

NETWORK QUALITY REPORT

A report on the reliability of Orion's electricity distribution network **2009/10**



Orion
yourNETWORK

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
- asset management plan – a document detailing our asset replacement, reinforcement and maintenance strategies over the next 10 years
- pricing guide – a guide to help customers understand our prices and how they compare with those of other electricity distributors.

Front cover image: Orion network access coordinator Hayley Head ensures our staff and contractors have the appropriate training and skills to access the electricity distribution network. An experienced electrician, Hayley worked at the company's subsidiary Connetics for nine years before joining Orion.



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Introduction

Welcome to Orion's sixth annual network quality report, where we detail our achievements in meeting our primary goal – to provide our community with a safe and reliable supply of electricity.

2008/09 was an eventful year for the New Zealand electricity industry, with high profile issues such as lack of generation capacity, transmission constraints and asset failures dominating the news.

I'm pleased to report that, amidst concerns around network reliability and security of supply in other parts of New Zealand, our network continues to rank as one of the most reliable and efficient distribution networks in the country.

This report shows our customers, owners and stakeholders how well we've done at 'keeping the lights on'. We outline our initiatives to measure and improve our network performance and also report on Transpower's reliability in our network area, to give a full picture of electricity supply reliability and performance in central Canterbury.

Continuous investment in our network is a key focus for Orion. Last year we reported on two notable investments in new technologies to further improve our network quality and reliability – the Ground Fault Neutraliser (GFN) and a fully integrated network management system (NMS).

The GFN, which has the potential to reduce rural power cuts by 20-40%, has now been installed at five of our rural substations. We're on track to purchase and install 10 more GFN units throughout the remainder of our network over the next three years.

The supervisory control and data acquisition (SCADA) phase of our NMS project is also complete. The NMS, which will be fully operational by mid 2010, will significantly improve our ability to respond to big network emergencies, and will help us to manage assets and programme maintenance in smarter ways.

We hope you find this report informative and we welcome any comments you may have on it or any other aspect of Orion's performance. Comments can be emailed to me at roger.sutton@oriongroup.co.nz.

Roger Sutton
CHIEF EXECUTIVE OFFICER



Orion network overview

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 our 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
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 years¹ our electricity distribution network has been one of the most reliable in New Zealand and our operating costs have been 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. This involves undertaking a range of consumer studies and holding discussions with network users to define what levels of service they expect. The feedback we receive 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 just how 'reliable' it is. This information is then used to target areas for improvement. The most important reliability performance measurements are detailed in this report.

¹ To 31 March 2008. This is the latest available date to which comparisons to other networks can be made.

A summary of some of this year's performance statistics is outlined in the following table.

Key service criteria	Quality measure (per annum unless otherwise stated)	Target level of service	Level of service for the year ended 31 March 2009*	Outcome	New Zealand average (year ended 31 March 2008**)	Wellington and Auckland average (year ended 31 March 2008**)
Reliability	Faults/100km of circuit	< 11	8.7	Achieved	13.3	16.1
Reliability	SAIDI ²	< 63	62	Achieved	238	449
Reliability	SAIFI ³	< 0.76	0.60	Achieved	2.3	3.09
Reliability	CAIDI ⁴	< 83	102	Not achieved	103	145
Power quality	Non compliances	< 70	28	Achieved	Not available	Not available
* Unless otherwise stated all level of service and reliability figures used in this network quality report are based on Orion's network only. They exclude those interruptions or complaints caused by failures on the Transpower-owned transmission network.					** Latest available figures	

In the year ended 31 March 2009 we were able to operate our network to targeted levels of service, with the exception of our CAIDI⁴ measure.

A range of factors contributed to our strong reliability performance – continued network improvements throughout the year, comprehensive maintenance programmes, sound engineering practices and a year free of any severe weather events.

Our targeted service levels are based on an 'average' year of weather, not a year of unusually severe weather conditions. As a result we are unlikely to meet our targeted service levels when severe climatic events occur. For example, when a major snow storm hit Canterbury in 2006, we were unable to meet our targeted service levels for the year ended 31 March 2007.

More information about our network can be found in our publicly released asset management plan or on our website oriongroup.co.nz

² SAIDI – system average interruption duration index. This is the average total duration of electricity supply interruptions that a customer experiences in a year.

³ SAIFI – system average interruption frequency index. This is the average number of electricity supply interruptions that a customer experiences in a year.

⁴ 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.



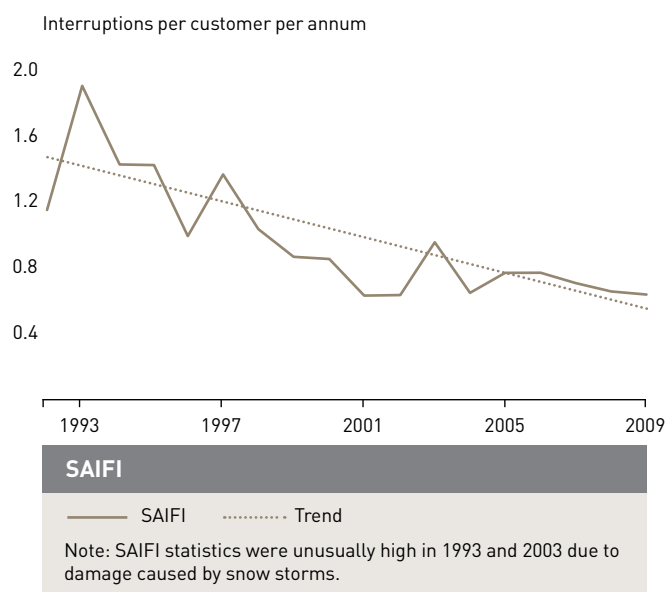
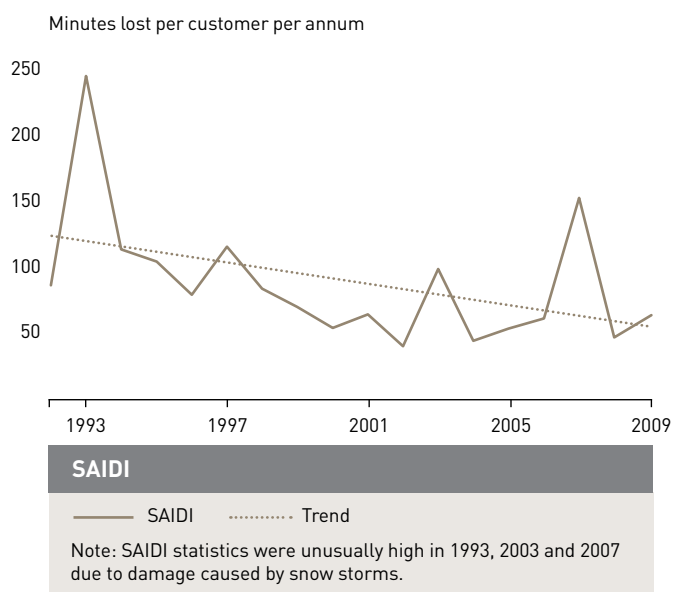
SAIDI and SAIFI

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.

As noted in the previous section, 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 an electricity network's SAIDI and SAIFI figures, rather than look at the figures for any one year.

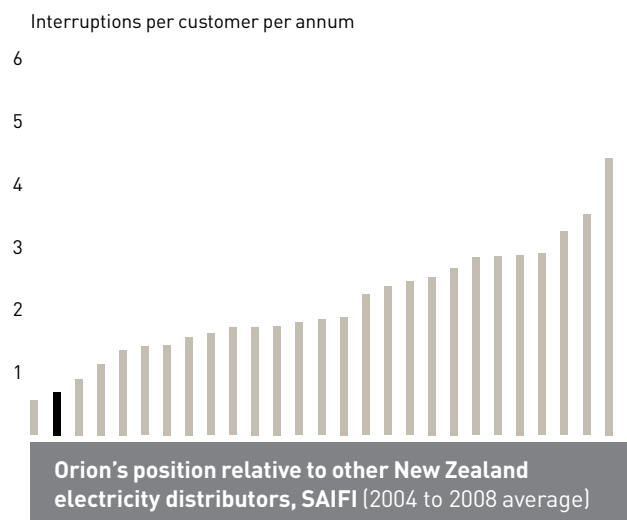
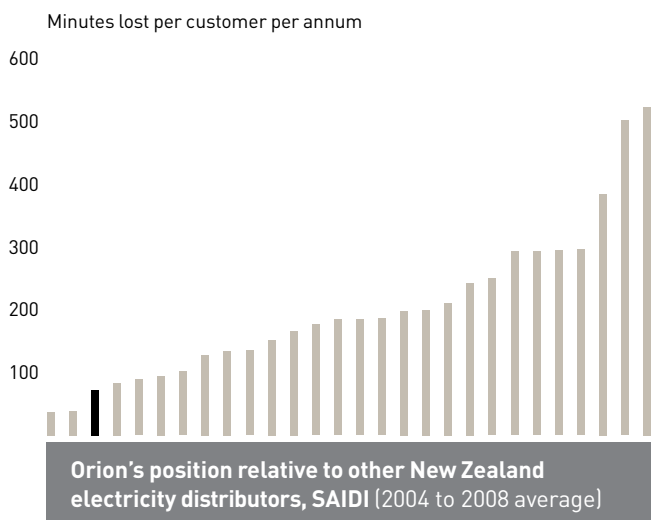
The trend of our network reliability performance figures since the early 1990s shows that we have improved our performance.



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)⁵
- second best performing New Zealand distribution company in terms of the frequency of interruptions per customer (SAIFI).

⁵ The two New Zealand network companies with superior SAIDI results to Orion's are both urban-only networks. Orion operates 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.



Internationally, Orion's network reliability also compares favourably⁶.

⁶ International comparisons are difficult to establish as different countries use different methods to calculate reliability data. For instance, Australia and the United Kingdom exclude extreme events (such as storms) from their statistics, while in the United Kingdom an outage does not officially occur until a customer's power has been off for three minutes (New Zealand regulations state one minute). For this reason international comparisons are not discussed in length in this network quality report but are available on request.

Reliability performance – urban and rural areas

Our electricity network serves areas from high-density urban to medium-density rural and remote rural countryside. Each of these areas is served by a technically different type of electricity network.

In urban areas, our electricity network is characterised by a network of 11kV 'primary' rings. These rings of 11kV (high voltage) cables connect our district substations to several hundred network substations. Network substations in turn supply power to a 'secondary' 11kV cable network which connects several thousand distribution transformers. These distribution transformers supply our low voltage network to which most Orion customers are connected.

This system is very secure as most of our urban network substations have at least two supply sources. If one source fails a network substation can still be fed from an alternate source without a break in electricity supply.

It is generally not financially viable to have two sources of electricity serving a rural area, as we do in urban areas, because of the distances involved and the number of customers affected. This means that if supply to a rural customer fails there is no other means of getting power to that customer. Interruptions in rural areas therefore generally result in the need to isolate the part of the network causing the interruption, and repair it, before power can be restored.

Underground cables vs overhead lines

About 60% of our low voltage network in Christchurch urban areas is overhead power lines, however more than 95% of Christchurch's streets have 11kV high voltage electricity cables underground. In contrast, most of our rural network is made up of 11kV overhead lines, serving diverse geographical locations including Banks Peninsula, the central Canterbury plains and the Canterbury high country.

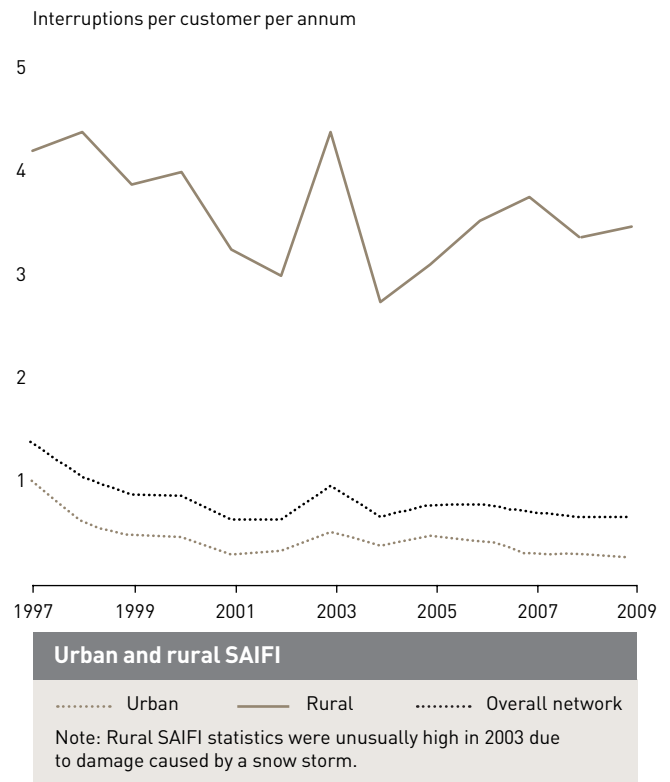
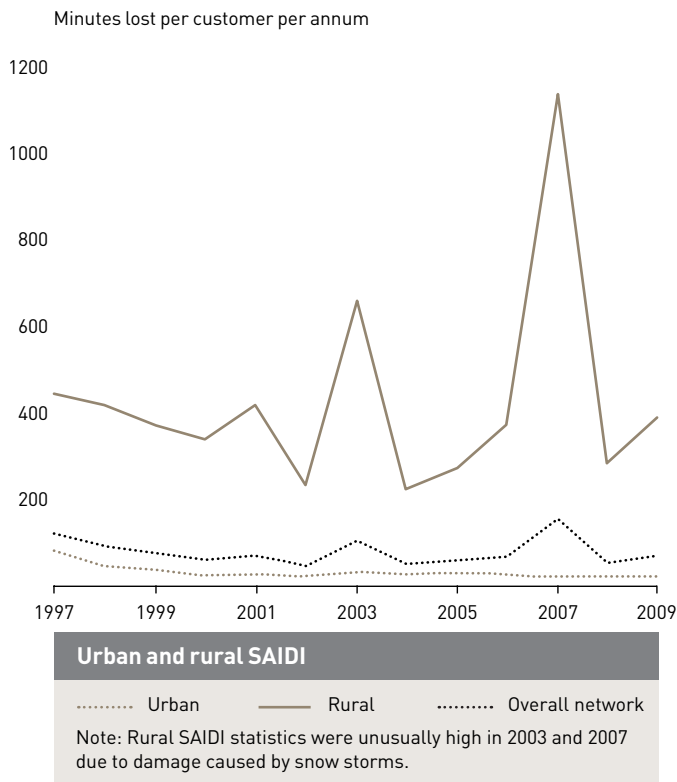
Overhead lines typically suffer more faults than underground cables because they are exposed to weather, tree and animal related damage and traffic accidents. However, when underground cables do have a fault, repairs can take much longer.

Most electricity supply interruptions on our network are caused by faults on rural 11kV overhead lines. The high proportion of 11kV underground cables in Christchurch urban areas contributes significantly to a very reliable electricity supply within the city.

However, the long circuit lengths and small customer loads typical of rural networks make it uneconomic for us to install underground cables. Revenue from rural customers is currently approximately \$25m per year. Undergrounding our rural network – at an estimated cost of \$720m – would result in very large price increases for our rural customers.

Improving rural network reliability

The overall differences in network structure mean our urban network is more reliable than our rural network. On average, rural customers experience around nine times more interruptions each year than urban customers. Each interruption typically lasts about two times the duration of an urban interruption.



Consultation with our rural customers who have large irrigation connections has shown that they are prepared to accept lower reliability in return for less upward pressure on prices. Very few rural customers are willing to pay more to improve reliability.

New technology introduced to our network will help to improve rural network reliability. In particular the Ground Fault Neutraliser (GFN), which is designed to reduce the amount of electrical arcing at the point a fault occurs on the network, has now been installed at our Darfield, Killinchy, Springston, Hills Road and Larcomb substations.

It has the potential to reduce rural power cuts by 20-40% within the next five to 10 years, while reducing the level of threat to human life and minimising the risk of fire.

We have budgeted to purchase and install 10 more GFN units throughout our network area over the next three years.

Based on national and international comparisons our urban network reliability appears to be above average, while our rural network reliability appears to be slightly below average.

We also measure the reliability of our supply to Christchurch's central business district (CBD). A reliable electricity supply is critical to the CBD given the economic impact of any electricity outage⁷. Our network supply to the CBD is very secure – several alternative sources can get power to the CBD if there is a fault somewhere on our system.

The level of reliability in Christchurch's CBD is good compared with that of Australian cities. Unfortunately New Zealand CBD figures are not available for comparison – to the best of our knowledge, Orion is the only New Zealand electricity distribution company that publicly discloses CBD reliability statistics.

	SAIDI*	SAIFI*
Christchurch CBD	5	0.14
Brisbane CBD	4	0.04
Hobart CBD	40	0.59
Melbourne CBD	7	0.13
Sydney CBD	8	0.04

* Based on latest available year figures (five-year averages are not available). Excludes transmission outages and is adjusted for extreme events in accordance with Australian reporting standards.

⁷ In 1998 the Auckland CBD experienced an electricity outage that lasted for almost six weeks. Economic studies of that outage estimate the long term economic costs to be equivalent to 0.1-0.3% of New Zealand's gross domestic product, or approximately \$150-\$450 million. 400 businesses are estimated to have failed as a result of the Auckland outage.

Transpower's reliability in Orion's network area

Transpower is the state-owned enterprise responsible for transmitting electricity produced by generators. It operates the national grid of high voltage power lines and pylons that connects to power stations to send electricity around the country.

Transpower's transmission network delivers electricity to Orion's network via the 10 grid exit points (GXPs) listed in the table below. We then deliver that electricity to homes and businesses in our region. While we have no direct control over the configuration or reliability of Transpower's network in our area, we work closely with Transpower to ensure the transmission network provides appropriate levels of service to our customers.

Transpower SAIDI and SAIFI in the Orion network area (year ended 31 March 2009)					
Transpower grid exit point (GXP)		SAIDI (minutes lost per customer per annum)		SAIFI (interruptions per customer per annum)	
		average ⁸	2008/09 ⁹	average	2008/09
Addington	66kV	0	0	0	0
	11kV	5.4	0	0.2	0
Arthur's Pass		515.8	4	5.6	1
Bromley	66kV	0	1.89	0	0.31
	11kV	0	0	0	0
Castle Hill		707	13	5.2	3
Coleridge		364.6	0	1	0
Hororata	66kV	15.4	57	0.2	1
	33kV	16.6	25.6	0.4	1.49
Islington	66kV	0	0	0	0
	33kV	8.6	0	0.4	0
Middleton		0	0	0	0
Papanui	66kV	0	0	0	0
	11kV	0	0	0	0
Springston	66kV	0	0	0	0
	33kV	19.6	0	0.6	0

The SAIDI and SAIFI results above show that Transpower's supply to major points on our network is very good. Last year Transpower transmission network outages affected less than 10% of our customers, with a very brief partial outage at the Bromley 66kV GXP causing disruption to the greatest number of customers (12,724).

In the five years to 31 March 2009, transmission network outages in our area caused only 15% of the total number of interruptions, while less than 6% of the total minutes lost by customers were the result of problems on the transmission network.

We anticipate that the remote rural GXPs at Arthur's Pass, Castle Hill and Coleridge will continue to be less reliable, as the overhead transmission lines in those areas are exposed to severe weather in difficult terrain. We will continue to work with Transpower to look for new technologies and economically appropriate solutions for those remote areas.

⁸ Five-year average to June 2008, based on latest available figures from Transpower.

⁹ To year ended 31 March 2009, based on Orion's records of recent outages.

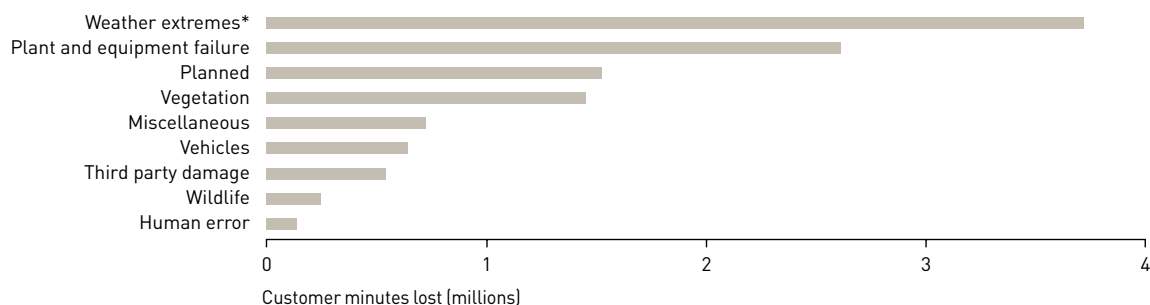


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Causes of supply interruptions

No electricity supply system is perfect. Periodic loss of supply can be caused by circumstances beyond a power company's control (such as wind, snow, equipment failure, traffic incidents or a shortfall in power generation), or by planned events when the electricity distribution company turns the power off for a purpose.

Most interruptions are caused by severe weather, plant and equipment failure and problems created by trees.



Causes of interruptions on Orion's network (2000 to 2009 average)

* includes interruptions caused by trees that fall onto power lines due to very high winds, severe snow storms etc.

Over the last decade improved maintenance programmes and techniques have significantly reduced the impact of planned interruptions. We regularly inspect assets and identify risks before they become a problem, which allows us time to minimise or remove the risk of failure.

Improved techniques include our 'corona camera' – a useful tool that detects defective equipment on the network that would be missed by both the naked eye and other commonly used inspection techniques. On our overhead high voltage network, the camera has occasionally revealed extreme corona discharge on insulators, identifying them for urgent and immediate replacement.

We have also improved our programme to prioritise when we refurbish and replace assets such as cable joints, transformers, switchgear and poles.

Additional performance benefits have been achieved by shortening existing 'feeders' when new district substations have been installed. Shorter feeder lines mean fewer customers are affected by any one outage unless the number of customers on that line increases dramatically.

When an interruption occurs, our website oriongroup.co.nz displays details on that interruption including what area is affected, the reason for the interruption and an estimated length of time before power supply will be restored. This information can also be obtained by calling Orion on 03 363 9898.

Planned interruptions

We determine our maintenance priorities by following the general principle that the assets supplying the greatest number of customers receive the highest priority.

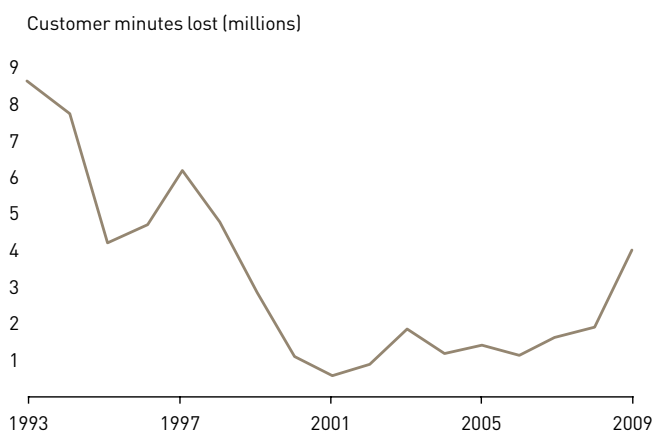
As our distribution network is hierarchical with the highest voltage at a few input points (Transpower grid exit points) and the lowest voltage at the many output points (customer connections), those parts of the network that operate at higher voltage are given higher maintenance priority.

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 for roadworks. The balance of our maintenance expenditure is allocated to emergency work to keep the network in service.

Orion or an Orion authorised contractor gives affected customers at least four weekdays' notice of planned interruptions. This allows households and businesses time to prepare for loss of power supply. Often these planned interruptions are necessary to allow us to connect new customers to our network or carry out expansion work in response to growth in electricity demand.

During the year to March 2009 there were 436 planned interruptions to our network. Of these, the top 10 interruptions accounted for 25% of the total number of customer minutes lost through planned interruptions. The longest any customer was without power was just under 12 hours; an outage that affected only five customers.

Our staff and contractors carried out less 'live-line' work during the year to 31 March 2009, which increased the total number of minutes lost through planned interruptions. Maintaining lines while they are live involves an additional level of risk, and during the year our staff and contractors undertook further training and competency checks to improve the quality of our live-line work and minimise any risks.



Total minutes lost through planned interruptions

The five largest planned interruptions on the Orion network (year ended 31 March 2009)

Date	Area affected	Reason for interruption	Total customer minutes lost*	Number of customers affected	Interruption duration
21 May 2008	Motukarara	Line maintenance	149,184	259	9 hrs 36 mins
8 July 2008	Hororata	Line maintenance	146,055	321	7 hrs 35 mins
29 May 2008	Burnham	Line maintenance	145,796	287	8 hrs 28 mins
6 August 2008	Templeton-north	Reliability enhancement project	105,878	317	5 hrs 34 mins
26 Nov 2008	Wainui	New connections added	94,392	411	4 hrs 36 mins

* The 'total customer minutes lost' calculation assumes that all customers whose supply of electricity is affected by the interruption are actually affected. In reality some homes and businesses (such as farm buildings) will not be using electricity at the time of these interruptions, some people may be at work or the dwellings may be holiday homes. Interruption duration times are also based on the time taken to restore the last customer. The total customer minutes lost figure therefore overstates the actual number of minutes lost.

Unplanned faults

Electricity supply outages that cannot be predicted account for approximately 20% of our annual maintenance expenditure. These 'unplanned faults' generally result from plant and equipment failure, severe weather and trees hitting lines.

When unplanned faults occur, we aim to get the power back on as soon as possible. Orion's customer surveys show that approximately 85% of our customers consider that rapid restoration of power is important. While we appreciate that very short outages can be inconvenient, in most cases a short outage is less problematic to customers than a long supply failure.

Our use of line circuit breakers helps to reduce the effect of unpredictable events on our network. We have now completed a programme to increase the number of line circuit breakers on our rural overhead lines, and this has contributed significantly to improved reliability in rural areas.

Line circuit breakers help reduce the number of customers disrupted when there's a fault caused by lightning or other transient events, like branches hitting wires.

When these events occur line circuit breakers quickly cut off the power so that no permanent damage is caused to the line. After a few seconds, when the lightning has ended or the branch falls away, the circuit breakers switch back on and power is automatically restored. If the cause of the fault remains, the line circuit breaker 'locks-out', cutting off the supply until the cause is found and rectified.

The effects of power outages on our network have also been reduced by our commitment to install additional district substations, which mean shorter feeder lines so fewer customers are affected by any one outage. On average we have installed one new substation per year on our network since 2001 to help the network cope with increased demand.

We also continue our tree maintenance programme. Cutting trees and branches in advance reduces the probability of tree debris causing faults during storms. Trees account for 10-20% of all unplanned faults and our annual spend on tree maintenance is around \$2.2m.

In the year ended 31 March 2009, 55% of customers who experienced a fault had their power supply restored within one hour, and 92% were restored within three hours.

The following tables show the five largest unplanned faults that occurred on our urban and rural networks respectively, in the year ended 31 March 2009.

The five largest unplanned faults on the Orion urban network (year ended 31 March 2009)

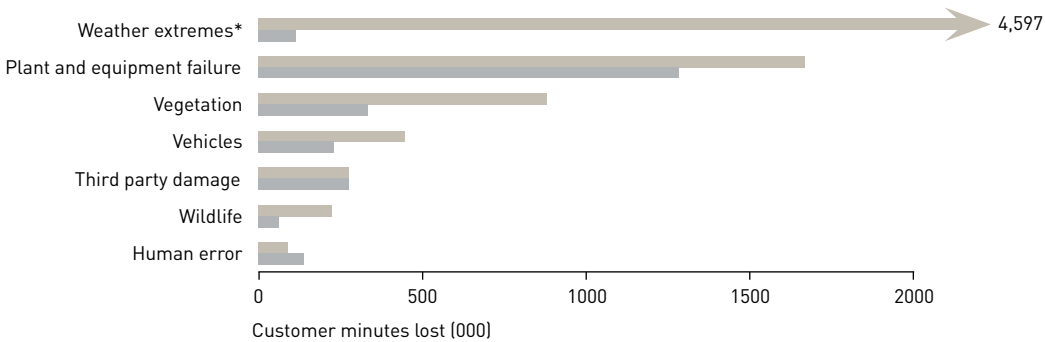
Date	Area affected	Reason for fault	Total customer minutes lost*	Number of customers affected	Fault duration*
1 April 2008	Hornby	Failed insulator	167,097	882	4 hrs 50 mins
27 Oct 2008	Harewood-east	Transformer fault	96,761	161	10 hrs 1 min
1 March 2008	Shirley-north	Probable branch in line	93,791	867	2 hrs 8 mins
18 Nov 2008	Marshland	Probable branch in line	76,795	484	3 hrs 18 mins
17 June 2008	Lower Cashmere	Failed cable joint	59,168	787	2 hrs 10 mins

* The 'total customer minutes lost' calculation assumes that all customers whose supply of electricity is affected by the fault are actually affected. In reality some homes and businesses will not be using electricity at the time of these faults, some people may be at work or the dwellings may be holiday homes. Fault duration times are also based on the time taken to restore the last customer. The total customer minutes lost figure therefore overstates the actual number of minutes lost.

The five largest unplanned faults on the Orion rural network (year ended 31 March 2009)					
Date	Area affected	Reason for fault	Total customer minutes lost*	Number of customers affected	Fault duration*
4 Jan 2009	Rolleston-south	Wire disconnected from insulator	280,908	3,468	1 hr 21 mins
27 Sept 2008	Rolleston-south	Branch in line	188,485	3,427	55 mins
12 July 2008	Leeston/Southbridge	Probable branch in line	159,819	1,927	1 hr 50 mins
9 June 2008	Little River	Protection malfunction	148,777	2,478	1 hr 10 mins
27 Sept 2008	Weedons	33kV insulator failed	117,722	2,366	3 hrs 17 mins

* The 'total customer minutes lost' calculation assumes that all customers whose supply of electricity is affected by the fault are actually affected. In reality some homes and businesses (such as farm buildings) will not be using electricity at the time of these faults, some people may be at work or the dwellings may be holiday homes. Interruption duration times are also based on the time taken to restore the last customer. The total customer minutes lost figure therefore overstates the actual number of minutes lost.

The following chart shows the causes of unplanned faults on our rural and urban networks in the year ended 31 March 2009. It shows that weather, trees and vehicles have a significantly greater effect on the rural network than the urban network. This reflects the higher proportion of overhead lines in our rural network.

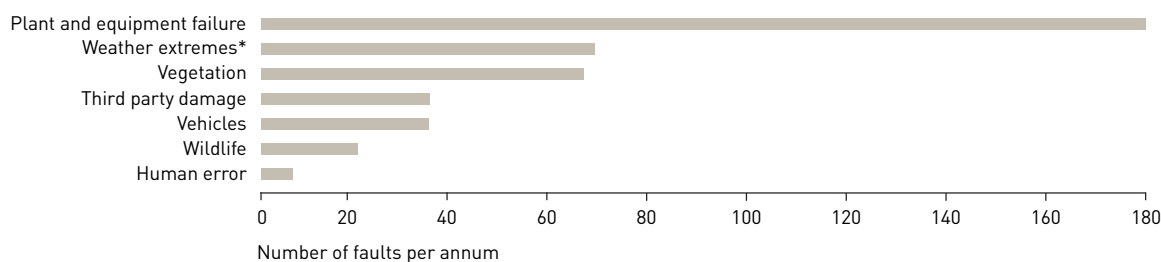


Causes of unplanned faults (2005 to 2009 average)

Legend: Rural (brown), Urban (grey)

* includes faults caused by trees that fall onto power lines due to very high winds, severe snow storms etc.

Reducing fault numbers



Causes of unplanned faults (2005 to 2009 average)

* includes faults caused by trees that fall onto power lines due to very high winds, severe snow storms etc.

Three factors cause approximately 80% of Orion's faults – plant and equipment failure, weather and trees.

Plant and equipment failure

Plant failure is always going to happen. However, certain actions can be taken to reduce the frequency of the 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 and look for ways to improve 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 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.

Weather

Strong wind, heavy rain and lightning can damage equipment and interrupt power supply. While the weather is beyond our control, we ensure we select plant and equipment that can withstand most of the vagaries of our local climate.

Unlike overhead lines, underground cables are not usually affected by weather and other environmental factors. This is why, in partnership with our local councils and roading authorities, we spent approximately \$3.5m in the year ended 31 March 2009 putting cables underground. As more overhead lines are replaced by underground cables, fault rates from weather and the environment will fall.

However, it is currently likely that the rate of 'undergrounding' in urban areas will decrease – local councils have indicated in their long term planning that other community projects should take priority over undergrounding projects.

To reduce the effects of weather on our network, we continue to install more line circuit breakers, shorten feeder lengths and replace existing bare conductors with covered conductors.

As travelling time has a significant impact on the time it takes to repair faults, particularly in rural areas, we continue to expand our network's remote control capabilities. These allow us to restore electricity supply to customers at a quicker rate.

Trees

Keeping tree branches at a safe distance from overhead lines effectively reduces the number of faults on lines.

In 2005 new tree trimming legislation came into effect that established safe distances between trees and lines, established land owners' responsibilities for keeping their trees clear of lines and clarified network companies' rights to trim trees. We expanded our tree trimming programme following this much needed law change and currently spend around \$2.2m each year on tree trimming.

We use the services of qualified arborists to ensure that tree trimming is carried out in an environmentally responsible and safe manner.

Other

Approximately 20% of unplanned interruptions are due to causes other than those described above. These include vehicle accidents, wildlife and human error. We continue to examine the reasons for these interruptions and look for ways to reduce future incidences.



Faults per 100km of circuit

We use 'faults per 100km of circuit' statistics to help determine which areas of our network require maintenance or upgrades.

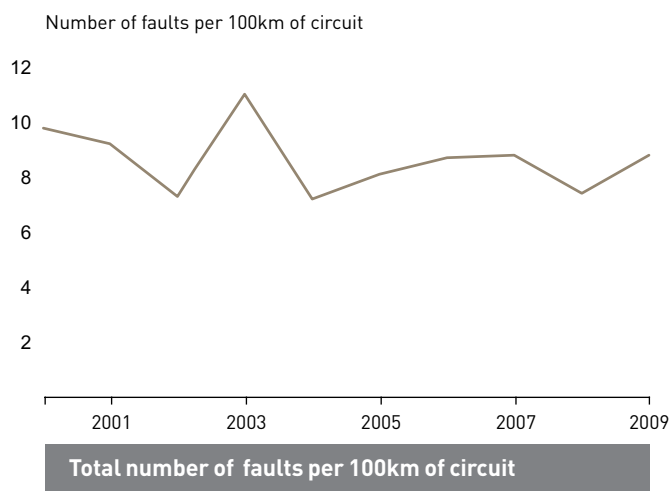
We gather these statistics each year across the following asset categories:

- 66kV, 33kV, and 11kV
- line and cable
- urban and rural.

In the year ended 31 March 2009 we achieved the following faults per 100km of circuit results.

Faults per 100km of circuit						
Voltage	Category	Length (km)	Approx % urban/rural	Urban	Rural	Total
66kV	Line	144	32/68	0.0	3.1	2.1
	Cable	63	100/0	0.0	0.0	0.0
33kV	Line	302	12/88	2.8	3.4	3.3
	Cable	25	60/40	0.0	10.0	4.0
11kV	Line	3,253	9/91	28.7	12.2	13.7
	Cable	2,190	99/1	2.1	59.4	2.6

The chart below shows our performance over the last 10 years with regard to the number of faults per 100km of circuit.



Comparisons with other New Zealand network companies (with broadly similar types of network to Orion) show that we currently perform well on this statistic¹⁰.

¹⁰ Orion has a customer density ratio of approximately 18 customers per kilometre of circuit. Three other New Zealand network companies have a customer density ratio of between 15 and 20 customers per kilometre of circuit. Of those three companies, none had better faults per 100km of circuit records than Orion in the year ended 31 March 2008 (latest available figures).

Least reliable feeders

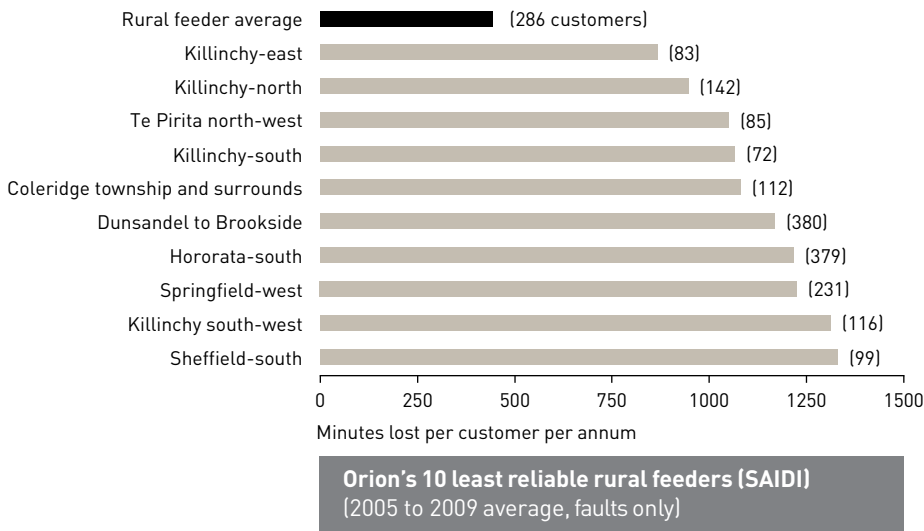
Generally speaking, a feeder is defined as a circuit that originates at a district substation and supplies several hundred households or businesses.

Orion's network has both 11kV feeders and 400 volt feeders. An 11kV feeder on our network typically serves more customers than a 400 volt feeder. Our network has 83 rural 11kV feeders and 336 urban 11kV feeders that originate at our district substations.

The 11kV feeders on our urban network perform differently from year to year. For instance, in one year an 11kV feeder in Hoon Hay may have the lowest performance, while the following year the 11kV feeder in Brighton may take its place. These changes reflect that one-off incidents, generally caused by equipment failure, dictate the performance of our urban network.

In regular customer surveys of urban and rural customers undertaken by Orion, approximately 95% of urban customers and approximately 80% of rural customers express satisfaction with the reliability of their power supply¹¹.

The 10 least reliable feeders on our rural network are shown below. Typically they are the rural feeders which are most adversely affected by storm damage.



¹¹ Margin of error in these surveys is generally 5% based on a 95% confidence interval.

Energy delivery performance

Line 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. These principles are laid out in our asset management plan.

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.

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 varying 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).

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.

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).

Power quality

To help us analyse Orion's network performance we are undertaking an initial three-year project to monitor power quality within our network, and are also working with the University of Canterbury to investigate specific power quality issues.

Power quality refers to the quality of voltage on an electricity network and is commonly determined by three factors:

- the 'steady state' level of voltage supplied to customers
- the level of 'harmonics' or distortion of the voltage of the power supply, and
- transient faults.

Steady state level of voltage

The steady state level of voltage supplied to customers has traditionally been the most common measure of power quality. As the term suggests, in 'steady state' the voltage is stable with only very small rates of change. We are required by regulation to supply power to customers within a specified range of voltage, to ensure that connected equipment will operate correctly.

'Voltage drop' naturally occurs when carrying electrical loads over cables, and this occasionally affects our customers. We monitor voltage issues and reinforce our network to maintain acceptable minimum voltage levels.

When voltage drops below minimum levels, it is generally due to unexpected increases in customers' electrical loads. The larger the load and longer the cable, the larger the voltage drop and therefore the lower the voltage at a customer's point of connection to the electricity distribution network.

Harmonics

Harmonics (wave form distortion) are often the cause of poor power quality. They distort the supply voltage, and can be caused by network components and equipment such as electrical motors and computers owned by customers.

Some equipment and appliances are affected by significant levels of harmonics. In most cases where this occurs the customer has caused the distortion themselves with their own connected equipment, usually electronic.

Harmonics and distortion within our network are increasing – a trend that is mirrored internationally. While these increases do not appear to be affecting our customers, we have seen some impacts on the equipment that monitors and controls our network.

Transient faults

Transient or momentary faults occur on Transpower's transmission network and within our distribution network, causing flickering lights and short term interruptions to power supply. We design and build our network to minimise the effects of these faults.

As customer equipment can have similar momentary impacts on our network, we limit the extent to which customers' problematic equipment can be connected.

Risk management

Risk management is integral to how we manage our electricity distribution network. We have designed our network to cope with a range of potentially damaging effects, such as:

- natural disaster
- earthquakes
- storms
- network asset failure
- contaminants entering the environment.

We recognise that risk cannot always be eliminated, as natural disasters can take various forms and differ in severity. Where risk cannot be eliminated, we use emergency training, staff competency, safe work practices, planning and network design to control the level of risk. Detailed information on our risk management is contained in our published asset management plan.

Network improvements to minimise risks

Earthquakes and storms are our network's major natural event risks, and we continue to invest significant time and money to ensure the network is protected against such events.

Over the past decade we have implemented a number of network improvements to cost-effectively minimise the overall risk to our network. We have:

- addressed communications risk at the two main communication sites serving Christchurch and surrounds – Sugarloaf and Marleys Hill. Generators now back up the primary network feed to these sites and we have replaced 'high risk' overhead supply lines with underground cable
- located an 800kVA generator in Lyttelton to mitigate any loss of power to the port
- improved security of power supply to the airport by installing a cable to allow power supply from both Harewood and Hawthornden district substations. Backup generation is also located on site
- spent approximately \$13m to install additional 66kV transmission capacity from a second point of supply, Bromley, to the central city. This cable, combined with numerous diesel generators around the city, gives the Christchurch CBD a more secure power supply than in Auckland or Wellington CBDs
- spent approximately \$5m on earthquake strengthening for bridges, cable supports and buildings. All of our district substations and all major 33kV and 66kV cables now meet a seismic structural standard. Around 98% of Orion-owned network and district substations also meet the standard.

We regularly contribute to emergency readiness programmes, and our backup control centre is located off-site so we can continue to function if anything happens to our primary control centre (located in the first floor of our head office, to avoid flood risk).

In recent years, we have reduced the risk of a major asset failure through periodic in-the-field electrical testing of equipment (partial discharge testing), replacing joints between 66kV cables (to prevent the mechanical problems that can occur when cables expand as they warm up) and introducing more ripple injection plant around the network to help reduce peak load.

Enhancement initiatives

Our network enhancement initiatives are driven by three aims – to improve reliability, improve security of supply and reduce the risk of catastrophe.

Several major projects have been identified as necessary in the next year. The four largest projects (by expenditure) are explained below. More information on each can be found in our asset management plan, available at oriongroup.co.nz

The four largest (by expenditure) projects (year to 31 March 2010)	
	\$000
Papanui 11kV switchgear – complete a project to replace Transpower’s 11kV switchgear at Papanui, and take over ownership of the equipment to reduce costs and improve efficiency. This project includes installing additional 11kV circuit breakers to provide extra capacity and security of supply for electrical load growth in Belfast and Harewood.	1,500
Springston to Larcomb conductor upgrade – increase the size of the 33kV overhead conductor between Transpower’s Springston grid exit point and the new Larcomb substation located between Weedons and Rolleston. This will enable us to maintain security of supply in the area as Rolleston township grows. As part of this project we will upgrade insulators to 66kV, enabling increased capacity and security of supply to the area in 2014 when the network will operate at 66kV.	940
Ground Fault Neutraliser – install five of these systems at the Duvauchelle, Rolleston, Lincoln, Brookside and Hororata substations. This project is expected to improve reliability of supply by 20% to Akaroa, Rolleston, Lincoln, Dunsandel, Doyleston, Irwell, Hororata and Coalgate. We intend to install more Ground Fault Neutralisers on our rural network between 2010 and 2013.	1,500
Network management system – implement this system in three steps: replace our Foxboro SCADA system with a GE ENMAC SCADA system (completed May 2009); introduce a computer-based distribution network management system to replace the existing control room wall map (October 2009), and implement an integrated outage management module (April 2010). Project to cost \$3.7m over three years.	900
	4,840

In addition, we will spend \$26.7m in the next year on other capital expenditure projects to connect new customers, reinforce the network and replace ageing equipment. We will also spend over \$23m on maintenance. More information on our capital expenditure and maintenance plans can be found in our asset management plan.

A summary of the expenditure forecast to be spent on capital and maintenance over the next five years is shown below. No provision for inflation has been made in the figures.

Summary of forecast expenditure (\$m)					
Year ending 31 March	2010	2011	2012	2013	2014
Capital expenditure	30.7	41.9	47.7	43.0	42.8
Maintenance expenses	23.4	25.1	25.1	25.1	23.5

Our investment and maintenance expenditure is characterised by:

- increased expenditure in Christchurch city – due to urban growth/infill and Environment Canterbury’s clean air plan
- steady medium term investment in rural areas – to meet increasing irrigation load and housing developments in Rolleston and Lincoln
- increased capital expenditure in the longer term – to replace assets installed during the growth bulge of the 1960s which are now reaching the end of their service life
- general increase in the cost of maintenance (often above the rate of inflation) – mostly due to increasing compliance costs (particularly in relation to working on roads and safety) and increased consultation requirements (in relation to land access and equipment location)
- specific maintenance provisions for the replacement of older oil-filled cable joints
- increased building substation maintenance costs – due to increases in insurance premiums, graffiti removal and other items.

Orion’s highest priority remains the continued cost-effective improvement of our network performance.

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.

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

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 electricity supply outage caused by an unplanned event (eg. weather, trees). Faults do not include electricity supply outages caused by planned events (eg. planned maintenance).

Feeder: a physical grouping of conductors that originate at a district substation and supply a number of customers.

Grid exit point: 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).

Line circuit breaker: a device which quickly cuts off power to a line after a fault so that no permanent damage is caused to the line. It switches power back on to the line after a few seconds if the cause of the fault has gone (eg. a branch has blown off a line).

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

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

Network deliveries: total energy supplied to our network through Transpower's grid exit points. Usually measured as energy supplied over the course of a 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.

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).

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.

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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