PRICEWATERHOUSECOOPERS

Horizon Energy Distribution Limited

Electricity Lines Business ODV Valuation as at 31 March 2004

2 December 2004

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Contents

1 Introduction

1.1 As requested, PricewaterhouseCoopers has determined the Optimised Deprival Value ("ODV") of Horizon Energy Distribution Limited's ("Horizon") Electricity Lines Business ("ELB") system fixed assets as at 31 March 2004.

1.2 The valuation covers the Horizon network located in the eastern Bay of Plenty inclusive of subtransmission, distribution and low voltage assets. In the subtransmission network Horizon operates assets at 33 kV. These assets include lines and cables from Transpower's points of supply to Horizon's zone substations, the substation buildings and associated land, transformers and switchgear. Horizon has four points of supply with Transpower located at Edgecumbe, Kawerau, Waiotahi and Te Kaha and 11 major zone substations. Embedded generation exists within two parts of the Horizon system fed from separate Transpower points of supply. On the Edgecumbe supplied system there is a 10 MVA co-generation facility owned by Bay of Plenty Electricity ("BOPE") on the Fonterra Milk Factory site. The generation facility is primarily to feed the site and islands at any time of system interruption. Excess generation from the site is exported through the Horizon system to other BOPE customers. Also on the Edgecumbe system is a 24 MVA hydro station owned by BOPE and located at Aniwhenua. The 33 kV system that connects the Galatea and Kaingaroa substations to the Edgecumbe point of supply is usually run open with the normal supply coming from the Aniwhenua station. Excess generation from Aniwhenua is exported via a 110 kV line to Matahina and then into the Transpower grid system. On the Kawerau system there are two small geothermal generation stations again owned by BOPE with a total capacity of about 5 MVA. These two systems operate as base load with a high load factor and supply into the surrounding Horizon system.

1.3 The distribution network operates at medium voltage - 11 kV, and low voltage - 400V. Distribution assets consist of lines and cables, distribution substations inclusive of transformers, switchgear and low voltage connections with consumers. Horizon's distribution network also includes street lighting assets. The system supplied 27,488 connections at valuation date.

1.4 The ODV valuation has been calculated in accordance with the Handbook for Optimised Deprival Valuation of System Fixed Assets of Electricity Lines Businesses ("the Handbook"). The Handbook was issued by the Commerce Commission on 30 August 2004.

1.5 Part 4 of the Commerce Act (Electricity Information Disclosure) Requirements ("the Requirements") requires that:

- ELBs publicly disclose various financial performance measures;

- these financial performance measures be based on the ODV of the ELB's system fixed assets; and
- the ODV be calculated in accordance with the Handbook.

1.6 We stress that the valuation derived using the ODV methodology in the Handbook is intended for regulatory purposes and may not necessarily represent the fair market value of the ELB's system fixed assets.

1.7 In determining the ODV valuation we have relied on advice from Maunsell Limited ("Maunsell"). In particular, Maunsell has reviewed the replacement costs, asset lives and optimisation of the system fixed assets.

2 Valuation methodology

2.1 The ODV of an asset is the minimum of the Optimised Depreciated Replacement Cost ("ODRC") and Economic Value ("EV"). The ODRC is a measure of the cost of replicating the network in the most efficient way possible, from an engineering perspective, given its service capability and the age of the existing assets. The EV is the earnings based value of the network, and is obtained by calculating the Net Present Value ("NPV") of the future cash flows of the least cost equivalent service not using system fixed assets. EV is used to value uneconomic parts of the network, which are not able to fully recover their costs (including their cost of capital), with assets valued at ODRC. This equates to the value of the assets if they were (hypothetically) replaced today, with their modern equivalent assets , and any excess or uneconomic assets removed.

2.2 The key steps in the application of the ODV approach to valuing the system fixed assets of an ELB are summarised below in simple terms:

- prepare a valuation asset register;
- determine Modern Equivalent Asset ("MEA") replacement costs of each asset to determine the Replacement Cost ("RC");
- optimise the asset base to determine the Optimised Replacement Cost ("ORC");
- depreciate the RC to determine the Depreciated Replacement Cost ("DRC");
- depreciate the ORC to determine the ODRC;
- apply the EV test; and
- determine the ODV being the minimum of ODRC or EV for each segment of the system.

2.3 For the purposes of this valuation, there are no assets where the valuation rules included in the Handbook are insufficiently prescriptive to require an alternative approach to be applied.

2.4 The Handbook requires the valuation report to contain the information listed below. References to the relevant information contained in this report are noted against each requirement:

a) the asset quantities in the valuation asset base, excluding stores and spares. This information shall be broken down into asset classes consistent with the asset classes contained in the tables in Appendix A of the Handbook (Appendix A);

b) the RC, ORC, DRC, ODRC and ODV for each asset class and for the valuation asset base as a whole. This information shall be shown separately for each geographically distinct, non-contiguous network. Stores and spares should be disclosed separately as separate line items and need not be disaggregated into asset classes (Appendix A);

c) a description of the method used for the valuation of any assets where the ELB considers that the valuation method is not specifically prescribed by the valuation rules in the Handbook (2.3);

d) a schedule of asset classes where asset quantities and/or asset ages have been estimated. For each such asset class the valuation report shall describe the methodology used to derive the estimates (4.5);

e) a schedule of asset classes and asset quantities to which multipliers or other adjustments have been made to the standard replacement costs given in the tables in Appendix A of the Handbook. In cases where a range of multipliers or other adjustments is allowed, the valuation report shall show the actual multiplier applied and describe the basis for the selection of a particular multiplier or other adjustment within the range (4.9 – 4.10, Appendix C);

f) a schedule of replacement costs and asset lives used as the basis for valuing non-standard assets where standard replacement costs or asset lives are not provided in Appendix A, and a general description of the basis for determining the replacement costs or lives of those assets. This information shall include, where appropriate, the basis for selection of MEAs and the methodology used to determine the current replacement cost of the MEA (4.12 – 4.15, Appendix D);

g) a schedule of asset classes and quantities for which standard asset lives have been extended or reduced in accordance with the provisions of clauses A.32-A.44 of the Handbook, together with the actual lives used, and a schedule showing the date of return to service and remaining life applied to individual assets that have been refurbished since the last valuation (4.31, Appendix H);

h) a general description of the evidence forming the basis for any change in the date of commissioning of assets from that used in the previous ODV valuation, except where this change is due to the replacement of assets (4.33);

i) details of assets to which a reduction in standard lives is applied due to routine replacement as part of the evolution of the network (4.34);

j) a general description of the methodology used to optimise the network (4.16 – 4.25);

k) a general description of the analysis and assumptions used where life cycle cost analysis is relied upon to avoid the use of an asset with a lower replacement cost in an optimised network (4.21);

l) the existing loads and the load growth forecast used as a basis for optimisation. This information shall be disaggregated by point of connection, zone substation and high voltage distribution feeder (4.20, Appendix F);

m) forecast new loads or load increases required to be separately disclosed in the valuation report (4.20);

n) a description of the quality of supply criteria used as the basis for optimisation (4.17, Appendix E);

o) a schedule of all network optimisations and details of the valuation impact of each optimisation, including details of the assets removed as stranded assets (4.26, Appendix G);

p) the justification for the inclusion of underground circuits in the optimised system fixed assets base (4.24);

q) details of any separate network segments with non-coincident peak loads where the distribution transformer capacity was optimised separately from the balance of the network or adjustments for transformer redundancy provided for in non-standard customer contracts (4.24);

r) where an ELB does not undertake a comprehensive EV test on any of its system fixed assets in accordance with the provisions of clause 2.59(i) of the Handbook a statement stating that it has reviewed its system fixed asset base and identified assets that may be potentially uneconomic, and (ii) a statement stating that it is satisfied that an Economic Valuation of those assets would not have resulted in a material reduction of the ODV of its system fixed assets, and a description of the basis on which that conclusion was formed (5.1 – 5.9) and;

s) where a comprehensive EV test is undertaken as part of the valuation process, (i) a description of the methodology used to identify the potentially uneconomic system fixed assets to which the comprehensive EV test was applied (ii) a description of the EV test methodology, and (iii) the ODRC and calculated EV of the assets tested, broken down for each geographically separate, non-contiguous network (n/a).

3 Sources of Information

3.1 The ODV valuation and conclusions contained in this report are based on the following information:

- The ODRC asset register of the system fixed assets as at 31 March 2004 compiled by Horizon.
- Maunsell's confirmation of asset replacement costs, asset lives and asset optimisation applied in the ODRC register.
- Discussions and meetings with Peter Dwyer and Ian Robertson of Horizon and Don Lewell and Graeme Mahoney (external consultants).
- Horizon's 2004 Asset Management Plan ("AMP") to 2014.
- Statistical data, including customer details, electricity consumption loads and load forecasts.
- Security standards, reliability targets and quality of supply information.
- Operational statistics and diagrams.
- Construction policies and practices and project costings.
- Local authority requirements.

3.2 PricewaterhouseCoopers has not, in the course of this assignment, conducted anything in the nature of an audit of the information provided. Accordingly, we do not express an opinion as to the reliability, accuracy or completeness of the information upon which this valuation is based.

3.3 No reconciliation has been undertaken between the valuation database and Horizon's historical accounting fixed asset records. The responsibility for the completeness and accuracy of the data lies with Horizon. We have reviewed the valuation methodology and performed sample checks on the ODRC asset register as described below.

3.4 Horizon assembled an ODRC register of their ELB system fixed assets as at 31 March 2004. Our check as to the completeness and accuracy of the ODRC asset register focused on the detailed registers and the Geographic Information System ("GIS") that underlie the summarised ODRC asset register. Representative portions of the data records were checked on a sample basis. Testing primarily focused on asset categories of a material nature although samples were tested from all asset categories. In addition,

reasonableness tests were performed on asset groups to ensure the completeness and accuracy of the summary schedules.

3.5 Horizon provided information necessary for defining the customer details, costs of supply and other information required for the EV tests for the ODV calculation.

3.6 In carrying out the assignment we have relied upon the engineering expertise of Maunsell and Horizon staff.

4 Optimised Depreciated Replacement Cost

4.1 Horizon produced an ODRC asset register of the system fixed assets as at 31 March 2004. This information formed the basis of our valuation. For the purposes of this asset valuation, the components of Horizon's electricity system were separated into a number of distinct asset categories (as specified in Table A.1 of the Handbook). A summarised version of this register is included as Table 1 overleaf. Appendix A includes an asset register for each category of asset replacement costs and lives used. More detailed information concerning asset categories is contained in Appendices B, C and D of this report.

4.2 The total RC of the system fixed assets of Horizon is $132,324,866. After charging depreciation of $58,875,639 to reflect the age of the assets, a DRC of $73,449,227 has been derived, and finally, following a review of system optimisation by Maunsell, an ODRC of $73,151,436 has been determined.

Table 1: Summary ODRC asset register for Horizon as at 31 March 2004

ASSET CLASS	Unit	Total Units	Std Life years	RC $	ORC $	DRC $	ODRC $
Subtransmission							
33kV Lines - concrete	km	128	60	5,915,945	5,681,644	3,350,342	3,209,793
33kV Lines - wooden	km	32	45	1,476,484	1,418,007	836,168	801,090
33kV Cables - xlpe	km	3	45	496,191	496,191	298,040	298,040
33kV Isolation and Surge Arrestors	No.	30	35	270,000	270,000	124,089	124,089
33 kV OD Circuit Breaker	No.	2	40	90,000	90,000	26,392	26,392
Zone Substations							
Land	Lot		-	137,000	137,000	137,000	137,000
Site Development and Buildings	No.	32	50	456,300	456,300	272,380	272,380
Transformers - 55 Years	No.	14	55	80,000	80,000	46,404	46,404
Transformers - 60 Years	No.	21	60	3,035,000	3,035,000	1,599,562	1,599,562
Switchgear Cubicles and Indoor Switchgear - Extended Life	No.	44	55	1,281,000	1,281,000	837,774	837,774
11 kV Surge Arrestor set	No.	72	35	346,500	346,500	108,850	108,850
Incoming (Outdoor) Switchgear, Protection and Controls	No.	193	45	1,234,900	1,234,900	645,759	645,759
Outdoor Structure Concrete	No.	20	60	244,000	244,000	139,805	139,805
SCADA and Communications Equipment	No.	131	15	589,950	589,950	249,551	249,551
Ripple Injection Plant	No.	14	20	670,900	670,900	200,341	200,341
Zone Substation Ring Main Unit	No.	1	40	16,000	16,000	9,496	9,496
L.V and D.C Supplies	No.	24	20	50,400	50,400	20,277	20,277
Power Cabling	km	15	45	124,000	124,000	88,968	88,968
Other items	No.	39	40	283,700	283,700	165,578	165,578
Distribution							
11kV Lines - concrete	km	1,403	60	36,710,515	36,536,230	18,685,290	18,595,390
11kV Lines - wooden	km	117	45	3,060,446	3,045,916	1,557,737	1,550,242
11kV Cables - xlpe	km	116	45	10,284,081	10,265,197	6,525,679	6,515,845
11kV Cables - pilc	km	26	70	2,416,161	2,408,235	1,574,014	1,568,892
Disconnectors, Load Break Switches, Dropout Fuses	No.	3,403	35	8,596,050	8,596,050	3,583,762	3,583,762
Sectionalisers, Reclosers, Circuit Breakers, Ring Main Units, Switches	No.	228	40	3,702,000	3,702,000	2,412,754	2,412,754
Distribution Transformers Extended Life	No.	2,991	55	18,478,300	18,451,300	10,680,660	10,670,847
Distribution Substations Extended Life	No.	2,991	55	4,593,914	4,593,914	3,051,094	3,051,094
LV Lines - concrete	km	296	60	7,267,650	7,267,650	3,662,518	3,662,519
LV Lines - wooden	km	25	45	605,882	605,882	305,333	305,333
LV Cables - xlpe	km	262	45	12,071,288	12,071,288	7,687,697	7,687,697
Streetlight Cables - xlpe	km	16	45	420,927	420,927	236,527	236,527
Link Pillars	No.	317	45	758,000	758,000	610,436	610,436
Customer Service Connections							
LV Overhead	No.	11,640	45	1,533,086	1,533,096	865,796	865,796
LV Underground	No.	15,848	45	3,964,650	3,964,650	2,395,955	2,395,955
Other System Fixed Assets							
Mobile Substation Equipment - 15 Years	No.	2	15	7,700	7,700	7,572	7,572
Mobile Substation Equipment - 20 Years	No.	2	20	241,500	241,500	187,801	187,801
Mobile Substation Equipment - 30 Years	No.	1	30	29,000	29,000	18,927	18,927
Mobile Substation Equipment - 55 Years	No.	1	55	16,000	16,000	15,887	15,887
SCADA and Communications (Central Facilities)	Lot		15	676,950	676,950	177,637	177,637
Strategic spares	Lot		-	92,497	92,497	49,373	49,373
Total				132,324,866	131,789,473	73,449,227	73,151,436

Note: Tables may not add due to rounding

Preparing a detailed asset register

4.3 The first step in the ODV methodology is to prepare an asset register of system fixed assets. The summary asset register has been derived from three databases containing details of assets of the Horizon network. These databases are known as the 'lines and cables database', the 'non lines and cables database' and the 'ICP details database'.

- Lines and Cables Database – The lines and cables database was constructed by an external organisation on behalf of Horizon. All data, with the exception of the locations, location conditions and configurations was extracted electronically from the GIS system. Within the GIS, each feeder is broken down into a number of segments, bound together by either switchgear or a termination. Each segment is identified using a unique identification number and is further divided into subsegments based on changes in attributes (for example, trench profiles for cables). Each subsegment has been assigned a unique equipment identification number. Data within the GIS system comes from a number of sources. Historical information in relation to lengths was uploaded from digitised computer measurements from maps, Electricity Supply Applications (ESAs) and construction drawings. Other information, such as conductor type and age, were taken from ESAs, construction records and asset registers for previous valuations. Information for amendments since the commissioning of the GIS system is input into the GIS from ESAs, work orders and asset modification or movement sheets.

- Non Lines and Cables Database – All other assets, including transformers, distribution substations, zone substations, switchgear and poles are recorded in the non lines and cables database. This database is maintained on the basis of work orders and asset modification or movement sheets.

- ICP Details Database – This database contains details about customer connections including ICP identification numbers, phases for non-domestic connections and the associated distribution substation. All of this data has been extracted directly from Horizon's billing system.

Estimating asset data

4.4 In compiling the asset register the following estimates and judgements were made where complete and accurate information about certain classes of asset was not available.

4.5 33kV and 11kV Overhead Lines – Lives are determined by the pole installation dates as recorded in the lines and cables database. The recorded dates are either actual installation dates or, if unknown, installation dates assessed upon individual pole inspection. A network-wide pole inspection was performed in the mid 1990s to capture these unknown pole installation dates.

An average pole installation date per feeder has been calculated and applied as the corresponding overhead line commissioning date on a feeder-by-feeder basis.

HV Cables – All assets are recorded in the GIS and have a commissioning date assigned. In some instances the commissioning date of an asset has been assessed as the date of the average known HV date on the respective feeder.

LV Lines and Cables – All known assets are recorded in the GIS and have a commissioning date assigned. In some instances, the commissioning date of an asset has been assessed as the date of the average known LV date on the respective feeder. LV Line and cable lengths and types are largely unrecorded outside of towns and the Rangitaiki Plains area. Known LV lengths were compared against typical lengths as provided by Maunsell Limited on a feeder by feeder basis for previous valuations, taking into account the capacity of transformers. Where significant differences arose on rural feeders, an adjustment was made to the data in line with Maunsell Limited's typical lengths. Quantities, replacement costs and depreciated replacement costs were then apportioned across the LV categories in proportion to the known LV data.

LV Switchgear – All assets are recorded in the Asset Register and have a commissioning date assigned. In some instances, the commissioning date of the asset has been assessed as the date of the average LV date on the connected feeder.

Streetlight Control Circuit Cabling – All known assets are recorded in the GIS and have a commissioning date assigned. In some instances the commissioning date of an asset has been assessed as the date of the average known LV date on the respective feeder.

Non Lines and Cables Assets – All assets are recorded in the Asset Register and have a commissioning date assigned. In some instances, the commissioning date of non lines and cables assets has been assessed as the average age of like assets for which commissioning dates are known. In many cases, the installation date of customer connections is unknown (in fact virtually all prior to 1 April 1999 are unknown). The installation date has been estimated as being equal to the commissioning date of the related LV cable, where this is known, or the commissioning date of the associated distribution substation. In considering streetlight connections, in some cases the connection type (overhead or underground) has been assessed based on the recorded column type, which may not fully identify the connection means.

Determination of RC

4.6 The next step in the ODV methodology is to value the system fixed assets identified in the asset register at RC.

4.7 Table A.1 of the Handbook (replicated in Appendix B of this report) contains standard replacement costs for system fixed assets, which must be applied to all assets for which they are provided.

4.8 The Handbook allows for the application of multipliers to the standard replacement costs of overhead lines, underground cables and other equipment in certain specified circumstances which result in higher installation costs than assumed by the standard replacement costs.

4.9 Horizon's own circumstances were reflected in the valuation by assessing which parts of the network were eligible for specific cost premiums reflecting terrain, ground conditions and line construction factors, which were location specific. The relevant locations for application of multipliers were identified using a geographical map of the network area and the detailed knowledge of Horizon staff based on the definitions provided in the Handbook. The condition of each location (as to whether or not it is rugged or rocky) was determined on a feeder by feeder basis following discussions between Horizon's engineering staff and other line construction contractors in the area. Remote locations were identified by considering the address of the works depots and examining areas more than 75 kilometres away.

4.10 The replacement cost multipliers applied comprise:

- Overhead line, Urban – The multiplier of 1.8 times is considered appropriate for single-circuit 33kV and 11kV lines, and 1.4 when applied to each circuit of dual-circuit 33kV and 11kV lines. This is based on a 50:50 value ratio (poles : conductor) for 11kV rural (90m spacing = 11 poles/km) and assuming poles are placed on each second urban property boundary (40m spacing = 25 poles/km) resulting in an installed line cost increase of 1.63 times. Other factors driving increased costs are increased conductor stringing/installation costs; heavier construction on terminations and angles due to guying constraints; avoidance of other services; pole placement constraints; etc. In the case of 33 kV, the calculated multiplier is higher still, due to the longer nominal spans in the rural environment.

- Overhead line and associated equipment, Remote area – there is only one distinct 'remote' area, Waihau Bay on the East Coast, being greater than 75 kilometres from Horizon's contractor depot in Opotiki. This area is serviced by poor roads resulting in considerable travelling time required. A multiplier of 1.25 times is considered appropriate.

- Overhead line rugged terrain – there are two main areas where much of the line is installed in 'rugged' terrain, Waihau Bay and Minginui/Ruatahuna. Some other feeders have small isolated line sections which also justify the application of the rugged multiplier. Extensive helicopter work is required for erection and servicing these areas giving rise to a multiplier of 1.3 times.

- Underground cable business district – underground cabling in established central business districts inevitably costs significantly more to install than cabling installed in developed suburban areas. The primary reasons include constraints imposed by

other services (for example, the location is often restricted to a small corridor), possible damage caused to others' services and infrastructure, reinstatement of ground surface requirements (concreting, resealing), need for special care with excavations (many typically performed by hand), construction constraints due to public access, retailer concerns and the occasional need for mobile generation plant to be utilised during outages. Horizon has performed numerous similar works in business districts over a considerable period of time. Based on this experience, Horizon has applied a multiplier of 1.25 times (1.125 when applied to each circuit of a dual circuit) which it considers very conservative.

- Underground cable: rocky ground – the Strand South feeder includes 620m of 11kV cable installed in rock (Hillcrest). Installation of this cable was difficult and time-consuming. Included is steel ducting through rocky areas. A multiplier of 2.0 times is considered appropriate.

- Traffic management – Horizon's franchise area covers the domain of the Whakatane, Opotiki and the Kawerau District Councils. The Whakatane District Council has produced a Traffic Management Booklet. Clause 3 states:

  > "The Whakatane District Council Traffic Management Handbook is developed from the Transit New Zealand Code of Practice for Temporary Traffic Management. Organisations and contractors using the Whakatane District Council Traffic Management Handbook are advised to use the Transit New Zealand Manual in conjunction with the Whakatane District Council Traffic Management Handbook 2002."

  The Opotiki and Kawerau Districts have not produced their own code and direct all parties to the Transit New Zealand Code of Practice for Temporary Traffic Management. It is considered that roads within the Horizon supply area all fall within Level LV or Level 1. The traffic management requirement for both of these road types are the same (Level 1). However it was determined that the level of traffic management cost incurred on LV roads did not meet the Handbook's criteria of "extensive traffic management", for example, the provision of dedicated staff to control traffic. It is therefore considered appropriate that the additional allowance of $800 per kilometre, for line located adjacent to a road, be applied to Level 1 roads only. Detail is not captured within the GIS system as to the location of all lines and cables with respect to roads. It is expected that the changes to the GIS will be made within the next six months to allow this factor to be applied directly from the base data. For the purposes of this valuation, the methodology used to apply the traffic multiplier is:

  1. Overhead line and underground cable length was obtained for all feeders split by location, voltage and configuration.
  2. The data was sorted by configuration in order to obtain the prime circuit.

3. Single or prime circuits were selected. Where under built line was installed it was ignored with consideration given to the highest voltage.
4. Lengths of line and cable were summed for each feeder.
5. Feeders were sorted into those known to be all on roads (fully within the major towns), those circuits known to be all off roads (all 33kV feeders) and those generally in rural areas with unknown percentage on the road.
6. 33kV feeders were ignored without application of a traffic management factor.
7. Four sample feeders were analysed in detail to identify the percentage of primary lines and cables on road. The sample feeders were predominantly rural to reflect the unknown feeders. The four feeders chosen and a description of their supply area is:

Table 2: Traffic Management feeder sample

Feeder	Description
Awaiti Feeder	Rural feeder fed from the Plains Substation covering general farming area on the Rangitaiki plains.
Ruatoki Feeder	Rural feeder fed from the Station Road Substation covering general farming area up the Ruatoki valley.
Harbour Feeder	Rural and urban mixed feeder fed from the Ohope Substation.
Hospital Feeder	Rural and urban mixed feeder fed from the Waiotahi Substation.

8. The on road percentage of the four feeders was applied to all of the feeders that had an unknown on road percentage.
9. The on road kilometre derived for the unknown feeders was added to the on road kilometres from the know feeders. This gave an overall ratio of the on road to total primary line and cable assets.
10. As it is considered that the traffic management factor would only apply to State Highways within the district, the ratio of State Highways to all roads was calculated.
11. The overall ratio obtained (State Highway ratio multiplied by percentage on road) was applied to the Level 1 road factor to obtain the traffic management factor to add to relevant primary circuits.

The results of the steps are summarised below:

Table 3: Traffic Management Calculation

Traffic Management - Factor Calculation		Overhead		Underground
Conductor - On Road (m)		47,209		268,966
Conductor - Off Road (m)		-		-
Conductor - Unknown (m)		1,307,468		254,193
Total Conductor (m)		1,354,677		523,159
Unknown On Road Allocation				
On Road % - Unknown Sample Testing		62.3%		52.0%
On Road - Unknown (m)		814,048		132,161
Total on Road (m)		861,256		401,127
% On Road		63.6%		76.7%
State Highway Ratio				
Total Road Length in District (km)	1,610			
Total State Highway Length in District (km)	361			
Ratio State Highway to all Roads	22%			
Traffic Management Factor				
Overall Ratio		14.3%		17.2%
Traffic Management Factors - Level 1 Road (per km)		$ 800		$ 6,000
Traffic Management Factor to Add		**$ 114.04**		**$ 1,031.53**

4.11 A schedule detailing the multipliers applied and the asset classes and quantities to which they have been applied is included in Appendix C.

4.12 The Handbook does not include maximum replacement costs for most zone substation assets and other non-standard assets, including link pillars, and some sizes of transformers, overhead lines and underground cables. Details of the replacement costs applied where no standards are available are listed in Appendix D. The replacement costs for zone substations and other non-standard assets have been derived using the same principles underlying the standard replacement costs in the Handbook. That is, they reflect installed costs for MEAs, including materials, labour for installation and commissioning, transport, plant and on costs, consistent with Clause A.3 of the Handbook. In addition, the replacement costs reflect large scale construction and efficient and competitive tendering and construction practices.

4.13 Current or recent projects have been used as a basis for deriving the MEA replacement costs, with modifications for the factors outlined above where appropriate. Quotes were obtained from equipment suppliers where recent project data was not available and benchmarked against the Maunsell database which includes information collected through international and local bidding processes. Local conditions have been incorporated in the assigned values. Installation costs include the particular requirements for Horizon relative to their specifications and contracting procedures. For non-standard lines and cables where costs don't exist or are significantly dated, ratios of other standard similarly-configured lines and cables were applied to determine a suitable value.

4.14 Horizon has predominantly relied on quotes from suppliers where standard costs were not specified in the handbook. For example, transformer quotes were obtained from Pauwels for three phase units. The list of non-standard items is provided in Appendix D.

4.15 Strategic spares have been included at their book value.

System optimisation

4.16 The ODV methodology requires that system fixed assets be optimised to identify stranded assets, excess capacity and over-engineering. Optimisation has been carried out to ensure that the quality of supply from such optimisation remains the same as the existing network, and the network has sufficient capacity to meet the prescribed future load growth.

4.17 The quality of supply criteria that have been applied for the purposes of optimisation are contained within the AMP of Horizon, as follows:

- security levels for different network circumstances based upon load magnitude, number of customers and restoration times. A discussion of Horizon's security levels is discussed at Appendix E;
- target reliability indices;

Table 4: Reliability Indices

	Current Target	2008 Target
SAIDI	145	145
SAIFI	1.80	1.80

- voltage regulation for subtransmission is uncontrolled due to the supply being taken from Transpower at regulation voltage at the supply point. The voltage range experienced at the end of the subtransmission circuit is dictated by the load and line impedance. Voltage regulation is ± 3.0% for 11kV distribution, - 2.0% for distribution transformers, ± 2.5% for LV distribution, ± 2.0% for service connections; and
- levels of electrical network losses of 3.5%.

4.18 The optimisation process includes the following system components; connection and supply points, subtransmission circuits, zone substations, distribution feeders, distribution transformers and the LV system. Other assets examined for optimisation were strategic spares. Optimisation considered stranded assets, optimised the configuration of the network, network engineering and the capacity of the elements in the network.

4.19 Optimisation of the network system was determined following discussions between Maunsell and engineers from Horizon. The following paragraphs document the general methodology used to optimise the network.

4.20 To incorporate the permitted load growth periods, load forecasts were used and applied to the network assets. Forecasts were derived for the zone substations and then applied to the distribution feeders. No future loads were applied to distribution transformers. The existing loads and load forecasts used as a basis for optimisation for Horizon are shown in Appendix F. The forecasts were developed from past network data, existing development plans and assumed growth rates and are consistent with the 2004 AMP for Horizon. The load for the connection points was derived by the aggregation of zone substation forecasts. Ten year forecasts were sufficient to justify the capacity and configuration of these assets. There were no separately identifiable new loads or load increments exceeding either 5% of existing maximum demand or 10 MW included within load forecasts.

4.21 There were no instances where life cycle cost analysis was applied during the optimisation process to avoid the use of an asset with a lower replacement cost than the optimised network.

4.22 Excluding stranded assets:

- Stranded assets – no instances of any assets that are not required to supply line services to existing customers were identified.

4.23 Optimising network configuration:

- Points of connection –

  a) Te Kaha: This point of service is geographically isolated from other parts of the Horizon system by many kilometres of rugged terrain. Distances and load necessitate the need for at least a 33 kV supply configuration. The current peak load on the Te Kaha system is about 1.3 MVA. The Te Kaha substation is approximately 60 kilometres in a straight line from the nearest alternative supply point at Waiotahi.

  b) Waiotahi: Load levels and the geographical location of this point of supply (POS) have required that it be increased to 110 kV supply (this voltage upgrade was completed in February 2004). Emergency configuration of the Horizon system during outages at this site have indicated that very limited support is available from the adjacent Station Rd and Ohope substations. The current peak load on the Waiotahi fed system is about 7.5 MVA. The Waiotahi substation is approximately 60 kilometres in a straight line from an alternative supply point at Te Kaha, about 17 kilometres from the zone substation at Ohope and about 23 kilometres from the zone substation at Station Rd. The voltage change at the site

has added an additional operational restraint in that a phase shift has been created between the 11 kV fed from this site and the 11 kV fed from the Edgecumbe 33 kV system.

c) Kawerau: Supply is taken at 11 kV from this POS and distributed to very large industrial loads. Operational restrictions indicate that it would be preferable to take supply at a higher voltage in order to lessen the distribution restrictions. There is a phase shift between this system and that fed from the Edgecumbe POS that makes support difficult to implement. The peak load on the Horizon section of the Kawerau substation is about 27 MVA. The substation has difficulty in supplying the large Carter Holt Harvey Tissue mill that is located approximately 2 kilometres from the substation. There are no alternative supply points that could negate this station. Ideally the point of supply should distribute at 33 kV in order to better serve the large industrial loads in the vicinity.

d) Edgecumbe: This POS is the major load point in the Eastern Bay of Plenty and feeds the primary Horizon 33 kV sub-transmission system. It has been demonstrated that very little support is available from either the Kawerau or Waiotahi systems. The peak load on the 33 kV system at the Edgecumbe substation is about 47 MVA. There are no alternative supply points at 33 kV in the Eastern Bay of Plenty that could negate this station.

e) Embedded Generation: Embedded generation exists within two parts of the Horizon system fed from separate Transpower points of supply. On the Edgecumbe supplied system there is a 10 MVA co-generation facility owned by BOPE on the Fonterra Milk Factory site. The generation facility is primarily to feed the site and islands at any time of system interruption. Excess generation from the site is exported through the Horizon system to other BOPE customers. No assets exist on the Horizon system that are specifically for the connection of the generation facility. On the Kawerau system there are two small geothermal generation stations again owned by BOPE with a total capacity of about 5 MVA. These two systems operate as base load with a high load factor and supply into the surrounding Horizon system. There are a number of large loads in close proximity to the stations and the distribution system was installed to service these loads before the construction of the generation facilities. No assets are installed for the embedded generation that can be considered for optimisation.

- Subtransmission Circuits –

f) Due to either load and/or distance parameters there are no circuits within the sub transmission system that could be replaced with a lower voltage system.

- Zone substations –

  g) Alternative configurations have been tried during outages of all zone substations and it has been demonstrated that no stations can be eliminated without seriously affecting and reducing the service standard offered from the system. In all cases the substations have single bus bars. Bus section breakers are installed on the indoor 11 kV switchgear units at Kopeopeo, Plains and Station Rd. These bus section units are installed to meet the N-1 reliability criteria of dual transformers at these stations apart from the Plains site. The bus section at the Plains site is to cater for the dual operational configuration with Eastbank Rd substation and the Fonterra Milk Factory supply.

  h) Kope Substation: This substation is located within the town of Whakatane and was the primary source of supply for the town prior to the merger of the Whakatane MED and Bay of Plenty Electric Power Board (BOPEPB) in 1989. As such very few assets are installed that interlink the Kope substation and the Station Rd substation which was the nearest BOPEPB supply point at the time. Since the merger there has been minor interconnection undertaken between the two systems but no assets have been installed that have the capacity to negate either of the sites.

  i) Ohope Substation: This substation is located near the settlement of Ohope and receives very little support from the adjacent points of supply at Station Rd or Waiotahi. During maintenance or fault outages at this station it has been demonstrated that only minimal load can be supplied from the adjacent stations. Operational difficulties have been added with the phase shift that was created between this station and the Transpower Waiotahi substation when the voltage upgrade work at that site was performed. This requires that an outage must be implemented before the load can be shifted from one station to another.

  j) Station Road Substation: This station supplies a very large rural area. Comments made for the two stations above relate also to this site as they are the two stations that border the supply area. The station serves an area that has a number of geographical and terrain boundaries that make it difficult to reinforce from adjacent points of supply. As such no optimisation is possible.

  k) Galatea Substation: This station supplies a very large rural area. The station serves an area that has a number of geographical and terrain boundaries that make it difficult to reinforce from adjacent points of supply. As such no optimisation is possible.

  l) Kaingaroa Substation: This station supplies a remote rural and forestry town settlement plus a saw mill. Some of the assets at this station are considered non-

regulated and as such have been removed from the ODV as they are considered competitive. The station serves an area that has a number of geographical and terrain boundaries that make it difficult to reinforce from adjacent points of supply. As such no optimisation is possible.

m) Plains Substation: This station supplies a very large rural area. The station has limited support from the South due to the phase shift that exists between the systems fed from the Edgecumbe and Kawerau points of supply. The only support that is available for this station is that provided by the East Bank Rd substation that is located adjacent to the Fonterra Milk Factory. Both of these stations are single transformer stations and as such operate to some degree as a single station split over the two sites. Interconnection assets that are installed are primarily to reinforce the critical milk factory supply system. As such no optimisation is possible.

n) Eastbank Road Substation: This station supplies a small rural area plus is the main connection and supply point for the Fonterra Milk factory. The only support that is available for this station is that provided by the Plains substation that is located adjacent to the Transpower supply point. Both of these stations are single transformer stations and as such operate to some degree as a single station split over the two sites. Interconnection assets that are installed are primarily to reinforce the critical milk factory supply system. As such no optimisation is possible.

- High voltage distribution network

o) Data from the GIS has been used for the identification of 3 phase sections of the distribution system that are not required due to the absence of any three phase customers. Lines requiring optimisation were determined by checking each 3-phase spur from the load end back towards the supply until the first 3-phase transformer was located. Any 11kV to the load side of this transformer was optimised. This data has been used to optimise these sections to single phase (two phase 11kV).

p) Apart from that listed under 4.24 (o), no other optimisation of the 11 kV network is required.

4.24 Optimising network capacity and network engineering:

- Subtransmission circuits

a) Subtransmission circuits conductor size – A full review of the sub transmission system was undertaken by Parsons Brinkerhoff and Associates (PBA) and relevant comments made in the Recalibration of Asset Values of Large Electricity

Line Owners Audit Report – Horizon Energy Distribution Ltd, Final Draft V1, January 2002. Since that time no change has been made to Horizon's subtransmission system.

- East Bank Feeder: The recalibration report concluded that the feeder should be optimised to light conductor. This feeder is in fact an underground cable and as such should not be optimised down in size. Subsequent to the report, Ms. Shubha Sarma of PBA advised that the existing cable is not required to be optimised to overhead.

- W.B.M. North Feeder: This feeder cannot be optimised to a smaller conductor size as this feeder, in conjunction with the WBM South feeder, supplies a single industrial customer with a load at the time of the review of 16MVA. This load to date has increased to a level in excess of 22 MVA with the commissioning of new ground mill equipment and the upgrade of the wet end of the paperboard machine. The current supply system operates with the two feeders in parallel feeding two transformers operating in parallel (16 and 22 MVA). One of the current pulp grinders is powered by a 2.2 MW direct on line starting motor. Another two units are 5 MVA direct on line through inline reactors. These grinders are started and stopped at least once every day and can only be started when the double feeder, double transformer configuration is operational. Anything other than this causes an excessive volt drop on the system resulting in the tripping of sensitive equipment on the paper machine. Any attempt at operation with a single feeder or with one feeder of a smaller capacity would result in a quality of supply reduction that would not be acceptable. The paperboard production process requires a reliable supply system in order to ensure continuous operation of the mill. Any momentary fluctuation or outage results in a prolonged cleanup of the machine and high wastage while the machine is brought back on line and up to the required paper quality. The current double feeder arrangement is equipped with directional protection to ensure any fault on either circuit does not result in a total outage of the site. For this reason either circuit must be capable of handling the full load of the mill. Any conductor size smaller than that at present is not capable of meeting this transfer requirement. Optimisation is therefore not justified on the need for transfer capacity, quality of supply and redundancy. Capacity of supply is a condition of the customer contract.

- Te Rahu North and Te Rahu Central feeders: These feeders are predominantly dual-circuit 158 mm2 'Cricket' circuit. Due to the load level not warranting the larger conductor size, these circuits are optimised to 'light'.

- Te Rahu South Feeder: The Te Rahu South feeder is a light conductor and no further reduction in capacity is required.

- Station Road Feeder: Station Rd 1 feeder operates in parallel with the Station Rd 2 feeder. Station Rd 2 Feeder is a very short line of 149m with light conductor and requires no optimisation. Station Rd 1 Feeder is also a very short line (208m) and requires no optimisation.

b) Subtransmission underground cable justification – Underground systems of all voltages are only installed in order to meet Local Authority requirements, congestion issues or as part of an undergrounding program that is jointly funded by the Local Authority and the Eastern Bay Energy Trust. In some cases in rural subdivisions, customers have elected to pay an additional contribution for an underground system to be installed in order to meet aesthetic requirements.

c) Subtransmission circuits underground cable trenching – During the data capture process from the GIS system, separately-installed circuits down the same side of the road have been combined into one trench and therefore identified as 'dual circuit' or shared trench and valued accordingly. As this optimisation is undertaken at the GIS level it is not easy to identify how many circuits have been treated in this manner. Cabling has therefore been optimised in accordance with this section in the data extraction process. Cables of 'unknown' configuration are excluded from the GIS optimisation process and have therefore been optimised subsequently.

- Zone substations –

d) Underutilised equipment – Components installed at substations are chosen to match the rating duty required of them or are the next largest size in accordance with standard components available. In all cases there is no equipment installed at any of the zone substations that is not required.

e) Land and buildings – In all cases the land size is appropriate for the control of stormwater, step and touch potentials, access to all parts of the site, animal control and proximity to neighbours. The buildings are all to a standard considered appropriate to the environment installed. Recent substations have utilised a 'Portacom' type building. In those locations where a flood risk has been identified the buildings have been elevated to clear the flood zone. 11 kV switchgear has been installed indoors at all new substations due to the cost effectiveness of multiple units installed in this manner and due to the reliability, operational and maintenance advantages.

f) Substation engineering – All substations are constructed to a similar standard with components selected at the time that were industry standard and competitively priced. Capacity requirements were selected to meet the fault and duty level of the site and to cater for the expected load growth within the planning period. It is considered that no sites would change their design if constructed

today to a MEA. It is likely that some betterment would occur due to the need to install oil containment and better flood protection at some of the sites.

g) Fire protection and oil retention facilities – There is no fire protection equipment installed at zone substations apart from heat or smoke sensors that are connected to the SCADA system and as such will raise an alarm on activation. Oil capture systems are installed at some of substations and are required due to Horizon's obligation to the Environmental Management Authority to progressively address any oil spill risk that may exist. As part of Horizon's corporate policy on environmental compliance, it is progressively correcting any zone substation where there is a possibility of an oil spill. There is a program of installing oil containment facilities at all zone substations with one site being done per year. Accordingly, no optimisation is possible.

- High voltage distribution –

h) Conductor and cable size – With the exception of optimisation of three-phase 11 kV spurs (to 2-phase) that do not supply 3-phase customers and the optimisation of SWER isolating transformers the following table sets out the justification for feeders that may appear to be overbuilt. In accordance with the Handbook, the load over the backbone section of each feeder is estimated based on a five year planning period. Horizon has determined, based on the size of the largest conductor on the feeder, based on the rating of the conductor and based on the 5 year load projection as presented in Appendix F the need or otherwise for the conductor size installed. Where conductor size is justified on load projections, the table below is marked as 'justified by load'. The table also sets out additional comments for those circuits where conductor size is required to meet reliability or quality of supply requirements.

Table 5: 11kV Feeder Size Justification

Feeder	Conductor Size (H/M/L)	Optimisation Justification
TE KAHA	M	Voltage support due to the 30 plus kilometre route length.
WAIHAU BAY	M	Voltage support due to the 60 plus kilometre route length.
HOSPITAL	M	The Transpower Waiotahi substation is poorly positioned in relation to the load centres supplied. Three medium capacity lines run in an easterly direction to supply the township of Opotiki and the table lands beyond. A number of very long SWER lines also exist on the system. Conductor choice is chosen for quality of supply criteria compliance, loss reduction, voltage and capacity support to the other

Feeder	Conductor Size (H/M/L)	Optimisation Justification
		two feeders that supply the area to the east of the Waiotahi substation.
OPOTIKI	M	Justified by load.
DAIRY FACTORY	M	Justified by load.
WAIMANA	M	This circuit supplies the rural land to the west of the Waiotahi substation and is the prime support line between this substation and the Station Rd and Ohope substations. Conductor choice is for loss reduction, voltage support and capacity support to the other two supply points.
STRAND SOUTH	M	Justified by load.
REX MORPETH	M	Justified by load.
STRAND NORTH	M	Justified by load.
KING ST	M	Justified by load.
VICTORIA	M	Justified by load.
PIRIPAI	M	Justified by load.
RUATOKI	M	This circuit supplies the rural land to the south of Whakatane up the Ruatoki valley and forms part of the support link between the Waiotahi and Station Rd substations. A connection is possible between this feeder and the Waimana feeder normally fed from the Waiotahi substation. At times of outage of Waiotahi the link is used to ensure that supply is maintained in the Waimana Valley. This along with the connection to the Ohope Substation enables all the load to the West of Waiotahi to be maintained. The connection arrangement can also be used in the opposite direction to support the Station Rd substation. This circuit also supports the Awakeri circuit from the Plains substation.
TANEATUA	M	This circuit is the only support for the critical Ruatoki feeder and is used whenever the early sections of this line are removed for maintenance or due to a fault condition. The conductor size is also required to meet the fault level requirements of the substation and design parameters.
CITY SOUTH	M	Justified by load
WBM PUMP	M	Although the largest conductor size on this feeder is medium there is only 160m installed for the support of adjacent feeders and to clear the substation location to a lower fault level area. The bulk of the conductor size is light construction.

Feeder	Conductor Size (H/M/L)	Optimisation Justification
MANAWAHE	M	Justified by load.
TE TEKO	M	Justified by load.
AWAITI	M	Justified by load.
AWAKERI	M	This circuit provides support between the Plains and Station Rd substations and was selected to comply with the fault level requirements of the system.
RANGITAIKI*	M	Reference must be made to the section above on the method of support that exists between the Plains and Eastbank Rd substations. This feeder is one of the support feeders and is normally run open at the Plains substation supply breaker.
BMP2 2nd cct	M	This circuit also acts as an interconnection between the Eastbank Rd and Plains substations through the Fonterra factory 11 kV bus. Due to the critical nature of the supply to this site and the on site generation this feeder also acts as an alternative supply arrangement operated up to its maximum rating of 4 MVA.
BMP1	H	Justified by load.
THORNTON	M	Justified by load.
POHUTUKAWA	M	Although the feeder is normally run with the open point near the bottom of the Ohope Hill this circuit is a critical support link between the Ohope and Station Rd substations due to the single transformer nature of the Ohope substation.
HARBOUR	M	Justified by load.
DUNN ROAD	L	Justified by load.
GALATEA	M	The four prime feeders from the Galatea Substation radiate in a radial manner from the site. No support is available from adjacent substations and support must be provided with interconnection at key points between adjacent feeders. Feeder conductors are chosen to maximise this support over those sections required to carry additional load during fault conditions. Conductor choice is to meet quality of supply criteria and fault level requirements.
JOLLY ROAD	M	The four prime feeders from the Galatea Substation radiate in a radial manner from the site. No support is available from adjacent substations and support must be provided with interconnection at key points between adjacent feeders. Feeder conductors are chosen to maximise this support over those sections required to carry additional load during fault

Feeder	Conductor Size (H/M/L)	Optimisation Justification
		conditions. Conductor choice is to meet quality of supply criteria and fault level requirements.
MANGAPAPA	L	Justified by load.
MURUPARA	M	The four prime feeders from the Galatea Substation radiate in a radial manner from the site. No support is available from adjacent substations and support must be provided with interconnection at key points between adjacent feeders. Feeder conductors are chosen to maximise this support over those sections required to carry additional load during fault conditions. Conductor choice is to meet quality of supply criteria and fault level requirements.
MINGINUI	M	This feeder supplies the settlement of Ruatahuna some 60 kilometre from the substation site. Conductor choice is for voltage support over the length of the line and to meet quality of supply criteria and fault level requirements.
KAWERAU	M	The fault level close in to the Kawerau grid exit point (GXP) (less than 1.5 kilometre) is very high due to the direct conversion of the 11 kV from the high capacity 110 kV system at this site. Conductors less than medium are not capable of meeting the fault capacity of the system.
CAXTON PULP	H	Justified by load.
CAXTON PAPER	H	Justified by load.
ONEPU	M	Justified by load.
PLATEAU	M	The fault level close in to the Kawerau GXP (less than 1.5 kilometre) is very high due to the direct conversion of the 11 kV from the high capacity 110 kV system at this site. Conductors less than medium are not capable of meeting the through fault capacity of the system.
MT EDGECUMBE	M	The large fault level that exists close to the Transpower Kawerau substation requires that at least a medium conductor is installed at all points on the system to ensure that the conductor is not damaged during any through fault situation.

m) Underground cable justification – Refer 4.24(b).

n) Underground cable trenching – Refer 4.24(c).

o) SWER isolating transformers have been optimised out.

- Voltage control devices –

p) No field voltage control devices are installed or operational. Voltage control devices are installed on all zone substation transformers for the purpose of meeting quality of supply requirements. In some cases line drop compensation is activated in order to better reflect the lengths of feeders being supplied. Tests were undertaken on the voltage control devices installed at Kopeopeo, Plains, Galatea, Station Rd, and Kaingaroa substations. The devices are required and justified in order to control the system voltage within defined limits during periods of increasing and reducing load.

- Distribution transformer capacity –

q) The distribution transformer utilisation for the last 5 (1999-2003) years has varied between 43% and 50%. Due to the low growth rate being experienced by Horizon on its distribution transformers, transformer capacity is not expected to change significantly. The design standard requires that wherever possible an opportunity is taken to ensure that transformers are sized to meet the expected after diversity demand of the supplied customers. A suite of standard size transformers is held as standard stock items to enable an economic and best fit to be made during the engineering and job specification process. Data is currently not available on the demand trends of individual feeders to enable the calculation of transformer utilisation over these assets. This will however be rectified with the commissioning of the new SCADA master station later in 2004.

- Low voltage distribution

r) Underground cable justification – Horizon is in partnership with the three local authorities within the supply area, Telecom and the Eastern Bay Energy Trust for the progressive undergrounding of the distribution system in urban and aesthetically important areas. A 10 year plan has been developed and a capital contribution is received from all parties for the undertaking of this work. Horizon's contribution is capped at the level that it would have otherwise needed to spend to undertake the required maintenance on the asset. In other situations undergrounding has been undertaken when identified as the best engineering solution due to terrain, congestion or reliability factors. Undergrounding is undertaken very often at the choice (and expense) of the customer. An example of this is the installation of the reticulation in new rural subdivisions. Horizon feels strongly that undergrounding of the system is a primary advantage in the attainment of improved reliability. Horizon has a statutory requirement to ensure that its reliability statistics improve.

s) Underground cable trenching – Refer 4.24(c).

t) Configuration and engineering of the low voltage network – Preferred conductor sizes and the configuration that is used for new LV works on the system are covered in the Horizon system Design Standards. Feeders and circuits are constructed of a mix of conductor sizes in order to meet the criteria of fault level rating, voltage support and supply quality as defined in the Standard. Limited support is installed between adjacent transformers at the LV level to ensure that an extended outage does not result if there is a failure within an HV component. Sub divisional designs undertaken ensure that the extent of interconnection proposed is controlled to ensure that an acceptable level of supply quality is maintained should an outage on selected parts of the system occur. The use of mobile generator as an alternative supply options is also always considered. Accordingly no optimisation of the configuration or engineering of the low voltage network is required.

- System control

u) Sophistication of SCADA equipment – The current SCADA master station is old and does not provide the level of service required to meet the Horizon reliability and reporting requirements. As a result an order has been placed with BJS for the supply of a new system. This new system will be commissioned before the end of 2004. An additional advantage of the new system will be its flexibility to meet a disaster recovery situation. The new system will provide the appropriate features for a lightly staffed, low density network company that has many regulatory and asset management reporting requirements. There is no justification to optimise the existing system.

- Justification for load control system –

v) Load control plants are located at:
- Plains Substation injecting into the 33kV system. This plant controls all the relays fed from the Edgecumbe fed 33 kV system.
- Galatea Substation – This plant controls all relays within the Galatea and Kaingaroa 11kV system.
- Waiotahi Substation – This plant supplies all the relays fed from the Waiotahi system and also those on the Te Kaha system via signal that is transmitted through the 50kV line between Waiotahi and Te Kaha.

w) No load control plant optimisation is required or possible due to the minimal cover that is currently provided by the 'spill over' system operating on the 33 and 50 kV systems.

4.25 Optimising network equipment spares – the schedule of strategic spares was examined and compared within the assets of the network and found to be very small in relation to the level of system assets. Spares are only held that are required due to the unique or rare nature of the asset and as such there is no justification to optimise the existing system.

4.26 The major components of optimisation are:

- Subtransmission circuits – Optimisation of the Te Rahu Central and North feeders from heavy conductor to light conductor.
- Distribution lines and cables – Optimisation of three phase conductors to SWER lines, optimisation of double trenches on the same side of the road to single trenches and optimisation of SWER isolating transformers.

4.27 A detailed schedule of the optimisation undertaken and the value impact of each optimisation is included in Appendix G.

4.28 The total value of optimisation made is $535,393 resulting in an ORC of $131,789,473.

Assessment of depreciation to determine DRC

4.29 Once the quantities, RCs and optimisation of assets have been determined, the values need to be depreciated.

4.30 Depreciation has been applied to each asset component in accordance with the Handbook. That is, the assets are depreciated on a straight-line basis from an assessed total or standard life for each asset component. The lives assumed for this valuation are the same as the standard lives included in Table A.1 of the Handbook (included in Appendix B of this report). For assets where no standard life is prescribed, the same lives as assets performing similar functions have been applied. These assumptions are included in Appendix D.

4.31 Lives for selected assets may be extended or reduced under specific conditions as prescribed in the Handbook. For the purposes of this valuation, the following life adjustments have been made. A schedule of the asset classes and relevant life extensions and reductions is included in Appendix H.

- Extended lives for zone substation transformers, distribution transformers and substations have been included in recognition of well established maintenance programmes, purchase specifications, examination of failure rates and asset loadings for each asset category.

a) Zone substation transformers: Horizon has a policy of undertaking yearly dissolved gas analysis (DGA) tests on its zone substation transformers to ensure that they are maintained in an optimum condition. These tests enable early intervention should any deterioration be noted. Data has been supplied that indicates that maintenance has been undertaken that justifies the life extension. Load magnitude and typical daily duty cycles that these transformers perform are contained within the AMP.

b) Distribution transformers and substations: Horizon has a policy of undertaking regular sample inspections of its distribution transformers. It is indicated by an analysis of the database that this policy has resulted in a life extension beyond 45 years for the transformers in service. An analysis of the transformer database indicated that all transformers that were commissioned over 45 years ago are either still in service or when they were decommissioned, had an average age of 55.52 years hence justifying the life extension.

- Refurbishment resulting in a material extension of an asset's total life has been considered. There are no assets that have been refurbished where a material extension of service life has resulted, and therefore no remaining life extensions have been applied to reflect refurbishment.

- There are no instances where total lives less than the Handbook standards are required as there is no evidence to suggest that existing assets will not perform in line with industry standards.

4.32 Land has not been depreciated. Spares have been included at book value.

4.33 There have been no changes to the dates of commissioning of assets since the previous valuation, other than for assets which have been replaced since that time.

4.34 As there has been no routine replacement of assets before their life expires, no reductions to standard asset lives have been made.

4.35 Where assets in use have been fully depreciated over their total life, or where they are within three years of their total life, a remaining life of three years has been assumed, in accordance with the Handbook.

4.36 When applied to the RC of the assets, the depreciation of $58,875,639 results in a DRC of $73,449,227. When applied to the ORC of the assets, the depreciation of $58,638,037 results in an ODRC of $73,151,436.

Review of the ODRC

4.37 The methodology used to derive the asset register database is outlined above. No reconciliation has been undertaken between the asset register database and accounting fixed asset records. The responsibility for the completeness and accuracy of the data lies with Horizon. We have reviewed the methodology and performed sample checks on the data as described below.

4.38 Our check as to the completeness and accuracy of the summarised valuation asset register as at 31 March 2004 focused on the GIS and records that underlie the summarised register. Representative portions of the data records were checked on a sample basis. Testing primarily focused on asset categories of a material nature although samples were tested from all asset categories. Testing was directed to examining the flow of information into the summary asset register. The steps undertaken were:

- the process for populating the GIS register was checked for quality assurance;
- source data was selected at random and the items were traced through the GIS into the asset register;
- items were selected from asset groups within the asset register and traced to source data such as drawings and supplier documentation; and
- reasonableness tests were performed on asset groups to ensure the completeness and accuracy of the summary spreadsheet schedules.

4.39 Our check as to the completeness and accuracy of the summarised valuation asset register as at 31 March 2004 focused on additions to and deletions from the GIS and asset databases, since the last ODV valuation. We did not consider it necessary to perform checks on the whole asset register because we had undertaken such checks during the previous valuation.

4.40 Representative portions of the additions and deletions were checked on a sample basis as follows:

- additions were traced from project records into the asset register;
- items were selected from a list of additions and deletions and traced into the asset register and to source documents such as as-builts; and
- reasonableness tests were performed on asset groups to ensure the completeness and accuracy of the summary spreadsheet schedules.

5 Economic Value

Introduction

5.1 The ODV of an asset is the lesser of its ODRC and EV. The EV of an asset is lower than the ODRC where it is possible to provide the same service, at lower cost to users of the network, by an alternative means.

Valuation of system fixed assets at EV

5.2 System fixed assets are valued at their EV when it is possible to supply users by alternative means at a lower cost than the existing network.

5.3 The strict application of the above approach would require EV testing for each part of the system. This would be time consuming and impractical in many instances. The Handbook states in paragraph 2.59 however, that a comprehensive EV test need only be applied if it is considered that the write-down in asset value as a result of the EV analysis on all potentially uneconomic assets would be greater than 1% of the ODRC of all system fixed assets. In accordance with clause 2.59 of the Handbook, the EV analysis undertaken for the 2000 ODV of Horizon has been considered as a guide to determine whether a comprehensive EV test is required.

5.4 In 2000, two spurs were selected for EV testing using the segmentation criteria prescribed in paragraph 3.70 of the Ministry of Economic Development's ODV Handbook (4th edition). Details of the 2000 ODV segmentation analysis are included in Appendix I. Together these segments comprised a total ODRC of $0.96 million or 1.4% of the total 2000 ODRC. The EV testing applied to these segments in 2000 resulted in no EV write-down. Details of the EV testing undertaken in 2000 are included in Appendix J.

5.5 Since 2000, there have been no significant changes to the configurations or supply requirements of these spurs and feeders. Increases in the replacement cost of the assets due to revised Handbook values have been offset by additional depreciation on the assets since 2000. As a result, there is no reason to consider that the results of the EV testing undertaken in 2000 would be materially different in 2004. In addition, there are no other segments of the network which are believed to be less economic than the feeders and spurs noted above. Therefore, as the EV write-down in 2000 was considerably less than 1% of the ODRC, it is not necessary to undertake a comprehensive EV analysis for the purposes of the 2004 ODV valuation.

5.6 Further support for this conclusion is provided by the cost of the alternative supply options for the relevant feeders and spurs. In 2000, the ODV Handbook prescribed that EV tests must be undertaken using a cost for the alternative supply option (excluding energy, but

including transmission) of no more than 30 cents per kWh (or 35 - 40c/kWh including energy). Based on our analysis undertaken in 2000 and again in 2004, for those customers connected to the least economic segments, the least cost alternative use able to provide the same service, is local diesel generation. In 2000, we assessed the total costs of supply for remote segments as being greater than the maximum alternative cost allowed in the 2000 Handbook. In 2000 however, in accordance with the Handbook, the EV tests were calculated using the maximum allowable tariff of 30 c/kWh. The EV write-downs calculated in 2000 were therefore potentially overstated due to the Handbook's requirement to use 30 c/kWh as the cost of the alternative.

5.7 The 2004 Handbook does not prescribe a maximum value to be used for alternative supply options. The current cost of the fuel itself is in excess of 30c/kWh (for remote locations) and forecasts of diesel prices are not expected to result in prices any lower than 2000 prices. In addition, we have no evidence that the capital costs for diesel generation are lower in 2004 than in 2000, or will become less than 2000 costs in the medium term. These factors support our conclusion that the EV analysis undertaken in 2000 was potentially overstated. Therefore for the purposes of this valuation, and given the 2000 EV results, we conclude that the potential EV write-down in 2004, if any, will be less than 1% of the ODRC.

5.8 In addition, the potential for by-pass of existing customers by alternative suppliers was considered in order to determine if additional EV analysis was required. Following discussions with Horizon staff, it was concluded that no additional analysis was required as there are no instances where large customers (that is those who are likely to be of most interest to alternative suppliers), could be supplied by another network or the transmission system with costs of supply less than existing costs of supply. Thus the EV of these assets will be greater than their ODRC, based on the higher alternative costs, and the ODV equals the ODRC.

5.9 For the reasons outlined above therefore, and in accordance with Clause 2.59 of the Handbook, we have reviewed the system fixed asset base of the Horizon network and have identified assets that are potentially uneconomic. As a result, and based on analysis previously undertaken, with consideration of changes in circumstances relevant to these assets, we conclude that an EV of these assets will not result in a material (or > 1%) reduction in the ODV of the total system fixed assets.

6 Optimised Deprival Value

6.1 In summary, PricewaterhouseCoopers has determined the ODV of Horizon's ELB system fixed assets to be $73,151,436 as at 31 March 2004. The ODV is represented by:

Table 6: Derivation of ODV

	Value as at 31 March 2004 ($)
ODRC of system fixed assets	73,151,436
Less ODRC of uneconomic segments	(-)
Plus EV of uneconomic segments	-
ODV of system fixed assets	73,151,436

6.2 Assets have been valued using the standard replacement costs included in the Handbook, and depreciated against the standard asset lives also incorporated in the Handbook. Assets for which the Handbook does not include standard replacement costs, such as zone substation equipment, have been valued by Horizon's engineers on a modern equivalent replacement cost basis and reviewed by Maunsell. System optimisation has been undertaken by Horizon and reviewed by Maunsell. Appendix K includes Maunsell written confirmation on these matters.

6.3 We have also considered whether a comprehensive EV test is required, as envisaged in paragraph 2.59 of the Handbook. We have concluded that a comprehensive EV test is not required as the value of potentially uneconomic assets is less than 1% of the ODRC of all system fixed assets. We have formed this conclusion on the basis of the EV segmentation and EV testing undertaken in 2000, together with a consideration of the likely costs of the relevant least cost alternatives and an assessment of changes to the network since 2000. We have therefore valued all segments of the distribution system at their ODRC value.

General

6.4 In accordance with our normal practice, PricewaterhouseCoopers specifically disclaim any responsibility to any party for any loss or damage whatsoever suffered as a result of acting in accordance with any information contained within this report. This report has been specifically prepared for the purpose set out above.

6.5 Neither the whole nor any part of this report nor any reference thereto may be included with or attached to any document, circular, resolution, letter or statement without the prior written consent of PricewaterhouseCoopers as to the form and context in which it may appear. We retain the right to review our opinion in light of information that now exists but becomes known to us after the date of this report.

6.6 This report has been prepared for the directors of Horizon solely to provide an opinion on the ODV value of the ELB system fixed assets as at 31 March 2004, for regulatory purposes. This report has not been prepared for any other purpose and we expressly disclaim any liability to any other party who may rely on this report for any other purpose.

6.7 Please do not hesitate to contact the undersigned if you have any queries about this report.

Craig S Rice
Partner
Corporate Finance

Lynne Taylor
Director
Corporate Finance

PRICEWATERHOUSECOOPERS

Appendix A

ODV asset register

ASSET CLASS	Unit	Total Units	Std Life years	RC $	ORC $	DRC $	ODRC $	ODV $
Subtransmission								
33kV Lines - Heavy - Concrete	km	12	60	719,512	700,173	319,027	307,346	307,346
33kV Lines - Heavy - Wooden	km	3	45	179,574	174,747	79,622	76,706	76,706
33kV Lines - Light - Concrete	km	82	60	3,721,227	3,721,227	2,139,683	2,139,683	2,139,683
33kV Lines - Light - Wooden	km	20	45	928,733	928,733	534,016	534,016	534,016
33kV Lines - Double Circuit Heavy - Concrete	km	18	60	859,808	644,845	515,447	386,580	386,580
33kV Lines - Double Circuit Heavy - Wooden	km	4	45	214,588	160,939	128,644	96,481	96,481
33kV Lines - Double Circuit Light - Concrete	km	17	60	615,398	615,398	376,184	376,184	376,184
33kV Lines - Double Circuit Light - Wooden	km	4	45	153,589	153,589	93,887	93,887	93,887
33kV Cables - xlpe (<240mm2 Al)	km	2	45	388,861	388,861	229,492	229,492	229,492
33kV Cables - Double Circuit - xlpe (<240mm2 Al)	km	1	45	107,330	107,330	68,548	68,548	68,548
33 kV Isolation	No	30	35	270,000	270,000	124,089	124,089	124,089
33 kV OD Circuit Breaker	No	2	40	90,000	90,000	26,392	26,392	26,392
Zone Substations								
Land	Lot		n/a	137,000	137,000	137,000	137,000	137,000
Site Development and Buildings	No.	32	50	456,300	456,300	272,380	272,380	272,380
Transformers - 55 Years	No.	14	55	80,000	80,000	46,404	46,404	46,404
Transformers - 60 Years	No.	21	60	3,035,000	3,035,000	1,599,562	1,599,562	1,599,562
33 kV Outdoor Circuit Breakers	No.	8	40	360,000	360,000	66,329	66,329	66,329
22/11kV Indoor Switchgear Cubicle - 55 Years	No.	44	40	1,281,000	1,281,000	837,774	837,774	837,774
Incoming Outdoor Switchgear	No.	35	40	186,100	186,100	115,657	115,657	115,657
11 kV Surge Arrestor set	No.	72	35	346,500	346,500	108,850	108,850	108,850
Transformer Protection and Controls	No.	12	40	59,000	59,000	44,837	44,837	44,837
Feeder Protection and Controls	No.	138	40	629,800	629,800	418,936	418,936	418,936
Outdoor Structure Concrete	Lot	20	60	244,000	244,000	139,805	139,805	139,805
SCADA and Communications Equipment	Lot	131	15	589,950	589,950	249,551	249,551	249,551
Ripple Injection Plant	Lot	14	20	670,900	670,900	200,341	200,341	200,341
Zone Substation Ring Main Unit	No.	1	40	16,000	16,000	9,496	9,496	9,496
DC Supplies, batteries and inverters	Lot	24	20	50,400	50,400	20,277	20,277	20,277
Power Cabling	km	15	45	124,000	124,000	88,968	88,968	88,968
Other items	No.	39	40	283,700	283,700	165,578	165,578	165,578
Distribution Lines & Cables								
11kV Lines - Heavy - Concrete	km	2	60	71,554	71,554	26,890	26,890	26,890
11kV Lines - Heavy - Wooden	km	0	45	5,965	5,965	2,242	2,242	2,242
11kV Lines - Medium - Concrete	km	345	60	10,675,185	10,669,859	5,212,095	5,209,979	5,209,979
11kV Lines - Medium - Wooden	km	29	45	889,958	889,514	434,517	434,340	434,340
11kV Lines - Light - Concrete	km	762	60	19,578,743	19,409,784	10,231,606	10,143,822	10,143,822
11kV Lines - Light - Wooden	km	64	45	1,632,221	1,618,136	852,978	845,660	845,660
11 kV Lines - Single Phase or SWER lines - Concrete	km	242	60	5,684,663	5,684,663	2,770,505	2,770,504	2,770,504
11 kV Lines - Single Phase or SWER Lines - Wooden	km	20	45	473,913	473,913	230,969	230,969	230,969
11kV Lines - Double Circuit - Heavy - Concrete	km	1	60	31,961	31,961	12,006	12,006	12,006
11kV Lines - Double Circuit - Heavy - Wooden	km	0	45	2,665	2,665	1,001	1,001	1,001
11kV Lines - Double Circuit - Medium - Concrete	km	1	60	10,767	10,767	5,090	5,090	5,090
11kV Lines - Double Circuit - Medium - Wooden	km	0	45	898	898	424	424	424
11kV Lines - Double Circuit - Light - Concrete	km	1	60	11,159	11,159	5,270	5,270	5,270
11kV Lines - Double Circuit - Light - Wooden	km	0	45	930	930	439	439	439
11kV Lines - Underbuilt - Medium - Concrete	km	18	60	253,423	253,423	161,914	161,914	161,914
11kV Lines - Underbuilt - Medium - Wooden	km	1	45	21,127	21,127	13,498	13,498	13,498
11kV Lines - Underbuilt - Light - Concrete	km	31	60	393,060	393,060	259,916	259,916	259,916
11kV Lines - Underbuilt - Light - Wooden	km	3	45	32,768	32,768	21,668	21,668	21,668
11kV Cables - Heavy - xlpe	km	1	45	153,765	153,765	100,838	100,838	100,838
11kV Cables - Heavy - pilc	km	0	70	13,088	13,088	7,391	7,391	7,391
11kV Cables - Medium - xlpe	km	32	45	3,394,530	3,379,194	2,086,426	2,078,830	2,078,830
11kV Cables - Medium - pilc	km	11	70	1,180,323	1,173,478	783,407	778,972	778,972
11kV Cables - Light - xlpe	km	71	45	5,880,553	5,877,005	3,774,556	3,772,319	3,772,319
11kV Cables - Light - pilc	km	14	70	1,117,275	1,116,194	717,887	717,200	717,200
11kV Cables - Double Circuit - Heavy - xlpe	km	0	45	7,911	7,911	5,328	5,328	5,328
11kV Cables - Double Circuit - Heavy - pilc	km	0	70	8,723	8,723	4,555	4,555	4,555
11kV Cables - Double Circuit - Medium - xlpe	km	12	45	847,322	847,322	558,531	558,531	558,531
11kV Cables - Double Circuit - Medium - pilc	km	1	70	96,752	96,752	60,773	60,773	60,773
Distribution Switchgear								
Distribution Disconnector 3 ph	No.	415	35	1,449,675	1,449,675	506,913	506,913	506,913
Distribution Disconnector 2 ph	No.	8	35	20,000	20,000	5,012	5,012	5,012
Distribution Dropout Fuse 3 ph	No.	2,313	35	5,783,375	5,783,375	2,535,174	2,535,174	2,535,174
Distribution Dropout Fuse 2ph	No.	667	35	1,343,000	1,343,000	536,663	536,663	536,663
Distribution Oil Sw/Sectionaliser	No.	1	40	18,000	18,000	10,233	10,233	10,233
Distribution Recloser	No.	26	40	702,000	702,000	436,735	436,735	436,735
Distribution Ring Main Unit - 3 way	No.	135	40	2,168,000	2,168,000	1,494,140	1,494,140	1,494,140
Distribution Extra Oil Switch	No.	45	40	614,000	614,000	358,998	358,998	358,998
Distribution Extra Fuse Switch	No.	21	40	200,000	200,000	112,648	112,648	112,648

ASSET CLASS	Unit	Total Units	Std Life years	RC $	ORC $	DRC $	ODRC $	ODV $
Distribution Transformers Extended Total Life								
Distribution Transformer - Single/Two Phase Unit - up to 15 kVA	No.	662	55	1,731,600	1,731,600	973,167	973,167	973,167
Distribution Transformer - Single/Two Phase Unit - 30 kVA	No.	118	55	392,700	392,700	237,311	237,311	237,311
Distribution Transformer - Single/Two Phase Unit - 50 kVA	No.	7	55	28,000	28,000	23,967	23,967	23,967
Distribution Transformer - Pole Mounted - Three Phase Unit - 11kV - Up to and including 30 kVA	No.	1,350	55	6,752,500	6,752,500	3,810,588	3,810,588	3,810,588
Distribution Transformer - Pole Mounted - Three Phase Unit - 11kV - 50 kVA	No.	331	55	2,320,500	2,320,500	1,564,739	1,564,739	1,564,739
Distribution Transformer - Pole Mounted - Three Phase Unit - 11kV - 100 kVA	No.	82	55	738,000	711,000	456,910	447,097	447,097
Distribution Transformer - Pole Mounted - Three Phase Unit -11kV - 200 kVA	No.	33	55	429,000	429,000	142,285	142,285	142,285
Distribution Transformer - Pole Mounted - Three Phase Unit - 11kV - 300 kVA	No.	19	55	303,000	303,000	114,273	114,273	114,273
Distribution Transformer - Ground Mounted - Three Phase Unit - 22kV - 200 kVA	No.	193	55	2,702,000	2,702,000	1,441,067	1,441,067	1,441,067
Distribution Transformer - Ground Mounted - Three Phase Unit - 11kV - 100 kVA	No.	52	55	468,000	468,000	322,078	322,078	322,078
Distribution Transformer - Ground Mounted - Three Phase Unit - 11kV - 300 kVA	No.	105	55	1,680,000	1,680,000	954,949	954,949	954,949
Distribution Transformer - Ground Mounted - Three Phase Unit - 11kV - 500 kVA	No.	29	55	638,000	638,000	481,096	481,096	481,096
Distribution Transformer - Ground Mounted - Three Phase Unit - 11kV - 750 kVA	No.	4	55	104,000	104,000	63,781	63,781	63,781
Distribution Transformer - Ground Mounted - Three Phase Unit - 11kV - 1000 kVA	No.	5	55	145,000	145,000	69,584	69,584	69,584
Distribution Transformer - Ground Mounted - Three Phase Unit - 11kV - 1500 kVA	No.	1	55	46,000	46,000	24,865	24,865	24,865
Distribution Substations Extended Total Life								
Distribution Substation - Pole Mounted - Up to 50 kVA	No.	2,390	55	2,395,914	2,395,914	1,552,121	1,552,121	1,552,121
Distribution Substation - Pole Mounted - Over 50 kVA	No.	107	55	214,000	214,000	121,186	121,186	121,186
Distribution Substation - Ground Mounted (Covered)	No.	489	55	1,956,000	1,956,000	1,353,914	1,353,914	1,353,914
Distribution Substation - Kiosk	No.	2	55	22,000	22,000	19,998	19,998	19,998
Distribution Substation - Extended Life - On Customer Premises	No.	3	55	6,000	6,000	3,875	3,875	3,875
LV Lines and Cables								
LV Lines - Medium - 4 wire - LV Only - Concrete	km	19	60	810,325	810,325	384,447	384,447	384,447
LV Lines - Medium - 4 wire - LV Only - Wooden	km	2	45	67,554	67,554	32,050	32,050	32,050
LV Lines Light - 4 wire - LV Only - Concrete	km	39	60	1,481,133	1,481,133	728,515	728,515	728,515
LV Lines Light - 4 wire - LV Only - Wood	km	3	45	123,478	123,478	60,734	60,734	60,734
LV Lines - Medium - 2 wire - LV Only - Concrete	km	1	60	19,394	19,394	8,493	8,494	8,494
LV Lines - Medium - 2 wire - LV Only - Wooden	km	0	45	1,617	1,617	708	708	708
LV Lines Light - 2 wire - LV Only - Concrete	km	3	60	96,015	96,015	44,541	44,542	44,542
LV Lines Light - 2 wire - LV Only - Wood	km	0	45	8,005	8,005	3,713	3,713	3,713
LV Lines - Medium - Underbuilt - 4 wire - Concrete	km	223	60	4,691,791	4,691,791	2,413,647	2,413,647	2,413,647
LV Lines - Medium - Underbuilt - 4 wire - Wooden	km	19	45	391,141	391,141	201,219	201,218	201,218
LV Lines - Light - Underbuilt - 4 wire - Concrete	km	3	60	62,930	62,929	33,693	33,693	33,693
LV Lines -Light - Underbuilt - 4 wire - Wooden	km	0	45	5,246	5,246	2,809	2,809	2,809
LV Lines - Medium - Underbuilt - 2 wire - Concrete	km	0	60	4,500	4,500	2,327	2,327	2,327
LV Lines - Medium - Underbuilt - 2 wire - Wooden	km	0	45	375	375	194	194	194
LV Lines - Light - Underbuilt - 2 wire - Concrete	km	7	60	101,561	101,562	46,855	46,855	46,855
LV Lines - Light Underbuilt - 2 wire - Wooden	km	1	45	8,467	8,467	3,906	3,906	3,906
LV Cables - Heavy -LV Only - xlpe/pvc	km	0	45	7,081	7,081	5,945	5,945	5,945
LV Cables - Medium -LV Only - xlpe/pvc	km	261	45	12,064,207	12,064,207	7,681,753	7,681,753	7,681,753
LV Cables - Streetlight Circuit - with HV - xlpe/pvc	km	16	45	420,927	420,927	236,527	236,527	236,527
2 way Link Pillar	No.	255	45	510,000	510,000	415,768	415,768	415,768
4 way Link Pillar	No.	62	45	248,000	248,000	194,668	194,668	194,668
Customer Service Connections								
LV Overhead - 1ph	No.	3,394	45	237,948	237,958	145,749	145,749	145,749
LV Overhead - 3ph	No.	6,574	45	1,178,098	1,178,098	650,242	650,242	650,242
LV Underground - 1ph - shared fuse pillar	No.	10,819	45	2,706,750	2,706,750	1,614,452	1,614,452	1,614,452
LV Underground - 3ph - shared fuse pillar	No.	2,581	45	1,072,000	1,072,000	647,875	647,875	647,875
LV Underground - 3ph - own fuse pillar	No.	78	45	20,000	20,000	14,070	14,070	14,070
LV Streetlights Overhead - 1ph	No.	1,672	45	117,040	117,040	69,805	69,805	69,805
LV Streetlights Underground - 1ph	No.	2,370	45	165,900	165,900	119,558	119,558	119,558
Other System Fixed Assets								
Mobile Substation Equipment - 15 Years	No.	2	15	7,700	7,700	7,572	7,572	7,572
Mobile Substation Equipment - 20 Years	No.	2	20	241,500	241,500	187,801	187,801	187,801
Mobile Substation Equipment - 30 Years	No.	1	30	29,000	29,000	18,927	18,927	18,927
Mobile Substation Equipment - 55 Years	No.	1	55	16,000	16,000	15,887	15,887	15,887
SCADA and Communications (Central Facilities)	Lot		15	676,950	676,950	177,637	177,637	177,637
Strategic Spares	Lot		15	92,497	92,497	49,373	49,373	49,373
Total System Fixed Assets				132,324,866	131,789,473	73,449,227	73,151,436	73,151,436

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Appendix B

Replacement costs and asset lives for standard assets

Distribution ELB Standard Replacement Costs and Lives

Asset Class	Unit	Standard Replacement Cost ($000)	Standard Life (Years)	
SUBTRANSMISSION			Pole Type	
			Concrete	Wood
33kV Lines – Heavy (≥150mm^2, ≤300mm^2 A1)	km	61	60	45
33kV Lines – Light (<150mm^2 A1)	km	45	60	45
33kV Lines – DCct Heavy	km	96	60	45
33kV Lines – DCct Light	km	72	60	45
			Cable Type	
			XLPE	PILC
33kV Cables – (≤240mm^2 A1)	km	175	45	70
33kV Cables – DCct (≤240mm^2 A1)	km	280	45	70
Pilot/Communications Ccts O/H	km	**	45	
Pilot/Communications Ccts U/G	km	**	45	
33 kV Isolation	No.	9	35	
33 kV Surge Arresters (3 phase set)	No.	8	35	
ZONE SUBSTATIONS				
Land	No.	-	-	
Site Development and Buildings	No.	**	50	
Transformers	No.	**	45	
33 kV Indoor Switchgear Cubicle	No.	50	45	
33 kV Bus Section/Coupler Indoor Switchgear	No.	55	45	
33 kV Outdoor Circuit Breakers	No.	45	40	
22/11 kV Indoor Switchgear Cubicle	No	30	45	
22/11 kV Outdoor Circuit Breakers	No	27	40	
Incoming Outdoor Switchgear	No.	**	40	
Transformer Outdoor Switchgear	No.	**	40	
Feeder Outdoor Switchgear	No.	**	40	
Bus Section/Coupler Outdoor Switchgear	No.	**	40	
Incoming Circuit Protection and Controls	No.	**	40	
Transformer Protection and Controls	No.	**	40	
Feeder Protection and Controls	No.	**	40	
Bus Section/Coupler Protection and Controls	No.	**	40	
			Pole Type	
			Concrete	Wood
Outdoor Structure if not included above	Lot	**	60	45
SCADA and Communications Equipment	Lot	**	15	
Ripple Injection Plant	Lot	**	20	
DC Supplies, Batteries and Inverters	Lot	**	20	
Other Items		**	40	

Asset Class	Unit	Standard Replacement Cost ($000)	Standard Life (Years)	
DISTRIBUTION LINES			Pole Type	
			Concrete	Wood
22 kV O/H Heavy (≥150mm², ≤240mm² A1)	km	32	60	45
22kV O/H Medium (>50mm², <150mm² A1)	km	29	60	45
22kV O/H Light (≤50mm² A1)	km	27	60	45
22kV single phase or SWER lines	km	24	60	45
22kV O/H DCct Heavy	km	50	60	45
22kV O/H DCct Medium	km	46	60	45
22kV O/H DCct Light	km	42	60	45
22kV O/H Underbuilt Heavy	km	17	60	45
22kV O/H Underbuilt Medium	km	16	60	45
22kV O/H Underbuilt Light	km	14	60	45
11kV O/H Heavy (≥150mm², ≤240mm² A1)	km	31	60	45
11kV O/H Medium (>50mm², <150mm² A1)	km	28	60	45
11kV O/H Light (≤50mm² A1)	km	25	60	45
11kV single phase or SWER lines	km	21	60	45
11kV O/H DCct Heavy	km	46	60	45
11kV O/H DCct Medium	km	42	60	45
11kV O/H DCct Light	km	38	60	45
11kV O/H Underbuilt Heavy	km	15	60	45
11kV O/H Underbuilt Medium	km	14	60	45
11kV O/H Underbuilt Light	km	12	60	45
DISTRIBUTION CABLES			Cable Type	
			XLPE	PILC
22kV U/G Heavy (>240mm², ≤300mm² A1)	km	155	45	70
22kV U/G Medium (>50mm², ≤240mm² A1)	km	118	45	70
22kV U/G Light (≤50mm² A1)	km	94	45	70
22kV U/G DCct Heavy	km	220	45	70
22kV U/G DCct Medium	km	160	45	70
11kV U/G Heavy (>240mm², ≤300mm² A1)	km	125	45	70
11kV U/G Medium (>50mm², ≤240mm² A1)	km	103	45	70
11kV U/G Light (≤50mm² A1)	km	81	45	70
11kV U/G DCct Heavy	km	170	45	70
11kV U/G DCct Medium	km	140	45	70
DISTRIBUTION SWITCHGEAR				
22/11 kV Disconnector 3 ph (Excl Pole)	No.	3.5	35	
22/11 kV Disconnector 2 ph (Excl Pole)	No.	2.5	35	
22/11 kV Load Break Switch (Excl Pole)	No.	6.5	35	
22/11 kV Dropout Fuse 3 Ph (Excl Pole)	No.	2.5	35	
22/11 kV Dropout Fuse 2 Ph (Excl Pole)	No.	2.0	35	
22/11 kV Sectionaliser (Excl Pole)	No.	18	40	
22/11 kV Recloser (Excl Pole)	No.	27	40	
Voltage Regulator	No.	**	55	
Ring Main Unit – 3 Way	No.	16	40	
Extra Oil Switch	No.	6	40	
Extra Fuse Switch	No.	8	40	

Asset Class	Unit	Standard Replacement Cost ($000)	Standard Life (Years)
DISTRIBUTION TRANSFORMERS			
Single/Two Phase, 22/0.4 and 11/0.4 kV, Bushing Terminations			
Up to and including 15 kVA	No.	2.6	45
30 kVA	No.	3.3	45
50 kVA	No.	4	45
75 kVA	No.	5	45
100 kVA	No.	7	45
Pole Mounted, Three Phase, Bushing Terminations			
22/0.4 kV			
Up to and including 30 kVA	No.	6	45
50 kVA	No.	8	45
100 kVA	No.	10	45
200 kVA	No.	15	45
300 kVA	No.	18	45
500 kVA	No.	23	45
11/0.4 kV			
Up to and including 30 kVA	No.	5	45
50 kVA	No.	7	45
100 kVA	No.	9	45
200 kVA	No.	13	45
300 kVA	No.	16	45
500 kVA	No.	20	45
Ground Mounted, Three Phase, 22/0.4 and 11/0/4 kV, Cable Entry			
22/0.4 kV			
100 kVA	No.	10	45
200 kVA	No.	16	45
300 kVA	No.	18	45
500 kVA	No.	25	45
750 kVA	No.	29	45
1,000 kVA	No.	34	45
1,250 kVA	No.	46	45
1,500 kVA	No.	53	45
11/0.4 kV			
100 kVA	No.	9	45
200 kVA	No.	14	45
300 kVA	No.	16	45
500 kVA	No.	22	45
750 kVA	No.	26	45
1,000 kVA	No.	29	45
1,250 kVA	No.	40	45
1,500 kVA	No.	46	45

Asset Class	Unit	Standard Replacement Cost ($000)	Standard Life (Years)	
DISTRIBUTION SUBSTATIONS				
Pole Mounted (50 kVA or less)	No.	1	45	
Pole Mounted (100 kVA or more)	No.	2	45	
Ground Mounted (Covered)	No.	4	45	
Kiosk (Masonry or block enclosure)	No.	11	45	
On Customer's Premises with Feedout	No.	2	45	
LV LINES			Pole Type	
			Concrete	Wood
Overhead Heavy 4 wire LV only (> 150 mm^2 Al)	km	45	60	45
Overhead Medium 4 wire LV only (≤150 mm^2 Al)	km	42	60	45
Overhead Light 4 wire LV only (≤ 50 mm^2 Al)	km	38	60	45
Overhead Medium 2 wire LV only (> 50 mm^2 ≤150 mm^2 Al)	km	36	60	45
Overhead Light 2 wire LV only (≤ 50 mm^2 Al)	km	30	60	45
Overhead Heavy Underbuilt 4 wire (> 150 mm^2)	km	24	60	45
Overhead Medium Underbuilt 4 wire (≤ 150 mm^2)	km	21	60	45
Overhead Medium Underbuilt 2 wire (> 50 mm^2 ≤150 mm^2) Al	km	17	60	45
Overhead Light Underbuilt 2 wire (≤ 50 mm^2) Al	km	14	60	45
LV CABLES			Cable Type	
			XLPE/PVC	PILC
Underground Heavy – LV Only (>240 mm^2)	km	72	45	70
Underground Medium – LV Only (≤ 240 mm^2)	km	63	45	70
Underground Heavy – with HV (>240 mm^2)	km	40	45	70
Underground Medium – with HV (≤ 240 mm^2)	km	32	45	70
Underground street light circuit (own trench)	km	30	45	70
Underground street light circuit (HV cable trench)	km	12	45	70
Link Pillars				
2 way Link Pillar	No.	2	45	
4 way Link Pillar	No.	4	45	
CUSTOMER SERVICE CONNECTIONS EXCLUDING METERS AND RELAYS				
LV overhead – 1 ph	No.	0.07	45	
LV overhead – 3 ph	No.	0.18	45	
LV underground – 1 ph shared fuse pillar	No.	0.25	45	
Own fuse pillar	No.	0.5	45	
LV underground – 3 ph shared fuse pillar	No.	0.4	45	
Own fuse pillar	No.	0.8	45	
OTHER SYSTEM FIXED ASSETS				
SCADA and Comms (Central Facilities)	Lot	**	15	

** No maximum value assigned

PRICEWATERHOUSECOOPERS

Appendix C

Replacement cost multipliers

PRICEWATERHOUSECOOPERS

Asset	Condition	Unit	Multiplier	Qty
SUBTRANSMISSION				
Overhead Light - SCct (Concrete)	urban	km	1.80	1.10
Overhead Light - SCct (Wood)	urban	km	1.80	0.27
Overhead Light - DCct (Concrete)	urbanDCct	km	1.40	1.26
Overhead Light - DCct (Wood)	urbanDCct	km	1.40	0.31
				2.95
DISTRIBUTION - Lines & Cables				
Overhead Medium - SCct (Concrete)	rugged	km	1.30	47.11
Overhead Medium - SCct (Wood)	rugged	km	1.30	3.93
Overhead Medium - SCct (Concrete)	urban	km	1.80	25.31
Overhead Medium - SCct (Wood)	urban	km	1.80	2.11
Overhead Light - SCct (Concrete)	remote	km	1.25	6.63
Overhead Light - SCct (Wood)	remote	km	1.25	0.55
Overhead Light - SCct (Concrete)	rugged	km	1.30	5.40
Overhead Light - SCct (Wood)	rugged	km	1.30	0.45
Overhead Light - SCct (Concrete)	urban	km	1.80	16.81
Overhead Light - SCct (Wood)	urban	km	1.80	1.40
Overhead Light - SCct (Concrete)	remote - rugged	km	1.55	2.00
Overhead Light - SCct (Wood)	remote - rugged	km	1.55	0.17
Overhead Medium - 1ph SCct (Concrete)	rugged	km	1.30	3.30
Overhead Medium - 1ph SCct (Wood)	rugged	km	1.30	0.28
Overhead Light - 1ph SCct (Concrete)	remote	km	1.25	3.23
Overhead Light - 1ph SCct (Wood)	remote	km	1.25	0.27
Overhead Light - 1ph SCct (Concrete)	rugged	km	1.30	86.28
Overhead Light - 1ph SCct (Wood)	rugged	km	1.30	7.19
Overhead Light - 1ph SCct (Concrete)	remote - rugged	km	1.55	1.92
Overhead Light - 1ph SCct (Wood)	remote - rugged	km	1.55	0.16
Overhead Medium - Underbuilt (Concrete)	urban	km	1.80	0.47
Overhead Medium - Underbuilt (Wood)	urban	km	1.80	0.04
Overhead Light - Underbuilt (Concrete)	urban	km	1.80	1.76
Overhead Light - Underbuilt (Wood)	urban	km	1.80	0.15
				216.93
Underground Medium PI - SCct	CBD	km	1.25	0.98
Underground Light PI - SCct	CBD	km	1.25	0.02
Underground Medium PI - DCct	CBD	km	1.25	0.05
Underground Light PI - DCct	CBD	km	1.25	0.03
Underground Medium XLPe - SCct	CBD	km	1.25	3.83
Underground Light XLPe - SCct	CBD	km	1.25	1.12
Underground Light XLPe - SCct	rocky	km	2.00	0.49
Underground Medium XLPe - DCct	CBD	km	1.25	0.73
Underground Light XLPe - DCct	CBD	km	1.25	0.18
Underground Light XLPe - DCct	rocky	km	2.00	0.12
				7.55
DISTRIBUTION - Switchgear				
11 kV ABS	remote	No.	1.25	1
11 kV 2-phase Dropout Fuse (set)	remote	No.	1.25	18
11 kV Dropout Fuse (set)	remote	No.	1.25	3
				22
DISTRIBUTION - Transformers				
Single phase <=15 kVA	remote	No.	1.25	16
Single phase 30 kVA	remote	No.	1.25	4
Three phase External Bush 15 kVA	remote	No.	1.25	1
Three phase External Bush 30 kVA	remote	No.	1.25	1
Three phase External Bush 50 kVA	remote	No.	1.25	2
				24
DISTRIBUTION - Substations				
Pole Mounted <=75 kVA	remote	No.	1.25	24
				24
LV - Lines & Cables				
Overhead Light - SCct (Concrete)	remote	km	1.25	0.23
Overhead Light - SCct (Wood)	remote	km	1.25	0.02
Overhead Light - SCct (Concrete)	rugged	km	1.30	0.11
Overhead Light - SCct (Wood)	rugged	km	1.30	0.01
Overhead Light - Underbuilt (Concrete)	remote	km	1.25	0.13
Overhead Light - Underbuilt (Wood)	remote	km	1.25	0.01
Overhead Light - Underbuilt (Concrete)	rugged	km	1.30	0.10
Overhead Light - Underbuilt (Wood)	rugged	km	1.30	0.01
Overhead Light - 1ph Underbuilt (Concrete)	remote	km	1.25	0.25
Overhead Light - 1ph Underbuilt (Wood)	remote	km	1.25	0.02
Overhead Light - 1ph Underbuilt (Concrete)	rugged	km	1.30	0.26
Overhead Light - 1ph Underbuilt (Wood)	rugged	km	1.30	0.02
				1.17
Underground Medium PVC - SCct	CBD	km	1.25	0.90
Underground Medium PVC - DCct	CBD	km	1.25	6.64
Underground Medium PVC - with HV	CBD	km	1.25	4.94
Streetlight Underground 2-core PVC - with HV	CBD	km	1.25	0.15
Streetlight Underground 2-core PVC - SCct	CBD	km	1.25	1.51
				14.13
CUSTOMER SERVICE CONNECTIONS				
3phLVOH	remote	No.	1.25	40
2phLVOH	remote	No.	1.25	1
1phLVOH	remote	No.	1.25	21
				62

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Appendix D

Replacement costs and asset lives for non-standard assets

Asset Group	ODV Category	Asset Item	Life	Replacement Cost ($)
11kV	Underground Light	16mm2 7/.064 1 x 3c Cu PILCSWA	70	55,000
		16mm2 7/1.70 1 x 3c Cu XLPE	45	55,000
		25mm2 1 x 3c Al PILCSTA	70	55,000
		25mm2 3 x 1c Al PILCSWA	70	55,000
		25mm2 3 x 1c Al XLPE	45	55,000
		50mm2 1 x 4c Cu SWA	45	55,000
		UNKNOWN - 95mm2	45	55,000
	Underground Heavy	400mm2 3 x 1c Al XLPE	45	69,000
	Underground Medium	185mm2 3 x 1c Al XLPE	45	52,000
	Underground Medium	95mm2 3 x 1c Al XLPE	45	52,000
	Underground Medium	95mm2 3 x 1c Al XLPE	45	52,000
	Underground Light	16mm2 7/.064 1 x 3c Cu PILCSTA	70	55,000
Customer Connections	ICPs	2phLVOH	45	70
	ICPs	2phLVUG	45	250
	ICPs	2phLVUG DPB	45	500
Low Voltage	04SWGR	Link Box 1-way	45	2,000
		Link Box 3-way	45	2,000
	04SWGR	Link Box 5-way	45	4,000
		Link Box 6-way	45	4,000
		Link Box 9-way	45	4,000
	Underground Heavy	3 x 1c 300mm Cu XLPE	45	49,000
	Underground Medium	106mm2 BEETLE 19/.105 (19/2.67) Al PVC	45	43,000
		120mm2 1 x 4c Al	45	43,000
		16mm2 7/.064 (7/16) Cu N/S	45	43,000
		16mm2 7/.064 (7/16) Cu N/S & P	45	43,000
		16mm2 7/.064 (7/16) HD Cu PVC	45	43,000
		185mm2 1 x 3c Al XLPE	45	43,000
		185mm2 HUHU 4x 1c Al	45	43,000
		23mm2 7/.080 (7/14) HD Cu PVC	45	43,000
		23mm2 7/.080 (7/14)Al PVC	45	43,000
		25mm2 3 x 1c Al XLPE	45	43,000
		25mm2 7/.083 Al PVC	45	43,000
		25mm2 7/.083 HD Cu PVC	45	43,000
		25mm2 NAMU 7/.083 Al PVC	45	43,000
		35mm2 19/.064 Cu N/S	45	43,000
		40mm2 19/.064 HD Cu PVC	45	43,000
		42mm2 7/2.77 (7/.110) Al PVC	45	43,000
		42mm2 LADYBIRD 7/2/77 (7/.110) Al PVC	45	43,000
		50mm Kutu 7/3.00 3 x 1c AAC	45	43,000
		50mm2 1 x 4c Al PVC	45	43,000
		50mm2 1 x 4c Cu SWA	45	43,000
		66mm2 19/.083 Cu PVC	45	43,000
		66mm2 HONI 19/2.11 (19/.083) Al PVC	45	43,000
		95mm2 1 x 4c Al PVC	45	43,000
		UNKNOWN	45	43,000
		UNKNOWN - 16mm2	45	43,000
		UNKNOWN - 185mm2	45	43,000
		UNKNOWN - 240mm2	45	43,000
		UNKNOWN - 40mm2	45	43,000
		UNKNOWN - 40mm2 Al	45	43,000
		UNKNOWN - 50mm2	45	43,000
		UNKNOWN - 66mm2 Cu	45	43,000
		UNKNOWN - 70mm2 Al	45	43,000
Other Assets	MOBSUB	GENERAL,15,3000	15	3,000
		MOBGEN300TrailerMtd	20	132,500
		MOBGEN300TruckMtd	20	109,000
		MOBGENTruck	30	29,000
		MOBSUBTrailer	15	4,700
	COMMS	COMM,15,1000	15	1,000
		COMM,15,10000	15	10,000
		COMM,15,12000	15	12,000
		COMM,15,1500	15	1,500
		COMM,15,18000	15	18,000
		COMM,15,200	15	200
		COMM,15,2000	15	2,000
		COMM,15,25000	15	25,000
		COMM,15,4000	15	4,000
		COMM,15,5000	15	5,000
		COMM,15,6000	15	6,000
		COMM,15,750	15	750
		COMM,15,7500	15	7,500
		COMM,15,8000	15	8,000
		COMM,8,10000	15	10,000
		COMM,8,50000	15	50,000

Asset Group	ODV Category	Asset Item	Life	Replacement Cost ($)
	SCADA	SCADA,15,90000	15	90,000
Subtransmission	33SWGR	FUSEset,35,2500	35	9,000
Zone Substations	11PROTCTRL	ARRESTORset,35,2000	35	2,000
		ARRESTORset,35,500	35	2,000
	GENERAL	BATCHARGER,15,1500	20	1,500
		BATCHARGER,15,2000	20	2,000
		BATCHARGER,15,2500	20	2,500
		BATCHARGER,15,3000	20	3,000
		BATCHARGER,15,4000	20	4,000
		BATCHARGER,15,500	20	500
		BATTERY,15,1000	20	1,000
		BATTERY,15,200	20	200
		BATTERY,15,2000	20	2,000
		BATTERY,15,4000	20	4,000
	11PROTCTRL	CT,40,2000	40	2,000
		CT,40,3000	40	3,000
		CT,40,4000	40	4,000
		PANEL,40,1500	40	1,500
		PANEL,40,2000	40	2,000
		PANEL,40,2500	40	2,500
		PLC,20,15000	40	15,000
		RELAY,40,3000	40	3,000
		RELAY,40,4000	40	4,000
		RELAY,40,8200	40	8,200
		VT1ph150VA,40,4000	40	4,000
		VT3ph100VA,40,4000	40	4,000
		VT3ph100VA,40,6000	40	6,000
		VT3ph150VA,40,4000	40	4,000
	GENERAL	PANEL,40,1500	40	1,500
	UFPROTCTRL	PANEL,40,5000	40	5,000
		RELAY,40,4000	40	4,000
	3311TRANS	VT1ph150VA,40,4000	40	4,000
	33PROTCTRL	CT,40,10000	40	10,000
		CT,40,12000	40	12,000
		CT,40,4000	40	4,000
		RELAY,40,17500	40	17,500
		RELAY,40,3000	40	3,000
		RELAY,40,8200	40	8,200
	CTRLCABLING	CABLECTRL,45,1000	40	1,000
		CABLECTRL,45,10000	40	10,000
		CABLECTRL,45,1500	40	1,500
		CABLECTRL,45,2000	40	2,000
		CABLECTRL,45,2500	40	2,500
		CABLECTRL,45,3500	40	3,500
		CABLECTRL,45,5000	40	5,000
	LAND	LANDEast,10000000,14000	na	14,000
		LANDGala,10000000,8000	na	8,000
		LANDKope,10000000,32000	na	32,000
		LANDOhop,10000000,30000	na	30,000
		LANDPlai,10000000,26000	na	26,000
		LANDStat,10000000,27000	na	27,000
	11PROTCTRL	GENERAL,40,5000	40	5,000
	3311SUBS	GENERAL,15,100	40	100
		GENERAL,15,15000	40	15,000
		GENERAL,15,400	40	400
		GENERAL,30,25000	40	25,000
		GENERAL,40,15000	40	15,000
		GENERAL,40,250	40	250
		GENERAL,40,300	40	300
		GENERAL,40,3000	40	3,000
		GENERAL,40,30000	40	30,000
		GENERAL,40,4000	40	4,000
		GENERAL,40,45000	40	45,000
		GENERAL,40,5000	40	5,000
		GENERAL,40,8000	40	8,000
	33PROTCTRL	GENERAL,40,4000	40	4,000
	GENERAL	PANEL,40,1000	40	1,000
		PANEL,40,10000	40	10,000
		PANEL,40,1250	40	1,250
		PANEL,40,4000	40	4,000
		PANEL,40,4500	40	4,500
		PANEL,40,5000	40	5,000
		PANEL,40,900	40	900

Asset Group	ODV Category	Asset Item	Life	Replacement Cost ($)
	STRUCTURES	ODSTRUCTURE,40,10000	60	10,000
		ODSTRUCTURE,40,15000	60	15,000
		ODSTRUCTURE,40,2000	60	2,000
		ODSTRUCTURE,40,20000	60	20,000
		ODSTRUCTURE,40,4000	60	4,000
		ODSTRUCTURE,40,45000	60	45,000
		ODSTRUCTURE,40,5000	60	5,000
		ODSTRUCTURE,40,8000	60	8,000
	331104CABLING	CABLE,45,11000	45	11,000
		CABLE,45,15000	45	15,000
		CABLE,45,20000	45	20,000
		CABLE,45,2500	45	2,500
		CABLE,45,3500	45	3,500
		CABLE,45,5000	45	5,000
		CABLE,45,7000	45	7,000
	LOADCTRL	LOADCTRL,20,10000	20	10,000
		LOADCTRL,20,15000	20	15,000
		LOADCTRL,20,150000	20	150,000
		LOADCTRL,20,5000	20	5,000
		LOADCTRL,20,50000	20	50,000
		LOADCTRL,20,95000	20	95,000
		LOADCTRL,40,50000	20	50,000
		PANEL,40,900	20	900
	COMMS	COMM,15,1000	15	1,000
		COMM,15,1200	15	1,200
		COMM,15,1500	15	1,500
		COMM,15,15000	15	15,000
		COMM,15,1800	15	1,800
		COMM,15,200	15	200
		COMM,15,2000	15	2,000
		COMM,15,2500	15	2,500
		COMM,15,25000	15	25,000
		COMM,15,300	15	300
		COMM,15,3000	15	3,000
		COMM,15,400	15	400
		COMM,15,4000	15	4,000
		COMM,15,500	15	500
		COMM,15,5000	15	5,000
		COMM,15,600	15	600
		COMM,15,750	15	750
		COMM,15,7500	15	7,500
		COMM,42,1000	15	1,000
	SCADA	SCADA,15,2000	15	2,000
		SCADA,15,20000	15	20,000
		SCADA,15,2500	15	2,500
		SCADA,15,3000	15	3,000
		SCADA,15,30000	15	30,000
		SCADA,15,4000	15	4,000
		SCADA,15,8000	15	8,000
	LOADCTRL	BUILDING,40,2000	50	2,000
	SITEDEVBLDG	BUILDING,40,10000	50	10,000
		BUILDING,40,20000	50	20,000
		BUILDING,40,300	50	300
		BUILDING,40,35000	50	35,000
		BUILDING,40,500	50	500
		BUILDING,40,55000	50	55,000
		BUILDING,40,6000	50	6,000
		PROPERTY,40,2000	50	2,000
		PROPERTY,40,20000	50	20,000
		PROPERTY,40,30000	50	30,000
	3311TAPCHANGER	PANEL,40,1500	40	1,500
		TAPCHANGER,40,11000	40	11,000
		TAPCHANGER,40,7000	40	7,000
		TAPCHANGER,40,8000	40	8,000
	3311TRANSPROTCTRL	PANEL,40,1500	40	1,500
		RELAY,40,3000	40	3,000
		RELAY,40,6000	40	6,000
	3311TRANS	1ph1.66MVA,60,45000	60	90,000
		1ph1.66MVA,60,71108	60	90,000
		1ph3.3MVA,60,90000	60	90,000
		3ph10MVA,60,270000	60	270,000
		3ph500kVA,60,50000	60	50,000
		3ph7.5/15MVA,60,375000	60	375,000
		3ph7.5MVA,60,270000	60	270,000

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Appendix E

Security levels

The details as stated in the AMP, Part 3 and in the Design Standard Section 3.1 refers specifically to the quality of supply criteria as a price versus quality trade off as requested by Horizon's customers and the general methodology that is applied in the design of the system to ensure that zone substations and their feeders are configured to ensure a degree of redundancy is available.

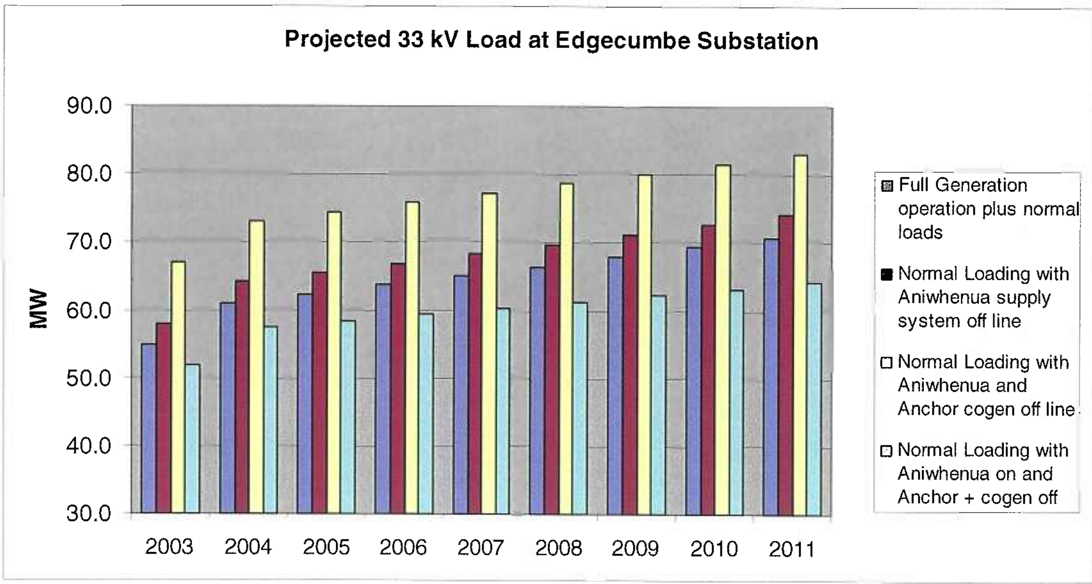
There is no specific statement that details the restoration times that apply to different load magnitudes or number of customers. However the design places a greater emphasis on those parts of the system that may impact on the target indices for reliability. A greater emphasis is also placed on the maintenance of supply to major customers due to the loss of income that they may incur due to any extended outage.

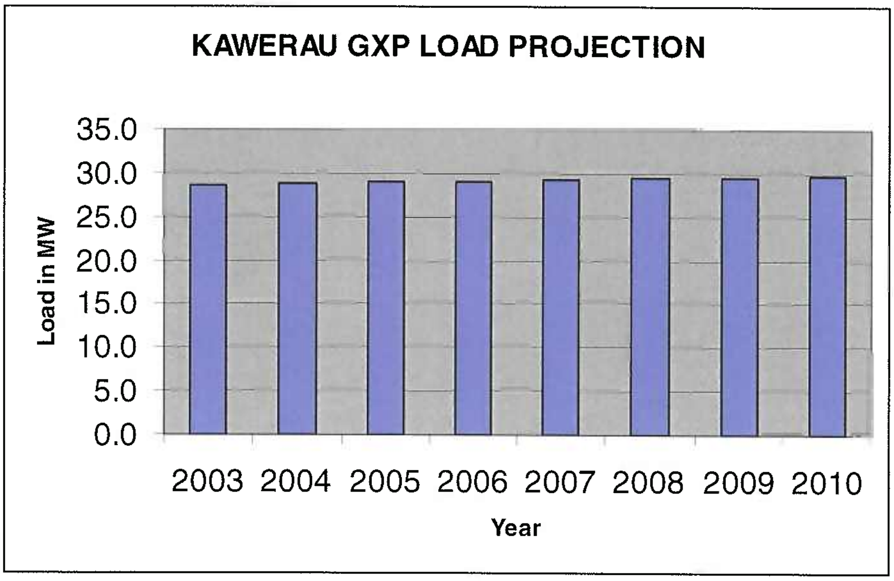
The criteria as stated are required in order to ensure that a progressive reduction in the reliability indices is achieved.

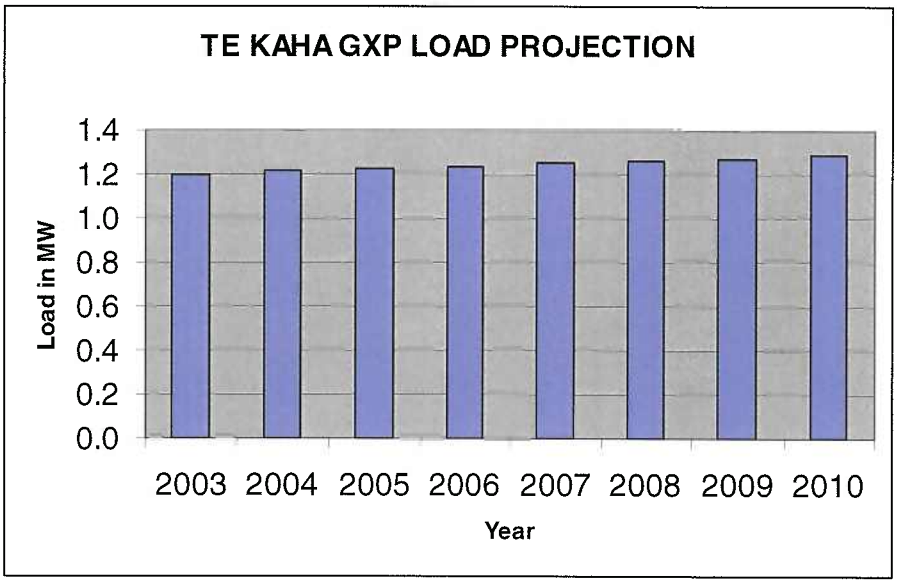
Appendix F

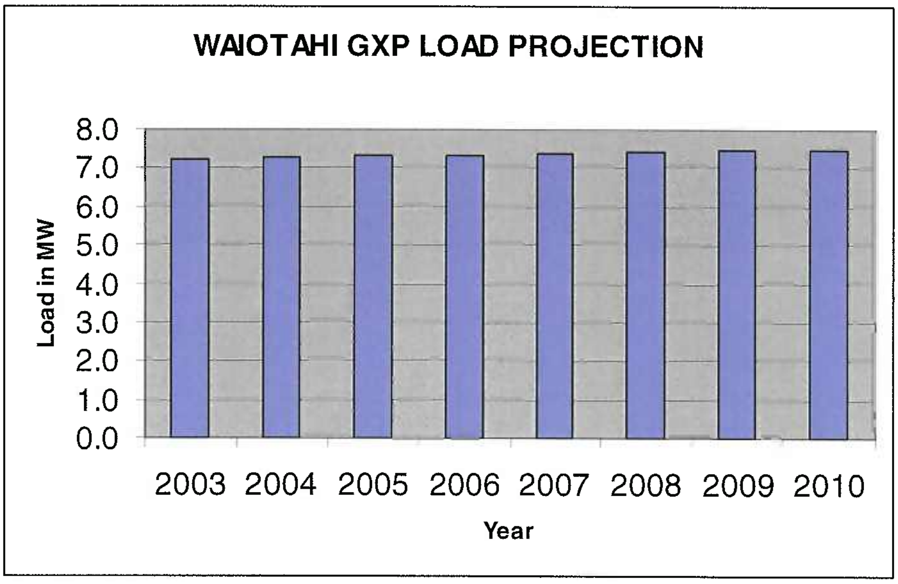
Existing loads and load forecasts

Grid Exit Points






TE KAHA GXP LOAD PROJECTION
Load in MW
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2003
2004
2005
2006
2007
2008
2009
2010
Year


WAIOTAHI GXP LOAD PROJECTION
Load in MW
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2003
2004
2005
2006
2007
2008
2009
2010
Year

Zone Substations	2004 (MVA)	2014 Forecast (MVA)
Kawerau	25.3	26.6
Plains	12.9	14.6
East Bank	6.1	6.7
Kaingaroa	2.0	2.1
Galatea	3.9	4.4
Station Road	7.6	8.4
Ohope	4.1	4.7
Kope	12.6	13.9
Waiotahi	7.0	7.7
Te Kaha	1.3	1.5
Edgecumbe CHHP	26	33.5

High Voltage Distribution Feeder	2004 (AMPS)	2009 AMPS
Te Kaha	23	24
Waihau Bay	46	48
Hospital	136	143
Opotiki	141	149
Waimana	96	101
Dairy Factory	146	154
Strand South	146	154
Rex Morpeth	152	159
Strand North	172	180
King Street	152	159
Victoria	152	159
Piripai	152	159
Ruatoki	111	117
Taneatua	111	117
City South	136	143
WBM Pump	51	53
Manawahe	131	138
Te Teko	182	191
Awaita	131	138
Awakeri	116	122
Rangitaiki	0	0
BMP2 2nd cct	0	0
BMP 1	303	318
Thornton	146	154
Pohutukawa	88	92
Harbour	131	138
Dunn Road	91	96
Galatea	81	85
Jolly Road	66	69
Mangapapa	0	0
Murupara	96	101
Minginui	40	42
Kawerau	111	117
Caxton Pulp	636	669
Caxton Paper	636	669
Onepu	263	276
Plateau	121	127
Mt Edgecumbe	11	12

Appendix G

Schedule of optimisation

Voltage	ODV Category	Feeder	Optimisation	Reduction in RC ($)	Reduction in DRC ($)
11kV	Overhead Light	Awaiti	Light - SWER	1,235	620
		AWAKERI	Light - SWER	344	180
		CITY SOUTH	Light - SWER	2,349	1,009
		FACTORY	Light - SWER	11,980	5,728
		GALATEA	Light - SWER	3,472	2,628
		HARBOUR	Light - SWER	6,942	3,678
		JOLLY ROAD	Light - SWER	22,069	14,366
		Manawahe	Light - SWER	24,644	14,475
		MINGINUI	Light - SWER	8,081	3,249
		PIRIPAI	Light - SWER	2,276	1,263
		PLATEAU	Light - SWER	9,103	3,931
		POHUTUKAWA	Light - SWER	460	233
		RUATOKI	Light - SWER	8,996	4,541
		TANEATUA	Light - SWER	12,320	4,956
		Te Kaha	Light - SWER	1,745	699
		Te Teko	Light - SWER	32,946	17,870
		THORNTON	Light - SWER	3,018	1,819
		Waihau Bay	Light - SWER	16,700	6,818
		WAIMANA	Light - SWER	13,550	6,617
	Overhead Medium	MINGINUI	Medium - SWER	751	302
		OPOTIKI	Medium - SWER	3,323	1,297
		Waihau Bay	Medium - SWER	1,675	685
	Underground Light	CITY SOUTH	Single - DCCT	1,777	1,135
		KAWERAU	Single - DCCT	47	31
		KING ST	Single - DCCT	258	157
		MURUPARA	Single - DCCT	234	174
		PLATEAU	Single - DCCT	191	56
		REX MORPETH	Single - DCCT	208	110
		STRAND NORTH	Single - DCCT	1,156	798
		STRAND SOUTH	Single - DCCT	700	428

Voltage	ODV Category	Feeder	Optimisation	Reduction in RC ($)	Reduction in DRC ($)
	Underground Medium	ANCHOR2	Single - DCCT	72	44
		HOSPITAL	Single - DCCT	957	283
		KAWERAU	Single - DCCT	1,496	235
		KING ST	Single - DCCT	804	531
		MT EDGECUMBE	Single - DCCT	1,086	887
		ONEPU	Single - DCCT	314	200
		OPOTIKI	Single - DCCT	957	64
		PLATEAU	Single - DCCT	4,737	2,074
		POHUTUKAWA	Single - DCCT	249	134
		REX MORPETH	Single - DCCT	3,703	2,634
		STRAND NORTH	Single - DCCT	2,815	1,960
		STRAND SOUTH	Single - DCCT	3,963	2,282
		VICTORIA	Single - DCCT	813	586
33kV	Overhead Heavy	TE RAHU CENTRAL	Heavy to Light	146,974	102,216
		TE RAHU NORTH	Heavy to Light	146,903	73,995
Total Lines and Cables				508,393	287,978

Feeder	ODV Category	ODV Item	Optimisation	Reduction in RC ($)	Reduction in DRC ($)
FACTORY	1104TRANS	3ph100EXTBUSH,45,7000	Optimisation of SWER Transformers	18,000.00	7,116.00
SNAKE HILL	1104TRANS	3ph100EXTBUSH,45,7000	Optimisation of SWER Transformers	9,000.00	2,697.00
Total Equipment				27,000.00	9,813.00

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Appendix H

Asset life extensions and reductions

Asset Class	Group	Service Life
ZONE SUBSTATIONS		
Transformers	33/11 kV Transformer	55
Transformers	33/11 kV Transformer	60
DISTRIBUTION - Transformers		
Single phase <=15 kVA	Distribution Transformer	55
Single phase 30 kVA	Distribution Transformer	55
Single phase 50 kVA	Distribution Transformer	55
Three phase Cable Entry 100 kVA	Distribution Transformer	55
Three phase Cable Entry 1000 kVA	Distribution Transformer	55
Three phase Cable Entry 1500 kVA	Distribution Transformer	55
Three phase Cable Entry 200 kVA	Distribution Transformer	55
Three phase Cable Entry 300 kVA	Distribution Transformer	55
Three phase Cable Entry 500 kVA	Distribution Transformer	55
Three phase Cable Entry 750 kVA	Distribution Transformer	55
Three phase External Bush 10 kVA	Distribution Transformer	55
Three phase External Bush 100 kVA	Distribution Transformer	55
Three phase External Bush 15 kVA	Distribution Transformer	55
Three phase External Bush 200 kVA	Distribution Transformer	55
Three phase External Bush 30 kVA	Distribution Transformer	55
Three phase External Bush 300 kVA	Distribution Transformer	55
Three phase External Bush 50 kVA	Distribution Transformer	55
DISTRIBUTION - Substations		
Ground Mounted (Covered)	Distribution Substation	55
Ground Mounted (Customer Premises)	Distribution Substation	55
Ground Mounted (Kiosk)	Distribution Substation	55
Pole Mounted <=75 kVA	Distribution Substation	55
Pole Mounted >=100 kVA	Distribution Substation	55

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Appendix I

2000 ODV Economic Value segmentation

Results of Segmentation Tests on Feeders

Feeder	ICPs	Kms	kVA	ICP/Km	kVA/ICP	Economic Value Test (y/n)
Awaiti	576	92	6,655	6.2	11.6	No
Awakeri	680	70	7,730	9.8	11.4	No
City South	1,318	24	7,135	55.7	5.4	No
Dunn	242	12	1,610	20.3	6.7	No
Factory	1,199	259	11,980	4.6	10.0	No
Galatea	222	58	4,590	3.9	20.7	No
Harbour	1,190	54	5,495	22.0	4.6	No
Hospital	1,126	48	7,040	23.4	6.3	No
Kawerau	1,325	12	7,555	106.1	5.7	No
King	835	4	3,100	186.4	3.7	No
Manawahe	707	145	7,045	4.9	10.0	No
Minginui	304	81	2,750	3.7	9.0	No
Murupara	860	36	4,435	24.0	5.2	No
Onepu	127	23	5,705	5.5	44.9	No
Opotiki	913	19	5,995	49.1	6.6	No
Piripai	870	83	6,835	10.5	7.9	No
Plateau	1,478	25	10,170	59.9	6.9	No
Pohutukawa	595	10	3,490	59.4	5.9	No
Rangitaiki	744	11	4,590	66.2	6.2	No
Rexmorpeth	846	5	4,800	156.4	5.7	No
Nuatoki	627	98	4,315	6.4	6.9	No
Strandn	1,013	6	5,700	171.1	5.6	No
Other	268	9	3,895	29.9	14.5	No
Taneatua	442	41	3,735	10.9	8.5	No
Te Kaha	375	33	2,095	11.4	5.6	No
Te Teko	792	93	8,125	8.5	10.3	No
Thornton	7	2	1,275	4.2	182.1	No
Victoria	1,009	7	3,800	142.7	3.8	No
Waihau Bay	538	75	3,585	7.1	6.7	No
Waimana	831	120	5,955	6.9	7.2	No
Pumps	30	5	1,875	6.4	62.5	No
Jolly	189	49	1,930	3.9	10.2	No
Strands	797	6	4,650	124.5	5.8	No

Results of Segmentation Tests on Spurs

Spur	ICPs	Kms	kVA	ICP/Km	kVA/ICP	Economic Value Test (y/n)
23Z10	8	5	115	1.6	14.4	Yes
29S3	17	5	90	3.4	5.3	No
31O19	65	7	430	9.3	6.6	No
Aniwhenua	25	8	435	3.1	17.4	No
Awaiti	20	6	265	3.5	13.3	No
Awakaponga	125	26	2,093	4.9	16.7	No
Bells	140	26	1,100	5.5	7.9	No
Braemar	39	9	415	4.3	10.6	No
Coast	501	100	4,445	5.0	8.9	No
Downards	22	5	230	4.7	10.5	No
Golf	70	15	1,193	4.6	17.0	No
Gorge	76	8	575	9.3	7.6	No
Greigs	31	7	275	4.7	8.9	No
Harbour	502	6	1,600	87.1	3.2	No
Hodges	45	4	375	10.5	8.3	No
Kaingaroa	215	11	2,945	20.4	13.7	No
Kopuriki	18	4	105	4.5	5.8	No
Manawahe	168	54	1,425	3.1	8.5	No
Maunders	49	7	580	6.8	11.8	No
McCarthy	29	4	188	6.5	6.5	No
McDonalds	98	9	680	10.7	6.9	No
Minginui	243	71	1,753	3.4	7.2	No
Ohiwa	182	19	1,148	9.7	6.3	No
Otamarakau	46	12	380	3.7	8.3	No
Owhakatoro	17	5	240	3.3	14.1	No
Pakahi	161	41	1,943	3.9	12.1	No
Pikowai	63	16	470	3.9	7.5	No
Raroa	49	9	375	5.2	7.7	No
Ruatoki	349	45	1,905	7.8	5.5	No
Ruatuna	32	4	188	7.2	5.9	No
Soldiers	45	8	760	5.5	16.9	No
Stanley	44	12	433	3.6	9.8	No
Sutherlands	22	5	230	4.7	10.5	No
TeTeko	19	4	185	4.3	9.7	No
ValleyRd	415	7	2,645	60.6	6.4	No
WaihauBay	501	77	3,518	6.5	7.0	No
Waioeka	151	52	1,465	2.9	9.7	Yes
Waiohau	79	12	473	6.6	6.0	No
Waiotahi	77	25	733	3.04	9.5	No
Woodlands	75	11	515	7.1	6.9	No

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Appendix J

Results of 2000 ODV Economic Value testing

Feeder	23Z10 Spur	Waioeka Spur
$		
Profit maximixing revenue	24,594	557,045
Transmission charges	1,108	25,097
Network maintenance costs	825	10,856
Network operating costs	538	10,161
Corporate and administration costs	473	8,931
Other expenses	323	6,104
Depreciation - system (@ ODRC)	2,232	29,368
Depreciation - other fixed assets	284	3,736
Taxation	6,409	155,367
NOPAT	12,402	307,425
Notional Net Asset Value	70,471	929,229
Required NOPAT (@ WACC)	4,881	64,359
Profit maximising unit sales price (c/kWh)	30.0	30.0
Required unit sales price (c/kWh)	15.9	10.2
Economic writedown required (y/n)	No	No
ODV equals (ODRC/EV)	ODRC	ODRC
ODRC	67,597	889,572
EV	-	-

PRICEWATERHOUSECOOPERS

Appendix K

Maunsell confirmation

PRICEWATERHOUSECOOPERS

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conrad.holland@maunsell.com
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maunsell

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Fax +64 9 379 1201
auckland@maunsell.com

18 November 2004

Mrs Lynne Taylor
Director
PricewaterhouseCoopers
Private Bag 92 162
AUCKLAND

Dear Lynne

Horizon Energy Distribution Ltd - Network ODV Valuation Year Ending 31 March 2004

We confirm that, on receipt of instructions of 12 February 2004, and following the FRS3 valuation earlier this year we undertook the following in connection with the Optimised Deprival Valuation of Horizon Energy Distribution Ltd (HEDL) network system fixed assets:

- advice on asset quantities and aging (where appropriate)
- advice on asset categorisation
- review and sign-off on replacement costs, including multipliers
- review and sign-off on asset lives
- review and sign-off on optimisation
- contribute to the final report on the above matters
- attend planning and progress meetings (as appropriate).

The engineering aspects of the valuation (dated 31 March 2004) have been undertaken in accordance with:

1. Commerce Commission document - Regulation of Electricity Lines Businesses. A Companion Report to the Handbook for Optimised Deprival Valuation of System Fixed Assets of Electricity Lines Businesses, dated 31 August 2004 and

2. Commerce Commission - Handbook for Optimised Deprival Valuation of System Fixed Assets of Electricity Lines Businesses, dated 30 August 2004.

Visit to Site

No further visits to site were undertaken following on from the earlier visits for FRS3 purposes.

Asset Quantities and Aging

The continuation of a maintenance and inspection program for distribution transformers in the company justifies the retention of the 60-year standard life for zone substations and 55 years for distribution transformers, with a residual life of 3 years.

The standard age of distribution substations was aligned with the transformers to be 55 years where appropriate. A similar alignment was applied for zone substation assets.

Replacement Costs

We reviewed with HEDL the replacement costs used for assets. Amendments were proposed in certain cases in accordance with the Commerce Commission's ODV Handbook.

We reviewed the replacement cost multipliers applied by HEDL in terms of their appropriateness to the network and their geographical location. We also took into account the replacement cost multipliers used in previous valuations. An additional margin for traffic management was approved, and has been applied to poles erected along major roads. However in the absence of detailed information, an assessment was made for the purposes of application, based on samples in urban and rural areas within the HEDL territory. A remote multiplier for equipment as well as lines was applied, to conform to current Commerce Commission recommendations. The multipliers proposed were accepted as reasonable.

Optimisation

We reviewed areas where optimisation of network capacity or configuration would be appropriate. For this purpose, we used the guidelines and companion report published by the Commerce Commission. We reviewed the methodology used by HEDL for optimisation purposes and considered it reasonable. We reviewed stranded assets and recommended optimisation of those assets not currently in service. Similarly the spares held by HEDL were optimised to include a reasonable quantity of items that would be "useful".

We checked the information supplied and were satisfied that the adjustments made and the final figures arrived at were in accordance with our opinion and appropriate in the context of the Commerce Commission's ODV Handbook.

On the foregoing basis, we confirm that the assessment complies with the engineering requirements to provide an Optimised Deprival Valuation of the Horizon Electricity Distribution Ltd assets as required by the Commerce Commission.

Valuer

Our opinion has been formulated by Mr Brett Wakefield and reviewed by the writer. Both Mr Wakefield and the writer are professionally qualified and experienced in the type of work concerned.

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Disclaimer

This opinion is intended to be used only for regulatory reporting purposes. We disclaim responsibility to any party other than PricewaterhouseCoopers and Horizon Energy Distribution Ltd and for any loss or damage whatsoever suffered as a result of acting in accordance with any information contained in this letter.

Non-Publication

Neither the whole nor any part of this letter may be included in any published document, circular or statement or published in any way without our prior written approval of the form and context in which it may appear.

Yours sincerely

C. W. Holland

Conrad Holland
BE MIPENZ CPEng

encl: Table A ODV Asset Summary
cc: Peter Dwyer, HEDL