ASSET MANAGEMENT PLAN

Summary of a 10-year management plan for Orion's electricity network
from 1 April **2009** to 31 March **2019**

Orion
your network

About Orion

Orion New Zealand Limited owns and operates the electricity distribution network in central Canterbury between the Waimakariri and Rakaia rivers and from the Canterbury coast to Arthur's Pass. Our network covers 8,000 square kilometres of diverse geography, including Christchurch city, Banks Peninsula, farming communities and high country.

We transport electricity from 10 Transpower grid exit points to more than 190,000 homes and businesses. Orion charges electricity retailers for this delivery service, and electricity retailers then on-charge homes and businesses. Retailers also charge customers for the cost of generating electricity plus a retail charge.

Orion's charges typically amount to about one third of a household's electricity bill.

Our shareholders are:

- Christchurch City Council 89.3%
- Selwyn District Council 10.7%

Further information about Orion is available from our:

- website – oriongroup.co.nz
- annual report
- network quality report – a report that examines Orion's performance in providing a reliable electricity distribution system
- pricing guide – a guide to help customers understand our prices and how they compare with those of other electricity distributors.

Front cover image: Fostering the development of Orion's current and future employees and contractors is crucial for the long term security of our network. Nigel Smith is one of hundreds of electrical workers each year who learn their trade and refresh their skills at the CPIT Distribution Trades Training Centre, of which Orion is a key partner.

Introduction

Welcome to this summary of Orion's asset management plan (AMP). Our AMP details how we plan to expand, maintain and reinforce our electricity distribution network over the next 10 years. Our full AMP is available at oriongroup.co.nz.

Our AMP is central to our day-to-day operations, and is a comprehensive, practical resource that captures the valuable insights and experience of our highly-skilled employees.

The foundation of our AMP is customers' views on the quality of service that they prefer. Extensive consultation tells us that customers want us to deliver electricity reliably and keep prices down. To meet this expectation we look for the right balance between costs for consumers and network investment. Our success in achieving this balance is reflected in our prices, which are below average, and in our ranking as one of the most reliable electricity networks in the country.

Because of recent regulatory changes, it is two years since we last published an AMP. Changes described in the AMP are referenced to our previous edition, which covered the 10-year period from 2007 to 2017.

Also, please note that because this AMP summary was published after 31 March 2009, it contains some figures, statistics and forecasts calculated at the end of the 2008/09 financial year. Our full AMP was published before 31 March 2009, therefore it contains the latest available data from the 2007/08 financial year.

This AMP summary identifies some of our main considerations as we manage and plan for the future of our electricity network. We hope you find it informative and we welcome your comments on our AMP or any other aspect of our performance. These can be emailed to me at roger.sutton@oriongroup.co.nz.

Roger Sutton
CHIEF EXECUTIVE OFFICER

Purpose of our AMP

The overall objective of our AMP is to provide, maintain and operate our electricity network while meeting agreed levels of service, quality, safety and profitability.

This year's AMP looks ahead for 10 years from 1 April 2009, with the main focus on the first three to five years – for this period most specific projects have been identified. Beyond this period, analysis is more indicative.

We created our first AMP in 1994 and have since developed the plan to comprehensively meet the requirements of the Electricity Information Disclosure Requirements 2004[1]. Our AMP is also a technical tool that goes beyond regulatory requirements. The extensive detail in the plan is used on a day-to-day basis by our employees and demonstrates responsible stewardship of our network assets on behalf of our shareholders, electricity retailers, government agencies, contractors, customers, employees, financial institutions and the general public.

Our plan focuses on 'optimising the lifecycle costs' for each network asset group (including construction, operation, maintenance, renewal and disposal of assets) to meet agreed service levels and future electricity demand. In other words, we consider all costs throughout the life of a network asset (including upfront and maintenance costs as well as indirect costs such as electrical losses[2]) and we aim to maintain and operate a cost-effective network to meet our customers' needs.

Each year our goal is to improve our AMP to take advantage of new information and changing technology. These innovations help us to maintain our ranking as one of the most reliable and efficient electricity networks in the country.

In this summary we outline the main considerations, principles and strategies that influence how we manage our electricity distribution network assets and meet the overall objective of our AMP. The detail behind this summary can be found in our full AMP, available on our website oriongroup.co.nz.

[1] A summary of the links between these regulatory requirements and our AMP is shown in Appendix B of our full AMP.

[2] See page 19 of this summary for more information on electrical losses.

Orion network overview

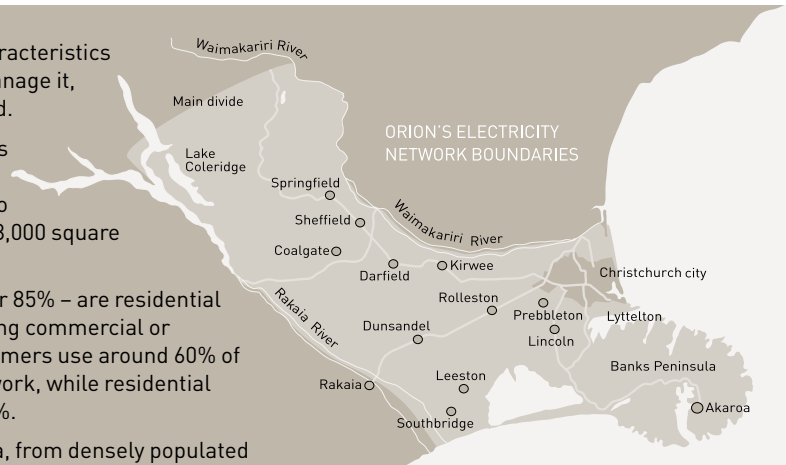
The geographical and historical characteristics of our network influence how we manage it, as does growth in electricity demand.

Orion operates one of New Zealand's largest electricity distribution networks. We distribute electricity to more than 190,000 customers over 8,000 square kilometres in central Canterbury.

The majority of our customers – over 85% – are residential households, with the remainder being commercial or industrial premises. Business customers use around 60% of the electricity delivered via our network, while residential customers account for the other 40%.

Orion's network covers a varied area, from densely populated residential neighbourhoods through to a widely dispersed rural population. To reach all of our customers, we manage a sophisticated network of electrical assets, load control equipment and multiple computer systems.

Our network is continually growing. In the last few years increased irrigation in Canterbury's rural districts and high levels of construction activity in urban areas have created strong growth in electricity demand. Growth in maximum electricity demand is the principal driver of Orion's network investment.



Network summary as at 31 March 2009	
Number of customer connections	190,000
Network maximum demand (MW)	624
Electricity delivered (GWh)	3,402
Total kilometres of lines and cables	14,518
District/zone substations	49
Distribution/network substations	10,536
Network capital expenditure	$30.7m (forecast in year to 31 March 2010)
Network maintenance expenditure	$23.4m (forecast in year to 31 March 2010)
Value of network assets	$940m

Over the last five years[3] our electricity distribution network has been one of the most reliable in New Zealand and our operating costs are at least 20% below the New Zealand average. To ensure we remain an industry leader we continually look at ways to cost-effectively improve our network performance.

A description of our asset quantities is available in section 1.3 of the summary of our full AMP. Section 4 of our full AMP gives more detail about various network components.

[3] To 31 March 2008. This is the latest available date to which comparisons to other networks can be made.

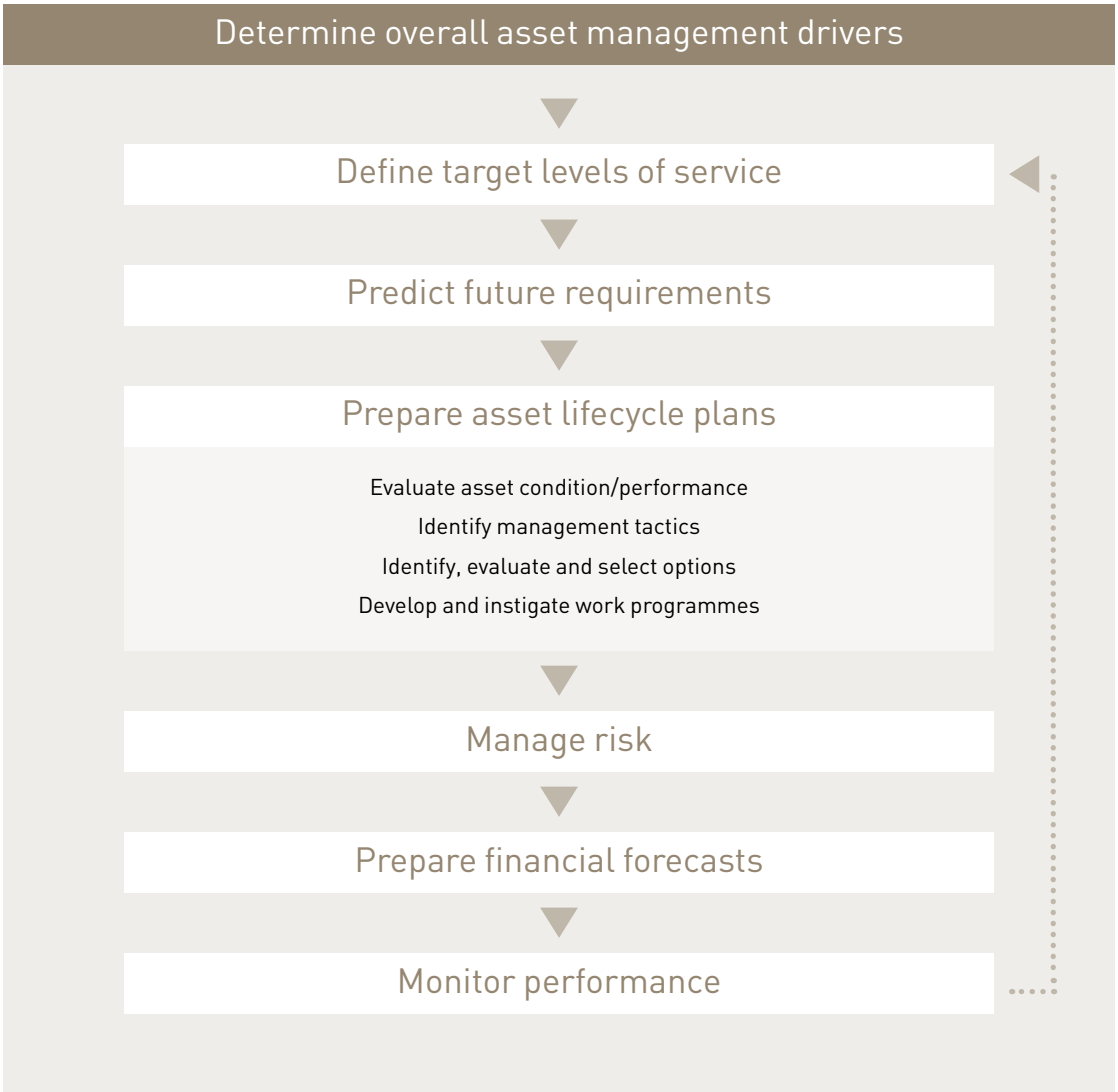
Summary of key issues

The key issues discussed in our AMP are:

- Our forecasts for peak demand growth – the principal driver of investment in our network. We expect winter peak demand on our total network to grow by an average of 1.3% per annum over the next 10 years, while summer peak demand on our rural network will grow by around 2.5% per annum.
- Our asset replacement strategies – we expect the annual cost to replace assets at the end of their useful lives to increase from $12.5m in 2010 to $19.7m in 2019.
- A review of our subtransmission system – an urban subtransmission options analysis paper is available for comment on our website oriongroup.co.nz.
- Our measures to mitigate and prevent major electricity outages – our network security and reliability is very high compared with that of other New Zealand and overseas electricity distribution networks; however we continue to look for innovative ways to improve our performance.
- Our continued investment in new technology to improve network reliability and quality of service, reduce costs and enable more effective management and control of our assets.
- Our proactive approach to ensuring public, contractor and employee safety.

Asset management process

The following diagram illustrates our asset management process:

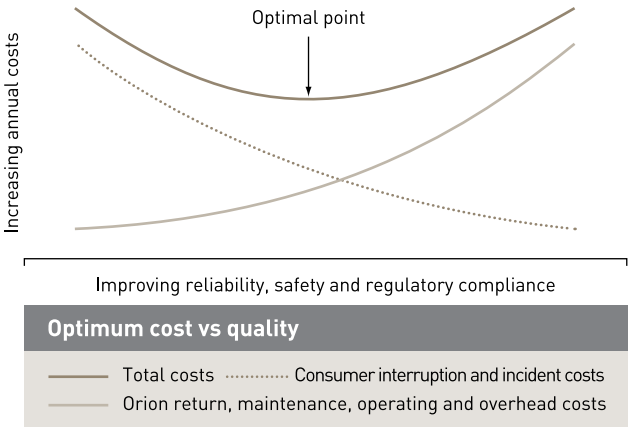


Optimal asset management

We aim to manage our network assets to the best of our ability to achieve excellent outcomes for our community. Our AMP outlines how we plan to accomplish optimal results.

Optimal investment

Our underlying asset management principle is that the 'optimum point of investment' is achieved when the value of further expenditure on our network would exceed the value of benefits to customers. This concept is illustrated in the following diagram.



Put simply, we need to find the right balance between costs and the standard of our electricity delivery service. We seek to achieve this optimal point by applying economic analysis when we develop and review our asset management practices.

Optimal regulation

To achieve optimal outcomes, we also commit significant resources to participate actively in the consultation phase of national rules and regulations. It is important that rules and regulations that affect our industry are well-informed, principled and practical.

Optimal technologies

The speed at which new asset and systems technologies become available has increased in the last decade. We welcome these new initiatives and are committed to keeping up-to-date with technological advancements. In line with our 'optimal point' approach above, we introduce new technology only when it results in an economic balance of cost and network performance.

The following technologies have been introduced to our network recently:

- a 'Ground Fault Neutraliser' system to improve the safety and reliability of our rural network
- 'corona' and 'thermal imaging' cameras to identify the need for preventative maintenance
- a new network management system to enable us to interact in real time with devices on the electricity network and significantly improve our ability to respond to network outages, especially during big events such as storms
- a new geographical information system to improve planning and operational efficiencies
- partial discharge monitoring of critical assets such as switchgear and cables, enabling us to detect failures at an early stage.

Key targets and performance measures

Feedback from our customers and stakeholders helps us to determine how well we manage our network to meet agreed levels of service and quality. Regular price/quality surveys and consultation show our customers are generally happy with our service.

We also measure our asset management against 'key asset management drivers' – a series of important factors that influence how we manage our network and plan for the future. The table below shows these key targets (safety, customer service, environmental responsibility and economic efficiency) and how we measure our performance against them. We explain these targets in more detail below.

Key asset management driver	Measure (per annum unless otherwise stated)	Target level of service	Level of service for the year ended 31 March 2009*	Performance indicator	Performance measurement procedure
Safety	Personal safety	Zero	Zero	Number of 'serious harm' injuries/ accidents	Accident/incident reports
Customer service	SAIDI[4]	<63	62	Figures published in accordance with the Electricity Information Disclosure Requirements 2004	Faults statistics exclude low voltage faults and faults with a duration of less than one minute
	SAIFI[5]	<0.76	0.60		
	CAIDI[6]	<83	102		
	Faults/100km of circuit	<11	8.7		
	Voltage complaints (proven)	<70	28	Non compliances	Tracking of all enquiries
	Harmonics (wave form) complaints (proven)	<2	Zero	Non compliances	Checks performed using an harmonic analyser
Environmental responsibility	PCBs (persistent organic pollutants)	Zero	Zero	Not applicable	Not applicable
	SF_6 gas lost	<1% loss	0.78% loss	Identification of environmental problems	Environmental spill/loss report
	Oil spills (uncontained)	Zero	Zero		
Economic efficiency	Capacity utilisation	No target set	36%	% utilised	Maximum demand/ transformer capacity
	Load factor	No target set	62%	% utilised	Average load/ peak load

* Unless otherwise stated all level of service and reliability figures used in this summary are based on Orion's network only. They exclude those interruptions or complaints caused by failures on the Transpower-owned transmission network.

[4] SAIDI – system average interruption duration index. This is the average total duration of electricity supply interruptions that a customer experiences in a year.

[5] SAIFI – system average interruption frequency index. This is the average number of electricity supply interruptions that a customer experiences in a year.

[6] CAIDI – customer average interruption duration index. This is the average duration of an electricity supply interruption for customers who experienced a supply interruption in the year.

Safety

As a responsible electricity network company, "zero" is the only prudent injury/accident target we can have – we are committed to keeping people safe around our network.

Customer service

As discussed in the service levels section on page 12, SAIDI[4] and SAIFI[5] are accepted internationally as the most important indicators of electricity network reliability. We use these indicators to measure our reliability.

We also measure power quality, voltage and harmonics to assess customer service levels. By "proven", we mean that investigation shows that the non-complying voltage or harmonic originated in our network.

Environmental responsibility

Our target for the level of sulfur hexafluoride (SF_6) gas emissions from our electricity network reflects the "Memorandum of Understanding Relating to Management of Emissions of Sulphur Hexafluoride to the Atmosphere"[7]. We do not purchase equipment containing SF_6 if a technically and economically acceptable alternative exists.

For oil spills, our target of zero is the only prudent goal. We operate oil containment facilities and implement oil spill mitigation procedures and training. Reported "uncontained" oil spills relate to incidents that fall outside these precautions.

Economic efficiency

We measure how 'efficient' our assets are by monitoring the capacity utilisation of our distribution transformers and our 'load factor'.

Capacity utilisation

Capacity utilisation is a measure of how well a network's transformers are utilised. It is calculated as the maximum demand experienced on an electricity network in a year divided by the transformer capacity on that network.

Although we monitor this ratio, we do not have a specific target. Our management process aims to ensure maximum economic efficiency through good design and lifecycle management practices. If we specifically targeted levels of capacity utilisation, we could create an incentive to design inefficiently, for example to install long lengths of low voltage cable or uneconomically replace transformers early in their lifecycle due to shifts in area load profiles.

In the year ended 31 March 2009 our capacity utilisation factor was 36%. The average capacity utilisation factor of New Zealand's electricity distribution companies was 29% in the year to 31 March 2008 (the latest available comparable figure).

Load factor

The amount of electricity passing through an electricity network is not always constant. In Christchurch for instance, electricity demand is higher on cold winter days than on warm summer days. The average load that passes through a network divided by the maximum load the network experiences that year produces a statistical measure called a network's 'load factor'. Load factor measures the constancy of load on an electricity network throughout a year.

Load factors always vary across different networks. This results from weather conditions and networks having different mixes of industrial, residential and rural customers. For instance, a network in an area with an even climate will typically have a higher load factor than networks in areas with large temperature variances.

Nevertheless, all networks seek to maximise their load factor. This is because a high load factor indicates better use of network assets (i.e. assets are more frequently used up to their electrical rating).

For the year ended 31 March 2009 Orion's load factor was 62%. The average load factor of New Zealand's electricity distribution companies was 61% in the year to 31 March 2008 (the latest available comparable figure).

More detail on efficiency is available in section 3.3 of our full AMP.

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[7] Developed and signed by the Government and major users in the electricity distribution industry.

Security of supply standard

We plan and invest in our network to meet a 'security of supply standard' that was originally developed with customer input in 1998. 'Security of supply' is the ability of our network to meet demand for electricity in certain circumstances when electrical equipment fails. The more secure an electricity network, the greater its ability to continue to perform or the quicker it can recover from a fault or series of faults.

Our original security of supply standard was based on the United Kingdom's P2/6, the regulated standard for distribution supply security in the UK.

Currently only one industry supply security guide is published in New Zealand (by the Electricity Engineers' Association of New Zealand) and no regulated national standard is in force.

The guiding principle of our security standard is that the greater the size or economic importance of the electricity demand served, the shorter the interruption to electricity supply that can be tolerated.

As nine years had passed since we started using the standard, we reviewed it in 2006 to ensure it continued to take into account customer preferences for the quality and price of service that we provide. As a result of the review, our standard was improved to better reflect the needs of our customers. The revised standard may result in slightly lower reliability for our outer-urban customers but this will also reduce the need for future price rises.

These kinds of trade-offs between price and electricity supply reliability are a constant focus for Orion. Generally, the more we spend, the more reliable our community's electricity supply becomes. However, the trade-off is that the more we spend the higher our prices become, as we need to recover our costs. We are committed to seeking our customers' views on the price/quality trade-off and we want to ensure that our network investment decisions reflect customer preferences.

More information on our security of supply standard is available in section 5.3.1 of our full AMP.


Orion
connetics

Levels of service

Our principal business is to deliver electricity to more than 190,000 customers across a range of customer groups. Each of these groups, such as residential, business and rural, has different needs for quality and service and this affects how we manage our electricity network and plan for the future.

Our key focus is to provide a service that, as far as practicable, meets all of our customers' requirements. To achieve this outcome, we undertake customer studies and hold extensive discussions with network users to define what levels of service they expect. Feedback received highlights the importance of "continuity of power supply". In particular, customers expect:

- no breaks in power supply, and
- if breaks do occur that power is quickly restored.

To help meet customer expectations we analyse the performance of our network to determine how reliable it is. This information is then used to target areas for improvement in our asset management planning. We aim to meet customer preferences by providing one of the most reliable and cost-effective networks in New Zealand.

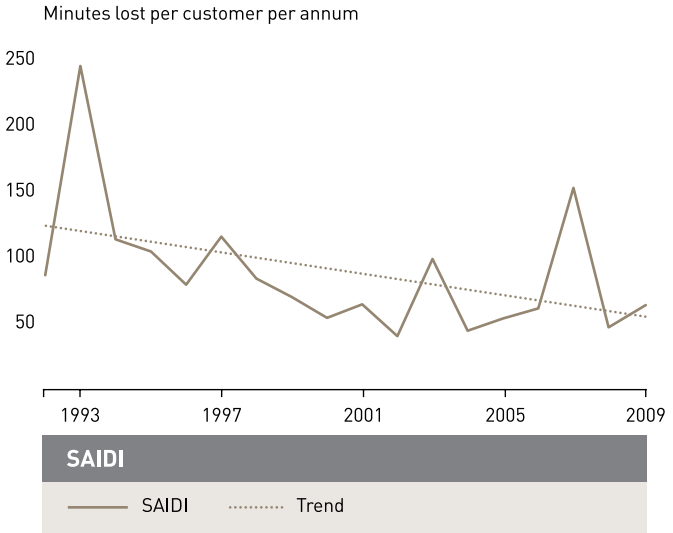
Reliability trends – SAIDI and SAIFI

Two measures are accepted internationally as the most important indicators of electricity network reliability. These measures are known as SAIDI and SAIFI.

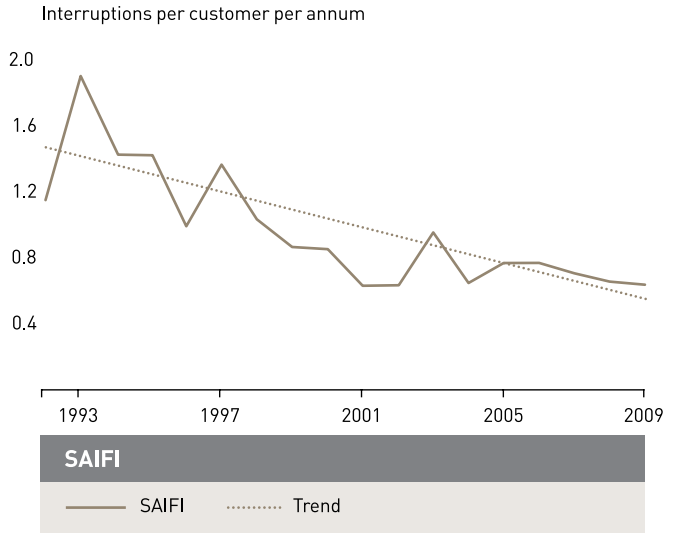
- SAIDI, or system average interruption duration index, measures the average number of minutes per annum that a customer is without electricity.
- SAIFI, or system average interruption frequency index, measures the average number of times per annum that a customer is without electricity.

Extreme weather events can have a major impact on an electricity network's performance. When considering performance it is therefore more meaningful to look at the long term trend in a network's SAIDI and SAIFI figures, rather than look at the figures for any one year.

The trend of our network reliability performance figures since the early 1990s shows that we have improved our performance.



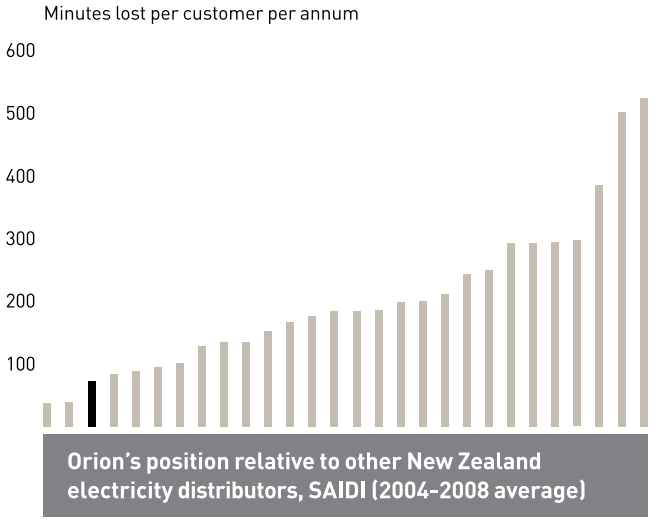
Note: SAIDI statistics were unusually high in 1993, 2003 and 2007 due to damage caused by snow storms.



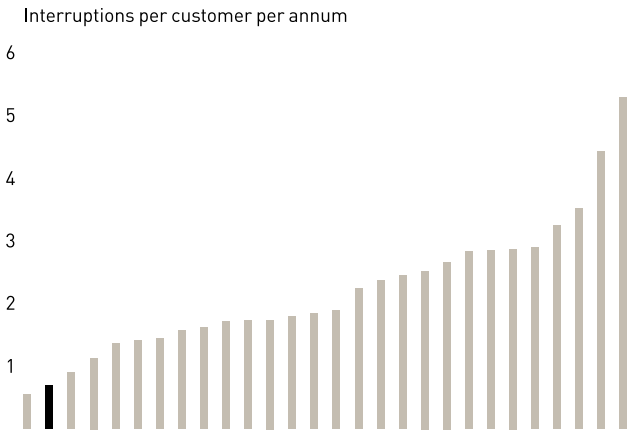
Note: SAIFI statistics were unusually high in 1993 and 2003 due to damage caused by snow storms.

SAIDI and SAIFI comparison figures are currently only available up to 31 March 2008. Based on these latest available figures, for the five years to 31 March 2008 Orion was the:

- third best performing New Zealand distribution company in terms of the duration of interruptions (SAIDI)[8]
- second best performing New Zealand distribution company in terms of the frequency of interruptions per customer (SAIFI).



[8] The two New Zealand network companies with superior SAIDI results to ours are both urban-only networks. We operate both an urban and a rural network. Rural networks usually have a greater number of interruptions than urban networks. There are 29 electricity distribution networks in New Zealand.



Orion's position relative to other New Zealand electricity distributors, SAIFI (2004-2008 average)

While an overall improvement in network reliability (with the exception of severe storms, as can be seen by Orion's SAIDI peaks in 1993, 2003 and 2007) has been the trend over the last 15 years, we recognise it is unrealistic to expect to improve every year. There comes a point where the added costs of improvements outweigh the added benefits.

Any major improvement in rural reliability would require large capital investment and correspondingly large increases in line charges. We are committed to examining other options to see if lower cost alternatives exist to increase rural reliability.

We are very optimistic about the potential of the 'Ground Fault Neutraliser'[9] earthing technique, which offers significant improvement in rural reliability at an economic cost. Once fully installed, we expect this system to reduce rural power cuts by 20-40%. Orion was the first to trial this technique in New Zealand and we plan to install 15 Ground Fault Neutralisers at substations across our rural network by the end of 2011. This, and other improvement initiatives, are discussed in more detail in section 7.8 of our full AMP.

Overall our electricity distribution network is one of the most reliable in the country and our operating costs are amongst the lowest.

[9] The Ground Fault Neutraliser reduces the effects of 'earth faults', which are generally caused when a tree or other object touches a power line.

Meeting electrical demand

Developing our network to meet future demand growth requires significant capital expenditure – this expenditure is coming under increasing scrutiny.

Before we invest capital in our network, we consider the following:

- 'demand side management' options
- 'distributed generation' options.

The amount we spend on our network is influenced by existing and forecast customer demand for electricity and the number of new customer connections to our network. Other significant demands on capital include:

- meeting safety and environmental compliance requirements
- meeting and maintaining our security of supply standard (see page 10)
- meeting shareholder desires to place existing overhead wires underground.

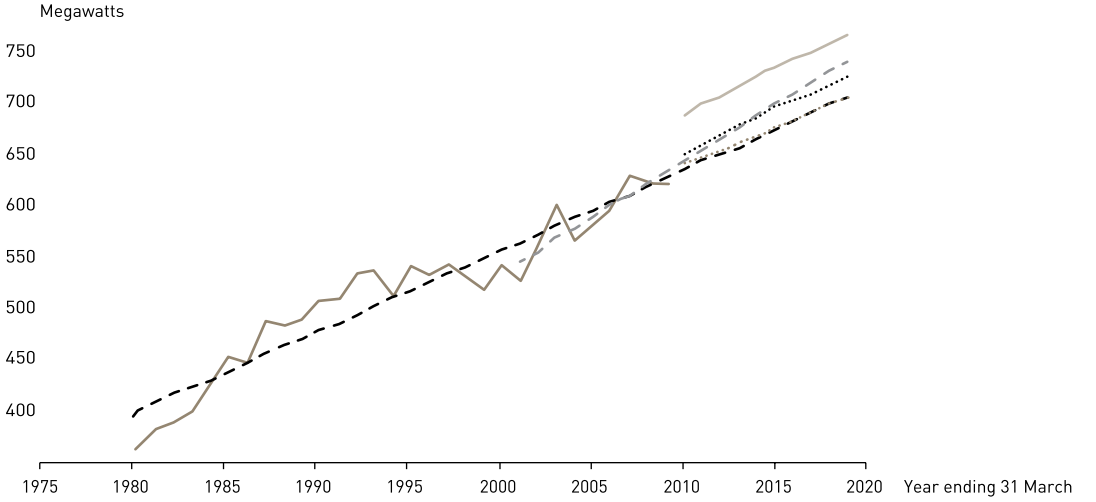
The growth rate in overall maximum network system demand (measured in megawatts) traditionally drives our capital investment. Maximum demand is strongly influenced in the short term by climatic variations (specifically the severity of our winter conditions). In the medium term it is influenced by growth factors such as underlying population trends, growth in the commercial/industrial sector, and changes in rural land use.

Overall maximum demand

As mentioned above, maximum demand is the major driver for our network investment. This measure is very volatile and varies substantially in Canterbury depending on the vagaries of winter weather.

Network maximum demand for the year ending 31 March 2009 was 624MW. Trends suggest a medium term demand growth rate of 1-2% per annum.

In the short term Environment Canterbury's clean air plan is driving higher demand growth (almost 2% per year), as the plan encourages customers to install electric heat pumps. We expect annual peak demand growth to fall to 1% towards the end of the 10-year period covered by our AMP.



Overall maximum demand trends on Orion's network

- Actual Orion network maximum demand
- Projected demand from 30 years' history (at 1.25% per annum)
- Projected demand from 10 years' history (at 1.73% per annum)
- Forecast demand – including clean air plan and severe snow storm
- Forecast demand – including clean air plan
- Forecast demand – excluding clean air plan

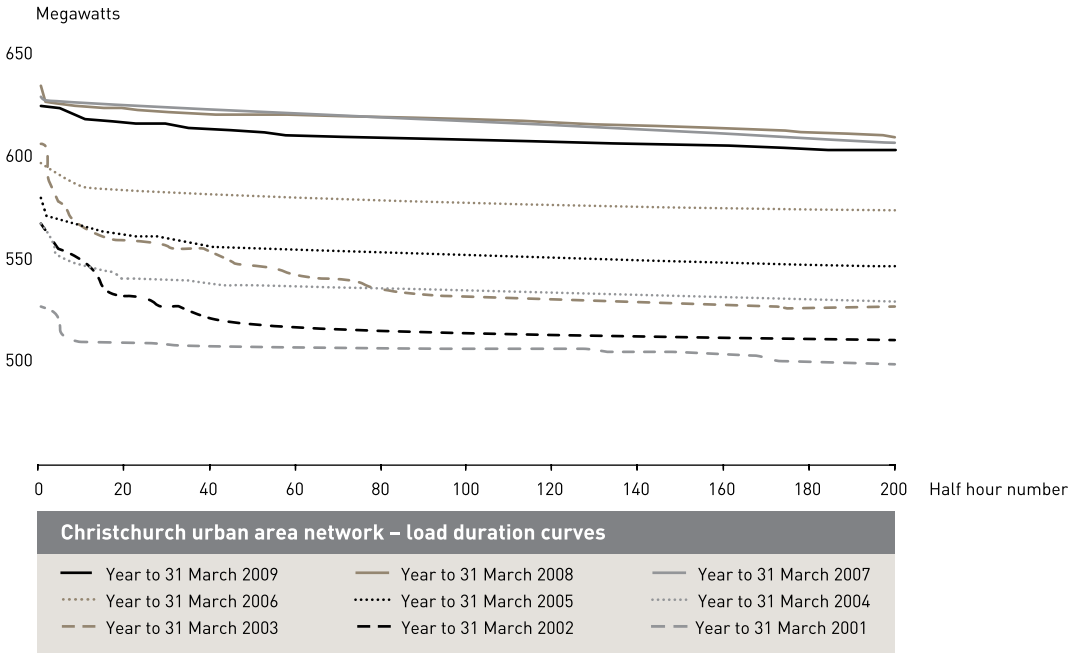
Load duration

Maximum demand on our network sets the network capacity that we need, but generally maximum demand only happens for very short periods.

We do what we can to manage load to reduce maximum demand. For example, we routinely use 'ripple control' to automatically turn household electric hot water cylinders off. We aim to turn cylinders off for short periods only, to prevent any noticeable effects on customers' hot water supply. Turning off the cylinders reduces the congestion on our network.

We also manage load indirectly through pricing incentives that reward retailers' customers who reduce the amount of electricity they use during our high priced 'peak period'. We provide a 'ripple signal' to tell customers that it is a peak period so that they can reduce their load and reduce their charges – this arrangement is more useful for larger business connections with special half-hour interval metering that records the reduced loading level during the peak period.

A load duration curve shows the amount of time a load exceeds a given value. The following graph shows our load duration curves. In the year ended 31 March 2009, load exceeded 620MW for only 10 half hours and the highest net demand was about 624MW. In the 2002 winter, if 'peaking generation' of 30MW had operated for only four hours on our network, this would have reduced our urban network maximum demand by about 30MW.

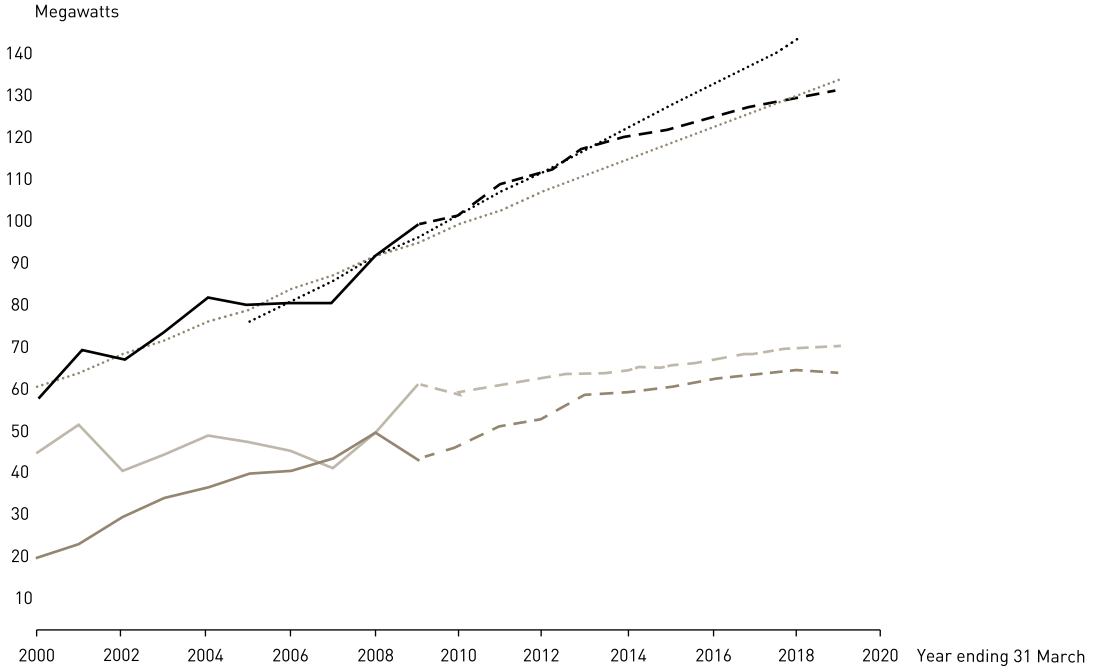


We note that peaking generation could help to delay the need to increase the capacity of Transpower's network. This generation would usually operate for only a few hours over the largest peak demand times to avoid Transpower network constraints. In unusually prolonged cold conditions, longer hours of operation could be needed.

Control of winter maximum demand depends heavily on suitable price signals and customer response to price signals. To create and maintain appropriate price signals, it is vital that electricity retailers continue to support demand side management initiatives. Night rate tariffs are particularly important, as is load control via 'ripple receivers'.

Rural maximum demand

Irrigation load creates high electricity demand on our rural network in summer. Growth rates for these summer peaking areas have been high for the last decade, and were very high from 2000 to 2005. When the rural electrical load was still relatively low, the annual growth rate reached an exceptional 20%. The following graph shows recent load growth in our rural area. Summer demand at Transpower's Hororata and Springston GXPs has increased by 20MW since 2007 – a significant load growth of 25%. We expect that irrigation and dairy farming loads will continue to grow at a steady rate. Note the effects of load transfers from Hororata GXP to Springston GXP in 2007/08.



Rural summer maximum demand

- Actual rural load (total)
- Actual load at Springston GXP
- Actual load at Hororata GXP
- Projected demand from ten years' history (at 4.20% per annum)
- Forecast rural load (total)
- Forecast load at Springston GXP
- Forecast load at Hororata GXP
- Projected demand from five years' history (at 5.52% per annum)

As electrical load on our urban and rural networks grows, we continue to focus on innovative solutions and appropriate network investment to meet our customers' needs.

Lifecycle asset management

We determine our maintenance priorities by following the general principle that the assets supplying the greatest number of customers receive the higher priority. As our distribution network is hierarchical with the highest voltage at a few input points (Transpower GXPs) and the lowest voltage at the many output points (customer connections), those parts of the network that operate at higher voltage are given higher maintenance priority. Our operating voltages are 66kV, 33kV, 11kV, 400V and 230V.

Generally assets are not replaced on age alone, but are kept in service until their continued maintenance is uneconomic or until they pose a safety, environmental or reliability risk.

Maintenance programmes are used to inspect assets and identify risks before they become a problem, which allows us time to minimise or remove the risk of failure.

Reliability performance is measured and used to identify areas where further maintenance is needed to improve our delivery service or where maintenance may be reduced without lowering service.

We typically schedule around 70% of our annual network maintenance expenditure in advance. This is known as 'planned' work. Another 10% of maintenance is not planned for but is required to be done, such as pole relocation or for road works. The balance of our maintenance expenditure is allocated to emergency work to keep the network in service.

Limiting electrical losses

Another key planning focus is how to manage and reduce 'electrical losses'. As electricity passes through lines, cables and transformers it creates a small amount of heat which is then 'lost' into the surrounding air. Such 'losses' are natural physical phenomena and are experienced in all electricity distribution networks. They cannot be avoided completely and mean that electricity retailers must purchase more energy from generators than is actually delivered to households and businesses.

Our policy is to maintain what is termed a 'low loss network', where overall losses are estimated at below 5% of energy delivered. We achieve this by following good industry practice with sound network design principles.

For instance, when deciding which transformer to purchase, we take into account the 'loss factors' of the different transformers available, as well as their price.

We also control operational voltage levels on our rural network to limit line losses. We choose transmission and distribution voltages and conductor sizes that best suit the load density, as overloaded conductors produce more line losses.

Our extensive urban cable network is inherently a low loss system.

Risk management

There are four main areas of risk in managing our electricity network:

- health and safety management
- environmental management
- natural events
- asset failure.

We outline each of these areas in more detail below. External consultants have advised on our risk assessment processes.

Health and safety management

It is not possible to entirely eliminate all hazards as we operate and maintain our electricity network. However we are committed to providing a safe, reliable network and a healthy work environment – we take all practical steps to ensure that our staff, the community and the environment are not at risk. We control hazards through training, guidelines and standards. Potential hazards, in particular electrical hazards, must also be considered when new network installations are designed and constructed.

We monitor concerns about health and electrical fields and run community education courses teaching children to stay safe around electricity. We also run an ongoing advertising campaign to promote public safety around our electricity network.

Environmental management

We follow a policy of environmental sustainability, initiate energy efficiency programmes and work to minimise electrical losses on our network wherever possible.

Our environmental sustainability policy covers protection of the biosphere, sustainable use of natural resources, reduction and disposal of waste, wise use of energy, risk reduction, restoration of environment, disclosure, commitment of management resources, stakeholder consultation, assessment and annual audit.

We instigated oil spill management systems several years ago and have successfully managed any significant spills.

Impact of natural events

Earthquakes and storms are our major natural event risks. We continue to invest significant time and money to ensure our network is protected against such events. During the mid-1990s our network was part of an 'engineering lifelines' study into how natural disasters would affect Christchurch. The study concluded that electricity supply would be essential for almost all service authorities after a natural disaster, with most service authorities' head offices located in the central city area.

Since this study we have made the following improvements:

- spent $13m to secure power supply to the central city via a second point of supply. This, combined with numerous diesel generators around the city, gives the Christchurch central business district (CBD) a more secure power supply than equivalent CBDs in Auckland and Wellington
- strengthened power supply to the port, airport and main communications sites
- spent $5m on earthquake strengthening for bridges, cable supports and buildings. All of our district substations and all major 33kV and 66kV cables now meet the seismic structural standard
- undertaken regular risk assessment and response studies to ensure we are well prepared for any disaster.

We have also reviewed how susceptible Transpower's GXP substations are to liquefaction. Our reviews show that Addington, Papanui and Bromley GXPs could be subject to uneven settlement in an earthquake. Due to differing soil types, settlement should not occur at all three GXPs during a single event.

Transpower is conducting a more detailed review of Papanui and Addington GXPs to determine the remedial work necessary to increase seismic security. As a result of this review, engineering measures are underway to reduce the likelihood of damage due to uneven settlement.

We note that emergency fuel storage has become a problem due to fewer private fuel tanks in our network area. There are also fewer commercial fuel stations – these all rely on electricity to pump fuel.

Plant and equipment failure

Plant failure is always going to happen. However certain actions can be taken to reduce the frequency of failure. Our policy is to buy reliable equipment rather than the cheapest equipment. Effective maintenance regimes are also very important.

Regular monitoring allows us to prioritise replacement and refurbishment based on the actual condition of equipment rather than just its age.

In addition to maintenance, we also continue to investigate how equipment is used and installed. We continually look for ways to improve our plant reliability. For example, we carry out thermal engineering checks of underground cables and have several initiatives to reduce problems experienced with metal-clad switchgear and associated terminations. Our approach to improving plant and equipment reliability also includes inspecting overhead lines and substations using state-of-the-art technology such as partial discharge tests, corona camera visual checks and infrared camera checks.

Subtransmission 66kV oil filled cables create the most significant potential for catastrophic plant failure. We have identified that these cables have unsatisfactory joint systems and we have prioritised replacing the joints with ones which withstand greater buckling forces. This programme is scheduled for completion in 2014, but this timing will depend on the final outcome of further joint assessments. Joints are being replaced as quickly as is practicable, given available resources and the need to avoid undue stress on neighbouring cables during the relatively long outages for the joint renewal work.

Comprehensive half-life maintenance of all major district substation transformers has been coordinated with our 66kV joint replacement programme.

Asset management systems

Our employees manage our asset information in-house. A wide range of asset management information systems and applications record and analyse the nature, condition and location of our network assets.

Our main applications are:

- network management system (NMS)
- mapping geographic information system (GIS)
- asset management system (AMS) and several linked asset registers
- valuation model
- a centralised real time monitoring and control system for our network (including load management software)
- work management documents, i.e. specifications and standards for operation and construction
- connection database
- network loading database
- power system modelling
- works order financial management system
- Microsoft PC inter-office network
- incident/accident reporting system.

Our recent priority has been to integrate the various databases and build potential links to other systems, particularly through our new NMS which enables us to interact in real time with devices on the electricity network.

We have now completed and installed the supervisory control and data acquisition (SCADA) phase of the NMS project. The entire system will be operational by mid 2010, and will significantly improve our ability to manage big network emergencies and help us to better manage our assets and programme maintenance in smarter ways.

Summary of forecast expenditure

A summary of our forecast capital and maintenance expenditure over the next 10 years is shown in the table below. No provision for inflation has been made in these figures.

Summary of forecast expenditure ($000)										
Year ending 31 March	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Capital expenditure	30,687	41,900	47,694	42,977	42,758	37,830	36,397	39,587	49,994	44,066
Maintenance expenses	23,376	25,057	25,145	25,059	23,461	23,501	22,588	22,545	22,646	23,049

The capital and maintenance budgets include a contingency of $1.5m per year each, to reflect the historic shortfall of budgets to meet unforeseen expenditure associated with the impact of local economic growth and further unforeseen regulatory compliance costs relating to land/road access and safety.

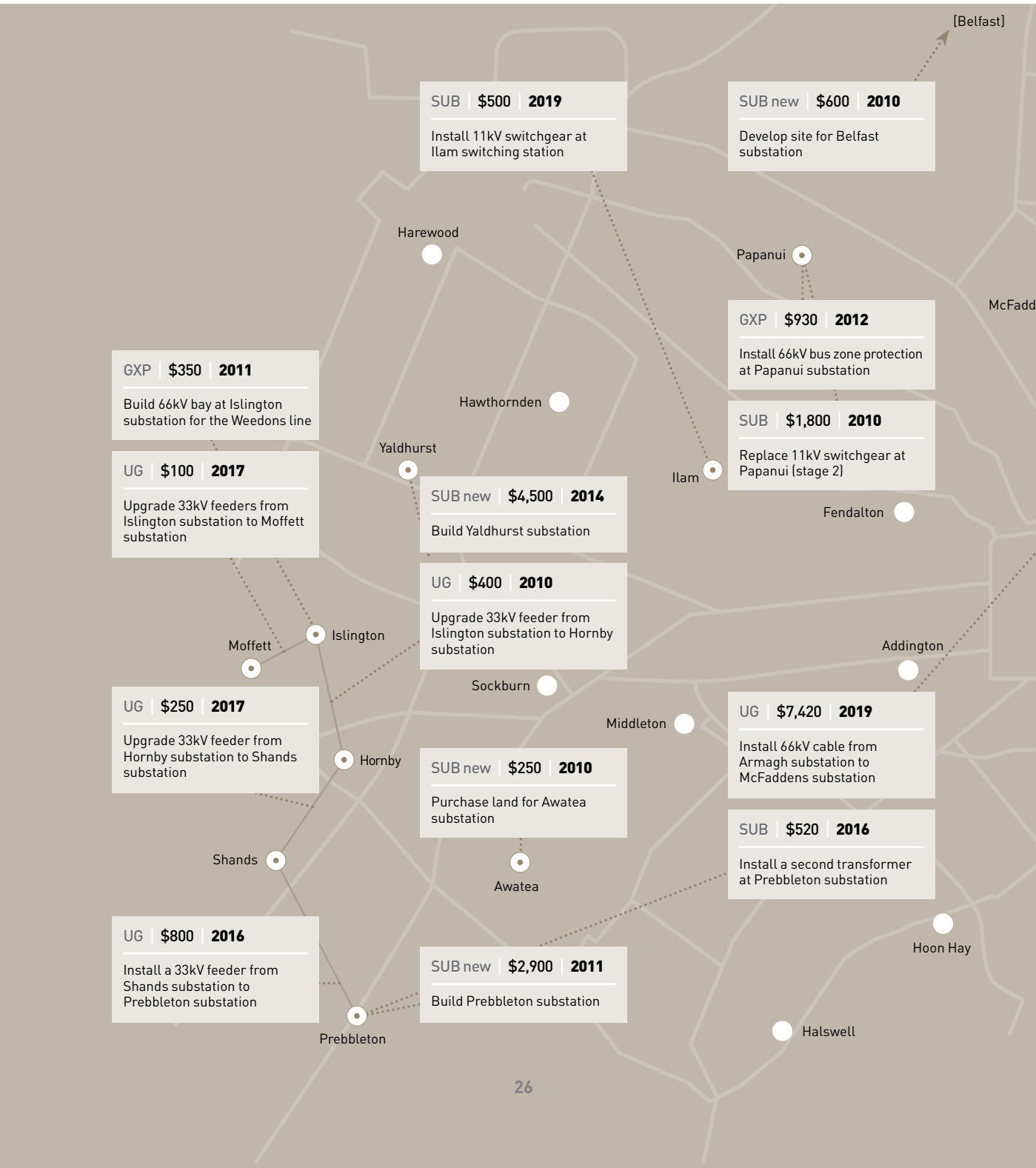
More detail on our forecast capital expenditure is shown in the table below.

Summary of forecast capital expenditure ($000)										
Year ending 31 March	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Customer connections to our network	3,600	3,800	4,200	5,000	5,400	5,400	5,400	5,400	5,400	5,400
Network extensions	2,000	2,200	2,600	2,800	2,900	2,900	2,900	2,900	2,900	2,900
Network reinforcement	4,568	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
Conversion of overhead lines to underground cables	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100
Major projects	5,960	13,915	19,400	13,057	8,675	1,910	1,320	3,950	14,560	7,920
Asset replacement	12,459	13,885	13,294	14,020	17,683	19,520	18,677	19,237	19,034	19,746
Contingency		1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total capital expenditure	**30,687**	**41,900**	**47,694**	**42,977**	**42,758**	**37,830**	**36,397**	**39,587**	**49,994**	**44,066**

Our planned capital expenditure on major projects is shown in the maps on the following pages.

Summary of major urban projects

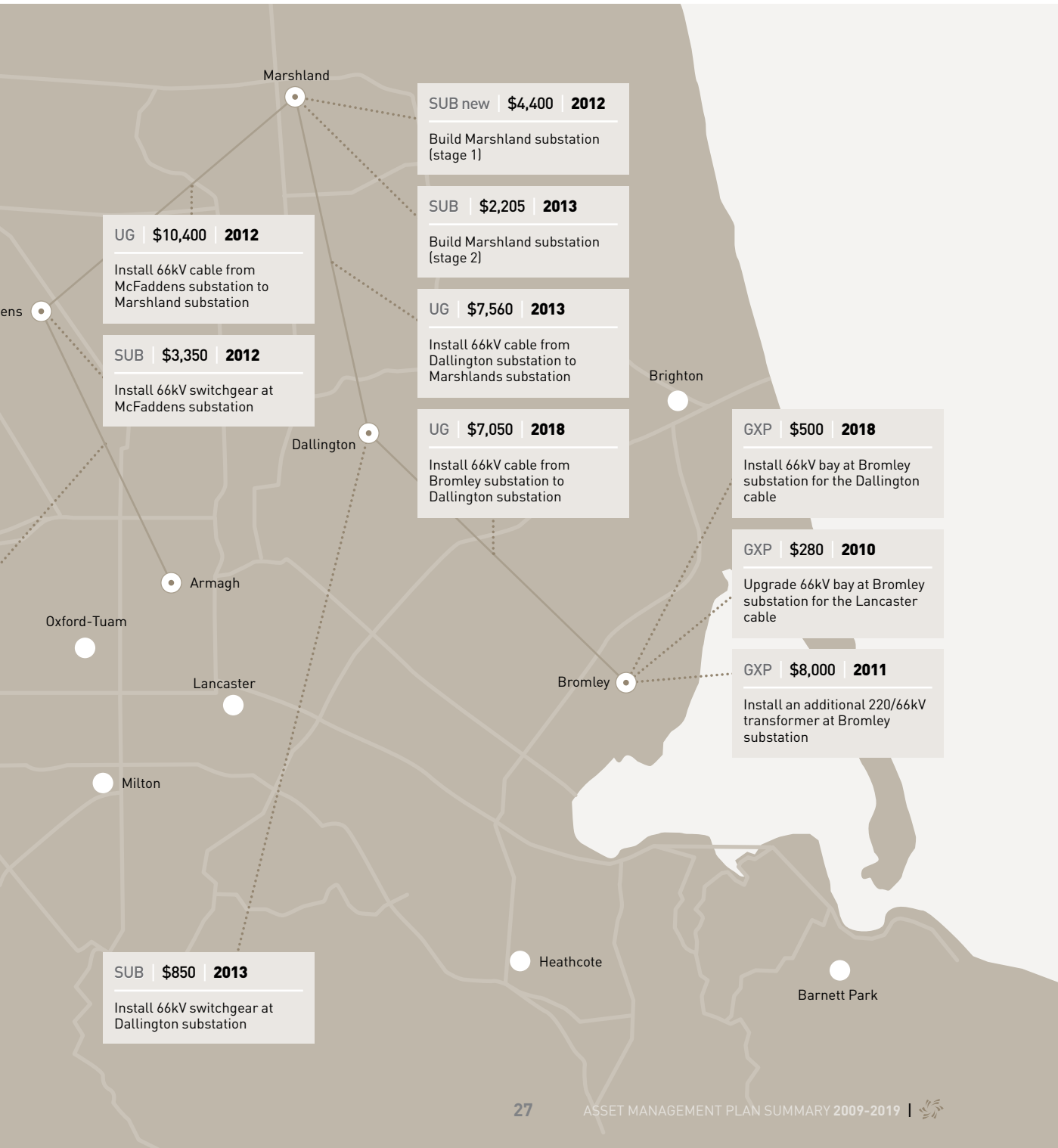
Over the next 10 years we plan to spend more than $65 million on major projects to strengthen and expand our urban electricity network. We outline planned major urban projects in the map below – more detail is available in our full AMP.



SUB	Substation	UG	Underground
OH	Overhead	GXP	Grid exit point

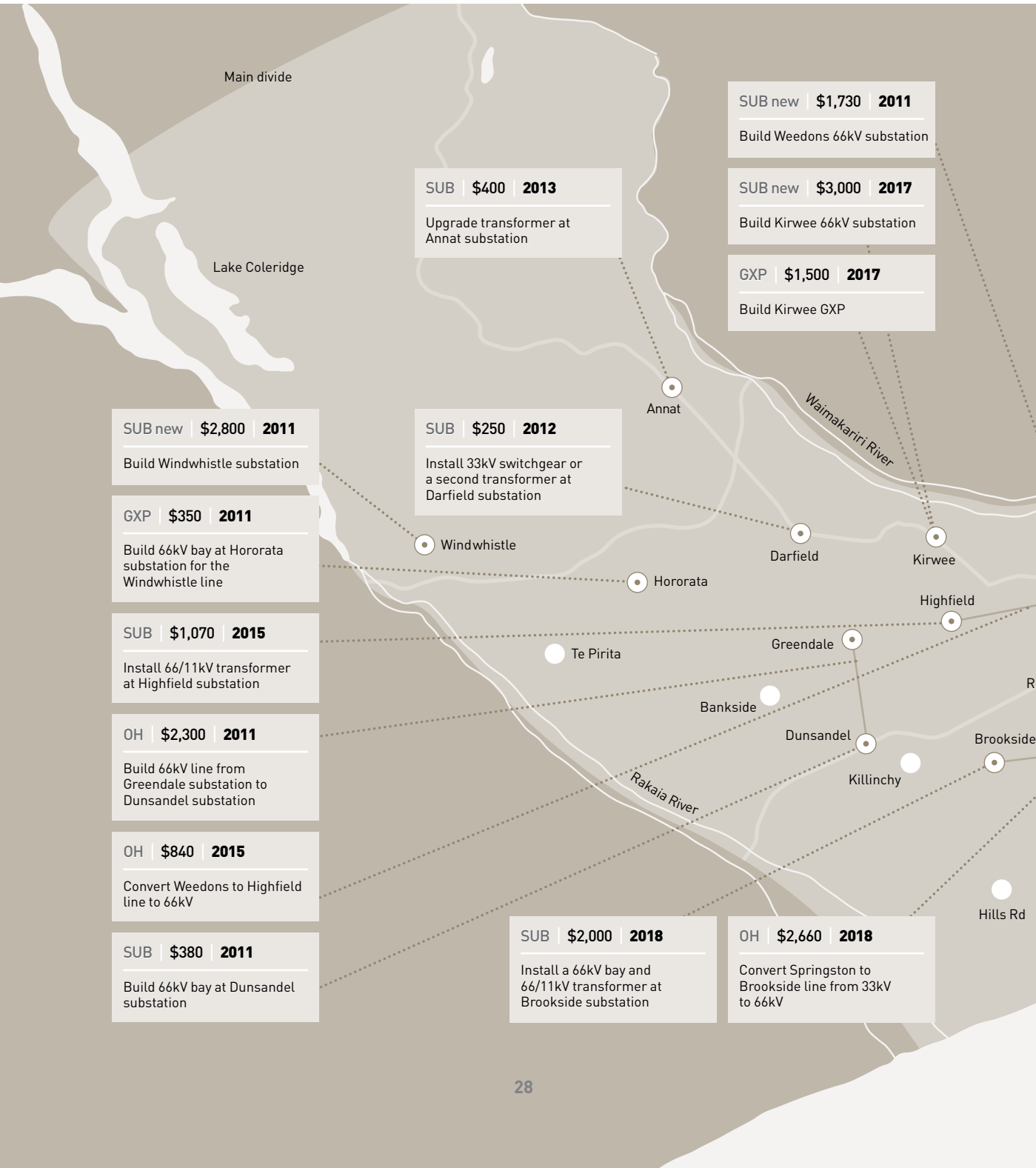
Locations marked on the map refer to Orion substations.

All figures are in $000, and the year indicated for completion of a project ends at 31 March in each case.



Summary of major rural projects

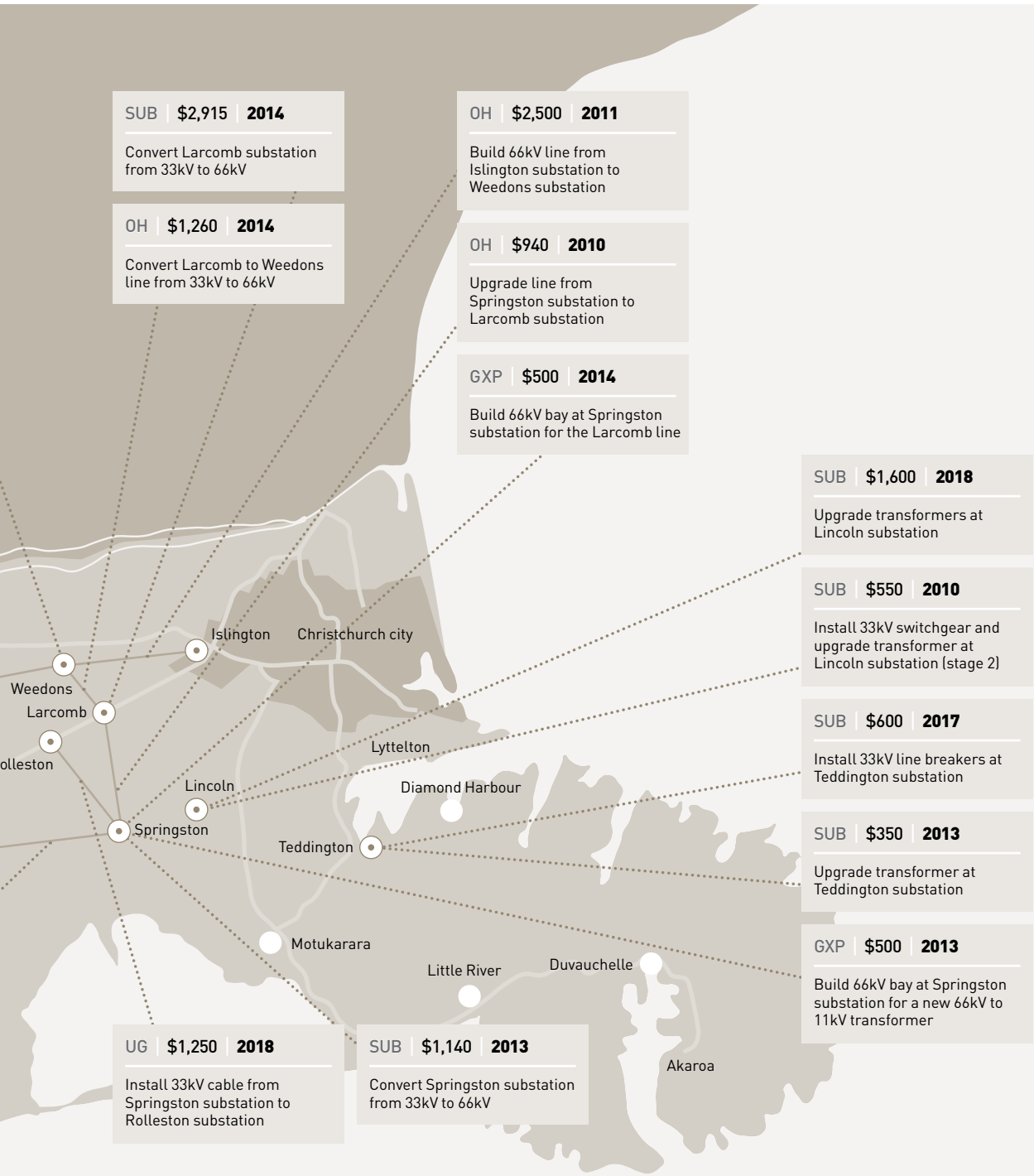
Major rural projects planned over the next 10 years are outlined in the map below – more detail is available in our full AMP. We also intend to install 15 Ground Fault Neutralisers at substations across our rural network by the end of 2011 at a total cost of $4.3m.



SUB	Substation	UG	Underground
OH	Overhead	GXP	Grid exit point

Locations marked on the map refer to Orion substations.

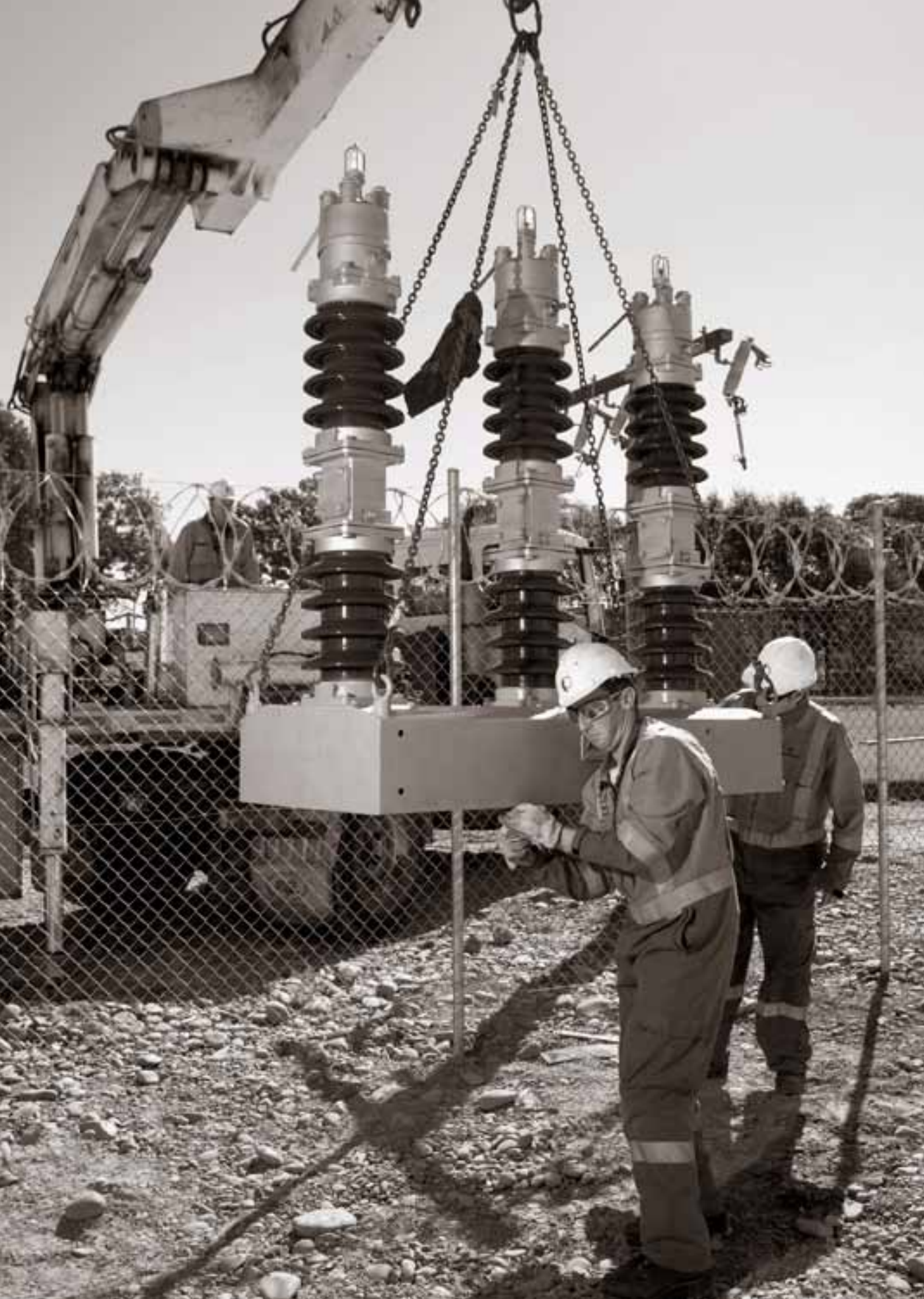
All figures are in $000, and the year indicated for completion of a project ends at 31 March in each case.



AMP outcome

One of the major outcomes we seek to achieve from our AMP is a 10-year capital investment and maintenance forecast. This year's AMP expenditure forecast is characterised by:

- Steady investment in the urban network to meet strong regional growth and the effects of the impending Environment Canterbury clean air plan.
- Continued investment in rural areas to meet strong residential growth at Rolleston and Lincoln and dairy farming loads between the Selwyn and Rakaia rivers.
- A steady overall increase in capital expenditure in the longer term to replace network assets installed in the high electricity growth years of the 1960s which are now reaching the end of their service life. The forecast cost of this replacement may change if we adopt future monitoring and risk assessment strategies across all asset classes.
- Relatively constant investment in new connections and extensions to the network. This forecast is based on overall modest growth with pockets of higher growth in specific areas.
- The additional cost of complying with regulations.
- Material and contractor cost increases that affect our construction costs.



Glossary

CAIDI: an index which measures the average duration of interruptions to supply for customers that have experienced an interruption to supply, in a year.

Capacity utilisation: a ratio which measures the utilisation of transformers in the system. Calculated as the maximum demand experienced on an electricity network in a year divided by the transformer capacity on that network.

Conductor: includes overhead lines which can be covered (insulated) or bare (not insulated), and underground cables which are insulated.

Demand side management: control of electricity demand. It includes a broad range of tools for changing electricity load shape. Demand side measures fall into roughly two categories – those that reduce total load, and those that change load shape by shifting demand into other periods throughout the day.

Distributed generators: generators located at a home or business which are capable of generating electricity for that home or business's own use. They may also be capable of putting surplus energy back into our network.

District substation: a major building substation and/or switchyard with associated high voltage structure where voltage is transformed from 66 or 33kV to 11kV, two or more incoming 11kV feeders from a grid exit point are redistributed or a ripple injection plant is installed.

Fault: an asset failure on our network which, depending on network configuration, may cause an outage. Faults do not include electricity supply outages caused by planned events (eg. planned maintenance).

Grid exit point (GXP): a point where Orion's network is connected to Transpower's transmission network.

Harmonics (wave form distortion): a distortion to the supply voltage which can be caused by network equipment and equipment owned by customers including electric motors or even computer equipment.

High voltage: voltage exceeding 1,000 volts, generally 11,000 volts (known as 11kV).

Interruption: an electricity supply outage caused by either an unplanned event (eg. weather, trees) or a planned event (eg. planned maintenance).

Load factor: The measure of annual load factor is calculated as the average load that passes through a network divided by the maximum load experienced in a given year.

Low voltage: voltage not exceeding 1,000 volts, generally 230 or 400 volts.

Maximum demand (peak demand): the maximum demand for electricity during the course of the year.

Network substation: a building substation which is part of the 11kV network and provides protection to connected cables and overhead lines.

Outage: when supply of electricity fails.

Peak period: the ripple-signalled high pricing period for general network connections, when our network is heavily loaded.

Proven voltage complaint: a complaint from a customer concerning a disturbance to the voltage of their supply which has been proven to be caused by the distribution company.

Ripple control system: a system used to control the electrical load on the network by, for example, switching load such as domestic water heaters off, or signalling to large users that they are in a high price period (thereby encouraging them to use as little power as possible during that time).

Ripple signal: A signal injected into an electricity distribution network which a receiver can pick up and which does not affect customers' other appliances.

Rural: the rural network covers all areas other than Christchurch city and includes rural towns.

SAIDI: an index which measures the average duration of interruptions to supply that connected customers experience in a year.

SAIFI: an index which measures the average number of interruptions to supply that connected customers experience in a year.

Transformer: a device that changes voltage up to a higher voltage or down to a lower voltage.

Transpower: the state owned enterprise that operates New Zealand's transmission network. Transpower delivers electricity from generators to various networks around the country.

Urban: the urban network largely covers Christchurch city.

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