ASSET MANAGEMENT PLAN
2005-2015

TABLE OF CONTENTS

TPCL ASSET MANAGEMENT PLAN

(A) SUMMARY OF ASSET MANAGEMENT PLAN

(i) Purpose of the Plan

The Asset Management Plan is intended to demonstrate responsible stewardship of assets by PowerNet Limited on behalf of The Power Company Limited and the latter's customers and other stakeholders. The purpose of the plan is to provide a systematic approach to asset management which is intended to ensure that the condition and performance of the shareholder's network assets are being maintained, utilised and extended to meet all safety, legislative and stakeholders' requirements in the most cost effective manner.

(ii) Date and Period of Plan

This Asset Management Plan is dated 29 June 2005 and is for the period 1 April 2005 to 31 March 2015. It is intended that this document is reviewed annually as a precursor to the preparation of the Annual Business Plan. The plan will be published on the web site and as part of the consultation procedure, submissions will be invited from all stakeholders prior to the next review process commencing at the end of 2005 with publication in June 2006.

(iii) Asset Management Systems, Processes and Information

Asset management systems in PowerNet include the Intergraph G/Frame Geographic Information System (GIS) databases, reliability databases, loadflow analysis software, SCADA, Finance 1 accounting package, WASP Asset and Maintenance Management System and UMS Optimisation tool.

(iv) Network and Asset Description

The Power Company Limited network mainly supplies a large rural area but includes some of the outer suburbs of Invercargill, the townships of Gore, Te Anau and Winton, and other smaller townships throughout Southland and West Otago.

There is approximately 357km of 66kV network, 471km of 33kV network and 7,686km of 11kV and 400V network.

The network is supplied through four Transpower Grid Exit Points (GXP's) and there are 33 zone substations and approximately 9,800 distribution transformers. There are a total of 32,000 ICPs which gives a density of 3.76 Installation Control Points (ICPs) per kilometre of line.

There is one significant embedded hydro generation facility (6.6MW) located at Monowai.

There is a good degree of interconnection at the subtransmission level between zone substations. There are, however, two substations supplied by radial feeders which have limited 11kV backup: Orawia (supplying Tuatapere) and Tokanui. All zone substations have duplicated equipment or a limited level of distribution system backup.

There are a total of five ripple injection plants, four located at the Transpower GXP's injecting at 33kV and the fifth at Winton Substation injecting at 66kV.

(v) Service Level Objectives

Consultation has taken place with different customer groups to ascertain whether the network reliability and system security policies are meeting their requirements. The result of this consultation confirmed the current policies with the proviso that the company should continue to meet the local customer requirements rather than seek to comply with the regulatory thresholds. This point addresses the conflict between the importance of the commercial interests of the community (e.g. restoring supply to a freezing works or a group of dairy farms) and regulatory compliance (e.g. restoring supply to a small township).

Although reliability statistics vary each year, the 10-year objective for The Power Company Limited network is to establish a decreasing trend to achieve an overall figure of equal to or less than 5.00 faults per 100 circuit kilometres (excluding major storms). The current level is 4.91 faults per 100 kilometres. This improvement in reliability is contingent on the price constraint by the Commerce Commission.

The current CAIDI index for network faults is 41 minutes. Over the 10-year period the objective is to achieve an average figure of less than 43.5 minutes (excluding major storms).

The equivalent SAIFI is 3.11 and the objective is to achieve an average figure of less than 3.37 during the next 10 years.

If the above can be achieved it will result in a SAIDI for network faults of 147 minutes compared to the current level of 117.8 minutes.

These figures compare favourably with other similar networks, will maintain the present levels of reliability continue to meet the customers' requirements and will comply with the regulatory thresholds.

The Company is optimistic that this can be achieved but it would be subject to regulatory controls on expenditure.

(vi) Life Cycle Asset Management

Asset maintenance management is condition-driven determined from diagnostic testing, visual inspections, fault incidents and technological, safety and operational obsolescence. Therefore assets are not replaced by age alone; they remain in service until they become uneconomic to repair or violate service level requirements.

The basis for the condition-driven maintenance originates from the ongoing surveys by the contractors and staff.

Diagnostic testing includes dissolved gas analysis of power transformers, ultrasonic and partial discharge testing of high voltage equipment and infrared surveys.

Maintenance budgets average approximately 1.0% of replacement value of the assets ($425 million) or 2.0% of the depreciated replacement value ($219 million).

Localised load growth, customer requirements, risk management, asset economic lives and regulatory and PowerNet Network Standard compliance are all inputs into the future works programmes.

(vii) Risk Assessment

The reticulation network covers a large area of the southern part of the South Island of New Zealand. Floods and severe storms tend to be localised and so the risk of catastrophic devastation is small.

The main risks to reliability are associated with the 11kV switchboards in zone substations, failure of the North Makarewa to Winton 66kV line, failure of one of the Transpower 220/33kV transformers at Invercargill and a large local earthquake.

The western area including Te Anau is now reliant on two 33/66kV transformers. Although this is (n-1) security, a failure of one unit would result in the reduction to "n" security for a prolonged period as these units are unique to Southland.

Other risks to the business include technology changes, increased embedded generation inside the network, significant load pattern changes either by customer group or throughout the network, regulatory changes and finally economic changes.

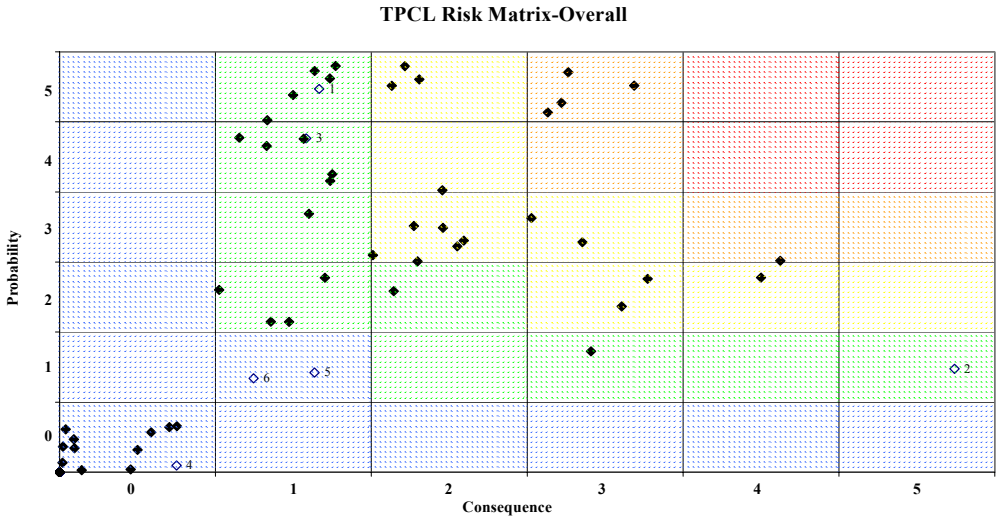
Changes in technology normally improve cost effectiveness of the network but can also impact on utilisation and hence load duration curves. There is growing evidence of significant irrigation schemes being planned for northern Southland during the next few years.

Planning is underway to determine the capability of the network to accommodate at least one significant embedded wind generation facility. There is an increased probability of large scale embedded wind generation being established in Southland that will have a significant impact on this network over the next 10 years.

All projections have also been based on no significant changes with respect to the local economy or load pattern changes of a general nature.

Impact of the proposed 2013 legislation terminating the obligation to supply has not been considered in this Asset Management Plan.

Risk assessment is also a key part of the spend optimisation process and the matrix from the model is shown below:



The vertical axis is "probability" and the horizontal axis is "consequence". There are five projects considered high risk scenarios to be addressed on the network.

(viii) Performance and Improvement Plans

Plans to improve performance are not only based on increased capital investment in network security and reliability, but also include optimising existing asset utilisation, better targeted maintenance, vegetation control and increased live line working.

Network performance incentives are included in maintenance and faults contracts that reflect the Customer Charter guarantees in the Use of System Agreements.

(B) BACKGROUND AND OBJECTIVES

(i) Interaction with Other Corporate Goals, Business Planning Processes and Other Plans and Drivers

The Asset Management Plan is used as a basis for the Annual Business Plan.

All planning is coordinated with the Company's Statement of Corporate Intent, Vision Statement, Key Performance Indicators and Goals and Strategies. These are all reviewed and approved by the Board on an annual basis.

The Corporate Objectives for the Company are listed as follows:

(a) The Company intends to manage its operations in a progressive and commercial manner.
(b) Undertake new investments, which are:
- Within the core business, and
- Yielding an acceptable return for the degree of risk
- Undertaken in a manor which will maximise the commercial value of the business
- Strive to become an efficient and effective operation within the electricity industry provide its customers with competitive prices and above average levels of service.

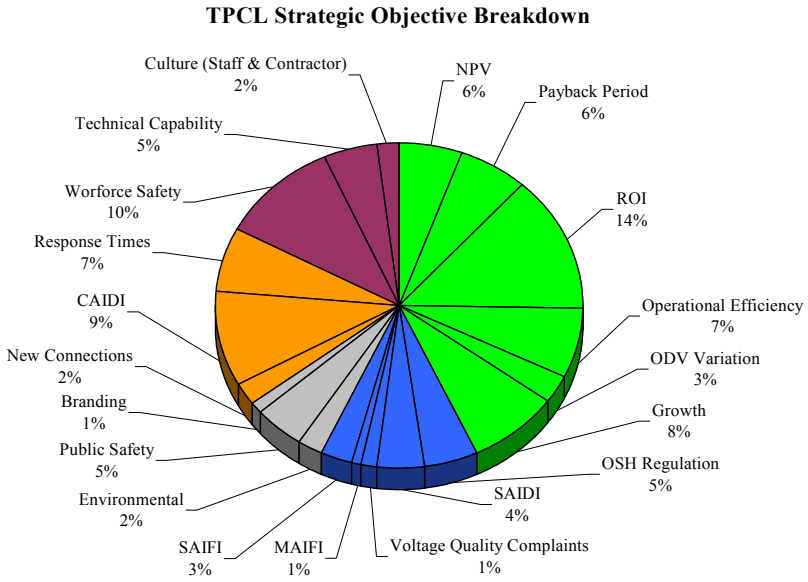
These objectives are used as drivers within the Asset Management Plan process with all work evaluated against the above criteria with the appropriate projects being undertaken.

Requirements of the Asset Management Plan are also incorporated into the PowerNet Quality System (ISO 9001:2000) procedures.

The drivers for the Asset Management Plan are as follows:

(a) Regulations – includes changes to ODV practice, prices and performance.
(b) The maintenance of or improvements in reliability and supply security to meet compliance with stated objectives and customer requirements.
(c) Variations in demand on the network.
(d) The quality of supply – ensuring voltage and harmonic levels are within prescribed limits.
(e) Economic efficiency – ensuring there is a correct balance between asset maintenance and renewal, network losses and capital investment, and network capacity and utilisation.
(f) Public and staff safety – design and maintenance will maintain or enhance public and staff safety.
(g) Environmental responsibility – maintenance and capital development projects will be subject to cognisance of environmental considerations.
(h) Rate of return.

The strategic objectives weightings for TPCL as determined by the Directors are shown below:



(ii) Planning Period

The Asset Management Plan is based on a 10 year period even though the life cycle of some assets is over 60 years. Criteria are also imputed into the Optimisation Tool, which is used to evaluate all capital expenditure to ensure that the project meets the business criteria.

Each asset category has a different life cycle with some assets having expected ages of over 60 years as such each asset category is evaluated against its appropriate maximum age over this period.

(iii) Stakeholder Interests

The principal stakeholders in the performance of the network assets are the end-use customers, the shareholder, i.e. the Southland Electric Power Supply Consumer Trust, the electricity retailers and PowerNet.

Other stakeholders indirectly involved with the management of the assets are the suppliers such as Transpower, contractors, and equipment and service providers.

The interests of stakeholders are taken into account by the following methods:

(a) End Use Customers – Achieved through the Trustees' representation and surveys undertaken by an external consultant.
(b) Discussion Forums and Presentations are made to interest groups by Management.
(c) Shareholders – Shareholders are represented by Directors in the Company and input from Shareholders is received by setting the criteria in the optimisation tool for evaluating projects and for approving the Annual Business Plans.
(d) Retailers – Discussion on the Use of System Agreement.
(e) Transpower New Zealand Limited – Through the Transpower Connection Contract.
(f) Contractors – input is received from these on the work that they deem necessary to meet their service level requirements.
(g) Suppliers – A contract is held with the main supplier being MasterTrade Limited. With discussions on equipment standards and equipment held in stock.

(iv) Accountabilities and Responsibilities for Asset Management

The ultimate responsibility for the management of the Company's assets lies with the Directors who are appointed by the Trustees who are in turn elected by the consumers.

The day-to-day management of the network is contracted to PowerNet Limited, a joint venture network management company whose co-owner is Electricity Invercargill Limited.

(v) Asset Management Systems and Processes

The principal systems used for the management of these assets are:

(a) The Intergraph GIS system which records the location, construction details, condition and any changes to the network assets.

The databases associated with this system include the attributes of every pole which are also separately identified on plans and physically in the field.

Loadflow and losses analyses use GIS data.

(b) The SCADA system improves the operational efficiency and safety of the network. This system provides information on loads, faults and other operations to the System Control room staff and expedites supply restoration through remote switching capability etc.

(c) The Faults and Outage databases which are linked to a network model and provide reliability analyses.

(d) The WASP Maintenance Management System that holds maintenance records and databases pertaining to individual pieces of equipment.

(e) Diagnostic testing, such as infrared and partial discharge, and records of visual inspections of equipment.

(f) Vegetation database linked to the GIS, which provides information on the proximity of vegetation to lines.

(g) Condition driven maintenance surveys, with information being fed back into GIS or the WASP system.

(h) ODRC analysis used for the preparation of the ODV.

(i) The UMS Spend Optimisation tool that will ensure expenditure is targeted at work that will support the strategic objectives of The Power Company.

Asset Management processes are managed via the PowerNet Quality Management System with the following procedures in the system:

- PNM-105 Maintenance Planning
- PNM-113 Network Development

These systems are quality audited by Telarc New Zealand Limited and managed by PowerNet Limited.

(C) DETAILS OF ASSETS COVERED

(i) Current Network Configuration

Transpower Points of Supply[1]

The points of supply for The Power Company Network are based at North Makarewa, Invercargill, Gore and Edendale. North Makarewa and Invercargill are supplied via the 220kV grid through 2 x 30/60 MVA and 2 x 50 MVA transformers respectively.

At Invercargill there is a 220/110kV inter-connecting bank which supplies Edendale and north at 110kV.

Gore is supplied at 110kV from Roxburgh or from Halfway Bush via Berwick and Balclutha. There is a 2 x 30MVA transformer capacity (110/33kV) at Gore.

There is also a Transpower 110kV line connecting Invercargill and Gore through Edendale and Brydone.

At Edendale there are two 110/33kV 30MVA transformers.

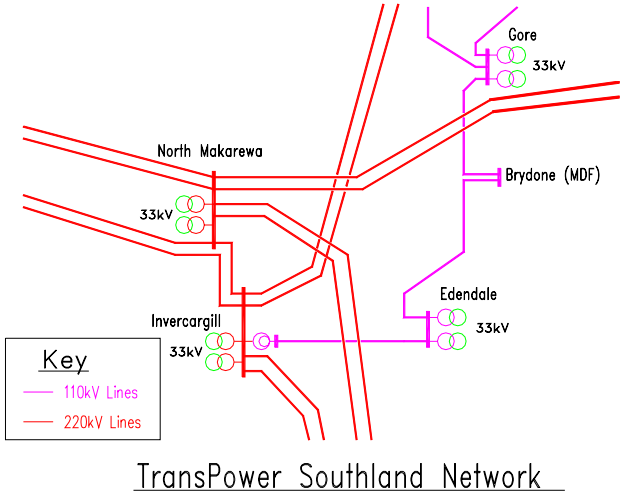
The Brydone substation only provides an exclusive supply to the Rayonier MDF Plant.

Supply security from Transpower is becoming marginal, with both Invercargill and Gore GXP's maximum demands projected to exceed the firm capacity[2] by the end of the planning period.

Since the Transpower Brydone point of supply was established, Transpower can only supply a limited capacity through the 110kV system from Roxburgh if the 220/110kV transformer bank at Invercargill is out of service through either a fault or maintenance.

There is a constraint on the grid limiting significant new load development in Southland. The constraint will not allow new loads in excess of 20MVA to be established as the grid at capacity if low lake levels or other reasons preclude generation from Manapouri.

The drawing shows the Transpower grid in Southland.

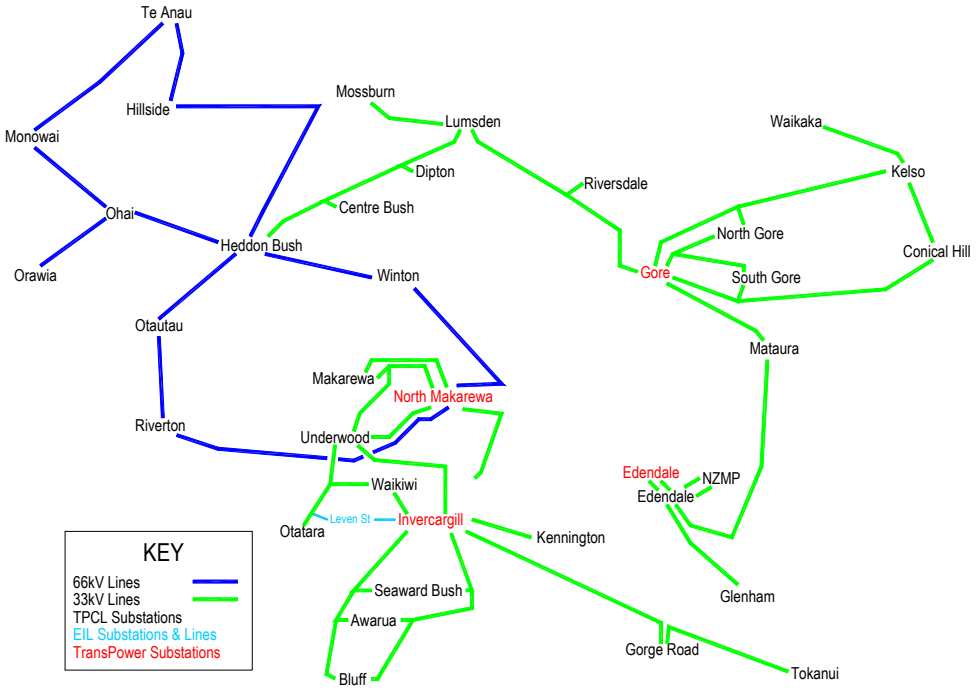


[1] Also known as Grid Supply Point (GXP)
[2] Firm capacity is when the capacity that can be supplied by a single transformer, with the other transformer disconnected, due either to a fault or for maintenance.

Subtransmission

The Power Company subtransmission network is supplied by the Transpower points of supply at North Makarewa, Invercargill, Gore, Edendale and the Pioneer Generation owned embedded Monowai power station.

The drawings show The Power Company Subtransmission system on a geographical and schematic basis.



North Makarewa

The area supplied through the North Makarewa point of supply is the western part of Southland and is supplied at 66kV and 33kV from North Makarewa.

At present it is operated as two 66kV rings. The south ring is from North Makarewa to Winton, Heddon Bush, Otautau and Riverton. The north ring starts at Heddon Bush and links Ohai, Monowai, Te Anau and Hillside.

The protection is designed to operate to disconnect any faulty section of the 66kV ring without loss of supply to customers.

At Heddon Bush, there is a 66/33kV transformer bank, which then supplies a 33kV line through Centre Bush and Dipton to Lumsden.

From Ohai there is a 66kV spur to Orawia just outside Tuatapere. Backup to the area supplied by Orawia is through the distribution network using portable regulators.

There is also a 33kV link from Gore through Riversdale to Lumsden. The link is of limited capacity, but during the shutdowns the Lumsden, Mossburn, Dipton and Centre Bush substations can be supplied directly from Gore.

The 33kV North Makarewa lines provide parallel lines to both Makarewa and Underwood and alternative supply to Waikiwi and into the Electricity Invercargill Limited Leven Street Substation.

Gore

The area supplied from the Transpower Gore point of supply includes the area through to Lumsden, Western Otago and the areas of Southland east of and including Mataura.

The areas north of Gore are supplied by a 33kV line through Riversdale and Lumsden. The security for these areas is the 33kV line from Western Southland through Lumsden.

In the east there is a 33kV ring through Kelso and Conical Hill substations which provides satisfactory security under most conditions. Included in the above ring are the North Gore and South Gore zone substations, both with adequate security. Supplied by a single line from Kelso is the Waikaka zone substation.

To the south there is a 33kV line to Mataura. The security for Mataura is provided by an alternative 33kV line from the Transpower Edendale point of supply.

Edendale

The area supplied from Edendale includes the local distribution network and a 33kV line to Glenham.

There is only a single line to Glenham, the security being provided through the distribution network utilising portable regulators.

The local supply has full redundancy and also includes the New Zealand Dairy Products Edendale Plant.

The 33kV line from Edendale to Mataura provides the required security for Mataura.

Invercargill

In the south there is a Transpower grid supply point at Invercargill.

The subtransmission system is all 33kV and comprises of parallel lines to Bluff, Seaward Bush and Awarua while Invercargill provides an alternative to Underwood.

The zone substations at Kennington, Gorge Road and Tokanui are supplied by single circuit radial lines. Backup security is through the distribution network using portable regulators.

The supply to Otatara has two routes, one via Waikiwi and the second through the Electricity Invercargill Limited Leven Street Substation.

Distribution

The 11kV distribution network has a high degree of interconnection between zone substations.

There are two significant radial lines, the first from Lumsden to Kingston and the other from Riversdale to Waikaia.

(ii) Current Supply Security

The summary of the supply security for the various zone substations and customers supplied from them is shown on the table below.

The table shows that the supply security for four zone substations does not meet the network design standard.

TPCL Network Supply Security

Zone Substation	Maximum Demand MVA	Security Rating Required	Present Security Rating		Notes	2015 Required Security Rating
Awarua	2.6	A(i)	A(i)			AA
Bluff	6.1	AA	**A(ii)**	-	Load transfer required	AA
Centre Bush	2.8	A(i)	A(i)			A(i)
Conical Hill	4.5	A(i)	AA			AA
Dipton	0.6	A(i)	A(i)			A(i)
Edendale NZMP	13.1	AAA	AAA			AAA
Edendale	5.5	AA	**AAA**	+	NZMP Aux. Plant	AA
Glenham	1.2	A(i)	A(i)			A(i)
Gorge Road	1.5	A(i)	A(i)			A(i)
Hillside	0.7	A(ii)	A(i)			A(i)
Kelso	4.2	A(i)	A(i)			A(i)
Kennington	3.5	A(i)	**A(ii)**	-	Need regulator	A(i)
Lumsden	2.8	A(i)	A(i)			A(i)
Makarewa	4.8	A(i)	AA			AA
Mataura	8.2	AA	AA			AA
Monowai	0.2	A(ii)	A(ii)			A(ii)
Mossburn	1.2	A(i)	A(i)		Low Voltage if from Gore	A(i)
North Gore	7.7	AAA	AAA	+	Hospital	AAA
North Makarewa	30.0	AAA	AAA			AAA
Ohai	2.0	A(i)	A(i)			A(i)
Orawia	2.8	A(i)	**A(ii)**	-	Need regulators	A(i)
Otatara	3.4	A(i)	A(i)			A(i)
Otautau	4.3	A(i)	A(i)			AA
Riversdale	3.4	A(i)	A(i)		Low Voltage if via Lumsden	AA
Riverton	4.5	A(i)	**AAA**	+	Spare 66/11kV TX site	AA
Seaward Bush	8.8	AAA	AAA	+	Hospital	AAA
South Gore	7.7	AAA	AAA	+	CBD	AAA
Te Anau	5.8	AAA	AAA	+	Tourism	AAA
Tokanui	0.9	A(ii)	A(ii)			A(i)
Underwood	13.4	AAA	AAA			AAA
Waikaka	1.2	A(i)	A(i)			A(i)
Waikiwi	10.9	AA	AA			AAA
White Hill				-	Customer only wants n	A(ii)
Winton	8.8	AA	**A(i)**	-	4 x 1ph 66/110kV TX	AA

(see Page 27 for Security Ratings definition).

- Kennington supplies the industrial area to the east of Invercargill. Failure of the line or power transformer would require the installation of a voltage regulator to enable industrial production to resume.
- The Bluff load now exceeds the full capacity of one transformer, therefore failure of a transformer, will require some load to be transferred to Awarua or Seaward Bush.

- Orawia supplies the south-western corner of Southland including Tuatapere. For any failure or outage of subtransmission components an 11kV regulator is needed to restore or maintain limited supply.

- Waikiwi Substation is presently supplied by the line from Invercargill GXP, if a fault occurs on this line manual switching is required to restore supply. An upgrade will be implemented to provide automatic change over within this Asset Management Plan.
- Winton Substation has four single phase 66/11kV transformers for the T1 bank and any faults on this will require manual change out of the faulty unit. If two units are damaged the spare 66/11kV transformer from Riverton would need to be installed. Due to this situation replacement 66/11kV transformers are planned to be installed in 2005/2006.

(iii) Assets by Category

Assets have been classified as:

- Overhead Lines
- Substation Buildings
- Power Transformers
- Zone Substation Structures
- Circuit Breakers
- Distribution Transformers
- SCADA Systems
- Ripple Injection Systems
- Communications Protection Systems
- Meters

(iv) Justification for Assets

In general the assets are the minimum required to provide a supply of adequate reliability to the end use customers and comply with the statutory requirements for voltage drop etc.

(v) Location, Age and Condition

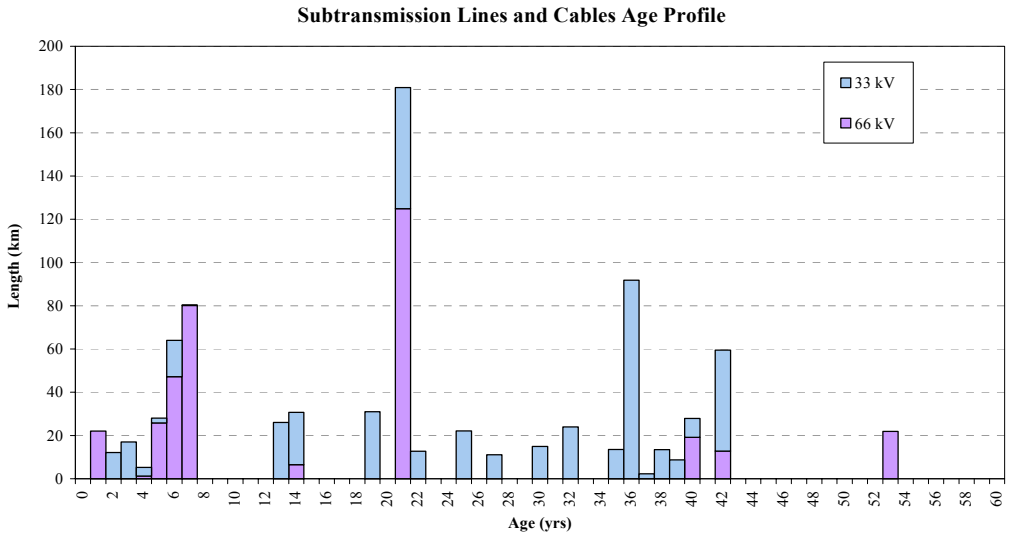
There is a dearth of accurate age data for the network plant and this does not necessarily reflect the condition. A complete survey of the condition was undertaken in 1995 with ongoing assessments on a five year cycle and feedback from other works. Generally the condition of the assets is good. In general purchase or commissioning dates have only recently been recorded for distribution assets. More detailed assessments of the age of the overhead lines have been carried out utilising pole construction and usage data.

The ages given in the following sections are a general guide for refurbishment or replacement. Actual timing will depend on a combination of:

(i) Safety
(ii) Failure to meet technical and service level requirements
(iii) Economics
(iv) Condition/Failure rates
(v) Synergy with other related work

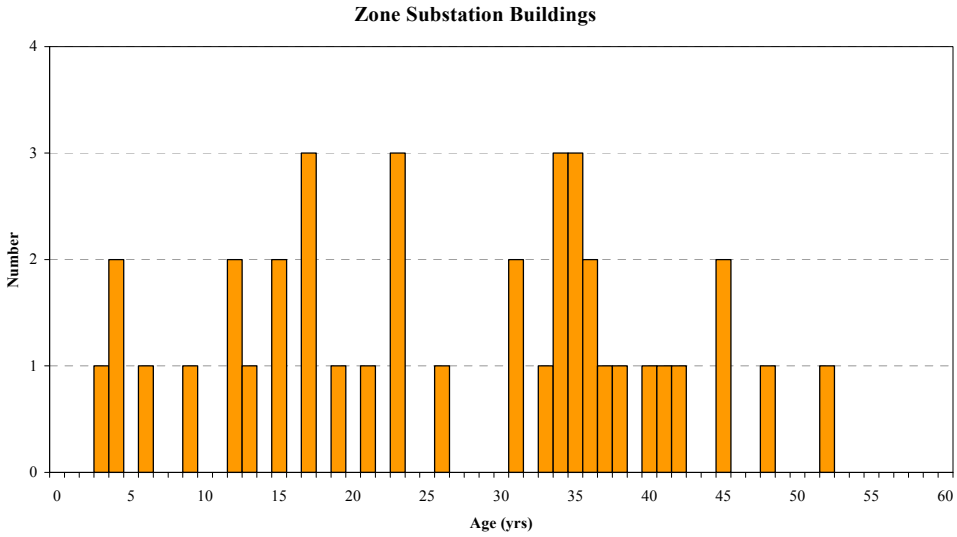
Subtransmission Circuits

The chart shows the length of line constructed each year. The Monowai to Redcliff 66kV circuit is over 45 years old and major refurbishment is programmed.



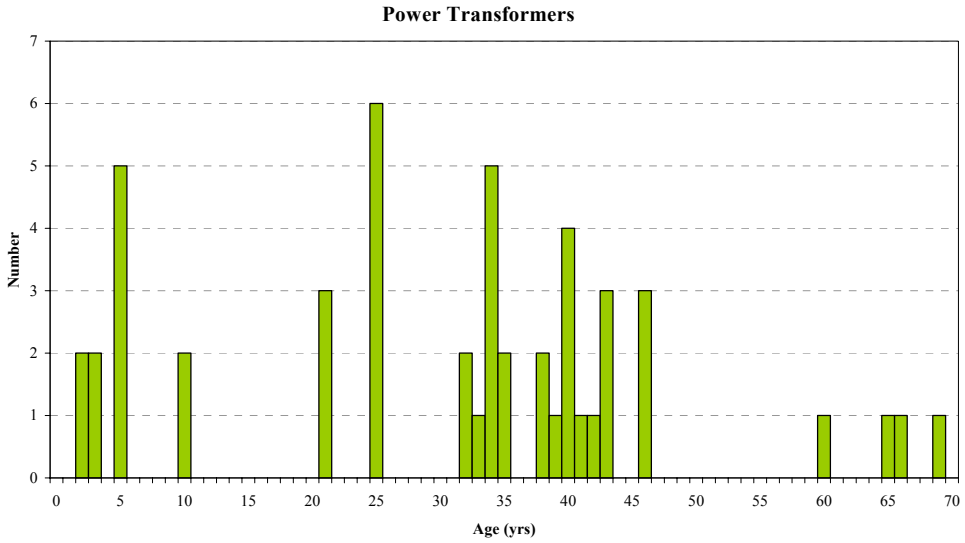
Substation Equipment

(a) Substation Buildings



The two oldest buildings are at Ohai and Orawia, both are of masonry construction.

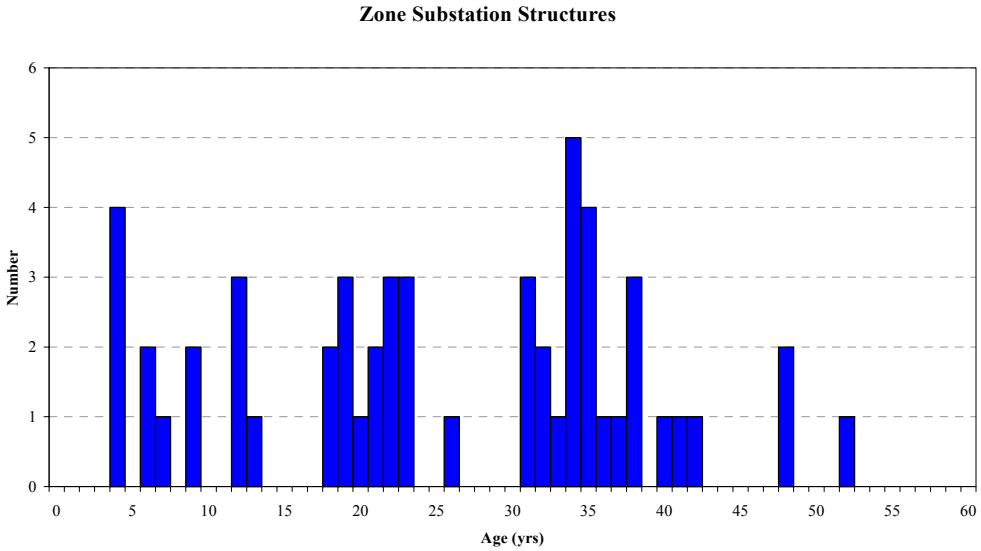
(b) Power Transformers



Spare units and emergency replacement plans exist for the older units, which, in the event of a fault, would be replaced rather than repaired. These units will be scrapped upon removal from their existing locations.

The table shows the age of transformers. The transformers that are over 55 years old are scheduled for replacement in the next 10 years.

(c) Zone Substation Structures

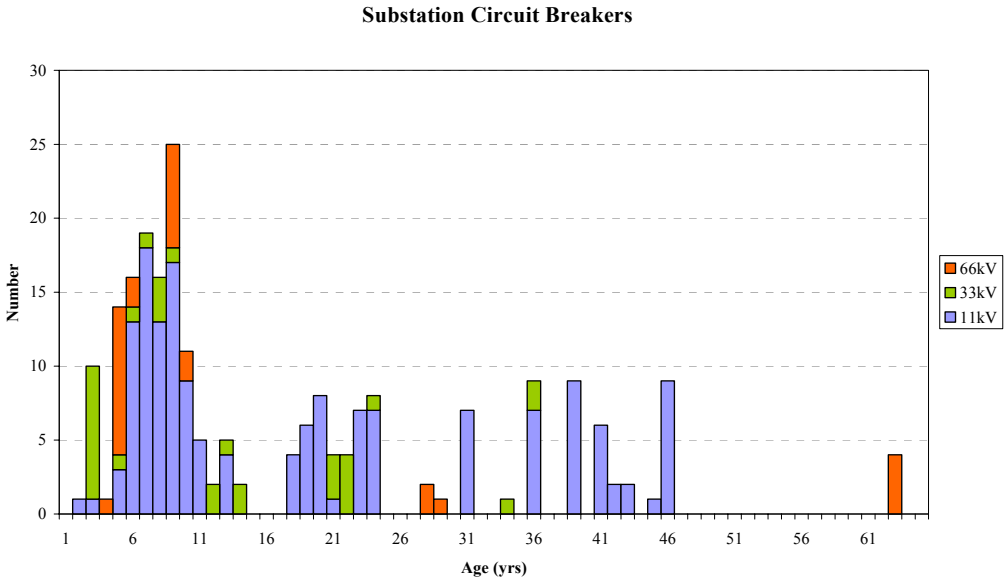


The two older structures are located at Ohai and both structures are still in relatively good condition and there are no plans to replace them. Insulators on the Ohai structure have recently been replaced.

A recent, independent condition survey of the zone substations concluded that:

"Those parts of the system which were visited are in no worse condition than could be expected: there are a few sites where major maintenance is due but this can be considered normal in an ongoing operation, none of the defects noted pose an immediate threat to continuity of supply."

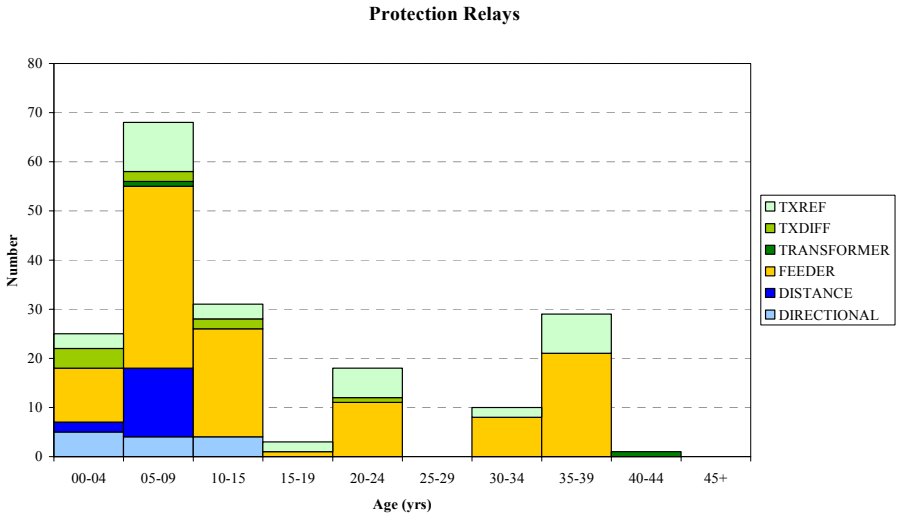
(d) Circuit Breakers



Replacement of all the circuit breakers over 45 years old has been programmed to be completed before 2015.

Almost all the circuit breakers are less than 40 years old with all the 66kV circuit breakers having been renewed in the past five years.

(e) Protection Relays



The age profit of protection relays closely mirrors that of the substation circuit breakers. Modern units are of electronic design with a large number of electromechanical units still in service. Regular checks and adjustments/maintenance ensure reliable service.

A programme is planned at the beginning of 2006 to upgrade a number of older units over the next 15 years. Most will be done with the associated circuit breaker.

(f) SCADA System

The Master Station for the SCADA protection unit is provided by PowerNet Limited as The Power Company Limited's network asset management company. It is an iFIX based system with a New Zealand company's developed add-on called iPOWER, which has configured iFIX for the Electrical Industry application.

Five types of RTU are in service on the network:

(a) GPT C68 RTU
(b) GPT MiniRTU
(c) Harris D25 RTU
(d) Harris D20++ RTU
(e) Kingfisher RTU

Replacement of the GPT RTUs is programmed at an average of five sites per year. Communications to the Control Centre is via radio using Analogue UHF, Digital UHF and Microwave.

(g) Ripple Injection

Five 33kV 217 Hertz ripple injection plants provide control of ripple receivers on the network with backup from the Electricity Invercargill Limited plant for Invercargill Grid Exit Point. The plants were installed in 1988-1993 and have had some electronics replaced in 2004.

(h) Meters

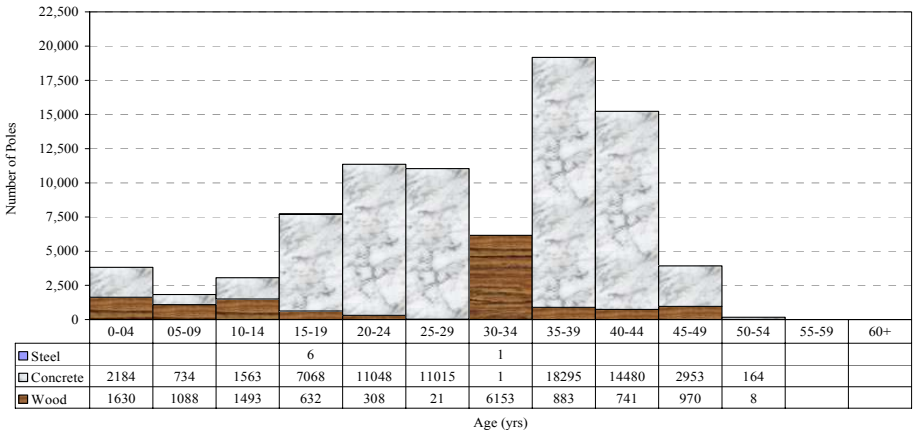
Customer meters are owned by a separate business unit. Zone substations have Time Of Use (TOU) kWh meters on the incoming 11kV circuit breakers. These are used to monitor substation loads and provide a load profile.

Distribution Equipment

(a) 11kV and 400V Overhead Lines

The chart shows the age profiles of pole supporting 11kV and 400V lines based on pole type.

11kV and 400V Pole Ages



	0-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
Steel				6			1						
Concrete	2184	734	1563	7068	11048	11015	1	18295	14480	2953	164		
Wood	1630	1088	1493	632	308	21	6153	883	741	970	8		

Age (yrs)

ODV maximum age for wooden pole circuits is 45 years and 60 years for concrete.

Based on the above age profile, approximately 260km of wooden pole lines and 5km of concrete pole lines should be renewed over the next 10 years, however, over the following 10 years approximately 1,967km would require renewal. In order to reduce the peak of work and consequent increase in resources required in the second ten year period, it is planned to bring forward some of those second ten year line renewals by gradually increasing the level of line renewal over the first ten years to the 20 year average of 110km per annum. The following 10 year period (2025/2035) would then average 160km per annum and the following 10 year period would average 200km per annum.

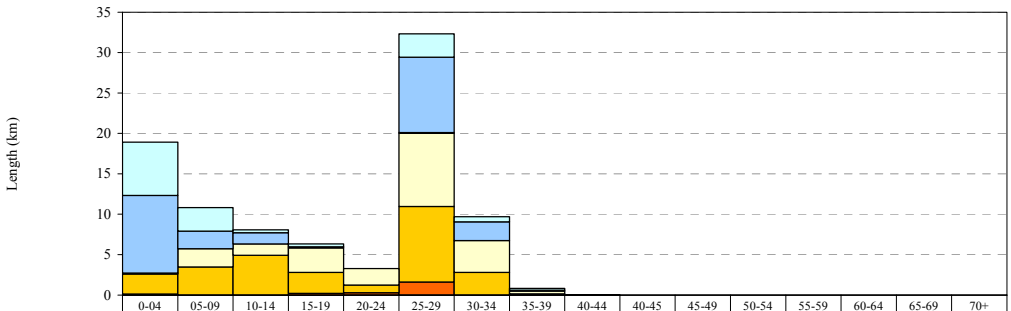
Five yearly maintenance inspections of all lines will ensure that the lines continue to provide a safe and reliable service.

(b) 11kV Underground Cables

The chart displays the age profile for the two general types of cable used on the network. ODV maximum ages of 70 years for paper-lead and 45 years for XLPE cable are used for planning purposes.

Therefore, 0.332 km of XLPE cable could be nearing the end of its life. Due to the uncertainty of the maximum life of XLPE cable, (many feel that longer life may be exhibited) no planned replacement is scheduled.

11kV Cables



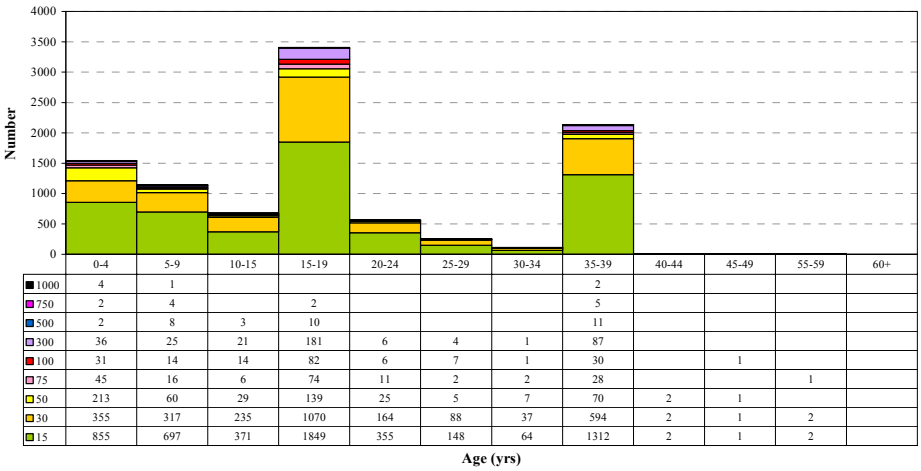
	0-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40-44	40-45	45-49	50-54	55-59	60-64	65-69	70+
Light XLPE	6.580	2.899	0.355	0.363		2.878	0.636	0.208								
Medium XLPE	9.615	2.164	1.378	0.141		9.338	2.306	0.120		0.005						
Heavy XLPE	0.118					0.075										
Light PILC	0.002	2.259	1.424	3.024	2.036	9.068	3.946	0.338								
Medium PILC	2.466	3.481	4.912	2.588	0.947	9.344	2.808	0.163	0.015		0.002					
Heavy PILC	0.138			0.221	0.292	1.620										

Age (yrs)

(c) Distribution Transformers

With over 9,858 transformers, ongoing replacement needs to average over 217 per year. In the short term (next 10 years) 205 require replacement.

Distribution Transformers



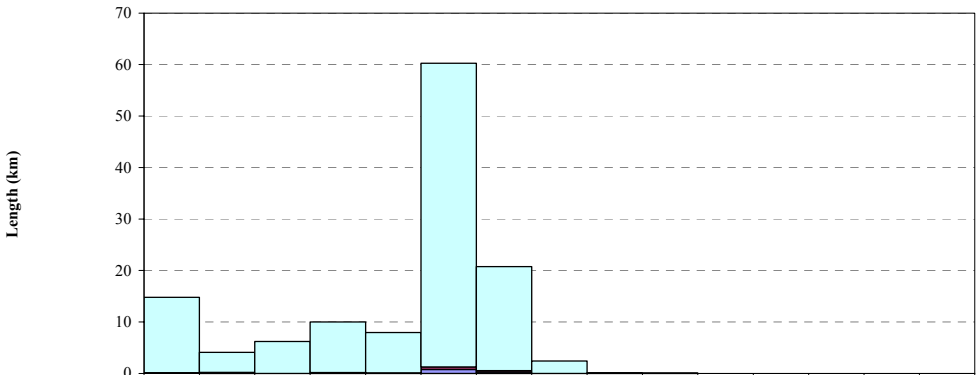
	0-4	5-9	10-15	15-19	20-24	25-29	30-34	35-39	40-44	45-49	55-59	60+
1000	4	1						2				
750	2	4		2				5				
500	2	8	3	10				11				
300	36	25	21	181	6	4	1	87				
100	31	14	14	82	6	7	1	30		1		
75	45	16	6	74	11	2	2	28			1	
50	213	60	29	139	25	5	7	70	2	1		
30	355	317	235	1070	164	88	37	594	2	1	2	
15	855	697	371	1849	355	148	64	1312	2	1	2	

Units over 100kVA are refurbished and are estimated to have a useful life of 55 years compared to other units' standard useful life of 45 years.

(d) 400V Cables

The analysis of 400V cables shows that only 2.7 km of cable could be nearing the end of its life. Due to the low number of customers affected by failure of 400V cables no programmed replacement is planned. All replacements of these cables will occur when they fail.

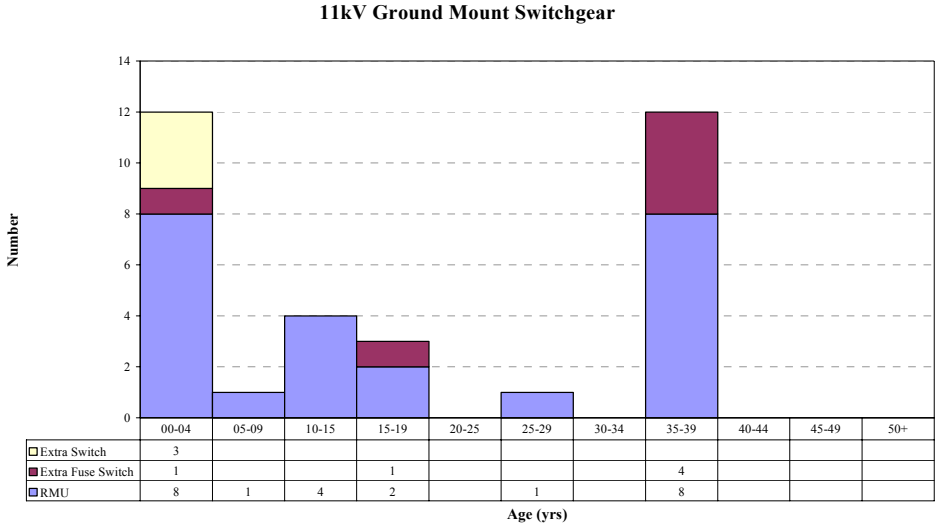
400V Cables



	0-04	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+
XLPE MEDIUM	14.625	3.894	6.209	9.818	7.817	59.019	20.211	2.425	0.142	0.106					
XLPE HEAVY	0.126			0.006											
PILC MEDIUM		0.209		0.025	0.127	0.511	0.275								
PILC HEAVY	0.035			0.151		0.746	0.271								

(e) 11kV Switchgear

(i) RMU



The network has 33 ring main units and 12 of these units are planned to be replaced in this Asset Management Plan period.

(ii) Isolators

There is a total of 853 ABS isolators and a total of 263 load break switches on the network (RC $4.8 million and DRC $1.5 million). With an estimated remaining life of 30% based on a standard life of 35 years, 32 units are required to be replaced every year ($140,000).

(iii) Dropout Fuses

There are 10,005 dropout fuses, therefore at least 286 need to be replaced every year (useful life is 35 years). As the remaining life is only 12%, higher than 286 dropout fuses are required to be replaced to bring the average remaining life closer to 50%.

(D) DETAILS OF PROPOSED LEVELS OF SERVICE

(i) Customer Oriented Reliability, Security and Availability Performance Targets

Reliability of Supply

The historical reliability performance, projected values for 2005/2006 and the target 10-year averages for outages originating within the TPCL network for the 1 April to 31 March periods, are:

Interruptions

Total Number of Interruptions

[Number]	Target	Projected	Actual				
Class	**10 Year Average**	**2005/06**	**2004/05**	**2003/04**	**2002/03**	**2001/02**	**2000/01**
B	120	72	63	85	149	194	177
C	344	368	369	391	388	375	389
TOTAL	464	440	432	476	537	569	566

System Average Interruption Duration Index

[Minutes]	Target	Projected	Actual				
Class	**10 Year Average**	**2005/06**	**2004/05**	**2003/04**	**2002/03**	**2001/02**	**2000/01**
B	19.61	9.7	7.7	11.1	18.9	20.0	16.0
C	146.82	120.8	117.8	140.7	147.8	117.8	130.0
TOTAL	166.43	130.5	125.6	151.9	166.7	137.7	146.0

System Average Interruption Frequency Index

[Number]	Target	Projected	Actual				
Class	**10 Year Average**	**2005/06**	**2004/05**	**2003/04**	**2002/03**	**2001/02**	**2000/01**
B	0.130	0.063	0.041	0.100	0.108	0.136	0.130
C	3.369	2.970	3.112	3.418	3.217	2.734	2.760
TOTAL	3.499	3.033	3.153	3.518	3.325	2.870	2.890

Customer Average Interruption Duration Index

[Minutes]	Target	Projected	Actual				
Class	**10 Year Average**	**2005/06**	**2004/05**	**2003/04**	**2002/03**	**2001/02**	**2000/01**
B	150.54	153.84	188.34	111.26	174.37	146.76	123.08
C	43.54	40.67	37.87	41.18	45.94	43.08	47.10
TOTAL	47.55	43.03	39.82	43.17	50.12	47.99	50.52

- NB: Class B are planned interruptions, Class C are unplanned interruptions due to faults.

Interruptions are projected to increase due to 11,000V service mains becoming classed as Works.

Therefore targets are based on a 1% improvement in faults, due to remote control of field devices and a 2% increase in planned work due to the large increase in distribution renewals. The starting point on the target is based on the average of the middle five values over the last seven years.

Under some Use of System Agreements the Company also has performance incentive payments whereby a domestic customer in an urban area will receive $40 if a contractor has not arrived on site within four hours of notification of failure of supply to the PowerNet Control Room. In the case of rural areas, the time limit is extended to eight hours.

If as a result of a general network failure the power supply has not been restored within six hours of notification of the failure for urban customers then the Company will pay the customer $50 and in the case of rural customers, if the power supply has not been restored within 10 hours the Company will pay the customer $50.

There are exemptions to these payments in the event of major widespread severe snow storms, winds, lightning, floods, earthquakes etc or faults caused by a third party such as Transpower and vehicles. Payments for 2004/2005 were $0.

(ii) Network Effectiveness

A general indication of the effectiveness is the capacity utilisation (System Maximum Demand/Total Transformer Capacity).

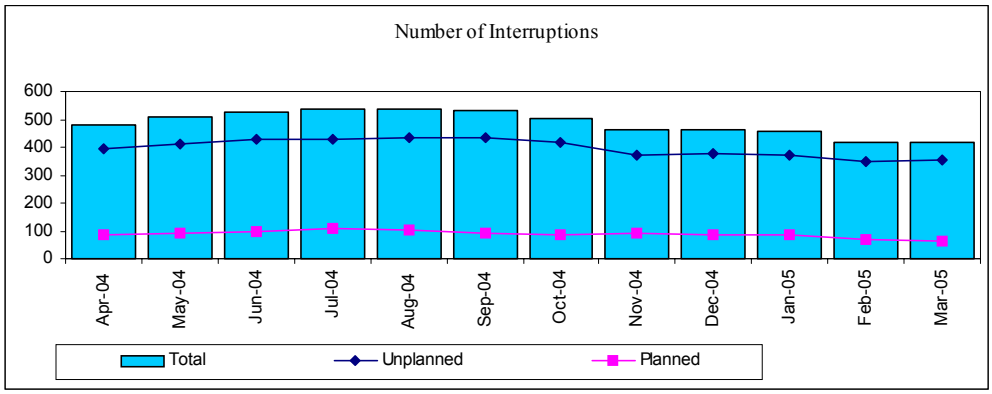
Year	Percentage of Asset Utilisation
2004/2005	34.1%
2003/2004	34.5%
2002/2003	35.9%
2001/2002	38.4%
2001/2000	34.8%

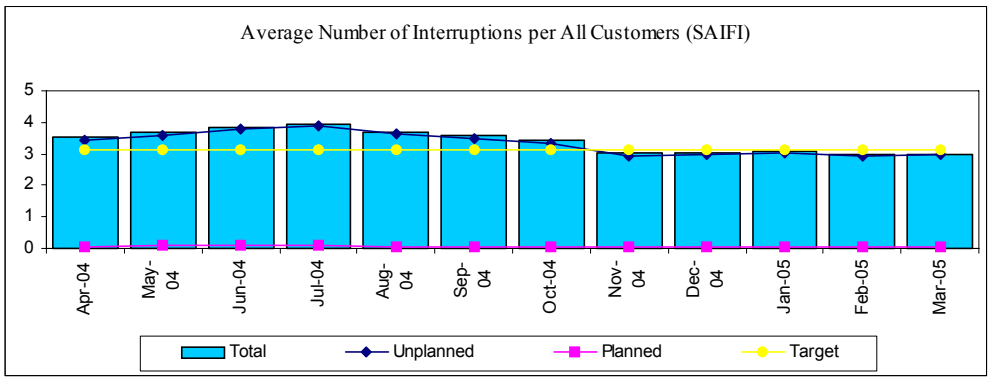
(iii) Other Targets for Asset Performance and Efficiency, Effectiveness and Efficiency of Line Company Activity

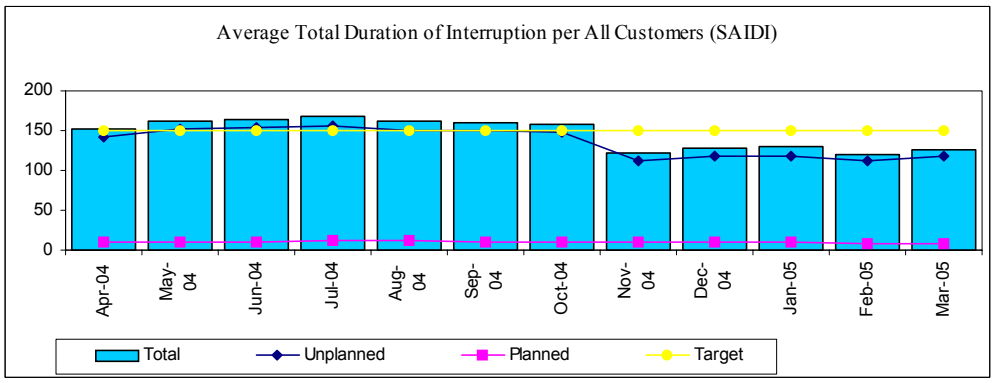
Network Efficiency (Losses)
Current system losses based on retailers' sale figures are 8.31% and will include fraud etc. Investigations are to be carried out on certain parts of the network to enable a better assessment of loss levels and pragmatic targets to be established.

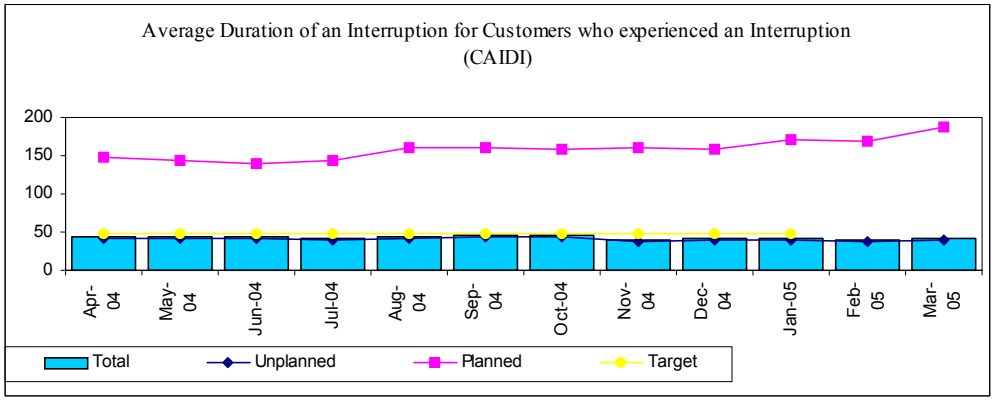
Reliability

Reliability is calculated monthly and reported against targets to the Board.



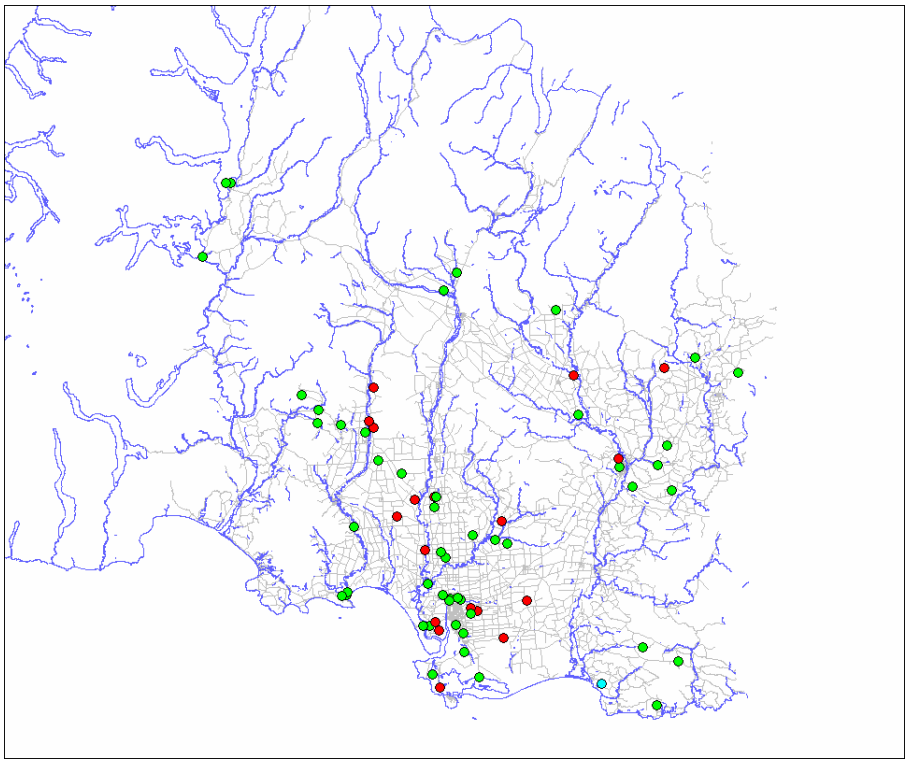






Quality of Supply

The statutory requirements for voltage level and variation and for harmonic content will be met, although in both cases the end use customer shares some responsibility in these matters.



2002 – 2004 Voltage Complaints (Red = Justified, Green = Unjustified)

The above map displays all the recorded voltage complaints for the last two years, (1 April 2002 – 31 March 2004). The red spots are those complaints that after investigation were found to be outside of the legal limits. As can be seen no specific areas have major complaints occurring.

It is the Company's intention to respond to all voltage complaints within five business days, to investigate and report on these within a further 20 business days, and to rectify justified complaints within 56 business days unless resource consent is required for any remedial works.

The Company has a target of no more than 10 proven voltage complaints per annum per 10,000 ICPs.

During 2004/2005 there were 36 complaints, with 15 of the complaints received being justified.

(iii) Justification for Target Levels of Service

Following consultation with customer groups, the reliability target levels of service are based on levels which the Company believes satisfy consumer expectations and which will compare favourably with the national statistics for networks similar to The Power Company Limited. It is also believed that these target levels can be achieved in a cost-effective manner through prudent investment in the network development and targeted maintenance. The targets are well under the Commerce Commission's regulatory thresholds, the latter being based on the previous five year average results. During those five years there has been significant investment in the network with consequent improvement in reliability.

It is intended to continue customer consultation on the issue price and quality throughout the year. Customers are invited to submit comments on the target levels and state whether they would be interested in being a member of a focus group on this issue.

(E) DETAILS OF NETWORK DEVELOPMENT

(i) Network Planning Criteria and Assumptions

The planning criteria for The Power Company Limited network are dependent on the required supply security and reliability and meeting legislative requirements, such as voltage. The Design Standard specifies the supply security levels which any new investment should meet and it also triggers some investment on the network on a retrospective basis.

Supply reliability is subject to planned supply interruptions. With respect to the design of the network, the policy on planned interruptions is shown below. Investment in the network should permit the future use of live line techniques wherever possible and where this is not feasible, design should permit restricted interruptions as described below.

Reliability is also dependent on the network design and some general criteria for the design of the 11kV distribution part of the network are shown below.

Investment in the subtransmission network is based on the supply security criteria and to meet legislative requirements.

Prioritisation is undertaken with the UMS optimisation tool and based on achieving the required levels and outcomes just prior to the service level need.

Security Standards

The design of the network is based on the following criteria:

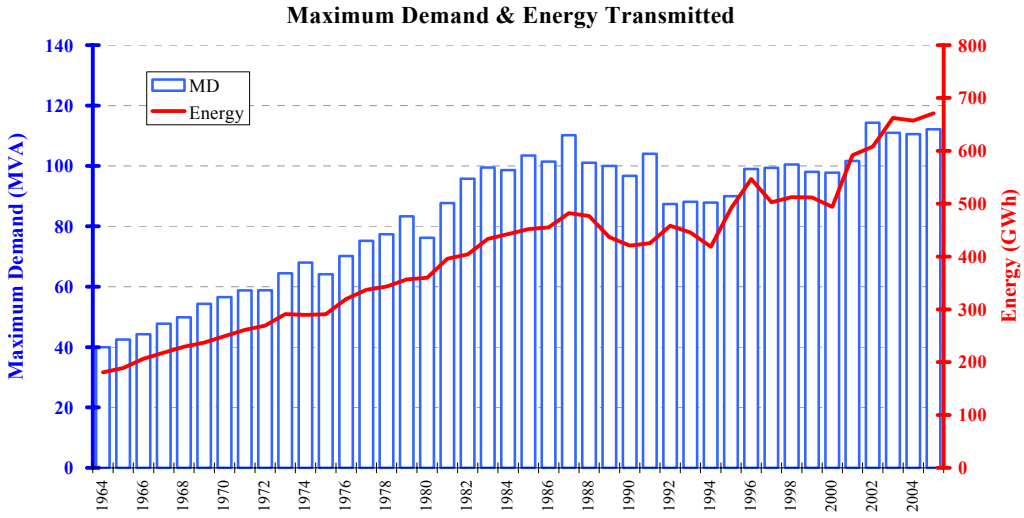
TPCL SECURITY RATINGS		
Group Demand	**Security Rating**	**Arrangement**
>12 Mwatts or 6,000 connections	AAA	(n-1) Uninterrupted
5-12 Mwatts or 2,000 to 6,000 connections	AA	25 minutes restoration time
1-5 Mwatts	A(i)	Isolate and Restore
<1 Mwatt	A(ii)	Repair time

Notes:

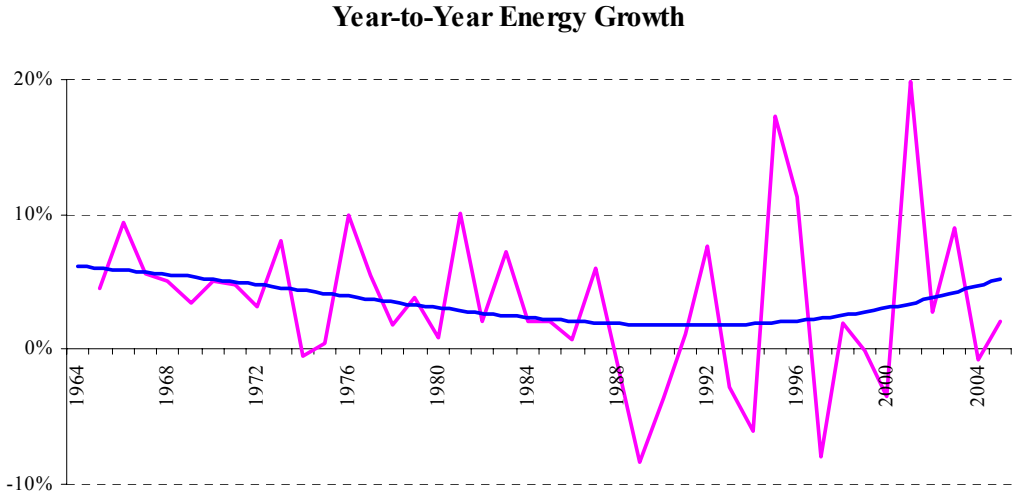
(a) Restoration time for 90% of load permits the prolonged loss of supply to individual customers following storm conditions.
(b) The above times are maximum and relate to network design parameters.
(c) For loads of less than 1 Mwatt supplied by underground 33kV/66kV cable, a security of A(i) will be required for cable faults.
(d) Transformers or transformer groups supplied by an underground 11kV cable and with more than 75 network connections will have a security of A(i).
(e) Certain parts of the network will demand enhanced supply security due to the type of load etc.
(f) Excludes short-term interruptions of less than one minute duration, and events external to the local network, eg. energy storage, Transpower outages, storms, etc.

(ii) Demand Forecasts

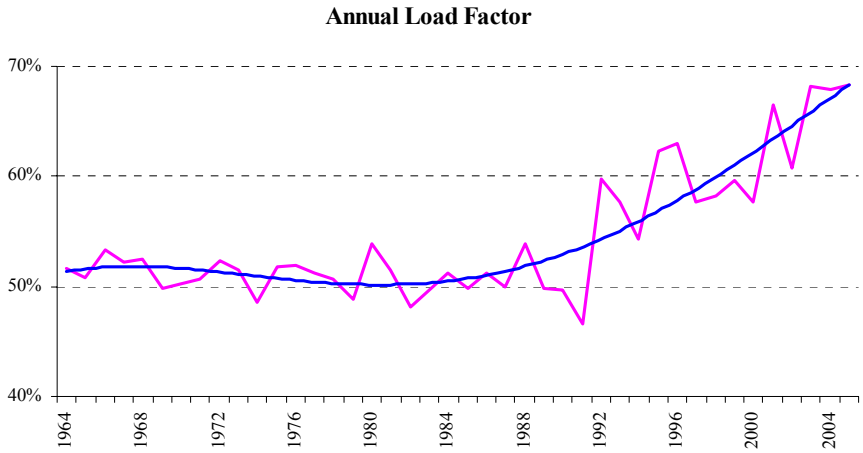
Continuing growth of between 1-5% for the next 10 years has been estimated. This is based on economic forecasts relating to continuing growth in dairy farms, increased use of irrigation, establishment of further timber mills and associated operations and expansion of the tourist industry particularly in the Te Anau basin.



The above graph shows the growth on the network since 1964. The introduction of ripple control in 1989 and its full automation in the following years is clearly shown.



The graph below shows the load factor over the same period. Seasonal industrial use and latterly an increase in nightstore heating after the introduction of ripple control have slightly improved the load factor.



The demand forecasts for each zone substation are shown in the table below. Overall the growth rate is approximately 2% with limited growth over most zone substations reflecting the conversion of farms from sheep to dairy.

Major growth is occurring in northern Southland/Waimea Plains due to Irrigation. A report by Venture Southland has highlighted the potential for irrigation, see figure 1.

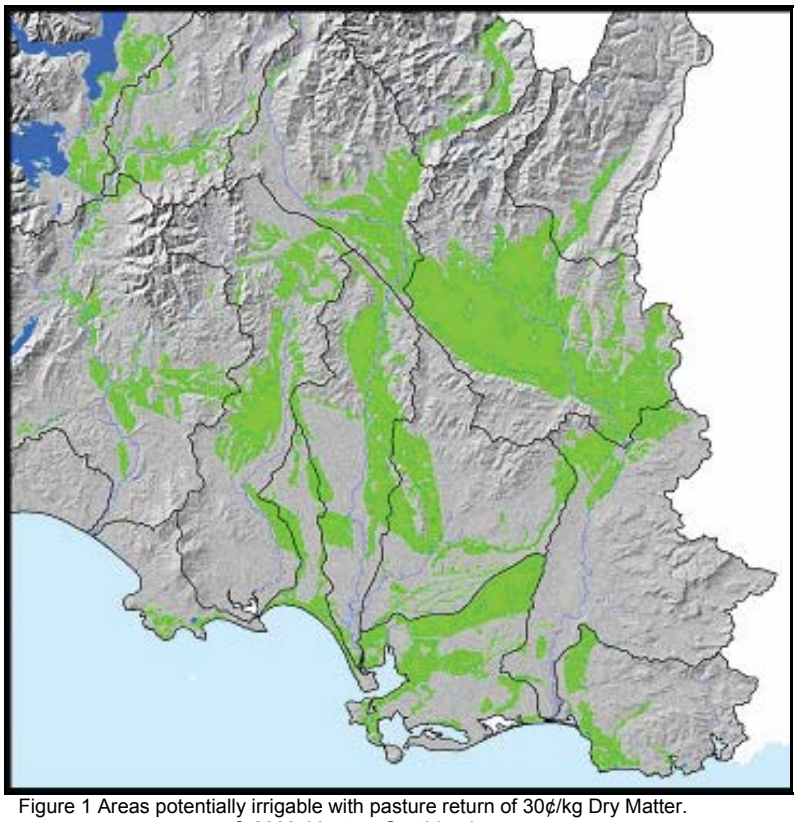
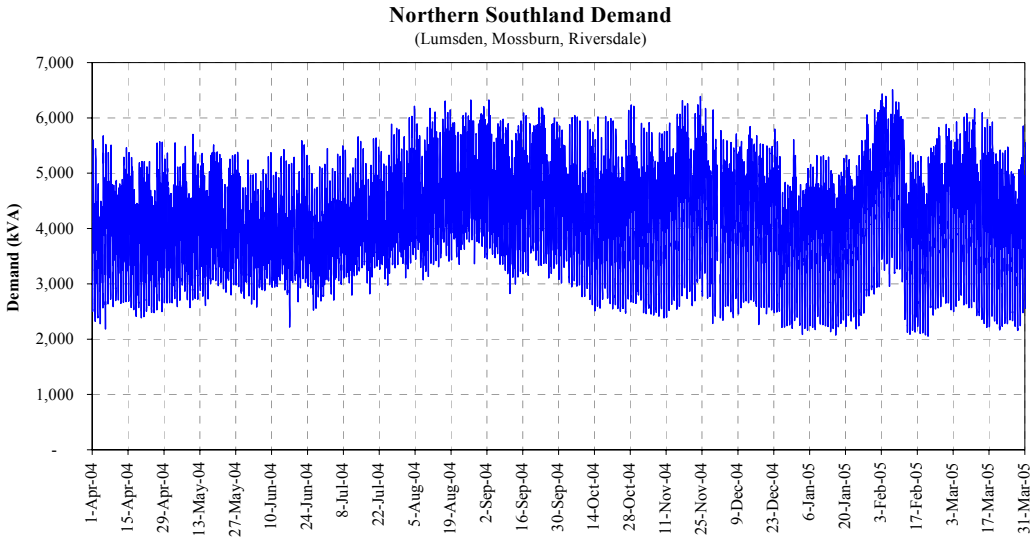


Figure 1 Areas potentially irrigable with pasture return of 30¢/kg Dry Matter.

Analysis of individual sites was done to determine areas of high and low growth. Over the last three years full half hour readings of the loads at zone substations show a generally increasing growth. Of the full set of readings the monthly maximums are calculated and the average trend of these calculated. The chart for Northern Southland (Mossburn, Lumsden, and Riversdale) is shown below as an example:



The impact of the irrigation can be seen from the end of January until mid February each year; this is normally a low load period.

Due to the system wide growth over the last two years and the consideration that this growth is unlikely to continue, due to the more conservative stable payouts in the Dairy Industry, this has been reduced to a 10 year growth of 1.5% per annum. The actual peak growth last year was 1.47%.

The Power Company Limited -Growth at the Zone Substations

Zone Substation	Installed Capacity (MVA)	Firm Capacity[3] (MVA)	2005 Maximum Demand (MVA)	Proposed Annual Growth	Projected Maximum Demand 2006	2010	2015	2015 Maximum Demand at 2.3 % pa
Awarua	5.0	5.0	2.6	1.5%	**5.1**	**5.5**	**5.9**	**6.5**
Bluff	10.0	5.0	**6.1**	0.5%	**6.1**	**6.3**	**6.4**	**7.7**
Centre Bush	5.0	5.0	2.8	1.5%	2.8	3.0	3.2	3.6
Conical Hill	10.0	5.0	4.5	1.0%	4.5	4.7	5.0	**5.7**
Dipton	1.5	1.5	0.6	0.5%	0.6	0.6	0.7	0.8
Edendale NZMP	46.0	23.0	13.1	5.0%	13.8	16.7	21.3	17.3
Edendale	24.0	12.0	5.5	2.0%	5.6	6.1	6.7	7.0
Glenham	1.5	1.5	1.2	1.5%	1.2	1.3	1.4	1.5
Gorge Road	1.5	1.5	1.5	1.5%	**1.6**	**1.7**	**1.8**	**2.0**
Hillside	2.3	2.3	0.7	1.0%	1.2	1.2	1.3	1.5
Kelso	5.0	5.0	4.2	1.0%	4.2	4.4	4.6	**5.3**
Kennington	5.0	5.0	3.5	1.0%	3.5	3.7	3.9	4.4
Lumsden	5.0	5.0	2.8	5.0%	3.0	3.6	4.7	3.8
Makarewa	24.0	12.0	4.8	0.5%	4.8	4.9	5.0	6.1
Mataura	20.0	10.0	8.2	0.5%	8.2	8.4	8.6	**10.3**
Monowai	0.5	0.5	0.2	0.5%	0.2	0.2	0.2	0.3
Mossburn	1.5	1.5	1.2	5.0%	1.3	**1.5**	**2.0**	**1.6**
North Gore	30.0	10.0	7.7	1.5%	7.8	8.3	8.9	9.8
North Makarewa 66kV	80.0	40.0	24.0	1.5%	24.4	-40.0[4]	-40.0[4]	30.6
Ohai	7.5	5.0	2.0	0.5%	2.2	2.2	2.3	2.8
Orawia	7.5	5.0	2.8	0.5%	2.8	2.8	2.9	3.5
Otatara	5.0	5.0	3.4	1.5%	3.5	3.7	3.9	4.3
Otautau	7.5	7.5	4.3	2.0%	4.4	4.7	5.2	5.5
Riversdale	5.0	5.0	3.4	5.0%	3.6	4.3	**5.5**	4.5
Riverton	15.0	7.5	4.5	1.5%	4.6	4.8	5.2	5.7
Seaward Bush	20.0	10.0	8.8	0.5%	8.8	9.0	9.3	**11.1**
South Gore	24.0	12.0	7.7	0.5%	7.7	7.9	8.1	9.7
Te Anau	24.0	12.0	5.8	2.0%	5.5	6.0	6.6	6.9
Tokanui	1.5	1.5	0.9	0.5%	0.9	0.9	1.0	1.1
Underwood	40.0	20.0	13.4	1.0%	13.5	14.1	14.8	17.0
Waikaka	1.5	1.5	1.2	1.5%	1.2	1.3	1.4	**1.5**
Waikiwi	24.0	12.0	10.9	1.0%	11.0	11.4	12.0	**13.8**
Winton	15.0	7.5	**8.8**	1.5%	**8.9**	**9.5**	**10.2**	**11.2**

The table shows the projected demands for each zone substation over the next 10 years based on anticipated load growths. The **red bold** highlights when the firm capacity is exceeded.

The calculated average energy growth over the last 20 years is 2.3% per annum with maximum demand increasing at 0.8% per annum. The last column shows the estimated maximum demands for each substation if the average demand growth continues at an optimistic level of 2.3% level. Edendale (Dairy Factory) and Waimea plain substations (Irrigation) have a proposed growth higher than this figure.

Loading of each substation is reviewed annually and the timing of projects varied to match the actual maximum demands achieved. The effects of energy crisis, war, SARS and other unknowns can have a major impact in any area, by slowing growth or adding additional industry.

[3] < 5MVA Transformer then full capacity

[4] This represents the projected maximum export of power due to White Hill wind generation

Analysis of the loadings under this scenario highlights 12 sites where the firm capacity may be exceeded. All site loadings are reviewed each year and the programme will be altered if it is projected that the firm capacity will be exceeded by more than 10%. The above does not take into consideration the impact of the distributed generation.

(iii) Asset and Non Asset Policies

The aim of the Company is to remain at the forefront of the utilisation of new technology, recently this has included control and protection schemes to improve reliability, the use of modern technology in switchgear to reduce maintenance and the provision of SCADA and GIS systems to improve information flows and operational performance.

Evaluations are carried out to determine whether assets should be disposed of rather than maintained for further use. These considerations take into account the cost of maintenance, replacement and performance, i.e. losses and operations.

Improvements in the performance of the network do not always entail new investment. Operational considerations such as transfer of load between GXP's or zone substations, extended use of ripple control or interactive demand side management with large customers and incentives through line charges which encourage off peak usage of the network are part of the overall strategy.

Through the use of databases and records of maximum demand readings etc., transformers are shifted from location to location to improve utilisation factors and reduce the degree of under-utilised capacity.

Consideration will also be given to the retrofitting of modern technology into existing 11kV switchgear and upgrading of 400V boards to meet the modern safety standards.

Capital assets can only be purchased in accordance with the approved Business Plan programme.

Authorisations for expenditure of capital items not included in the Business Plan are by either the Chief Executive or Board.

All capital projects are evaluated by the UMS Optimisation Tool prior to recommending to the Chief Executive or the Board.

The impact of distributed generation is unlikely to affect the network demand, due to the generation not being 100% availability.

Power factor impact on the network is monitored and controlled by the Use of System Agreements if a customer has a power factor of less than 0.95 extra charges are applied giving a good incentive to maintain good power factor.

(iv) Options Available

No allowance for inflation is included and no customer contributions are included in the budget cost.

Supply Reliability

To improve operational performance in the sphere of reliability, consideration is given to the following four factors:

(a) *Reduce the Number of Faults*

This is achieved through improved maintenance and in particular focussing on vegetation, condition of assets and reliability history. The recent introduction of the tree regulations will result in significantly increased expenditure over at least the next three years.

(b) *Reduce the number of Planned Interruptions*

This is being achieved by increasing the use of live line working. Justification is based on the economics taking into account the cost of non-supply, advertising, control room operations and switching. Improved work programmes, which coordinate all the work, required on areas of the network and faults contracts which include incentives for contractors to improve performance in their respective areas also contribute to reducing planned interruptions on the network.

It is PowerNet's policy that:

- All low voltage work shall be done live.
- All 11kV work shall, where appropriate, be done live.
- For most jobs only one supply interruption shall be approved.

Any supply interruptions, which are found necessary, shall meet the following conditions:

- It is technically unsafe to use live line techniques or is uneconomic using the cost of non-supply criteria.
- Supply interruptions should not be longer than three hours duration at any one time unless the proposed work makes it impossible to complete within three hours or when customers agree to the duration of the outage.
- Supply interruptions should not extend over the normal lunch time period, usually 12noon to 1.00pm.
- Morning and afternoon supply interruptions shall take place only if warranted. Time span shall be 9.00am to 12noon, and 1.00pm to 4.00pm. Only in exceptional circumstances will they be permitted during May to September inclusive. The total planned outage should not exceed six hours in a 24-hour period.
- If the maximum ambient temperature is forecasted to be below 5^{o}C supply interruption will only take place for urgent maintenance.
- In summer and on hot days there shall be no all day supply interruptions as farmers are not able to pump enough water for households and stock use. In these situations morning supply interruptions shall be preferred.
- Generally, farming areas supply interruption periods shall be:
  - NOT off before 9.00am or after 3.30pm – milking.
  - ON between 12noon and 1.00pm.
- It is general policy that supply interruptions affecting domestic customers shall take place from Monday to Friday and shall not take place over the weekend or on public holidays.
- Commercial and industrial areas shall be assessed on an individual basis.
- Night time supply interruptions shall be considered under some circumstances.
- Some areas with special conditions shall be treated on an individual basis.

(c) *Reduce the Impact of Supply Interruptions*

This is being addressed through more sophisticated protection, i.e. distance protection enabling closed-ring supplies on the subtransmission network to exist. Other methods include the installation of reclosers or field circuit breakers on urban/rural boundaries or in locations to reduce feeder lengths and the impact of remote faults affecting customers close into the zone substation. This is also carried out in conjunction with an optimisation of the lengths of 11kV feeders to reduce the number of customers affected by a fault.

(d) *Reduce the Duration of Supply Interruptions*

This is addressed by the use of SCADA that not only provides indication from all zone substations but also enables the remote control of the switchgear reducing the cost and improving the speed of restoration of supply in the event of faults.

(ix) 11kV Distribution Design

All Distribution Design shall use sound engineering judgement and good industry practice in all aspects.

Urban Feeders

- Unless the existing reticulation is predominantly overhead new extensions will be installed underground.
- Maximum group demand 3 MW.
- Generally transformer group capacity 4.5MVA.
- Maximum transformer capacity between isolation points 800kVA.
- Earth Fault Indicators are required on predominantly underground system.
- All transformers will have suitable HV fault protection, i.e. fuses or circuit breakers and isolation.
- Transformer overload protection will generally be through the LV fuses or switchgear or physical load constraints.

Rural Feeders

- Overhead reticulation is predominantly used in all rural areas.
- Maximum accumulated length – 40 km coastal feeder.
- Maximum accumulated length - 100 km inland feeder.
- Maximum length between isolation points - 10 km.
- Maximum transformer capacity between isolation points - 800kVA.
- All transformers shall have individual isolation capability.
- Feeders shall be protected by circuit breakers with auto-reclosing facility.
- Combined urban/rural feeders shall include line circuit breakers to separate the urban and rural segments. The line breakers shall have auto-reclosing facility.
- Group fusing is permitted, but shall not involve more than five individual transformers or 600kVA transformer capacity. Installation of permanent fault indicators should also be included.

(v) Maintenance

The objective of maintenance is to ensure that the component:

- Achieves its standard life
- Provides the service level specified (e.g. ABS will open when desired)

Alternative options are evaluated by calculating their NPV with the lowest implemented. Note this could change a maintenance (opex) job into a capital (capex) job.

Local fault contractor has Key Performance Indicators (KPI's) that impact on their profit margin; therefore there is an incentive to locate problems prior to an outage occurring.

Projected expenditure is shown below, with expenditure for future years decreasing by 1% due to efficiency gains. The 2004 ODV replacement cost for each asset grouping is given to indicate the level of expenditure.

($000)	2005/06	2014/15	Replacement Cost
66kV Lines	128.0	118.1	24,937
33kV Lines	130.0	120.0	25,455
11kV Lines	1,950.0	1,799.6	188,893
11kV Switchgear	450.0	415.3	30,234
400V Lines	400.0	369.1	27,180
33kV Cables	10.0	9.2	544
11kV Cables	70.0	64.6	6,827
400V Cables	100.0	92.3	10,551
Buildings & Structures (Incl DC. Aux.)	150.0	138.4	12,742
SCADA	35.0	32.3	2,819
Power Transformers	210.0	193.8	20,093
Circuit Breakers (incl. Protection)	120.0	110.7	11,678
Distribution Transformers	650.0	599.9	61,549
Ripple Plant	30.0	27.7	1,708
Total	**4,433**	**4,091**	**425,210**

Costs include PowerNet and Contractors' overheads related to maintenance management.

Maintenance for each asset group is shown below:

(a) *Overhead Lines/Underground Cables*

Annual maintenance includes visual inspection of each circuit, approximately 3,000 pole top inspections and approximately 3,000 wood pole tests using an ultrasonic tester. Failed poles are red tagged and replaced immediately with other noted problems reported to PowerNet for inclusion in a work package.

The low maintenance costs on the 66/33kV overhead lines reflect the current major renewal and upgrade programme.

Costs have been increased to accommodate the increased vegetation control costs. PowerNet uses a dedicated tree contractor to liaise with tree owners and to undertake the trimming.

(b) *Substation Buildings and Structures*

Monthly checks highlight problem areas and remedial work is planned. The level of urgency is determined by considering the risk to the network.

(c) *Power Transformers*

Transformer maintenance includes the following:

- Monthly – visual check of transformers including silica gel breathers, oil levels etc.
- Annually – DGA, dielectric strength, acidity and moisture content testing of transformer oil.

Transformer maintenance and overhauls are then based on the condition. Refurbishment/ replacement decisions are based on NPV.

Tap changer overhauls are based on the number of operations.

(d) *Circuit Breakers*

Circuit breaker maintenance is based on the results of monthly visual inspections, number and type of operations and specific time intervals.

Oil levels, gas pressures, battery condition and protection devices are checked regularly.

Injection testing of protection systems is carried out at five-yearly intervals.

(e) *Distribution Transformers*

Approximately 15-20 transformers of rating 100kVA or above are overhauled annually.

Approximately 150 transformers of rating less than 100kVA are replaced annually.

(f) *SCADA and Communications*

Annual checks of all communications links and continuous monitoring of SCADA health is managed by update timers within the iPOWER System.

(g) *Ripple Injection Plants*

Monthly visual checks are undertaken as well as an annual measurement of injected signal.

(vi) Proposed Network Configuration

The following plan is based on information known at the time of preparation of this document. Due to the major impact of unknowns this plan is reviewed annually and the justification of projects checked to ensure optimum management of the assets.

Gore – Transpower

The long term plan for Transpower was to establish a 220/110kV point of supply at Gore and/or Balclutha and a short 110kV line was to be built to link the new substation with the existing Gore substation.

According to the December 2004 Transpower "Failure of the National Gird-Transmission Plan Summary" is being investigated for 2009.

Subtransmission and Zone Substations

Most of the proposed work in the 10-year plan on the Subtransmission network is to improve the security of supply to the PowerNet Network Design Standard, improve reliability through the replacement of deteriorating equipment and improve the quality of supply through reconductoring.

Works Programme for 2005/06

(a) Complete installation of regulators at Devery's Corner and Jacks Hill, to provide emergency backup capability to Tuatapere and Tokanui.
(b) Complete the upgrade of Awarua Substation to supply expanded industrial load in the vicinity.
(c) Upgrade protection & RTU[5], install new 33kV Circuit Breaker and replace old 33kV structure at Underwood. Present equipment at end of useful life and allows remote switching of backup link to Otatara.

[5] RTU = Remote Terminal Unit, the field interface electronics that collects and receives information at the site from the central control point at System Control in Invercargill.

(d) Continue the two year project to underground the 33kV line across Waikiwi and to replace the outdoor 33kV structure at Waikiwi with a modern indoor switchboard. This will remove the possibility of a vehicle hitting the 33kV line and causing the 33kV to clash with the 11kV and 400V lines. The new indoor switchboard will provide improved protection and security for the connection of equipment at Waikiwi substation.
(e) Continue the programme to replace the old GPT RTU's with modern units. (Four year programme).
(f) Continue the three year project to replace the Auto Earth Switch on the 33kV network with Circuit Breakers. (Riversdale, Glenham, and Tokanui). This improves the protection performance by not relating of the supplying line protection to operate, and does not create a large Earth Rise Potential (ERP) that can damage personnel and adjacent telecommunications equipment.
(g) Connect the old Winton 110 kV line to provide a 33kV backup between North Makarewa and Invercargill Transpower GXP's.
(h) Continue the programme to install SCADA control and monitoring to Field devices. (Three year programme). Will allow System Control Staff to monitor and control these field devices.
(i) Replacement of the Glenham Substation building, due to poor condition.
(j) Upgrade work at Winton with the installation of two 66/11kV transformers and construction of a second 66kV line between North Makarewa and Heddon Bush, will extend over two years. This will provide for redundancy in the supply giving the required AAA (n-1) security rating.
(k) Continue the three year programmed replacement of the Brush SF_6 circuit breakers at Tokanui, Kelso and Lumsden. These are now at the end of their life.
(l) Replace the 33kV cables crossing Transpower's Invercargill GXP. These cables have failed in the recent past and are required to be reliable.

Works Programme for 2006/07

(a) Continue the programme to fit Oil Containment to all Zone Substation Transformers. Sites to do over the next three years are, Otatara, Gorge Road, Tokanui, Riverton, Otautau, Heddon Bush, Mossburn, Lumsden, Dipton, Centre Bush, Riversdale, Kelso, Conical Hill, and Glenham. This will ensure all leaks are contained and do not pollute the environment.
(b) Replace the two 33/11kV transformers at Bluff due to load growth and transformer age.
(c) Rebuild the Monowai to Redcliff 66kV line over two years, line in poor condition and well over the expected maximum age for this type of asset.
(d) Connection of major Wind Generation project at White Hill. Includes the installation of 66kV capacitor banks at North Makarewa and Heddon Bush, a new 66kV Bus at White Hill, a 3km double circuit 66kV line and a major upgrade of the distance protection on the 66kV network.
(e) Replacement of old substation incomer circuit breakers over the next two years at Riversdale and Lumsden. This is being done due to recent failures at similar units and the high opex cost in maintaining these.
(f) Install a second transformer at Gorge Road substation, due to load growth.
(g) Investigate new spare for North Makarewa 33/66kV Transformer, to overcome the security issue of a single transformer failure.

Works Programme 2007/08

(a) Reconductoring of the Gore to Mataura line has been programmed for this year. This work is being undertaken due to losses on the circuit.
(b) Replacement of the 11kV switchboard at Mataura, the existing board will be at the end if its life and a modern unit will allow remote operation of all circuit breakers not just the feeders.
(c) Expansion of the Kennington Substation to provide local area feeders will be undertaken during this period. This will allow the removal of the Fairweather Road Regulator and reduction in line length in the coastal region.

Works Programme 2008/09

(a) Replacement of the South Gore 11kV switchboards is programmed due to the deterioration of the switchgear and also to replace this with more modern equipment.
(b) Begin a two year project to reconductor the 33kV line from Riversdale to Lumsden. This will improve the backup capability and the reliability of this line.
(c) Connection of Mossburn Substation onto the 66kV network to reduce load on the 33kV and begin the upgrade of the Mossburn – Dipton – Centre Bush – Heddon Bush to 66kV.

Works Programme 2009/10

(a) Replacement of the Winton 11kV switchboard – this will allow the field equipment just outside the substation to be made surplus with provision of full circuits from the switchboard. At present one circuit breaker feeds three reclosers which supply some of the local area.
(b) Work will also be undertaken at Monowai to provide separation between the Power Station owner's equipment and The Power Company Limited's equipment. May be done by extending the 11kV network to the south and having no 11kV source at Monowai.
(c) Replacement of the Underwood 11kV switchboards is programmed due to the deterioration of the switchgear and also to replace this with more modern equipment.
(d) Work may begin in stages to upgrade the insulation on the Mossburn – Dipton – Centre Bush – Heddon Bush to 66kV. Budgeted to spread over three years with livening at 66kV in 2013.

Works Programme 2010/11

(a) Major refurbishment will be undertaken from the North Makarewa to Winton ex 110kV circuit to ensure that this line provides reliable service.
(b) Replacement of the Riverton 11kV switchboards is programmed due to the deterioration of the switchgear and also to replace this with more modern equipment.
(c) If expected grow at Riversdale has occurred a second transformer should be installed and splitting of the tee-off 33kV line into the substation.

Works Programme 2011/12

(a) Major refurbishment on the circuit from North Makarewa to Invercargill to ensure that this line provides reliable service.
(b) The Gore to Riversdale line will be rebuilt to as new status over the next two years. This will improve the reliability of the line.
(c) Replace Seaward Bush power transformers due to loading and age of the two units.

Works Programme 2012/13

(a) Rebuilding of the Hillside to Te Anau 66kV line will be undertaken, to ensure that this line provides reliable service.
(b) Third round of replacements of SCADA RTU's is allowed for due to an estimate life of only 15 years.

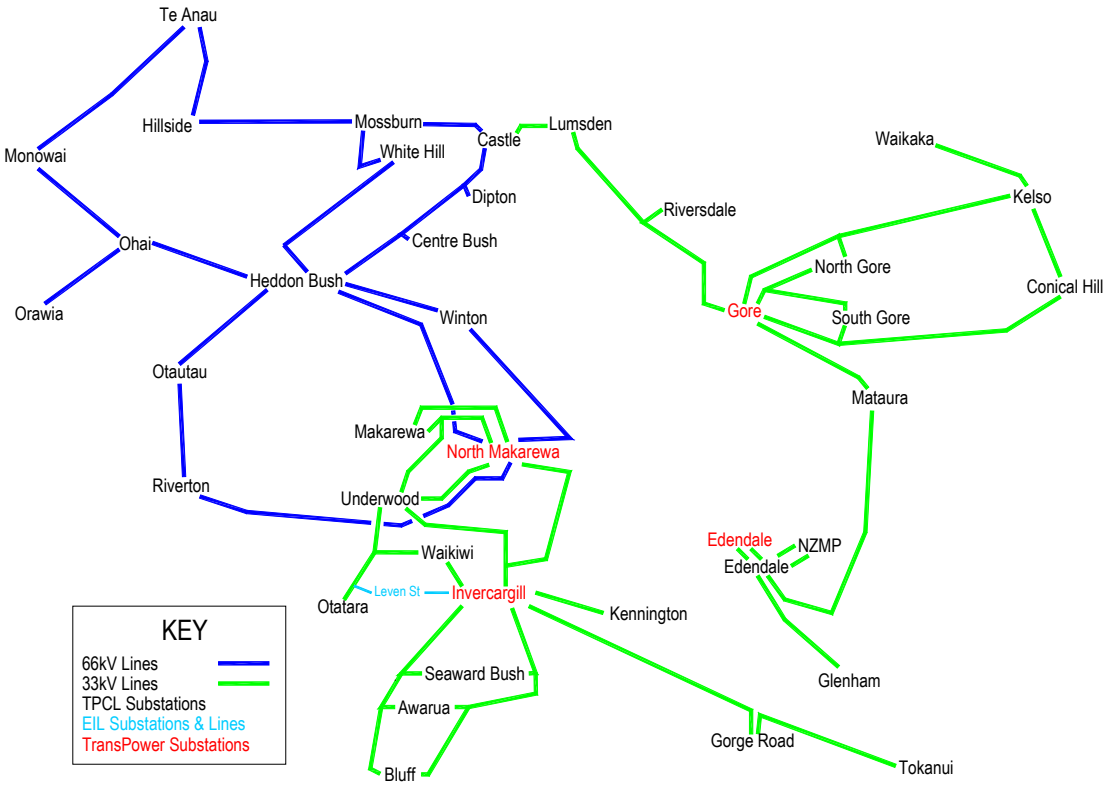
Works Programme 2013/14

(a) Replace the old 3 MVA Gresham power transformer, due to age.
(b) Investment for the upgrade of the Invercargill Transpower 220/33kV transformers.

Provision has been made to include the replacement of the old voltage regulating relays with computer based units. These new units enable the matching of different transformers, and are more reliable and accurate.

The continuing installation of Time of Use metering on all the 11kV feeders will assist in the more accurate determination of losses and provide information on feeder profiles and diversity. The latter two factors are important in determining the line pricing, development plans and supply quality.

The schematic shows the subtransmission network in 2015:



Distribution

General renewal of lines and installation of additional line circuit breakers to improve reliability by reducing the line length controlled by each circuit breaker.

Miscellaneous line renewals, new connections and subdivisions have been allowed for at approximately $2,600,000 per annum. This could increase significantly if more detailed surveys revealed accelerated renewal of lines was required within the ten years.

Provision has been made for the continuing installation of possum guard, lightning arrestors and Distribution Transformer renewals.

A summary of the 10 Year Capex Plan is shown below:

TPCL Capital Programme 2005/2006 to 2014/2015

($000)	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Distribution	2,850	3,480	4,750	5,610	4,970	5,040	5,760	5,620	5,900	5,900
Customers	2,590	2,500	2,590	2,590	2,650	2,650	2,630	2,630	2,630	2,630
Substations	2,940	1,530	1,710	1,250	1,810	1,120	1,690	660	1,000	660
Subtransmission	570	480	1,410	720	900	1,450	1,360	1,270	30	30
Expansion	2,360	7,430	1,040	1,480	1,330	1,380	630	2,000	2,680	3,030
Grand Total	**11,310**	**15,420**	**11,500**	**11,650**	**11,660**	**11,640**	**12,070**	**12,180**	**12,240**	**12,250**

(F) RISK POLICIES

(i) Methods, Details and Conclusion of Risk Analysis

As the assets are distributed over a wide geographical area, they are not susceptible to a single event and even major wind and storms do not affect more than a small proportion of the network.

Most failures can be restored within days by the construction of new lines etc.

A risk analysis has been carried out on the network in 2000. Items were identified and plans put in place to mitigate the risk. These plans also included the levels and location of network spares and contractor availability and training.

The highest risk equipment is the 11kV indoor switchgear panels inside zone substations. Regular diagnostic testing of this gear is now an important part of the maintenance programme to try and identify suspected faults before they occur.

A major risk is the situation that could occur if one of the 33/66kV transformers at North Makarewa were to fail. This would leave north-western Southland on n reliability until the failed unit was repaired or replaced. A period of more than six months is projected. While the likelihood of a failure occurring is very low the consequence is extremely high. Therefore a spare transformer is proposed to mitigate this risk,

Other risks include the records and computer data located in the PowerNet offices and these risks are reduced by offsite storage of both hard copy records and computer backup tapes etc.

(ii) Emergency Response and Contingency Plans

Emergency response for the Company is centred on the System Control Room which is manned 24 hours a day by PowerNet staff. The Company encourages customers to use its 0800 number for all system faults to expedite service and repairs to equipment in the event of faults.

PowerNet has faults contracts with all its contractors who have people on immediate standby at all hours in case of equipment breakdowns. There are various levels of backup to respond to the different types of fault or widespread events such as storms etc.

There are also PowerNet engineers on standby at any time to provide backup assistance for contract issues and other engineers for network operational issues.

There is a fully documented Disaster Recovery Plan being established covering both network and office contingencies. This is due for completion by December 2005.

(G) DETAILS OF PERFORMANCE MEASUREMENT, EVALUATION AND IMPROVEMENT

(i) Review of Progress Against Physical and Financial Plan

PowerNet provides monthly Board Reports which include a summary of all network operations for both the PowerNet Directors and the Company Directors. These reports review progress against the annual Business Plan both from a physical aspect and financially. An example of the reliability charts is shown on page 23.

In addition engineering staff of PowerNet attend weekly network performance meetings at which all incidents on the network are examined and actions taken to prevent reoccurrence, mitigate the effects or investigate further.

Both capex and opex were 15% under spent for the period from 1 April 2004 to 31 March 2005. This was due to the renegotiation of the faults contract and the ensuing setup stage for the new contractors, poor ground conditions in late 2004 and limited resources.

The capex and opex budget was $11.6M expenditure incurred was $9.9M.

(ii) Evaluation and Comparison

The evaluation and comparison of performance against the targets is shown in the Information Disclosure Regulations and in the Annual Reports where performance is compared to the targets in the Statement of Corporate Intent.

The Company is showing an overall positive improvement in performance reflecting the significant capital investment in the network over the past five years. Performance for the year ending 31 March did achieve the targets.

Comparing the actual achieved values with the 10 year target set in the last AMP shows that targets have been surpassed. Total SAIDI actual of 125.6 minutes compared to the target of 134.0 minutes, and the corresponding CAIDI was 39.82 compared to the target of 49.4.

(iii) Gap Analysis and Identification of Improvement Initiatives

In general the Company has met or exceeded its KPIs in all areas. Most improvement initiatives have already been mentioned in the previous text and include improving the utilisation factor and load factor by the redeployment of under-utilised assets and more interactive load control respectively.

Part of the Company's capital plan also includes projects to reduce losses where there are significant losses occurring.

Increased use of live line techniques, SCADA, WASP and integration of databases and software within PowerNet will all contribute to improving the operation of the Network.

As the Company has not set targets for energy delivery efficiency no comparisons are available.