

Electricity Invercargill Limited

**ASSET MANAGEMENT PLAN
2004-2014**

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EIL 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 Electricity Invercargill Limited, its customers and shareholders. 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, customer and shareholder requirements in the most cost effective manner.

(ii) Date and Period of Plan

This Asset Management Plan is dated 24 June 2004 and is for the period 1 April 2004 to 31 March 2014. 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 2004 with publication in June 2005.

(iii) AM Systems and Information

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

(iv) Network and Asset Description

The network is in two non-contiguous sections: the larger network supplies most of the urban area of Invercargill, the other network supplies the area, which was formerly the Borough of Bluff. The City section of the network is supplied from the Transpower substation at Findlay Road via seven 33kV circuits and four 33/11kV zone substations. One zone substation can also be supplied at 33kV from the Transpower North Makarewa Substation. The 11kV network is heavily meshed and a large and increasing proportion of the circuits are underground. The Bluff section is supplied via The Power Company Limited's 33/11kV substation and the network is almost entirely overhead.

(v) Service Level Objectives

The recent Commerce Commission Price Path and Reliability Regulations have highlighted Price and reliability and the respective trade off between them.

Consultation has taken place during the year 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 especially the undergrounding policy.

Although reliability statistics vary each year, the 10-year objective for the Electricity Invercargill Limited network is to maintain its present level of reliability, which is one of the best in New Zealand. The Company is optimistic that this can be achieved but it would be subject to regulatory controls on expenditure.

The current SAIDI index for network faults is 31 minutes. Over the 10-year period the objective is to maintain a level of under 31 minutes.

The equivalent SAIFI is 0.97 and the objective is to maintain this at under 0.97 over the 10 years.

If the above can be achieved it will result in a CAIDI for network faults of 32 minutes.

Taking into account the continuing undergrounding of the network, the SAIDI for planned interruptions is expected to remain at about 4 minutes, SAIFI at 0.03 resulting in a CAIDI of 133 minutes.

(vi) Life Cycle Asset Management

The philosophy for asset management is based on condition-driven maintenance, which is determined from diagnostic testing, visual inspections, fault incidents and technological, safety and operational obsolescence.

The initial basis for the condition-driven maintenance originated from a survey carried out when all assets were captured for a GIS database.

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

There is also an ongoing tree trimming programme, which has an objective of ensuring all trees are trimmed on a three-year basis.

Maintenance budgets average at approximately 2% of the depreciated replacement value.

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 two urban networks. There have been two major floods with minor impact and damage to the network. Eighty-four (11kV and 400V) percent of the reticulation in the Invercargill city network is underground and unaffected by storms. Maximum loading of cables and transformers occurs in winter when ambient and ground temperatures are low.

The main risks to reliability are associated with the 11kV switchboards in zone substations, the Transpower Grid Exit Point (GXP) supply and a large local earthquake.

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. Although on a national basis it is anticipated that there will be an increased level of embedded generation, it is not anticipated this will have a significant impact on this network over the next 10 years.

All projections have been based on no significant changes to the local economy.

It is not projected that there will be any significant changes to Asset Management policies subsequent to 2013 when the obligation to supply is scheduled to cease.

(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 and vegetation control and increased live line working.

The Council driven undergrounding programme is having a significant impact on reliability, mitigating Telecom induced voltage problems, increasing safety in urban areas and improving quality of supply.

Network performance incentives are included in maintenance and faults contracts, which 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 preparation, which extends over a period of five years.

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 Electricity Invercargill Limited Board on an annual basis.

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) 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 cognizance of environmental considerations including the Invercargill City undergrounding policy.
- (h) Rate of return.

(ii) Planning Periods Adopted

The Asset Management Plans are based on a 10-year period.

(iii) Stakeholder Interests

The principal stakeholders in the performance of the network assets are the end-use customers, the shareholder, ie Invercargill City Council as the ultimate owner, Invercargill City Holding Company, 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.

(iv) Accountabilities and Responsibilities for Asset Management

The ultimate responsibility for the management of the Company's assets lies with the Electricity Invercargill Limited Directors who are appointed by Invercargill City Holdings Limited who are appointed by the Invercargill City Council who are in turn elected by the ratepayers.

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

(v) Asset Management Systems and Processes

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

1. The Intergraph GIS system, which records the location, construction details, condition of, and any changes to the network assets.

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

Load flow and losses analyses use GIS data.

2. 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.
3. The Faults and Outage databases which are linked to a network model and provide reliability analyses.
4. The WASP Maintenance Management System that holds maintenance records and databases pertaining to individual pieces of equipment.
5. Diagnostic testing, such as infrared and partial discharge, and records of visual inspections of equipment.
6. Vegetation database linked to the GIS, which provides information on the proximity of vegetation to lines.
7. A condition driven maintenance survey carried out during the data capture phase of the establishment of a GIS system.
8. ODRC analysis used for the preparation of the ODV.
9. Inspections carried out in preparation of the schedules for the Asset Management Agreement between PowerNet and Electricity Invercargill Limited.
10. The UMS Optimisation tool that will ensure operational expenditure (opex) and capital expenditure (capex) is targeted at work, which will support the strategic objectives of the company.

(C) DETAILS OF ASSETS COVERED

(i) Current Network Configuration

Transpower GXP

The point of supply for the Electricity Invercargill Limited network is based at Invercargill. Invercargill is supplied by the 220kV grid through 2 x 50MVA 33kV transformers.

Supply security from Transpower satisfies PowerNet's requirements although there have been two total supply interruptions from Invercargill GXP within the last 20 years.

Subtransmission

The Electricity Invercargill Limited 11kV distribution network in the Invercargill City part of the network is supplied from four zone substations. These substations are Doon Street, Southern, Leven Street and Racecourse Road.

Doon Street substation has two 11.5/23MVA OFAF* transformers supplied by two 33kV oil filled cables.

Southern Substation has one 11.5/23MVA OFAF* transformer which is normally supplied by one 33kV oil filled cable. A 33kV cross-linked polyethylene cable has been installed from this substation to connect into The Power Company Limited 33kV overhead line from Invercargill Transpower GXP to its Seaward Bush substation. This cable would be used in an emergency in the event of failure of the oil filled cable.

At this substation the structure has also been extended so that a spare transformer could be installed there quickly in the event of a failure of the 11.5/23MVA transformer.

* 23MVA rating OFAF is an Emergency Standby Rating (ESR) at 5°C ambient

Leven Street substation has two 11.5/23MVA OFAF* transformers and is supplied by a 33kV cross-linked polyethylene cable from the Invercargill Transpower GXP. Its supply can also be backed up by a 33kV cable and overhead line connecting Leven Street to The Power Company Limited 33kV overhead line from the Invercargill Transpower GXP to Otatara. During 2002/2003 a second 11.5/23MVA transformer was installed at site. Note that as the alternate cable is from another GXP full non-interruption n-1 reliability is not achieved but a short changeover time will be required.

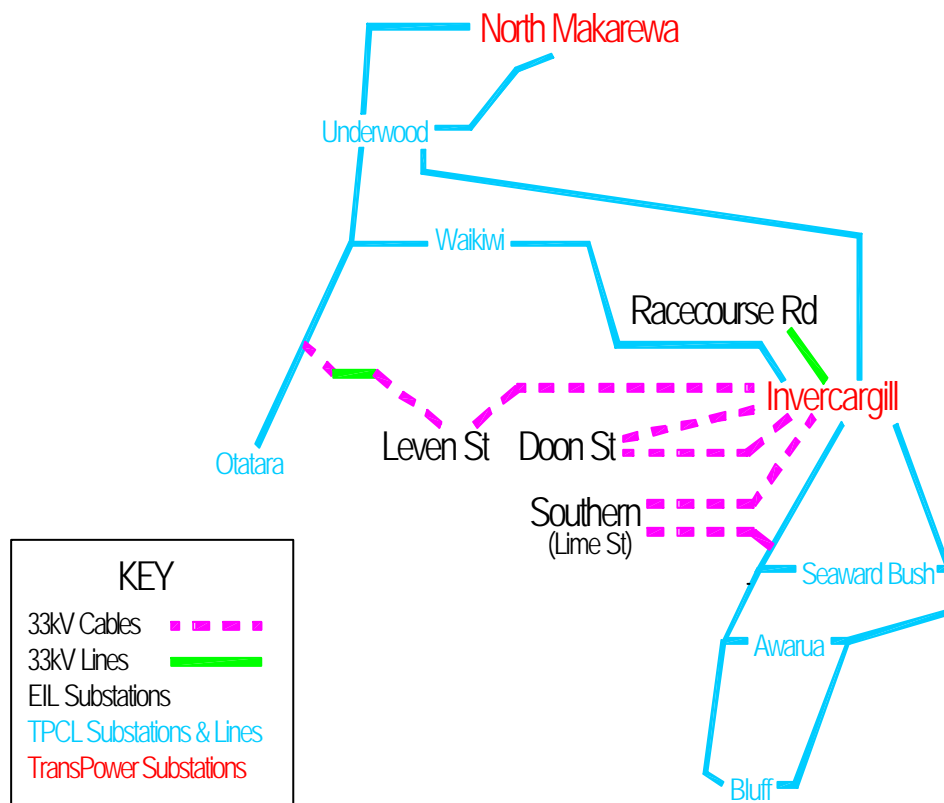
As Otatara can be supplied from the North Makarewa Transpower GXP, it will result in the CBD and hospitals within Invercargill being able to be supplied from two separate Transpower GXPs.

Racecourse Road substation has one 11.5/23MVA OFAF* transformer and is supplied by a short 33kV overhead line from the Invercargill Transpower point of supply. There is provision for an emergency transformer to be installed there in the event of a failure of the existing 11.5/23MVA transformer. Adjacent to the substation is The Power Company Limited 33kV overhead line which supplies Waikiwi and Otatara.

Supply security for the zone substations has in the past been reliant on the 11kV interconnections between these substations. This was partly historic as originally the entire City was supplied at 11kV from the Invercargill Transpower GXP and thus there was a reasonably solid 11kV reticulation network in Invercargill.

As loads and the age of equipment have increased, there was an increasing risk of a high impact failure occurring and inadequate backup capacity available to supply the CBD and some emergency services. This has now been addressed to a large extent except the risk of a catastrophic failure of either Doon Street or Leven Street substations.

The Bluff part of the network is supplied from Bluff's zone substation which itself is supplied via two 33kV Power Company Limited owned overhead lines. There is full parallel protection thus the failure of any section of the line supplying Bluff does not result in an interruption of supply to this township. Both 33kV lines have recently been reinsulated to reduce problems with salt pollution.



11kV Distribution

Most of the 11kV distribution network in the City area is underground but with some overhead sections still in operation. Most substations are 200kVA and above and with a supply security of manually switched (n-1) via the 11kV network or via the 400 volt network.

There are some areas, which are still overhead with a capacity of less than 1MVA which are single circuit security with no adequate 400 volt backup. This single circuit security also applies to individual transformers of less than 1MVA capacity. The 400 volt system is over 92% underground with good backup capacity and good reliability. Cables in the CBD area are a mixture of paper lead and PVC depending on the size and date of installation. Switching in the CBD area is via under footpath link boxes or switching pillars. Backup 400 volt supplies in the residential and non-CBD areas are via physically connecting cables within pillar boxes.

Current Supply Security

The summary of the supply security for the four zone substations and The Power Company Limited's Bluff Substation are shown in Table 1.

Racecourse Road's maximum demand is growing slowly and it is expected to exceed the threshold near the end of the planning period.

Leven Street Substation almost meets the required security level. The difficulty is that the alternate 33kV supply is from a separate GXP and therefore cannot operate closed. Therefore a short changeover time will occur if the primary 33kV is isolated.

Southern Substation is programmed to have the second transformer installed in 2006 to achieve the required security level. At present the 11kV-meshed network to other Electricity Invercargill Limited and The Power Company Limited substations can maintain supply after manual reconfiguration of the network.

Table 1 Supply Security

Zone Substation	2004 Maximum Demand MVA	2004 Customer Connections	Security Rating Required	Present Security Rating	2014 Required Security Rating
Doon Street	17.9	6,346	AAA	AAA	AAA
Leven Street	14.9	1,719	AAA	AAA	AAA
Racecourse Road	11.7	3,290	AA	AA	AAA
Southern Sub	11.9	4,734	AA	AA	AAA
Bluff (TPCL)	5.8	1,010	AA	AAA	AA

See Page 16 for the definition of the EIL Security Ratings.

(ii) Network and Asset Description

Assets have been classified as:

- Subtransmission Circuits.
- Subtransmission Transformers and Switchgear.
- 11kV Overhead Lines and Underground Cables.
- Distribution Substation Switchgear.
- Distribution Transformers.
- 400V Overhead Lines and Underground Cables.

(iii) Justification for Assets

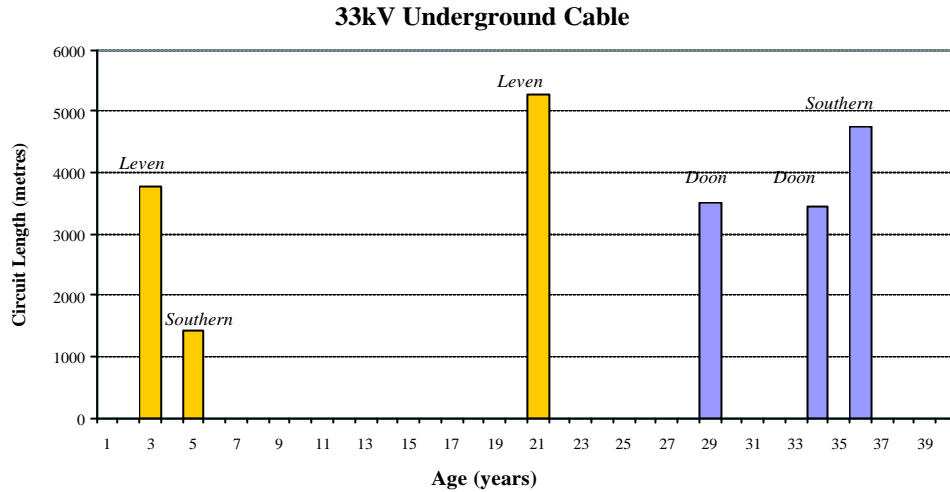
In general the assets are the minimum required to provide a supply of adequate reliability to the end use customers and comply with the statutory requirements for voltage drop.

(iv) Location, Age and Condition

The ages given in the following section are guidelines only, major refurbishment will depend on a combination of the following factors:

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

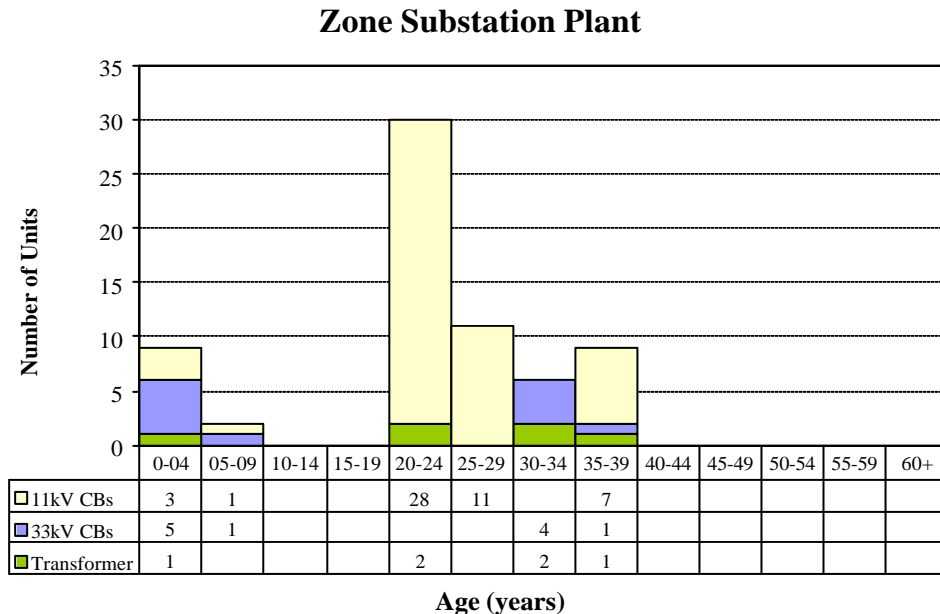
Subtransmission Circuits



The above graph shows the age profile of the 33kV cables supplying the Electricity Invercargill Limited City network. All cables are less than 40 years old and considering the loading of the cables, they should all be inside the first half of their economic lives. The three oldest cables are oil filled and the three younger cables are XLPE.

In addition, there is a short (0.6km) overhead 33kV line supplying the Racecourse Road Substation and (1km) part of the Otatara to Leven Street Substation supply.

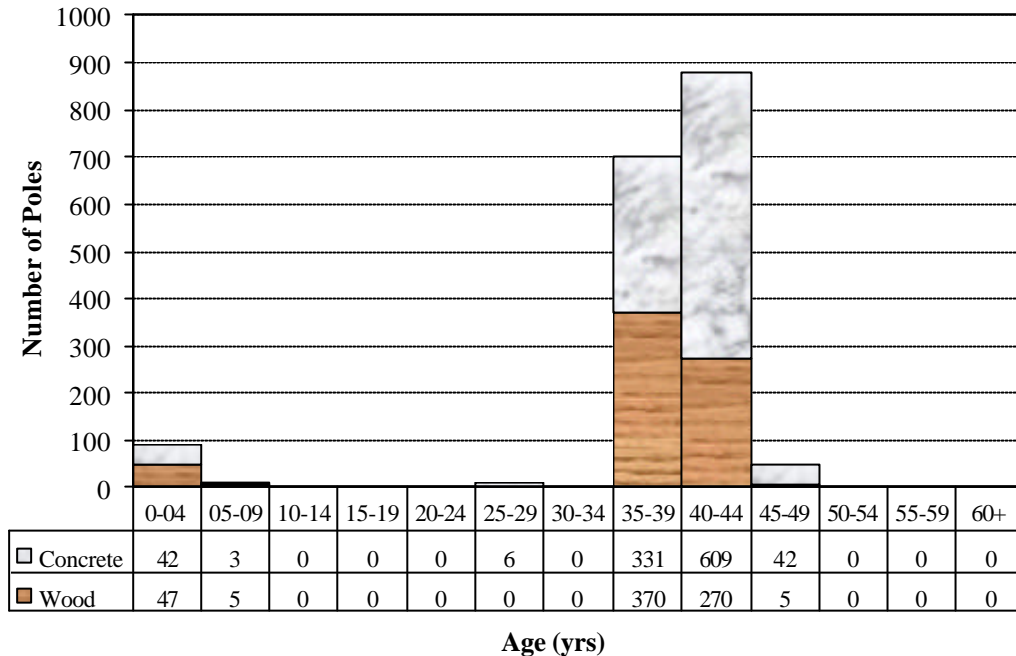
Subtransmission Transformers and Switchgear



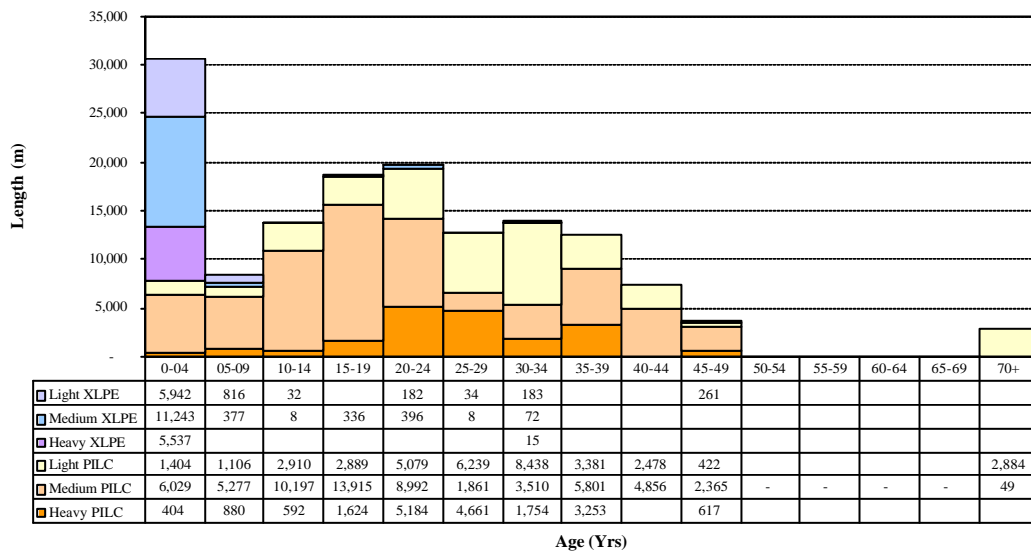
All the above equipment will still be within the expected life cycle after 10 years hence there are no replacement plans within that period. At the end of the period the original gear at Southern Substation will reach 45 years of age, due to ongoing refurbishment it is planned to keep this gear in service for at least another five years.

11kV Overhead Lines and Underground Cables

11kV and 400V Pole Ages



11 kV Cables



Electricity Invercargill Limited is 84% of its way through a programme to underground its network in Invercargill City.

The undergrounding programme has primarily focussed on undergrounding the sections of overhead reticulation, which are in the worst condition to minimise maintenance costs.

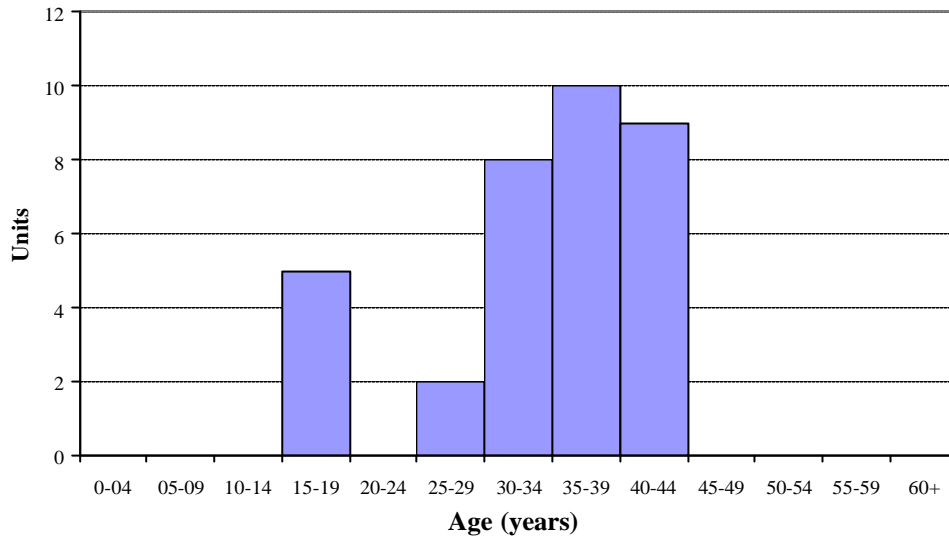
This priority is now coupled with completing areas of underground reticulation rather than just streets to minimise transitional pole mounted cable potheads and other costs. As all remaining 11kV

overhead lines are generally now in a good operating condition, the undergrounding of them is mainly driven by the 400 volt programme.

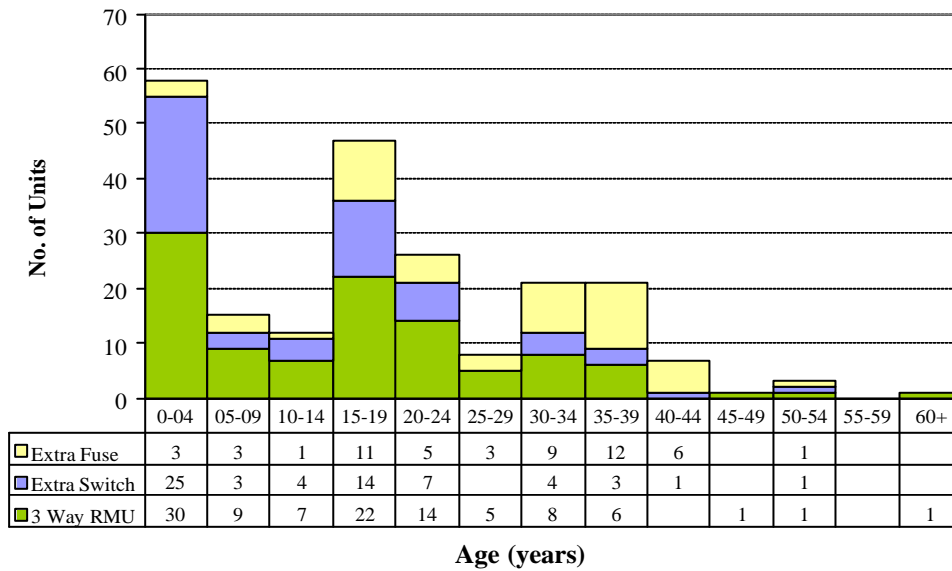
11kV Distribution Substation Switchgear

Oil Circuit Breakers

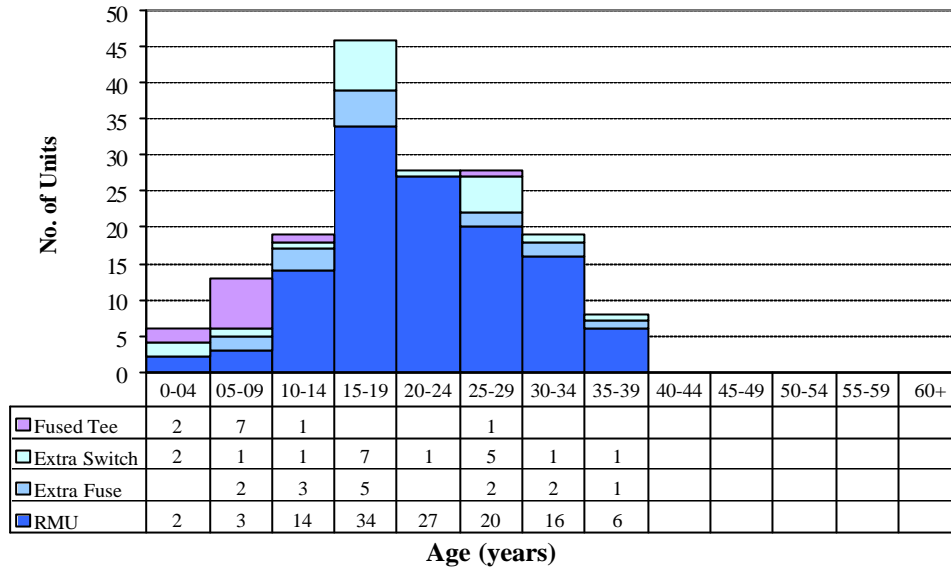
(Excluding Zone Substations)



Oil Insulated 11kV Switchgear



Air Insulated 11kV Switchgear

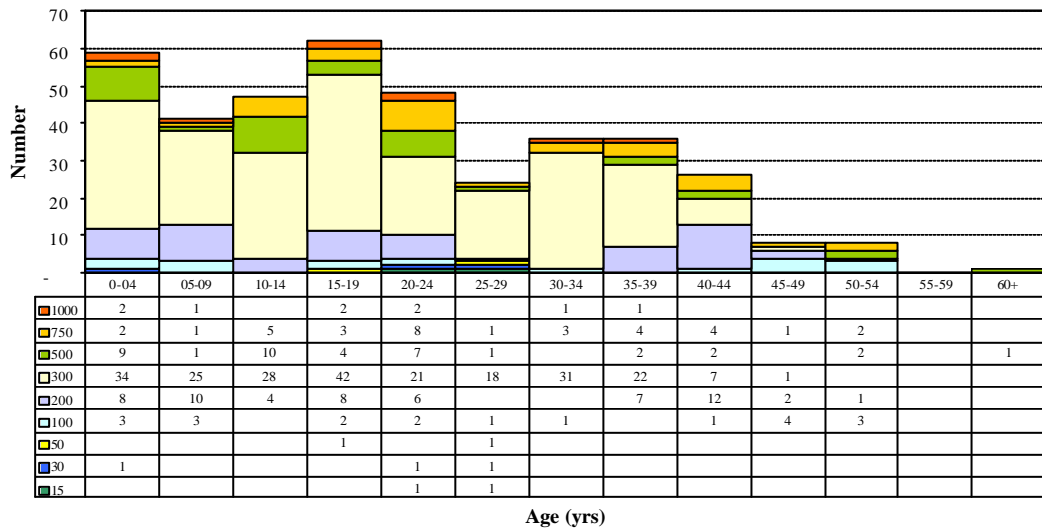


A replacement programme is under way to replace all KRONE RMU's and Frank Wilde Tee's due to insulation deterioration and no available spare parts.

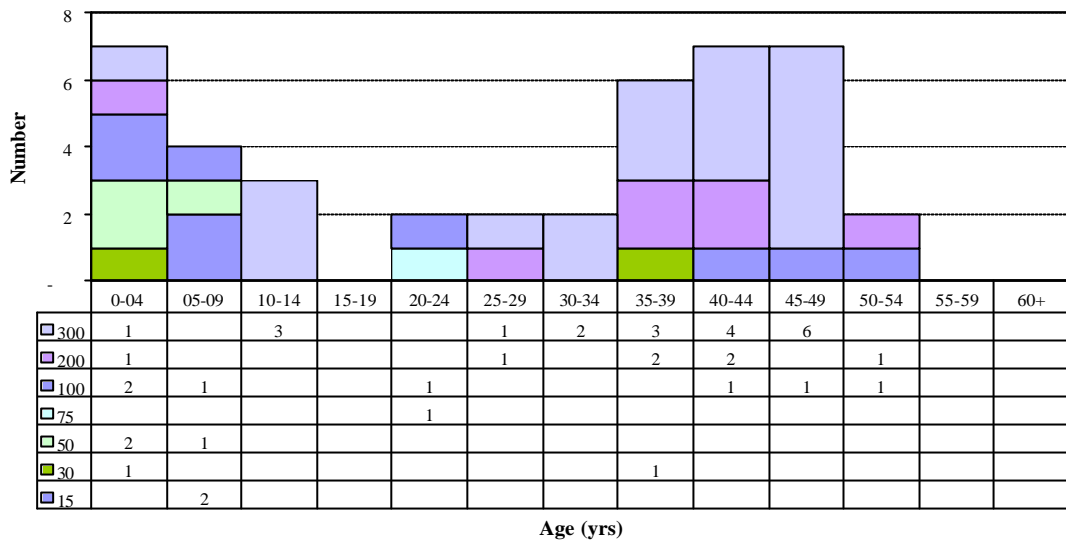
Distribution Transformers

The charts below show the age profile of the distribution transformers on the network. Ongoing refurbishment of larger units and the housing of many of these inside buildings will extend their life to 60 years. Transformers less than 50 kVA will be replaced when they fail, or when the area is undergrounded.

Ground Mounted Distribution Transformers



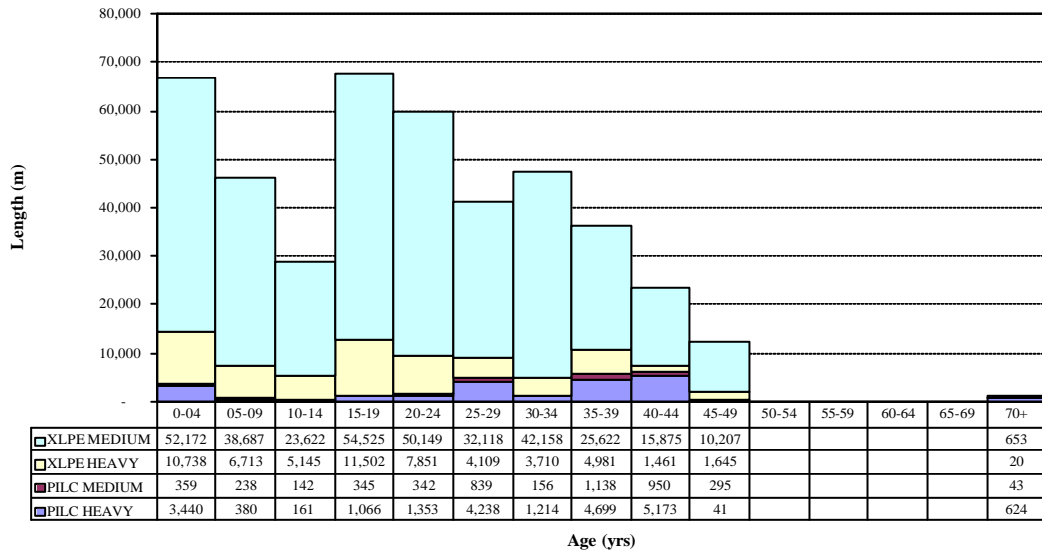
Pole Mounted Distribution Transformers



400V Overhead Lines and Underground Cables

The age profile for 400 volt cables has been derived from the age of the supplying equipment. Overhead lines are being undergrounded in Invercargill, with only emergency maintenance repairs done. Lines in Bluff are not planned to be undergrounded and these will be maintained to ensure reliable service.

400 Volt Cables



(D) DETAILS OF PROPOSED LEVELS OF SERVICE

(i) Service Level Objectives

Reliability of Supply

The historical reliability performance, projected values for 2002/2003 and the target five-year averages for outages originating within the Electricity Invercargill Limited network are:

Total Number of Interruptions

[Number]	Target	Projected	Actual				
Class	5-Year Average	2004/05	2003/04	2002/03	2001/02	2000/01	1999/00
B	9	9	9	6	11	11	18
C	17	17	19	15	22	29	22
TOTAL	26	26	28	21	33	40	40

System Average Interruption Duration Index

[Minutes]	Target	Projected	Actual				
Class	5-Year Average	2004/05	2003/04	2002/03	2001/02	2000/01	1999/00
B	4	4	4.5	2	4.0	4.0	4.7
C	31	31	45	19.4	32.0	31.0	29.0
TOTAL	35	35	49.5	21.4	36.0	35.0	33.7

System Average Interruption Frequency Index

[Number]	Target	Projected	Actual				
Class	5-Year Average	2004/05	2003/04	2002/03	2001/02	2000/01	1999/00
B	0.03	0.03	.03	.01	0.04	0.05	0.011
C	0.97	0.97	1.25	.69	1.12	1.07	0.53
TOTAL	1.00	1.00	1.28	.7	1.16	1.12	0.64

Customer Average Interruption Duration Index

[Minutes]	Target	Projected	Actual				
Class	5-Year Average	2004/05	2003/04	2002/03	2001/02	2000/01	1999/00
B	133	133	150	200	98.8	80.4	42.5
C	32	32	36	28	28.5	28.9	54.8
TOTAL	35	35	38.7	30.5	31.0	31.25	52.66

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

In accordance with some of the retailer agreements, the Company also has performance incentive payments which include payments to domestic customers following a "no power" call received by the PowerNet Control Room if there has been no attendance by a PowerNet authorised contractor on site within four hours of that notification. The payment in this case is \$40.

If as a result of a general network failure, the power supply has not been restored within six hours of notification of the failure then the Company will pay each domestic customer \$50.

There are certain conditions where the payment is exempted such as widespread severe snowstorms, windstorms or lightning etc, or faults caused by third parties such as Transpower or major damage to equipment.

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

Network Efficiency (Losses)

Current system losses are estimated to be approximately 5%. Any significant reduction would require major capital expenditure. This level is seen as acceptable and appropriate and consequently no lower target is set.

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.

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

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 60 business days unless resource consent is required for any remedial works.

(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. 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 also in line with the Commerce Commission regulatory thresholds.

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 Electricity Invercargill 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.

Security Standards

The Standards of Security of Supply adopted by the Company are summarised in the following table.

EIL SECURITY RATINGS		
Group Demand	Security Rating	Arrangement
>12 MWatts or 6,000 connections	AAA	(n-1) Uninterrupted
4-12 MWatts or 2,000 to 6,000 connections	AA	15 minutes restoration time
1-4 MWatts	A(i)	Isolate and Restore (2hrs)
<1 MWatt	A(ii)	Repair time

Notes:

1. Restoration time for 90% of load permits the prolonged loss of supply to individual customers following storm conditions.
2. The above times are maximum and relate to network design parameters.
3. Transformers or transformer groups supplied by an underground 11kV cable and with more than 75 network connections will have a security of A(i).
4. Certain parts of the network will demand enhanced supply security due to the type of load, eg CBD 11kV network will require a level of security of AA.
5. Where possible part group demand will be supplied via LV interconnections prior to the repair being actioned.
6. For AAA and a second circuit outage, restore 33% of the group demand within two hours.
7. Excludes short-term interruptions of less than one minute duration, and events external to the local network, eg energy storage, Transpower outages, storms, etc.

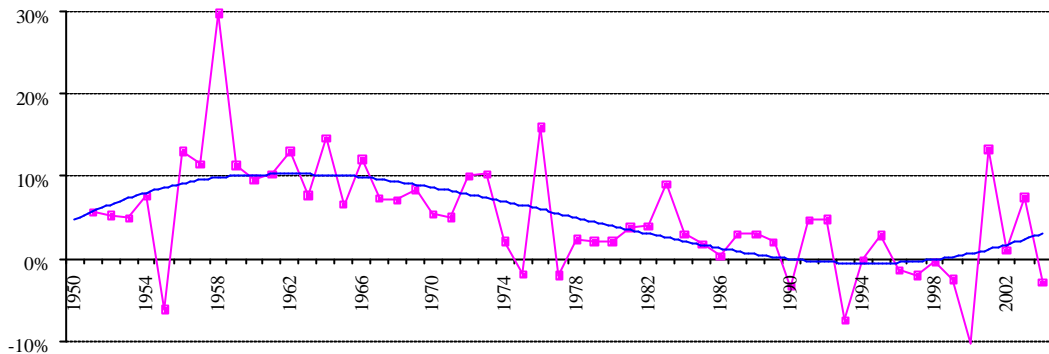
(ii) Demand Forecasts

The following growth rates have been selected for the next 10 years.

Zone Substation	Growth (per annum)	Maximum Demand 2014 (MVA)
Doon Street	0.25%	18.40
Leven Street	1.60%	17.50
Racecourse Road	0.25%	12.00
Southern Sub	0.25%	12.20
Bluff (TPCL)	1.30%	6.60

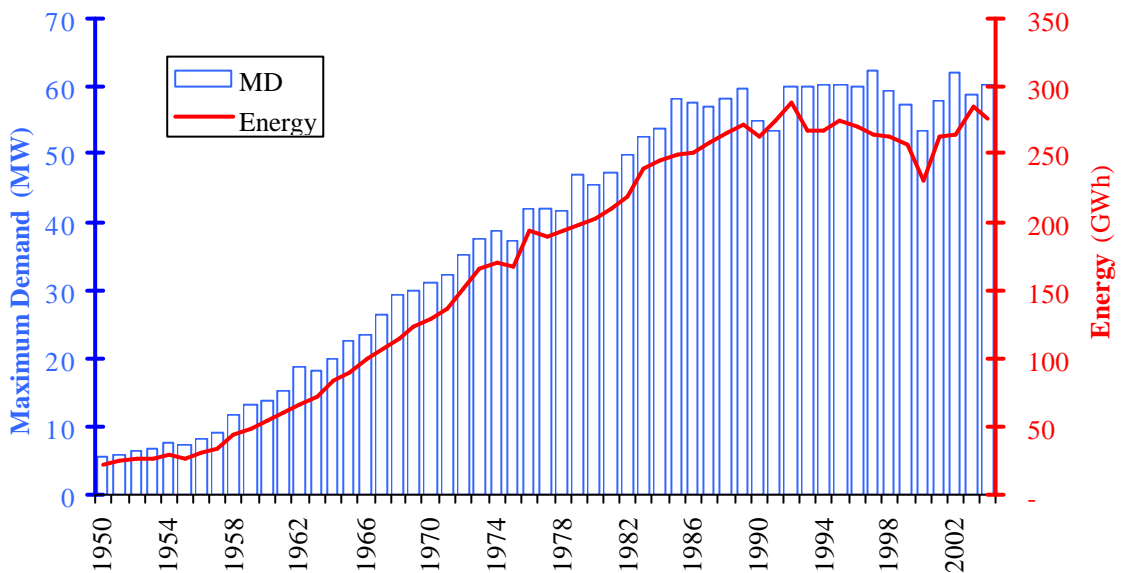
Over the last 20 years the Energy Usage and Maximum Demand has increased at 0.7% per annum. Use of load control to limit the Invercargill GXP peak is done in conjunction with The Power Company Limited to reduce overall Transpower charges.

Year-to-Year Energy Growth



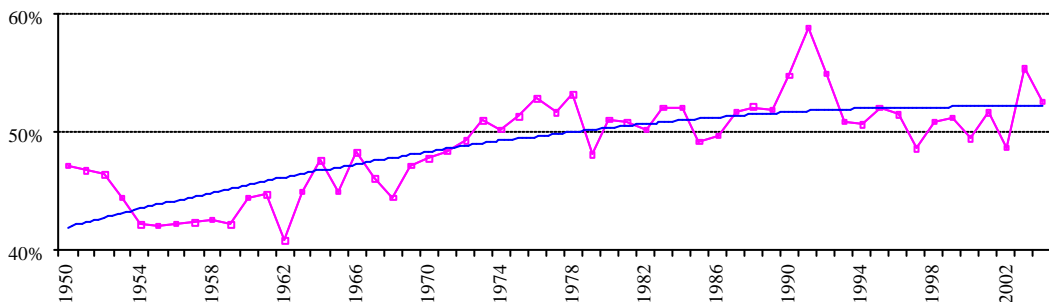
The graph below shows the growth and stabilising of demand and energy growth over the past 50 years.

Maximum Demand & Energy Transmitted



The graph of Annual Load Factor below shows the impact of the introduction of ripple control in 1956 and the gradual increase in Off Peak Water and space heating up to 1990.

Annual Load Factor



(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, ie losses and operations.

Improvements in the performance of the network do not always entail new investment. Operational considerations such as transfer of load between 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 stranded capacity.

Consideration is also 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.

(iv) **Options Available**

Supply Reliability

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

1. Reduce the Number of Faults

This is achieved through good maintenance and progressing the undergrounding programme in the City. The recent introduction of the tree regulations will result in increased expenditure over at least the next three years

2. Reduce the number of Planned Interruptions

This is being achieved by increasing the use of live line working on the remaining overhead high voltage lines. Justification is based on the economics taking into account the cost of non-supply, advertising, control room operations and switching.

It is PowerNet 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 12.00 noon to 1.00 pm.

- ❑ Morning and afternoon supply interruptions shall take place only if warranted. Time span shall be 9.00 am to 12.00 noon, and 1.00 pm to 4.00 pm. 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°C supply interruption will only take place for urgent maintenance.
- ❑ 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.
- ❑ Nighttime supply interruptions shall be considered under some circumstances.
- ❑ Some areas with special conditions shall be treated on an individual basis.

3. *Reduce the Impact and Duration of Supply Interruptions*

The use of SCADA not only provides indication from all zone and CBD distribution 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.

11kV Distribution Design

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

- ❑ Unless the existing reticulation is predominantly overhead (Bluff) all new extensions will be installed underground.
- ❑ Earth Fault Indicators are required on predominantly underground system.
- ❑ All transformers will have suitable HV fault protection, ie fuses or circuit breakers and isolation.
- ❑ Transformer overload protection will generally be through the LV fuses or switchgear or physical load constraints.

(v) Maintenance

Maintenance for each asset group is shown below:

1. *Subtransmission Circuits*

Maintenance includes weekly visual inspection of terminations and oil pressure readings, quarterly checking of cable pressure alarms and annual cable sheath integrity testing and a contingency sum for initial response to a cable fault.

Tri-annual profiling by Time Domain Reflexology (TDR) is done to allow early detection of insulation degradation.

The annual estimated expenditure is \$70,000.

2. *Zone Substations, Power Transformers and Switchgear*

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.

Tap changer overhauls are based on the number of operations.

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.

The annual estimated expenditure is \$150,000.

3. *11kV Overhead Lines and Underground Cables*

Annual maintenance includes a visual inspection of the overhead lines and cable terminations.

The annual estimated expenditure is as follows:

11kV Overhead Lines	\$160,000
11kV Underground Cables	\$170,000

4. *11kV Switchgear*

Maintenance of the oil filled circuit breakers is similar to those in zone substations.

For the 11kV ground mounted switchgear, 30 units are overhauled each year, oil routinely changed in external units every five years and a “visual” inspection carried out annually.

Ground mounted switchgear is a mixture of oil filled metal clad equipment and epoxy resin insulated (air insulated).

CBD substations are inspected monthly including all of the equipment therein.

Annual estimated expenditure is \$130,000.

5. *Distribution Transformers*

Transformers in CBD substations are visually checked monthly, others at six-monthly intervals when MDIs are read.

Approximately 20 transformers are overhauled annually.

Annual estimated expenditure is \$100,000.

6. *400V Overhead Lines and Underground Cables*

Maintenance includes annual inspection of underground link boxes, distribution pillars and overhead lines.

Annual estimated expenditure is:

400V Overhead Lines	\$90,000
400V Underground Cables	\$25,000

The above costs are the direct costs of materials and contractor time and equipment.

In addition there are PowerNet internal costs, which are estimated at \$320,000 per annum, which includes all operations, and maintenance related personnel and overheads.

(vi) **Network Development Programme**

Subtransmission System

As stated previously the security of the Company's City subtransmission system still relies mainly on the backup capability of the 11kV network between the four zone substations. The main drawback to this arrangement is the time taken to restore supplies through the 11kV network if a loss of supply is caused by a fault on the subtransmission network and the need for all the various parts of the 11kV network to operate to full capacity during this period.

This is particularly so in the winter when significant peak periods do occur on the Company's network.

To reduce the risk the Company has already embarked on reinforcing the subtransmission network to three of the four zone substations. In 1998/99 the installation of a backup cable connecting the Southern substation to The Power Company Limited 33kV line was completed. The provision to enable a second transformer to be installed quickly was also completed.

In 2000/2001 the backup 33kV supply to Leven Street substation was done on the network with the upgrade of the TPCL subtransmission network in 2001/2002. This permits a backup from an alternative Transpower point of supply via The Power Company Limited subtransmission network into the CBD area and to supply hospitals within the City.

A second 33/11kV transformer has been installed at Leven Street substation in 2003.

The final part of this reinforcement was the provision for a second temporary emergency transformer at Racecourse Road.

Depending on growth rates provision is allowed in the Capital Works Programme for a second transformer at Southern substation in 2006/2007 and a second transformer at Racecourse Road Substation in 2013/2014.

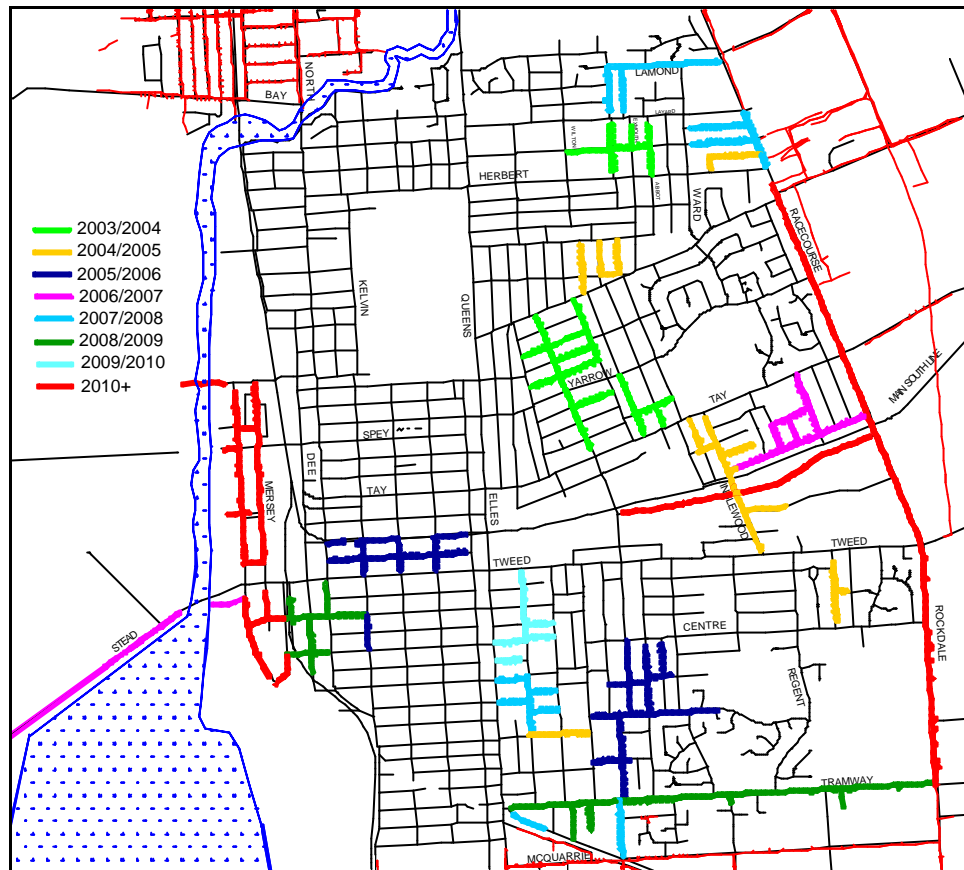
As all existing oil cables are under 60 years old and 35 years for the XLPE cables there are no plans to replace any of them within the next 10 years. Likewise the power transformers and zone substation switchgear that will reach their maximum life of 45 years will be refurbished to extend their lives to 60 years.

It is planned to retrofit or replace the 11kV oil filled circuit breakers at all zone substations to reduce the risk of fire and catastrophic failure of the substation. It is proposed to commence the programme at Doon St in 2007.

Distribution

The major part of the distribution capital work involves the continuation of the programme to underground the Invercargill City network. The programme is well advanced and has negated the need to do some major overhead line maintenance and renewals during the past few years.

Figure 1 shows the undergrounding programme from 2003. Minor variations have occurred recently with more focus on poor condition assets.



The thrust of the programme over the next few years is to complete the undergrounding of the City area by area.

The undergrounding programme is scheduled to cost between \$1.0-1.6 million per annum until 2010 depending on other works and the availability of funds.

In addition to the above work, general capital expenditure will be required for replacement of transformers, upgrading of earths, expansion of the SCADA system, renewal of old unreliable multi-core cables and replacement of oil filled 11kV switchgear in high risk locations.

The total annual budget for capital expenditure will be between \$1.0 and \$2.0 million depending on the funds available to continue the undergrounding policy.

Most of the reticulation in the Bluff Township was upgraded when the reticulation was converted from 3.3 to 11kV. There are only minor areas remaining for upgrading.

A copy of the 10-Year Capex Plan is shown below.

Electricity Invercargill Limited - Proposed Future Capital Expenditure

\$000	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Distribution Total	323	252	286	180	183	371	951	955	1,240	581
New Customers Total	214	90	102	103	103	105	103	103	103	103
Substations Total	224	60	692	410	413	72	300	300	16	675
Subtransmission Total	17	15	17	6	7	7	7	8	8	8
Undergrounding Total	1,560	1,604	1,136	1,462	1,449	1,067	11	6	6	6
Grand Total	2,337	2,021	2,234	2,160	2,155	1,623	1,373	1,373	1,373	1,373

(F) RISK POLICIES

(i) Methods, Details and Conclusion of Risk Analysis

As the assets are distributed they are less susceptible to a single event.

A risk analysis has been carried out on the network and from this analysis critical 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.

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 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 and 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 2004.

(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.

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.

Until March 31st 2004, the financial year end of TPCL was 30th June. The last financial period was only 9 months duration to bring the financial years in line with the regulatory year. This has made progress reports, particularly financial reports, more difficult for part way through the financial year. From 31 March 2005 this will be easier to accomplish.

Physical progress on last year's capital plan was as follows:-

- Completion of second transformer at Leven Street
- Chelmsford Undergrounding
- Lindisfarne Undergrounding
- New connections

Both capex and opex were under spent for the period from 1st July 2003 to 31st March 2004. This was mainly due to the shortened financial year and uneven flow of work.

The capex budget was \$1.6M for 12 months and expenditure incurred over 9 months was \$1.1M

(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.

Operational performance for the year ending 31 March 2004 did not meet the targets. Contributing to the result was a fault occurring on relatively new 33kV switchgear at Leven Street and a vehicle hitting a pole in the city.

SAIDI was 49.5 minutes and SAIFI was 1.27 compared to the Commerce Commission targets of 35 minutes and 1.0 respectively.

The Company is showing an overall improvement reflecting the significant capital investment in the network over the past five years. This improvement is mainly manifested in the increased reliability to its customers.

(iii) Gap Analysis and Identification of Improvement Initiatives

In general the Company has met or exceeded its Key Performance Indicators (KPI) 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.

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.

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