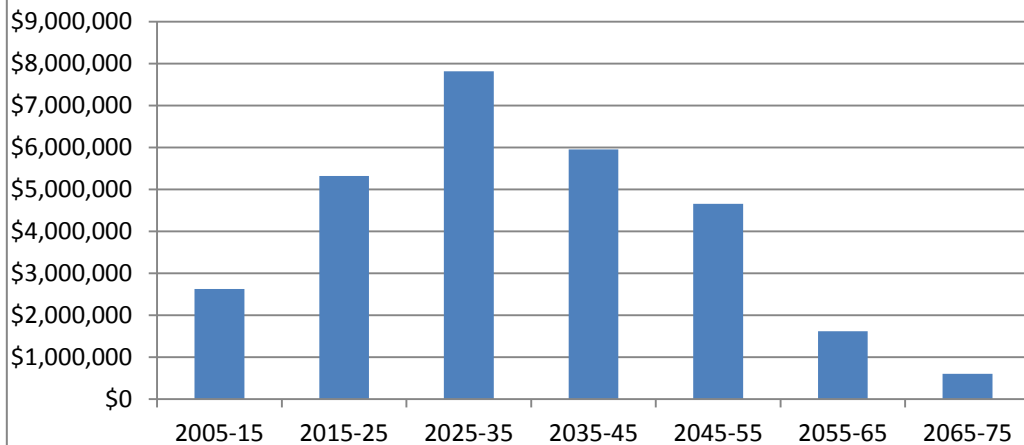
## ***Standard Physical Asset Life Table***

**(Electricity Distribution Services Input Methodology Determination 2012)**

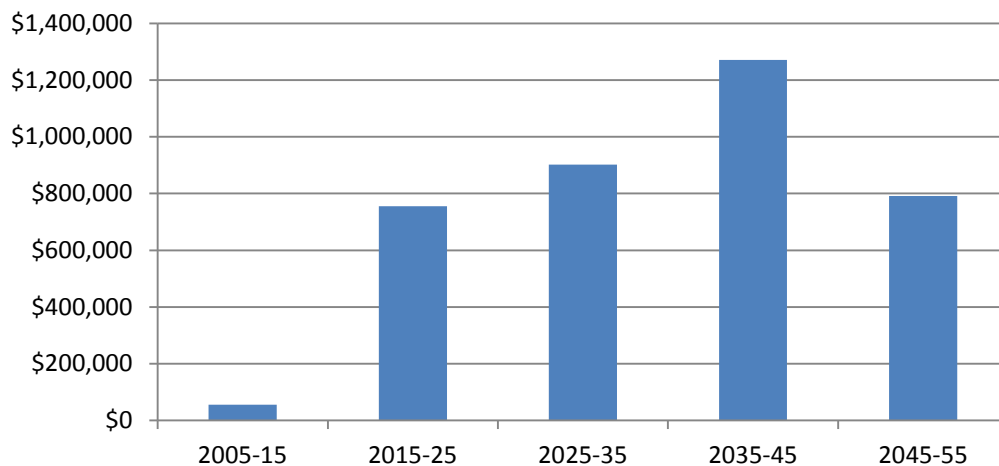
<b>Asset Type</b>	<b>Standard Life (Years)</b>
Transformers	45
HV Switches	40
Sub-transmission Cables – XLPE (Pre 1985/Post 1985)	45/55
Sub-transmission Cables - PILC	70
Distribution Cables – XLPE (Pre 1985/Post 1985)	45/55
Distribution Cables - PILC	70
Distribution Lines - Wood	45
Distribution Lines - Concrete	60
LV Cables – XLPE (Pre 1985/Post 1985)	45/55
LV Cables - PILC	70
LV Lines - Wood	45
LV Lines - Concrete	60



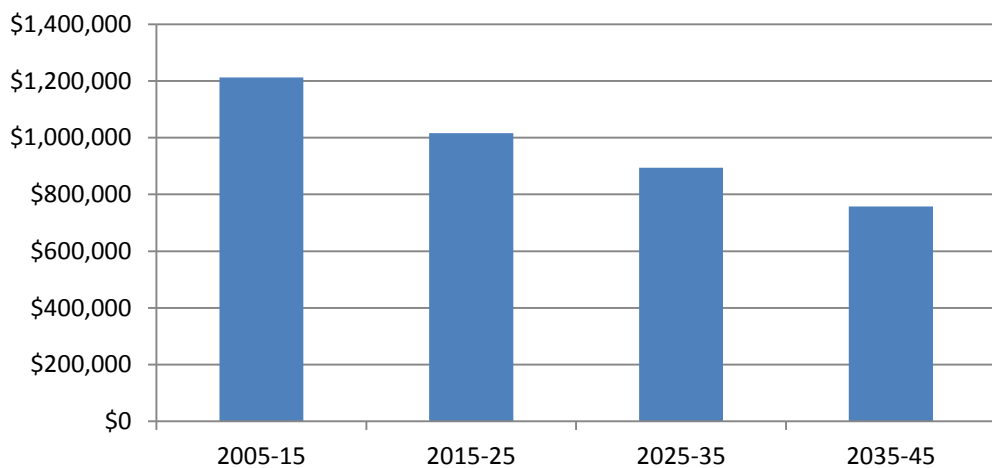
### Estimated Overall Asset Renewal Costs

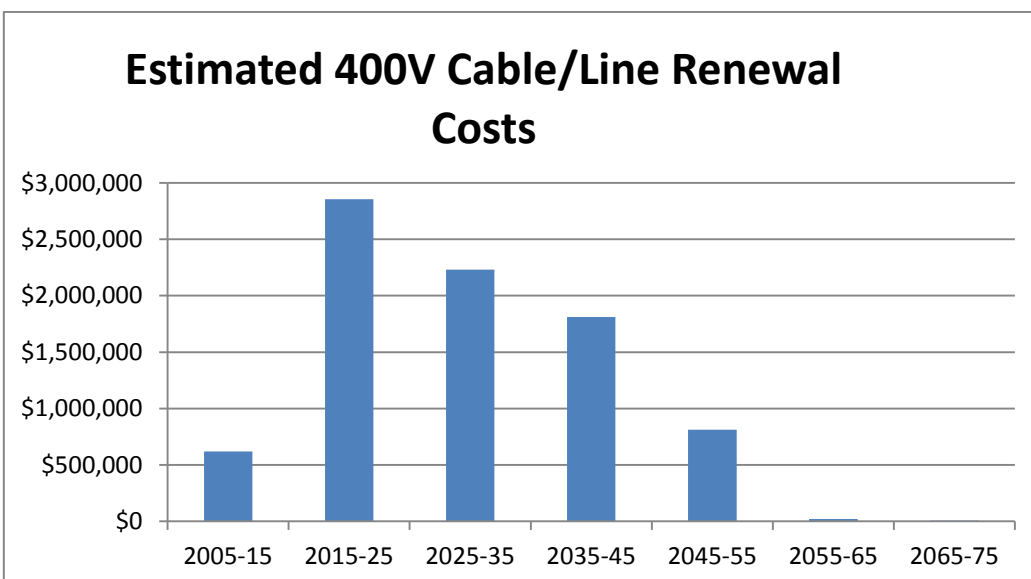
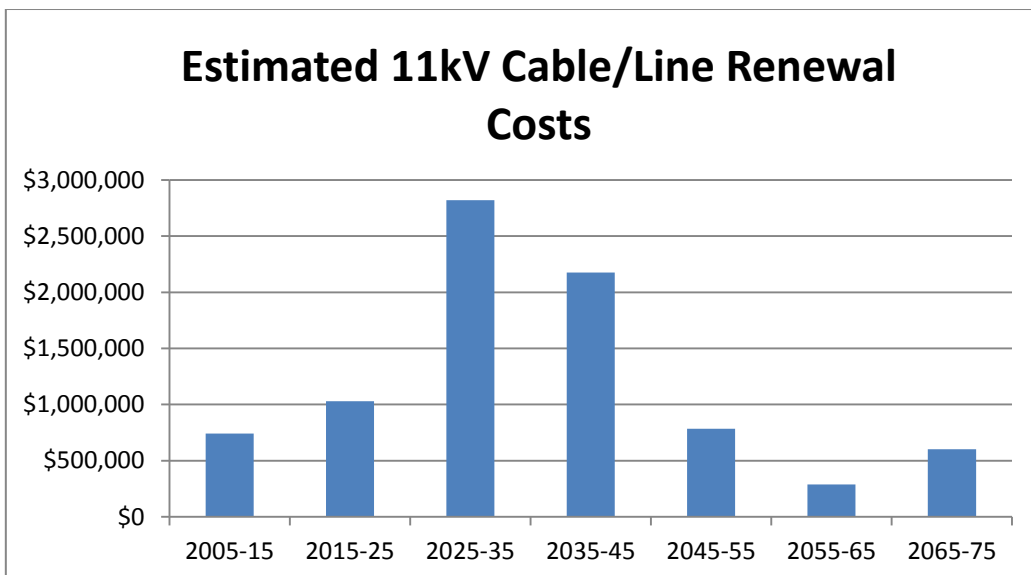
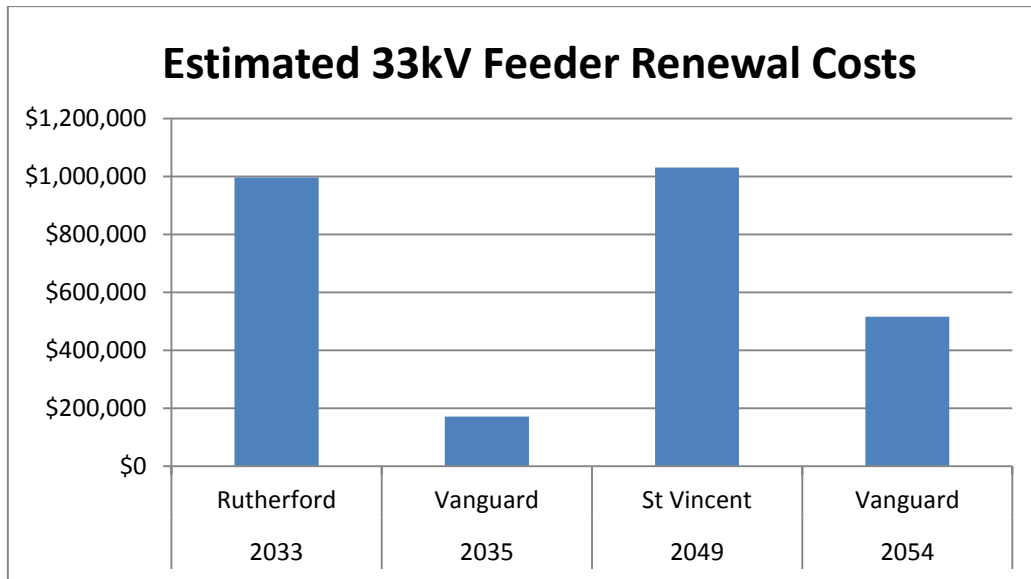


### Estimated Transformer Renewal Costs



### Estimated HV Switchgear Renewal Costs





## Secondary Assets

Also of significant importance to the operation of the network are Secondary Assets such as buildings, SCADA, Ripple Generators and Switchyards. These assets are also audited on a regular basis and, where required, maintenance or replacements are scheduled. The overlay to the life cycle of these assets is based on the standard physical asset lives as outlined in the Electricity Distribution Services Input Methodologies Determination 2012.

### Standard ODV Asset Life Table

Asset Type	Standard Life (Years)
Ripple Injection Plant	20
SCADA	15
Switchyard Structure - Concrete	60
Buildings	70

**Ripple Injection Plant** – The two existing ripple generators are scheduled for replacement in the 2013-2014 financial year. The existing generators have given over 40 years of service but regular vibration testing has indicated signs of wear and so modern equivalents will be installed.

**SCADA** – The present system is less than five years old and being gradually extended to provide more feedback from the network operations.

**Switchyard** – The existing structures mostly date back over 50 years but are showing few signs of deterioration. This will be replaced with the new indoor Zone Substation at Haven Road by 2014.

**Buildings** – The oldest of the existing buildings was constructed in the 1950s and are generally in sound condition. Additional earthquake bracing was installed in 2009.

## 3.6 Non-Asset Solutions

Evaluation of appropriate non-asset solutions is a key strategy in the deferment, minimization or elimination of capital and maintenance spend otherwise required in the acquisition of assets for maintaining, reinforcing or extending the existing network.

The objectives of this policy statement are to ensure:

- Integration of non-asset options in long term asset development planning;
- Evaluation of non-asset options in the day to day implementation of network operations;
- That the non-asset solutions contribute to the achievement of Key Performance Indicators.

Application of the above criteria reinforces a discipline in lateral thinking and enhances the end objective of a best-cost solution for network investment decisions by the network management team and company directors.

Nelson Electricity assesses non-asset solutions on a case by case basis. Many of the options introduced are within the network but there are some that include consumer involvement. Given the network is dense urban, there is limited opportunity for some solutions like distributed generation.

The following solutions have been implemented and continue to be reviewed as an option for the future:

- Load control is used to reduce demand peaks. This is being used to not only minimise transmission costs but also to maximise the utilisation of existing assets and deferring the need for asset replacement. It is also used through differential pricing to provide incentives for consumers to minimise peak demand loads which can remove the need for consumer capacity upgrades or provide additional spare capacity to be used elsewhere. Load control has been used in

New Zealand extensively and still proves the most cost effective way to manage electricity peaks at a distribution network level. Nelson Electricity is currently reviewing the effectiveness of load control and will be replacing the system in 2013.

- Power factor correction is installed at Haven Road Zone Substation. This improves the loads on the 33kV sub-transmission feeders maximising the N-1 security of supply. The introduction of power factor pricing has also encouraged larger consumers to improve power factor on their sites further increasing the performance of not only their supply but also the NEL network. This investment decision has deferred the requirement of an additional 33kV feeder at a cost of \$2 million for three years. Power factor charges have been implemented into the line charges for Time of Use consumers to encourage large consumers with poor power factor to improve, thus improving the performance of the network and potentially delaying some infrastructure upgrades.
- Demand Side Management. In addition to load control, Nelson Electricity has agreements in place with select major consumers in the event of a major outage during peak winter times to minimise/reduce load. This provides additional capability to maintain supply to the entire NEL network. This non-network solution has been used to minimise the overall network peak or constraint but consideration for this option for internal network constraint is also an option but it is likely there will be limited opportunity. Given this is a contractual situation it is not considered a viable long term solution.
- Some capacity upgrades have also been deferred by load shifting across the network. Some as simple as shifting breakpoints on the HV or LV system depending on where the potential constraint is. This option is looked at on an annual basis by balancing load across transformers or 11kV feeder catchments. This has proven to be effective to ensure the n-1 security of supply standard is maintained on the 11kV network.

Non-network opportunities will continue to be looked at as an alternative to investment in the network.

### **3.7 Distributed Generation**

Nelson Electricity recognises the value of distributed generation in the following ways:

- Reduction of peak demand at Transpower Grid Exit Points (only if used for generation at peak times);
- Reducing the effect of existing network constraints;
- Avoiding investment in additional network capacity;
- Contributing to supply security;
- Making better use of local primary energy resources thereby avoiding line losses;
- Decreased line losses through smaller generation closer to load;
- Avoiding the environmental impact associated with large scale power generation.

Nelson Electricity also recognises that distributed generation can have the following undesirable effects:

- Increased fault levels requiring protection and switchgear upgrades;
- Potential stranding of assets, or at least part of an asset's capacity, if significant levels of generation are installed.

Despite the potential undesirable effects, Nelson Electricity will facilitate the development of distributed generation that will benefit both the generator and Nelson Electricity. The key requirements for those wishing to connect distributed generation to the network broadly fall under the following headings.

### **3.8 Environmental Considerations**

Consideration for any distributed generation option must be given to any environmental impacts in the area ie; noise, air pollution, visual impacts.

### **3.9 Connection Terms and Conditions (Commercial)**

- Connection of distributed generation up to 10kW to an existing connection will not incur any additional line charges. Connection of distributed generation greater than 10kW to an existing connection may incur additional costs to reflect network reinforcement, which can be either on a full, up-front basis or over time. Costs charged under either method are likely to be capped by Regulation.
- Distributed generation that requires a new connection to the network will be charged a standard connection fee and may also be charged a fee to reflect reinforcement of the network back to the next transformation point.
- An annual administration fee will be payable by the connecting party to Nelson Electricity.
- Installation of suitable metering (refer to technical standards below) shall be at the expense of the distributed generator and its associated energy retailer.
- Nelson Electricity is happy to recognise and share the benefits of distributed generation in reducing its own costs (such as transmission costs or deferred investment in the network) provided the distributed generation is of sufficient size to provide real benefits.
- Those wishing to connect distributed generation must satisfy Nelson Electricity that a contractual arrangement with a suitable party is in place to consume all injected energy.

### **3.10 Safety Standards**

- A party connecting distributed generation must comply with any and all safety requirements promulgated by Nelson Electricity.
- Nelson Electricity reserves the right to physically disconnect any distributed generation that does not comply with such requirements.

### **3.11 Technical Standards**

- Metering capable of recording both imported and exported energy must be installed. If the owner of the distributed generation wishes to share in any benefits accruing to Nelson Electricity, such metering may need to be half-hourly.
- Nelson Electricity may require a distributed generator of greater than 10kW to demonstrate that operation of the distributed generation will not interfere with operational aspects of the network, particularly such aspects as protection and control.
- All connection assets must be designed and constructed to technical standards not dissimilar to Nelson Electricity's prevailing asset management standards.

### ***3.12 Re-deployment and Upgrade of Existing Assets***

Nelson Electricity has a policy of re-deploying assets into functions matching each assets dimension. In particular, Nelson Electricity re-deploys distribution transformers to better match rating with maximum demand.

### ***3.13 Acquisition of New Assets***

The acquisition of assets (materials, equipment or apparatus) for network expansion, renewal or maintenance requires careful optimization of capital resources. To optimize the investment decisions, formal evaluation criteria shall be used that applies dollar values to a standard formula or framework. The basis of, and the ground rules for these assumptions, require definition and valuation within an appropriate financial model.

The economic evaluation process will enable full consideration of conventional and nebulous economic factors which are often difficult to place a dollar value on. For example, quality, reliability, life, costs of non-supply, customer impacts, SAIDI, risks liability (such as wind return periods, likelihood of a given incident occurring, etc). The results will be output to standardized formats evaluating net present value and economic value added for capital and maintenance investments.

This policy is supported by life cycle costing models for inclusion in the overall economic evaluation process, which considers the following issues:

- Remaining life strategies for aging network equipment;
- New equipment total life cycle costs as part of materials procurement;
- New technology;
- Project tender evaluations.

Application of the above criteria reinforces a discipline in lateral thinking and enhances the end objective of a best-cost solution for network investment decisions by the network management team and company directors.

### ***3.14 Adoption of New Technology***

Because Nelson Electricity is very small business and because of the Commerce Commission's revenue constraints, Nelson Electricity seeks to avoid the exposure of adopting leading edge technologies, preferring instead to adopt only proven technologies that are used by other network utilities for vendor support to be maintained in New Zealand. Where appropriate, Nelson Electricity takes advantage of the advice and recommendations from its shareholders Network Tasman and Marlborough Lines with regard to the asset type selection.

### ***3.15 Disposal of Existing Assets***

Assets deemed unsuitable for redeployment on the basis of condition, capacity or technology will be disposed of in an environmentally sensitive manner.

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## SECTION 4 - Service Levels

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### 4.1 Reliability and Performance

Nelson Electricity's goal is to have a network reliability and performance consistent with other networks of similar kind in New Zealand while also meeting consumer expectation.

The aim is for continual improvement of network reliability and performance even with the restrictions and limitations of a regulated environment. Nelson Electricity has selected target levels which it believes are acceptable for the size of the network.

Consultation through a recent customer survey indicates that the present service levels are acceptable and that changes to charges to improve the level are not seen as necessary. All stakeholder interests in reliability versus the costs to improve the reliability of the network - the Unplanned Target - is reviewed annually and altered accordingly.

The Nelson Electricity network is dense urban and predominantly underground. Fault response times are minimised as first response fault men live close to the network. Fault diagnosis and restoration is minimised due to the meshed type 11kV and 400V system allowing for back-feeding of areas affected by a fault. The performance levels are set taking this into account.

Although the Nelson Electricity service levels are acceptable this can be expected to decline unless replacement of aging assets and maintenance levels continue. Nelson Electricity will seek to do this within any pricing limitations imposed by the Commerce Commission.

Reliability and performance are gauged by the following standard industry measures.

**NOTE 1:** The forecasted figures do not include Transpower related interruptions as Nelson Electricity does not have any influence over them.

**NOTE 2:** Year end is 31 March 2012 for "actual" figures and 31 March 2013 for "forecast" figures.

**NOTE 3:** The industry average figures do not include the Orion Network given these figures were not available.

It will be noted that the actual figures for planned interruptions (Class B) has been significantly higher than the target figures in 2009 and 2010. This can be attributed to the planned replacement of Series 1 Andelect HV switches. Other planned events affecting the planned figures during those two years have been transformer changes due to increased load and oil condition. The years 2010-2011, 2011-2012 and 2012-2013 were typically normal with regard to the planned interruptions undertaken.

### ***Justification for Target Levels of Service***

Nelson Electricity has extremely high levels of reliability compared to the industry, but considers them to be in line with other networks of similar kind. The network is dense urban and predominantly underground. As such there is an expectation of high reliability. Most networks in New Zealand have a significant proportion of rural overhead lines and so it is difficult to directly compare network reliability statistics.

Nelson Electricity believes the levels, as outlined above, are a fair measure when compared to the dense urban portions of networks throughout New Zealand as these areas typically have more back-feed options, more automation and are closer to where the fault staff are based. Nelson Electricity does constantly review its target figures based on network performance over recent years whilst taking into account extreme events and any particular planned projects that may have unduly distorted annual figures.

The average SAIDI figures for the last six years of operation show that the Planned Interruptions (Class B) were 20 and the Unplanned Interruptions (Class C) were 43. Therefore, it is believed that the Class B target of 15.00 and Class C target of 30.00 are not unreasonable. Even so, both average figures have been marginally influenced by significant events and projects and so there may be justification for the target values to be lowered in future years.

The average NEL SAIFI Class C figure for the last six years was 0.55 and the NEL Target is 0.6 and so the target is achievable. The combined Class B and C target is 0.9 which is well below the industry average for 2011 which was 2.3.

The average overall NEL CAIDI figure for the last six years was 91.35, which does not compare so well to the NEL target of 50 minutes or the industry average of 86 minutes. On further analysis it was noted that the target figure has not been achieved in the past nine years even during good years. Perhaps this target is unrealistic for such a small and dense network and that an adjustment to 70 or 80 minutes should be considered.

Consumer surveys indicate that they are mostly happy with current reliability and do not want to pay more for increased reliability and conversely do not want to pay less for a less reliable supply. These findings have to be tempered by the fact that consumers do not differentiate between retailer, electricity networks or transmission. To them a power outage is a power outage.

We believe that the target levels of service generally satisfy both the consumer expectation and the comparison of dense urban parts of other networks, but perhaps the CAIDI Target needs further consideration.

## ***Continual Improvement***

Nelson Electricity aims to continually improve the Asset Performance Standards with assistance from:

- Shareholders;
- Energy traders;
- Major customers;
- Other stakeholders.

A full description of Asset Performance Standards is covered in section 7.5.

In the Standard Use of System Agreement the supply to the consumer's point of supply will only be interrupted intentionally for reasons of:

- Planned outages;
- Inspections, maintenance or alterations;
- Safety;
- Protection of Nelson Electricity's or other networks;
- Protection of the consumers quality of supply;
- Transpower instruction;
- Providing remote signal services;
- Response to an event of Force Majeure.

Where supply to the consumer's point of supply is to be interrupted Nelson Electricity shall:

- Where possible, give seven days' notice to retail companies for planned shutdowns;
- Advise the energy trader of the duration time and consumer affected in the event of unplanned outages;
- Consult with the energy trader where Transpower requests an interruption;
- Act in accordance with good industry practice at all times.

The Use of System Agreement requires that the consumer's equipment or demand does not interfere with the supply to other network users.



Nelson Electricity has a target of supplying all consumers with a quality of supply that meets or exceeds the standards set in the Electricity Regulations and in other industry codes of practice and, furthermore, will provide alternative levels of supply, quality and price for customers who are prepared to enter into commercial contracts. Measures of quality of supply are voltage magnitude, harmonic level and interference.

During times of peak loading in winter voltage checks are made throughout the network at substations and end of line boxes and poles. Data gathered is entered into the Office Management System, the results analysed and identified problems are rectified.

The likelihood of a new connection to the network causing interference to other users is assessed at the time of application. Guidelines, which address harmonics and interference, are contained in the NEL Network Code. Harmonics and interference are typically reported by the consumer, resulting in testing and recordings being made at the consumer's premise and on the network.

## 4.2 SAIDI - System Average Interruption Duration Index

SAIDI is the measure of the number of minutes that a customer on the network is without power per year. The formula is outlined below.

$$\frac{\text{Sum of [No. of Interrupted Consumers x Interruption Duration]}}{\text{Total Number of Connected Consumers}}$$

Over the last three years the NEL network has had an average of 74 minutes interruption of supply per consumer per year. It should be noted that one outage has a significant impact on the SAIDI minutes given the size of the NEL network. The industry average for 2011 was 195 (Average excludes Orion Network).

**NOTE:** As the year end 31 March 2013 is not complete, a 2013 forecast figure has been entered into the following tables.

As can be seen, the NEL total forecast figures were lower than the total target figures for 2013, but the Planned and Unplanned figures differ slightly from the target.

### SAIDI

	Year End	Transpower Planned	Transpower Unplanned	Transpower Total	NEL Planned	NEL Unplanned	NEL Total	Overall SAIDI
Actual	2003	0.00	0.00	0.00	27.00	72.00	99.00	99.00
Actual	2004	0.00	0.00	0.00	7.00	46.00	53.00	53.00
Actual	2005	0.00	0.00	0.00	12.00	39.00	51.00	51.00
Actual	2006	0.00	101.00	101.00	12.00	10.00	22.00	123.00
Actual	2007	0.00	215.00	215.00	9.00	16.00	25.00	240.00
Actual	2008	0.00	0.00	0.00	5.00	12.00	17.00	17.00
Actual	2009	0.00	70.00	70.00	29.00	87.00	116.00	186.00
Actual	2010	0.00	90.00	90.00	54.00	25.00	79.00	169.00
Actual	2011	0.00	0.00	0.00	9.00	106.00	115.00	115.00
Actual	2012	0.00	0.00	0.00	9.00	54.00	63.00	63.00
Present Target	2013	0.00	0.00	0.00	15.00	30.00	45.00	45.00
FORECAST	2013	0.00	0.00	0.00	9.00	34.00	43.00	43.00
Future Target	2014	0.00	0.00	0.00	15.00	30.00	45.00	45.00
Future Target	2015	0.00	0.00	0.00	15.00	30.00	45.00	45.00
Future Target	2016	0.00	0.00	0.00	15.00	30.00	45.00	45.00
Future Target	2017	0.00	0.00	0.00	15.00	30.00	45.00	45.00
Future Target	2018	0.00	0.00	0.00	15.00	30.00	45.00	45.00
Future Target	2019	0.00	0.00	0.00	15.00	30.00	45.00	45.00
Future Target	2020	0.00	0.00	0.00	15.00	30.00	45.00	45.00
Industry 2011 Average								195.00



The targets forecasted are at an achievable level given the predominantly dense urban network. The issue with this measure is that one fault can have a significant impact on results. The network development undertaken in recent years, including automating the 33kV feeder supplies and reinforcement of 11kV feeders from Haven Road, will help to reduce the impact of a single fault and make these targets achievable.

### 4.3 SAIFI - System Average Interruption Frequency Index

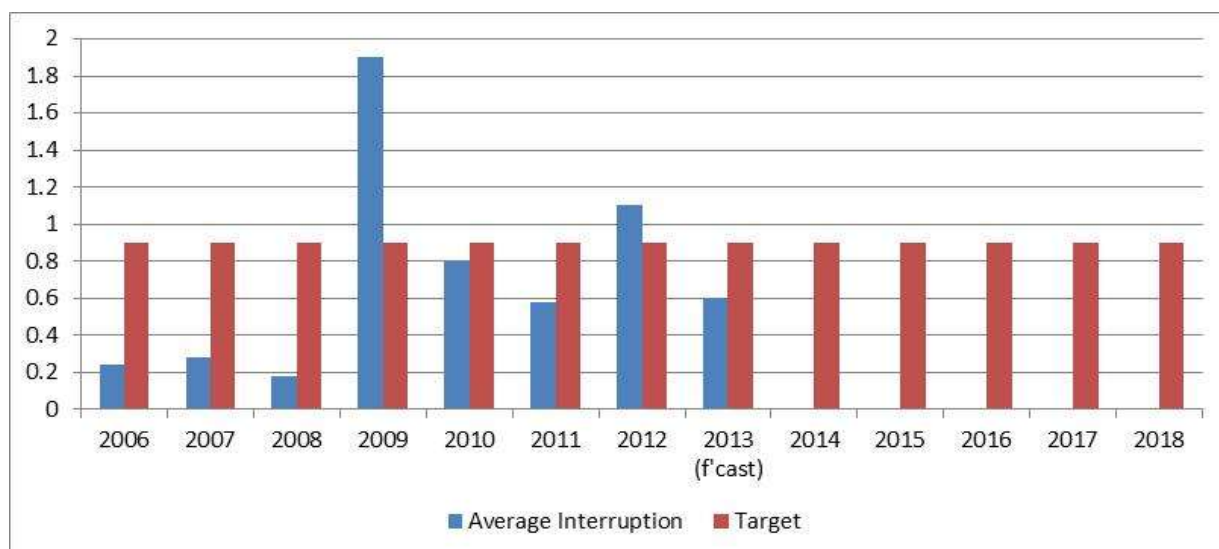
SAIFI is the average number of interruptions of supply that a consumer experiences per year. The formula is outlined below.

$$\text{SAIFI} = \frac{\text{Sum of [No. of Interrupted Consumers]}}{\text{Total Number of Connected Consumers}}$$

The Nelson Electricity network has had an average of 0.072 interruptions of supply per consumer over the past two years. The industry average for 2011 was 2.3. However, the actual figures for 2012 and forecast for 2013 shows continuing improvement. The implementation of 400V back-feeding has continued to hold the Planned SAIFI figures well under the target.

#### SAIFI

	Year End	Transpower Planned	Transpower Unplanned	Transpower Total	NEL Planned	NEL Unplanned	NEL Total	Overall SAIFI
Actual	2003	0.00	0.00	0.00	0.16	1.27	1.43	1.43
Actual	2004	0.00	0.00	0.00	0.28	0.47	0.75	0.75
Actual	2005	0.00	0.00	0.00	0.09	0.75	0.84	0.84
Actual	2006	0.00	1.99	1.99	0.08	0.16	0.24	2.24
Actual	2007	0.00	1.99	1.99	0.06	0.21	0.28	2.26
Actual	2008	0.00	0.00	0.00	0.03	0.15	0.18	0.18
Actual	2009	0.00	1.00	1.00	0.20	1.70	1.90	2.90
Actual	2010	0.00	1.00	1.00	0.18	0.58	0.76	1.76
Actual	2011	0.00	0.00	0.00	0.042	0.54	0.58	0.58
Actual	2012	0.00	0.00	0.00	0.05	1.05	1.1	1.1
Target	2013	0.00	0.00	0.00	0.3	0.6	0.9	0.9
FORECAST	2013	0.00	0.00	0.00	0.04	0.51	0.55	0.55
Future Target	2014	0.00	0.00	0.00	0.30	0.60	0.90	0.90
Future Target	2015	0.00	0.00	0.00	0.30	0.60	0.90	0.90
Future Target	2016	0.00	0.00	0.00	0.30	0.60	0.90	0.90
Future Target	2017	0.00	0.00	0.00	0.30	0.60	0.90	0.90
Future Target	2018	0.00	0.00	0.00	0.30	0.60	0.90	0.90
Future Target	2019	0.00	0.00	0.00	0.30	0.60	0.90	0.90
Future Target	2020	0.00	0.00	0.00	0.30	0.60	0.90	0.90
Industry 2011 Average								2.30



Nelson Electricity has a low number of faults on the network due to the high proportion being underground cabling. In past years a 33kV feeder fault would severely impact on numbers of consumers affected. With this risk alleviated due to the automation of the three 33kV feeders, Nelson Electricity should be able to maintain a SAIFI below 1.00.

#### 4.4 CAIDI - Customer Average Interruption Duration Index

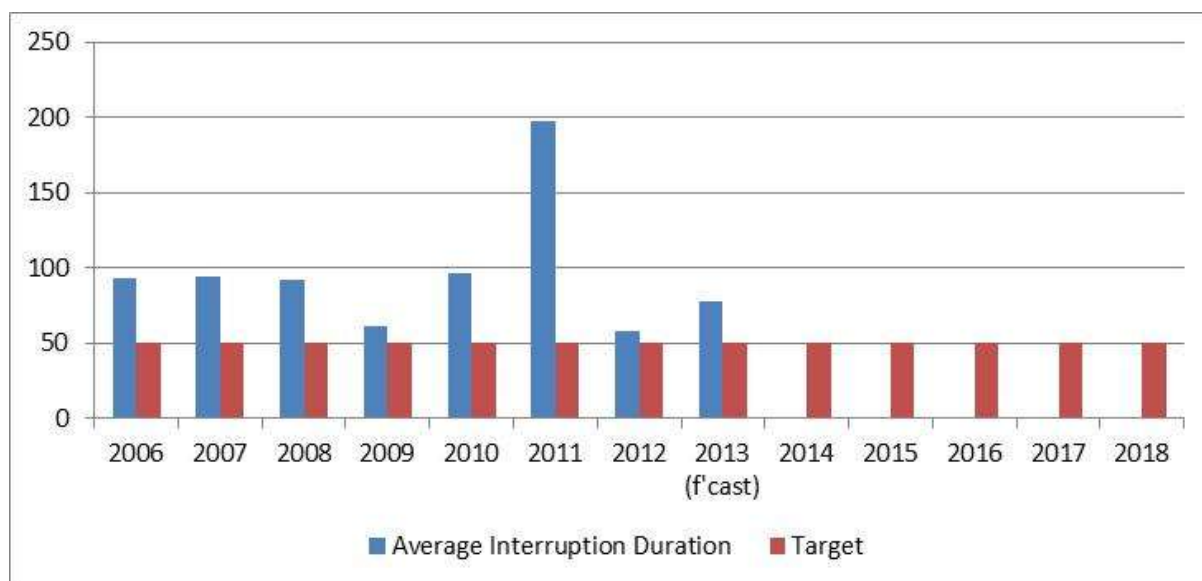
CAIDI is the average duration of an interruption of supply for consumers who experienced an interruption of supply in a year. The formula is outlined below.

$$\text{CAIDI} = \frac{\text{Sum of [No. of Interrupted Consumers x Interruption Duration]}}{\text{Sum of [Number of Interrupted Consumers]}}$$

The Nelson Electricity network had average interruption duration of 157 minutes over the last two years. The industry average was 86.00 for 2011. The actual figure for 2012 shows improvement on previous years with planned outages the main influence away from target.

##### CAIDI

	Year End	Transpower Planned	Transpower Unplanned	Transpower Total	NEL Planned	NEL Unplanned	NEL Total	Overall CAIDI
Actual	2003	0.00	0.00	0.00	171.10	56.90	69.80	69.80
Actual	2004	0.00	0.00	0.00	23.40	99.40	70.80	70.80
Actual	2005	0.00	0.00	0.00	135.40	51.70	60.40	60.40
Actual	2006	0.00	50.20	50.20	161.00	61.90	93.30	54.80
Actual	2007	0.00	107.36	107.36	158.45	77.06	94.60	105.80
Actual	2008	0.00	0.00	0.00	159.00	79.00	91.80	91.80
Actual	2009	0.00	70.00	70.00	134.00	52.00	61.00	64.00
Actual	2010	0.00	90.00	90.00	300.00	43.00	104.00	96.00
Actual	2011	0.00	0.00	0.00	214.00	197.00	198.00	198.00
Actual	2012	0.00	0.00	0.00	201	51.00	58.00	58.00
Target	2013	0.00	0.00	0.00	50.00	50.00	50.00	50.00
FORECAST	2013	0.00	0.00	0.00	228.00	65.00	77.00	77.00
Future Target	2014	0.00	0.00	0.00	50.00	50.00	50.00	50.00
Future Target	2015	0.00	0.00	0.00	50.00	50.00	50.00	50.00
Future Target	2016	0.00	0.00	0.00	50.00	50.00	50.00	50.00
Future Target	2017	0.00	0.00	0.00	50.00	50.00	50.00	50.00
Future Target	2018	0.00	0.00	0.00	50.00	50.00	50.00	50.00
Future Target	2019	0.00	0.00	0.00	50.00	50.00	50.00	50.00
Future Target	2020	0.00	0.00	0.00	50.00	50.0	50.00	50.00
Industry 2011 Average								86.00



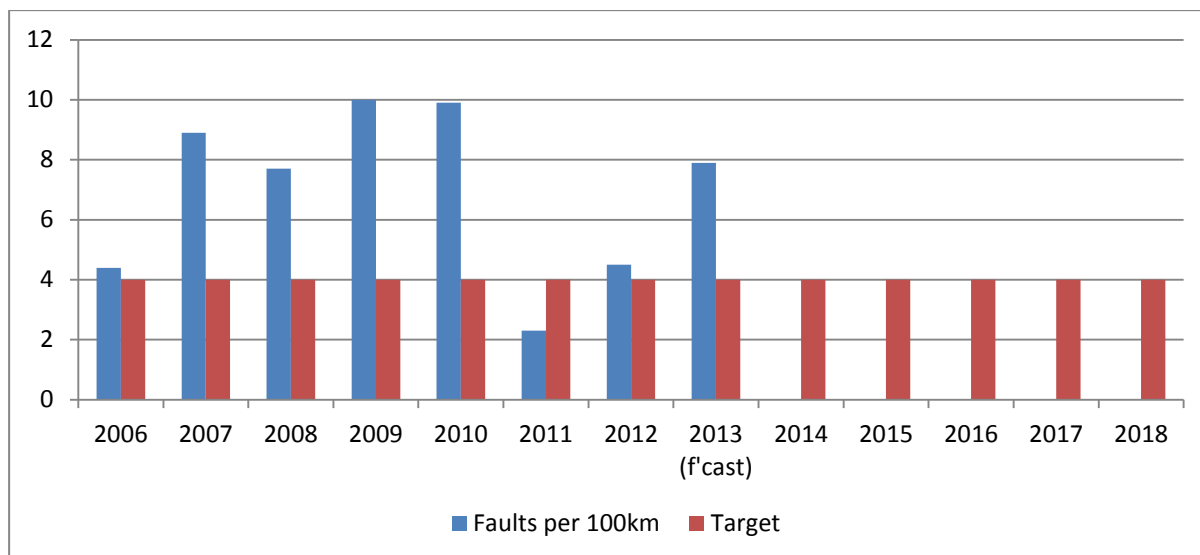
CAIDI is impacted more by Planned Outages. Any planned outage is managed to ensure outage time is at a minimum. This is, however, typically more than an hour. With dense urban network most unplanned outage areas can be back-fed from another supply reducing the duration. The balance of the planned (low numbers of consumers, long duration) and unplanned (high numbers of consumers, shorter duration) make the targets achievable. Any extra planned outages in any given year may affect this.

#### 4.5 Number of Faults per 100 Kilometres of Network

This is a measure of the number of faults in relation to the total length of the network.

In the last two years Nelson Electricity has had an average of 6.0 faults per 100 kilometres of line per year. The industry average was per 100 kilometres of line for 2011 was 9.3.

Faults per 100 km of line		
	Year End	Total
Actual	2004	9.80
Actual	2005	13.60
Actual	2006	4.40
Actual	2007	8.90
Actual	2008	7.70
Actual	2009	9.96
Actual	2010	9.94
Actual	2011	2.27
Actual	2012	4.54
Target	2013	4.00
Forecast	2013	
Future Target	2014	4.00
Future Target	2015	4.00
Future Target	2016	4.00
Future Target	2017	4.00
Future Target	2018	4.00
Future Target	2019	4.00
Future Target	2020	4.00
2011 Industry Average		9.29



The target set is a difficult level to achieve. Nelson Electricity is a small network and any fault has a severe impact on this. In previous years the performance levels have been affected by contractors digging up cables. An added awareness campaign on usage of cable locations and safety observers looks to have reduced the number of these types of cable faults. During 2012 two of the faults on the 11kV network were caused by contractors and were avoidable. The other two were attributed to forces of nature.

The target of four faults per 100 kilometres of line is a target set based on the theoretical best performance of an underground type network. It has to be noted that many faults that occur are not network related but more third party or contractor related. Nelson Electricity has attempted to minimise this and will continue to educate contractors and public on electricity network risks.

## 4.6 Asset Performance

Nelson Electricity's asset performance is in line with typical failure rates of assets throughout New Zealand. The table below is a summary from the "Electricity Engineers Association Guidelines for Security of Supply in New Zealand Electricity Networks" June 2000.

As Nelson Electricity is a small network a single failure has a significant effect on failure statistics and trends must be taken by comparing at least five years of failures. Currently, Nelson Electricity averages two 11kV/400V transformer failures per year but has had no 11kV switch failures in the last five years.. The cable and line failure rates are also in line with the table.

**Typical Failure Rates of Assets**

Item	Typical Failure Rate	
	Rate	Per
33kV Pole Lines	57	100 cct km/year
11kV Pole Lines	26	100 cct km/year
33kV Cables	0	100 km/year
11kV Cables	6	100 km/year
33kV/11KV Transformers	0	1000/units/year
11kV/ 400V Transformers	2	1000/units/year
11kV Indoor Switchgear	0	1000/units/year
11kV Outdoor Switchgear	0	1000/units/year

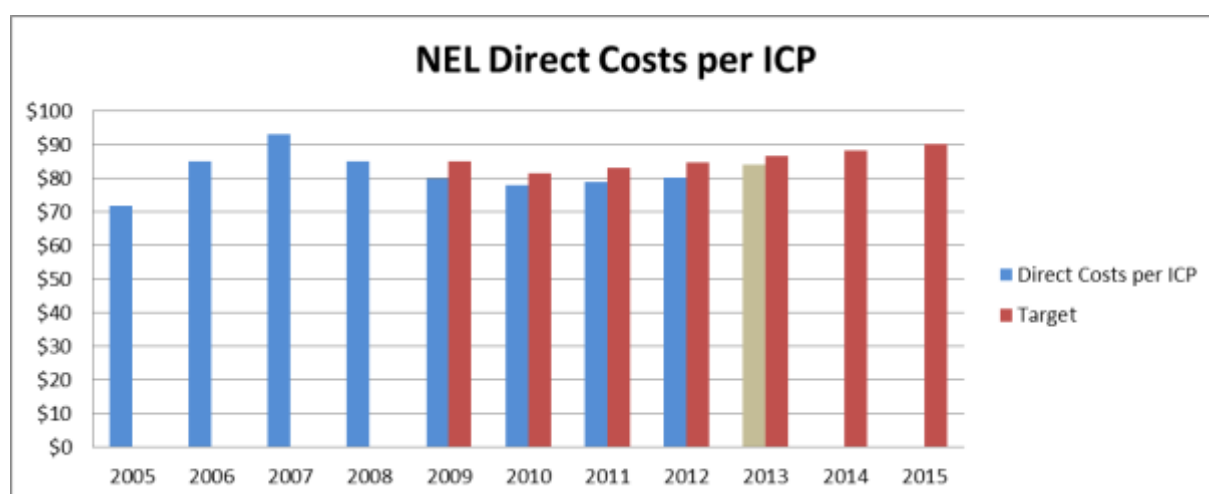
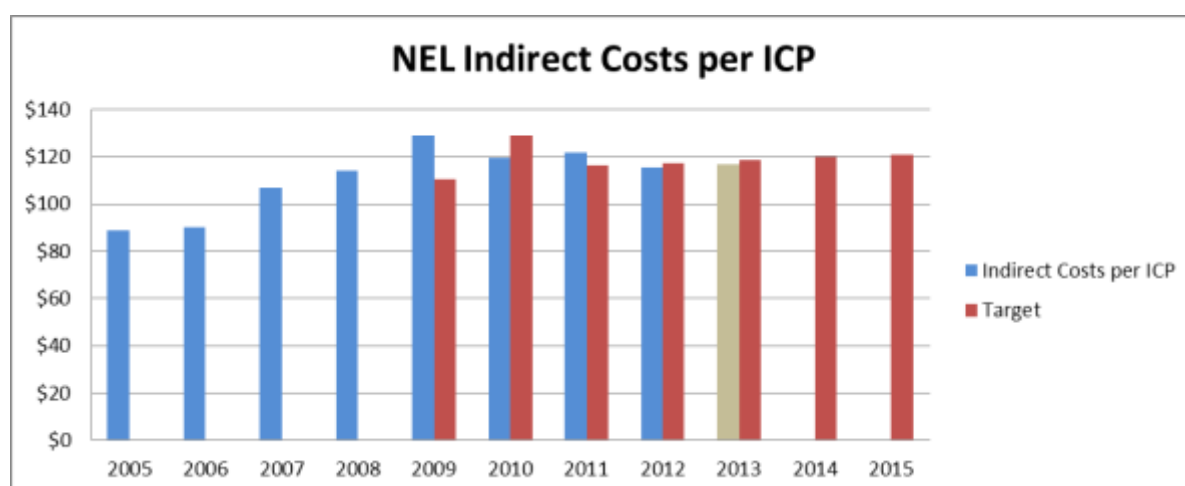
## 4.7 Financial Performance

The most appropriate financial target measures for Nelson Electricity are the Direct and Indirect costs per connection point. It is, however, difficult to compare financial network performance with other networks given that these measures vary greatly depending on the type of network.

	Industry Ave 2008	2007	2008	2009	2010	2011	2012	2013 Forecast
<b>Indirect Cost per ICP</b>	\$87	\$107	\$114	\$129	\$119	\$122	\$116	\$117
<b>Direct Cost per ICP</b>	\$125	\$93	\$85	\$80	\$78	\$79	\$80	\$84

Direct and indirect costs per ICP are overall in line with targets for 2013. Nelson Electricity will be aiming to decrease indirect costs per ICP back by 1% per year (allowing for CPI adjustments) over the planning period. This will reflect the improved efficiency of the management of the network. Offsetting this is the increasing compliance costs associated with being a regulated business.

Direct costs have also reduced compared to the previous year and also below target. The costs experienced by Nelson Electricity for works undertaken in Nelson city have increased significantly over the last few years. There is an expectation they will increase further given the additional requirements and warranties required by the Nelson City Council. Although Nelson Electricity currently does not have a full appreciation of the increases Nelson Electricity will attempt to maintain direct costs per ICP at 2010 levels for the planning period (allowing for CPI adjustments).



## 4.8 Improvements

As shown above, Nelson Electricity has a reasonably high reliability and performance level compared to the industry average. The 2003 and 2005 figures have been adversely affected as a result of an uncharacteristic number of cable faults caused by contractors. The 2006, 2007, 2009 and 2010 figures were significantly affected by Transpower outages at Stoke, Kikiwa and Islington substations. To further improve reliability and performance Nelson Electricity is continuing to implement measures to reduce system interruptions further by the following:

- **33kV Improvements**

NEL has completed the automating of switching for the three 33kV feeders supplying Haven Road Zone Substation. This now avoids the 20 minute plus delay previously experienced to manually switch these feeders when there was a fault. This one improvement has improved Nelson Electricity's network reliability dramatically. Furthermore, NEL is at present, in the process of installing a fourth 33kV feeder from the Transpower grid exit point at Stoke Substation which will further reinforce the 33kV network and N-1 requirements. This cable is due to be laid and commissioned during 2013.

- **11kV Reinforcement**

Nelson Electricity is continually planning to improve the 11kV supply by investigating the following:

- Backup supply;
- Complete ring feed;
- Reduce risk of failure;
- Reduce any interruption time;
- Addressing excavation contractor issues;
- As part of the 33kV cabling project, NEL is taking the opportunity to lay spare ductlines for future underground 11kV reinforcement and extensions.

- **400V Improvement**

Nelson Electricity is progressively improving the flexibility of the 400V network by:

- Installing LV Bus Isolators on 11kV/400V substation LV Boards;
- Installing easy break sectionalisers on 400V lines;
- Installing NCP fusing in ground mounted boxes where possible;
- As part of the 33kV cabling project, NEL is taking the opportunity to lay spare ductlines for future underground 400V reinforcement and extensions.

- **Reducing Cable Faults**

Nelson Electricity continues to identify, audit and model cable performance and any cable not meeting standard or approaching overload will be scheduled for replacement or reinforcement.

Nelson Electricity has a number of faults every year attributable to cable damage caused by excavation contractors. Such incidents further reduce the reliability and integrity of the network due to additional cable joints and cable repairs. The Cable Location Contractors are authorised to perform all cable locations on the Nelson Electricity network. As part of this function, the Contractors are required to meet the excavation contractor on site prior to any excavation near a Nelson Electricity cable. If there is either a 33kV cable or an 11kV cable present, the Cable Location Contractors will encourage the excavation contractor to request that an Approved Observer is on site while the excavation is being carried out. Recent changes to Nelson Electricity policy means that an Observer is provided for free of charge for excavations of two hour duration. Nelson Electricity also keeps in contact with excavation contractors to ensure they are aware of any concerns Nelson Electricity may have.

Incidents, accidents and near misses are recorded internally in Nelson Electricity's register. Where required a letter is sent to OSH, for their information, advising of the incident/accident and the action taken by Nelson Electricity to correct or prevent a future occurrence. A report is also obtained from the contractors involved in the incident.

- **Reducing Planned Interruption Numbers and Duration**

Nelson Electricity is seeking to reduce the frequency and/or duration of planned interruptions and is continually looking at ways to minimise the numbers and duration of interruptions by the following:

- An audit is carried out prior to any shutdown to identify any additional works to be performed taking advantage of the shutdown. The result will give Nelson Electricity maximum benefit from any network shutdown, possibly reducing the requirement of future planned interruptions;
- Implement procedures, which will either eliminate the requirement for interruption or reduce the duration;
- Ensure maximum resources are allocated to the shutdown;
- Improvement of back feed options;
- Use of approved contractors for live HV and LV work.

It has to be recognised that live line work is more expensive to undertake. The level of live line work performed on the network will be monitored. Nelson Electricity will seek to do this within any pricing limitations imposed by the Commerce Commission.

- **Asset Life Cycle Audits**

Nelson Electricity strives to improve the asset life cycle audit process. Ongoing communication with other network companies will ensure processes are in line with best industry practice. This will ensure Nelson Electricity's ability to determine the best approach to asset management and ultimately reduce the possibility of interruption. Refer Audit Programme **Appendix A**.

Assets are audited at different frequencies depending on the type of asset:

- 33kV main substation(including transformers and OCBs)– weekly;
- Substations(including transformers and OCBs/switches) – six monthly;
- 33kV poles – two yearly;
- 11kV and 400v wood poles – three yearly;
- 11kV and 400v concrete poles – five yearly;
- Link boxes – two yearly visual safety, five yearly internal audit;
- Service boxes – two yearly visual safety, five yearly internal audit.

Nelson Electricity has comprehensive maintenance and development programmes which continue to aid in the improvement of the network. These plans attempt to maintain or improve the network security of supply.

- **Communication Links**

Nelson Electricity has installed radio telephone links between its major switching stations and the Zone Substation to enable accurate status reports to be available on the SCADA system. Where suitable circuit breakers are installed, these links have been utilised to allow remote switching at the major sites.

## **4.9 Quality of Supply**

Nelson Electricity has a target of supplying all consumers with a quality of supply that meets or exceeds the standards set in the Electricity Regulations and in other industry Codes of Practice. Additionally, Nelson Electricity will meet alternative standards of reliability and price for customers who are prepared to enter into contracts. The qualities of supply that are measured or monitored are:



- Voltage;
- Capacity utilisation;
- Load factor;
- Distribution losses;
- Power factor;
- Harmonics;
- Interference.

It is anomalous that if Nelson Electricity were to improve power factor by way of installing capacitors, it is unable to pass on the cost to consumers due to the current Price Path Threshold regulations, but if Power Factor was improved at the Transmission level these costs will be able to be passed on through the increase in transmission pricing.

## ***Voltage***

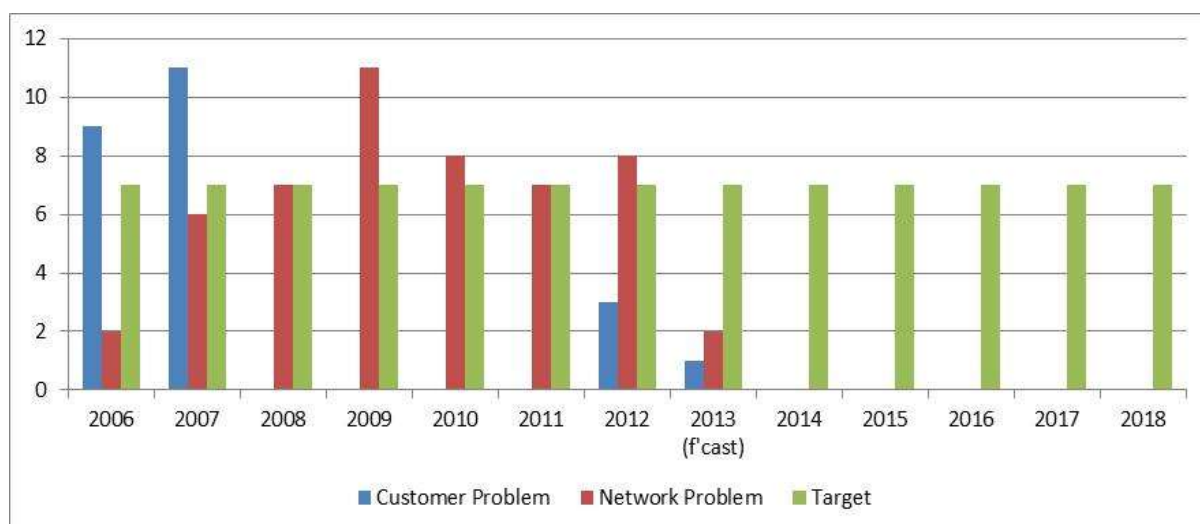
During times of peak winter loading, voltage snap shots are taken across the entire network. Voltage and load checks are made at all substations and recordings are made at substations and end of line boxes. Data is gathered at these points, entered for analysis into the Office Management System and any voltage or overload problems are scheduled for rectification.

## ***Fluctuating Voltage***

Regulations require voltage supplied to consumers to be 230 volts  $\pm 6\%$ . The network is designed to meet this requirement. There are, however, times where load changes can cause consumers to experience voltages outside of the requirements. Any complaints are investigated and, if proven, changes to the network are made to remedy the situation.

Nelson Electricity's target is to have no more than seven proven complaints received per year.

A comparison between target and the customer and network problems is shown in the table below.



If the network problem cannot be identified and rectified at the time of the complaint, a voltage recorder is installed at the Network Connection Point for a 24 hour period. Although voltage variations are sometimes detected by the recorder, they very seldom fall outside the tolerances allowed by the industry. For the year ending 31 March 2012, the network problems were traced to each of the following; faulty failed service fuses/holders and neutral conductor problems. Three of the 11 fluctuating voltages were found to be not genuine problems. All problems reported could be attributed to the 400 volt network and were rectified quickly.

The overall genuine problems reported for 2012 did not meet the target of seven proven complaints. At 1 January 2013 three fluctuating voltage faults had been reported of which one was not genuine, one was on a service line and one was a service fuse. In recent years there has been a gradual reduction in network related faults in this area and this trend is continuing.

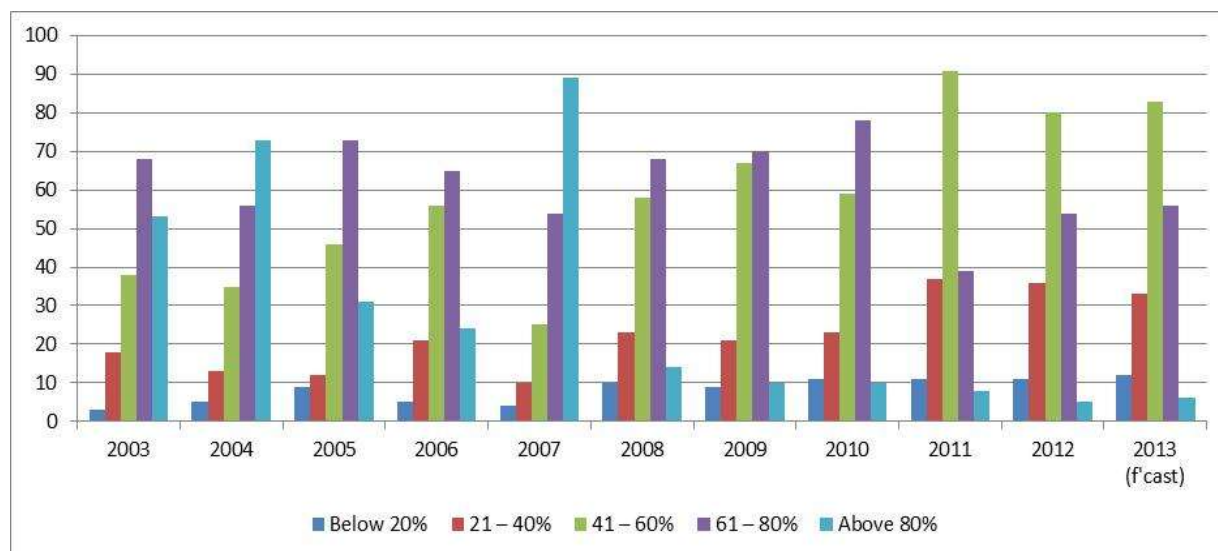
## Capacity Utilisation

Nelson Electricity has traditionally relied on Maximum Demand Indicators to record the loadings on key sections of the network. However, recent changes in the industry have resulted in networks being driven harder and so the accurate logging of data in areas previously covered by Maximum Demand Indicators is now becoming a necessity.

Nelson Electricity has installed Loggers onto its key 11kV feeders to read half-hourly loads. Similarly, portable loggers are installed temporarily at substations that are showing high loadings on the transformer or network cabling.

The figures indicated in the graph below are derived from the average Maximum Demand Indicator reading across the three phases at each 11kV/400V distribution transformer. The winter of 2006 was a significantly colder one than in previous years and this is reflected in the increased number of transformers shown to be more than 60% fully loaded but 2007 was significantly milder. (Note: On the graph the year 2007 covers the period 1/4/2006 to 31/3/2007 and, therefore, takes into account transformer loadings for the winter of 2006.)

In conjunction with load recording, transformer temperatures are typically monitored as part of the Planned Maintenance Programme. Where high temperatures are reported a portable logger is installed in order to provide more accurate information about the temperature and associated load of the transformer. If overheating is occurring the transformer will be programmed for replacement.



The key 11kV feeder loadings are logged every 10 minutes. It should be noted that the ratings of key feeder capacities have been downgraded to reflect the rating of cables partially installed in ducts rather than direct buried. Refer to the 11kV Feeder Loadings graphs in the Network Development section (section 5.1).

Overall network capacity utilisation is 34% which is 8% above industry average. The current level of capacity utilisation is considered satisfactory. This figure is affected by developer related projects, where the consultants over-estimate the supply requirements meaning larger transformers than actually necessary being installed. This reduces capacity utilisation. The target for the planning period is 37%.

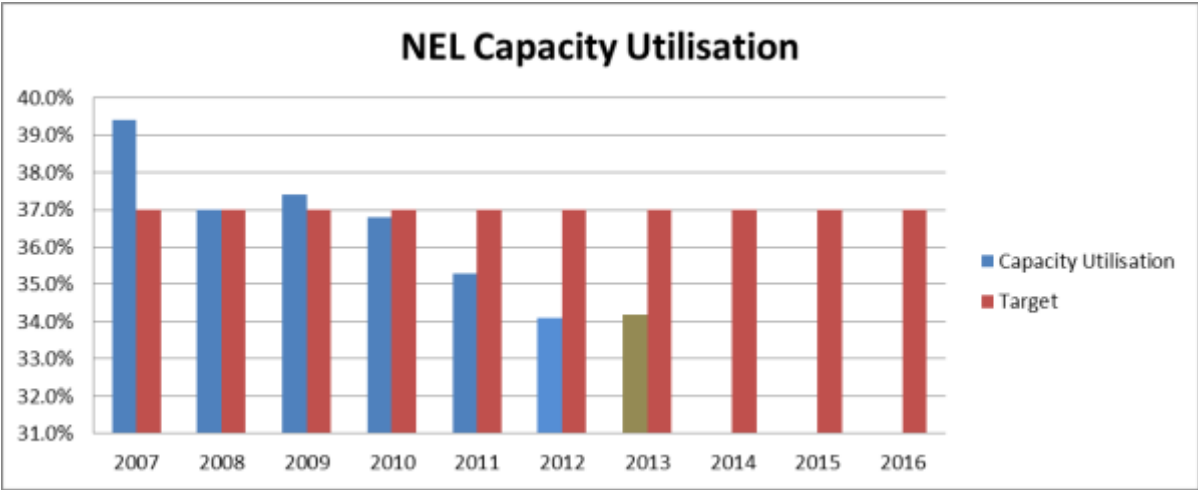
The forecasted 2013 level is 34.2%. This is mainly due to a reduced network maximum demand whilst installed distribution transformer capacity has remained stable. There are two ways this can improve, either an increase in network peak demand or reduction of installed transformer capacity. It is expected that the capacity utilisation will recover slowly as larger consumers do rationalise their supplies to cut costs. This will also have an impact on line charge revenue. It is unlikely that Nelson Electricity will downsize transformers elsewhere on the network unless there is a continuing decline in demand and there is a cost justification to do so. Any increase in peak demand will increase this factor.

Note that utilisation of ripple control does have an impact and the more it is used at peak demand times the lower the factor. Load control was heavily used during this peak time.

It may take some time to increase capacity utilisation back to the target of 37%.

Capacity utilisation is calculated by the following formula:

$$\frac{\text{Maximum Demand}}{\text{Transformer Capacity}}$$



### Load Factor

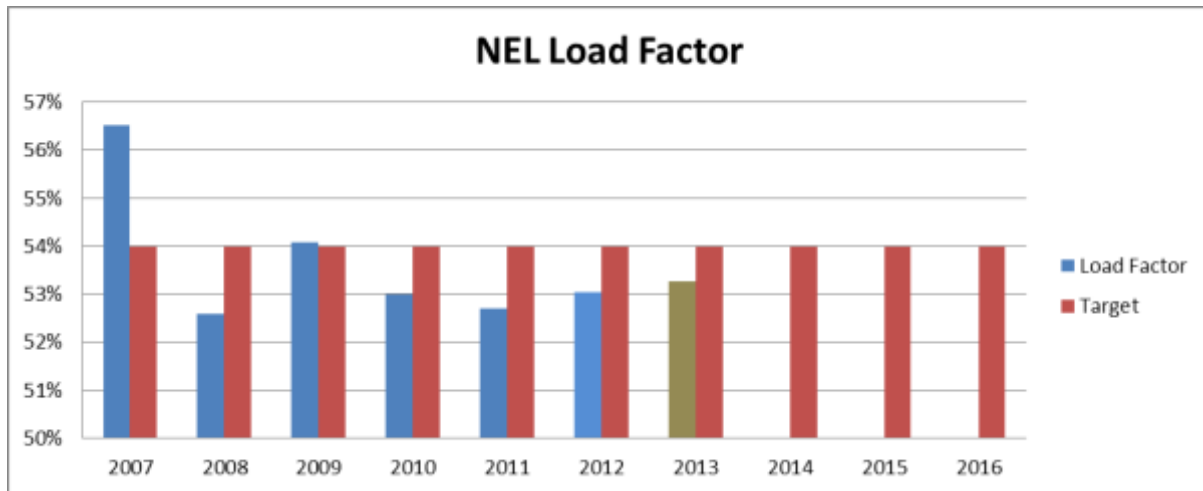
Nelson Electricity’s load factor is currently 53% which is 9% below industry average. Key reasons for this level are as follows:

- With 9,100 consumers located in an area of only 24 square kilometres, Nelson Electricity does not benefit from as much diversity as the larger network companies do;
- Nelson Electricity has a high proportion of business consumers with higher day time loads;
- High seasonal differences between summer and winter.

It would be difficult to improve load factor without compromising or seriously affecting the level of load control already utilised. This could result in less hot water heating and increasing consumer dissatisfaction. The target set for the planning period is 54%.

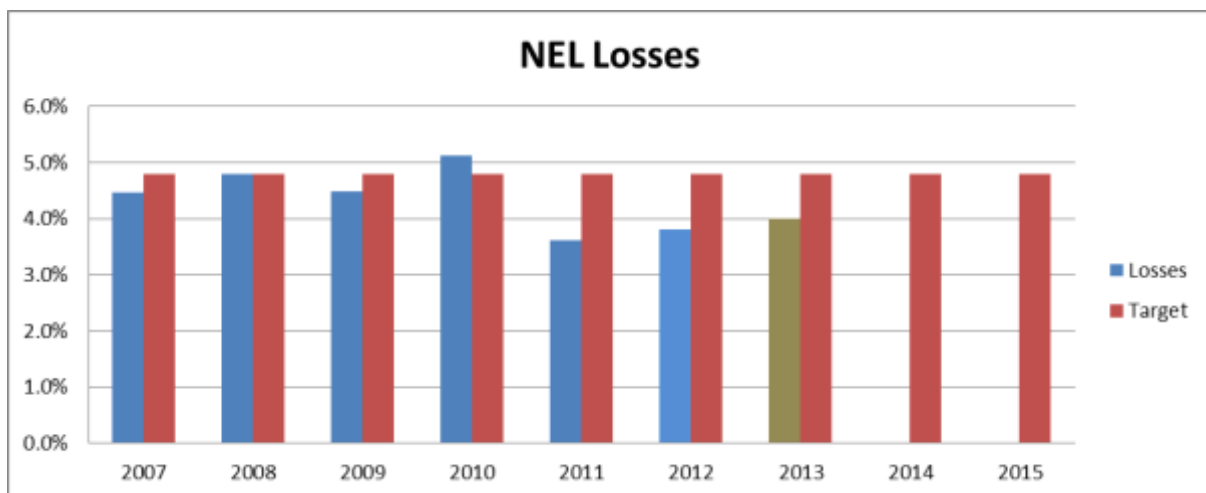
The load factor is calculated by the following formula:

$$\frac{\text{GXP kWh}}{\text{Maximum Demand x hours in the year}}$$



### ***Distribution Losses***

The actual loss ratio for the year ending 31 March 2012 is 3.8%. This is considered satisfactory given the type of network although slightly lower than the 4.8% expected. Note - the 2013 level is forecasted.



The 12 monthly losses have some variability due to the reliance of retailer billing information. The table below shows the NEL assessment of technical and non-technical losses. Technical losses are those occurring on the network.

Technical Losses	
33kV	0.78%
Zone	0.24%
11kV	0.95%
Dist Sub	0.76%
400V	0.69%
Services	1.17%
Total	4.60%

Non-technical are those losses that cannot be explained, eg; unbilled electricity or theft. This has been estimated is at 0.2%. The total losses forecast for the planning period are 4.8%.

## ***Power Factor***

Current average power factor is 0.94 - 0.95. The aim for is to have an average power factor greater than 0.95. To achieve this Nelson Electricity will continue to install test equipment on sites to monitor power factor. Where sites of poor power factor are located Nelson Electricity recommends the installation of power factor correction. This is further encouraged by the introduction of Power Factor Charges that applies to larger consumers who have a power factor of less than 0.95. In 2009, 5MVA of power factor correction has been installed at Haven Road Substation which improved power factor up to 0.98 - 0.99 during peak demand times. This also improves the efficiency of the 33kV supply.

Nelson Electricity has a winter target for the planning period of power factor greater than 0.98. This level will be easily maintained while the power factor correction unit is connected to the network.

## ***Harmonics and Interference***

The Network Code, which is available to contractors and public, contains guidelines which address harmonics and interference. Typically harmonic and interference problems are reported by consumers, which results in testing and recordings being made at the consumer's premises. Such reports are entered and tracked through the Office Management System until the problem is resolved and signed off.

The target level of service for harmonics and interference is that there should be no more than one proven non self-inflicted complaint received per year.

## ***Environmental***

Nelson Electricity cares for the environment. Measures are in place to minimise any effect Nelson Electricity has on the environment. Examples are:

- An oil spill kit on hand at the Zone Substation in case of any spills on the network;
- Bunding for the 33kV transformers at Haven Road.

All assets are assessed for negative environmental impact and are remedied if an issue is identified.

Nelson Electricity has a target level of service of zero oil spills on the network per year and zero fires causing damage to third parties resulting from distribution assets.

## ***Safety***

Nelson Electricity is committed to providing a safe network and healthy work environment for all staff, contractors and public. Nelson Electricity takes all practical steps to ensure network safety and if issues are identified they are then remedied within an appropriate timeframe. Issues regarding public safety take priority and are addressed on every Capital Works project.

Nelson Electricity has a target level of service of no loss time injuries from staff and contractors working on the network. All assets that have been identified as being a safety risk to public (for example; following asset damage, break in) are required to be attended to by fault contractors within 30 minutes of receiving notification.

## ***4.10 Customer Service***

Nelson Electricity distributes electricity to approximately 9,100 customers and communicates with customers by way of newsletters covering pricing and issues relevant at the time. Consumers generally address their enquiries to their retailer or in the case of a fault, to Nelson Electricity's fault call provider.

When dealing with customer service the issue of quality is defined as the quality of the electrical supply a customer receives. This includes any issue that has an impact on the customer's perceived level of supply from Nelson Electricity. For example; voltage, frequency, reliability, backup supply, alternative supply options and dedicated assets.

Customer engagement is part of normal business process. Nelson Electricity's asset management decisions, in relation to price and quality trade-offs, are compiled from engagements with customers.

For the purposes of this section, the customer is an electricity customer connected to the Nelson Electricity network.

## ***Advising Customers about Price-Quality Trade-Offs***

- **Tariff Options**

Nelson Electricity properly advises its customers of direct tariff price and quality trade-offs by publishing prices and associated quality in The Nelson Mail newspaper and on the Nelson Electricity website (refer [www.nel.co.nz](http://www.nel.co.nz)) in accordance with the Electricity Disclosure Regulations. The tariffs provide direct price and quality trade-offs through, for example, controlled and uncontrolled tariffs.

Pricing options and other network issues are periodically published in the Nelson Electricity newsletter that is delivered by NZ Post to all of its customers (refer [www.nel.co.nz/NEL\\_Newsletters.htm](http://www.nel.co.nz/NEL_Newsletters.htm)).

Nelson Electricity is also reliant on Electricity Retailers to appropriately advise their customers on the most appropriate pricing options. Retailers are in contact with the customer on a monthly basis as part of the billing process. Retailers also have account managers for the larger customers who are typically skilled in issues relating to quality of supply and price.

Electricity Retailers are informed of any changes to the Nelson Electricity tariffs so they can properly advise their customers of the options available to them.

- **Major Customer Survey**

Customer surveys provided the largest 20 customers with the opportunity to broadly consider price and quality trade-offs. Four broad options were presented to each customer:

- Pay a bit less to receive a bit less reliability;
- Pay about the same to receive about the same reliability;
- Pay a bit more to receive a bit more reliability;
- Pay a lot more to receive a lot more reliability.

Most of these 20 largest customers indicated a preference to continue paying about the same to receive about the same reliability.

- **Mass Market Telephone Survey**

Two hundred random customers were surveyed in March/April 2012 and of those only 8% surveyed would be prepared to pay more for an improved reliability of supply.

- **New and Changed Connections**

NEL provides specific price and quality information to customers in response to new or changed connection enquires. The types of price quality considerations include; capacity, how to configure the network for the connection cost of options, consideration for joint benefit options, etc.

## ***Consultation with Customers about the Quality of Goods and Services they require with Reference to Price***

- **Major Customer Consultation**

Nelson Electricity engaged an engineering consultant to consult with customers about price quality trade-offs. The top 20 largest customers were contacted directly via telephone. These 20 customers represented a broad cross-section of the larger customer base from 18GWh down to 500,000kWh per year. The smallest of the 20 were supermarkets, hotels and retirement villages.

- **Mass Market Telephone Survey**

Two hundred random customers were surveyeded in March/April 2012. Price quality trade off type questions were included in the survey.

- **Tariff Options**

Nelson Electricity has provided mass market customers the opportunity to consider tariff price and quality trade-offs via the mail dropping of newsletters and publishing of tariff prices in The Nelson Mail newspaper. The newsletter and newspaper provide the opportunity for customers to directly contact Nelson Electricity with any issues or requests on the price and quality information included. Tariffs have been included in April 2007 and May 2008 newsletters. The May 2009 edition included a survey for customers to complete. The results of surveys helped with the pricing options and asset management of Nelson Electricity.

- **Contractual Relationship with Retailers**

Nelson Electricity engages the Electricity Retailers in many ways.

Nelson Electricity has a signed Use of System Agreement (UoSA) with retailers and, as part of this Agreement, provides them with price and quality information. Nelson Electricity had to negotiate the terms of the UoSA with the retailers including price and quality of supply.

There have been informal discussions with the three dominant retailers on the network that being; Trustpower, Meridian Energy and Contact Energy. The methods of discussion vary from face to face to phone conversations. Indirectly these discussions can have an influence on the price quality trade-off. The issue for Nelson Electricity is that its reliability has always been excellent and that the customer is used to this level of reliability.

There is a low level of community understanding over the difference between actual line charges and what retailers repackage them as. Informal discussion with most customer type's show that many cannot differentiate between line charges and the retailers delivered charges.

- **New and Changed Connections**

Nelson Electricity consults with Electricity Retailers, developers, electrical contractors and customers in response to new or changed connection enquires through meetings, telephone calls and written communications. Nelson Electricity has a vested interest in ensuring the network is configured in a manner that can provide the appropriate capacity for new loads while not reducing the security of supply to existing connections.

## ***Consideration of the Views Expressed by Customers***

- **Tariff Options**

Informal feedback as a result of the tariff price and quality information from newsletters from the mass market indicates customers have lost touch with the role a Line Company plays in the electrical industry since the separation of Line and Energy companies in 1999. The mass market customer only considers the total electricity bill value without separating out line charges. The perception to them is that electricity prices are always increasing and have little regard to the fact that line charges have remained the same or at similar levels while retail electricity prices have increased. Consequently it is difficult in some instances to discuss and demonstrate price versus quality trade-offs.

Nelson Electricity gives the customers the ability to fill out a survey (included in January 2006 newsletter and in May 2008 newsletter). The findings of the surveys showed that half did not know that Nelson Electricity was a Line Company but that most were happy with the current system reliability. It is clear that customer's impressions are industry impressions and do not differentiate between generation, transmission, distribution and retail.

- **Major Customer Survey**  
A review of consultation with major customers has revealed that only one of the 20 largest customers was willing to consider alternative price and reliability options (specifically receiving increased reliability).
- **Mass Market Telephone Survey**  
A review of the survey confirms results from previous newsletter surveys in that customers do not want to pay more for an improved quality of supply. There are some findings that have been introduced which include more safety advertising to get the Nelson Electricity name more in the media including improvement in utilisation of radio when larger outages occur to convey relevant information with likely restoration times to customers.
- **New and Changed Connections**  
In agreeing to new or changed connections, Nelson Electricity has implicitly considered the views and requirements of the customer in terms of quality and quantity. Typically Nelson Electricity will receive a Network Connection Application with a requested capacity and then will investigate what or if any alterations to the network are required to supply the requested capacity. In some situations Nelson Electricity may suggest options whereby both parties can benefit. In the example of a new substation for a building, Nelson Electricity may offer the capacity at a reduced price if a larger transformer can be installed on their premises and have excess capacity available for the network.

Nelson Electricity will evaluate the dollar contribution required for the new load to connect to the Network on a case by case basis.

## ***Taking Customers Views into Account when Making its Asset Management Decisions***

Nelson Electricity is in a good position where it can demonstrate an excellent reliability track record while providing average prices to customers.

At a high level Nelson Electricity has adopted the following processes for acting on customer responses:

- Nelson Electricity's Asset Management Plan includes the customer consultation phase in all major decisions concerning capacity and supply security;
- Nelson Electricity remains responsive to approaches from customers about service levels;
- Nelson Electricity takes into consideration any feedback it receives from customers;
- The Asset Management Plan is designed and caters for the input of customers views. There are two parts to this;
  - Where a specific customer wants an enhanced quality of supply and is willing to enter into an appropriate commercial contract with Nelson Electricity to achieve this. Currently, Nelson Electricity does not have any arrangements with any customers for an enhanced quality of supply.
  - Where large numbers of customers demand a price quality trade-off that differs from that currently provided.
- **Tariff Options**  
Through informal feedback received from customers, Nelson Electricity has identified that customers do not currently have sufficient information about the network to enable it to effectively consult on price and quality trade-offs. Whilst this directly affects tariff options its implications in relation to price and quality are broader.

Nelson Electricity is considering a number of mechanisms to better inform customers of its role. One such process has been through its newsletters where Nelson Electricity has provided information on industry structure and Nelson Electricity's function within that structure.



From the 2008 survey only 55% of respondents were aware Nelson Electricity was their electricity lines company. This demonstrates that the survey responses were, on a whole, an electrical industry response. The majority of the larger customers and mass market customers are happy with current prices and system reliability. Neither group has supported increasing prices for an increase in reliability.

It should be noted that 9% of mass market customers indicated they would be happy to pay more for a more reliable electricity supply and 20% of mass market customers were willing to pay less money for a less reliable electricity supply. Nelson Electricity will continue to monitor this as there may be a change in customer perception in the future and the drive for improved system reliability. The customers who support paying more for a more reliable electricity supply are spread throughout the network and so currently it is difficult to be able to cater to their specific needs without upgrading the whole network for the benefit of all.

- **Major Customer Survey**

Nelson Electricity intends to meet with customers who are willing to consider different price quality options on a one-on-one basis to discuss the customer's particular requirements and then assess the feasibility of entering into a commercial agreement for Nelson Electricity to provide a different quality of supply (and hence price) for that customer.

## ***Customer Service Summary***

Nelson Electricity has one of the best electricity network reliabilities in New Zealand. The service levels as outlined in the Asset Management Plan also reflect this. The SAIDI for year ending 31 March 2012 was 63.5 minutes. The target level for year ending 31 March 2012 was 45 minutes. This seemingly poor result was due to one unplanned 11kV cable fault which contributed 54.3 minutes to the total SAIDI statistics for the year. Planned outages contributed 9.2 minutes. The existing target service level of 45 minutes is achievable under favourable conditions.

It has to be noted that given the small network size of Nelson Electricity only one outage could result in exceeding the target. This is illustrated by the figures for 2009, 2011 and 2012 where one or two significant outages per year can cause the figures exceed target.

It is also salient that Nelson Electricity has aging assets and over time even if existing levels of reliability are to be maintained, increased levels of investment will be required.



The customers are predominantly satisfied with Nelson Electricity's current system reliability performance. We do have to be realistic when we survey customers on reliability, they do not necessarily differentiate between whether an issue is a Retailer, Distributor, Transmission or Generator issue. The important issue for them is what they experience at their premise.

Nelson Electricity has comprehensive maintenance and development programmes which continue to aid in the improvement of the network. These plans attempt to maintain or improve the network security of supply.

Refer also to Asset Performance Standards under Risk Management.



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## SECTION 5 - Network Development

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### 5.1 Planning Criteria

The Office Management System is the key source of information required for network development planning. The data is gathered from the following sources:

- Planned Preventive Maintenance;
- Annual Load Survey;
- Life Cycle Audits;
- Known future growth;
- Asset Performance Standards;
- SCADA.

### ***Planning Periods***

Nelson Electricity has different planning periods for different asset types. The planning periods adopted reflect the useful life of the asset and the ability to change or upgrade. As an example, a cable will have an expected life of 45 to 70 years. This type of asset cannot be upgraded and as such will have a longer planning period. A transformer at a substation can be changed to a higher capacity transformer easily so planning periods used will be shorter. There is also limitation imposed by the ODV Handbook as to an acceptable planning period allowing for load growth. These are also taken into consideration.

The classifications and planning periods used are:

- 33kV feeder cabling - 15 years;
- Zone substation - 10 years;
- 11kV feeders – 10 years;
- Distribution transformers – five years;
- 11kV switches – five years;
- 400V reinforcement – 10 years.

The Planning Periods are used to determine the capacity of new assets. Factors which impact on the planning for changes of the various asset types are safety, asset condition, operating life and operating capacity. Measurements and assessments of these factors are gathered from regular testing, recording and audit programmes. The prioritisation of works is governed by safety in the first instance then by the quality of supply to the end user and the number of end users affected. Any network upgrades have to be financially justified and approved.

### ***Planned Preventive Maintenance***

Nelson Electricity has a Planned Preventive Maintenance programme in place which requires each of its 192 11kV/400V substations and thirty three 11kV Link Boxes to be audited every six months. The programme is designed to carry out visual internal and external checks of the substation and associated assets, record any defects, record maximum demand indicator readings, and to carry out basic dusting and cleaning. Each asset type is audited against a pre-printed check sheet and the data gathered is entered into Office Management System.

The maximum demand information gathered is the first pointer to possible overload. It allows areas of perceived overload to be identified and so lends weight to decisions made regarding network alterations or upgrades. Once possible sites have been identified, loggers are installed to assess the timing and duration of peak loadings. The logged data is compared to manufacturer recommendations for the equipment and a decision is then made on whether to replace the equipment.

## ***Annual Load Survey***

During times of peak loading between May and September each winter, a load survey is carried out on areas of the network. In this survey, the load on the transformer, time of day, air and transformer temperature, individual LV feeder loads and end of line voltage on the longest LV leg connected to each substation is recorded as a snap shot. The data gathered is entered into the Office Management System and analysed and further site recordings are carried out if required. Where load/voltage problems are identified data loggers are again utilised. The output of this data forms the basis for any decisions taken to reinforce or alter the network. Remedial action is taken immediately if voltages outside the limits of those specified in the Electricity Act are logged. Similar action is taken with equipment or cables that are found to be overloaded.

## ***Life Cycle Audits***

As outlined in the Risk Management section (section 7), Nelson Electricity is continually condition auditing its assets. Typical causes for remedial action are service boxes not meeting the industry's touch-proof requirements, wooden poles failing below ground tests, cables showing excessive partial discharge and evidence of partial discharge in HV switches.

## ***Known Growth***

Nelson Electricity encourages network designers, property owners, electricity owners, property developers and promoters of distributed generation to advise of future projects as early as possible, so that advanced planning can be put in place to ensure that the development can be supplied with the capacity requested. Data gathered through the three previous processes above is implemented to manage the network growth.

## ***Asset Performance Standards***

Refer Risk Management (section 7).

## ***SCADA***

The SCADA system is now used to log current flow every 10 minutes for the key 11kV feeders, so more accurate load diversity and duration data can be gathered for each feeder.

The 33kV/11kV transformer temperatures, currents and voltages are now monitored on the SCADA system.

## ***Other Planning Considerations***

At the Zone Substation, weekly checks and recordings are made on the 33kV/11kV transformers and the data gathered is entered into the Office Management System. Monthly reports are produced for the Operations Manager for any necessary action.

A portable data logger is used to log the loadings of transformers that have indicated higher maximum demand readings. This information is vital to assess the necessity of upgrading.

## ***Criteria for Determining New Assets***

Based on the information gathered in the Planning Criteria, decisions then need to be made on the capacity and type of replacement asset. The new asset may not necessarily be an identical replacement of the original asset as the requirements of the asset may have changed significantly since the original asset was installed, perhaps some 50 years ago. The selection of the new asset may be influenced by a number of aspects which are listed below.

- The predicted future growth in that part of the network. This will typically be faster in commercial situations, however, future residential subdivisions may need to be catered for.
- The type of load to be serviced. The area may have been re-designated from residential to commercial meaning that a faster growth rate is likely.

- The type of role the new asset has to perform. Recent 11kV cabling installed around the CBD has formed a sizeable “back-bone” for transferring load from one substation to another. This “back-bone” is now being extended towards critical customers like hospitals.
- The type of asset to be installed. Typically the 11kV switches and transformers utilised have been mineral oil filled but the recent emergence of vacuum switchgear is influencing the choice of switch to be installed as is the development of vegetable oil. Paper insulated 11kV cables have typically been preferred over the use of cross linked polyethylene but the improved performance of the modern generation of the latter is creating further cause for reconsideration. However, while paper insulated cables continue to be manufactured in New Zealand and remain reasonably competitively priced, NEL will continue to utilise them.

## ***Prioritisation of Projects***

Nelson Electricity has a relatively simple process for the prioritisation of projects. Firstly the processes are broken into two distinct types of projects.

- **Developer or consumer initiated** eg; residential subdivision or commercial building. Often in this type of project there may be involved the installation of new assets to supply a new load on the network. The project will often be driven by demands external to Nelson Electricity. There will be a capital contribution required from the developer/consumer for work like this to proceed and the timing will typically be for whenever the developer requires the supply.
- **Network related** eg; 11kV cable replacement, transformer change, service box replacement.

NEL prioritises most of the projects undertaken on the network based on the risk ratings of an asset as detailed in **Section 7**. This rating takes into account all aspects about asset performance including:

- Safety;
- Asset condition;
- Loading on the asset;
- Asset fault history;
- Restoration time if failure occurs;
- Environmental considerations of failure and location;
- Number of consumers;
- Public response if there is an outage;
- Cost due to failure;
- Asset life expectancy.

The timing or priority of projects is based on the risk ratings which typically have been in line with the Asset Replacement Guide in section 3.5. Projects are prioritised with the highest priority being:

- **Safety:** Assets that have been identified as having a safety issue with the public, staff and contractors working on or near assets take top priority. Examples are the replacement of Andelect Series One switchgear and additional touch proofing of LV boards in distribution substations.
- **Technical:** Assets needing replacement or additional assets installed due to load growth and lack of spares to maintain existing assets.
- **Condition:** Asset condition from auditing shows assets need to be replaced.
- **Age:** If an asset is beyond its life expectancy.

There are often projects of similar weighting or priority. These are assessed and prioritised with the projects with the best financial outcome being first. This could be due to project cost, minimising of maintenance costs or timing with another project.

## 5.2 Predicted Network Demand Growth

The load on the Zone Substation up until 2008 had shown a slow but steady demand growth in the order of 1.0% - 1.5%. This has since declined to negative growth as a result of a combination of the economic downturn and warmer weather especially during the winter months. The network peaks during the winter period show a considerable sensitivity to the ambient temperature and extent or type of cloud cover.

### *Nelson Electricity 33kV Network Peaks*

Year	Controlled peak (MW)	Month	Comment on Winter
1995	28.100	July	Medium
1996	28.095	July	Medium
1997	28.185	July	Medium-cold
1998	28.185	July	Warm
1999	28.225	July	Warm
2000	28.800	September	Warm
2001	30.470	July	Cold
2002	29.800	July	Medium
2003	29.800	July	Medium
2004	30.130	August	Cold
2005	31.066	June	Medium
2006	31.699	June	Cold
2007	34.230	July	Cold
2008	32.800	July	Medium
2009	33.530	July	Cold
2010	32.750	July	Warm
2011	32.933	July	Medium
2012	32.040	July	Medium

Analysis of electricity consumption of consumer groups, undertaken to determine growth levels, indicates that the negative growth over the last three years is a combination of the economic downturn and also a change in consumer electricity usage behaviour. All consumer groups on a per consumer basis are using less kWh. The mass market has shown this trend since 2009 and only in 2012/2013 have the Time of Use consumers shown a reduction.

The larger customers are more influenced by economic downturn whilst the mass market consumers will use electricity on an as needed basis. The mass market (particularly residential) is also influenced by the types of appliances being purchased being more energy efficient as well as changes to more efficient heating options and increased retrofitting of improved insulation. Another significant influence is the effect caused by weather with Nelson consumption being affected by cooler temperatures. As an example for mass market business and residential consumers from the start of the 2010 year the kWh (based on sales) was similar to the previous year but has dropped since May/June 2010 with the onset of winter. The winter of 2009 was shown to be a colder winter compared to the 2010 winter when analysing climate data from NIWA. The level of drop is approximately 5% on mass market consumption comparing the winters of 2010 to 2009.

Inquiries at the Nelson City Council have confirmed that within the area supplied by Nelson Electricity, there is little prospect of further extensive subdivision development, with only a small portion of land being still available for future housing but there is the possibility of other types of development. The waterfront area around Wakefield Quay is slowly being developed with apartment complexes being built. There is also the potential for apartments being developed around the central business district fringes, but this is seen as being some time away before this will occur. Although the apartment building trend is in its infancy, this could make a significant contribution to Nelson Electricity's future growth.

The Nelson City Council has a plan improving air quality in the city. This plan aims to improve Nelson air quality by 2020. One significant factor is the encouragement to shift to non-polluting heating options. As electricity is the most environmentally friendly option. The initial anticipation that there could be an increase in household load as more and more houses convert to electrical heating has not occurred due to these houses reducing other non-efficient electrical heating options at the same time. Much of the heating

load will be in the evenings so will have a lesser impact than if the additional load coincided with the winter morning peaks. To date the conversion to electrical heating has not shown sign of additional load on the network.

Another Nelson City Council initiative is facilitating the increasing utilisation of solar for hot water heating and also photo voltaic panels. Currently there are 12 Solar PV connections totalling 32kW and survey results also show 5% of residential consumers have solar water heating of some kind. Although in its early stages, these will have some impact on kWh consumption but minimal impact on the peak demand as the Nelson Electricity network peaks on miserably, cold, cloudy, winter mornings which will not assist solar devices. In most cases these sites will rely on the Nelson Electricity network as a backup.

Latest kWh consumption figures suggest that the kWh load is still reducing. There is still some uncertainty around whether this is the bottom or whether consumption will drop further.

Another variable is the effect of the Christchurch earthquake and the influx of people from Canterbury shifting to Nelson. To date consumption changes have not been seen as a result of any increase in population. Given that the Nelson Electricity network is already developed and with minimal room for new housing, much of this growth will occur on the Network Tasman network.

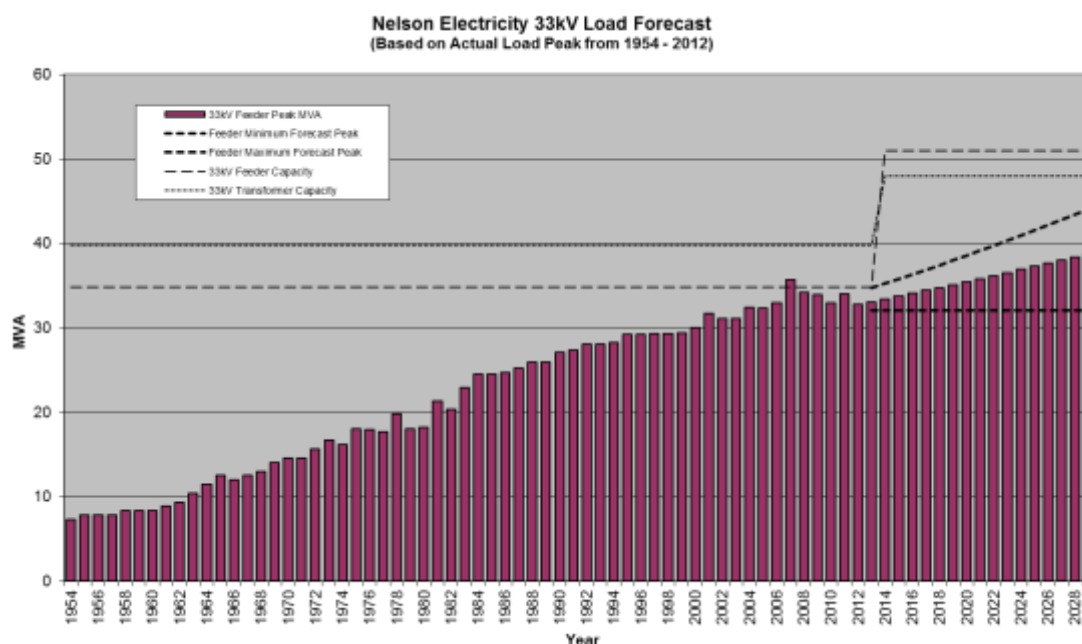
Nelson Electricity does utilise load control to minimise peaks using its ripple control system. This is used not only to reduce highest demand peaks on the network but to also minimise transmission charges by assisting in reducing the Stoke Grid Exit Point peak demand and also the Upper South Island peak demand. The controllable peak set for the purposes of network control for the past year was set at 32.0MW but Nelson Electricity will control to a lower level if there is a transmission requirement.

This loading forecast has to date been expressed in the form of active power or MW, but it is critical to the rating of much of the equipment supplying the load that the element of power factor be considered. This is currently in the region of 0.94 - 0.95 for the combined loads at Stoke for Network Tasman and Nelson Electricity. If related to the load at Haven Road, it places extra strain on the 33kV lines, cables and 33kV/11kV transformers to supply the active load without exceeding design MVA ratings. Power Factor Correction was installed at Haven Road in 2009 to improve power factor to the 33kV level. This has improved the Nelson Electricity power factor at peak demand times from 0.97 to 0.99. The forecasts in this Plan will assume that the Power Factor Correction is operating during peak demand times.

The previous table shows the actual peak loadings on the system at Haven Road for the past 18 years. This is used as a base for the following years demand forecast. This forecast has been difficult as the demand and consumption figures have been in decline and there is enough uncertainty as to when this will stop and typical load growth pattern re-establish themselves.

For the purposes of this Asset Management Plan, Nelson Electricity has had to assume that the 2013 year will begin to show signs of growth unless there is conclusive evidence to the contrary. To not allow for this could see the Plan fall short in its ability to cater for the demands on the network in a timely manner. The forecast is more conservative than previous years using the 2012 winter peak as a base and allowing for a 1.0% increase per year.

## Network Demand Growth Forecast



Nelson Electricity's load growth predictions are based very much on a basis of historical growth and then other known or perceived upcoming influences are included to arrive at a final predicted figure for that year. The graph above demonstrates the load pattern since 1954.

- The growth moving forward is assessed at 1.0%. Nelson Electricity has had a steady growth rate of 1.5% per year over a long period of time prior to 2008 but since then the peak has dropped due to the economic downturn and other reasons as described in the previous section. The forecast is considered appropriate given the demand growth uncertainty over the last four to five years.
- Most of the residential infill has already occurred and there are limited subdivision options available in the network area. There is the potential for apartment style accommodation but to date there is a limited market for this. For the purposes of the planning period it is estimated that growth would increase 1% per year, recognising there is significant consumption uncertainty which could result in significant re-forecasting once more consumption behaviour evidence becomes apparent.
- The forecast includes the impact of load control. This is in the order of 3MW during peak demand times in the winter. It is assumed, for the load forecasting period, that this level of load control will continue to be utilised.
- Given the limited opportunity for distributed generation, there has not been an allowance made, although an increase in Solar PV installations less than 10kW in capacity has been noted with the reduction in cost of PV panels. This is expected to increase over the coming years.
- There is an upper and lower forecast line included in the forecast to allow for the uncertainties including annual climate and seasonal differences. The Asset Management Plan is designed, and/or contingencies designed, around the maximum forecast level to provide N-1 security of supply. The lower forecast is set at no growth at all for the planning period.
- Uncertain projects or developments form only 0.5% of the assessed growth. In recent years the majority of these projects have typically come from the commercial/industrial customer base and have been in the 200kVA to 500kVA range.



- It is forecast that the demand will not exceed 35MVA next winter and Nelson Electricity will have the added contingency of demand side management with larger consumers.
- The effect of the Nelson City Council meeting air quality targets is also included in the forecasts. In the longer term distributed generation and other forms of load management are expected to impact on the growth demand pattern but this influence, although expected to be significant, is too unpredictable to judge at this stage. To date the effect has not been noticeable in the overall demand growth.

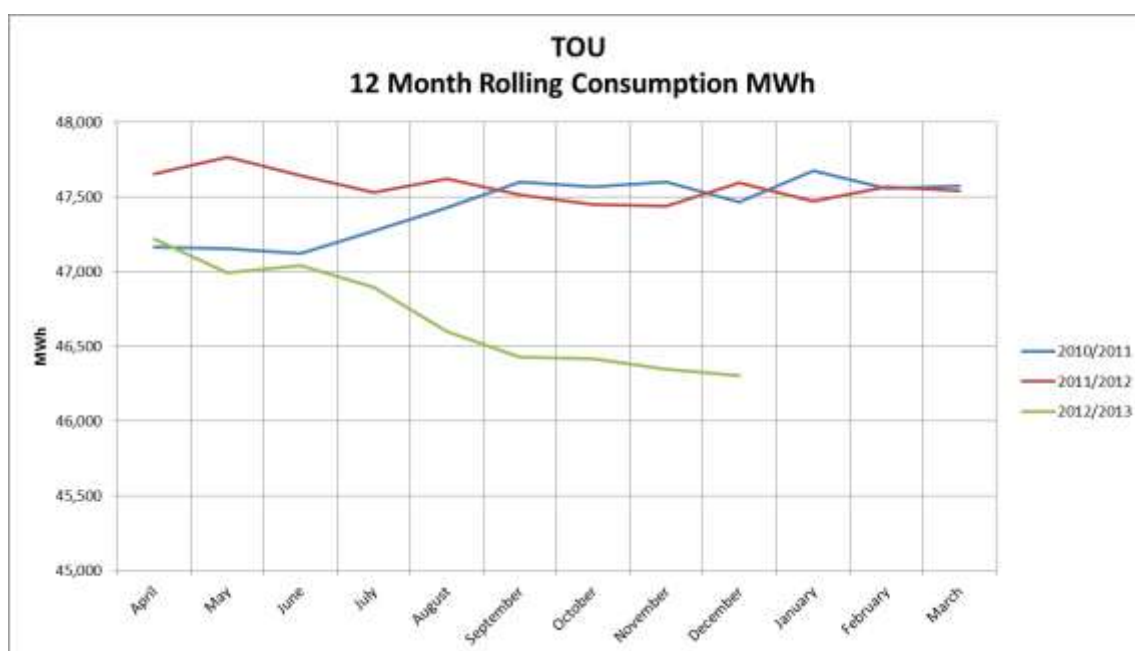
## Network MWh Growth

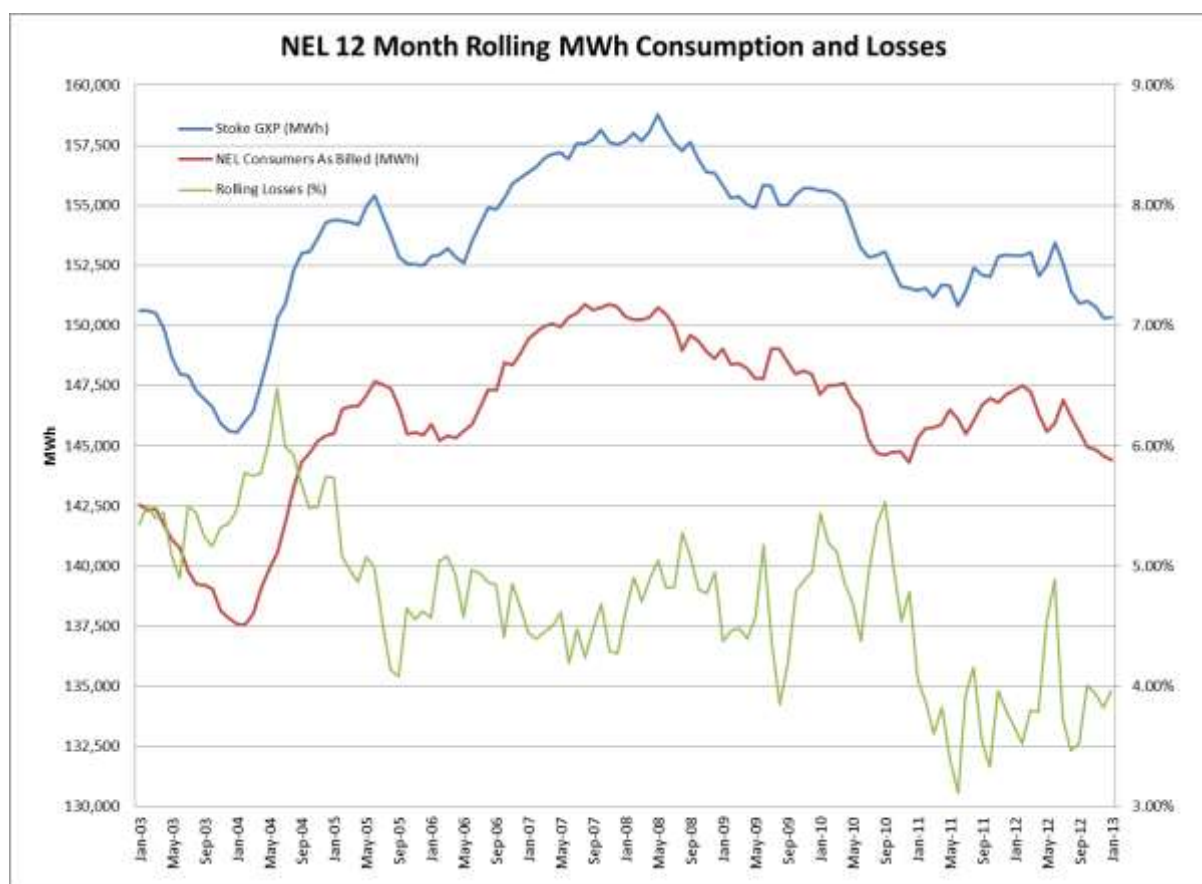
Up until 2008 Nelson Electricity had shown a steady increase of approximately 1.5% growth in electricity consumption on the network in line with the demand growth. Since then there have been three events that have reduced demand and consumption. In 2008 there was the “low lake level electricity crisis” and immediately following that was the effect of the economic downturn. The economic downturn coupled with warmer weather has also reduced it further.

Average kWh consumption per consumer has been shown to reduce since 2008. The table below demonstrates that the average residential consumer in 2012 was using 7,135kWh per year down 3.5% from 2008. The business consumers are only using slightly less on a per consumer basis, although the true result is masked by larger consumers which were on Time of Use tariffs switching to Load Group 2 which artificially inflates this outcome.

Group	2008	2010	2012	% Change in 4 years
Group 1 and 2 Residential Average	7,392kWh	7,163kWh	7,135kWh	-3.5%
Group 2 Business	24,365kWh	23,972kWh	24,308kWh	-0.2%

The larger Time of Use consumers have maintained kWh consumption at stable levels but in 2012 this level reduced.





Nelson Electricity, as a prudent electricity distribution business, has taken a forecasting approach that protects the effectiveness of the Asset Management Plan. The Plan caters for consumption to begin to grow again as the 2013 year progresses to a growth rate of around 1.0%. This Plan recognises there is significant consumption uncertainty which could result in significant re-forecasting once more consumption behaviour evidence becomes apparent.

Forecasted MWh Consumption								
	2007	2008	2009	2010	2011	2012	Estimated 2013	Estimated 2014
Stoke GXP MWh	156,973	157,679	155,376	155,463	151,205	153,043	149,571	151,985
MWh Billed	149,979	150,106	148,416	147,498	145,751	147,228	143,588	145,024
Losses	4.46%	4.80%	4.48%	5.12%	3.61%	3.80%	4.00%	4.80%

### 33kV Configuration for Load Growth Requirements

The existing configuration of 33kV lines is currently managing the Nelson Electricity peak demand load. It is expected that at the upper end peak demand forecast will not reach 35MVA (feeder maximum capacity is based on independent engineering assessments which down-rate the cable due to cable installation conditions) during the winter of 2013.

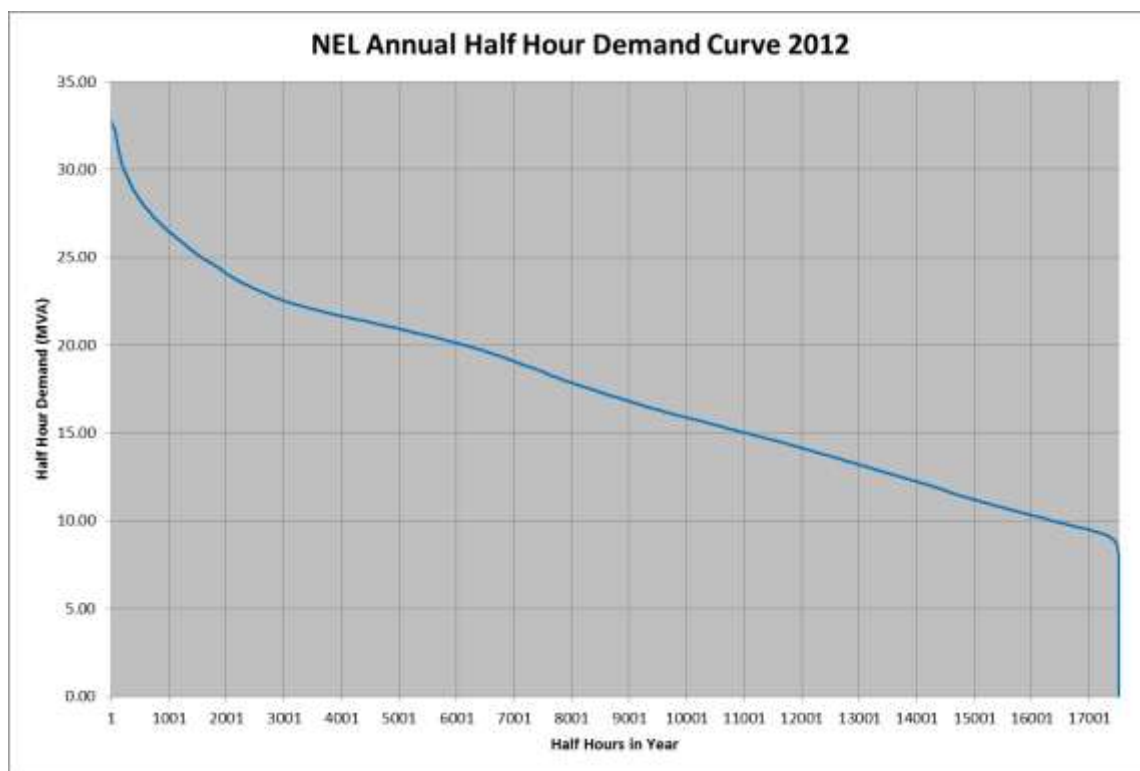
The maximum load NEL can draw from any two of the existing three 33kV feeders from Stoke Grid Exit Point is 35MVA. At that stage the third cable would need to be used in conjunction with the other two to cater for the demand and Nelson Electricity will not be able to provide an N-1 security of supply level. Cable sheath temperature monitoring along the 33kV feeder cables currently supports that the cables are currently not overloaded and so Nelson Electricity is satisfied that the cables can be used up to at least 35MVA for long run durations.

The installation of 5MVar of capacitors on the Rutherford 33kV feeder ensures that all three 33kV feeders are capable of supplying 17.5MVA each. The forecasted peak demand has reduced compared to previous years for reasons as discussed in previous section 5.2. This has provided some additional headroom which has delayed the 33kV feeder limit of 35MVA by two years.

From all analysis of the three 33kV feeder performances it will also be possible to overload these cables beyond the conservative engineering assessments by up to 1MVA for a short duration of 30 minutes while alternative options are actioned to maintain N-1 if required.

The current contingency if a 33kV feeder outage occurs during a winter peak demand time that is in excess of forecast and higher than 35MVA demand, is to arrange for major consumers to shed load. (The required reduction is likely to be in the region of 0.5MW.) There is in excess of 2.5MW of load shedding and distributed generation available to utilise in an emergency (excluding benefits of 3.0MW of ripple control).

Nelson Electricity is currently installing a new 33kV feeder from Transpower's Stoke Substation to Haven Road Zone Substation. This increases the feeder capacity from 35MVA to 50MVA. This feeder will be connected to the new Haven Road Zone Substation when commissioned in spring 2013. The increased feeder capacity will reduce the need for load control for peak demand, but load control will still be utilised for managing transmission costs and emergency load management situations.



The half hour demand curve above shows 220 half hour network peaks above 30MVA and below 35MVA and no half hour periods above 33MVA. The mitigating options are only necessary if the demand was to be in excess of 35MVA, which is extremely unlikely in the upcoming year, but the options remain available for NEL.

To allow for the network growth and ensure an N-1 security of supply level, NEL is to increase the 33kV supply from Transpower's Stoke substation, replace and increase transformer capacity at the Haven Road Zone Substation. Any interim shortfalls in capacity will be managed by demand side participation. The 11kV capacity at Network Tasman's Founders Substation will only be used in an emergency, due to the technical and reconciliation issues.

Nelson Electricity continues to monitor the existing 33kV feeder performance by monitoring temperature sensors installed at strategic points along the three 33kV feeder routes.

The three 33 kV line and cable combination ratings are as shown in the table below:

Component	Feeder: Rutherford St	Feeder: Vanguard St	Feeder: St Vincent St
Line	Dog Rating: 305/365 A (17.5/21 MVA)	Dog Rating: 305/365 A (17.5/21 MVA)	Dingo/Weka Rating: 330/370 A (19/21.2 MVA)
Cable	330A (17.5 MVA)	330A (17.5 MVA)	330A (17.5 MVA)
Overall assigned continuous rating	17.5 MVA	17.5 MVA	17.5 MVA
Total capacity: 52.5 MVA			

Note that the overhead line sections are owned, operated and maintained by Network Tasman, whilst Nelson Electricity has sole utilisation of them for supplying its network.

### ***33kV/11kV Transformer Configuration for Load Growth Requirements***

The existing configuration of 33kV/11kV transformers at Haven Road Substation is two banks of single phase 5MVA transformers. Engineering studies undertaken in previous years supported that the existing transformers are working well below the design temperatures during the peak of winter and can have a higher load rating of 7MVA each. This is due to the location of the transformers shaded from the sun during the peak winter loading times. These transformers could have managed the load requirements until approximately 2026.

Studies also demonstrate that there are some risks with continuing to utilise these transformers due to their age, limited availability of spare parts and the consequences of failure with the predominantly urban load they supply.

Nelson Electricity was not prepared to accept this additional risk and decided, as part of the replacement of the Haven Road Zone Substation, to replace the existing transformers with three new 16MVA/24MVA ONAF 33kV/11kV transformers. This Zone Substation is due for commissioning in spring 2013.

### ***11kV Feeder Configuration for Load Growth Requirements***

Nelson Electricity has 13 main 11kV Feeders that link up with the 33kV/11kV Zone Substation with key 11kV/400V switching stations on the network. These 11kV feeders have the N-1 security level.

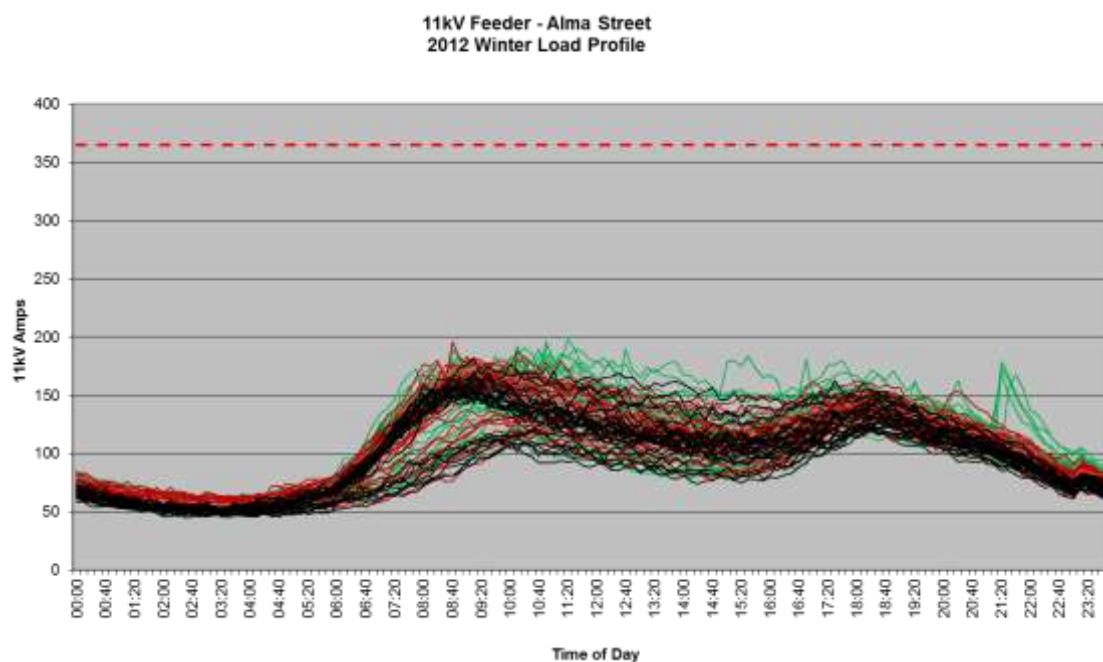
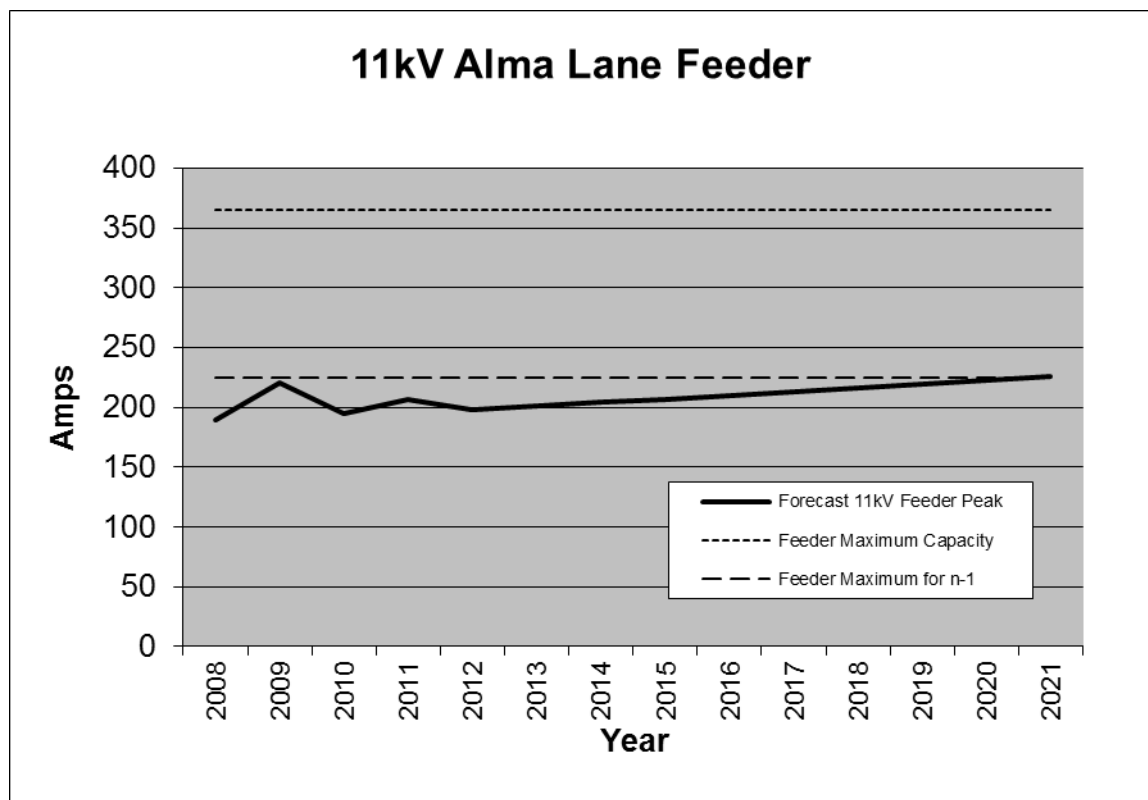
Two 11kV feeders are planned to be replaced in the next three years. These are Snobs Hill and Trafalgar Centre. Snobs Hill is being replaced due to capacity constraints and Trafalgar Centre due to cable condition. Most other 11kV requirements involve upgrading further out in the network. There are also various new and upgraded 11kV lines linking the existing 11kV feeders out in the network which are planned to simplify back-feeding of supply in the event of an 11kV outage.

### ***11kV Feeders from Haven Road Substation***

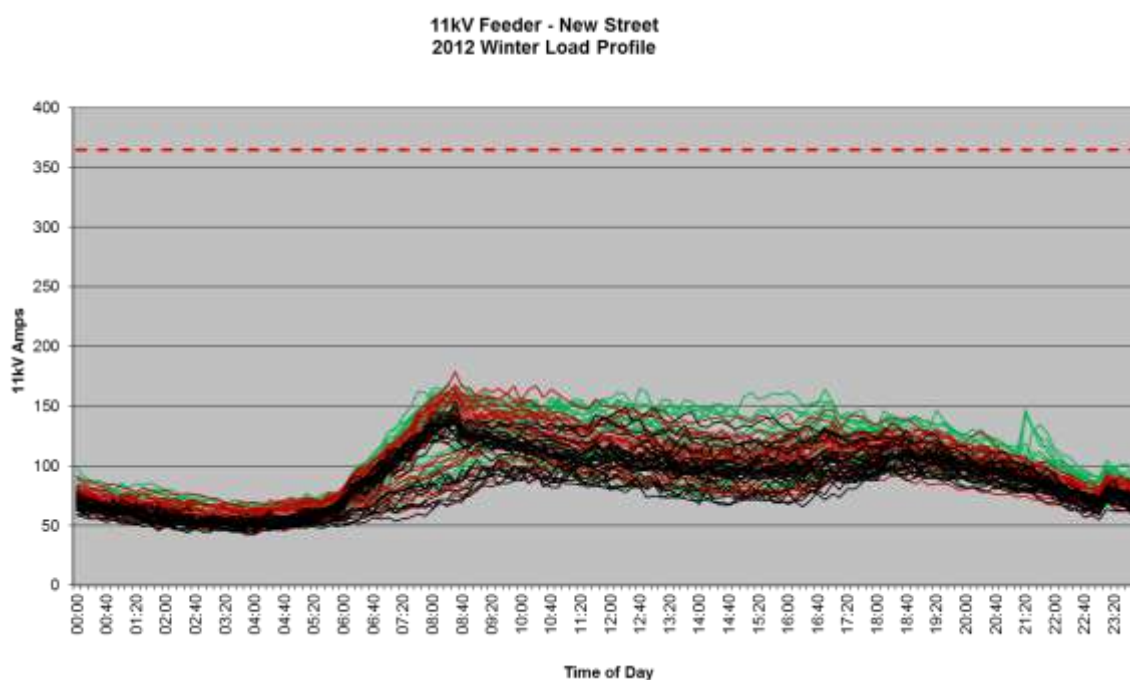
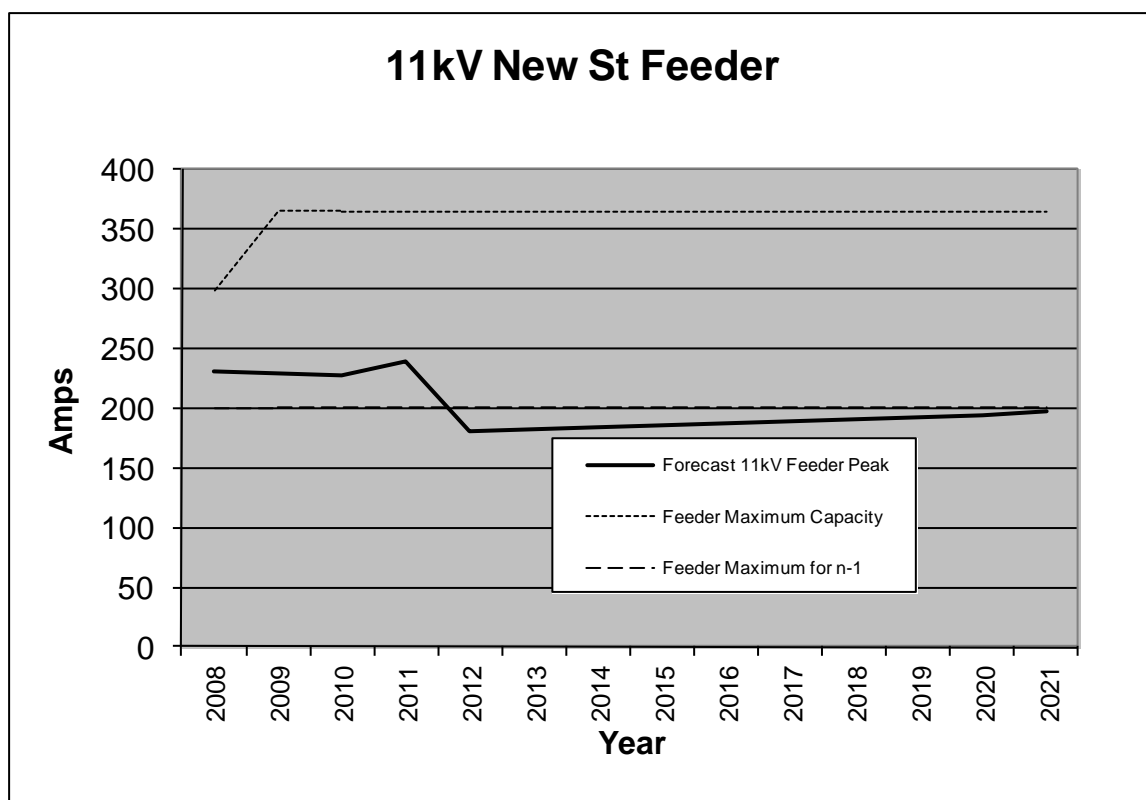
The 11kV feeders are a critical part of the network. They radiate out from the single Zone Substation and provide backup capacity for the neighbouring feeders in the event of another 11kV feeder outage. The following are individual 11kV feeder forecasts out to 2021. They also give an indication as to the forecasted loadings of all feeders as they will be set up for the winter of 2013. Also, there is a table demonstrating the assessed capacity and N-1 backup support for other 11kV feeders. Note, the tables and graphs in this section target the peak demand times during the winter and do not take into consideration the different diversity characteristics of each 11kV feeder. These then represent a worst case scenario.

There is some flexibility in changing of 11kV break points in the network to alter feeder loads. Break point locations are reviewed annually to optimise the network efficiency and back up support capability.

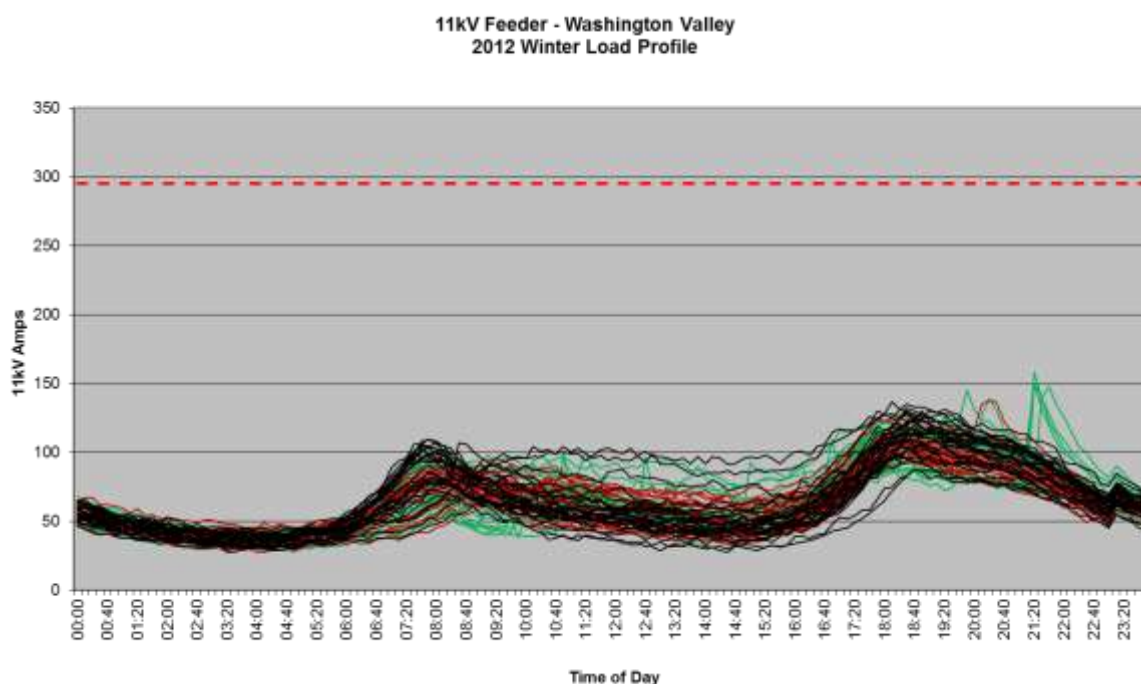
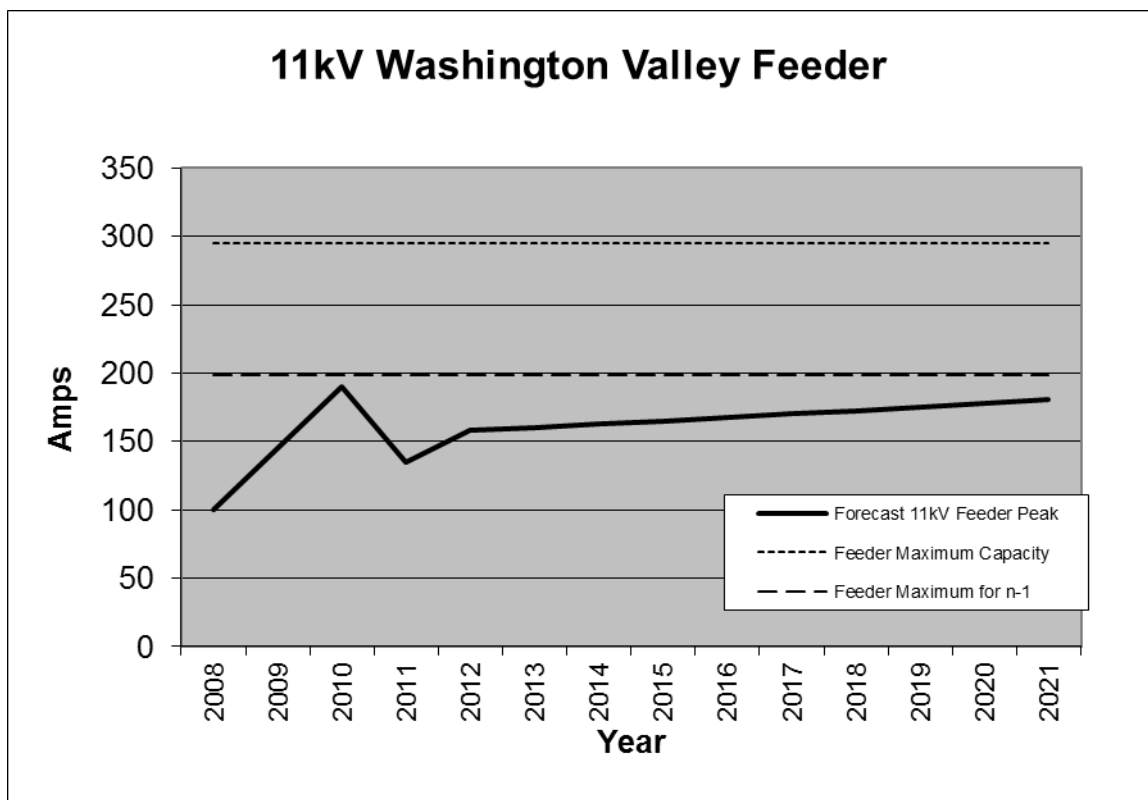
Nelson Electricity 11kV Feeder Backup Capacity																			
(Based on 2012 Winter Load Profiles)																			
			N-1 Support for 11kV Feeders (Amps)																
Feeder	Rating	2012	GPO	Anzac Park	New St	Alma Lane	Bank Lane	Snows Hill	Victory Square	Emano Street	Wash Valley	Port	Vick Street	Sealord	Traf Centre	N-1 Support	Feeder Max Load Level	Reserve Capacity 2012	
GPO	365	176		120	120		120									120	245	189	
Anzac Park	365	185	140				140	100	135							140	225	180	
New St	365	179	125			125										125	240	186	
Alma Lane	365	198			140		140	140								140	225	167	
Bank Lane	300	178	100	100		100		100								100	200	122	
Snows Hill	280	180		70		70	70		70							70	210	100	
Victory Sq	280	177		100				100		100						100	180	103	
Emano St	365	167							155		125					155	210	198	
Washington	300	158								100		100				100	200	142	
Port	365	118									135		140			140	225	247	
Vickerman	280	142										130		130	130	130	150	138	
Sealord	365	168											120		120	120	245	197	
Traf Centre	145	62											60	60		60	85	83	
Total Backup Capacity			365	390	260	295	470	440	360	200	260	230	320	190	250				
Total Spare Backup Capacity			189	205	81	97	292	260	183	33	102	112	178	22	188				



The Alma Lane feeder supplies the south eastern Nelson central business district, Nelson Marlborough Institute of Technology and Brook areas. It has a mixture of commercial and domestic load.

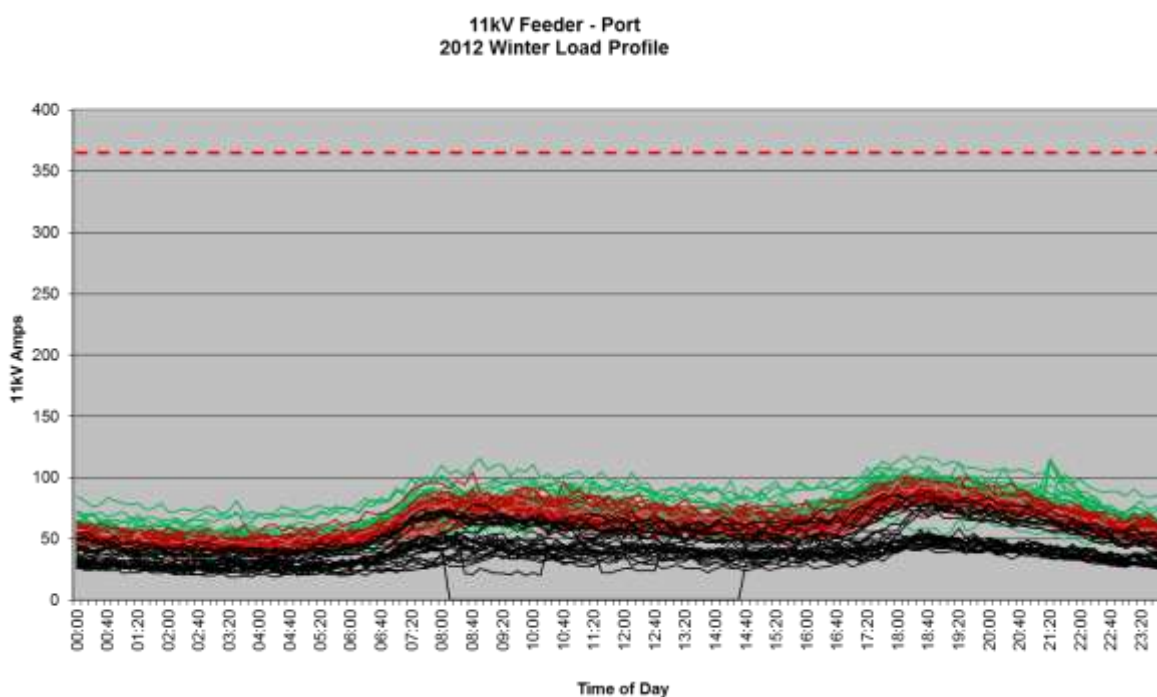
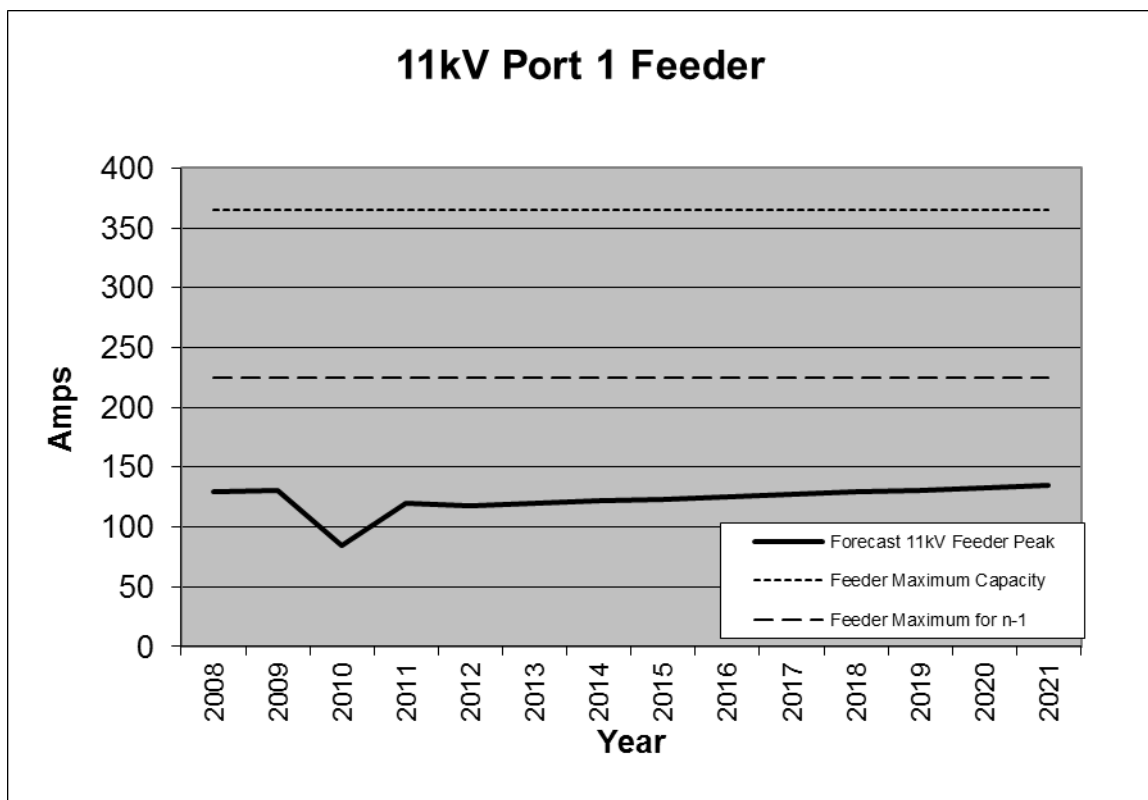


The New Street feeder supplies the north eastern Nelson central business district, Botanics and Nile Street East areas. Load is a mixture of commercial and domestic. This feeder was replaced in 2009 and will provide additional N-1 backup capacity at 11kV feeder level.

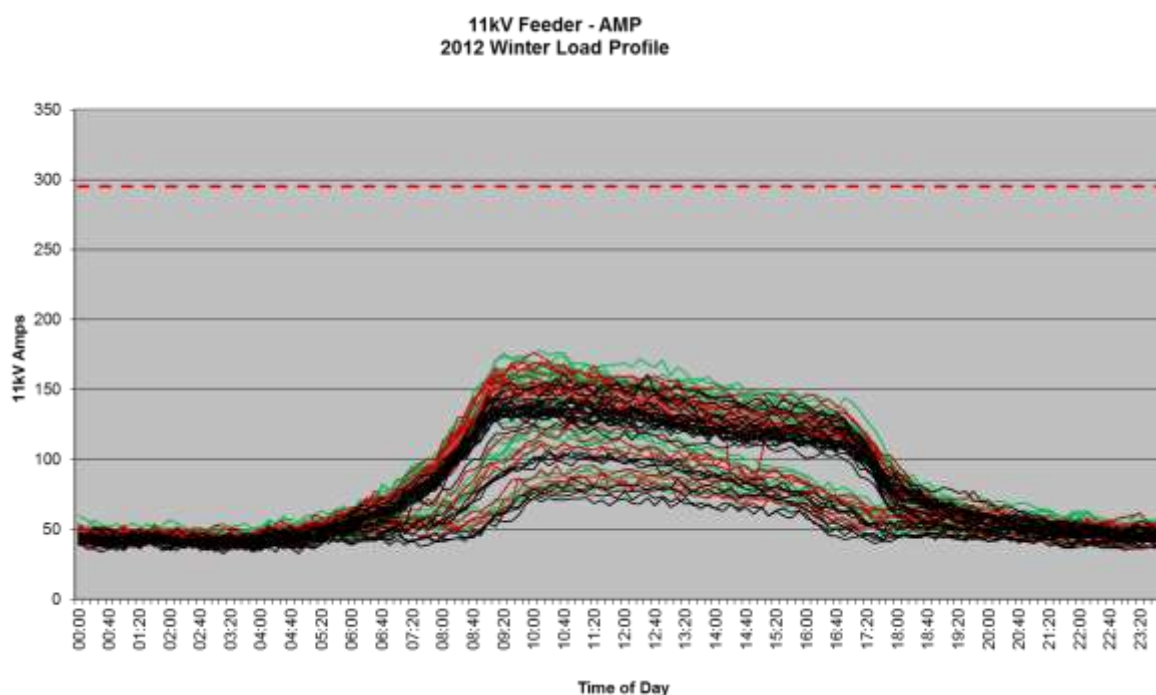
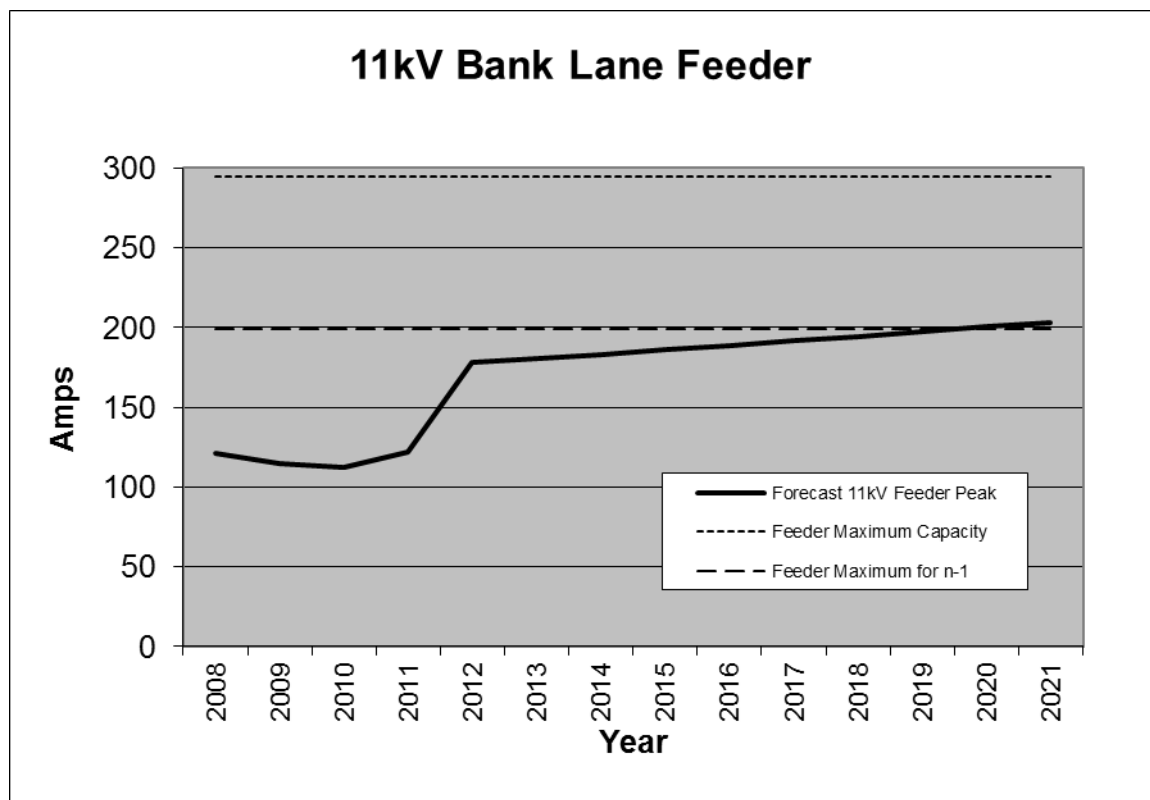


The Washington Valley feeder supplies the Washington Valley and Port Hills areas. Load is mostly domestic. This feeder provides backup supply to the Port and Emano Street feeders.

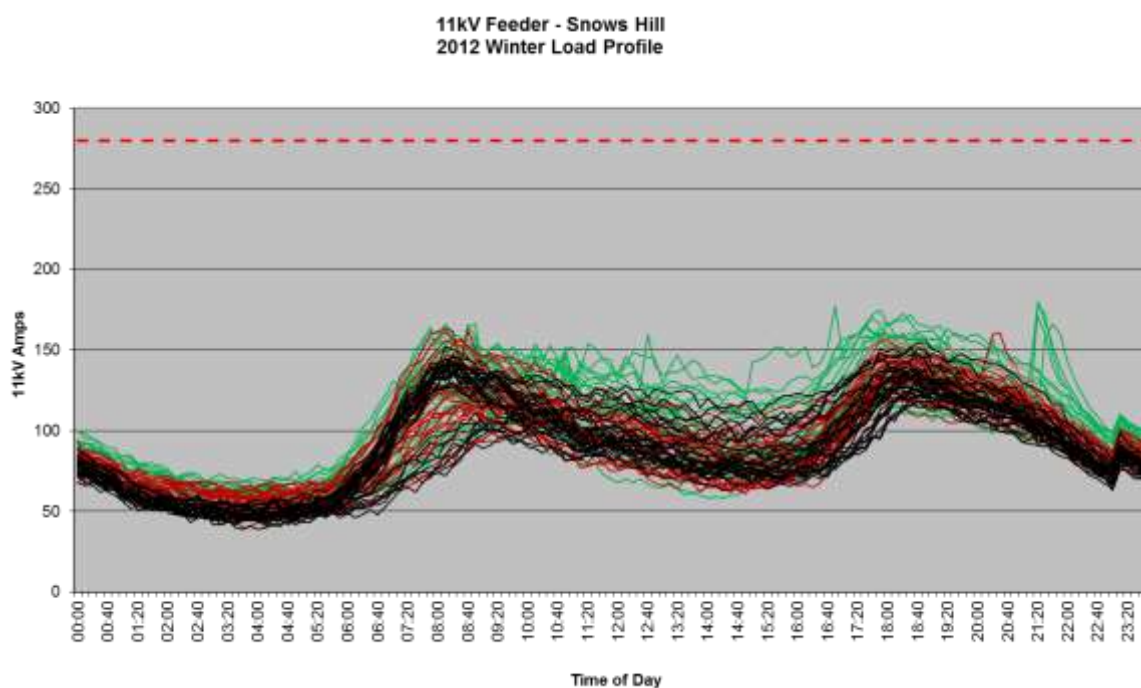
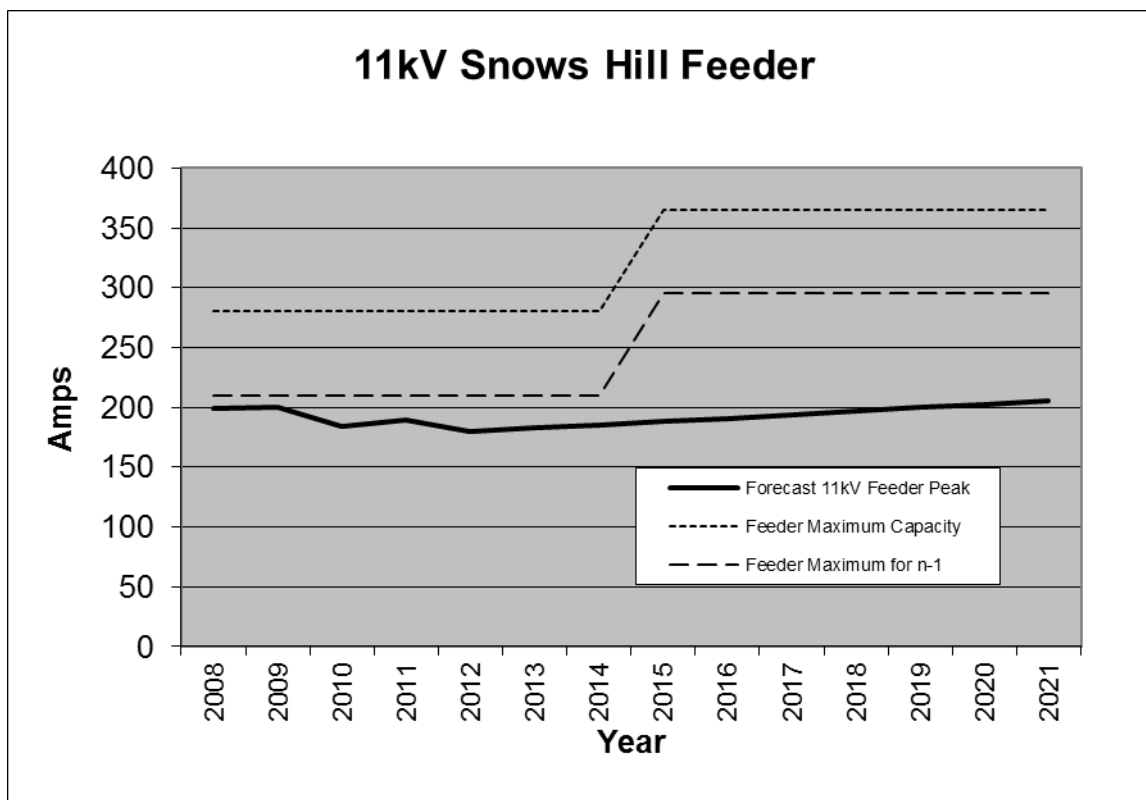




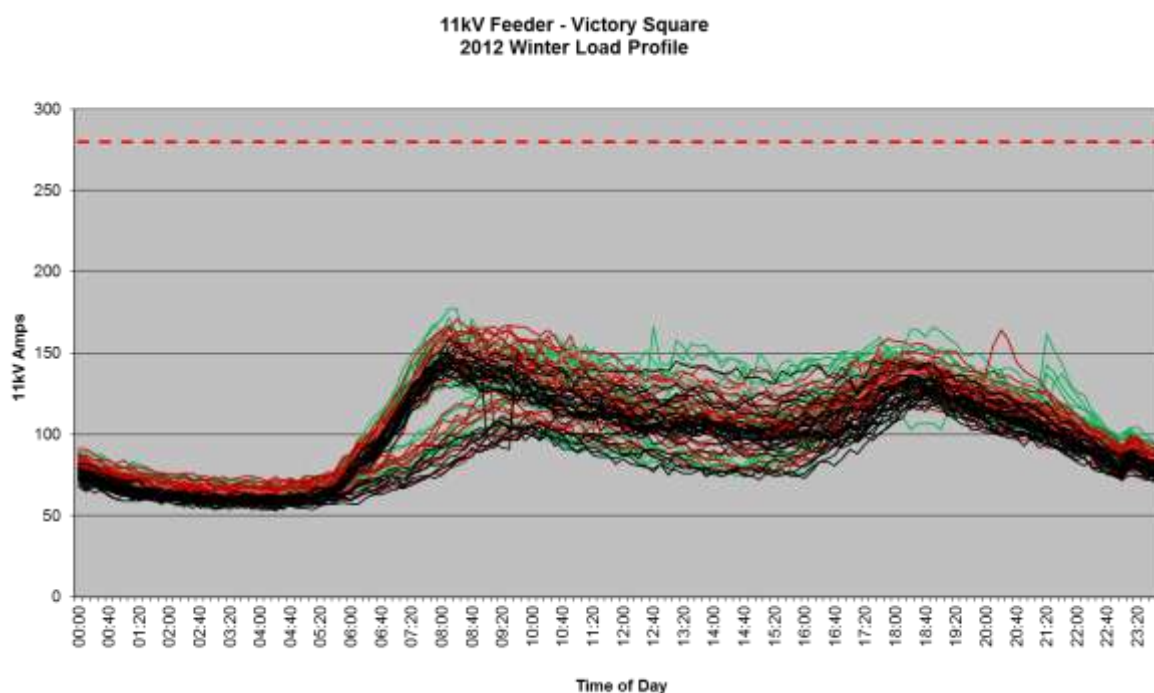
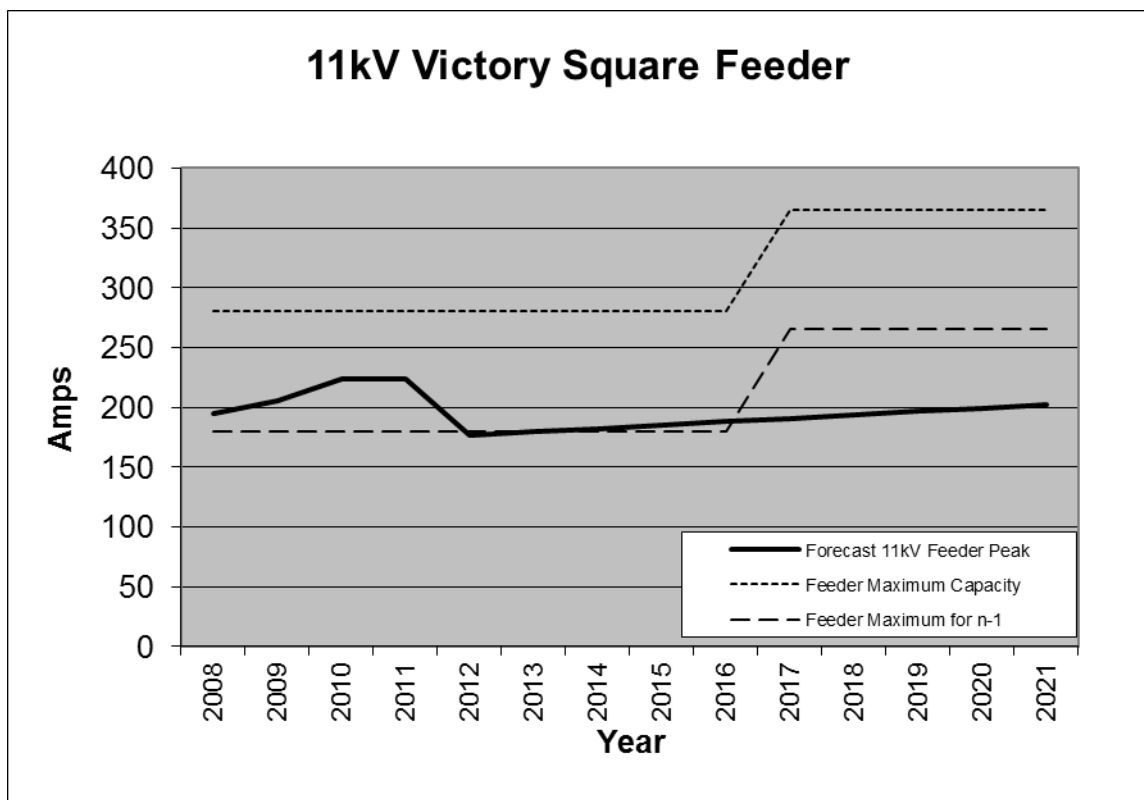
The Port 1 feeder supplies the western end of the Port and Wakefield Quay areas. The load is mostly commercial and light industrial. This feeder provides additional backup supply to the Washington Valley feeder.



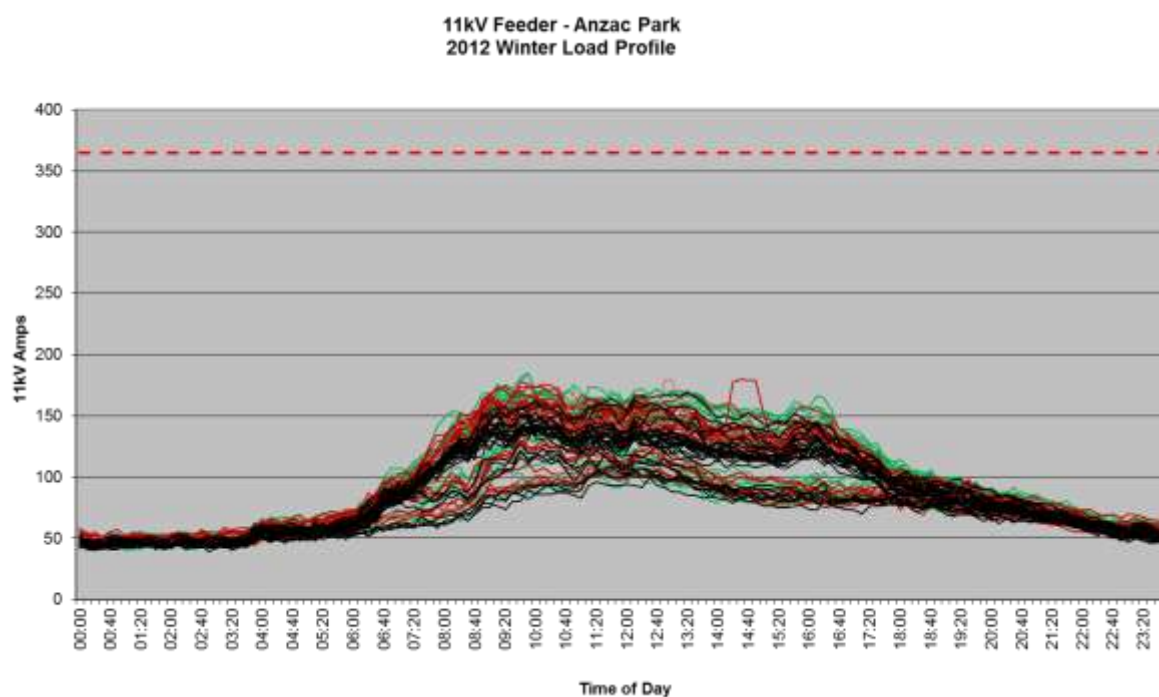
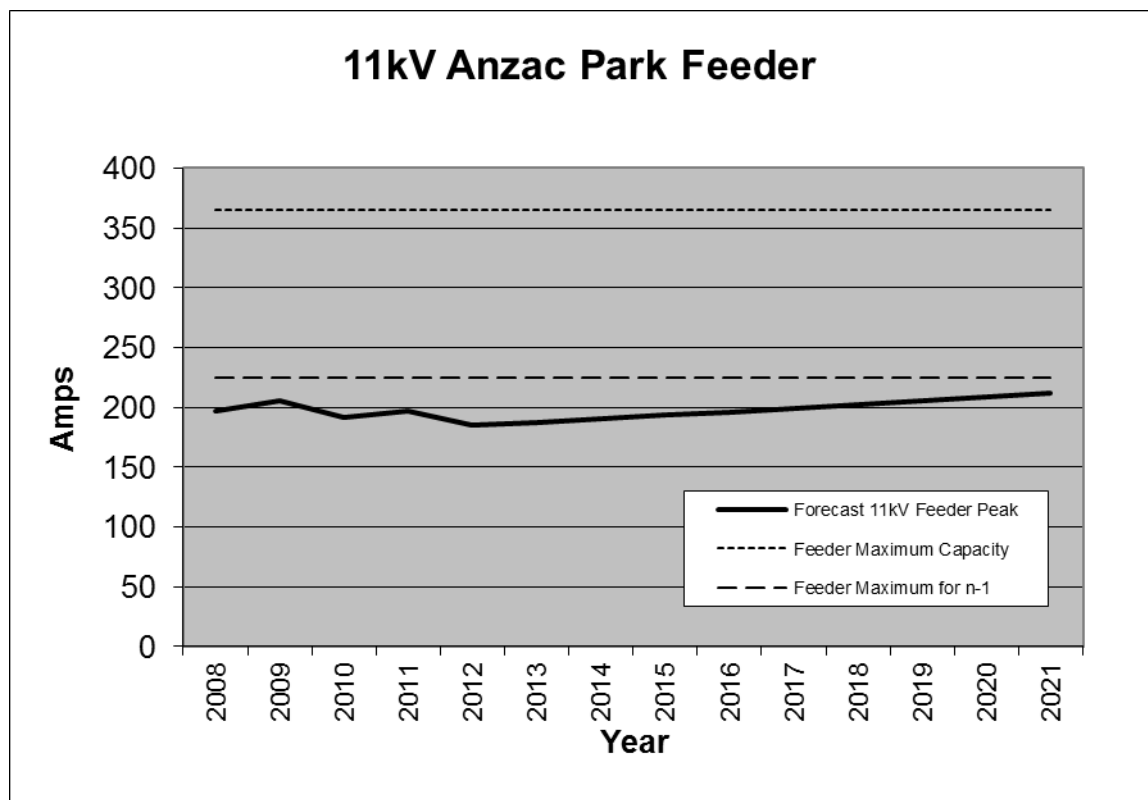
The Bank Lane feeder supplies the inner Nelson central business district. Its loading is commercial. It also provides a necessary 11kV back-feeding option for Alma Lane, GPO and Snows Hill feeders.



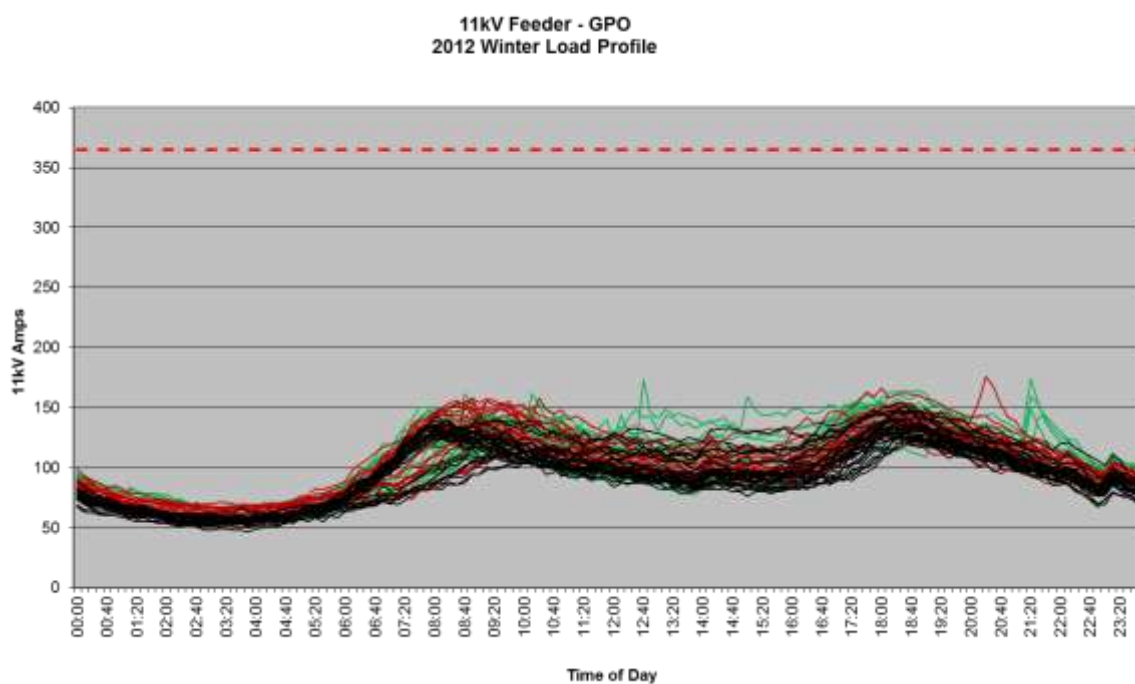
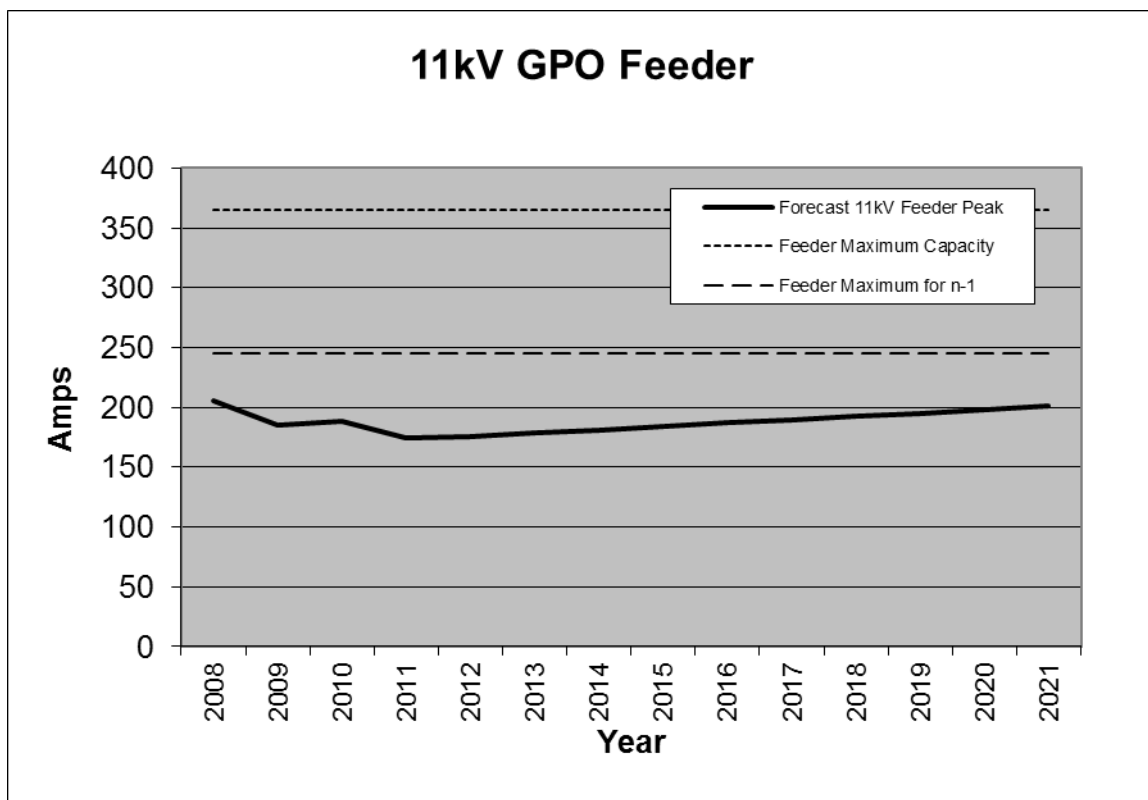
The Snows Hill feeder supplies the south eastern side of town including; the colleges and Mount Street areas. The loading is mostly domestic as well as school load.



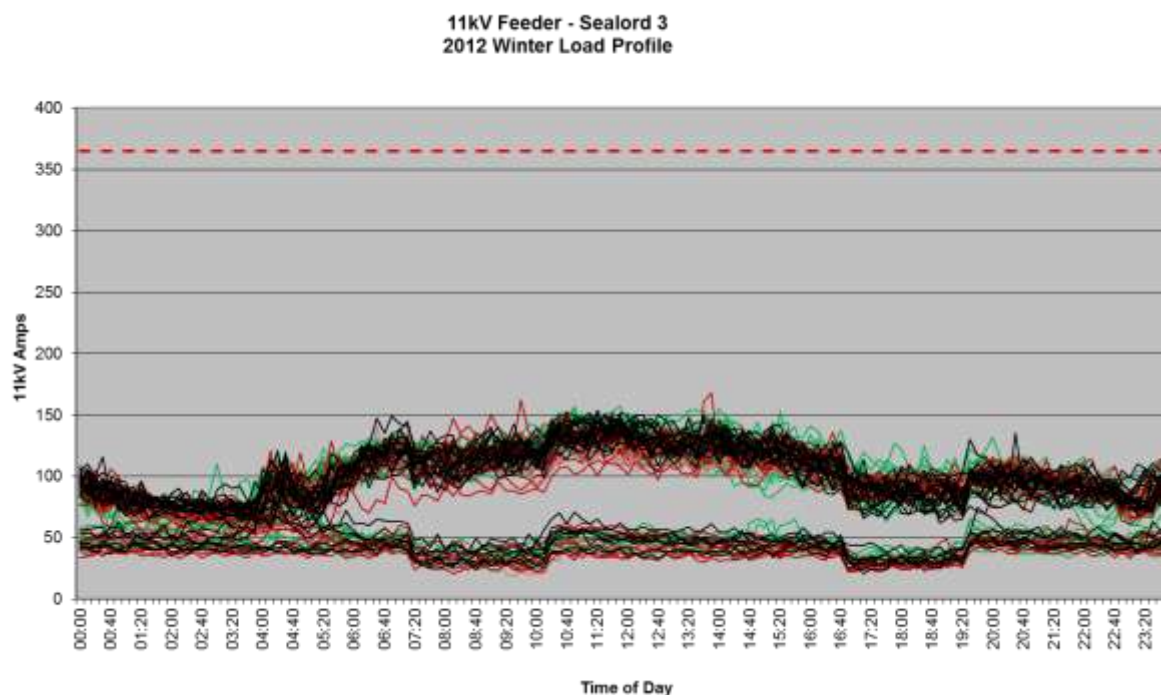
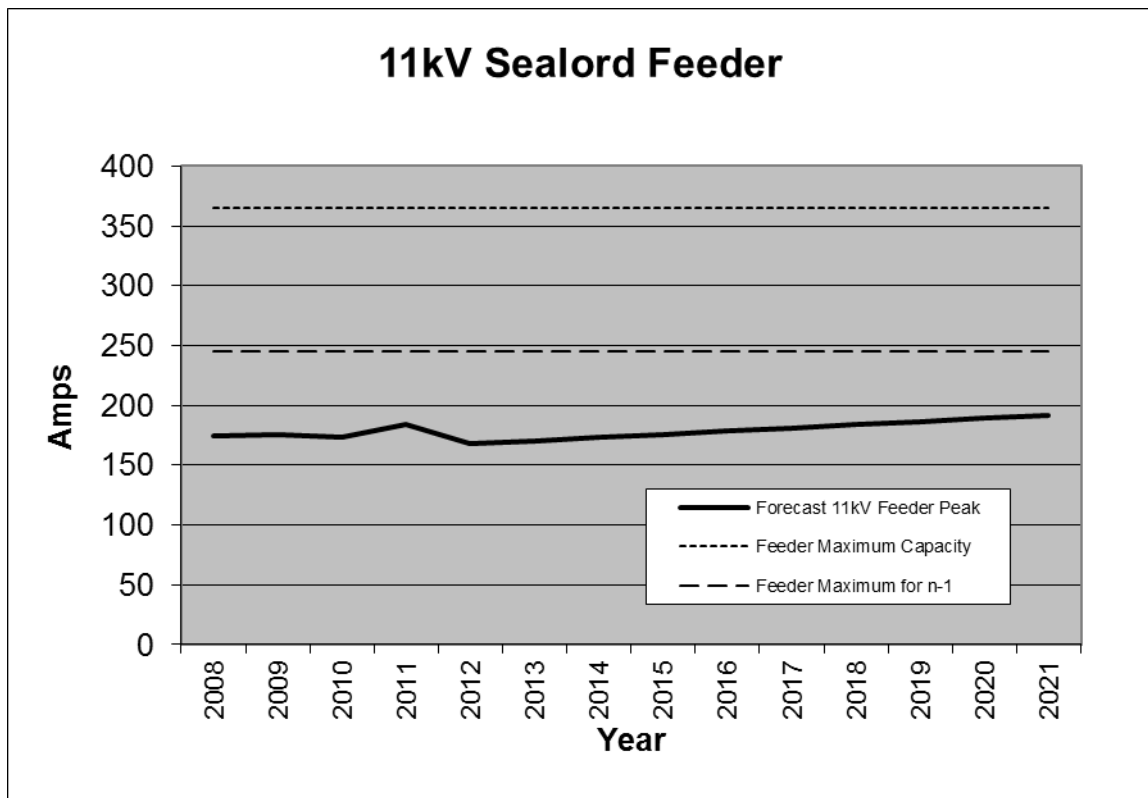
The Victory Square feeder supplies the southern end of town including; Victory Square, Toi Toi, Intermediate and Hospital areas. The supply is a mixture of domestic, light industrial and Hospital load.



The ANZAC Park feeder supplies the western side of the Nelson central business district and lower Vanguard Street areas. The load is commercial and light industrial. This feeder is also an important back-feeding option for the central business district, Snows Hill and Victory Square areas.

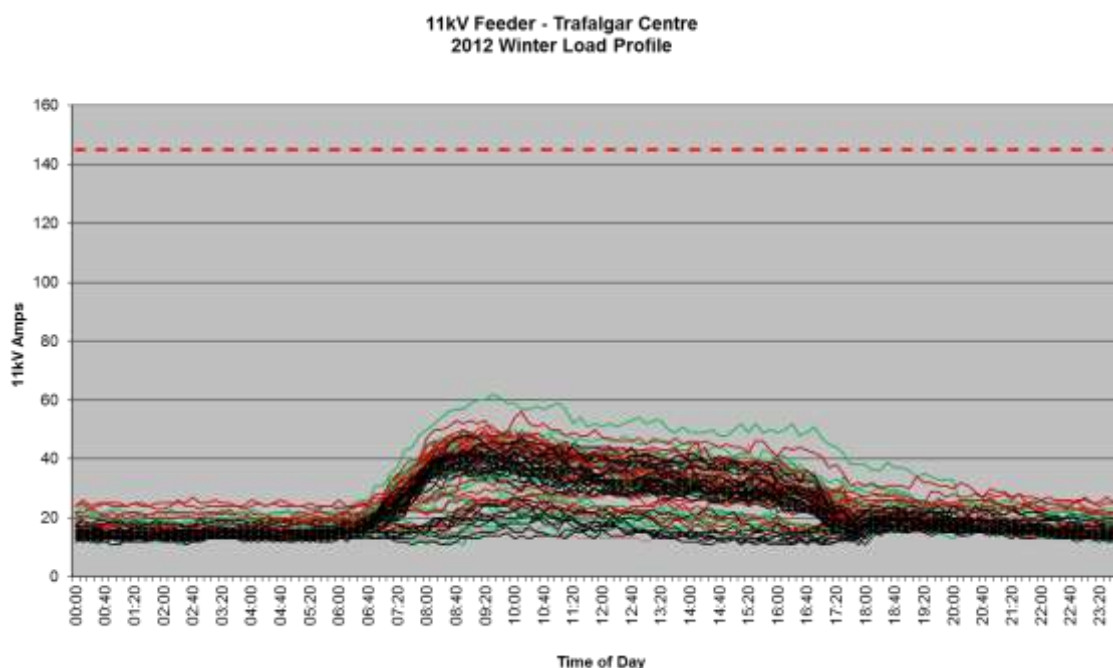
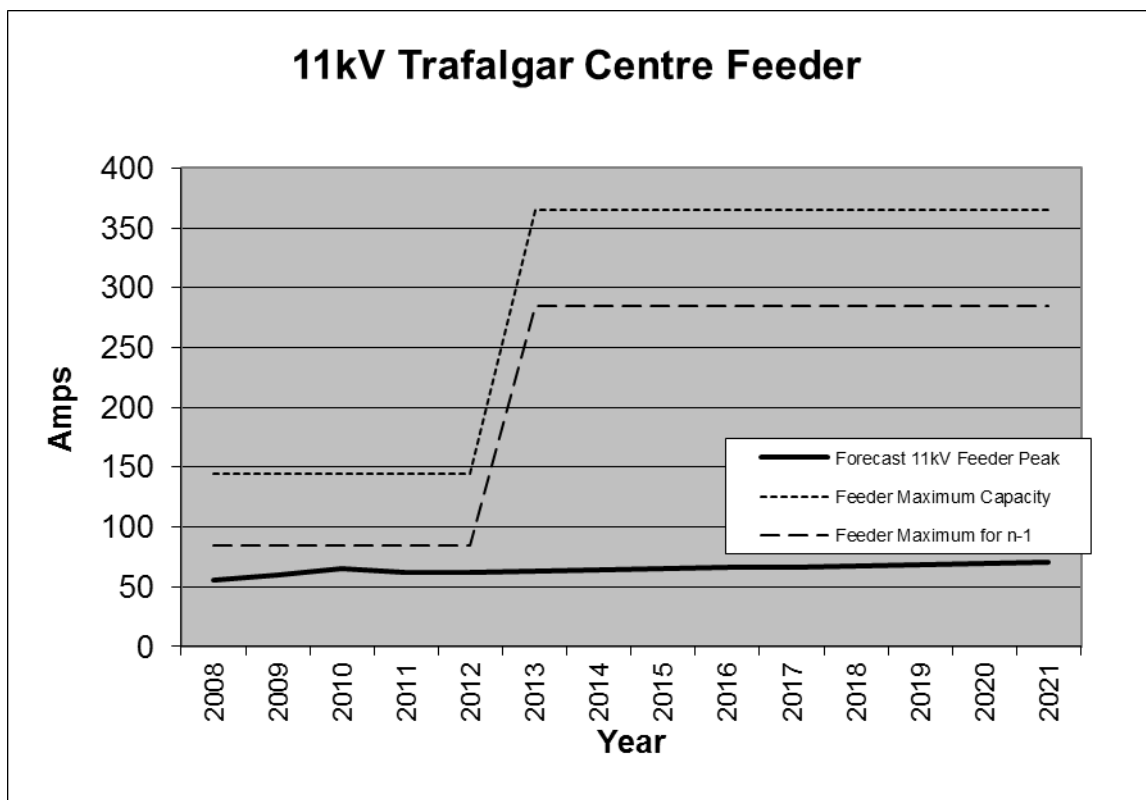


The GPO feeder supplies the northern end of town including Halifax Street (CBD) and the Wood suburb. The load is a mixture of commercial and domestic. This feeder is also an important back-feeding option for the central business district and New Street feeder.



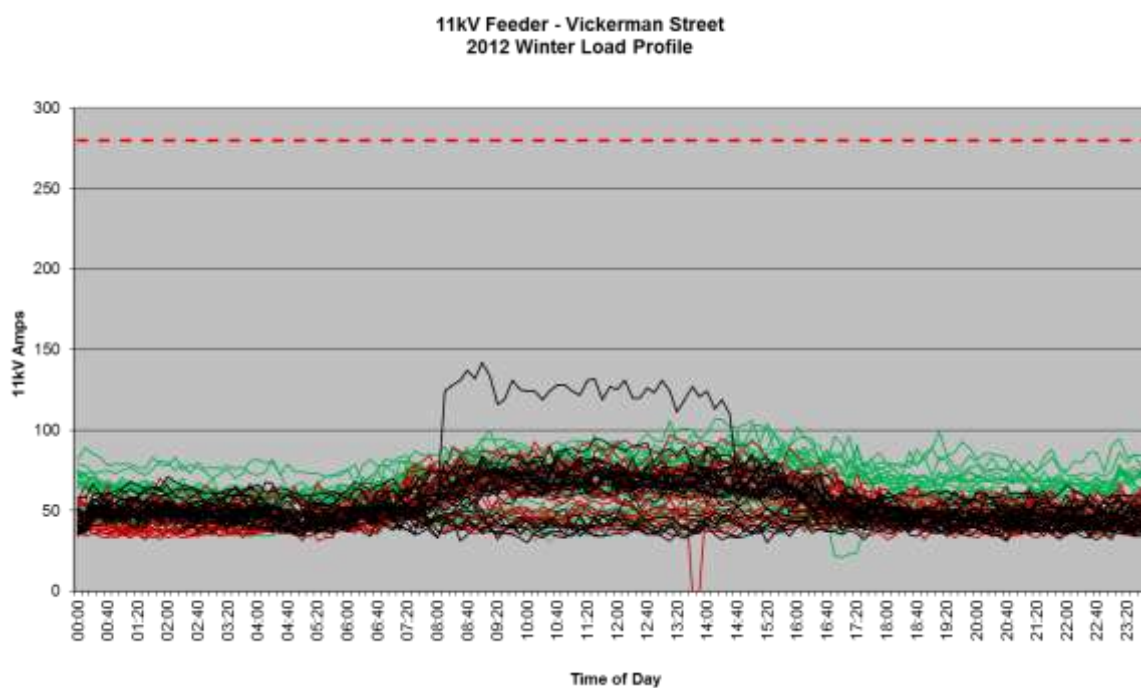
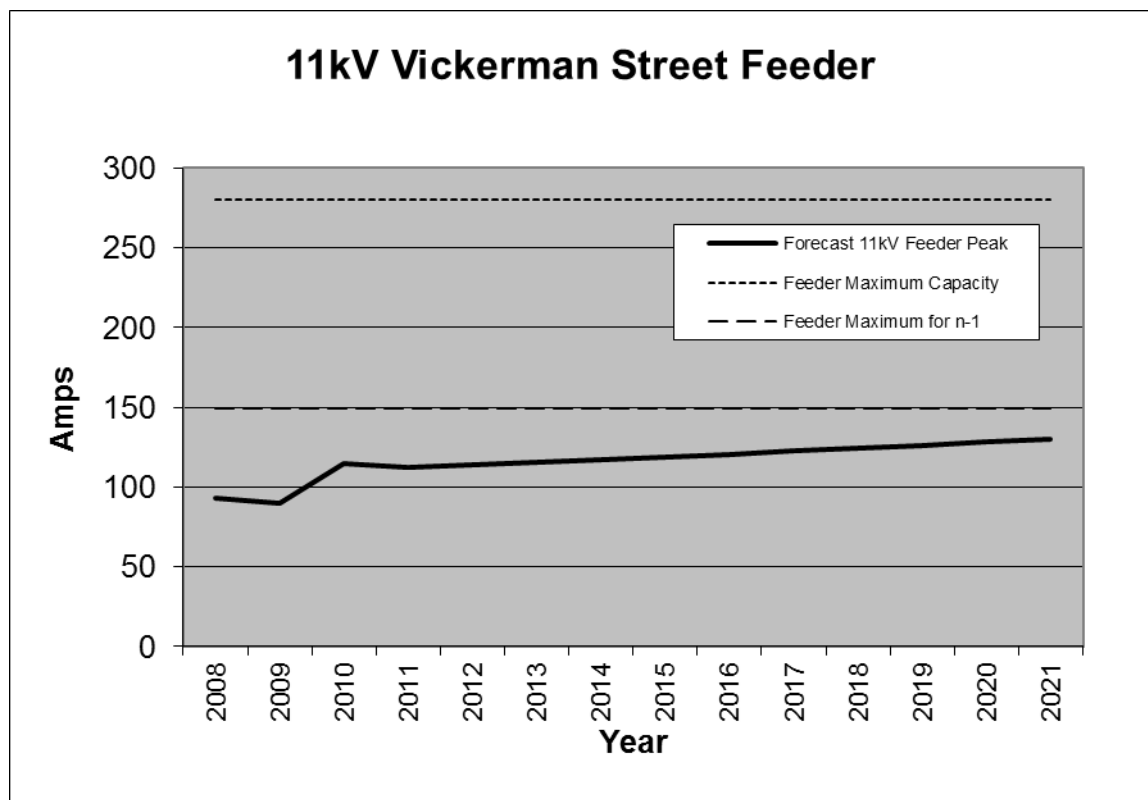
The Sealord feeder supplies the Sealord fishing complex at the Port area. This feeder is also used as a back-feeding option for the Port area.



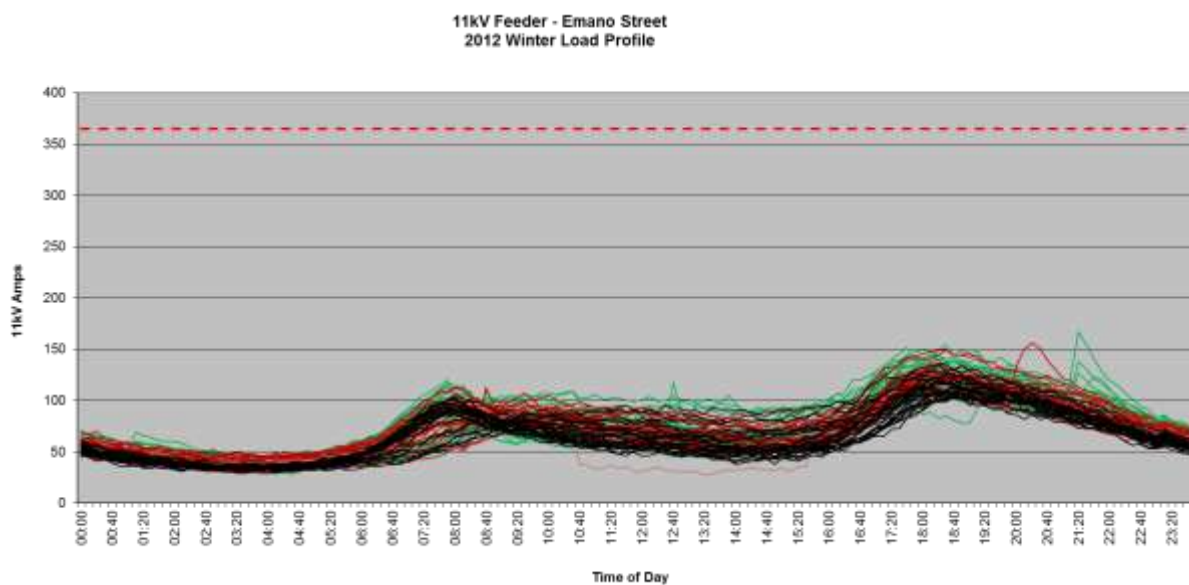
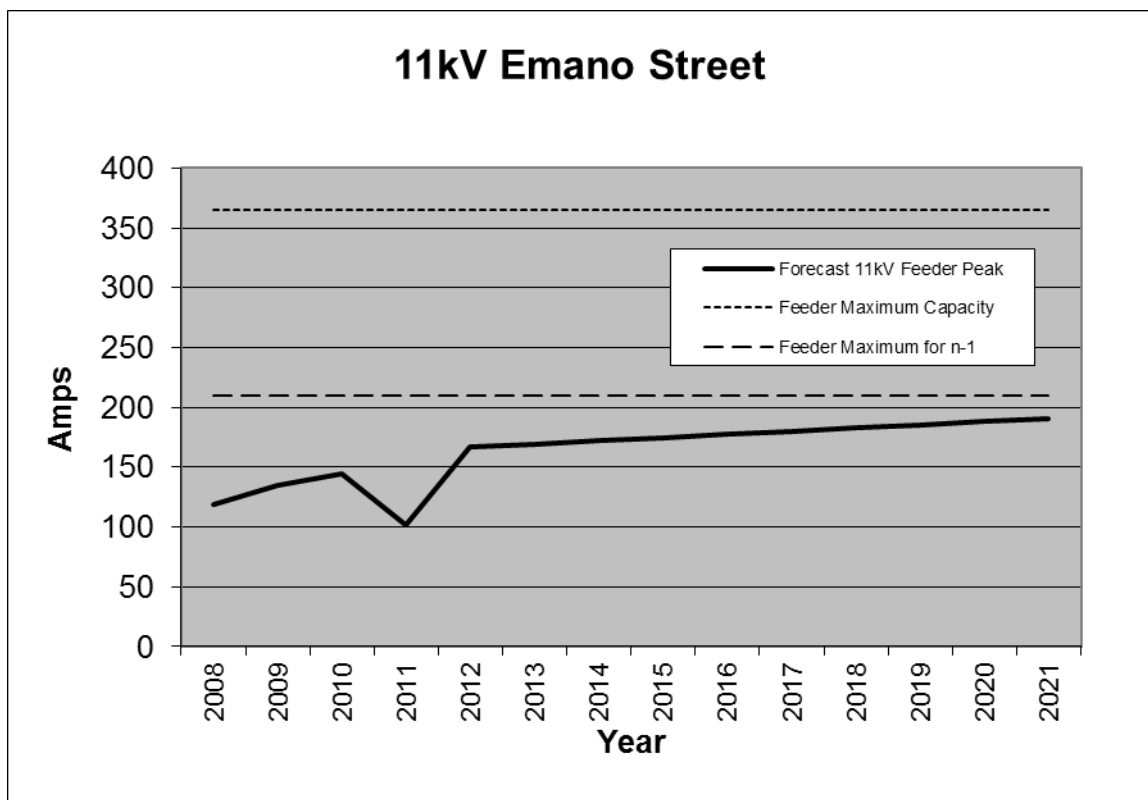


The Trafalgar Centre feeder supplies the Haven Road area and eastern Port area. The load is mostly light industrial and commercial.





The Vickerman Street feeder supplies the Port area. The load is mostly industrial. This feeder is an important back-feeding option for Sealord's and the rest of the Port areas.

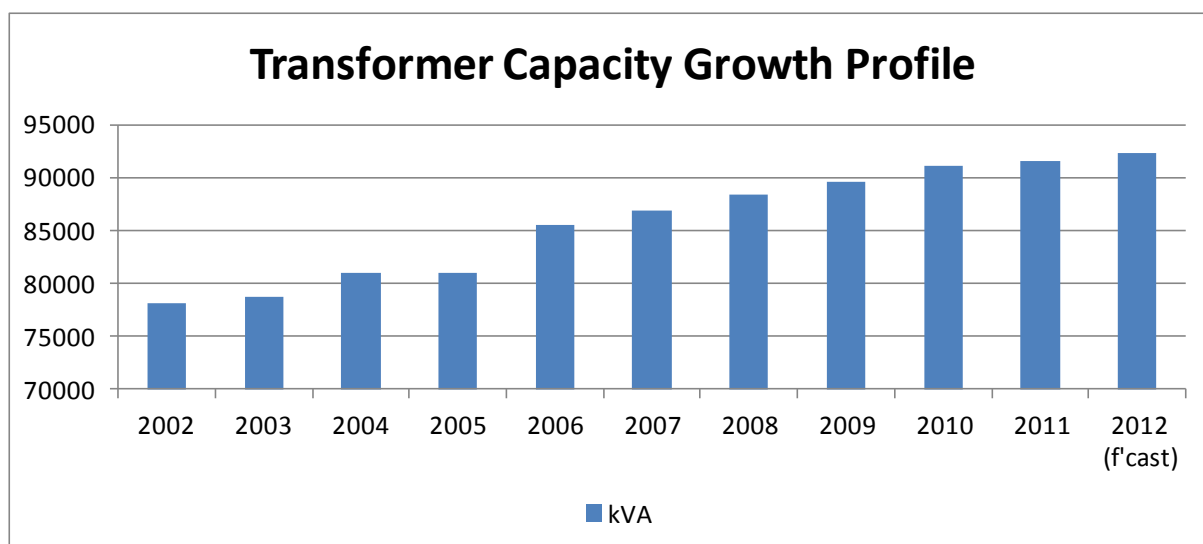


The Emano Street feeder was installed for the beginning of winter of 2005. The demand on this feeder has relieved the load on the Victory Square, Snows Hill and Washington Valley feeders.

## ***Distribution Transformers***

Transformer capacity has typically increased at approximately 0.8MVA per year but during 2009/2010 an extra 1.5MVA of extra capacity was installed. The growth trend has continued in all parts of the network. Most of this is based on new developments or upgrades in consumer capacity.

The 2013 year may see some reduction in transformer capacity through rationalising of capacity with larger consumers reducing demand.



## ***Alternative Solutions***

Refer to Section 3.6 – Non-Asset Solutions and 3.7 – Distributed Generation. These sections outline possible methods of reducing peak demand and avoiding additional network investment.

## ***Transpower***

Nelson Electricity is supplied from Transpower's Stoke Substation 7 kilometres from the Haven Road Zone Substation. Transpower have undertaken significant work in recent years to ensure the load growth in the top of the South Island is met by the transmission system. The significant addition was a third 220kV line from Kikiwa to Islington.

Network Tasman and Nelson Electricity share the load at Stoke Substation at the 33kV level. There is currently no apportionment or limit of capacity between the two networks as Nelson Electricity currently derives its transmission services through Network Tasman. Network Tasman is responsible for the full capacity at Stoke and passes on the Transpower charges to Nelson Electricity.

Both networks utilise load control systems to minimise system peaks. The main use of load control for Network Tasman is to minimise the upper South Island (including Christchurch area) transmission peak, whilst Nelson Electricity manages both the upper South Island peak and local system peak. This system has worked well and has been in place since 2009. Nelson Electricity was able to target more effectively its load control times to provide better service for consumers while being able to minimise future transmission costs. The Christchurch load fell back significantly during 2011 following two major earthquakes.



***NEL's 33kV transformers arriving in Jan 1960***

Three 50MVA supply transformers supply the 33kV load at Stoke, providing:

- A total nominal installed capacity of 150 MVA; and
- N-1 capacity of 114/114 MVA (summer/winter).

The peak load at Stoke during 2009 was 120.4MW, 2010 was 122.0MW, 2011 was 126.6MW and 2012 was 124.1MW. The current supply transformers are made up of single phase units with a contracted on-site spare allowing replacement within 8 to 14 hours following a unit failure. The current N-1 220kV/33kV transformer capacity at Stoke is 114MVA. The transformer capacity is limited by protection equipment; with this limit resolved, the N-1 capacity will be 124/133 MVA (summer/winter).

Transpower are, however, currently undertaking significant work at Stoke Substation by replacing the existing 220kV/33kV transformers with two 120MVA three phase transformers as well as replacing the outdoor 33kV bus with an indoor 33kV switchboard at approximately \$14 million. This will be commissioned in 2013. The new N-1 transformer capacity will be lifted to 143MVA.

Refer to Transpower's Annual Planning Report –

<https://www.transpower.co.nz/sites/default/files/publications/resources/Chapter%2015%20Nelson-Marlborough%20Region.pdf>

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## 5.3 Development Plan

The drivers for development and replacement on the network have been covered in more detail in the Planning Criteria section of this document.

Nelson Electricity has structured its Development Plan based on the following criteria:

- Network Growth;
- Network Improvement;
- Network Renewal.

In many of the projects planned for the next 10 years, the criteria of Growth, Improvement and Renewal overlap and a single project may well address more than one of these criteria. Therefore, the projects as listed under Capital Expenditure may be equally applicable under another heading. The aspects of the criteria are governed by ongoing and regular indicators such as asset performance and asset audits.

Plans for future **Network Growth** or reinforcement are developed from information received of known or planned industrial, commercial or residential growth. Typically NEL finds there is very little advanced warning of imminent growth especially in the industrial and commercial sector which can often occur in less than 24 months.

A key driver for **Network Improvement** is asset age. Over 85% of the network is installed underground and much of that underground network was installed in the 1960s and 1970s. This means that over the next 20 years many cables will come to the end of their 45 year theoretical life span.

Areas of **Network Renewal** are identified from planned maintenance records, annual load surveys, condition monitoring audits and risk assessment.

### Network Growth

There is a steady if small continuous growth occurring on the network and this is being addressed right across the network at the 33kV level and right down to 400 volt level. A load forecast for the network is used to identify future capacity constraints and solutions are developed from that information. Financial and technical options are analysed to identify the best long term solution and then a project planning programme is developed.

## **Network Improvement**

Network Improvement encompasses the areas of security, safety and environmental issues. Projects concerning safety especially public safety are always treated as top priority. As they are identified, network security and environmental issues are added to the Capital Expenditure plan.

## **Network Renewal**

This criterion covers assets requiring upgrade due to growth or performance and replacement due to age or condition. Renewal projects can often be predicted quite accurately and often condition and age are the prime drivers for the project.

### **5.4 Capital Expenditure Planning**

There is considerable resource put into the development of the capital plan. It is broken down into; growth, improvement and renewal as described above in 5.3. The Plan is also split into the various network categories from 33kV feeders to 400 volt network. The major planning decisions or directions are described below. There are two major projects to be undertaken over the next year:

- A new 33kV feeder (7 kilometres) from Haven Road Zone Substation to Transpower's Stoke substation;
- Full replacement of the existing Haven Road Zone Substation.

These two projects are discussed further in the Major Projects section of the Capital Expenditure Plan.

It has to be recognised that Nelson Electricity is a small network by comparison to other networks in New Zealand. The detail of each project outlined is considered appropriate. Detailed descriptions of projects are the new 33kV feeder and Zone Substation replacement as well as projects valued over \$200,000. Smaller projects are described as summary only.

### **33kV Feeders**

The Zone Substation is supplied via three 33kV feeders connected to the Network Tasman Grid Exit Point at Stoke Substation. At present two of the feeders are connected in parallel to supply half of the split 11kV bus at the NEL Zone Substation while the third feeder is connected to the other half of the bus. Although an auto-switching arrangement for the 33kV feeders covers continuity of supply in the event that one feeder fails, both the lack of a further backup feeder and the potential of rising load on each side of the 11kV bus means that there is a need for a fourth feeder to be installed in 2013. This feeder will be installed underground and will be rated for 33kV operation. The project is currently proceeding in conjunction with Network Tasman who are also installing their own 33kV feeder along half of the route. This project has been delayed by 12 months due to problems gaining consent to part of the cable route.

The fourth 33kV feeder will be laid 7 kilometres underground from Stoke Substation to the Haven Road Zone Substation. Along part of the route the trench will also accommodate a second underground 33kV cable to replace a section of existing overhead 33kV feeder.

### **33kV Zone Substation**

Nelson Electricity will be replacing the existing outdoor structure at Haven Road Zone Substation with a new indoor Zone Substation to be located at the rear of the existing site.

The existing Zone Substation has a total 33kV/11kV transformer rating of 30MVA, although enhancements such as forced air cooling have increased the capacity to 40MVA. There are additional risks in utilising aging transformers even though engineering assessments support they are in good condition for their age. Plans are now proceeding to replace the existing transformers with three 16/24MVA ANAF transformers to provide for 72MVA firm capacity with N-1 security of supply level of 48MVA. This is to be located at the rear of the present Zone Substation site.

The existing 33kV oil circuit breakers (OCBs) and air break switches (ABS) will be replaced with new 33kV SF6 circuit breakers and are to be located indoors at the new Zone Substation site.

The existing 11kV switchboard was installed in the late 1950s and, although continuing to operate reliably, spare parts are not now readily available. Replacement 11kV switchboards, in the form of SF6/Vacuum CBs, are on order and these will be located in the new Zone Substation.

The existing outdoor structure, although in good condition, will be dismantled after the full commissioning of the new Zone Substation.

This project will be undertaken during the 2012/2013 and 2013/2014 financial years.

### ***11kV Feeders***

Of the thirteen 11kV feeders that exit the Zone Substation only one has a rating lower than 300 amps and 10 have been replaced within the last 20 years so growth on the network is well covered in this area. The Capital Works programme addresses the replacement of the remaining undersized cables within the next 10 years.

As part of the new Zone Substation project the existing 11kV feeders will be progressively disconnected from their existing OCBs, extended and re-terminated to the new CBs in the new Zone Substation.

### ***11kV Cabling***

The age of the 11kV cabling ranges from 1938 to the present time with the bulk of underground network being installed between the 1960s and 1980s. The 11kV cabling is a combination of paper insulated and cross linked polyethylene cables and so the technical end of life for most of the latter will occur within the next 10 years.

The Asset Management Plan addresses the aspects of growth, improvement and renewal on the 11kV network partly through single links between substations or a continuous interconnected number of links. An example of the latter is an 11kV Outer Ring which at present consists of cables rated at less than 150 amps, and has been found to be operationally inadequate in the event of 11kV failures when substantial capacity needs to be back-fed, so is planned for replacement.

### ***11kV Transformers***

As the 11kV network was converted from an overhead to underground network, previously pole mounted transformers were refurbished and recycled as ground mounted transformers. This trend continues today and where possible in areas of growth, larger pre-used transformers are utilised to replace those with less capacity. With the continuing growth on the network the requirement for higher rated transformers continues and the number of 100 and 200kVA transformers is now significantly reduced. Nowadays the requirement for 500 and 750kVA transformers is much more common. The Capital Expenditure includes transformer uprates expected for the next two years and a budgeted figure for the following eight years.

### ***11kV Switches***

Following recent upgrades of older 11kV oil switches to more modern switching technology, the average age of this part of the network has reduced considerably. Nelson Electricity has deliberately retained oil type switches on the distribution network, but is investigating vacuum as a possible new insulating medium. There are a number of sites tagged for the use of vacuum switchgear.

### ***400V Network***

Approximately 15% of the 400 volt network remains as overhead reticulation and the remainder is installed underground. The underground network dates from 1937 to the present and, as with the 11kV network, the bulk of the 400 volt network was installed underground between the 1960s and 1980s. Any recent new 400 volt underground projects, apart from subdivisions, have required rigorous cost justification and therefore they were usually only approved when the installation was part of a cost-share project, usually with the Nelson City Council.

Much of the existing 400 volt network is adequately sized for the load it is supplying, however, in areas where in-fill housing has been prolific some undersized cables are approaching maximum capacity. The other area of concern is the CBD where the age and capacity of the existing network will require reinforcement in the near future. In order to defer immediate expenditure in this area, the existing network is being progressively sectionalised in order to maximise the existing available capacity. However, an ongoing replacement programme for the 400 volt underground network has been established and is outlined below.

At the present time Nelson Electricity has 135 km of 400 volt underground network which consists of a combination of XLPE and Paper Insulated cables with ODV life spans 45 and 70 years respectively. Based on this data, a replacement programme of 60 years has been allowed to replace the existing 135 km of cable which means that 2.2 km of cable needs to be replaced each year. The average metre cost for cable replacement has been based on a combination of the new cable being installed in a dedicated trench, a shared trench or an existing ductline. The first 10 years of the replacement cost has been spread evenly across Capital Expenditure budget and replacement projects will be prioritised on a year by year basis.

It has been recently identified from as-built records that small pockets of 400 volt underground cable, although installed at the correct depth 50 years ago, may not meet acceptable depth requirements today. Such cables installed under grass berms have now largely been addressed and cables laid under sealed tarmac will be dealt with in the next two years. Another project is currently underway to address cables identified in a vulnerable state laid in footpaths and roadways. These are being addressed in an urgent manner and will be completed in 2013.

## ***Capital Expenditure Plan***

The following three pages is a summary of capital expenditure for the next 10 year period demonstrating NEL's development and reinforcement of the network. The classification section expands and explains the breakdown by asset category.

The regulatory requirements financial summary for the capital expenditure plan is referred to in section 9.1 of this document.

## ***Classifications***

<p>The Development Plan has been divided into six distribution classifications and each has been addressed separately. The classifications are:</p> <ul style="list-style-type: none"> <li>• 33kV feeders;</li> <li>• 33kV Zone Substation;</li> <li>• 11kV feeders;</li> <li>• 11kV cabling</li> <li>• 11kV transformers;</li> <li>• 11kV switches;</li> <li>• 400V network</li> </ul>	<p>The Capital Expenditure Summary is broken into the following classifications to tie up with the disclosure requirements and Appendix F;</p> <ul style="list-style-type: none"> <li>• Growth</li> <li>• Renewal</li> <li>• Improvement</li> <li>• Overhead to underground</li> </ul>
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## Capital Expenditure 2013-2023

Category	Location	y/e 31/3/14	y/e 31/3/15	y/e 31/3/16	y/e 31/3/17	y/e 31/3/18	y/e 31/3/19	y/e 31/3/20	y/e 31/3/21	y/e 31/3/22	y/e 31/3/23	y/e 31/3/24
33kV Lines & Cables	33kV Feeder Cabling	1,000,000										
33kV/11kV Substations	33kV Transformer Capacity & 11kV Sw Board	5,000,000										
11kV/400V Transformers	New St Tfr Uprate	65,000										
11kV/400V Transformers	Snows Hill Tfr Uprate	40,000										
11kV/400V Transformers	St Lawrence St Tfr Uprate	40,000										
11kV/400V Substations	Halifax 51 Development	55,000										
11kV/400V Substations	Wakefield Qy Gibbons Dev Substation	40,000										
11kV/400V Transformers	Arrow St North Tfr Uprate		40,000									
11kV/400V Transformers	Bronte St Tfr Uprate		50,000									
11kV/400V Transformers	Collingwood St 90 Tfr Uprate		30,000									
11kV/400V Transformers	DB Hotel Tfr Uprate		65,000									
11kV/400V Transformers	Tukuka St Tfr Uprate		40,000									
11kV/400V Transformers	Vanguard St South Tfr Uprate		30,000									
400V Lines & Cables	Alma Street 400V Extension from Collingwood 90		20,000									
11kV/400V Substations	Green Gables Development		60,000									
11kV/400V Transformers	Transformer Uprates	100,000	80,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Miscellaneous	Unknown Provision	50,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
		6,390,000	515,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
11kV Lines & Cables	Main Sub - Snows Hill HV Uprate	525,000										
11kV Lines & Cables	Main Sub - Trafalgar Centre HV Uprate	135,000										
11kV Lines & Cables	Montreal North - Montreal South HV Uprate & Sub	100,000										
11kV Lines & Cables	Trafalgar St LB - Bronte St HV Uprate	70,000										
11kV Lines & Cables	McDonalds - Hardy St West HV UG & Sw Alteration		130,000									
11kV Lines & Cables	North Rd - Milton St North HV Uprate		100,000									
11kV Lines & Cables	Seymour Ave - Scotland St LB HV Uprate		100,000									
11kV Lines & Cables	AMP - McDonalds HV Uprate			264,000								
11kV Lines & Cables	Gloucester St - Kirkpatricks HV Uprate			120,000								
11kV Lines & Cables	Hardy St West - Kirkpatricks HV Uprate			80,000								
11kV Lines & Cables	ABC Sub - Victory Sq HV Uprate				30,000							
11kV Lines & Cables	Hampden St LB - Alfred St HV Uprate				30,000							
11kV Lines & Cables	Griffins - Nile St Bridge HV Uprate				100,000							
11kV Lines & Cables	Main Sub - Victory Square HV Uprate				250,000							
11kV Lines & Cables	Abraham Hts East - Montreal North HV Uprate					175,000						
11kV Lines & Cables	Quebec Rd - Abraham Hts East HV Uprate					110,000						
11kV Lines & Cables	Snows Hill - Rutherford 130 LB HV Uprate					200,000						



Category	Location	y/e 31/3/14	y/e 31/3/15	y/e 31/3/16	y/e 31/3/17	y/e 31/3/18	y/e 31/3/19	y/e 31/3/20	y/e 31/3/21	y/e 31/3/22	y/e 31/3/23	y/e 31/3/24
11kV Lines & Cables	Watson St - Quebec Rd HV Uprate					120,000						
11kV Lines & Cables	Anzac Pk - Halifax 28 HV Uprate						120,000					
11kV Lines & Cables	Anzac Pk - NSW HV Uprate						215,000					
11kV Lines & Cables	Anzac Pk - Rutherford 73 HV Uprate						100,000					
11kV Lines & Cables	Halifax 28 - GPO HV Uprate						45,000					
11kV Lines & Cables	Emano St North - Totara St HV Uprate							115,000				
11kV Lines & Cables	Emano St North - Victory Sq HV Uprate							130,000				
11kV Lines & Cables	New St - Wakatu HV Uprate							80,000				
11kV Lines & Cables	Port 1 - Russell St Pumps HV Uprate							140,000				
11kV Lines & Cables	Powerhouse - Poynters Cres HV Uprate								140,000			
11kV Lines & Cables	Rocks Rd - Wakefield Qy HV Uprate								220,000			
11kV Lines & Cables	Rocks Rd - The Cliffs HV Uprate								175,000			
11kV Lines & Cables	Wakefield Qy - Poynters Cres HV Uprate								50,000			
11kV Lines & Cables	Carkeek St East - N&B HV Uprate									165,000		
11kV Lines & Cables	Hospital - Waimea Rd LB HV Uprate									75,000		
11kV Lines & Cables	Waimea Rd LB - Tukuka St HV Uprate									75,000		
11kV Lines & Cables	Waimea Rd LB - Vanguard St South HV Uprate									210,000		
11kV Lines & Cables	Wildman Ave - Carkeek St East HV Uprate									115,000		
11kV Lines & Cables	Carkeek St - Dormans HV Uprate										50,000	
11kV Lines & Cables	Hay St 2 - Carkeek St HV Uprate										150,000	
11kV Lines & Cables	Quebec Rd - Montcalm HV Uprate										170,000	
11kV Lines & Cables	Sealord 1 - Coolstor HV Uprate										85,000	
11kV Lines & Cables	Nalder&Biddle - Vickerman St North HV Upgrade											245,000
11kV Lines & Cables	Wakatu - Normanby Bridge HV Uprate											110,000
400V Lines & Cables	Non Standard Cable Depth Project	100,000										
11kV Switches	11kV Switch replacements	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
400V Lines & Cables	Cable Replacement	352,000	352,000	352,000	352,000	352,000	352,000	352,000	352,000	352,000	352,000	352,000
400V Lines & Cables	Link Box Replacements	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
400V Lines & Cables	Service Box Replacements	50,000	40,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Miscellaneous	Network Asset Renewals	150,000	180,000	190,000	200,000	210,000	220,000	220,000	220,000	220,000	220,000	220,000
		1,532,000	952,000	1,086,000	1,042,000	1,247,000	1,132,000	1,117,000	1,237,000	1,292,000	1,107,000	1,007,000
11kV Lines & Cables	Main Sub - Gloucester HV Link	30,000	50,000									
11kV Lines & Cables	Brook St - Seymour Sub to Tantragee Sub HV Ring			350,000								
11kV Lines & Cables	Brook St - Tantragee Sub to Brook 504 Sub HV Ring				180,000							
11kV Lines & Cables	Locking St - Wellington St HV Link						50,000					
11kV Lines & Cables	Tipahi St - Motueka St HV Link											30,000
11kV/400V Substations	Substation LV Board Replacements	15,000										
11kV/400V Substations	Normanby Br Sub relocate		50,000									
11kV Switches	GPO Tripping VCB		220,000									

Category	Location	y/e 31/3/14	y/e 31/3/15	y/e 31/3/16	y/e 31/3/17	y/e 31/3/18	y/e 31/3/19	y/e 31/3/20	y/e 31/3/21	y/e 31/3/22	y/e 31/3/23	y/e 31/3/24
11kV Switches	Emano St North Tripping VCB			250,000								
11kV Switches	Toi Toi / Montreal Rd HV LB	20,000										
11kV Switches	Abraham Hts HV LB				20,000							
11kV Switches	Wellington St HV LB						20,000					
11kV Switches	Tipahi St HV LB										22,000	
11kV Switches	Motueka St HV LB											22,000
400V Lines & Cables	Bridge St East LV Sectionalisation	30,000										
400V Lines & Cables	Hardy St East LV Sectionalisation		30,000									
400V Lines & Cables	Hardy St West LV Sectionalisation			30,000								
400V Lines & Cables	Trafalgar St Central LV Sectionalisation				30,000							
400V Lines & Cables	Trafalgar St North LV Sectionalisation					30,000						
400V Lines & Cables	Trafalgar St South LV Sectionalisation						30,000					
400V Lines & Cables	Reclamation LV Replacement							80,000				
400V Lines & Cables	Reclamation LV Replacement								80,000			
400V Lines & Cables	Reclamation LV Replacement									80,000		
400V Lines & Cables	Reclamation LV Replacement										80,000	
		95,000	350,000	630,000	230,000	30,000	100,000	80,000	80,000	80,000	102,000	52,000
		y/e 31/3/14	y/e 31/3/15	y/e 31/3/16	y/e 31/3/17	y/e 31/3/18	y/e 31/3/19	y/e 31/3/20	y/e 31/3/21	y/e 31/3/22	y/e 31/3/22	y/e 31/3/22
Capital Expenditure: Customer Connection		0	0	0	0	0	0	0	0	0	0	0
Capital Expenditure: System Growth		6,390,000	515,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Capital Expenditure: Reliability, Safety and Environment		95,000	350,000	630,000	230,000	30,000	100,000	80,000	80,000	80,000	102,000	52,000
Capital Expenditure: Asset Replacement and Renewal		1,532,000	952,000	1,086,000	1,042,000	1,247,000	1,132,000	1,117,000	1,237,000	1,292,000	1,107,000	1,007,000
Capital Expenditure: Asset Relocations		0	0	0	0	0	0	0	0	0	0	0
Subtotal - Capital Expenditure on asset management		8,017,000	1,817,000	1,866,000	1,422,000	1,427,000	1,382,000	1,347,000	1,467,000	1,522,000	1,359,000	1,209,000
Overhead to Underground Conversion Expenditure		0	120,000	20,000	120,000	100,000	100,000	65,000	0	0	190,000	0
11kV Lines & Cables	Arrow St North - Washington Rd HV/LV		120,000									
11kV Lines & Cables	Brook St - Uprate and UG HV at Tantragee			20,000								
11kV Lines & Cables	Toi Toi St UG HV/LV				120,000							
11kV Lines & Cables	Murphy St - Jenner Rd Junction HV Uprate & Sw					100,000						
400V Lines & Cables	Vanguard St - Gloucester to North Esk St LV Cabling						100,000					
11kV Lines & Cables	Locking St - Hampden St HV							65,000				
11kV Lines & Cables	Intermediate - Tukuka Sub HV Cabling - Tukuka St										90,000	
11kV Lines & Cables	Kawai St - Intermediate HV/LV Cabling - Tipahi St										100,000	
		0	120,000	20,000	120,000	100,000	100,000	65,000	0	0	190,000	0

## **Major Projects**

The two major capital projects which have been in the plan for a number of years are the new 33kV feeder and 33kV/11kV transformers, both budgeted at a total of \$9.5 million. Note that the capital expenditure table above assumes a level of expenditure in the 2012-2013 year for the 33kV feeder and Zone Substation replacement. If this does not occur as planned then the 2013-2014 year expenditure will correspondingly increase.

### **33kV Sub-transmission Feeder**

Over the last few years Nelson Electricity has been indicating the need to install an additional 33kV sub-transmission feeder to Transpower's Stoke substation or provide some alternative option. The growth had been approximately 1.0% to 1.5% per year up to 2008, although has been negative since then. The current 33kV N-1 security of supply capacity is 35MVA.

Nelson Electricity has been using non-network options to minimise winter demand peaks. Currently, without the use of load control, peak load would be in excess of 35MVA during winter. Whilst there are contingencies in place to cover the loss of load control or an extreme lift in demand by consumer demand side management, the new feeder will be installed in 2013 increasing N-1 feeder capacity to 52MVA.

The timing of the new feeder coincides with Network Tasman installing a 33kV cable to their Zone Substation at Founders (north of Nelson). Nelson Electricity is working closely with Network Tasman by laying cable at the same time along the same route for half the distance. There has been significant savings to both parties as a result. This project is necessary and will improve security of supply to the Nelson Electricity network for the foreseeable future.

Nelson Electricity has reviewed a number of alternatives to a costly 33kV underground feeder. These ranged from utilisation of existing distributed generation on the network, interconnection with Network Tasman as well as feeders of higher voltages e.g. 66kV and 110kV.

Although the higher voltage options could potentially have provided for a better long term option, reducing the number of feeders required, the costs were significantly higher by up to four times the 33kV feeder cost.

Reliance on consumer demand and embedded generation is only seen as a short term measure as Nelson Electricity does not have the diversity of options to consider this for anything more than a small number of half hours in a winter period.

Interconnection with Network Tasman was a viable option which could island off a section of network and be supplied by Network Tasman's Founders Zone Substation at 11kV, but there were additional costs involved with ripple signal for consumers, reconciliation and rental of capacity. This may have been considered further but the 33kV feeder installation also coincides with the Zone Substation replacement. One of the reasons for the Zone Substation replacement was due to the reliance on aging 33kV/11kV transformers.

Provision has been made in the planning for future parallel inter-connection with Network Tasman, in times of emergency, by purchasing new 33kV/11kV Transformers with Star-Star configuration for the new Nelson Electricity Zone Substation.

Interconnection in the end could only have been a deferral option for up to five years. There was minimal difference in the present value of both options with the transformer failure risk being seen as more important than any small savings through interconnection.

## **Growth Projects**

### **33kV Feeder Cabling (Growth)**

The installation of a new underground 33kV cable between Transpower's Stoke Substation and Haven Road Substation is proceeding. This will be installed in 2013 as discussed in the major projects section above.

#### **Timing 2013/14**

### **Haven Road 11kV Switchboard Reinforcement (Security)**

The existing 11kV Switchboard is being replaced with a modern equivalent as part of the Haven Road Zone Substation replacement project as discussed in the Major Projects section above.

***Timing 2013/14***

### **Zone Substation 33kV Transformer Capacity Options (Growth)**

Planning is well advanced to replace the existing Haven Road Zone Substation in 2013 with a new 33kV/11kV Indoor Zone Substation located at the rear of the existing site. Three new 3 phase 16/24MVA transformers will be purchased for the project and will be housed indoors with the new 33kV and 11kV circuit breakers. Existing 33kV and 11kV cables will be extended from the existing to the new site. This project is mentioned in more detail in the major projects section above. At the writing of this plan all major plant was on order.

***Timing 2013/14***

\* \* \* \* \*

## ***Transformer Change Programme***

Nelson Electricity has a transformer replacement programme in place. The need to replace the transformer is typically influenced by load changes on the network or transformer maintenance criteria. Long-range change projections often require alteration if the conditions which apply to either of these criteria happen to change. Typically replacement transformers are installed on the ground and in most cases the only choice to be considered is the product to be used at that particular site.

### **New Street Transformer Uprate to 1500kVA (Growth)**

***Timing 2013/14***

### **Snows Hill Transformer Uprate to 500kVA (Growth)**

***Timing 2013/14***

### **St Lawrence Transformer Uprate to new 300kVA (Growth)**

***Timing 2013/14***

### **Halifax 51 Development Substation (Growth)**

This project will involve the installation of a new transformer and HV switch and a short length of HV cable. The substation will be installed to supply a new office building being constructed at the site. The potential 200kVA load at this site negated the possibility of considering an LV option. Spare feed-out capacity is being installed to provide reinforcement for the local 400V network. **A customer contribution will apply to this project.**

***Timing 2013/14***

### **Gibbons Wakefield Quay Development Substation (Growth)**

This project will involve the installation of a new transformer and HV switch and a short length of HV cabling. The substation will be installed solely to supply the 32 new apartments being constructed at the site. The potential 200kVA load at this site negated the possibility of considering an LV option. **A customer contribution will apply to this project.**

***Timing 2013/14***

### **Arrow Street North Transformer Uprate to 750kVA (Growth)**

***Timing 2014/15***

### **Bronte Street Transformer Uprate to 750kVA (Growth)**

***Timing 2014/15***

### **Collingwood Street 90 Transformer Uprate to 500kVA (Growth)**

***Timing 2014/15***

### **DB Hotel Transformer Uprate to 2x750kVA (Growth)**

***Timing 2014/15***

### **Tukuka Street Transformer Uprate to 500kVA (Growth)**

***Timing 2014/15***

### **Vanguard Street South Transformer Uprate to 500kVA (Growth)**

***Timing 2014/15***

### **Alma Street 400V Extension from Collingwood St 90 Substation (Growth)**

This project will involve the installation of a new 400V cable from Collingwood St 90 Substation to a new Link Box to be sited on the north east corner of Buxton Carpark. This will link into the existing 400V network on the north and east side of the carpark, and provide relief for the transformer at Alma St Substation.

***Timing 2014/15***

### **Green Gable Development Substation (Growth)**

This project will involve the installation of a new transformer and HV switch and a length of HV cabling and HV Link Boxes. The substation will be installed to supply a retirement complex being constructed at the site. The potential 300kVA load at this site negated the possibility of considering an LV option. Spare feed-out capacity is being installed to provide for the local 400V network and relocation of a local 750kVA substation. **A customer contribution will apply to this project.**

***Timing 2014/15***

\* \* \* \* \*

## ***Renewal Projects***

Many items listed under this category are for “replacement” of existing assets. As none of these assets are redundant or stranded at present their presence and replacement is unquestioned and the only alternatives to be considered at the time of design are the cable route and size.

### **Zone Substation - Snows Hill HV Replacement (Renewal)**

The existing cable was installed in 1963. Recent excavation and relocation of the cable showed some deterioration to the outside sheath of the cable. The performance and condition of the cable is continued to be monitored.

This major feeder supplies the Nelson south area including the College areas and southern fringes of the CBD. It also provides an important back-feed option to Victory Square (which includes the Nelson Hospital) and Alma Lane feeders. The cable is rated at 280 amps. Maximum loading during the winter of 2009 was 200 amps. The N-1 security of supply level for this cable is close to this limit. This project is necessary to improve the ease of back-feeding and reinforce supply to the 11kV CBD outer ring which is currently being reinforced.

The timing of this project has been delayed two years to align with the Zone Substation replacement. It was considered appropriate so the new cable can be connected directly to the new Zone Substation 11kV switchboard.

There is the possibility the disused Snows Hill feeder would be utilised to form an HV link between the local 11kV switch at the Zone Substation and St Vincent Street North substation. This would enable the new Snows Hill feeder to be laid directly between the Zone Substation and Snows Hill substation.

This feeder is one of the major feeders from the Zone Substation and consideration will be given closer to the time to the route and appropriate cable size.

***Timing 2013/14***

### **Zone Substation - Trafalgar Centre HV Feeder Replacement (Renewal)**

The trend of continuing growth in the Port/Wakefield Quay area of the network may require this feeder to be uprated to provide support for the existing HV infrastructure already in place. The present feeder is only rated at 145 amps and an uprate in size would be planned. This feeder is one of the major feeders from the Zone Substation and consideration will be given closer to the time to the route and suitable cable size. The timing of this project has been altered to fit with the Zone Substation replacement.

***Timing 2013/14***

#### **Montreal North – Montreal South HV Feeder and Substation Replacement (Renewal)**

The existing pole mounted substation structure requires replacement and the existing underground 11kV cable is undersized and shallow. The decision has been made to replace the 11kV cable while making provision for an underground 400V cable and install a new 300kV ground mounted substation. The installation of an HV Link Box will add further flexibility for future switching operations. The existing cable route was the most direct so alternatives were not considered.

***Timing 2013/14***

#### **Trafalgar Street LB - Bronte Street HV Replacement and LV (Renewal)**

The existing cable was installed on this route in 1938. Although this is an aged asset, the cable is still in good working order. This cable is, however, programmed for replacement. Future test results or load growth will determine the exact timing for replacement. An optional route for the replacement cable would not be economically practical. Provision will be made for future LV replacement.

***Timing 2013/14***

#### **McDonald's - Hardy West HV Replacement and Switch Alteration (Renewal)**

The existing HV cable from McDonald's to Kirkpatrick's is rated at only 145 amps on a section of fringe central business district network which is to be used to alter and uprate the circuit and create an alternative supply route into the central business district and beyond. HV Switch alterations will be required at Hardy West substation. The optional route for the replacement cable has been adopted in this case. Provision will be made for future LV replacement.

***Timing 2014/15***

#### **North Road – Milton Street North HV Uprate (Renewal)**

The major portion of this circuit is paper insulated and was installed in 1965. However, the circuit has been identified as under-sized in a section of the network required to maintain supply to eight substations downstream and to be utilised for back-feed and load balancing purposes.

***Timing 2014/15***

#### **Seymour Avenue – Scotland Street LB HV Uprate (Renewal)**

The majority of this circuit was installed in 1974 and after this uprate the cable would be utilised as the major route for 11kV supply into the constantly increasing load requirements in the Brook Valley. This would free up capacity on other circuits for strategic back-feeding and load balancing.

***Timing 2014/15***

#### **AMP – McDonald's HV Replacement (Renewal)**

The existing HV cable is rated at only 135 amps on a section of central business district network which is to be used to create an alternative supply route into the central business district and beyond. It is proposed to uprate this HV link with a more substantially rated cable. An optional route for the replacement cable will be considered at the time of final design.

***Timing 2015/16***

#### **Gloucester Street - Kirkpatrick's HV Replacement and LV (Renewal)**

Following the upgrading of the NEL Zone Substation to Snows Hill feeder, and after appropriate testing, it is proposed to utilise that disused feeder to form a link between Kirkpatrick's substation and Gloucester Street substation. This would enhance the size of the existing feeder between these substations. In this case an existing asset is being "recycled" to provide a secure feed which is the most practical and economic option as opposed to a new cable. Provision will be made for future LV replacement.

***Timing 2015/16***

#### **Hardy Street West - Kirkpatrick's HV Replacement (Renewal)**

The existing paper insulated cable which was installed in 1966 is rated at only 145 amps on a section of fringe central business district network which could be used as an alternative supply route into the central business district and beyond. It is proposed to up-rate this HV link with a more substantially rated cable. There is no optional route for the 178 metre length of cable.

***Timing 2015/16***

#### **ABC Substation – Victory Square Substation HV Replacement (Renewal)**

The existing 185 mm<sup>2</sup> cable was installed between the NEL Zone Substation and Victory Square in 1981 but is now under-sized for that purpose. However, it will be re-utilised between ABC Substation and Victory Square Substation to provide a supply route to an increasingly commercial but also industrial and residential customer base. An optional route for the replacement cable would not be economically practical.

***Timing 2016/17***

#### **Hampden Street LB – Alfred St HV Uprate (Renewal)**

The existing 70 mm<sup>2</sup> cable, although only installed in 1983, is now required as the main source of supply to the Nelson Hospital 11kV network and so regarded as under-sized for that purpose. An optional route for the replacement cable would not be economically practical.

***Timing 2016/17***

#### **Griffins – Nile Street Bridge HV Uprate (Renewal)**

The majority of the existing circuit was installed 1977 and this forms a significant back-feed option for the New Street feeder into the spur fed Maitai Valley. As part of the circuit is only rated at 145 amps it is now regarded as under-sized for that purpose. An optional route for the replacement cable would not be economically practical.

***Timing 2016/17***

#### **Zone Substation – Victory Square HV Replacement (Renewal)**

The existing 185 mm cable is now not adequately sized to provide the capacity that could be required at Victory Square Substation under fault conditions as a back-feed path. Part of the existing cable will be re-utilised in the ABC Sub to Victory Square link (See below).

***Timing 2016/17***

#### **Abraham Heights East – Montreal Road North HV Replacement (Renewal)**

This circuit will consist partly of the replacement of an existing undersized cable and, in order to take the most direct route, the installation of a new cable and link box. The existing paper insulated cable was installed in 1976 but the rating of 155 amps is insufficient for the back-feed link that the circuit is to be now used for.

***Timing 2017/18***

#### **Quebec Road – Abraham Heights East HV Replacement (Renewal)**

The HV link between Washington Road Feeder and Emano Street Feeder is scheduled for uprating and this circuit forms part of that link. This existing cable consists of 320 metres of paper insulated cable which was installed in 1976. Although continuing to provide reliable service the 155 amp rating of the cable does not meet required 300 amp rating of the new link. As a result the existing cable is to be replaced with a new higher rated cable along the same direct route as the existing.

***Timing 2017/18***

#### **Snows Hill - Rutherford 130 Link Box HV and LV Replacement (Renewal)**

The majority of this circuit was installed in 1959 and it now provides a back-feed link to the fringe of the CBD network. The capacity of this cable may present a problem for back-feed purposes in the near future. An optional route for the replacement cable will be considered at the time of final design. Provision will be made for future LV replacement.

***Timing 2017/18***

#### **Watson Street – Quebec Road HV Replacement (Renewal)**

Similar to an earlier project, this circuit forms part of a link between Washington Road Feeder and Emano Street Feeder which is scheduled for uprating. This circuit consists of 296 metres of paper insulated cable which was installed in 1975. However, the cable is only rated at 145 amps and as a result the existing circuit is to be replaced with a new higher rated cable along the same direct route as the existing.

***Timing 2017/18***



#### **ANZAC Park - Halifax 28 HV Replacement (Renewal)**

The existing cable is only rated at 145 amps and although this asset was installed in 1966, it is still in good working order. This cable will be considered for replacement as part of the project to replace the ANZAC Park – New South Wales cable. There is an alternative cable route which may be considered nearer the time of final design.

***Timing 2018/19***

#### **ANZAC Park - NSW HV Replacement and LV (Renewal)**

The existing cable which was installed in 1963 is a significant backup link to the central business district and, although still providing reliable service, is only rated at 145 amps. Because of its significance in the network, the cable is programmed for replacement. The project cost will be shared with the ANZAC Park - Halifax 28 replacement project. There is an optional route between these sites which will be given consideration. Provision will be made for future LV replacement.

***Timing 2018/19***

#### **ANZAC Park - Rutherford 73 HV Replacement (Renewal)**

Part of this link consists of 200 metres of .06 copper HV cable. It is proposed to change this cable for a 230 metre length of larger modern cable. As this project is totally upgrading an existing HV cable between two existing substations, the only option may have been to change the route but this was not economically practical.

***Timing 2018/19***

#### **Halifax 28 – GPO HV Replacement (Renewal)**

Having been installed in 1966 this cable should still be capable of continuing with reliable service, apart from the low end capacity of the cable. It may be required to replace the cable if development in this part of the central business district continues. An optional route for the replacement cable would not be economically practical.

***Timing 2018/19***

#### **Emano Street North - Totara Street HV Replacement (Renewal)**

The existing cable which is only rated at 90 amps now forms a crucial alternative link to the Nelson Hospital and Nelson south area. Replacement with a higher rated cable is proposed. As this project is totally upgrading an existing HV cable between two existing substations, the only option may have been to change the route but this was not economically feasible.

***Timing 2019/20***

#### **Emano Street North – Victory Square HV Upgrade and LV (Renewal)**

This circuit is part of an enhanced southern outer ring and connects two “first out” switching stations directly together. The existing 318 metres of paper insulated cable was installed in 1973 and is rated at 155 amps, however the capacity required for the southern ring is 300 amps. Both switching stations provide feeds directly and indirectly to the public hospital. The most direct route between the stations is the existing route. Provision will be made for future LV replacement.

***Timing 2019/20***

#### **New Street - Wakatu HV Replacement (Renewal)**

This circuit provides backup support into the fringe central business district, Wood and Maitai areas which consist of up to 15 substations. It is the cable’s capacity rather than its age which makes it necessary to list it for possible replacement. An optional route for the replacement cable will be considered at the time of final design.

***Timing 2019/20***

#### **Port 1 - Russell Street Pump HV Replacement (Renewal)**

The existing cable along part of this route was installed in 1938 and although giving no problems at present its replacement will be programmed if problems do occur and the load rises in the area. The present feeder is only rated at 145 amps. Consideration will be given closer to the time to the route and suitable cable size.

***Timing 2019/20***



#### **Powerhouse - Poynters Crescent HV Uprate and LV (Renewal)**

The installation date of the existing HV cable at this site was May 1965. The cable is also only rated at only 160 amps on a section of waterfront network where a number of commercial premises and apartment buildings have now been developed. It is proposed to uprate this HV link with a more substantially rated cable. As this project is totally upgrading an existing HV cable between two existing substations along the waterfront road, no other route option exists. Provision will be made for future LV replacement.

***Timing 2020/21***

#### **Rocks Road – Wakefield Quay HV Replacement and LV (Renewal)**

This is one of the last lower capacity cables in an otherwise uprated circuit and alternative back-feed backbone into the recently developed waterfront and Port hills area. The original XLPE cable is rated at 160 amps and was installed in 1979. The existing cable route is the most direct between the two substations. Provision will be made for future LV replacement.

***Timing 2020/21***

#### **Rocks Road - The Cliffs HV Replacement and LV (Renewal)**

The existing cable was installed in 1968 and provides the only supply route to an exclusive residential customer base. The reliability of a spur feed is paramount and although providing reliable service at present, as the cable ages, the risk of failure increases significantly. Part of the existing 400 volt network, which is laid parallel to the 11kV route, has been identified as having reduced cover and this will be addressed at the same time. As the LV is also being replaced an alternative route will not be considered in this case.

***Timing 2020/21***

#### **Wakefield Quay – Poynters Crescent HV Replacement (Renewal)**

This is the last lower capacity cable in an otherwise uprated circuit into the recently developed waterfront area. The original XLPE cable is rated at 160 amps and was installed in 1979. The existing cable route is the most direct between the two substations.

***Timing 2020/21***

#### **Carkeek Street East - Nalder & Biddle HV Replacement (Renewal)**

This cable is part of a backup circuit into the Reclamation and Sealord's sites. Being only rated at 145 amps may leave it undersized for this purpose in the future. An optional route for the replacement cable will be considered at the time of final design.

***Timing 2021/22***

#### **Hospital – Waimea Road LB HV Uprate (Renewal)**

This cable forms an important link between the Snobs Hill and Victory Square 11kV feeders to supply Nelson south. The existing cable was installed in 1974 and is only rated at 155 amps. There is no obvious alternative installation route between the two termination points.

***Timing 2021/22***

#### **Waimea Road LB – Tukuka St HV Replacement and LV (Renewal)**

The existing paper insulated cable that is laid this circuit, part of which is rated at 145 amps was installed in 1974. However because of its capacity the cable now is under sized for the purpose of a main supply to the network at the south end of the city. The existing route is the most direct between these substations. Provision will be made for future LV replacement.

***Timing 2021/22***

#### **Waimea Road LB – Vanguard Street South HV Replacement and LV (Renewal)**

The existing paper insulated cable which is rated at 145 amps was installed in 1972 but which because of its capacity now creates a weak link in one of the main circuits to the southern network. The existing route is the most direct between these substations. Provision will be made for future LV replacement.

***Timing 2021/22***

#### **Wildman Avenue - Carkeek Street East HV Replacement and LV (Renewal)**

This cable is part of a backup circuit into the Reclamation and Sealord's sites. Being only rated at 145 amps may leave it undersized for this purpose in the future. An optional route for the replacement cable will be considered at the time of final design. Provision will be made for future LV replacement.

***Timing 2021/22***

#### **Carkeek Street – Dorman’s HV Upate (Renewal)**

The existing cable which was installed during the 1960s is now undersized for its purpose. Although providing reliable service at present its capacity may present a problem in the near future for the commercial customer base. A major route change for the replacement cable would not be economically practical.

***Timing 2022/23***

#### **Hay Street 2 - Carkeek Street HV Upate (Renewal)**

Although part of this leg was installed in the early 1990’s, the remainder is dated as early as 1965. As it forms part of the reclamation industrial network it is envisaged that replacement will be required near this date. However, the ever changing complexion of the Port layout may dictate a different option in the future.

***Timing 2022/23***

#### **Quebec Road - Montcalm HV Replacement (Renewal)**

The paper insulated cable which serves these transformers at this time is rated at 145 amps and was installed in 1976. Although continuing to provide reliable service the two lengths of cable concerned will be considered for replacement at this time on the basis of capacity. No alternative route is practical in this hilly suburb.

***Timing 2022/23***

#### **Sealord 1 - Coolstore HV Replacement (Renewal)**

This is a small length of undersized cable which forms part of Sealord’s network and so the size and reliability of cables in this area is of significant importance. An optional route for the partial replacement cable would not be economically practical.

***Timing 2022/23***

#### **Nalder & Biddle – Vickerman Street North HV Replacement (Renewal)**

Part of the cable in the southern section of this route was installed in the early 1970s and has several joints installed on it. It may be possible to defer the replacement of the northern portion of the route which was not installed until 2000. An optional route for the partial replacement cable would not be economically practical.

***Timing 2023/24***

#### **Wakatu – Normanby Bridge HV Replacement (Renewal)**

This cable provides a secondary 11kV supply via a substation supplying significant customers to Normanby Bridge. An optional route for the replacement cable would not be economically practical.

***Timing 2023/24***

#### **Non Standard Cable Depth Project (Renewal)**

There are a number of locations over the network where short sections of 400 volt cable have been identified from as-built records as having reduced cover. During 2010-2012 those sites in grass berms or gardens were re-laid or replaced. : During 2010-2012 other sites with possible reduced cover but installed under seal tarmac were investigated further and will be addressed during 2013-2014.

***Timing 2011/14***

#### **Service Box Replacements (Renewal)**

The initial auditing cycle of all existing LV Service Boxes is complete and so it is expected that the bulk of any replacements will be completed within the next few years although there will always be an on-going replacement programme as a result of the continuous audit programme.

***Timing 2013/14***

\* \* \* \* \*

## **Improvement Projects**

### **Zone Substation – Gloucester Street HV Link (Security)**

The ex-Snows Hill feeder cable is to be diverted into a spare way on the Local Transformer HV switch at the Zone Substation and a spare way at the Gloucester Street HV switch to create an HV link and complete an HV ring circuit. This objective of the project was to utilise an existing cable to remove an HV spur for minimum cost. The alternative is to simply not do the work.

**Timing 2014/15**

### **Brook Street - Seymour Avenue Sub to Tantragee Sub HV Link (Security)**

It is proposed to install a second 11kV cable between these two substations to provide an alternative 11kV supply to the top of Brook Street where significant development has occurred in recent years. Existing spare ducts will be utilised where possible.

**Timing 2015/16**

### **Brook Street - Tantragee Sub to Brook Street 504 Sub HV Link (Security)**

It is proposed to install a second 11kV cable between these two substations to provide an alternative 11kV supply to the top of Brook Street where significant development has occurred in recent years. Existing spare ducts will be utilised where possible.

**Timing 2016/17**

### **Locking Street – Wellington Street (Security)**

It is envisaged that a new link will be installed in the HV network between Locking Street substation and Wellington Street via an existing ductline. This link will remove an existing HV spur line from a dense residential urban area of the network. As the ductline will be existing by the time of these works, no other practical route has been contemplated.

**Timing 2018/19**

### **Tipahi – Motueka Streets HV Link (Security)**

It is proposed to install an 11kV cable between Motueka Street and Tukuka Street in Tipahi Street to provide an alternative 11kV supply to the southern. Existing spare ducts laid with the 33kV will be utilised.

**Timing 2023/24**

### **Substation LV Board Replacements (Security)**

In order to provide LV protection for distribution transformers, provide operational flexibility, improve SAIDI statistics and remove potential hazards in substations, LV boards progressively been upgraded with modern equivalents of the existing in recent years. Most substations have already been addressed but others still require attention.

**Timing 2013/14**

### **Normanby Bridge Substation Relocation (Security)**

Following recent seismic surveys of the network and Christchurch's experience of failures of infrastructure near waterways it has been decided to relocate this substation away from the banks of the Maitai River and reconfigure the existing 11kV network in the area to suit the change.

**Timing 2014/15**

### **GPO Substation Tripping VCB (Security)**

In order to maximise the full capacity of a recently installed HV cable there is a requirement to upgrade non-tripping switches to a tripping type fitted with Over Current and Earth Fault protection at the above site. This item has been included in this Plan for a number of years and finally suitable vacuum circuit breakers and switches are appearing on the market. It is expected that the new technology will meet the requirements of the project.

**Timing 2014/15**

#### **Emano Street North Link Box Tripping VCB (Security)**

In order to improve on outage durations in this area of the network and improve overall SAIDI statistics there is a requirement to upgrade the existing non-tripping switch to a tripping type fitted with Over Current and Earth Fault protection at the above site. This item has been included in this Plan for a number of years and finally suitable vacuum circuit breakers and switches are appearing on the market. It is expected that the new technology will meet the requirements of the project.

***Timing 2015/16***

#### **Toi Toi/Montreal Street HV Link Box (Security)**

To enable more flexibility and efficiency during HV switching operations and to improve SAIDI statistics and safety, it is proposed to install a ground mounted 3-way HV link box at this junction of HV network. Nelson Electricity has adopted a practice of installing HV switching points onto the ground wherever possible.

***Timing 2012/13***

#### **Toi Toi/Montreal Road HV Link Box (Security)**

Along with the replacement of the HV network in the Montreal Rd South, a new HV Link Box will be installed at the Toi Toi/Montreal Road intersection to provide a switching point for existing and new HV cables.

***Timing 2013/14***

#### **Abraham Heights HV Link Box (Security)**

Along with the replacement of the HV network in the Abraham Heights area, a new HV Link Box will be installed at the Montreal Road intersection to provide a switching point for existing and new HV cables.

***Timing 2016/17***

#### **Wellington Street HV Link Box (Security)**

To enable more flexibility and efficiency during HV switching operations and to improve SAIDI statistics and safety, it is proposed to install a ground mounted 3-way HV link box as part of the Locking Street HV Cabling project

***Timing 2018/19***

#### **Tipahi Street HV Link Box (Security)**

To enable more flexibility and efficiency during HV switching operations and to improve SAIDI statistics and safety, it is proposed to install a ground mounted 4-way HV link box as part of the Tipahi Street HV cabling project

***Timing 2022/23***

#### **Motueka Street HV Link Box (Security)**

To enable more flexibility and efficiency during HV switching operations and to improve SAIDI statistics and safety, it is proposed to install a ground mounted 3-way HV link box as part of the Waimea Road – Vanguard Street South HV cabling project, while making provision for the Tipahi Street project to come later.

***Timing 2023/24***

\* \* \* \* \*

### ***400V Replacement***

In general 400V reinforcement applies to existing assets that are being upgraded resulting in improvements to the existing. Consideration is given in each case to alternatives but in most cases the choices are between the suppliers of a similar product. As cable routes are typically short, few variations are available for consideration and existing route is typically adopted as the most practical.

#### **Bridge Street East LV Sectionalisation (Security)**

Existing service boxes and tee joints are to be replaced with LV link/fuse boxes to enable the existing LV circuits in this area of the CBD network to be easily sectionalised in the event of an LV cable failure. Removal of the tee joints has the added benefit of moving the premises Network Connection Point onto the Road Reserve instead of at the Main Switch Board.

***Timing 2013/14***

#### **Hardy Street East LV Sectionalisation (Security)**

Existing service boxes and tee joints are to be replaced with LV link/fuse boxes to enable the existing LV circuits in this area of the CBD network to be easily sectionalised in the event of an LV cable failure. Removal of the tee joints has the added benefit of moving the premises Network Connection Point onto the Road Reserve instead of at the Main Switch Board.

***Timing 2014/15***

#### **Hardy Street West LV Sectionalisation (Security)**

Existing service boxes and tee joints are to be replaced with LV link/fuse boxes to enable the existing LV circuits in this area of the CBD network to be easily sectionalised in the event of an LV cable failure. Removal of the tee joints has the added benefit of moving the premises Network Connection Point onto the Road Reserve instead of at the Main Switch Board.

***Timing 2015/16***

#### **Trafalgar Street Central LV Sectionalisation (Security)**

Existing service boxes and tee joints are to be replaced with LV link/fuse boxes to enable the existing LV circuits in this area of the CBD network to be easily sectionalised in the event of an LV cable failure. Removal of the tee joints has the added benefit of moving the premises Network Connection Point onto the Road Reserve instead of at the Main Switch Board.

***Timing 2016/17***

#### **Trafalgar Street North LV Sectionalisation (Security)**

Existing service boxes and tee joints are to be replaced with LV link/fuse boxes to enable the existing LV circuits in this area of the CBD network to be easily sectionalised in the event of an LV cable failure. Removal of the tee joints has the added benefit of moving the premises Network Connection Point onto the Road Reserve instead of at the Main Switch Board.

***Timing 2017/18***

#### **Trafalgar Street South LV Sectionalisation (Security)**

Existing service boxes and tee joints are to be replaced with LV link/fuse boxes to enable the existing LV circuits in this area of the CBD network to be easily sectionalised in the event of an LV cable failure. Removal of the tee joints has the added benefit of moving the premises Network Connection Point onto the Road Reserve instead of at the Main Switch Board.

***Timing 2018/19***

#### **Reclamation LV Replacement (Security)**

It is expected that the existing aluminium sheath LV cables installed during the 1960s in this area will be showing signs of degradation and require replacement by way of a staged programme.

***Timing 2020/23***

\* \* \* \* \*

## ***Overhead to Underground***

#### **Arrow Street North - Washington Road HV/LV Conversion (Overhead to Underground)**

This section of network is the only remaining aerial line on the Washington Road Feeder and being on a busy road and close into the Zone Substation puts the rest of the circuit downstream into the Port Hills and Wakefield Quay at some risk. An optional route for the replacement cable will be considered at the time of final design.

***Timing 2014/15***

#### **Brook Street - Uprate and UG HV at Tantragee (Overhead to Underground)**

A short length of overhead HV network near Tantragee Substation is only rated at 125 amps. With future residential expansion predicted along the network “down-stream” of the substation, this span of network will require uprating. It is proposed to replace the overhead line with underground cable. As this is a spur line the only alternative is replacement of the aerial line.

***Timing 2015/16***

#### **Toi Toi Street Underground HV/LV (Overhead to Underground)**

There are existing spare ducts both sides of the street over the route and some of the dwellings already have underground cables installed to them. In order to utilise the existing ductlines and avoid further aerial maintenance it is proposed to replace this section of aerial network with underground cabling. Replacing the aerial network is another option but the existence of ductlines assists in making the underground option justifiable.

***Timing 2016/17***

#### **Murphy Street – Jenner Road Junction HV Replacement and HV Switch (Overhead to Underground)**

The existing 16 mm<sup>2</sup> aerial line is now required as the main source of supply to the Nelson South 11kV network and so regarded as under-sized for that purpose. The utilisation of an existing ductline for a new underground cable is the proposed option along with a new ground mounted 11kV switch. An optional route for the replacement cable would not be economically practical.

***Timing 2017/18***

#### **Vanguard Street – Gloucester to North Esk Street LV Cabling (Overhead to Underground)**

Recent pole audits carried out over the entire network indicate that the lines and poles in Vanguard Street require upgrading in the near future. The section of street concerned is the only remaining portion of overhead network in the area. Initial underground conversion designs have been revised and the project re-scheduled to coincide with any increased load demands in the area. In the meantime poles identified as high risk have been replaced.

***Timing 2018/19***

#### **Locking Street – Hampden Street (Overhead to Underground)**

It is proposed to install the existing overhead 11kV lines underground as part of the Locking Street HV Cabling project while making provision for future underground 400V cabling. There is no practical alternative cable route.

***Timing 2019/20***

#### **Intermediate – Tukuka Street HV Cabling (Overhead to Underground)**

This is a section of aerial network which forms part of a link between Emano Street and Victory Square feeders in the southern network and is of significant importance. It is planned to replace the low capacity and aged aerial network will be replaced with underground cable. An optional route for the replacement cable would not be economically practical.

***Timing 2022/23***

#### **Kawai Street – Intermediate HV/LV Cabling and HV Switch (Overhead to Underground)**

A length of small capacity and aged aerial network is to be by-passed and a new underground cable laid through an existing ductline with the 33kV cable via Tipahi Street to a new HV Switch at Tukuka Street. In this case the optional route was more economically practical.

***Timing 2022/23***

\* \* \* \* \*

### ***Opportunities for Distributed Generation***

Nelson Electricity will facilitate where practical any opportunities for distributed generation on the network.

Given the dense urban nature of the network it is almost certain that all distributed generation will be based around thermal plant at industrial sites ie; there would appear to be few opportunities for small hydro plants. Although Nelson Electricity itself is not planning any distributed generation, it welcomes approaches from promoters of distributed generation that would enhance the value of operations.



## SECTION 6 - Life Cycle Asset Management Planning

### 6.1 Introduction

Nelson Electricity has adopted a Condition Driven Maintenance approach to its network operations. Condition Driven Maintenance is based on the results of risk modelling against the Asset Performance Standards. Where an asset has to be replaced, the removed asset is modelled to determine whether it is to be deployed or suitable for re-deployment elsewhere on the network. The projected Asset Maintenance expenditure breakdown is detailed below. Because the major asset groups have been divided equally to fit the audit period, the projected budget is very much cyclic and apart from major maintenance, like 33kV/11kV transformer overhauls, will remain much the same each year.

### Operational Expenditure Forecast

Operational Expenditure Forecast										
<b>Planned Maintenance</b>										
Description	2013/14	2014/15	2015/16	2016/17	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
400V Lines & Cables R & M	\$270,000	\$275,400	\$280,908	\$286,526	\$292,257	\$298,102	\$304,064	\$310,145	\$316,348	\$322,675
11kV Lines & Cables R & M	\$48,000	\$48,960	\$49,939	\$50,938	\$51,957	\$52,996	\$54,056	\$55,137	\$56,240	\$57,364
33kV Lines & Cables R & M	\$30,000	\$30,600	\$31,212	\$31,836	\$32,473	\$33,122	\$33,785	\$34,461	\$35,150	\$35,853
11kV/400V Subs R & M	\$86,000	\$87,720	\$89,474	\$91,264	\$93,089	\$94,951	\$96,850	\$98,787	\$100,763	\$102,778
33kV/11kV Subs R & M	\$20,000	\$20,400	\$20,808	\$21,224	\$21,649	\$22,082	\$22,523	\$22,974	\$23,433	\$23,902
Control Room	\$7,000	\$7,140	\$7,283	\$7,428	\$7,577	\$7,729	\$7,883	\$8,041	\$8,202	\$8,366
Tree Trimming	\$20,000	\$20,400	\$20,808	\$21,224	\$21,649	\$22,082	\$22,523	\$22,974	\$23,433	\$23,902
Other incl Fixed Contracts	\$120,000	\$122,400	\$124,848	\$127,345	\$129,892	\$132,490	\$135,139	\$137,842	\$140,599	\$143,411
<b>Total Planned Mtce Costs</b>	<b>\$601,000</b>	<b>\$613,020</b>	<b>\$625,280</b>	<b>\$637,786</b>	<b>\$650,542</b>	<b>\$663,553</b>	<b>\$676,824</b>	<b>\$690,360</b>	<b>\$704,167</b>	<b>\$718,251</b>
<b>Unplanned Maintenance</b>										
Description	2013/14	2014/15	2015/16	2016/17	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
Service Fuses	\$15,000	\$15,300	\$15,606	\$15,918	\$16,236	\$16,561	\$16,892	\$17,230	\$17,575	\$17,926
S/Box Failure/Damage	\$5,000	\$5,100	\$5,202	\$5,306	\$5,412	\$5,520	\$5,631	\$5,743	\$5,858	\$5,975
400V Line /Cable Fault	\$21,000	\$21,420	\$21,848	\$22,285	\$22,731	\$23,186	\$23,649	\$24,122	\$24,605	\$25,097
11kV Line /Cable Fault	\$18,000	\$18,360	\$18,727	\$19,102	\$19,484	\$19,873	\$20,271	\$20,676	\$21,090	\$21,512
33kV Line /Cable Fault	\$12,000	\$12,240	\$12,485	\$12,734	\$12,989	\$13,249	\$13,514	\$13,784	\$14,060	\$14,341
Transformer Fault	\$13,000	\$13,260	\$13,525	\$13,796	\$14,072	\$14,353	\$14,640	\$14,933	\$15,232	\$15,536
Burglar Alarm	\$1,000	\$1,020	\$1,040	\$1,061	\$1,082	\$1,104	\$1,126	\$1,149	\$1,172	\$1,195
<b>Total Unplanned Mtce</b>	<b>\$85,000</b>	<b>\$86,700</b>	<b>\$88,434</b>	<b>\$90,203</b>	<b>\$92,007</b>	<b>\$93,847</b>	<b>\$95,724</b>	<b>\$97,638</b>	<b>\$99,591</b>	<b>\$101,583</b>
<b>Total</b>	<b>\$686,000</b>	<b>\$699,720</b>	<b>\$713,714</b>	<b>\$727,989</b>	<b>\$742,548</b>	<b>\$757,399</b>	<b>\$772,547</b>	<b>\$787,998</b>	<b>\$803,758</b>	<b>\$819,834</b>

Nelson Electricity uses the Electricity Distribution Services Input Methodologies Determination 2012 as a guide to life expectancy of an asset. Asset auditing and maintenance is used as a final determination as to when an asset is retired from the network. It is noted that there is a significant difference between the life expectancy between different types of cable XLPE versus PILC. Nelson Electricity, as an example, still installs PILC cable at 11kV and above to maximise asset life. A summary of the 2004 ODV Handbook asset life expectancy is included in Section 3.3.

### 6.2 Maintenance Inputs

The development of the plan is driven by the following key inputs:

- Planned Preventive Maintenance programme;
- Asset Auditing Programme;
- Annual Load Survey;
- Regulatory Compliance;
- Risk modelling against the Asset Performance Standards (refer Risk Management section 7).

## 6.3 Maintenance Types

Typically the main types of maintenance are:

- Planned Preventive Maintenance;
- Planned Maintenance;
- Unplanned Maintenance.

### ***Planned Preventive Maintenance***

Refer Network Development Planning - Planning Criteria (section 5.1).

### ***Planned Maintenance***

The Planned Maintenance works program is a result of assets modelled not meeting Asset Performance Standards. The work list is prioritised from worst score to best. Any asset meeting standard will be audited as per the auditing cycle for the asset type.

### ***Unplanned Maintenance***

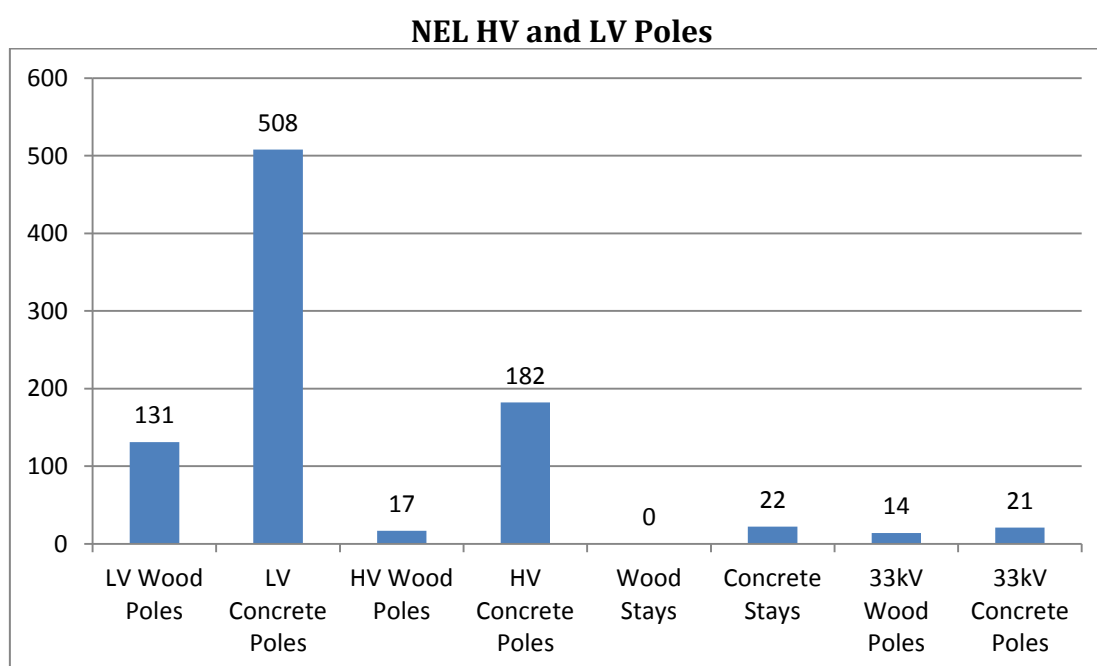
Unplanned maintenance results from faults or outages where there is no prior warning of the event and may typically be caused by external forces such as storms, contractors or accidents. The emphasis is to restore power as quickly and safely as possible and for follow-up planned maintenance to restore the asset to a condition that meets the Asset Performance Standard.

## 6.4 Auditing and Maintenance by Asset Type

The Auditing and Planned Maintenance checks are carried out by contractors filling out pre-printed sheets with check boxes for each type of asset. On completion of the daily checks, the sheets are returned to the office for punching into the Office Management System. All assets are audited on a longer term basis but major assets receive a regular Planned Maintenance check at shorter intervals.

### ***Poles***

As at 25 February 2013, the network comprised 86% underground and 14% overhead reticulation. The overhead network consists of 895 poles.





## **33kV Poles**

Concrete and wooden poles are all audited every two years and the connections viewed through a heat gun. The audit of the concrete pole is purely visual and covers the pole, cross-arm and fittings. The audit of wooden poles includes a below ground test of the pole by driving a spike and a visual inspection of the pole, cross-arms and fittings.

## **11kV Poles**

Concrete poles are audited every five years and the connections viewed through a heat gun. The audit of the concrete pole is purely visual and covers the pole, cross-arm and fittings. Wooden poles are audited every three years and the connections viewed through a heat gun. The audit of wooden poles includes a below ground test of the pole by driving a spike and a visual inspection of the pole, cross-arms and fittings.

## **400V Poles**

Concrete poles are audited every five years and the connections viewed through a heat gun. The audit of the concrete pole is purely visual and covers the pole, cross-arm and fittings. Wooden poles are audited every three years and the connections viewed through a heat gun. The audit of wooden poles includes a below ground test of the pole by driving a spike and a visual inspection of the pole, cross-arms and fittings.

In the event of any pole being rated at a remaining life span of less than five years, the pole will usually be replaced or the next audit will be set for a shorter period. Any resulting repair or replacement will ensure the overhead network meets standard.

## **Aerial Conductors**

The aerial network is primarily copper conductor apart from aluminium/steel conductors used on the 33kV feeders and an 11kV feeder which is also steel.

Nelson Electricity has 700 metres of 33kV overhead line. Nelson Electricity is also supplied by Network Tasman through 7.0 kilometres of 33kV line back to Transpower's Stoke substation. Network Tasman carries out the maintenance of the lines at Nelson Electricity's cost. All of the 33kV lines are well maintained and in good condition.



**Stoke-Nelson transmission line  
1954**

The 11kV overhead network totals eight kilometres of line. This is all copper conductor apart from a 1.85 kilometre line to Fringed Hill, which is steel. Generally these lines are situated in areas that are remote or protected from the direct influence of any salt-laden wind. The most remote and rural portion of the 11kV network is the spur feeder in the Brook Valley. The Fringed Hill line is a spur feed off the Brook Valley feeder and can in certain circumstances, be exposed to falling trees and forest fires, as it runs through a pine plantation and then scrub country. In all, a total of nine faults have occurred on the 11kV aerial network in the past five years. Two of these faults were caused by trees, three by asset failures, two by animal/bird strikes, and two by a storm. Measuring against the appropriate Asset Performance Standard will ensure these types of faults are kept at acceptable levels.

The 400V aerial network consists of 30 kilometres of lines, which are all copper conductors. The condition of these lines varies throughout the network and although the conductors are in sound condition, in some areas the cambric insulation is separating from the conductors. NEL's approach to this problem has been to strip the insulation off the conductors to improve the aesthetics of the lines. Historically trees have been the main source of outages on these lines but the threat from trees has been monitored and addressed much more stringently in recent years.

## ***Tree Trimming***

Nelson Electricity previously trimmed trees within the limits of the law of the time, however, the new law has clarified tree owner and line company roles more specifically and although the initial trimming cost has been forced on the line companies, the ongoing cost for trimming privately owned trees will fall on the tree owner. Approved tree trimming contractor's carry out tree trimming around the lines where required. Although trees historically play only a minor part in outage statistics and the economics of trimming are probably not justified, the issue of public safety always forms a major consideration the company. A separate database has been formed to track all details pertaining to trees which are of interest to Nelson Electricity.

Aerial lines are not audited in the technical sense but any deterioration in their visual condition and the proximity to trees to the line is noted as part of the pole audits.

## ***Underground Cables***

As mentioned previously, approximately 86% of the network is underground with a total length of 216 kilometres of cable. The cable conductors are a mixture of copper and aluminium and the insulation used has been primarily paper, PVC and cross-linked polyethylene (XLPE). The underground network is in good condition and the paper insulated cables in particular have given good service.

The earliest cables installed were paper insulated, but in the early 1970s PVC and XLPE became the trend and all 11kV and 400V cables installed between that time and 1997 were XLPE, when it was deemed that all new 11kV cables installed were to be paper insulated. XLPE cables continue to be installed on the 400V network.



***Trees close to powerlines Feb 2007***

The first 33kV cable was installed in 1979. It was an aluminium cable with paper insulation and has given reliable service. Since then two other cables were installed in 1986 and 1987. One of these cables is also aluminium with paper insulation which was extended with copper cable with XLPE insulation. The last cable installed has copper conductor with XLPE insulation and HDPE sheath and was laid in 1987. In the last five years there has been only one outage on two of the cables and none on the other one caused by an intruder in the switchyard at the Haven Road Zone Substation. Health checks are carried out on all of the 33kV cables annually. To date no potential problems in the cables and joints have been identified.

Nelson Electricity operates 72 kilometres of 11kV underground network. The conductors used have been a mixture of aluminium and copper, the preference being mainly driven by cost at the time. Recent industry information relating to XLPE cables resulted in Nelson Electricity taking a more cautious approach to the installation, commissioning, testing and fault finding on XLPE cables, resulting in a preference for paper lead cables for future works.

As with the 11kV network, the 400V cable types have changed from paper insulated to XLPE over the years. The XLPE cables have performed well on the 135 kilometres of 400V underground network and the only technical issues to be addressed have been a change to bi-metal lugs and sleeves at terminations and joints. Some early resin joints and older pitch filled joints have failed over the years but the low numbers and intermittent nature of these faults have not given any cause for alarm.

There has been a problem with aluminium sheathed cables in one area of the network which is subjected to saltwater, however further work has been carried out to identify other areas with similar cable types and environmental conditions and these cables have been found to be in good condition.

### **33kV Cables PD Testing**

This test involves three 33kV feeder cables. To date these cables are audited by way of Partial Discharge testing every two years. Previous discharge test results are then compared to the latest results for signs of degradation and a recommendation for the next test date made.

### **11kV Cables PD Testing**

This test involves thirteen 11kV feeders from the Zone Substation and approximately 20 other cables from the major switching stations. From time to time other random samples are tested. To date these cables are audited by way of Partial Discharge testing every two years. Previous discharge test results are then compared to the latest results for signs of degradation and a recommendation for the next test date made.

### **400V Cables PD Testing**

These are not tested or audited in any planned programme.

## ***33kV Zone Substation***

The only Nelson Electricity Zone Substation switchyard is in good condition and has seismological bracing fitted to the key components. The substation building built in the 1950s required some additional seismic bracing. An engineer's report was commissioned in 2006 and strengthening of the building was completed in 2008-2009.

Weekly operational checks and readings are carried out at the substation and any significant defects are programmed for immediate action. The switchyard is checked with thermal imaging equipment during the winter, on an annual basis.

As outlined earlier, the switchyard is to be superseded by an indoor equivalent during 2013. The existing building and control room will continue to be utilised for operational purposes.

## ***33kV/11kV Power Transformers***

The Zone Substation supplying Nelson Electricity contains four Metrovickers 5MVA transformers which were installed in 1959 and three Ferranti 5MVA transformers that were installed in 1970. Weekly temperature readings are completed on the transformers and oil samples are tested annually. The Metrovicker and Ferranti transformers have been fully serviced in recent years and the Metrovickers fitted with fans to allow forced air-cooling with a consequent up rating of the transformers from 5MVA to 7MVA. Similarly the Ferranti transformers have had components uprated in the past 12 months in order to increase their rating from 5MVA.

A visual audit of the transformers and temperature readings are recorded each week. Oil testing is carried out on the transformers annually and on the tap changers every two years. Major overhauls are carried out every 10 years.

As outlined earlier, these transformers are to be replaced by new 3 phase higher capacity models in 2013.

## ***33kV Switches***

The Zone Substation switches consist of ABSs and OCBs. These are attached to an outdoor structure and connected to the three incoming 33kV feeders.

The ABSs are checked for insulator damage as part of the weekly maintenance check.

The OCBs were installed in 1981 (two) and 1991 (one), were manufactured by Inoue Denki and are in good condition. Oil samples are taken and tested annually. Partial Discharge testing is carried out every two years.

As outlined earlier, these switches are to be replaced by new indoor models in 2013.

## ***Zone Substation 11kV OCB***

The Zone Substation's thirteen 11kV OCBs were manufactured and supplied by South Wales Switchgear Ltd in 1957. They are located in a clean concrete enclosed chamber. All 13 of the OCBs are in service.

Oil samples are taken each year and Partial Discharge tests are performed every two years. The OCBs are also fully serviced every two years unless they have operated under fault conditions then they are serviced as soon as possible after the fault.

As outlined earlier, these switches are to be replaced by new models in 2013.

## **Zone Substation Protection**

The protection relays utilised by NEL at the Zone Substation are of the electromechanical type, except for the 33kV network which is electronic. The electromechanical relays are scheduled for replacement 2012-2013 and the 33kV during the year ending 2012-2013.

As outlined earlier, all protection relays are to be replaced with new SEL models in 2013.

## **Air Break Isolators**

There are two ABSs on two of the 33kV feeders supplying Nelson Electricity which are rocker arm type. They provide a satisfactory service when required and are normally operated in no load situations. The units are viewed through the heat gun as part of the annual audit.

Nelson Electricity has three rocker arm types of ABSs on the 11kV network. The moving parts on these isolators are in a good condition but the wooden operating arms require maintenance from time to time. As part of the pole audits the ABSs are viewed through the heat gun.

As outlined earlier, these isolators are to be replaced by new indoor switches in 2013.

## **11kV Auto Recloser**

Nelson Electricity owns only one auto recloser which is located in a rural portion of the 11kV feeder in the Brook Valley and which was replaced with a modern recloser during 2006. The recloser receives a six monthly check as part of the Planned Preventive Maintenance schedule. No other audits are performed on the Auto Recloser.

## **11kV/400V Substations**

The 11kV network supplies 192 11kV/400V distribution substations. The rating of these assets ranges from 1500kVA three phase to 5kVA single phase in capacity. All pole-mounted substations have Chance type dropout HV fuses and all ground-mounted substations are connected to a fused switch located locally or remotely. All ground-mounted substations have 400V fuses associated with them and in most cases utility boards with Maximum Demand Indicators mounted on them.



**Bronte Street substation 1950 – still in use today**

The enclosures for ground-mounted substations include concrete block buildings, underground concrete chambers, padmount enclosures, fibreglass covers, outdoor fenced enclosures and transformer rooms in the case of single customer substations.

The majority of the transformers were manufactured in the 1960s and 1970s. Regular monitoring, maximum demand readings and temperature checks, are carried out during Planned Preventative Maintenance. Oil sampling every of each 11kV/400V transformer above 100kVA is carried out every five years. Over the past 10 years only three distribution transformers have failed in service. One of the failures was attributed to the substation chamber being flooded after a burst water main, one caused by an HV winding failure from a manufacturing fault and the other by loose LV connections within the transformer tank. This signifies that the transformers are in good working condition with generally unforeseen events causing failures.

The substation earths are tested to ensure that they are 10 ohms or less. Where this standard is not met work is scheduled to bring the earthing up to standard. Earths are audited as part of the Auditing Programme. If the 10 ohm standard cannot be achieved, a warning notice is placed on the equipment involved and a similar notice entered onto the asset database.

MDIs are fitted to 95% of three phase distribution transformers and provide valuable feed-back on the peaking loads. Any anomalies detected are checked by installation of a portable data logger. The half-hourly logger information provides the basis for upgrades and network reinforcement.

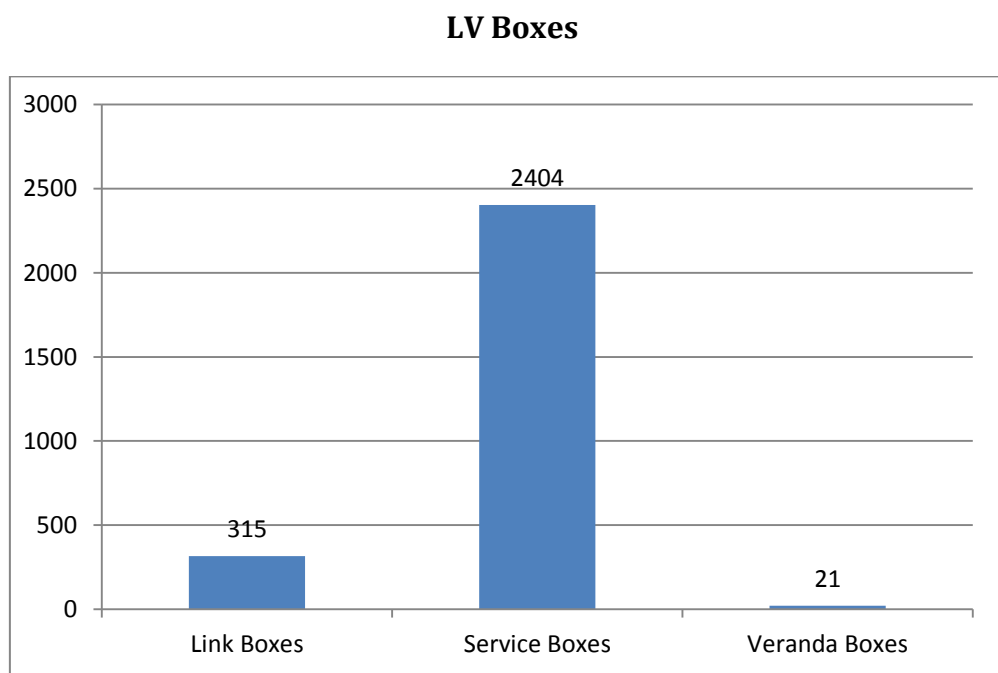
There are several types of Air, Oil, Vacuum and SF6 HV switches utilised on the network. These range from the automatic tripping Reyrolle type oil and vacuum switches which are located at the end of seven of the 13 key 11kV feeders laid from the Zone Substation to one Holec Vacuum switch. They provide an interruption point between the rest of the network and the Zone Substation and are linked via alarm circuits to the Zone Substation.

At the other distribution substations a variety of oil, SF6 and air HV switches and fuses are used. These include ABB SD, Hazemeyer and Merlin Gerrin switches. The condition of these switches is regularly monitored with the six monthly Planned Preventive Maintenance cycle. Until recently the oil in the oil switches was not tested but a sample test was taken during 2006 and found that two of the 14 switches sampled required oil replacement. Since then regular five yearly testing programmes have been put in place for all of the oil switches on the network.

The 400V fusing at the substations typically utilises Jean Mueller, Weber and Effen fuse units. These are reliable and require little maintenance and are progressively replacing the older style porcelain J fuse. For installations that only require one or two LV outputs, the three-phase break version of these fuses is being used.

## ***LV Boxes***

As at 25 February 2013 NEL has 2,740 LV boxes on its network. A breakdown of box types is shown.



All distribution boxes including Link Boxes and Service Boxes receive a two yearly visual audit and all have a five yearly visual and heat gun audits. Consideration will be given to extending or reducing the audit cycle time depending on future asset auditing results.

During 2012, 544 LV Boxes were audited. Those that did not meet the Asset Performance Standard were either repaired or replaced where urgent or scheduled for repair or replacement according to Risk Number.

## ***Ripple Generators***

Nelson Electricity has two Ripple Generators on its network located at the Haven Road Zone Substation and ANZAC Park Substation. Regular two yearly vibration testing is carried out on the generator and motor sets, the most recent being in 2010. Both sets are in acceptable condition for continued service,

however, plans have been put in place to replace the units with one modern electronic equivalent during 2013.

Nelson Electricity has a contingency in place if there is a generator failure. It can operate with one ripple generator on the network with a closed 11kV Bus at the Zone Substation. Ripple signal tests indicate there is good strength coverage across the majority of the network operating on the one generator but there could be some older type relays in outer areas that may struggle to pick up the signal.

## **6.5 Network Connection Points**

Single-phase residential installations are typically fused at 63 amps. With the possible introduction of new tariff structures through changes in pricing strategy, a wider range of residential and business fuses may have to be considered. These assets are included within the distribution box and pole auditing that is carried out on a regular basis.

Each time a pole fuse is changed the replacement is an HRC fuse.

In the central business district area of the network there are many cases where tee joints on 400V feeders in the road reserve feed directly to the customer's switchboard. This is of concern for network operations. These connection points are being relocated outside into Distribution Boxes as re-development occurs.

## **6.6 New Technology**

Nelson Electricity has standardised on proven technology and equipment in the construction and maintenance of the network.

As technology changes and equipment is updated, Nelson Electricity analyses the new trends for efficiency and cost effectiveness against current options/practice.

In recent years the drop in cost of heat guns has encouraged Nelson Electricity to purchase their own low cost unit however specialist contractors are still employed for testing the key network assets.

Nelson Electricity is also considering using specialists to carry out Ultra Sound testing on wooden poles.

The oil in 11kV OCBs was sampled from "live" switches by trained personnel for the first time in 2006.

The use of vacuum 11kV switchgear continues to be investigated.

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## SECTION 7 - Non-Network Development, Maintenance and Renewal

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### 7.1 Introduction

This section provides a summary of non-network assets. These are material assets that are necessary and used for the purpose of management of the electricity distribution network.

### 7.1 Non Network Asset Description

Nelson Electricity has a number of non-network assets that support the management of the network. The material assets (assets greater than book value \$5,000) are listed below:

Office Building – 63 Haven Road

Vehicles – two Toyota Ravs

### 7.2 Non Network Asset Development, Maintenance and Renewal Policies

Nelson Electricity has three key areas of non-network asset expenditure being accommodation, vehicles and computer hardware/software. There is a practise of ensuring staff are provided with appropriate working conditions and having appropriate equipment to undertake their roles.

Non-network assets are maintained in good working order during their expected economic life. At the end of their economic life, non-network assets are replaced unless they are rendered obsolete or redundant due to a development initiative.

All expenditure has to be justified to the Nelson Electricity Board.

### 7.3 Description of Material Capital Expenditure or Maintenance Projects

There are no large individual non-network asset capital expenditure projects or significant maintenance projects planned for the next five years.

The following replacements/renewals are budgeted:

Non Network Asset Expenditure (\$000)					
	31-Mar-14	31-Mar-15	31-Mar-16	31-Mar-17	31-Mar-18
Replacement of 2 Vehicles				\$60	
Computers	\$16			\$17	
File Server	\$40				
<b>Total</b>	\$56	\$0	\$0	\$77	\$0

Note: Figures are in constant prices.





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## SECTION 8 - Risk Management

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### 8.1 Introduction

Nelson Electricity places a high focus on Risk Management as the tool to an efficient, economically maintained network.

The process used for Risk Management is based on AS/NZS ISO 31000:2009. This standard is a generic guide to managing risk. Nelson Electricity has taken the principals of the standard and applied them in its risk management process as it applies to the Nelson Electricity situation.

The system Nelson Electricity uses is described in this section. Nelson Electricity can demonstrate that its processes achieve the objectives of the standard by:

- A confident and rigorous basis for decision making and planning;
- Better identification of opportunities and threats;
- Gaining value from uncertainty and variability;
- Proactive rather than reactive management;
- More effective allocation of resources;
- Improved incident management and reduction in loss and the cost of risk;
- Improved stakeholder confidence and trust;
- Improved compliance with relevant legislation;
- Better corporate governance.

The main components of Risk Management for managing NEL are:

- Risk Modelling;
- Asset Performance Standards;
- Asset Condition Auditing.

### 8.2 Risk Modelling

Nelson Electricity uses a Risk Modelling process to determine an asset's current and/or future suitability on the network. The Risk Modelling uses a probabilistic approach in which it uses a series of subjective and objective measures, as outlined in 7.3 and 7.4, to assess the likely condition of an asset. This has proven to be a good asset management tool in planning network changes and configurations. There is also, however, a need to include a deterministic approach as assets need to also comply with the Security of Supply Standards. If an asset doesn't meet the standard then even though it may be in good operating order, something needs to be done to make it comply.

The risk model Nelson Electricity utilises was developed in-house to measure asset performance against a Performance Standard which has been formulated for each asset type. The Performance Standard has been calculated based on what is considered to be an acceptable Impact and Probability risk using criteria as described in 7.3 and 7.4. By analysing the Impact and Probability of the failure of an asset on the network, a Risk Number for that asset is calculated. The Risk Number is then compared to the Performance Standard and if it is found to be higher than the Standard then appropriate action will be taken to reduce the risk. If the Risk Number is lower than the Performance Standard then it is deemed to meet the requirements of Nelson Electricity's risk. Risk modelling is also used as an indicator as to whether any work or what type of work is to be undertaken on an asset. It also helps prioritise work.

Although Risk Modelling looks like a black and white process whereby an asset meets or fails a standard, in practise this is not quite the case. It should be noted that a Risk Model is used as a tool to help assess the condition of an asset and, although it is a good indicator, it should only be used in conjunction with good industry practise as sometimes it is possible that criteria weightings may cause slight anomalies when comparing the risk associated with each individual asset.

The charts below illustrate the Performance Standards applied to each category of an asset, based on the main headings of Impact and Probability and respective sub headings listed below.

<b>Risk Standard For Individual 400 Volt Networks</b>				
Restoration Time Hrs		No more than 1 - 3 hours		
No consumers affected		No more than 50 customers		
Customer Load		%of NEL's total load		
Other Party Interaction		3 (1-Excellent to 7-Bad)		
Environmental Impact		Insignificant		
Costs Due To Failure		No more than \$3000		
Fault Cause		No worse than unpredictable cause by others		
Safety		Insignificant		
Average Annual Fault Assumption		1 fault in 15 - 50 Years		
ODV Life Expectancy		No less than 5 - 10 Years		
Loading % > Full Load		No greater than full load		
Environment		No worse than moderate exposure		
Deterioration Audits		That reflect a life expectancy of at least 5 - 10 Years		
A 400V network is defined as everything beyond the 400V transformer storks.				

<b>Risk Standard For Transformers</b>				
Restoration Time Hrs		No more than 3 - 5 hours		
No consumers affected		No more than 100 customers		
Customer Load		% of NEL's Total Load		
Other Party Interaction		4 (1-Excellent to 7-Bad)		
Environmental Impact		insignificant		
Costs Due To Failure		No more than \$20,000		
Fault Cause		No worse than Unpredictable cause by others		
Safety		Insignificant		
Average Annual Fault Assumption		1 fault in 15 - 50Years		
ODV Life Expectancy		5 - 10 Years		
Loading % > Full Load		No greater than full load		
Environment		No worse than minor exposure		
Deterioration Audits		That reflect a life expectancy of at least 5 - 10 Years		
This Standard applies to transformers only				

<b>Risk Standard 11KV Networks</b>				
Restoration Time Hrs		No more than 3 hours		
No consumers affected		No more than 800 customers		
Customer Load		% of NEL's Total Load		
Other Party Interaction		5 (1-Excellent to 7-Bad)		
Environmental Impact		insignificant		
Costs Due To Failure		No more than \$20,000		
Fault Cause		Unpredictable cause by others		
Safety		Insignificant		
Average Annual Fault Assumption		1 fault in 15 - 50 Years		
ODV Life Expectancy		10 - 15 Years		
Loading % > Full Load		No greater than full load		
Environment		No worse than minor exposure		
Deterioration Audits		That reflect a life expectancy of at least 10 - 15 Years		
This Standard applies to 11KV Networks Only				

<b>Risk Standard 33 / 11KV Transformers</b>				
Restoration Time Hrs		No more than 1 hour		
No consumers affected		No more than half of NEL customer base (4250)		
Customer Load		No more than 50% of NEL's Total Load		
Other Party Interaction		6 (1-Excellent to 7-Bad)		
Environmental Impact		insignificant		
Costs Due To Failure		>\$50,000		
Fault Cause		Unpredictable cause by others		
Safety		Insignificant		
Average Annual Fault Assumption		1 fault in 15 - 50Years		
ODV Life Expectancy		10 - 15 Years		
Loading % > Full Load		No greater than full load		
Environment		No worse than minor exposure		
Deterioration Audits		That reflect a life expectancy of at least 10 - 15 Years		
This Standard applies to 33KV Transformers Only				

<b>Risk Standard 33KV Networks</b>				
Restoration Time Hrs		Less than 1hour		
No consumers affected		No more than half of NEL customer base (4250)		
Customer Load		No more than 50% of NEL's Total Load		
Other Party Interaction		6 (1-Excellent to 7-Bad)		
Environmental Impact		insignificant		
Costs Due To Failure		No more than \$20,000		
Fault Cause		No worse than unpredictable cause by others		
Safety		Insignificant		
Average Annual Fault Assumption		1 fault in 15 - 50 Years		
ODV Life Expectancy		5 - 10 Years		
Loading % > Full Load		No greater than full load		
Environment		No worse than minor exposure		
Deterioration Audits		That reflect a life expectancy of at least 15 Years		
This Standard applies to 33KV Networks Only				

<b>Risk Standard For Disaster Recovery</b>				
Restoration Time Hrs		15 - 24 Hours		
No consumers affected		No more than 3/4 of NEL customer base (6375)		
Customer Load		No more than 75% of NEL's Total Load		
Other Party Interaction		7 (1-Excellent to 7-Bad)		
Environmental Impact		Moderate		
Costs Due To Failure		>50K		
Fault Cause		Act of God		
Safety		Minor		
Average Annual Fault Assumption		1 fault in 100 Years		
ODV Life Expectancy		10 - 15 Years		
Loading % > Full Load		No greater than full load		
Environment		No worse than minor exposure		
Deterioration Audits		That reflect a life expectancy of 10 - 15 Years		
This Standard applies to Disaster Recovery				

The Impact model addresses the operational side of risk and covers off reasonable restoration times if customers are without supply. The number and type of customers without supply will have an impact on this Standard as well as the expected customer response to an extended outage. Obviously the impact on environment is an important factor as are the consideration of costs both to business customers and Nelson Electricity itself. Predictable and preventable causes are addressed along with the important issue of safety to contractors and especially to the public.

The Probability model deals with the likelihood of asset failure. The issues addressed here are any fault history which applies to the asset and the expected remaining service life based on the ODV model. The electrical loading the asset is required to carry and the environment the asset resides in will also impact on the probable failure of the asset. The life cycle of the asset, unlike the service life, is assessed based on actual physical audits and testing of assets rather than a theoretical model.

Overall it is believed that even though the Risk Model has been developed in-house, it comprehensively addresses the issues of good industry practice and accepted risk practices in the electrical distribution industry in New Zealand.

### **8.3 Impact**

The consequences of an asset failure occurring.

#### ***Impact Variables Used for the Model***

- **Restoration Time**  
The time taken to restore power by repair, replace or bypass.
- Number of Consumers Affected
- **Customer Load**  
Expressed as a percentage of Nelson Electricity's Maximum Demand.
- **Public Response**  
Ranges from excellent to bad.
- **Failure Environmental Impact**  
Reflects any adverse effects on the environment caused by a predictable asset fault.
- **Cost Due to Failure**  
Restoration costs caused by a predictable asset fault.
- **Likely Fault Cause**  
Ranges from unpredictable and unpreventable to predictable and preventable.
- **Safety**  
Covers any safety issue associated with the asset.

### **8.4 Probability**

Asset issues that contribute towards the assessment of the probability of failure.

#### ***Probability Variables Used for the Model***

- **Fault History**  
Derived from the fault history records for the specific asset type.
- **Life Expectancy**  
Derived from ODV remaining life of an asset.
- **Loading**  
Percentage of full working load of the asset.
- **Environment**  
Environment in which the asset is located.
- **Life Cycle**  
Information derived from Asset Condition Audits indicating the physical assessment of the remaining life of an asset.

Each element of Impact and Probability, as outlined above, is rated and appropriate weightings are allocated to establish relativity. The summation of impact is multiplied by the summation of probability to calculate an overall risk rating. This rating is then used as a guide to rank the performance of each individual asset, and is also used when comparing with Asset Performance Standards.

## 8.5 Asset Performance Standards

The Asset Performance Standards are set based on experience and knowledge of staff, standards and industry trends. The allocation of a number as a result of multiplying the Impact by Probability makes it easy to rank assets according to Risk. This is more comprehensive than the simple high/medium/low rankings that some companies use. It is accepted that there is a fine line at times when it comes to an asset meeting or failing the standard and so there is a need for judgement at times. There was, however, considerable investigation and analysis undertaken to ensure that the standards were set appropriately. It is important that the standards are reviewed at least annually to take into consideration latest good industry practise and new legal requirements. The model is similar in structure to that of other companies.

Outages on the network, in many cases based on actual historical events, have been modelled for five categories of assets as listed below:

- 33kV network;
- 33kV/11kV transformers;
- 11kV networks;
- 11kV/400V transformers;
- 400V networks.

Nelson Electricity is a small network with relatively short lengths of cable and aerial between substations. The policy is to not deliberately overload cables or lines in times of emergency. Consequently Nelson Electricity does not aim to operate the network in such a way as to compromise it and cause voltage problems during normal or emergency conditions. Under emergency conditions, the end of line voltage along with other conditions is monitored and if, during the event, the voltage drops below the industry standard, the supply is disconnected to the affected consumers.

Asset standards have been set for the network categories listed above that reflect a minimum acceptable level of performance. Assets are modelled against the asset standard, with the results being used to determine whether assets are compliant with the standard or require maintenance, upgrading or replacement. Modelling of all assets is an ongoing process.

Asset condition audits provide accurate information on each individual asset and its life cycle performance. The audit results are input to the Office Management System and the asset remodelled for its own asset performance ranking compared to the standard.

The assets not complying with the asset standard are prioritised by the risk assessment results and are programmed for repair or replacement.

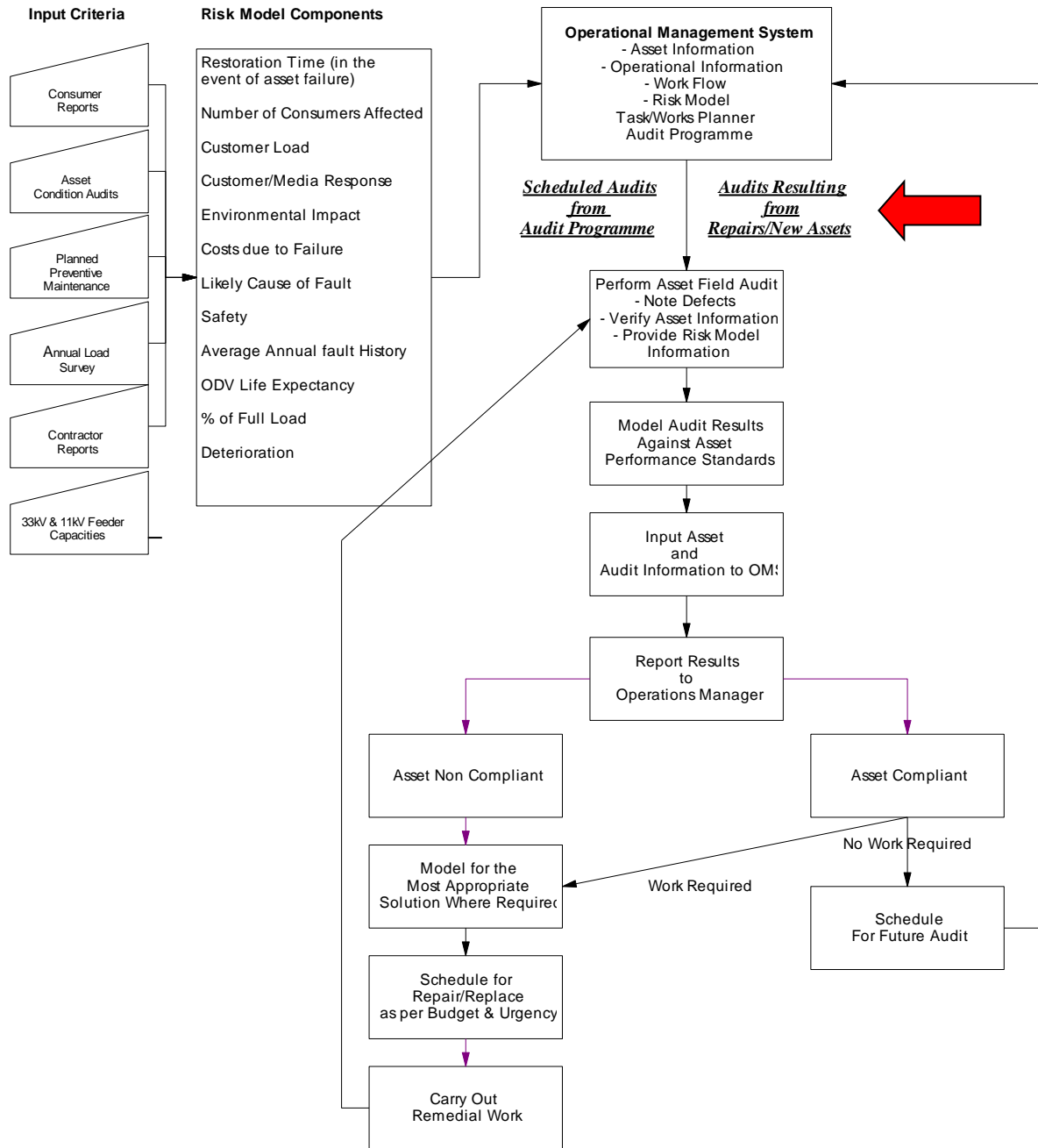
Any asset that has a **safety issue** or **security issue** identified through the risk management process is automatically identified and repairs or replacement undertaken immediately.

Asset Performance Standards are also used for:

- Evaluating capital work;
- Modelling corrective action contingencies for the most appropriate solution for non-complying assets.

The flow chart on the following page outlines the risk management process.

## Network Assets - Risk Management



## **8.6 Auditing Programme**

A programme has been implemented for asset condition auditing. This involves each asset being audited and specific information gathered relating to each asset. The data is risk modelled and input to the Office Management System. The content and operation of the Office Management Systems is discussed between Section 2.8 and 2.12, but in basic terms it utilises Microsoft Office software to carry out its functions. Prioritised reports generated by the System are given to the Operations Manager on a regular basis for him to analyse and schedule assets for repair or replacement. After repair or replacement the asset is again audited for its new condition and that information updated in the System.

The GIS which utilises ArcView software is discussed between Section 2.12 and 2.15, and provides a supporting role to the Office Management System as well as a key role for Faults and Operational Staff and Contractors.

An Asset Database and ICP spreadsheet also links to the GIS to provide sources of useful asset management and operational data.

As the auditing programme is undertaken on an ongoing rotational basis on above ground assets between six monthly and five yearly, the accuracy of asset information held is regarded as very accurate. The major area where completely accurate condition data is assessed more than measured is the underground cable network. Even so, partial discharge testing is carried out every two years on all 33kV feeders and key 11kV feeders (refer Appendix A) as well as other 11kV cables as required from time to time.

Where the age of HV cables has been assessed as a concern to future reliable service, spot checks have been made on the cables concerned by excavating down and inspecting the physical condition of the cable. The information retrieved is then recorded and filed for future reference with the asset replacement programme. If concerns still exist, a partial discharge test may be scheduled for the cable.

The information on the condition of the 400 volt network is limited. Assumptions have been made on their condition. There have been occasions where NEL has inspected cable condition when cables are exposed. It is planned that NEL will undertake more 400 volt cable testing to ensure the assumptions currently being used are still appropriate.

## **8.7 Risk Assessment**

NEL has identified risk that can be divided into two main areas. These are Controllable Risk and Catastrophic Risk.

## **8.8 Exposure to Natural Disasters**

### ***Catastrophic Risk***

This risk typically involves the forces of nature and third party interference that can cause multiple asset failures and have serious impact on electricity supply throughout the Nelson city area. The processes for the recovery of an event of this nature are contained within the NEL Emergency Recovery Plan. That plan is reviewed annually.

The effect of the Christchurch Earthquakes has made Nelson Electricity review the risks associated with any natural disaster. At the time of writing this Plan there have been some areas identified where Nelson Electricity has taken these into consideration when developing this Asset Management Plan. This section will continue to be developed further as additional information is received.

Main areas being reviewed are around design standards and contingencies for safe restoration of electricity supply. Substation building strength is also a key issue being addressed.



Apart from the actual catastrophic risk, a key issue is to ensure that there are emergency communication options and the ability for staff and contractors to get to where they are needed. All staff have cellphones and handheld radios to be used in an emergency. If there is a problem in being able to get to the NEL Control Room or it is not functional, then NEL will utilise the Network Tasman Control Room.

Below are the events NEL has to consider:

- **Earthquake** – Nelson, by its location, is extremely susceptible to earthquake. A major fault line runs along the foot hills to the east of the city. This means that cables, lines and substations in its close vicinity as well as the whole network would be exposed during a large earthquake. The earthquakes that have occurred in Christchurch in 2010 and 2011 have further highlighted the importance of electricity supply to the community and also the slow restoration of predominantly underground networks.

NEL is continuing to review the impact of an earthquake close to the city and how it could impact on the NEL network both in asset failure as well as business continuity. Although all major assets are seismically braced, there have been some smaller assets and pieces of equipment that have been identified needing to be secured in place, eg; battery banks in some substation buildings, computers and asset spares. The work to remedy these issues has been undertaken. It is likely additional risks to the network will be identified in the coming months as a direct result of the problems and issues encountered in Christchurch.

**Mitigation:** Major assets are seismically braced to minimise the damage from an earthquake. Additional seismic strength assessments are being undertaken on all of NEL's substation buildings. It is expected that any issues will be factored into the Asset Management Plan and corrective work undertaken.

- **Liquefaction** - There is also the risk of liquefaction in the Port, Wood and Maitai River areas. Most of these areas are on reclaimed land and are identified as a risk. NEL only has 11kV and 400V assets in these areas with eight indoor 11kV/400V substations that could be affected. Most of the reticulation in these areas is underground.

Liquefaction can result in cables being stretched and pulled from their assets and, as such, there can be a lengthy period to restore electricity supply. In both the Port and Wood risk areas there are a number of backup 11kV cable options able to supply the areas. Some research work is being undertaken to see what additional measures that can be undertaken to mitigate the impact of liquefaction not only for the existing assets but for new assets installed in the areas.

**Mitigation:** Existing substations are built to Council standards which include minimum foundation requirements. Multiple 11kV feeders are also available into the areas. An additional study has been undertaken to identify areas of liquefaction risk to NEL. This report highlights assets more likely to suffer damage and also potentially assist NEL in the future development of the network.

- **Tsunami** - Being close to the sea, Nelson is also indirectly exposed to tsunami and large areas of the network, especially in the Port area, and could be inundated if a significant rise in sea level were to occur. Nelson city is protected to a degree by not only a boulder bank but also the North Island and shores of Tasman Bay due to the geographical location. The only negative is that much of the city is built close to sea level meaning the level does not have to raise much to cause damage.

The risk of a tsunami in Nelson has to be considered as a real threat. The following is a section of a release from the Nelson Tasman Emergency Management Office, 15 March 2011.

*"There are three main tsunami sources for Nelson Tasman: distant earthquake sources; local earthquake sources; and other local sources (landslides, undersea slumping, volcanic activity).*

*Distant* earthquake sources (eg; from South America or Japan) mean any tsunami generated crosses the Pacific Ocean to reach New Zealand. Realistic warning of many hours can therefore be expected for distant source tsunami.

Moreover, Tasman and Golden bays are less exposed to tsunami arriving from these directions than other parts of New Zealand. While tsunami can come into Tasman and Golden bays from these distant sources some of the wave energy is lost due to travel through Cook Strait and the nature of the geography of the bays.

*Local* earthquake sourced tsunami are of more concern to Tasman and Golden bays. An example would be an earthquake in the Cook Strait or an undersea slip or earthquake in the Taranaki Basin. The risk is potential for a large wave, and there is likely to be no practical warning from authorities. Such waves could move very quickly – at the speed of a jet liner.

Overall the Nelson Tasman region faces a modest tsunami risk compared to other parts of New Zealand's coastline. *Local* earthquake sources are the likely source for the largest tsunami expected in the region. Such larger tsunamis are very infrequent (ie; return period in the order of 2,500 years on average according to GNS).

Not all earthquakes result in tsunami. For example the major earthquakes of 1929 in Murchison and 1968 in Inangahua did not produce tsunami nor did the recent Christchurch earthquakes. It is when earthquakes cause displacement of the sea floor that tsunamis are generated.

There is evidence in Abel Tasman National Park and other local places of large tsunamis having occurred in the past, albeit very infrequently."

**Mitigation:** The new Haven Road Zone Substation will be designed and located to minimise the impact of a tsunami. This will include a raised floor for switchboards and minimum height requirement for any electrical connection.

- ***Flooding*** – Nelson is susceptible to flooding. There are areas identified by the Nelson City Council that could be inundated in the event of localised heavy rainfall. One issue for the city is that it is built close to sea level which makes it difficult for flood waters to escape to the sea at high tide.

**Mitigation:** Nelson City Council have, over the last 20 years, minimised the risk of flooding by improving stormwater systems, building flood dams in strategic locations and constructed the Maitai Dam. It is unlikely that Nelson Electricity would have any major consequences other than at the 400V level.

- ***Sabotage*** – Nelson Electricity, being an important utility to Nelson city, is at risk of sabotage from individuals or terrorism. The likelihood of such an event causing more than minor damage is low. The two scenarios being considered are the demolition of the Zone Substation at Haven Road and 33kV feeder damage.

**Mitigation:** Given that Haven Road Zone Substation is critical to the supply to Nelson city, Nelson Electricity will require the use of the 11kV interconnects to get limited supply from Network Tasman, if possible, until supply (temporary or permanent) is restored. The Zone Substation is monitored by First Security, security cameras and by security alarms monitored by Nelson Alarms.

In the end catastrophic risk events have to be managed as they cannot be totally eliminated.

## ***Climate Change***

With Nelson city being located close to sea level the effect of global warming and rising sea levels could in years to come have a huge impact on the network. Nelson Electricity will be working with the Nelson City Council to make a risk assessment of the potential impacts.

## **8.9 Exposure to Natural Disasters**

### ***Transpower Grid Exit Point - Stoke***

Nelson Electricity takes its 33kV supply via Network Tasman Grid Exit Point at Transpower's Stoke Substation. Although Transpower have an extensive seismic protection programme, Nelson Electricity cannot comment on the likely effect of an earthquake on Transpower's transmission system and Substation at Stoke. There are some national transmission supply issues that could impact on the Nelson, Marlborough and West Coast areas in the future. Transpower have been progressing through upgrade steps to ensure these areas have an adequate transmission system.

Steps completed:

- Installed capacitors at Stoke substation in 2005;
- Installed a third 220kV line from Islington to Kikiwa in 2006;
- Installed a second 110kV line from Stoke to Blenheim in 2006.

Nelson Electricity has been concerned with the transmission supply to the top of the south and has worked in with other lines companies to ensure concerns are addressed in a timely manner.

Suffice to say, there is, a continued risk to the 220kV supply from Islington to Kikiwa that crosses a significant faultline. There is the potential for a significant outage as a result of the 220kV lines being damaged in a severe earthquake. This would affect the top of the South Island including Buller. The only major generation available to the area would be via Cobb Dam which is a 30MW hydro station. In any transmission failure event Nelson Electricity would work closely with Network Tasman to manage the outage and restoration.

**Mitigation:** Transpower will be replacing the 220kVA/33kVA transformers as well as replacing the outdoor 33kV bus with indoor 33kV switchboard to be commissioned in 2013.

### ***33kV Feeder Supply***

Nelson Electricity is currently being supplied by three 33kV feeders. All three feeders are aerial lines from the Grid Exit Point at Stoke to the Nelson Electricity boundary where they covert to underground cables. Two of the feeders form a double circuit line and all lines are located near fault lines and so susceptible to damage in an earthquake. Earth movement from slippage or erosion is the only other natural danger to the lines. The severe weather encountered in December 2011 demonstrated this with a slip causing a tree to slide down a hill and ultimately fall onto one of the 33kV overhead lines. Supply was not lost but NEL had to operate at security of supply level n for over 12 hours.

**Mitigation:** Nelson Electricity is installing a new fourth 33kV feeder totally underground from Stoke Grid Exit Point to Haven Road Zone Substation, to reinforce the sub-transmission supply to the network.

### ***Haven Road Zone Substation Building***

The Haven Road Substation building was built in the 1950s. A structural assessment of the building was undertaken in 2006. The building required some additional bracing to meet the earthquake provisions of the new standard AS/NZS 1170.

**Mitigation:** The earthquake bracing was completed during 2008-2009 to meet the IL4 new building standard.

### ***Haven Road Zone Substation 11kV Switchboard***

The 11kV switchboard consists of fifteen 1960s model OCBs. It is not anticipated that any significant damage would occur to the switchgear during an earthquake unless there was damage to the Zone Substation building. However, if there was damage which made any switches inoperable, it is likely that some form of bypass would need to be installed as spare parts are very limited.

**Mitigation:** The 11kV switchboard is to be replaced in 2013 with the Haven Road Zone Substation replacement.

### ***Haven Road Zone Substation 33kV/11kV Switchyard***

The Zone Substation switchyard consists of concrete poles and open bus-work which is susceptible to earthquake. The ground mounted equipment could be exposed to tsunami.

**Mitigation:** The switchyard structures have been braced against earthquake within the last 20 years. The whole of the switchyard is planned for replacement indoors in 2013.

### ***11kV/400V Substations***

The 11kV/400V substations consist of a variety of kiosks, underground vaults and padmount structures as well as pole mounted types. It is expected that the ground mounted structures will withstand an earthquake but may be more susceptible to flooding and those near the tidal areas to tsunami and liquefaction. The few remaining pole mounted substations would be susceptible to earthquake.

**Mitigation:** The transformers in ground mounted substations have been bolted down and those below ground could be sealed against water intrusion. The pole mounted substations are being systemically installed on the ground. All substation buildings seismically checked and brought up to appropriate new building standard.

### ***Underground Cabling***

The underground network is expected to remain intact unless there is significant ground movement in an earthquake or soil erosion in a flood or tsunami. In some areas of reclamation, liquefaction may be an issue.

Given the high proportion of the network being underground it is difficult to alter the risk profile so it becomes more of a managing of the risk. The most appropriate method is by providing alternative backup supply options.

**Mitigation:** Ensure that as many areas of the network as possible have an alternative route of supply by ring-feeding.

### ***Communications/Control***

It is anticipated that cellphones, which are held and operated daily by all staff, should be operational following a disaster but, as a backup, radio telephones operating via simplex would be utilised. The Zone Substation Control Room computer would enable limited computer systems to be utilised for operational purposes. It is anticipated that most operations would be controlled by the Civil Defence/Lifelines Control Centre where an NEL liaison officer would be stationed. Communications would be via cellphone or radio telephone.

**Mitigation:** An on-site backup generator is able to provide a limited electrical supply to the Control Room and essential services for operational purposes.

## ***8.10 Exposure to Physical Risk***

### ***Controllable Risk***

This is risk that is within the control of the asset owner and can be controlled by adding or removing particular assets to meet the risk standard required. The Asset Management Plan revolves primarily

around this risk. Nelson Electricity plans ahead and makes assessments as to when an asset needs to be replaced, upgraded or removed.

### ***33kV Feeder Supply***

Nelson Electricity is currently being supplied by three 33kV feeders. Two of the feeders are overhead on a double circuit line at a road edge of an increasingly busy road in the Ridgeway (Stoke [Network Tasman] suburb) area. There have been two incidents in recent years where cars have hit poles supporting the double circuit. In both incidents there was no damage to the line or loss of supply. There have been no other known incidents in the previous year.

An assessment has been undertaken to forecast traffic volumes with the risk of Nelson Electricity losing supply from the double circuit leaving only one 33kV feeder to supply the network with reliance of other contingencies to restore supply to the network.

**Mitigation:** Nelson Electricity will be installing a new fourth 33kV feeder totally underground to reinforce the sub-transmission supply to the network.

### ***Haven Road Zone Substation and 33kV/11kV Switchyard***

The Zone Substation building is protected by fire and intruder alarms but the location of the switchyard makes it susceptible to intruders and sabotage. In spite of new fencing installation the fatal entry of a recent intruder caused a significant outage in the city but no structural damage to the network.

**Mitigation:** A total indoor replacement of the switchyard within the next year is to be installed in 2013.

### ***11kV/400V Substations***

The 11kV/400V substations consist of a variety of kiosks, underground vaults and padmount structures as well as pole mounted types. It is expected that the ground mounted structures will withstand an earthquake but are more susceptible to flooding and those near the Port to tsunamis. The few remaining pole mounted substations would be susceptible to earthquake.

**Mitigation:** The transformers in ground mounted substations have been bolted down and those below ground could be sealed against water intrusion. The pole mounted substations are being systemically replaced on the ground.

### ***Underground Cabling***

The underground network is expected to remain intact unless there is significant ground movement in an earthquake or soil erosion in a flood or tsunami.

**Mitigation:** Ensure that as many areas of the network as possible have an alternative route of supply by ring-feeding.

### ***Communications/Control***

It is anticipated that cellphones, which are held and operated daily by all staff, should be operational following a disaster but, as a backup, radio telephones operating via simplex would be utilised. The Zone Substation Control Room computer would enable limited computer systems to be utilised for operational purposes. It is anticipated that most operations would be controlled by the Civil Defence/ Lifelines Control Centre where an NEL liaison officer would be stationed. Communications would be via cellphone or radio telephone.

**Mitigation:** An on-site backup generator is able to provide a limited electrical supply to the Control Room and essential services for operational purposes.

## 8.11 Emergency Plans

Nelson Electricity has an Emergency Recovery Plan, which is available in electronic form or with hard copies available in-house, with individual staff, Nelson Electricity control room and fault contractor. Issue is restricted to relevant Lifeline and Civil Defence groups.

The Plan includes:

- Restoration contingencies and procedures with accurate identification of risk areas in the Nelson city and on the network. An example of the type of contingency measure in place is the interconnection switches which will be used to accept supply from Network Tasman in the event of a major 33kV or 11kV feeder failure. Restoration of supply to significant customers is also addressed in the contingency measures.
- Lists detailing contractor contact details and emergency suppliers as well as lists of asset spares.
- Nelson Electricity will be working closely with Network Tasman and Nelson Tasman Lifelines in the event of an emergency. Nelson Electricity has identified interdependence with other Lifeline members and continues to attend Lifeline events to form working relationships with these other organisations.

### ***Supplementary Records Information***

Records information held at the main substation consist of:

- ***Hardcopy and Scanned***  
Cable location plans, LV schematics, HV schematics.
- ***Computer Files***  
Substation loadings, transformer sizes, cable sizes, asset locations, and AutoCad drawings. All hard copy files are scanned and stored electronically.

Because of the nature of this information it supplements rather than forms part of the Emergency Recovery Plan. All scanned data is backed up and copies kept offsite.

The Asset Performance Standards are also used to set the levels of availability of spares and resources required to recover from a disaster situation while still meeting the Standard.

Restoration contingencies and procedures are based on single event emergencies.

### ***Document Security***

In the event that the Haven Road Zone Substation was destroyed and all plans and computer information destroyed, Nelson Electricity has processes in place to minimise the disruption.

**Mitigation:** Nelson Electricity has backup copies of the following:

- Computer network file server data;
- Underground cable records;
- Field book records;
- GIS data;
- Network schematics.

Copies are stored off site and can be accessed and used in an emergency. Nelson Electricity has now completed construction of a fire-rated document storage area within the building to minimise risk of damage to network information stored in this room.

Zone Substation records, schematics and plans are drawn or have been redrawn using AutoCad. These are held on the file server and backed up daily. Older records have been captured on microfilm.

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## SECTION 9 - Evaluation of Performance

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### 9.1 Evaluation of Performance

Nelson Electricity network development is in line with load growth and the replacement of aged assets as detailed in this Plan and previous Plans. There are situations where some projects are brought forward and others deferred based on new information, increased growth, new developments, and finding more cost effective solutions.

Previous sections of this Plan refer to the Asset Risk Model and associated Performance Standards as the tool for measuring the reliability of asset performance. Where maintenance is required to an asset the Risk Model will assist with evaluating the most efficient and economical solution.

With continual auditing of the assets and use of the Office Management System reporting and Improvement Form, asset management and the Nelson Electricity business as a whole are under continual analysis and improvement.

Nelson Electricity takes into consideration comments and evaluations made in the Commerce Commission reviews into the previous Asset Management Plan. It also compares with other Electricity Distribution Business performances to assess best practise. The Asset Management Plan, when complete, is then peer reviewed by Network Tasman (as part of the engineering support agreement) and additional changes made to further improve the quality and compliance level of the document. This review is undertaken prior to director endorsement and disclosure.

### 9.2 Review of Progress and Gap Analysis

#### *Financial Performance*

Nelson Electricity has introduced the financial targets below and will report actual versus target.

	2010	2011	2012	2012 Target	2013 Target	2013 Forecast
<b>Indirect Costs per ICP</b>	\$119	\$122	\$116	\$117	\$119	\$117
<b>Direct Costs per ICP</b>	\$78	\$79	\$80	\$85	\$87	\$84

Direct and Indirect costs per ICP overall are below target for 2012. Nelson Electricity will be aiming to decrease indirect costs per ICP back by 1% per year (allowing for CPI adjustments) over the planning period. This will reflect the improved efficiency of the management of the network. Offsetting this is the increasing compliance costs associated with being a regulated business.

Direct costs have also reduced compared to previous year and also below target. The costs experienced by Nelson Electricity for works undertaken in Nelson city have increased significantly over the last few years. There is an expectation they will increase further given the additional requirements and warranties required by the Nelson City Council. Although Nelson Electricity currently does not have a full appreciation of the increases Nelson Electricity will attempt to maintain direct costs per ICP at 2010 levels for the planning period (allowing for CPI adjustments).

## Reliability and Performance

Nelson Electricity has been actively recording 33kV and 11kV outage statistics since 1994-1995 and the annual figures reflect significant improvement from those of the early years. The main improvement has come in the area of the 33kV feeders where problems with cable/joint failures and contractor strikes in the 1990s have been reduced with the implementation of policy and regular contact with excavation contractors.

Network reliability, in the long run, is excellent. However, over three of the last four years the disclosed statistics show high SAIDI statistics.

- The 2009 year was dominated by one transmission outage resulting in 70 SAIDI minutes. Nelson Electricity is supplied by Transpower's Stoke Grid Exit Point and does not have any alternative transmission supply option. Any Transpower outage cannot be avoided.
- The 2010 year was influenced by planned outages to replace a series of 11kV switch around the network with 37 SAIDI minutes additional compared to a typical year.
- The 2011 year has had one long duration Zone Substation outage of 3.5 hours that being 105 SAIDI minutes. This outage was a protection issue where the system tripped due to a circulating earth current. The temporary 11kV network configuration at the time and other set of circumstances surrounding this outage was unique and identifying the cause was difficult. This was further exaggerated by the low frequency of large fault situations on the network making familiarisation of these types of issues difficult to maintain. Nelson Electricity has reinforced switching procedures to ensure a situation like this cannot occur as well as additional familiarisation training for control room operators and faultman.
- The 2012 year was also above target with an 11kV cable fault due to contractors using a directional drill striking the Port 1 11kV feeder.

Planned outages have had a major impact on the outage statistics between 2009 and 2012 and during two of the last four years a number of 11kV switch replacements were undertaken which in many cases required shutdowns to often large areas. Every attempt is made to minimise outage areas and durations but the work has been necessary. Planned outage SAIDI statistics have now dropped back to below target levels since 2011.

### SAIDI

	Year End	NEL Planned	NEL Unplanned	NEL Total	Transpower Total
Actual	2004	7	46	53	0
	2005	12	39	51	0
	2006	12	10	22	101
	2007	9	16	25	215
	2008	5	12	17	0
	2009	29	87	116	70
	2010	54	25	79	0
	2011	9	106	115	0
	2012	9	55	64	0
	2013	15	30	45	0
Target FORECAST	2013	9	34	43	0
	2014	15	30	45	0

Nelson Electricity will continue to work with contractors to ensure that appropriate care is taken around network assets.



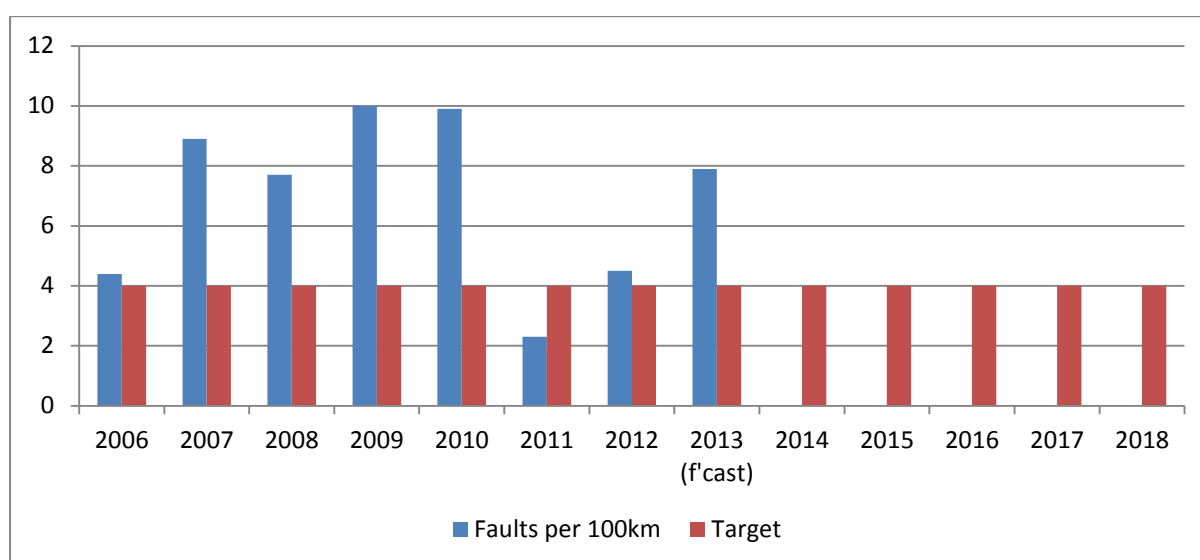
It has to be noted that Nelson Electricity is a small network and that any outage has a huge impact on outage statistics. There will always be annual differences and extremes. This is demonstrated in the 2012 forecast showing a total SAIDI of 64 minutes. One outage accounts for 55 minutes and one outage in 2013 which contributes 23 minutes of the total 34 minutes of unplanned SAIDI.

All unplanned outages will continue to be investigated and corrective procedures and actions put in place to reduce or eliminate the risk of a similar outage and reduce the impact if a similar outage does occur. Tables of all outage statistics are included in the Service Level section.

One key project that has seen some significant improvement in 33kV feeder related outages has been the 33kV feeder automation project. This has ensured that the network has not lost supply due to a feeder fault where in the past we would expect one feeder fault every two years on average taking at least 40 minutes and often in excess of an hour to restore full supply.

### ***Number of Faults per 100 Kilometres of Network***

The number of faults per 100 kilometres of line was below target for 2011 and significantly below the industry average of 9.2 faults per 100km of line.



The target set is a difficult level to achieve. Nelson Electricity is a small network and any fault has a severe impact on this. In previous years the performance levels have been affected by contractors digging up cables. An added awareness campaign on usage of cable locations and safety observers looks to have reduced the number of these types of cable faults.

The target of four faults per 100 kilometres of line is a target based on the theoretical best performance of an underground type network. It has to be noted that many faults that occur are not network related but more third party or contractor related. Nelson Electricity has attempted to minimise this and will continue to educate contractors and public on electricity network risks.

An initiative undertaken in 2010 was to identify and lower or replace vulnerable cables identified in the grass berm. These cables may be of a depth or condition that makes them at a heightened risk of being struck by public or contractors. This was seen as more of a safety issue for the public but could also reduce number of faults. The public were also advised as soon as these cables were identified as a risk. This initiative has now been extended to vulnerable cables laid in footpaths and roadways and will be completed in 2013-2014.

## ***Fluctuating Voltage***

There were six voltage complaints received for the year. Four were proven to be network related. All issues were resolved in a timely manner. The network standard was for no more than seven proven network voltage complaints received per year. Given the elevated number of complaints received during the 2009 year, Nelson Electricity has been monitoring this issue closely to ensure this is not more than a statistical abnormality. The voltage complaints received and confirmed since 2009 confirm there is not a degradation of voltage on the network.

## ***Capacity Utilisation and Load Factor***

The Capacity Utilisation and Load Factors have reduced in the 2010, 2011 and 2012 years predominantly due to the declining peak demand and kWh consumption. The decline in peak demand and consumption may see some transformer downgrades but this will most likely be through consumers with dedicated transformers requesting downsizing. It is expected that these rates will begin to recover to target levels over a length of time as soon as the consumption increases again.

## ***Harmonics and Interference***

There were no issues with harmonics last year.

## ***Environmental Performance***

The environmental performance for the year was satisfactory. There were no environmental incidents on the network during the year. The oil spill kits are maintained at appropriate locations and available when lifting oil filled equipment on and off trucks.

## ***Safety Performance***

There were no loss time injuries by staff or contractors working on the network. Any public safety issues with distribution assets were dealt with within the 30 minute response time.

There were no public safety or property damage events during the year.

## ***Records***

Nelson Electricity is in the process of implementing a Geographic Information System and this project, although ongoing, is still under development. Nelson Electricity holds a set of hard copy underground record plans of which staff and contractors rely heavily for day to day operations of the network. These records have been found to be devoid of cable sizes and depths of lay in some areas but these issues are being addressed with ongoing audits. The plans are supported by field book as-built records of the most recent network extensions. With the development of the Geographic Information System and an associated database, the physical and operational records of all assets will be linked under a single Asset Management system.

## ***Gap Analysis Process***

Gap Analysis comprises:

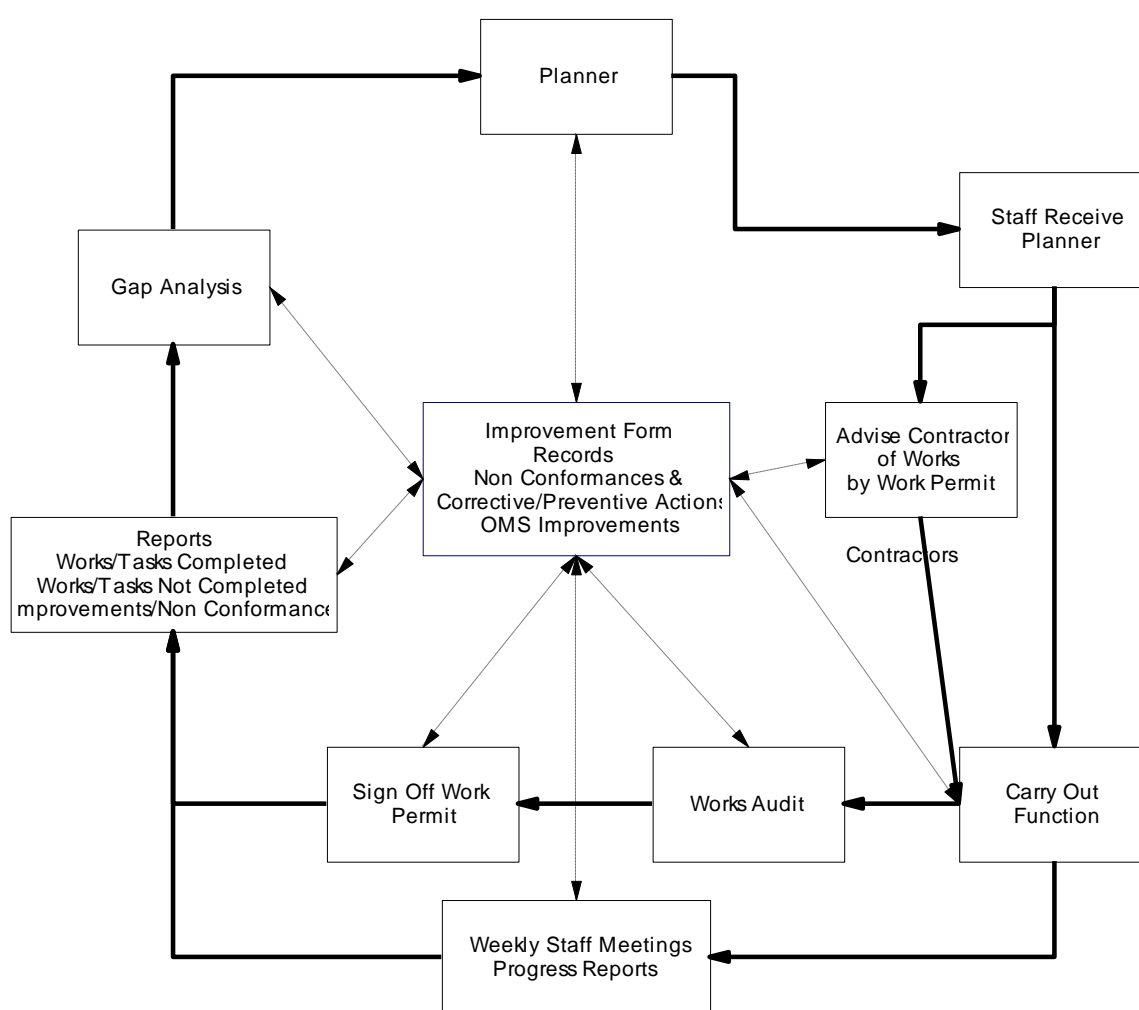
- Identification of the gap;
- Analysis of problems and solutions;
- Corrective/preventive actions.

The Office Management System provides the ideal tools for identifying, analysing and correcting problems within the business. All works and business tasks are programmed on a Planner, which is issued to each staff member in the last days of the month, for the following month, with copies of each to the General Manager. During the weekly staff meetings the General Manager requests updates on all tasks. Any non-conformances are recorded on the Improvement Form and discussed between the staff member and General Manager.

Contractors' works are delivered by way of the Work Permit. When the work/task is completed it may be audited, then the Work Permit is signed off. Reports are produced for management to analyse all works/tasks completed and those not completed. Likewise Improvement Form reporting is also analysed. Possible solutions are discussed and may be risk modelled then corrective/preventive measures put in place. Refer flow chart below.

System reliability targets and statistics will also be analysed regularly as programmed on the Planner. The Planner will also programme reviews of the Office Management System, Asset Management Plan and Business Plan progress. The reviews and continuous improvement strategies will be discussed at the weekly staff meetings.

### ***NEL Staff and Contractor Work/Task Flow***



### ***Asset Management and Planning***

On an annual basis, Nelson Electricity reviews its asset management processes by various means to ensure it is appropriate for the network. There are three fundamental processes undertaken to ensure that the processes used are appropriate and in line with good industry practise.

- Nelson Electricity has the Asset Management Plan peer-reviewed by Network Tasman engineering staff. This process identifies, on occasion, new initiatives that may have been missed. It also ensures that the asset management processes are confirmed as appropriate.

- Nelson Electricity critically reviews any Asset Management Plan reviews commissioned by the Commerce Commission. This review always highlights new areas for improvement and also helps target resources when reviewing the asset management processes.
- Monitor other network company asset management plans.

The Asset Management Plan has now been reformatted to align with the Electricity Information Disclosure Handbook. This has the benefit of the plan being easier to review by the Commission as well as simplifying the document which has become quite large with some fragmented information.

## ***Asset Management Maturity Assessment***

Nelson Electricity has undertaken an asset management maturity assessment as required under the Electricity Distribution Information Disclosure Determination 2012. The accompanying Schedule 13 from the Determination is included at the back of this Asset Management Plan. The Schedule has been compiled and assessed by utilising an Independent Qualified Electrical Engineer. This provides a level of independence in the assessment.

While the assessment undertaken shows Nelson Electricity has a reasonable level of maturity, there are some areas identified which will be focussed on during the 2013 year.

### **Areas Identified for Improvement from the Asset Management Maturity Assessment**

#### **Q.3 Asset Management Policy**

Nelson Electricity will improve the documentation which demonstrates the appropriate asset management policies in place beyond those described in this Plan and on the Nelson Electricity website and there is evidence of appropriate levels of endorsement from top management and the Board of Nelson Electricity.

#### **Q.31 Asset Management Plan**

Nelson Electricity will develop the Plan further to describe what is being done to ensure appropriate arrangements are made available for efficient and cost effective implementation. Currently Nelson Electricity have appropriately experienced and qualified staff, contractors or other personnel through contract to ensure appropriate resources are available to undertake the requirements of this Plan. The Plan will expand to include training requirements, supply chain capability and procurement timescales.

#### **Q.48 Training Awareness and Competence**

Nelson Electricity has a low number of staff and is reliant on robust contractor relationships for field work and contracting of other resources for other engineering, accounting and administration services. The Plan needs to develop further on how Nelson Electricity is to seamlessly manage these requirements over the planning horizon of greater than 10 years.

#### **Q.62 and Q.64 Information Management**

Nelson Electricity has a GIS system and information systems which support asset management. A review of the asset management systems will be undertaken to ensure the inputs, checks and outputs are appropriate and it provides the flexibility for changes of asset standards, new technologies and regulatory requirements.

#### **Q.79 Use and Maintenance of Risk Information**

Nelson Electricity will review the utilisation of risk information as well as the assessment of appropriate resourcing to match the changing requirements over time.

#### **Q.82 Legal and Other Requirements**

Nelson Electricity utilises a number of methods to ensure it is aware of its legal, regulatory, statutory and other asset management requirements. While this has been workable, procedures and processes need to be incorporated into the Asset Management Plan.

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## SECTION 10 - Expenditure Forecasts and Reconciliations

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As a review of progress against the portions of the Asset Management Plan 2011–2021 and the Asset Management Plan 2012–2022 the following is the Asset Management Plan Requirement: Expenditure Forecasts and Reconciliation Schedule as per the Commerce Commission - Information Disclosure Handbook, section 4.5.9.

### **10.1 Capital Expenditure**

#### **2011-2012 Asset Management Plan- Original Estimate versus Actual**

The Board approve, in principal, the capital expenditure budget at the beginning of the financial year. Individual capital projects, subject to delegations of authority, require further approval by the Board. The capital expenditure for the 2011-2012 year was under the current Asset Management Plan estimate. Original estimates were \$5,957,000 when the end of year actual was \$1,182,000. This significant under-spend has mainly been due to the deferment of the replacement of the Haven Road Zone Substation and new 33kV feeder by one year, this accounts for over \$4,000,000. Other reasons which have been common through recent years:

- Deferred due to further testing determining favourable condition of asset;
- Developers not proceeding with projects or projects delayed;
- Overhead to underground projects not financially justifiable.

Many of the projects not proceeded with were pushed into the years following 2011-2012 year and are included in the 2013-2023 Asset Management Plan.

Major items not completed in the past year were:

- Ripple generator replacement - there are several alternatives being considered, so a decision to defer was made to appropriately consider these in tandem with the future development plans of Haven Road Zone Substation - \$350,000;
- 11kV switch replacements delayed due to determining the appropriate switchgear (Emano, GPO) - \$390,000;
- Developer related projects being delayed by developer (Grampian Oaks) - \$85,000.

#### **2012-2013 Asset Management Plan – Original Estimate versus Forecast End of Year**

The forecast capital expenditure for 2012-2013 will be under the current Asset Management Plan estimate as disclosed in the 2012-2022 Asset Management Plan and was \$10,199,000. The year end estimate is now \$4,412,000. This significant under-spend has been again due to the Haven Road Zone Substation replacement and new 33kV feeder projects totalling \$8,000,000 being undertaken over the 2012-2013 and 2013-2014 years. This has also required the deferment of the ripple generator replacement valued at \$350,000. A significant proportion of the 33kV feeder installation will be spent in 2012-2013 while only deposits for substation equipment and design costs will be incurred in 2012-2013.

There were some other additional projects not undertaken during the year;

- Determining the appropriate switchgear (Emano, GPO) - \$390,000;
- Developer related projects being delayed by developer (Grampian Oaks) - \$80,000.

There were, however, some additional projects not allowed for in the original estimates that will be completed by the end of the year. Various cable replacements due to depth and mechanical protection issues - \$60,000.

Refer to table on the progress of the 2012-2013 Capital Expenditure programme as at the date of writing of this Plan.

Capital Expenditure Programme 2012/13					
Project Type	Category	Location	Cost Estimate	EOY Expenditure Estimate	Status
<b>GROWTH</b>					
Growth	33kV Lines & Cables	33kV Feeder Cabling	2,000,000	1,108,849	Progressing
Growth	33kV/11kV Substations	33kV Transformer Capacity & 11kV Sw Board	6,000,000	562,070	Progressing
Growth	11kV/400V Transformers	Grampian Oaks Stage 6, HV & Tfr	80,000	0	Pending developer
Growth	11kV/400V Transformers	Abraham Hts East Tfr Uprate	0	0	Deferred - Load shift
Growth	11kV/400V Transformers	Vanguard St Central Tfr Uprate	30,000	8,598	COMPLETE
Growth	11kV/400V Transformers	Collingwood Street 105 Tfr & HV Cabling	115,000	34,878	COMPLETE
Growth	11kV/400V Transformers	Collingwood Street 90 Tfr & HV Cabling	59,000	29,000	COMPLETE
Growth	11kV/400V Transformers	Locking Street Substation	30,000	86,118	COMPLETE
Growth	11kV/400V Transformers	Transformer Uprates	100,000	0	Pending
Growth	Miscellaneous	Unknown Provision	50,000	25,773	Progressing
<b>RENEWAL</b>					
Renewal	33kV/11kV Substations	Ripple Generator Replacement	350,000	0	Progressing
Renewal	33kV/11kV Substations	Haven Rd Zone Sub Protection Relay replace	100,000	0	Progressing
Renewal	11kV Lines & Cables	Hampden St - Hospital HV Uprate	220,000	95,000	Progressing
Renewal	11kV Lines & Cables	Reliance - Vang LB HV Uprate	60,000	49,561	COMPLETE
Renewal	11kV Lines & Cables	Vanguard St LB - Hardy St West HV Uprate	0	0	Deferred-Alternative option
Renewal	11kV Lines & Cables	Walls - Hampden St HV Uprate	110,000	60,000	Progressing
Renewal	400V Lines & Cables	Non Standard Cable Depth Project	100,000	62,931	Progressing
Renewal	11kV Switches	11kV Switch replacements	30,000	0	Pending
Renewal	400V Lines & Cables	Cable Replacement	352,000	90,525	Progressing
Renewal	400V Lines & Cables	Link Box Replacements	30,000	10,414	Progressing
Renewal	400V Lines & Cables	Service Box Replacements	60,000	73,171	Progressing
Renewal	Miscellaneous	Network Asset Renewals	120,000	78,103	Progressing
<b>IMPROVEMENT</b>					
Security	11kV Switches	Jenner / Murphy HV LB	0	0	Deferred-Alternative option
Security	11kV Switches	Kawai St North HV LB	22,000	20,000	COMPLETE
Security	400V Lines & Cables	Bridge St East LV Sectionalisation	20,000	0	Deferred
<b>OH to UG</b>					
OH to UG	11kV Lines & Cables	Hampden St - Alfred St HV	80,000	86,246	COMPLETE
OH to UG	400V Lines & Cables	Pioneer Cres - UG LV from Washington with NCC	20,000	5,860	COMPLETE
OH to UG	11kV Lines & Cables	Russell St UG HV/LV with NCC	60,000	35,527	COMPLETE
OH to UG	11kV Lines & Cables	Toi Toi St UG HV/LV	120,000	0	Deferred
OH to UG	400V Lines & Cables	Vanguard St - UG LV from ABC to Nth Esk	10,000	0	Deferred

## 10.2 Operational Expenditure

### 2011-2012 Asset Management Plan - Forecast versus Actual

Expenditure for the year ending 2012 was \$600,000 which was \$10,000 over the budget of \$590,000. The variances differ between sub-categories which, however, is to be expected.

All planned asset auditing has been completed for the year.

All scheduled maintenance and urgent maintenance resulting from audits is forecast to be completed, where required, by end of the financial year. There have been a continued number of service box and link box replacements throughout the year as predicted.

## ***2012-2013 Asset Management Plan - Forecast versus Forecast End of Year***

Asset Management Plan forecast for the year ending 2013 was \$590,000. The latest predicted expenditure was revised from the initial level of \$590,000 to \$767,000 due to increases in expenditure in three key areas:

- Increase in overhead network maintenance;
- Additional costs associated with adding protection to vulnerable cables;
- Higher costs associated with unplanned outages.

All planned asset auditing has been completed for the year.

All scheduled maintenance and urgent maintenance resulting from audits is forecast to be completed where required by end of the financial year. There have been a continued number of service box and link box replacements throughout the year as predicted.

### ***Maintenance Initiatives***

The auditing and maintenance programme, which has been continually fine-tuned, is working effectively. The main reason for its effectiveness is due to having a robust auditing programme undertaken by extremely competent people. The work that comes from the audits are prioritised and undertaken in a timely manner. The frequency of the auditing is reviewed on an annual basis to ensure Nelson Electricity is in line with at least good industry practise.

There will always be modifications to the programmes and the current changes or initiatives revolve around cable condition and protection and the need to check older cable, mechanical protection and depths. This will be extended into 2013-2014 where there will be a focus on protection of cables under footpaths, driveways and roadways.





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# APPENDICES

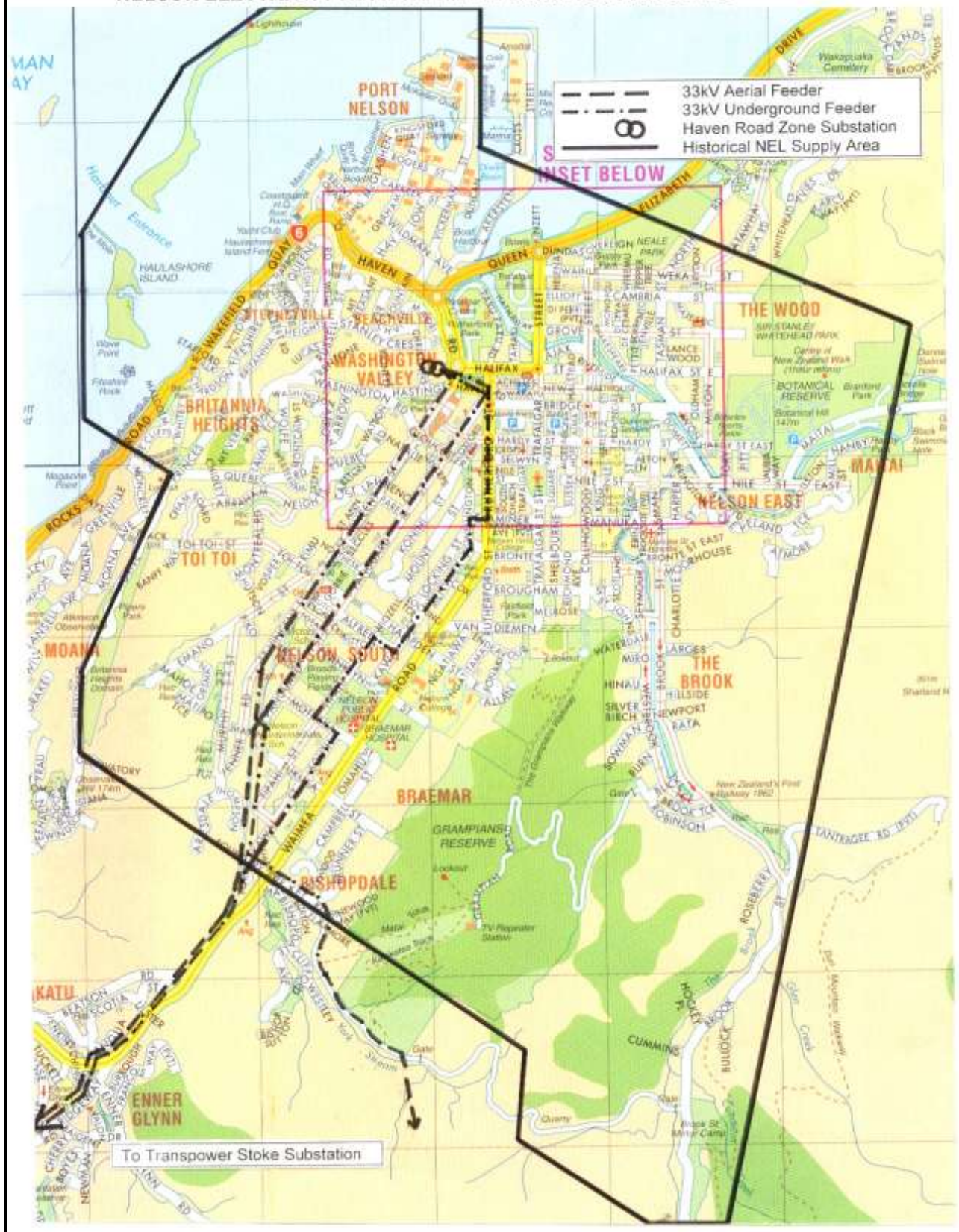
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## Audit Programme 1 April 2013 - 31 March 2023

Category	Asset Type	Audit Type	Description	Audit Frequency ID	Total No of Assets	Comments	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023										
33 kV Networks	OCB Switch	Partial Discharge	33 yard	2 Yearly	3			3	1/04/2014		3	1/04/2016		3	1/04/2018	3	1/04/2020		3	1/04/2022						
33 kV Networks	OCB Switch	Oil Sample	33 yard	Annually	3		3	1/04/2013	3	1/04/2014	3	1/04/2015	3	1/04/2016	3	1/04/2017	3	1/04/2018	3	1/04/2019	3	1/04/2020	3	1/04/2021	3	1/04/2022
33 kV Networks	OH/UG Structure	Thermal Imaging (ABB)	33 yard / Boundary Rd / Vanguard St	Annually	3	ABB	3	1/04/2013	3	1/04/2014	3	1/04/2015	3	1/04/2016	3	1/04/2017	3	1/04/2018	3	1/04/2019	3	1/04/2020	3	1/04/2021	3	1/04/2022
33 kV Networks	Pole	Visual	Concrete	2 Yearly	21		10	1/04/2013	11	1/04/2014	10	1/04/2015	11	1/04/2016	10	1/04/2017	11	1/04/2018	10	1/04/2019	11	1/04/2020	10	1/04/2021	11	1/04/2022
33 kV Networks	Pole	Visual/Heat Gun/UG Test	Wood	2 Yearly	14		7	1/04/2013	7	1/04/2014	7	1/04/2015	7	1/04/2016	7	1/04/2017	7	1/04/2018	7	1/04/2019	7	1/04/2020	7	1/04/2021	7	1/04/2022
33 kV Networks	Structure	Visual	33 Yard (Plan Mtce)	Weekly	1																					
33 kV Networks	UG Cable	Partial Discharge	St Vinc / Vang / Ruth	2 Yearly	3		3	1/04/2013			3	1/04/2015			3	1/04/2017			3	1/04/2019			3	1/04/2021		
33 kV Networks	Earths	Test	33 yard compound (all earths)	Annually	1		1	1/04/2013	1	1/04/2014	1	1/04/2015	1	1/04/2016	1	1/04/2017	1	1/04/2018	1	1/04/2019	1	1/04/2020	1	1/04/2021	1	1/04/2022
33/11 kV Transformers	Transformer	Tap Change/Oil Sample	T1-T7	Annually	7		7	1/04/2013	7	1/04/2014	7	1/04/2015	7	1/04/2016	7	1/04/2017	7	1/04/2018	7	1/04/2019	7	1/04/2020	7	1/04/2021	7	1/04/2022
33/11 kV Transformers	Transformer	Tap Change Recordings	Plan Mtce	Weekly	7																					
33/11 kV Transformers	Transformer	Temperature	Plan Mtce	Weekly	7																					
11kV Networks	Bus (11kV busbar)	Thermal Imaging	33 Yard	Annually	2	Winter		2	1/04/2014		2	1/04/2016		2	1/04/2018		2	1/04/2020		2	1/04/2022		2	1/04/2024		
11kV Networks	Earths	Test	Distribution Subs	5 Yearly	193		38	1/04/2013	38	1/04/2014	39	1/04/2015	38	1/04/2016	38	1/04/2017	38	1/04/2018	38	1/04/2019	39	1/04/2020	38	1/04/2021	38	1/04/2022
11kV Networks	Earths	Visual	Distribution Subs (Plan Mtce)	6 Monthly	193																					
11kV Networks	Incoming Cables	Partial Discharge	Main Sub	2 Yearly	2			2	1/04/2014		2	1/04/2016		2	1/04/2018		2	1/04/2020		2	1/04/2022		2	1/04/2024		
11kV Networks	HV Link Box	Visual	Plan Mtce	6 Monthly	25																					
11kV Networks	Main Feeders	Partial Discharge	Main Sub	2 Yearly	14			14	1/04/2014		14	1/04/2016		14	1/04/2018		14	1/04/2020		14	1/04/2022		14	1/04/2024		
11kV Networks	Main Sub OCB	Partial Discharge	11kV OCB (Main Sub)	2 Yearly	14			14	1/04/2014		14	1/04/2016		14	1/04/2018		14	1/04/2020		14	1/04/2022		14	1/04/2024		
11kV Networks	OCB Switch	Oil Sample / Earth Test / Protection Settings	HV Switches (first out subs)	2 Yearly	55	7 Substations		1/04/2013			1/04/2015			1/04/2017			1/04/2019						1/04/2021			
11kV Networks	OCB Switch	Partial Discharge	HV Switches (first out subs)	2 Yearly	55	7 Substations	3	1/04/2013	4	1/04/2014	3	1/04/2015	4	1/04/2016	3	1/04/2017	4	1/04/2018	3	1/04/2019	4	1/04/2020	3	1/04/2021	4	1/04/2022
11kV Networks	Pole (concrete)	Visual	includes stay poles	5 Yearly	182		36	1/04/2013	36	1/04/2014	36	1/04/2015	36	1/04/2016	36	1/04/2017	36	1/04/2018	36	1/04/2019	36	1/04/2020	36	1/04/2021	36	1/04/2022
11kV Networks	Pole (wood)	Visual/Heat Gun/UG Test	includes stay poles	3 Yearly	17		6	1/04/2013	6	1/04/2014	6	1/04/2015	6	1/04/2016	6	1/04/2017	6	1/04/2018	6	1/04/2019	6	1/04/2020	6	1/04/2021	6	1/04/2022
11kV Networks	HV Switches	Visual	Plan Mtce	6 Monthly	310																					
1kV Networks	HV Switches	Oil Sample	Maintenance	5 Yearly	310		62	1/04/2013	62	1/04/2014	62	1/04/2015	62	1/04/2016	62	1/04/2017	62	1/04/2018	62	1/04/2019	62	1/04/2020	62	1/04/2021	62	1/04/2022
11kV/400V Transformers	Transformer	Oil Sample		5 Yearly	197		39	1/04/2013	39	1/04/2014	39	1/04/2015	39	1/04/2016	39	1/04/2017	39	1/04/2018	39	1/04/2019	39	1/04/2020	39	1/04/2021	39	1/04/2022
11kV/400V Transformers	Transformer	MDI Readings	Plan Mtce	6 Monthly	197																					
11kV/400V Transformers	Transformer	Temperature	Plan Mtce	6 Monthly	197																					
11kV/400V Transformers	Transformer	Visual	Plan Mtce	6 Monthly	197																					
400V Networks	LV Link Box	Visual/Heat Gun		5 Yearly	314		62	1/04/2013	62	1/04/2014	61	1/04/2015	62	1/04/2016	62	1/04/2017	62	1/04/2018	62	1/04/2019	62	1/04/2020	62	1/04/2021	62	1/04/2022
400V Networks	Pole (wood)	Visual/Heat Gun/UG Test	includes stay poles	3 Yearly	131		43	1/04/2013	43	1/04/2014	43	1/04/2015	43	1/04/2016	43	1/04/2017	43	1/04/2018	43	1/04/2019	43	1/04/2020	43	1/04/2021	43	1/04/2022
400V Networks	Pole (concrete)	Visual	includes stay poles	5 Yearly	529		105	1/04/2013	105	1/04/2014	105	1/04/2015	105	1/04/2016	105	1/04/2017	105	1/04/2018	105	1/04/2019	105	1/04/2020	105	1/04/2021	105	1/04/2022
400V Networks	Service Box	Visual/Heat Gun		5 Yearly	2425		485	1/04/2013	485	1/04/2014	485	1/04/2015	485	1/04/2016	485	1/04/2017	485	1/04/2018	485	1/04/2019	485	1/04/2020	485	1/04/2021	485	1/04/2022
400V Networks	Link/Service Box	External Safety Audit		2 Yearly	2718		1359	1/04/2013	1359	1/04/2014	1359	1/04/2015	1359	1/04/2016	1359	1/04/2017	1359	1/04/2018	1359	1/04/2019	1359	1/04/2020	1359	1/04/2021	1359	1/04/2022
400V Networks	Sub Station	Visual	Plan Mtce	6 Monthly	195																					
400V Networks	Sub Station	Hot Spots	Plan Mtce	6 Monthly	195																					
400V Networks	OH Lines	Line Heights		5 Yearly	N/A	All OH Lines		1/04/2013									1/04/2018									
With planned changes due at the NEL substation 2013/2014 then it is likely the 33kV network audit programme will change - to date however we are uncertain what these changes are.																										

## APPENDIX B

### NELSON ELECTRICITY NETWORK AREA & 33kV CABLE ROUTES

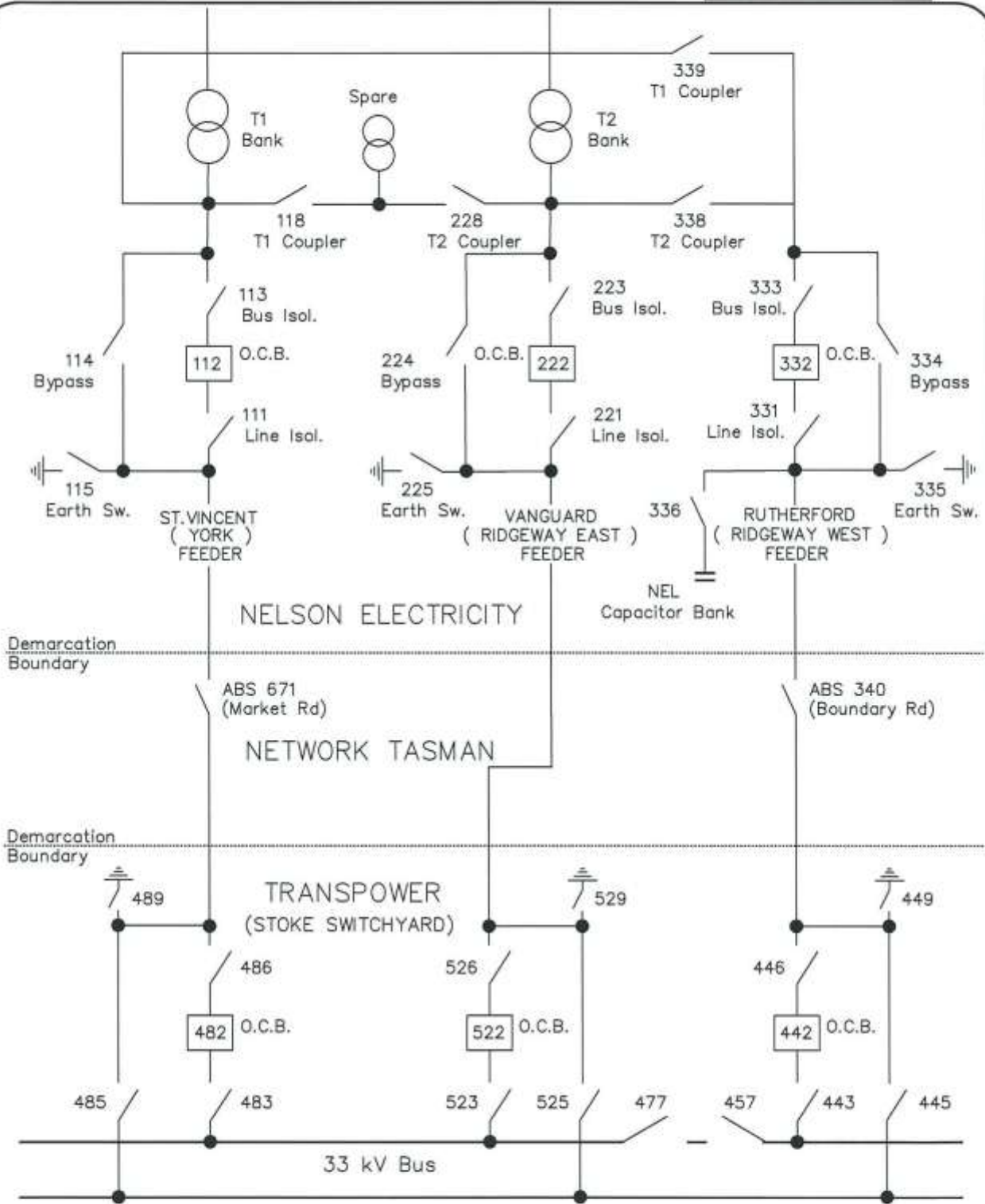


**NEL - ELECTRICAL LV BOUNDARIES****since April 2003**

<b>Location</b>	<b>Last Consumer</b>
North Road (East Side)	No 38
North Road (West Side)	No 25
Atawhai Drive (East Side)	No 22
Atawhai Drive (West Side)	No 23A
Maitai Drive (North Side)	Branford Park Ablutions Block
Hanby Park (South Side)	No 26
Upper Brook Street	Brook Camp and Gibbons Quarry
Market Road (North Side)	To Pinewood Way
Waimea Road (East Side)	No 201 - Bowling Club
Waimea Road (West Side)	No 204
Boundary Road	All North Side
Kawai Street (West Side)	No 248
Princes Drive (East Side)	No 187C
Princes Drive (West Side)	No 128
The Cliffs (East Side)	No 35 and then from No 56
The Cliffs (West Side)	No 22 and then from No 53
Rocks Road (East Side)	No 455
Rocks Road (West Side)	No 350
Haulashore Island and Boulder Bank to Lighthouse	Port Area
Akersten Street	To Dixon Basin



## APPENDIX C



**Title:** DETAILS OF 33KV FEEDERS BETWEEN TRANSPower (STOKE SUB) & NELSON ELECTRICITY LTD SUB



63 Haven Road,  
PO Box 7083, Nelson, New Zealand.  
Phone (03) 546-9256, Fax (03) 546-0487

Issue	<del>A</del> <del>B</del> <del>C</del> <del>D</del> <del>E</del> <del>F</del> <del>G</del> <del>H</del> <del>I</del> <del>J</del>		
Date	14.11.2011	JOB. No.	sheet 1 of 1
Scale	N.T.S.		
Drawn	D.W.R.	DRAWING No. 1339	
Designed			
Checked		COMP. REF: NZED-NCC	
Approved			



Equipment	Unit	Total Units	Std Life years	RC \$	ORC \$	DRC \$	ODRC \$
<b>SUBTRANSMISSION</b>							
33kV Lines Light -Wood Pole	km	0.70	45	32,060	32,060	2,137	2,137
33kV Underground-paper	km	5.57	70	1,015,170	1,015,170	671,024	671,024
33kV Underground-XLPE	km	4.17	45	754,770	754,770	478,735	478,735
Arrestors 33kV	No.	6.00	35	48,000	48,000	22,286	22,286
Air Break Switch	No.	6.00	35	54,000	54,000	18,900	18,900
Air Break Switch-Load Breaking	No.	3.00	35	27,000	27,000	9,450	9,450
7 Core Pilot Cable	km	7.69	45	79,810	79,810	21,773	21,773
10 Core Pilot Cable	km	7.20	45	153,706	153,706	10,247	10,247
27 Core Pilot Cable	km	0.25	45	7,997	7,997	5,020	5,020
<b>ZONE SUBSTATIONS</b>							
All NEL owned land	No.			1,162,500	1,125,500	1,162,500	1,125,500
Site Development & Buildings	No.	1.00	40	110,000	110,000	8,250	8,250
20/30 MVA Transformer	No.	2.00	60	1,054,000	1,054,000	346,942	346,942
OCB 33kV	No.	3.00	40	135,000	135,000	66,094	66,094
Sub Zone 11kV OCB	No.	14.00	45	420,000	420,000	32,167	32,167
Buscoupler	No.	1.00	45	30,000	30,000	2,000	2,000
Transformer Protection	No.	4.00	40	48,000	48,000	12,825	12,825
Feeder Protection	No.	14.00	45	70,000	70,000	5,361	5,361
Outdoor 33/11kV Structure	No.	1.00	60	120,000	120,000	74,500	74,500
Ripple Generators	No.	2.00	20	350,000	350,000	52,500	52,500
Comms	No.	1.00	15	12,000	12,000	2,400	2,400
Battery Charger	No.	1.00	20	8,717	8,717	1,308	1,308
Voltage transformers	No.	2.00	40	30,000	30,000	12,938	12,938
<b>OTHER ITEMS</b>							
Pilot Box - Pilot Cables	No.	7.00	30	1,295	1,295	245	245
Datran Unit - Pilot Cables	No.	7.00	30	14,000	14,000	2,650	2,650
Rectifier - Pilot Cables	No.	5.00	20	8,775	8,775	1,316	1,316
Protect-Lite - Pilot Cables	No.	4.00	20	10,800	10,800	1,620	1,620
Battery - Pilot Cables	No.	3.00	20	8,100	8,100	1,215	1,215
Fencing	No.	100.00	40	2,000	2,000	150	150
Local Service 11kV	No.	1.00	55	16,000	16,000	2,691	2,691
Data Logger	No.	1.00	30	4,000	4,000	400	400
Indoor Switchgear Cubicle	No.	2.00	45	60,000	60,000	4,000	4,000
Oil Containment	No.	1.00	45	91,070	91,070	77,410	77,410
Maximum Demand Controller	No.	1.00	20	20,600	20,600	9,528	9,528
<b>DISTRIBUTION LINES</b>							
3ph 11kV O/H Medium (<150mmAl) - Conc Pole	km	0.00	60	0	0	0	0
3ph 11kV O/H Light (<50mmAl) - Conc Pole	km	3.53	60	96,560	96,560	46,602	46,602
3ph 11kV O/H Medium- Conc UnderBuilt	km	2.76	60	69,476	69,476	20,158	20,158
3ph 11kV O/H Light - Conc UnderBuilt	km	2.14	60	43,841	43,841	13,856	13,856
<b>DISTRIBUTION CABLES</b>							
11kV U/G Heavy 241 to 300mm2 Paper	km	5.88	70	1,260,818	1,260,818	1,226,003	1,226,003
11kV U/G Heavy 241 to 300mm2 XLPE	km	2.91	45	671,748	671,748	400,251	400,251
11kV U/G Medium 51 to 240mm2 paper	km	24.66	70	3,503,585	3,500,813	1,977,079	1,974,307
11kV U/G Medium 51 to 240mm2 XLPE	km	18.27	45	2,551,912	2,551,912	1,356,093	1,356,093
11kV light U/G 1&3 phase to 50mm2 -paper	km	4.71	70	537,088	403,432	310,965	240,410
11kV light U/G 1&3 phase to 50mm2 -XLPE	km	0.66	45	78,453	69,345	45,751	41,831
11kV U/G Medium 51 to 240mm2 paper	km	2.36	70	386,632	386,632	222,904	222,904
11kV U/G Medium 51 to 240mm2 XLPE	km	0.87	45	165,311	165,311	95,421	95,421
11kV light U/G 1&3 phase to 50mm2 -paper	km	0.37	70	32,364	32,364	16,298	16,298
11kV light U/G 1&3 phase to 50mm2 -XLPE	km	0.08	45	13,282	2,610	5,523	1,523
11kV U/G Medium 51 to 240mm2 paper (HV trench share)	km	2.84	70	453,662	168,624	275,997	106,948
11kV U/G Medium 51 to 240mm2 XLPE (HV trench share)	km	2.44	45	378,707	135,553	194,328	71,766
11kV U/G Medium 51 to 240mm2 paper (HV trench share)	km	1.34	70	253,026	78,462	144,733	45,052
11kV U/G Medium 51 to 240mm2 XLPE (HV trench share)	km	1.52	45	240,628	62,996	125,494	31,325
11kV light U/G 1&3 phase to 50mm2 -paper (HV trench share)	km	0.73	70	111,204	30,665	70,051	19,347



<b>DISTRIBUTION SWITCHGEAR</b>							
Ring Main Unit - 3 Way	No.	70.00	40	1,120,000	1,008,000	823,900	754,600
Extra Fuse Switch	No.	8.00	40	62,000	48,000	41,850	32,200
Extra Oil Switch	No.	34.00	40	214,000	144,000	132,263	96,450
Dropout Fuse 3ph	No.	18.00	35	45,000	45,000	5,929	5,929
11kV Disconnecter 3 ph	No.	13.00	35	45,500	45,500	18,525	18,525
Link Box (HV cabinet for Hazemeyer)	No.	18.00	55	45,000	45,000	26,795	26,795
Circuit Breaker	No.	40.00	45	1,200,000	1,020,000	482,667	407,667
3 Way Magnefix Unit	No.	106.00	40	1,696,000	1,696,000	714,500	714,500
1 Way Magnefix Unit	No.	40.00	40	240,000	174,000	93,975	62,363
Bolted Tee (Wilde HV Box)	No.	1.00	40	3,000	3,000	2,119	2,119
Fused Bolted Tee (Wilde HV Box)	No.	5.00	40	20,000	20,000	17,025	17,025
<b>DISTRIBUTION TRANSFORMERS</b>							
3ph 15kVA Pole Mounted	No.	6.00	45	30,000	30,000	12,056	12,056
3ph 30kVA Pole Mounted	No.	1.00	45	5,000	5,000	1,917	1,917
3ph 50kVA Pole Mounted	No.	0.00	45	0	0	0	0
3ph 100kVA Pole Mounted	No.	1.00	55	9,000	9,000	491	491
3ph 200kVA Pole Mounted	No.	7.00	55	91,000	91,000	13,886	13,886
3ph 300kVA Pole Mounted	No.	5.00	55	80,000	80,000	25,891	25,891
3ph 100kVA Cable Entry	No.	0.00	55	0	0	0	0
3ph 200kVA Cable Entry	No.	31.00	55	434,000	434,000	147,509	147,509
3ph 300kVA Cable Entry	No.	59.00	55	944,000	944,000	458,400	458,400
3ph 500kVA Cable Entry	No.	45.00	55	990,000	990,000	633,800	633,800
3ph 750kVA Cable Entry	No.	9.00	55	234,000	234,000	228,327	228,327
3ph 1000kVA Cable Entry	No.	28.00	55	812,000	812,000	444,359	444,359
3ph 1500kVA Cable Entry	No.	1.00	55	46,000	46,000	41,191	41,191
3ph 1000kVA Cable Entry - 11/3.3kV	No.	0.00	55	0	0	0	0
<b>DISTRIBUTION SUBSTATIONS</b>							
Pole Mounted Substation Up to 50 kVA exc Tx	No.	6.00	45	6,000	6,000	2,828	2,828
Pole Mounted Substation Above 50 kVA exc Tx	No.	13.00	55	26,000	26,000	6,727	6,727
Ground Mounted Substation exc Tx	No.	111.00	55	642,000	444,000	398,100	290,491
Above Ground Kiosk Substation (Exc Tx)	No.	24.00	55	264,000	264,000	108,300	108,300
Substation on Customer Premise with Feedout exc Tx	No.	20.00	55	40,000	40,000	23,045	23,045
11/400V building - CBD	No.	10.00	55	340,000	340,000	106,945	106,945
11/400V Underground building - CBD	No.	3.00	55	102,000	102,000	39,409	39,409
MDI Set for Padmounted Distribution transformers	No.	174.00	45	110,490	110,490	78,454	78,454
MDI set LV for pole substations	No.	14.00	45	29,400	29,400	19,763	19,763
<b>LV LINES</b>							
3ph O/H Medium LV only (<150mmAl)- Concrete	km	11.02	60	471,742	468,676	216,087	214,618
3ph O/H Medium LV only (<150mmAl)- Wood	km	0.11	45	4,751	4,797	1,665	1,645
3ph O/H Light LV only (<50mmAl) - Concrete	km	4.21	60	163,503	178,381	84,988	95,323
3ph O/H Light LV only (<50mmAl) - Wood	km	1.80	45	69,974	70,826	23,467	23,597
1ph O/H Light LV (<50mmAl) -Wood Pole	km	4.43	45	136,444	133,673	58,290	57,158
3ph O/H Medium LV only (<150mmAl)- Conc. UnderBuilt	km	4.68	60	98,343	98,343	51,048	51,048
<b>LV CABLES</b>							
LV U/G heavy (>240mm) paper	km	2.52	70	301,104	299,130	156,820	155,719
LV U/G heavy (>240mm) XLPE	km	2.82	45	325,192	331,642	191,482	195,542
LV U/G Medium (<240mm) paper	km	14.93	70	1,552,346	1,577,036	757,760	769,777
LV U/G Medium (<240mm) XLPE	km	75.06	45	5,829,407	5,841,367	2,901,121	2,902,360
LV Heavy in others trench - (>240mm) Paper	km	0.03	70	1,080	1,080	760	760
LV Heavy in others trench - (>240mm) XLPE	km	0.56	45	23,696	23,696	13,390	13,390
LV Medium in others trench - (<240mm) Paper	km	3.23	70	145,670	145,670	73,443	73,443
LV Medium in others trench - (<240mm) XLPE	km	28.73	45	970,419	970,419	436,855	436,855
Streetlight Circuit U/G in own trench	km	6.72	45	241,848	241,848	216,320	216,320
Streetlight Circuit U/G in HV cable trench	km	35.88	45	430,524	430,524	117,198	117,198



<b>LV PILLARS</b>							
2 way link pillar	No.	211.00	45	500,000	500,000	313,889	313,889
4 way link pillar	No.	56.00	45	108,000	108,000	103,800	103,800
<b>CUSTOMER SERVICE CONNECTIONS</b>							
1ph service overhead	No.	2147.00	45	150,290	150,290	10,019	10,019
3ph service overhead	No.	7.00	45	1,260	1,260	84	84
1ph service underground - shared fuse pillar	No.	4746.00	45	1,186,500	1,186,500	639,392	639,392
1ph service underground - own fuse pillar	No.	275.00	45	137,500	137,500	74,097	74,097
3ph service underground - shared fuse pillar	No.	1534.00	45	613,600	613,600	330,662	330,662
<b>OTHER SYSTEM FIXED ASSETS</b>							
SCADA & Comms							
Spares				164,204	164,204	164,204	164,204



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## INFORMATION DISCLOSURE COMPLIANCE SCHEDULES

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***SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE***

***SCHEDULE 11b: REPORT ON FORECAST OPERATIONAL EXPENDITURE***

***SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY***

**Schedule 11a: Report on Forecast Capital Expenditure**

Company Name	NELSON ELECTRICITY LTD
AMP Planning Period	1 April 2013 – 31 March 2023

**SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE**

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

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

This information is not part of audited disclosure information.

sch. ref.

[illegible]



116	<b>11a(v):Asset Relocations</b>						
117	Project or programme*						
118	[Description of material project or programme]						
119	[Description of material project or programme]						
120	[Description of material project or programme]						
121	[Description of material project or programme]						
122	[Description of material project or programme]						
123	*Include additional rows if needed						
124	All other asset relocations projects or programmes						
125	<b>Asset relocations expenditure</b>	-	-	-	-	-	-
126	less Capital contributions funding asset relocations						
127	<b>Asset relocations less capital contributions</b>	-	-	-	-	-	-
128							
129	<b>11a(vi):Quality of Supply</b>						
130	Project or programme*						
131	[Description of material project or programme]						
132	[Description of material project or programme]						
133	[Description of material project or programme]						
134	[Description of material project or programme]						
135	[Description of material project or programme]						
136	*Include additional rows if needed						
137	All other quality of supply projects or programmes						
138	<b>Quality of supply expenditure</b>	-	-	-	-	-	-
139	less Capital contributions funding quality of supply						
140	<b>Quality of supply less capital contributions</b>	-	-	-	-	-	-
141							
142	<b>11a(vii): Legislative and Regulatory</b>						
143	Project or programme*						
144	[Description of material project or programme]						
145	[Description of material project or programme]						
146	[Description of material project or programme]						
147	[Description of material project or programme]						
148	[Description of material project or programme]						
149	*Include additional rows if needed						
150	All other legislative and regulatory projects or programmes						
151	<b>Legislative and regulatory expenditure</b>	-	-	-	-	-	-
152	less Capital contributions funding legislative and regulatory						
153	<b>Legislative and regulatory less capital contributions</b>	-	-	-	-	-	-
161							
162							
163	<b>11a(viii): Other Reliability, Safety and Environment</b>						
164	Project or programme*						
165	Security	60	167	361	294	54	415
166	[Description of material project or programme]						
167	[Description of material project or programme]						
168	[Description of material project or programme]						
169	[Description of material project or programme]						
170	*Include additional rows if needed						
171	All other reliability, safety and environment projects or programmes						
172	<b>Other reliability, safety and environment expenditure</b>	60	167	361	294	54	415
173	less Capital contributions funding other reliability, safety and environment						
174	<b>Other reliability, safety and environment less capital contributions</b>	60	167	361	294	54	415
175							
176							
177							

for year ended

Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
31 Mar 13	31 Mar 14	31 Mar 15	31 Mar 16	31 Mar 17	31 Mar 18

\$000 (in constant prices)						
60	167	361	294	54	415	
60	167	361	294	54	415	
60	167	361	294	54	415	

178	<b>11a(ix): Non-Network Assets</b>						
179	<b>Routine expenditure</b>						
180	Project or programme*						
181	Purchase of New Vehicles	55				60	
182	Computers		16			17	
183	Computer Network File Server		40				
184	[Description of material project or programme]						
185	[Description of material project or programme]						
186	*Include additional rows if needed						
187	All other routine expenditure projects or programmes						
188	<b>Routine expenditure</b>	55	57	-	-	78	-
189	<b>Atypical expenditure</b>						
190	Project or programme*						
191	[Description of material project or programme]						
192	[Description of material project or programme]						
193	[Description of material project or programme]						
194	[Description of material project or programme]						
195	[Description of material project or programme]						
196	*Include additional rows if needed						
197	All other atypical projects or programmes						
198	<b>Atypical expenditure</b>	-	-	-	-	-	-
199							
200	<b>Non-network assets expenditure</b>	55	57	-	-	78	-



## Schedule 11b: Report on Forecast Operational Expenditure

Company Name  
AMP Planning Period

NELSON ELECTRICITY LTD  
1 April 2013 – 31 March 2023

### SCHEDULE 11b: REPORT ON FORECAST OPERATIONAL EXPENDITURE

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

sch ref

	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5	CY+6	CY+7	CY+8	CY+9	CY+10
for year ended	31 Mar 13	31 Mar 14	31 Mar 15	31 Mar 16	31 Mar 17	31 Mar 18	31 Mar 19	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23
<b>Operational Expenditure Forecast</b>	<b>\$000 (in nominal dollars)</b>										
Service interruptions and emergencies	141	127	127	127	127	127	127	127	127	127	127
Vegetation management	22	20	20	20	20	20	20	20	20	20	20
Routine and corrective maintenance and inspection	226	211	211	211	211	211	211	211	211	211	211
Asset replacement and renewal	365	315	315	315	315	315	315	315	315	315	315
<b>Network Opex</b>	<b>754</b>	<b>673</b>	<b>673</b>	<b>673</b>	<b>673</b>	<b>673</b>	<b>673</b>	<b>673</b>	<b>673</b>	<b>673</b>	<b>673</b>
System operations and network support	236	228	228	228	228	228	228	228	228	228	228
Business support	1,241	1,244	1,244	1,244	1,244	1,244	1,244	1,244	1,244	1,244	1,244
<b>Non-network opex</b>	<b>1,477</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>	<b>1,472</b>
<b>Operational expenditure</b>	<b>2,231</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>	<b>2,145</b>
	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5	CY+6	CY+7	CY+8	CY+9	CY+10
for year ended	31 Mar 13	31 Mar 14	31 Mar 15	31 Mar 16	31 Mar 17	31 Mar 18	31 Mar 19	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23
	<b>\$000 (in constant prices)</b>										
Service interruptions and emergencies	141	128	131	133	136	139	142	144	147	150	153
Vegetation management	22	20	21	21	21	22	23	23	23	24	24
Routine and corrective maintenance and inspection	226	213	217	222	226	230	235	240	245	249	254
Asset replacement and renewal	365	318	325	331	338	345	351	359	366	373	380
<b>Network Opex</b>	<b>754</b>	<b>680</b>	<b>693</b>	<b>707</b>	<b>721</b>	<b>736</b>	<b>750</b>	<b>765</b>	<b>781</b>	<b>796</b>	<b>812</b>
System operations and network support	236	230	235	240	244	249	254	259	265	270	275
Business support	1,241	1,256	1,282	1,307	1,333	1,360	1,387	1,415	1,443	1,472	1,502
<b>Non-network opex</b>	<b>1,477</b>	<b>1,487</b>	<b>1,516</b>	<b>1,547</b>	<b>1,578</b>	<b>1,609</b>	<b>1,641</b>	<b>1,674</b>	<b>1,708</b>	<b>1,742</b>	<b>1,777</b>
<b>Operational expenditure</b>	<b>2,231</b>	<b>2,166</b>	<b>2,210</b>	<b>2,254</b>	<b>2,299</b>	<b>2,345</b>	<b>2,392</b>	<b>2,440</b>	<b>2,489</b>	<b>2,538</b>	<b>2,589</b>
<b>Subcomponents of operational expenditure (where known)</b>											
Energy efficiency and demand side management, reduction of energy losses											
Direct billing*											
Research and Development											
Insurance	144										
* Direct billing expenditure by suppliers that direct bill the majority of their consumers											
	Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5	CY+6	CY+7	CY+8	CY+9	CY+10
for year ended	31 Mar 13	31 Mar 14	31 Mar 15	31 Mar 16	31 Mar 17	31 Mar 18	31 Mar 19	31 Mar 20	31 Mar 21	31 Mar 22	31 Mar 23
<b>Difference between nominal and real forecasts</b>	<b>\$000</b>										
Service interruptions and emergencies	-	(1)	(4)	(6)	(9)	(12)	(15)	(17)	(20)	(23)	(26)
Vegetation management	-	(0)	(3)	(1)	(1)	(2)	(2)	(3)	(3)	(4)	(4)
Routine and corrective maintenance and inspection	-	(2)	(6)	(11)	(15)	(20)	(24)	(29)	(34)	(39)	(44)
Asset replacement and renewal	-	(3)	(10)	(16)	(23)	(29)	(36)	(43)	(50)	(58)	(65)
<b>Network Opex</b>	<b>-</b>	<b>(7)</b>	<b>(20)</b>	<b>(34)</b>	<b>(48)</b>	<b>(63)</b>	<b>(77)</b>	<b>(92)</b>	<b>(108)</b>	<b>(123)</b>	<b>(139)</b>
System operations and network support	-	(2)	(7)	(12)	(16)	(21)	(26)	(31)	(37)	(42)	(47)
Business support	-	(12)	(38)	(63)	(89)	(116)	(143)	(171)	(199)	(228)	(258)
<b>Non-network opex</b>	<b>-</b>	<b>(15)</b>	<b>(44)</b>	<b>(75)</b>	<b>(106)</b>	<b>(137)</b>	<b>(169)</b>	<b>(202)</b>	<b>(236)</b>	<b>(270)</b>	<b>(305)</b>
<b>Operational expenditure</b>	<b>-</b>	<b>(21)</b>	<b>(65)</b>	<b>(109)</b>	<b>(154)</b>	<b>(200)</b>	<b>(247)</b>	<b>(295)</b>	<b>(344)</b>	<b>(393)</b>	<b>(444)</b>



## Schedule 13: Report on Asset Management Maturity

Company Name  
AMP Planning Period  
Asset Management Standard Applied

NELSON ELECTRICITY LTD  
1 April 2013 – 31 March 2023  
PASS5

### 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/document information
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	2	The AMP sets out a broad description of Objectives and Processes which could be considered to embody policy.	S.Reed indicated that the AMP contains a written AM Policy which is also on the website. DELTA is made aware of NEL's long-term asset plans.	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?	3	Section 4.10 of the AMP records a major customer survey in which the 20 largest customers expressed a preference to pay about the same to receive about the same reliability. The projected constant SAIDI reflects this preference. Work streams such as the PSMS are further evidence of alignment to stated goals and wider stakeholder requirements.	S.Reed confirmed that customer surveys are a key input to the AM Process, which matches reliability and hence work to customer preferences to have about the same reliability.	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 policies, 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	Oil Tests, Earth Tests and Megger Test records have been inspected.	S.Reed confirmed that all assets are inspected on a regular basis reflecting their criticality. Returned inspection data is recorded and outlying data is marked for intervention. Inspection check sheets are amended when new assets are added or removed. Safety bulletins such as EEA notices are circulated to all staff and trigger a review of NEL's assets. M.Braden confirmed that urgent (next day) action will be taken if an asset is	Good asset stewardship is the hallmark of an organisation compliant with widely used AM standards. A key component of this is the need to take account of the lifecycle of the assets, asset types and asset systems. (For example, this requirement is recognised in 4.3.1 d) of PAS 55). This question explores what an organisation has done to take lifecycle into account in its asset management strategy.	Top management. People in the organisation with expert knowledge of the assets, asset types, asset systems and their associated life-cycles. The management team that has overall responsibility for asset management. Those responsible for developing and adopting methods and processes used in asset management	The organisation's documented asset management strategy and supporting working documents.
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	3	The Network Extension Design & Construction Standards manual has been inspected, and it is confirmed that this embodies typical power engineering standards and principles.	S.Reed confirmed that Policies, Standards etc are in place for all lifecycle phases. These are controlled documents for which variations to scope, quality, materials etc must be approved by NEL. The asset database generates lifecycle activities as new assets are added.	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).

**SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)**

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	The organisation does not have a documented asset management policy.	The organisation has an asset management policy, but it has not been authorised by top management, or it is not influencing the management of the assets.	The organisation has an asset management policy, which has been authorised by top management, but it has had limited circulation. It may be in use to influence development of strategy and planning but its effect is limited.	The asset management policy is authorised by top management, is widely and effectively communicated to all relevant employees and stakeholders, and used to make these persons aware of their asset related obligations.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
10	Asset management strategy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	The organisation has not considered the need to ensure that its asset management strategy is appropriately aligned with the organisation's other organisational policies and strategies or with stakeholder requirements. OR The organisation does not have an asset management strategy.	The need to align the asset management strategy with other organisational policies and strategies as well as stakeholder requirements is understood and work has started to identify the linkages or to incorporate them in the drafting of asset management strategy.	Some of the linkages between the long-term asset management strategy and other organisational policies, strategies and stakeholder requirements are defined but the work is fairly well advanced but still incomplete.	All linkages are in place and evidence is available to demonstrate that, where appropriate, the organisation's asset management strategy is consistent with its other organisational policies and strategies. The organisation has also identified and considered the requirements of relevant stakeholders.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
11	Asset management strategy	In what way does the organisation's asset management strategy take account of the lifecycle of the assets, asset types and asset systems over which the organisation has stewardship?	The organisation has not considered the need to ensure that its asset management strategy is produced with due regard to the lifecycle of the assets, asset types or asset systems that it manages. OR The organisation does not have an asset management strategy.	The need is understood, and the organisation is drafting its asset management strategy to address the lifecycle of its assets, asset types and asset systems.	The long-term asset management strategy takes account of the lifecycle of some, but not all, of its assets, asset types and asset systems.	The asset management strategy takes account of the lifecycle of all of its assets, asset types and asset systems.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	The organisation does not have an identifiable asset management plan(s) covering asset systems and critical assets.	The organisation has asset management plan(s) but they are not aligned with the asset management strategy and objectives and do not take into consideration the full asset life cycle (including asset creation, acquisition, enhancement, utilisation, maintenance decommissioning and disposal).	The organisation is in the process of putting in place comprehensive, documented asset management plan(s) that cover all life cycle activities, clearly aligned to asset management objectives and the asset management strategy.	Asset management plan(s) are established, documented, implemented and maintained for asset systems and critical assets to achieve the asset management strategy and asset management objectives across all life cycle phases.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

Company Name	NELSON ELECTRICITY LTD
AMP Planning Period	1 April 2013 – 31 March 2023
Asset Management Standard Applied	PAS55

### SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented information
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	3	Section 5.4 of the AMP sets out the 10 year indicative work program that includes the scope and timing projects. This is consolidated at Section 9.1 and sorted by spend driver. The OpEx is presented in Section 9.2 as a narrative.	S.Reed indicated that DELTA are given the AMP which includes a 10 year work program, but it is not clear that other electrical contractors bother to read the AMP. M.Braden indicated that detailed work programs are based on asset inspection results and provided to DELTA 1 month ahead.	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 receiver's role in plan delivery. Evidence of communication.
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	3	Section 2.6 of the AMP describes each NEL staff member's role in detail. The AMP also sets out the Board and General Manager's delegated authorities.	S.Reed indicated that the AMP describes AM responsibilities, and that Job Descriptions also include key AM responsibilities. NEL also has established delegated authorities.	The implementation of asset management plan(s) relies on (1) actions being clearly identified, (2) an owner allocated and (3) that owner having sufficient delegated responsibility and authority to carry out the work required. It also requires alignment of actions across the organisation. This question explores how well the plan(s) set out responsibility for delivery of asset plan actions.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team.	The organisation's asset management plan(s). Documentation defining roles and responsibilities of individuals and organisational departments.
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)?  (Note this is about resources and enabling support)	2	There is no evidence that resources are inadequate eg. increasing backlogs of work.	S.Reed indicated that there is no sign that NEL's engineering resources are inadequate. Additional engineering expertise is available from NTL. There is some flexibility with planned work if DELTA need to focus on emergency work. Although engineering succession planning is regularly discussed, it is not clear that a firm plan is in place. P.Goodall indicated that credible tenders were received from the contracting industry in response to the RFP for what is now the DELTA contract.	It is essential that the plan(s) are realistic and can be implemented, which requires appropriate resources to be available and enabling mechanisms in place. This question explores how well this is achieved. The plan(s) not only need to consider the resources directly required and timescales, but also the enabling activities, including for example, training requirements, supply chain capability and procurement timescales.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team. If appropriate, the performance management team. Where appropriate the procurement team and service providers working on the organisation's asset-related activities.	The organisation's asset management plan(s). Documented processes and procedures for the delivery of the asset management plan.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	3	The Emergency Recovery Plan has been inspected, and appears consistent with other EDB's Plans.	S.Reed confirmed that an Emergency Recovery Plan is in place. This plan identifies the additional field service resources that are available. Alignment with NTL and the NCC has been confirmed. During the 2011 flood it appears that the NCC did not fully comprehend NEL's request for an excavator.	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.

**SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)**

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	The organisation does not have plan(s) or their distribution is limited to the authors.	The plan(s) are communicated to some of those responsible for delivery of the plan(s).  OR Communicated to those responsible for delivery is either irregular or ad-hoc.	The plan(s) are communicated to most of those responsible for delivery but there are weaknesses in identifying relevant parties resulting in incomplete or inappropriate communication. The organisation recognises improvement is needed as is working towards resolution.	The plan(s) are communicated to all relevant employees, stakeholders and contracted service providers to a level of detail appropriate to their participation or business interests in the delivery of the plan(s) and there is confirmation that they are being used effectively.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	The organisation has not documented responsibilities for delivery of asset plan actions.	Asset management plan(s) inconsistently document responsibilities for delivery of plan actions and activities and/or responsibilities and authorities for implementation inadequate and/or delegation level inadequate to ensure effective delivery and/or contain misalignments with organisational accountability.	Asset management plan(s) consistently document responsibilities for the delivery of actions but responsibility/authority levels are inappropriate/ inadequate, and/or there are misalignments within the organisation.	Asset management plan(s) consistently document responsibilities for the delivery actions and there is adequate detail to enable delivery of actions. Designated responsibility and authority for achievement of asset plan actions is appropriate.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)?  (Note this is about resources and enabling support)	The organisation has not considered the arrangements needed for the effective implementation of plan(s).	The organisation recognises the need to ensure appropriate arrangements are in place for implementation of asset management plan(s) and is in the process of determining an appropriate approach for achieving this.	The organisation has arrangements in place for the implementation of asset management plan(s) but the arrangements are not yet adequately efficient and/or effective. The organisation is working to resolve existing weaknesses.	The organisation's arrangements fully cover all the requirements for the efficient and cost effective implementation of asset management plan(s) and realistically address the resources and timescales required, and any changes needed to functional policies, standards, processes and the asset management information system.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	The organisation has not considered the need to establish plan(s) and procedure(s) to identify and respond to incidents and emergency situations.	The organisation has some ad-hoc arrangements to deal with incidents and emergency situations, but these have been developed on a reactive basis in response to specific events that have occurred in the past.	Most credible incidents and emergency situations are identified. Either appropriate plan(s) and procedure(s) are incomplete for critical activities or they are inadequate. Training/ external alignment may be incomplete.	Appropriate emergency plan(s) and procedure(s) are in place to respond to credible incidents and manage continuity of critical asset management activities consistent with policies and asset management objectives. Training and external agency alignment is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

**SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)**

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	3	Section 2.6 of the AMP records the General Manager's responsibilities and authorities.	P.Goodall has been appointed to manage NEL's daily activities under the delegated authority of the Board.	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?	3	Discussions with P.Goodall indicated that there is no clear evidence of under-staffing either within NEL or within DELTA, as measured by an increasing backlog of work not done. This is notwithstanding a constant minor backlog of work (eg. wet day jobs) and an acceptance of some flexibility with field crews (eg. pulling staff off planned maintenance during big storms).	P.Goodall confirmed that there was been interest from the electrical contracting industry for NEL's O&M contract. S.Reed indicated that there are no backlogs of engineering or planning work, inspections or maintenance. Although the minor CapEx budget is under spent (genuine reasons such as NCC prohibiting street openings during the Rugby World Cup, or subdivisions not proceeding) there is no evidence that asset condition is declining. The AMP anticipates increasing renewals, however no resourcing plans are in place yet.	Optimal asset management requires top management to ensure sufficient resources are available. In this context the term 'resources' includes manpower, materials, funding and service provider support.	Top management. The management team that has overall responsibility for asset management. Risk management team. The organisation's managers involved in day-to-day supervision of asset-related activities, such as frontline managers, engineers, foremen and chargehands as appropriate.	Evidence demonstrating that asset management plan(s) and/or the process(es) for asset management plan implementation consider the provision of adequate resources in both the short and long term. Resources include funding, materials, equipment, services provided by third parties and personnel (internal and service providers) with appropriate skills competencies and knowledge.
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	3	Section 2.6 of the AMP records that the Board meeting agenda includes outage data, safety performance, works performance and financial performance.	S.Reed indicated that the requirement to report SAIDI, OpEx and Capex to the Board places a continual emphasis on AM outcomes. In a very company such as NEL, events such as outages or asset failures involve all 4 staff. All field services contracts require the contractor to guarantee their work for 5 years, emphasising the importance that NEL places on supply reliability.	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 walkabouts 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	The Network Extension Design & Construction Standards manual has been inspected. A tender RFP for a new 11kV substation was inspected, and confirmed as embodying suitable controls such as references to NEL's design and construction standards, the NCC street works standards, as-built requirements etc.	S.Reed confirmed that NEL controls work quality using the Design Standards Manual, Construction Standards Manual and various maintenance procedures. Minor works contractors complete a check-list of key safety and quality items for each job, and M.Braden audits a sample of those check-lists. The major project completion check-list includes a range of safety and quality items to be signed off by S.Reed. There have been instances of errors eg. NCC have not advised NEL of altered road configuration (DELTA has amended its cable location policy) eg. a contractor installed NTL's fuse configurations in pillar boxes (corrected at contractors expense). P.Goodall indicated that the DELTA contract includes some processes for ordering re-work of sub-standard work.	Where an organisation chooses to outsource some of its asset management activities, the organisation must ensure that these outsourced process(es) are under appropriate control to ensure that all the requirements of widely used AM standards (eg, PAS 55) are in place, and the asset management policy, strategy objectives and plan(s) are delivered. This includes ensuring capabilities and resources across a time span aligned to life cycle management. The organisation must put arrangements in place to control the outsourced activities, whether it be to external providers or to other in-house departments. This question explores what the organisation does in this regard.	Top management. The management team that has overall responsibility for asset management. The manager(s) responsible for the monitoring and management of the outsourced activities. People involved with the procurement of outsourced activities. The people within the organisations that are performing the outsourced activities. The people impacted by the outsourced activity.	The organisation's arrangements that detail the compliance required of the outsourced activities. For example, this this could form part of a contract or service level agreement between the organisation and the suppliers of its outsourced activities. Evidence that the organisation has demonstrated to itself that it has assurance of compliance of outsourced activities.

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**SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)**

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	Top management has not considered the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management understands the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management has appointed an appropriate people to ensure the assets deliver the requirements of the asset management strategy, objectives and plan(s) but their areas of responsibility are not fully defined and/or they have insufficient delegated authority to fully execute their responsibilities.	The appointed person or persons have full responsibility for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s). They have been given the necessary authority to achieve this.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	The organisation's top management has not considered the resources required to deliver asset management.	The organisations top management understands the need for sufficient resources but there are no effective mechanisms in place to ensure this is the case.	A process exists for determining what resources are required for its asset management activities and in most cases these are available but in some instances resources remain insufficient.	An effective process exists for determining the resources needed for asset management and sufficient resources are available. It can be demonstrated that resources are matched to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	The organisation's top management has not considered the need to communicate the importance of meeting asset management requirements.	The organisations top management understands the need to communicate the importance of meeting its asset management requirements but does not do so.	Top management communicates the importance of meeting its asset management requirements but only to parts of the organisation.	Top management communicates the importance of meeting its asset management requirements to all relevant parts of the organisation.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
45	Outsourcing of asset management activities	Where the organisation has outsourced some of its asset management activities, how has it ensured that appropriate controls are in place to ensure the compliant delivery of its organisational strategic plan, and its asset management policy and strategy?	The organisation has not considered the need to put controls in place.	The organisation controls its outsourced activities on an ad-hoc basis, with little regard for ensuring the compliant delivery of the organisational strategic plan and/or its asset management policy and strategy.	Controls systematically considered but currently only provide for the compliant delivery of some, but not all, aspects of the organisational strategic plan and/or its asset management policy and strategy. Gaps exist.	Evidence exists to demonstrate that outsourced activities are appropriately controlled to provide for the compliant delivery of the organisational strategic plan, asset management policy and strategy, and that these controls are integrated into the asset management system	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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**SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)**

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	2		S.Reed indicated that succession issues are certainly discussed informally, and have been raised in annual performance reports. P.Goodall confirmed that succession issues are being actively discussed.	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?	3	Contractor safety training and authorisation records have been inspected.	S.Reed confirmed that field services safety training and competencies are done to a very high level. External contractors including DELTA have to provide evidence of individual staff training and competency. Relevant courses are attended by NEL staff, 2 staff attend the annual EEA conference. New assets include a demonstration by the supplier, and NEL will compile operating instructions. The AMP anticipates an increased number of field services contractors will be required in the medium-to-long term, and that the required competencies will be available as the network ages.	Widely used AM standards require that organisations to undertake a systematic identification of the asset management awareness and competencies required at each level and function within the organisation. Once identified the training required to provide the necessary competencies should be planned for delivery in a timely and systematic way. Any training provided must be recorded and maintained in a suitable format. Where an organisation has contracted service providers in place then it should have a means to demonstrate that this requirement is being met for their employees. (eg, PAS 55 refers to frameworks suitable for identifying competency requirements).	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of an established and applied competency requirements assessment process and plan(s) in place to deliver the required training. Evidence that the training programme is part of a wider, co-ordinated asset management activities training and competency programme. Evidence that training activities are recorded and that records are readily available (for both direct and contracted service provider staff) e.g. via organisation wide information system or local records database.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	3	A tender request for construction of an 11kV substation has been inspected, and clearly sets out that only AHC authorised contractors can bid for the work. DELTA's responses to the Faults and the Preventive Maintenance tenders have been inspected, and clearly state DELTA's health and safety policies.	S.Reed confirmed that NEL has tight controls to ensure that only AHC approved contractors can access, operate or work on the network. Specialist resources such as civil works would be sub-contracted by the lead AHC approved electrical contractor, however NEL's tender documents specify that relevant safety and design codes must be met.	A critical success factor for the effective development and implementation of an asset management system is the competence of persons undertaking these activities. organisations should have effective means in place for ensuring the competence of employees to carry out their designated asset management function(s). Where an organisation has contracted service providers undertaking elements of its asset management system then the organisation shall assure itself that the outsourced service provider also has suitable arrangements in place to manage the competencies of its employees. The organisation should ensure that the individual and corporate competencies it requires are in place and actively monitor, develop and maintain an appropriate balance of these competencies.	Managers, supervisors, persons responsible for developing training programmes. Staff responsible for procurement and service agreements. HR staff and those responsible for recruitment.	Evidence of a competency assessment framework that aligns with established frameworks such as the asset management Competencies Requirements Framework (Version 2.0); National Occupational Standards for Management and Leadership; UK Standard for Professional Engineering Competence, Engineering Council, 2005.

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**SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)**

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	The organisation has not recognised the need for assessing human resources requirements to develop and implement its asset management system.	The organisation has recognised the need to assess its human resources requirements and to develop a plan(s). There is limited recognition of the need to align these with the development and implementation of its asset management system.	The organisation has developed a strategic approach to aligning competencies and human resources to the asset management system including the asset management plan but the work is incomplete or has not been consistently implemented.	The organisation can demonstrate that plan(s) are in place and effective in matching competencies and capabilities to the asset management system including the plan for both internal and contracted activities. Plans are reviewed integral to asset management system process(es).	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	The organisation does not have any means in place to identify competency requirements.	The organisation has recognised the need to identify competency requirements and then plan, provide and record the training necessary to achieve the competencies.	The organisation is the process of identifying competency requirements aligned to the asset management plan(s) and then plan, provide and record appropriate training. It is incomplete or inconsistently applied.	Competency requirements are in place and aligned with asset management plan(s). Plans are in place and effective in providing the training necessary to achieve the competencies. A structured means of recording the competencies achieved is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	The organization has not recognised the need to assess the competence of person(s) undertaking asset management related activities.	Competency of staff undertaking asset management related activities is not managed or assessed in a structured way, other than formal requirements for legal compliance and safety management.	The organization is in the process of putting in place a means for assessing the competence of person(s) involved in asset management activities including contractors. There are gaps and inconsistencies.	Competency requirements are identified and assessed for all persons carrying out asset management related activities - internal and contracted. Requirements are reviewed and staff reassessed at appropriate intervals aligned to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.



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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)								
Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	3	Close-in inspection reports were examined, and S.Reed discussed the process for scoping the close-in inspection based on the routine inspection results.	S.Reed indicated that asset inspection check sheets are systematically completed and passed back to NEL from DELTA for data entry and action. The works auditing program results in a comprehensive report that may result in targetted inspections. It is noted that changing pole inspectors resulted in a different threshold being adopted and a consequent increase in pole maintenance - this was a key reason for adopting a 2nd tier of close-in inspections before ordering replacement.	Widely used AM practice standards require that pertinent asset management information is effectively communicated to and from employees and other stakeholders including contracted service providers. Pertinent information refers to information required in order to effectively and efficiently comply with and deliver asset management strategy, plan(s) and objectives. This will include for example the communication of the asset management policy, asset performance information, and planning information as appropriate to contractors.	Top management and senior management representative(s), employee's representative(s), employee's trade union representative(s); contracted service provider management and employee representative(s); representative(s) from the organisation's Health, Safety and Environmental team. Key stakeholder representative(s).	Asset management policy statement prominently displayed on notice boards, intranet and internet; use of organisation's website for displaying asset performance data; evidence of formal briefings to employees, stakeholders and contracted service providers; evidence of inclusion of asset management issues in team meetings and contracted service provider contract meetings; newsletters, etc.
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	3	Sections 2.8 to 2.15 of the AMP describe the key AM systems, the data contained and typical user requirements.		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?	1		S.Reed indicated that there is a small number of assets (about 2% by number) where the data requirements are not yet accurately reflected in NEL's data environment. It is noted that most of the checks are generic, and that there may be instances where a check sheet needs to be amended eg. where vacuum needs to be checked rather than oil level - a degree of common sense is used by the contractor. NEL does not believe that any critical safety or asset integrity issues are being overlooked as a result of this slight mis-match.	Effective asset management requires appropriate information to be available. Widely used AM standards therefore require the organisation to identify the asset management information it requires in order to support its asset management system. Some of the information required may be held by suppliers.  The maintenance and development of asset management information systems is a poorly understood specialist activity that is akin to IT management but different from IT management. This group of questions provides some indications as to whether the capability is available and applied. Note: To be effective, an asset information management system requires the mobilisation of technology, people and process(es) that create, secure, make available and destroy the information required to support the asset management system.	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Operations, maintenance and engineering managers	Details of the process the organisation has employed to determine what its asset information system should contain in order to support its asset management system. Evidence that this has been effectively implemented.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	3	The document control system has been inspected on a previous occasion. The RFP for the DELTA has been inspected, and confirmed that it requires fault data and as-builts to be returned to NEL.	S.Reed confirmed that K.Homan manages the document control system which requires approval to amend policies, standards etc. K.Homan confirmed that she follows up incomplete or doubtful inspection check-sheets with the contractor. The RFP for the DELTA contract specified that information feedback to NEL is a key aspect of the contract. It is noted that a change of pole inspector lead to an increased number of defects being reported, and this was addressed by inserting a 2nd tier of close-in inspections before ordering replacement.	The response to the questions is progressive. A higher scale cannot be awarded without achieving the requirements of the lower scale.  This question explores how the organisation ensures that information management meets widely used AM practice requirements (eg, s 4.4.6 (a), (c) and (d) of PAS 55).	The management team that has overall responsibility for asset management. Users of the organisational information systems.	The asset management information system, together with the policies, procedure(s), improvement initiatives and audits regarding information controls.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)										
Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented information		
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	3	Close-in inspection reports were examined, and S.Reed discussed the process for scoping the close-in inspection based on the routine inspection results.	S.Reed indicated that asset inspection check sheets are systematically completed and passed back to NEL from DELTA for data entry and action. The works auditing program results in a comprehensive report that may result in targeted inspections. It is noted that changing pole inspectors resulted in a different threshold being adopted and a consequent increase in pole maintenance - this was a key reason for adopting a 2nd tier of close-in inspections before ordering replacement.	Widely used AM practice standards require that pertinent asset management information is effectively communicated to and from employees and other stakeholders including contracted service providers. Pertinent information refers to information required in order to effectively and efficiently comply with and deliver asset management strategy, plan(s) and objectives. This will include for example the communication of the asset management policy, asset performance information, and planning information as appropriate to contractors.	Top management and senior management representative(s), employee's representative(s), employee's trade union representative(s); contracted service provider management and employee representative(s); representative(s) from the organisation's Health, Safety and Environmental team. Key stakeholder representative(s).	Asset management policy statement prominently displayed on notice boards, intranet and internet; use of organisation's website for displaying asset performance data; evidence of formal briefings to employees, stakeholders and contracted service providers; evidence of inclusion of asset management issues in team meetings and contracted service provider contract meetings; newsletters, etc.		
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	3	Sections 2.8 to 2.15 of the AMP describe the key AM systems, the data contained and typical user requirements.		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?	1		S.Reed indicated that there is a small number of assets (about 2% by number) where the data requirements are not yet accurately reflected in NEL's data environment. It is noted that most of the checks are generic, and that there may be instances where a check sheet needs to be amended eg. where vacuum needs to be checked rather than oil level - a degree of common sense is used by the contractor. NEL does not believe that any critical safety or asset integrity issues are being overlooked as a result of this slight mis-match.	Effective asset management requires appropriate information to be available. Widely used AM standards therefore require the organisation to identify the asset management information it requires in order to support its asset management system. Some of the information required may be held by suppliers.  The maintenance and development of asset management information systems is a poorly understood specialist activity that is akin to IT management but different from IT management. This group of questions provides some indications as to whether the capability is available and applied. Note: To be effective, an asset information management system requires the mobilisation of technology, people and process(es) that create, secure, make available and destroy the information required to support the asset management system.	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Operations, maintenance and engineering managers	Details of the process the organisation has employed to determine what its asset information system should contain in order to support its asset management system. Evidence that this has been effectively implemented.		
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	3	The document control system has been inspected on a previous occasion. The RFP for the DELTA has been inspected, and confirmed that it requires fault data and as-builts to be returned to NEL.	S.Reed confirmed that K.Homan manages the document control system which requires approval to amend policies, standards etc. K.Homan confirmed that she follows up incomplete or doubtful inspection check-sheets with the contractor. The RFP for the DELTA contract specified that information feedback to NEL is a key aspect of the contract. It is noted that a change of pole inspector lead to an increased number of defects being reported, and this was addressed by inserting a 2nd tier of close-in inspections before ordering replacement.	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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<b>SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)</b>							
Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	The organisation has not recognised the need to formally communicate any asset management information.	There is evidence that the pertinent asset management information to be shared along with those to share it with is being determined.	The organisation has determined pertinent information and relevant parties. Some effective two way communication is in place but as yet not all relevant parties are clear on their roles and responsibilities with respect to asset management information.	Two way communication is in place between all relevant parties, ensuring that information is effectively communicated to match the requirements of asset management strategy, plan(s) and process(es). Pertinent asset information requirements are regularly reviewed.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	The organisation has not established documentation that describes the main elements of the asset management system.	The organisation is aware of the need to put documentation in place and is in the process of determining how to document the main elements of its asset management system.	The organisation in the process of documenting its asset management system and has documentation in place that describes some, but not all, of the main elements of its asset management system and their interaction.	The organisation has established documentation that comprehensively describes all the main elements of its asset management system and the interactions between them. The documentation is kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	The organisation has not considered what asset management information is required.	The organisation is aware of the need to determine in a structured manner what its asset information system should contain in order to support its asset management system and is in the process of deciding how to do this.	The organisation has developed a structured process to determine what its asset information system should contain in order to support its asset management system and has commenced implementation of the process.	The organisation has determined what its asset information system should contain in order to support its asset management system. The requirements relate to the whole life cycle and cover information originating from both internal and external sources.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	There are no formal controls in place or controls are extremely limited in scope and/or effectiveness.	The organisation is aware of the need for effective controls and is in the process of developing an appropriate control process(es).	The organisation has developed a controls that will ensure the data held is of the requisite quality and accuracy and is consistent and is in the process of implementing them.	The organisation has effective controls in place that ensure the data held is of the requisite quality and accuracy and is consistent. The controls are regularly reviewed and improved where necessary.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)								
Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	2		S.Reed confirmed that NEL has standardised assets, and over time the AM IS needs have become well aligned. NEL does recognise that new or different types of assets (but not new classes of assets) are being introduced due to technology changes, supplier obsolesence etc. NEL recognises that its processes for amending lifecycle procedures are informal, and that while manageable with the small numbers of new assets at present, this should be looked at for the future.	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	NEL's valid PSMS certificate has been inspected. The Network Extension Design & Construction Standards have been inspected, and confirmed as embodying standards that minimise safety and reliability risks. Commissioning sheets have been inspected.	S.Reed confirmed that asset integrity risks are addressed thru' the Design Standards Manual and the Construction Standards Manual eg. NEL does not use 11kV XLPE cable due to bad experiences with water treeing. The asset inspection process is used to minimise the risks to public safety and supply interruption, and the insertion of a 2nd tier of close-in inspections provides additional assurance. There are also post-completion inspections of all new connection points (fuses and pillars) and a sample of maintenance work. The review of numbers of pole defects and the subsequent insertion of close-in inspections mis evidence that data consistency issues are considered.	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?	1		S.Reed indicated that the number and nature of network defects is stable, and that the current number and competency mix is sufficient. NEL acknowledges that as certain asset classes eg. 11kV cables transition into end-of-life, that field services numbers and competencies may need to increase.	Widely used AM standards require that the output from risk assessments are considered and that adequate resource (including staff) and training is identified to match the requirements. It is a further requirement that the effects of the control measures are considered, as there may be implications in resources and training required to achieve other objectives.	Staff responsible for risk assessment and those responsible for developing and approving resource and training plan(s). There may also be input from the organisation's Safety, Health and Environment team.	The organisations risk management framework. The organisation's resourcing plan(s) and training and competency plan(s). The organisation should be able to demonstrate appropriate linkages between the content of resource plan(s) and training and competency plan(s) to the risk assessments and risk control measures that have been developed.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	2		P.Goodall indicated that NEL has a general awareness of primary legislative and regulatory requirements, but only some systematic analysis. NEL does rely on external advice including comprehensive advice from both shareholders as part of their management agreements.	In order for an organisation to comply with its legal, regulatory, statutory and other asset management requirements, the organisation first needs to ensure that it knows what they are (eg, PAS 55 specifies this in s 4.4.8). It is necessary to have systematic and auditable mechanisms in place to identify new and changing requirements. Widely used AM standards also require that requirements are incorporated into the asset management system (e.g. procedure(s) and process(es))	Top management. The organisations regulatory team. The organisation's legal team or advisors. The management team with overall responsibility for the asset management system. The organisation's health and safety team or advisors. The organisation's policy making team.	The organisational processes and procedures for ensuring information of this type is identified, made accessible to those requiring the information and is incorporated into asset management strategy and objectives

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**SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)**

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	The organisation has not considered the need to determine the relevance of its management information system. At present there are major gaps between what the information system provides and the organisations needs.	The organisation understands the need to ensure its asset management information system is relevant to its needs and is determining an appropriate means by which it will achieve this. At present there are significant gaps between what the information system provides and the organisations needs.	The organisation has developed and is implementing a process to ensure its asset management information system is relevant to its needs. Gaps between what the information system provides and the organisations needs have been identified and action is being taken to close them.	The organisation's asset management information system aligns with its asset management requirements. Users can confirm that it is relevant to their needs.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	The organisation has not considered the need to document process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle.	The organisation is aware of the need to document the management of asset related risk across the asset lifecycle. The organisation has plan(s) to formally document all relevant process(es) and procedure(s) or has already commenced this activity.	The organisation is in the process of documenting the identification and assessment of asset related risk across the asset lifecycle but it is incomplete or there are inconsistencies between approaches and a lack of integration.	Identification and assessment of asset related risk across the asset lifecycle is fully documented. The organisation can demonstrate that appropriate documented mechanisms are integrated across life cycle phases and are being consistently applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	The organisation has not considered the need to conduct risk assessments.	The organisation is aware of the need to consider the results of risk assessments and effects of risk control measures to provide input into reviews of resources, training and competency needs. Current input is typically ad-hoc and reactive.	The organisation is in the process ensuring that outputs of risk assessment are included in developing requirements for resources and training. The implementation is incomplete and there are gaps and inconsistencies.	Outputs from risk assessments are consistently and systematically used as inputs to develop resources, training and competency requirements. Examples and evidence is available.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	The organisation has not considered the need to identify its legal, regulatory, statutory and other asset management requirements.	The organisation identifies some its legal, regulatory, statutory and other asset management requirements, but this is done in an ad-hoc manner in the absence of a procedure.	The organisation has procedure(s) to identify its legal, regulatory, statutory and other asset management requirements, but the information is not kept up to date, inadequate or inconsistently managed.	Evidence exists to demonstrate that the organisation's legal, regulatory, statutory and other asset management requirements are identified and kept up to date. Systematic mechanisms for identifying relevant legal and statutory requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)								
Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/document Information
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	3	The Network Extension Design & Construction Standards manual has been inspected. This manual is referred to in the RFP for construction of an 11kV substation. The document control system has been inspected on a previous occasion.	S.Reed indicated that contracting out of field services was a major driver for compiling detailed standards and procedures. This occurred against a slowly evolving industry background that included issues such as worker safety, public safety, increasing pressure for supply continuity, reporting etc. These policies and standards are now mature and are controlled by a document management system.	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 Network Extension Design & Construction Standards manual has been inspected. This manual is referred to in the RFP for construction of an 11kV substation. The RFP for the Preventive Maintenance contract has been inspected, and confirmed that NEL's objectives of safety and supply continuity are embodied in the contract. The RFP also includes various check sheets that are aligned to asset condition, safety and reliability objectives.	S.Reed indicated that AM processes and activities are controlled thru' the use of standards such as Design Standards Manual, the Construction Standards Manual, maintenance procedures, inspection check sheets etc. These standards reflect asset integrity and cost drivers, and are themselves controlled thru' a document control system. These asset quality, safety and reliability requirements are reflected in field services contracts.	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 inspection check sheets have been inspected. The NEL Board report for October 2012 was examined, and reporting of SAIDI and key works (33kV substation) was confirmed.	S.Reed confirmed that asset condition is routinely assessed by ground-level inspections with a 2nd tier of close-in inspections if asset condition is in doubt. All major assets such as transformer kiosks are inspected every 6 months. This includes MDI and voltage readings to ensure that overloading is not occurring. Key performance measures that are reported on monthly to the General Manager include SAIDI, number of faults, description of faults causing more than 1 SAIDI minute, physical progress of CapEx works, financial performance of CapEx works, and financial performance of OpEx.	Widely used AM standards require that organisations establish implement and maintain procedure(s) to monitor and measure the performance and/or condition of assets and asset systems. They further set out requirements in some detail for reactive and proactive monitoring, and leading/lagging performance indicators together with the monitoring or results to provide input to corrective actions and continual improvement. There is an expectation that performance and condition monitoring will provide input to improving asset management strategy, objectives and plan(s).	A broad cross-section of the people involved in the organisation's asset-related activities from data input to decision-makers, i.e. an end-to-end assessment. This should include contactors and other relevant third parties as appropriate.	Functional policy and/or strategy documents for performance or condition monitoring and measurement. The organisation's performance monitoring frameworks, balanced scorecards etc. Evidence of the reviews of any appropriate performance indicators and the action lists resulting from these reviews. Reports and trend analysis using performance and condition information. Evidence of the use of performance and condition information shaping improvements and supporting asset management strategy, objectives and plan(s).
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformance is clear, unambiguous, understood and communicated?	3	Pg 2 of the Emergency Recovery Plan describes the authorities and duties for civil emergency situations. This is also described in Section 7.11 of the AMP.	S.Reed indicated that asset failures are investigated. Actions taken may include inspection of similar assets (eg. Andelect RMU's), redesign of assets (eg. underground transformer vaults), amending standards to ensure problematic asset configurations are avoided.	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 conformance. 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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						Asset Management Standard Applied	PASS5
<b>SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)</b>							
Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	The organisation does not have process(es) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning but currently do not have these in place (note: procedure(s) may exist but they are inconsistent/incomplete).	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning. Gaps and inconsistencies are being addressed.	Effective process(es) and procedure(s) are in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	The organisation does not have process(es)/procedure(s) in place to control or manage the implementation of asset management plan(s) during this life cycle phase.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during this life cycle phase but currently do not have these in place and/or there is no mechanism for confirming they are effective and where needed modifying them.	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process for confirming the process(es)/procedure(s) are effective and if necessary carrying out modifications.	The organisation has in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process, which is itself regularly reviewed to ensure it is effective, for confirming the process(es)/ procedure(s) are effective and if necessary carrying out modifications.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	The organisation has not considered how to monitor the performance and condition of its assets.	The organisation recognises the need for monitoring asset performance but has not developed a coherent approach. Measures are incomplete, predominantly reactive and lagging. There is no linkage to asset management objectives.	The organisation is developing coherent asset performance monitoring linked to asset management objectives. Reactive and proactive measures are in place. Use is being made of leading indicators and analysis. Gaps and inconsistencies remain.	Consistent asset performance monitoring linked to asset management objectives is in place and universally used including reactive and proactive measures. Data quality management and review process are appropriate. Evidence of leading indicators and analysis.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	The organisation has not considered the need to define the appropriate responsibilities and the authorities.	The organisation understands the requirements and is in the process of determining how to define them.	The organisation are in the process of defining the responsibilities and authorities with evidence. Alternatively there are some gaps or inconsistencies in the identified responsibilities/authorities.	The organisation have defined the appropriate responsibilities and authorities and evidence is available to show that these are applied across the business and kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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						Asset Management Standard Applied	PAS55	
SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)								
Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented information
105	Audit	What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	3	The TELARC assessment report of the SMS dated 21st December 2011 was inspected. An ESS audit report from December 2010 was also inspected.	S.Reed confirmed that AM policies and procedures have been reviewed as part of the SMS compilation, and then the SMS audit. NEL's policies and assets have been inspected by Energy Safety. The AMP has been prepared by an independent expert (about 8 years ago), is regularly reviewed by NTL and is assessed by the Commerce Commission.	This question seeks to explore what the organisation has done to comply with the standard practice AM audit requirements (eg, the associated requirements of PAS 55 s 4.6.4 and its linkages to s 4.7).	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit teams, together with key staff responsible for asset management. For example, Asset Management Director, Engineering Director. People with responsibility for carrying out risk assessments	The organisation's asset-related audit procedure(s). The organisation's methodology(s) by which it determined the scope and frequency of the audits and the criteria by which it identified the appropriate audit personnel. Audit schedules, reports etc. Evidence of the procedure(s) by which the audit results are presented, together with any subsequent communications. The risk assessment schedule or risk registers.
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	3	The Network Extension Design & Construction Standards manual has been insepcted. Commissioning sheets have been examined.	S.Reed confirmed that standards and procedures are used to build appropriate levels of safety and reliability into assets, that works are inspected after completion, that as-builts are received, and that asset inspections result in prioritised remedial work.	Having investigated asset related failures, incidents and non-conformances, and taken action to mitigate their consequences, an organisation is required to implement preventative and corrective actions to address root causes. Incident and failure investigations are only useful if appropriate actions are taken as a result to assess changes to a businesses risk profile and ensure that appropriate arrangements are in place should a recurrence of the incident happen. Widely used AM standards also require that necessary changes arising from preventive or corrective action are made to the asset management system.	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit and incident investigation teams. Staff responsible for planning and managing corrective and preventive actions.	Analysis records, meeting notes and minutes, modification records. Asset management plan(s), investigation reports, audit reports, improvement programmes and projects. Recorded changes to asset management procedure(s) and process(es). Condition and performance reviews. Maintenance reviews
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	3	Close-in inspection reports were examined, and S.Reed discussed the process for scoping the close-in inspection based on the routine inspection results.	S.Reed indicated that the 2 shareholders maintain a keen interest in continually optimising costs, asset inspection processes are amended eg. insertion of a 2nd tier of close-in inspections. NEL recognises that many of its processes appear optimal and it is not clear that the incremental benefits of process improvement will outweigh the incremental costs.	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 than reviews and audit (which are separately examined).	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. Managers responsible for policy development and implementation.	Records showing systematic exploration of improvement. Evidence of new techniques being explored and implemented. Changes in procedure(s) and process(es) reflecting improved use of optimisation tools/techniques and available information. Evidence of working parties and research.
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	3		S.Reed indicated that NEL staff attend relevant courses, magazine articles are noted, involvement in EEA working parties, use of independent consultants, and advice from NTL.	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)**

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
105	Audit	What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	The organisation has not recognised the need to establish procedure(s) for the audit of its asset management system.	The organisation understands the need for audit procedure(s) and is determining the appropriate scope, frequency and methodology(s).	The organisation is establishing its audit procedure(s) but they do not yet cover all the appropriate asset-related activities.	The organisation can demonstrate that its audit procedure(s) cover all the appropriate asset-related activities and the associated reporting of audit results. Audits are to an appropriate level of detail and consistently managed.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	The organisation does not recognise the need to have systematic approaches to instigating corrective or preventive actions.	The organisation recognises the need to have systematic approaches to instigating corrective or preventive actions. There is ad-hoc implementation for corrective actions to address failures of assets but not the asset management system.	The need is recognized for systematic instigation of preventive and corrective actions to address root causes of non compliance or incidents identified by investigations, compliance evaluation or audit. It is only partially or inconsistently in place.	Mechanisms are consistently in place and effective for the systematic instigation of preventive and corrective actions to address root causes of non compliance or incidents identified by investigations, compliance evaluation or audit.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	The organisation does not consider continual improvement of these factors to be a requirement, or has not considered the issue.	A Continual Improvement ethos is recognised as beneficial, however it has just been started, and or covers partially the asset drivers.	Continuous improvement process(es) are set out and include consideration of cost risk, performance and condition for assets managed across the whole life cycle but it is not yet being systematically applied.	There is evidence to show that continuous improvement process(es) which include consideration of cost risk, performance and condition for assets managed across the whole life cycle are being systematically applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	The organisation makes no attempt to seek knowledge about new asset management related technology or practices.	The organisation is inward looking, however it recognises that asset management is not sector specific and other sectors have developed good practice and new ideas that could apply. Ad-hoc approach.	The organisation has initiated asset management communication within sector to share and, or identify 'new' to sector asset management practices and seeks to evaluate them.	The organisation actively engages internally and externally with other asset management practitioners, professional bodies and relevant conferences. Actively investigates and evaluates new practices and evolves its asset management activities using appropriate developments.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard.  The assessor is advised to note in the Evidence section why this is the case and the evidence seen.