

Cross Submission to Commerce Commission
Regulation of Electricity Line Businesses
Draft Handbook for Optimised Deprival Valuation of System
Fixed Assets



30 April 2004

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Dear Sir

Regulation of Electricity Lines Businesses, Cross Submission on the Draft ODV Handbook

On April 15, we presented our submission to the Commerce Commission's ("the Commission") conference on the Draft Optimised Deprival Value Handbook. This submission was prepared by PricewaterhouseCoopers on behalf of the following 19 large Electricity Lines Businesses ("ELBs"):

- Alpine Energy Limited
- Counties Power Limited
- Eastland Network Limited
- Electra Limited
- Electricity Ashburton Limited
- Electricity Invercargill Limited
- Horizon Energy Distribution Limited
- MainPower New Zealand Limited
- Marlborough Lines Limited
- Nelson Electricity Limited
- Network Tasman Limited
- Network Waitaki Limited
- Northpower Limited

Paolo Ryan

30 April 2004

- OtagoNet Joint Venture
- Scanpower Limited
- The Lines Company Limited
- The Power Company Limited
- Top Energy Limited
- Waipa Networks Limited.

During the conference presentation we undertook to provide the Commission with further evidence to support our submission. In addition we would like to take this opportunity to present our views on some of the issues raised by other submitters in their written submissions and at the conference.

Determining Replacement Costs

1. As discussed at the conference we have undertaken a significant amount of work to derive replacement costs for standard items that we believe should be included in the ODV Handbook. These were included in our submission on the draft ODV Handbook dated 9 February 2004. In addition we also support the use of replacement cost multipliers to enable location specific circumstances to be reflected in the valuation. We do however recognise that there may be additional specific circumstances that some ELBs may face which result in costs which fall outside of those that will be and should be included in the ODV Handbook. In these instances, the valuation should reflect the additional costs associated with special circumstances, supported by evidence supplied by the ELB, which is subject to external review.
2. The costs and multipliers included in our submission of 9 February 2004 reflect efficient costs based on large scale projects. They reflect the best estimate we have available to us of efficient costs that a hypothetical new entrant would face. We are therefore concerned that in compiling the draft ODV Handbook, the Commission has adopted costs which are, for the majority of asset categories, lower than those submitted by ourselves. Given our submission reflects the evidence supplied to us across 19 ELBs, and has been subject to independent review and verification by David Edwards of Maunsell Limited (who presented to you at the conference and has extensive experience in the valuation of distribution networks and importantly

Paolo Ryan
30 April 2004

- appreciates the regulatory context for the valuation). Accordingly we urge the Commission to reconsider the values included in the draft ODV Handbook.
3. During the conference we undertook to provide you with further explanation about how we derived the standard costs included in our submission. In this respect we circulated a questionnaire to each ELB participating in the group submission, a copy of this is attached as Appendix 1. The questionnaire comprised a set of “Guidelines for the Composition of Standard Costs” and a series of schedules for completion by each ELB. The guidelines set out the requirements of the costs being sought, in particular it was stated that costs should be installed costs for a significant scale of construction. We requested that the costs provided were separated into survey/design, materials and site work (including labour). The categories of assets for which costs were sought were similar to the MED Handbook, although we did take the opportunity to test whether there was sufficient evidence and support for extending the range of assets in the ODV Handbook to include, in particular, 22kV and 66kV voltage levels.
 4. Not all of the submission group were able to provide cost information. More than half of the total submitters participated in the composition of the table although not all had relevant costs available across all categories of assets. It was possible however to extrapolate across assets within a category in a robust manner and therefore we were able to derive costs for all assets covered in the ODV Handbook. Based on the raw information provided to us, we compared the values, and their various components and sought additional information and explanation from each ELB to enable us to understand any variances in costs. This included a review of the conditions that applied to projects, the source of the costs and the availability of resources at the time. The impacts of special circumstances were removed from the costs, and included in our assessment of replacement cost multipliers. Once we understood the variances, we eliminated those that were not appropriate (for example because the project was too small, or because key components had been omitted from the costs). Where possible, and in consultation with the ELB concerned, we also amended cost estimates that were incomplete or incorrect, and finally we compiled a draft table of costs. The draft table of costs reflects, based on our judgement and knowledge of the projects used to provide the evidence, an efficient average cost that did not incorporate multipliers or either maximum or minimum costs or prices.
 5. The draft table was circulated to all ELBs in the submission group for comment. ELBs made comments on particular asset categories where they were concerned

Paolo Ryan
30 April 2004

that the values were not truly representative of their actual costs. After minor modifications, the draft table was once again circulated to the submission group for review and sign off. Appendix 2 contains the table of replacement costs included in our submission of 9 February 2004. For the purposes of this cross submission we have included in the table the range of responses we received when compiling the table to provide an indication of how we selected the submitted values. Where appropriate we have included in the footnotes to the table further explanation about how individual costs were derived.

6. In respect of replacement cost multipliers, the ELBs provided comments on the MED Handbook multipliers. Some ELBs requested new categories of multipliers and each was examined on its merits, in particular whether the condition justified additional cost, and how widespread the conditions were across the submission group. Several of the suggested new conditions were found to be rare. Where this was the case and they were material to an individual ELB, it was concluded that they would be more appropriately treated as non-standard asset values. Such conditions included, for example, tidal; swampy ground; snow and ice loadings; transportation across water; and distribution substation earthing in difficult conditions.
7. There was however a universal concern for the cost of traffic management requirements imposed by road authorities to be covered. As a result a separate questionnaire was sent to a number of ELBs located across the country. Based on the information provided, the traffic management multiplier range included in the submission was derived, and agreed with the submission group. It is recognised that there will be some instances where traffic management costs exceed those included in the submission as a result of the special circumstances in some locations. These are likely to reflect the installation of underground cables in areas subject to extreme congestion, narrow streets, heavy traffic counts, special reinstatement needs and limited access. It is our view that these costs should be included as non standard assets, supported by sufficient evidence to justify the departure from the standard traffic multiplier range.

Paolo Ryan
30 April 2004

The Application of Standard Replacement Costs

8. It is our submission that standard replacement costs are a useful approach for deriving ODV (or Optimised Depreciated Replacement Cost (“ODRC”)) for opening values for the thresholds and control regime, for post breach inquiries and investigations and for the existing information disclosure requirements, although it is noted that the disclosure requirements will be subject to a major review in 2004. This review may alter the purpose of the valuations of system fixed assets in this context. We do however stress the point made above, that standard values will not be appropriate for all assets in all locations, and, in addition to the provisions of the allowed replacement cost multipliers, there needs to be allowance for special costs to reflect special circumstances for any valuation prepared for regulatory purposes.
9. For this reason we support the view that an ELB should be able to include assets valued at special costs, if it can prove that these costs reflect efficient costs relevant to its own network. We support the principle that the onus of proof should lie with the ELB. In order to ensure the onus of proof requirement is reasonable however, it will be necessary for the Commission to be able to provide some specification or detail behind the ODV Handbook standard costs and to commit to reviewing and updating the standard values regularly. It will be virtually impossible for an ELB to provide sufficient justification for its alternative costs if it is unable to understand the “standards” applied in deriving the ODV Handbook costs.
10. In order to provide sufficient rigor in the process of deriving and reviewing special costs, we recommend that the following principles be applied:

The ELB must document and provide evidence to support the adoption of alternative costs including:

- i) a description of and evidence to support the special circumstances pertaining to the relevant asset including the location of the asset or assets;
- ii) the replacement cost for the relevant asset or assets compiled in accordance with clause A.3; and
- iii) evidence to verify that the replacement cost for the relevant asset or assets reflects efficient costs, including evidence that the cost reflects competitive pricing and large scale construction and any

Paolo Ryan
30 April 2004

other evidence required to reasonably determine that the costs reflect efficient costs.

In addition, clauses A.1 and A.2 must be amended to incorporate this approach.

Valuing Easements

11. The underlying objective of the ODV Handbook is to achieve a valuation of system fixed assets which reflects the cost the business would incur if it were deprived of the use of its assets. Whilst this may imply that all easements regardless of their status should be valued under the ODV methodology, Appendix A of the draft ODV Handbook, applies a modified approach for easements. The relevant clauses in the draft ODV Handbook are similar to those in the MED's Handbook in respect of easements, that is the ODV Handbook deems:
 - pre 1 January 1993 easements as having nil value; and
 - post 31 December 1992 easements to be valued at historical purchase cost, provided that sum has not already been expensed.
12. After considering other submissions and the discussions at the conference on the valuation of easements, we consider that it is appropriate that all assets included in the ODV valuation be valued on the same basis, that is using a replacement cost approach. The difficulty in achieving this for easements in a robust manner is however acknowledged. The solution in other jurisdictions has been to apply an indexed historical cost valuation to easements (for example Australian electricity distribution and transmission). Unlike other jurisdictions however, there is a lack of historical information on easement costs in New Zealand. This may be due, in addition to poor records, to either no payments or payments in-kind being made for access to private land for the purposes of constructing electrical networks. These reasons however do not imply that easements have no value, or that a hypothetical new entrant would be able to avoid easement costs.
13. In acquiring easements, ELBs are faced with two types of costs, transaction costs and potential compensation for the land owner. In respect of transaction costs, it is possible to derive robust standard costs that reflect the survey, consent and registration requirements for those acquiring easements. These are common tasks provided by many service providers and market prices are readily established for these services. We recommend that a transaction cost for all easements held be included in ODV valuations based on current costs incurred by ELBs, irrespective

Paolo Ryan
30 April 2004

of whether historical transaction costs were incurred, or expensed. The accounting treatment of expenditure is not relevant when considering a valuation undertaken at a point in time which is intended to reflect the deprival value of the asset at that time. This is consistent with the valuation approach adopted for the remainder of the system fixed assets.

14. The valuation of the compensation that may be paid to landowners is more problematic. For compensation actually paid, we submit that an indexed historical cost approach is valid. For easements where compensation has not been paid, the principle of the land use detriment is also valid although we do not believe this should be applied to all easements. Anecdotal evidence suggests that many landowners have not traditionally sought compensation from an ELB when the ELB has constructed new lines. Where compensation has been sought, ELBs attempt to find the least cost solution which may involve rerouting a distribution line where possible, to minimise the length of line required to cross private land. Even if the line route is longer, the avoided compensation costs and ongoing access issues may make the alternative route the least cost solution. Thus for distribution lines, unless compensation has been paid, we submit that no compensation value should be included in the valuation. Where compensation has been paid we submit that an indexed historical cost approach is valid.
15. For sub transmission lines however, it is unlikely that land owner compensation can be avoided. The nature of the sub transmission “backbone” of an existing network is that its location is difficult to change because of the embedded nature of these assets. As the assets are larger and of less potential direct use to affected land owners, that is they are not constructed primarily for the purpose of local power supply, compensation is more likely to be sought. It is in this instance that the concept of land use detriment is useful and it is submitted that, if ELBs are able to obtain estimates of the land use detriment for sub transmission routes from qualified valuers and if these are able to be verified against values where compensation has actually been paid for other routes, then these should be able to be included in the ODV valuation.

Paolo Ryan
30 April 2004

Planning Periods

16. There was much debate at the conference concerning the appropriate planning periods for inclusion in the ODV Handbook in order to determine whether excess capacity exists in a network and whether it should be optimised out of the regulatory valuation. In this respect we would like to restate our key concerns:
- the draft Handbook is ambiguous in its specification of the allowed planning period for 33kV lines and cables. These should be included with the other sub transmission voltages;
 - the planning periods assigned to zone substations should be the same as the sub transmission system. Together they form the backbone of the network, and their planning and design is highly interconnected;
 - a planning period of 25 years should be allowed for subtransmission assets, including zone substations;
 - a planning period of 10 years should be allowed for distribution lines and cables; and
 - a planning period of 5 years should be allowed for distribution transformers as new transformers are expected to remain on site for at least five years.

Total Customer Solution

17. Counties Power raised an issue at the conference which we concur with. The draft Handbook has not resolved the anomaly that existed in the MED Handbook in respect of ensuring that the least cost solution across the transmission and distribution boundary is recognised in the valuation process. Currently the optimisation requirements treat distribution assets in isolation from transmission assets. Thus, where additional investment is made by a distributor to avoid transmission charges, and where this results in a lower cost of supply, the distributor may be penalised in the valuation process by being required to optimise out part of this investment, particularly in the short term. It is our recommendation, that optimisation of subtransmission assets should only be undertaken if it fails to satisfy the least cost solution test for consumers, once transmission costs are considered.

Paolo Ryan
30 April 2004

Economic Value Test

18. In the December 2002 Draft Decisions for the Targeted Control Regime the Commission determined that opening valuations, for the regulatory period commencing 1 April 2003, were to be prepared using the ODV methodology. The date was subsequently changed to 1 April 2004. Ongoing values were to be calculated using either ODV or Depreciated Historical Cost (“DHC”). Prior to this decision, the Commission consulted with interested parties on the relative merits of the replacement cost alternatives and the historical cost alternatives. In making the decision to require ODV for opening values, the December 2002 Draft Decision indicated that ODV had been selected because:
- ODVs had been recently audited by the Commission;
 - ODV in the excess profits measure, which was being considered at the time, was consistent with the Regulations which had applied since 1995;
 - reconstructing DHC values would be costly and may result in arbitrary and inaccurate values;
 - measuring profits based on vesting values would be problematic and would require specific analysis, contrary to the targeted nature of the regime;
 - the new regime was to focus on incentives for future conduct, rather than historical outcomes; and overall,
 - selecting ODV provided a smooth transition from one regime to the other.
19. What the paper did not indicate however was that given the replacement cost option was preferred, why it was ODV and not ODRC or even DRC that was selected as the preferred option. It is possible that ODRC could meet all of the criteria used by the Commission when ODV was selected as the preferred outcome. As the thresholds and control regime has considerably evolved since the December 2002 draft decision, and also as the regime is now notably different to the light handed information disclosure regime, for which ODV was first developed, it seems timely to reconsider whether ODV is the appropriate method for the targeted control regime, or whether ODRC is more appropriate.
20. The contents of the draft Handbook suggest that justification for the full deprival method is not clear. The draft ODV Handbook itself does not incorporate a full deprival value methodology, particularly with the omission of an Economic Value (“EV”) method or approach. The EV clauses in the draft Handbook indicate that a full deprival value method is not required for the fixed asset valuation. If this is the case, an ODRC valuation approach may be an acceptable alternative.

Paolo Ryan

30 April 2004

21. The EV component of the ODV methodology has applied to date under the light handed information disclosure regime, where ODV values were required to calculate three measures for comparative monitoring of the financial performance of lines businesses. The EV component of the valuation methodology was effectively an impairment test, testing whether or not sufficient cash flows could be generated to provide a commercially appropriate rate of return on assets valued at ODRC. The test was undertaken on distinct segments of the network. Where cash flows for a segment were deemed to be constrained below a level necessary to provide target returns, the EV, and therefore ODV was less than its ODRC.
22. The revenue constraints which led to EV write downs resulted from the ability of consumers to take supply from alternative means at prices less than those required to support the ODRC asset value. Potential cheaper supply options included:
 - supply from an alternative network or the transmission grid,
 - supply from local generation, or
 - supply from other fuels.

What the revenue constraints did not reflect was regulatory constraints on prices or revenues, that is, the regulatory regime was sufficiently light handed in respect of prices that it was not possible to quantify any potential revenue constraints which may have resulted in EV write downs. In this context however, it is important to note that the EV component of ODV valuations reflected prices that theoretically could be charged by a line owner, specified as a profit maximising price, or to put it another way, the maximum price that could be charged before consumers switched away to alternative supplies. These were explicitly not required to reflect actual prices or planned prices. Thus the EV component of the ODV did not reflect current prices charged by a line owner, nor did it reflect regulatory constraints on prices.

23. With the introduction of the threshold and control regime, the purpose of the EV component of ODV is less clear, and it may in fact differ for the various uses for fixed asset valuations. In any event, the appropriate prices to be used to test whether network segments are revenue constrained, may be different. For example, the price path threshold has effectively fixed existing prices for each ELB at the start of the regime and, unless the threshold is breached, ELBs must maintain average prices at existing levels subject to permitted annual CPI-X movements and the pass through of allowed costs. If the price path threshold is breached, then the ELB is subject to investigation which may or may not result in price control. This raises the following questions:

Paolo Ryan
30 April 2004

- if EV testing is valid, should it be undertaken with revenues constrained to the “non-breach” threshold price levels (potentially resulting in significant EV write downs for those ELBs currently earning less than their Weighted Average Cost of Capital (“WACC”) for example;
 - should EV be undertaken with revenues constrained to prices resulting from the investigation and control process, and if so by what process; and
 - in any event is the valuation process the appropriate place in the regime to be making these assumptions.
24. As a result of the targeted control regime, the New Zealand ELBs have moved a lot closer to where New South Wales and Victoria are in respect of asset valuations for example. That is the inherent circularity in regulated asset valuations is emerging, where regulated revenues influence asset values, which in turn influence regulated revenues. The solution in New South Wales and Victoria has been to value at Depreciated Optimised Replacement Cost (“DORC”)¹ – equivalent to ODRC, not ODV.
25. It is therefore our submission, that the most appropriate solution, particularly given the draft Handbook’s omission of an EV test approach, is to require ELBs to prepare ODRC valuations, and any revenue constraint on valuations to be dealt with at the investigation and control phase of the regulatory process.

Principle versus Prescription

26. One of the key changes in the draft ODV Handbook when compared to the MED Handbook, is the attempt to include additional prescription into the ODRC component of the valuation methodology. In is our submission that this is a highly risky approach which, as illustrated in the draft ODV Handbook, tends to result in anomalies and errors. The resulting methodology makes the practical application of the ODV Handbook overly onerous, and in some instances nonsensical. In this respect we urge the Commission to seriously reconsider its approach to the ODV Handbook and focus on providing clear valuation principles and guidance rather than too much narrow and specific prescription.

¹ Specifically, DORC was used to establish opening values, and the depreciated historical cost approach has been used for assets commissioned in subsequent years.

Paolo Ryan
30 April 2004

Summary

27. In summary, we submit the following:

- The costs and multipliers included in our submission of 9 February 2004 reflect efficient costs based on large scale projects. They reflect the best estimate we have available to us of efficient costs that a hypothetical new entrant would face. We have provided further explanation in this cross submission to support these costs. We urge the Commission to reconsider the values included in the draft ODV Handbook in light of this evidence.
- Standard replacement costs are a useful approach for deriving ODV (or ODRC) values for all regulatory requirements. Standard values however will not be appropriate for all assets in all locations, and there needs to be allowance for special costs to reflect special circumstances for any valuation prepared for regulatory purposes. An ELB should be able to provide evidence to support departures from the standards where special circumstances apply. In order to ensure the onus of proof requirement on ELBs is reasonable however, it will be necessary for the Commission to provide some specification or detail behind the ODV Handbook standard costs and to commit to reviewing and updating the standard values regularly.
- Easements should be valued using a replacement cost approach to ensure consistency with other assets. Easement values comprise transaction costs (which are able to be valued at market prices) and compensation. Actual compensation paid, irrespective of the accounting treatment of that expenditure, should be included at an indexed historical cost value. For easements where no record of compensation payments exist, no value should be included for distribution (less than 33kV) lines or cables, but if defensible values are provided by a qualified valuer, compensation costs should be included for easements for sub transmission assets.
- The specifications of planning periods for optimisation require amending to clarify the treatment for 33kV assets, to align zone substation and subtransmission planning periods and to extend the periods permitted.
- Optimisation on assets at the boundary between transmission and distribution should only be made if they fail the 'least cost solution to the consumer' test, after consideration of transmission costs.

Paolo Ryan
30 April 2004

- ODRC values should be prepared for regulatory purposes to avoid the inherent circularity in attempting a revenue test as part of the valuation process. Any revenue constraint on valuations should be dealt with at the investigation and control phase of the regulatory process.
- And finally, we urge the Commission to seriously reconsider its approach to the ODV Handbook and focus on providing clear valuation principles and guidance rather than too much narrow and specific prescription.

We thank you for the opportunity to present this cross submission and we would be happy to discuss these points further if required.

Yours sincerely



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COMPILATION OF SUBMISSION ON ODV HANDBOOK

GUIDELINES FOR THE COMPOSITION OF STANDARD COST EVIDENCE

It is some years since the standard replacement costs in Table B.1 of the ODV Handbook have been reviewed.

The attached schedule indicates components included in Table B.1 with some minor changes to the Asset Description so a wider field of assets are incorporated based on the data accumulated during the process of valuation composition. Assets not listed on these schedules, it is suggested, could remain as the “non-standard” assets as per clause B.5 of the MED Handbook.

All values from recent tenders/estimates should be based on installed costs (excluding GST) for modern equivalent assets (MEA). The Replacement Cost should still represent a significant scale of construction and **not** be based on piecemeal additions (clauses B.6 of the MED Handbook). The notes given on page 51 of the MED Handbook also apply to costs.

The cost of standard configuration drawings and specifications should not be included unless there is a deviation from the normal arrangement.

The composition of the costs should be appropriate to the content as described in the categories below and ready for service. The contractors margin where applicable should be included.

Lines-Cables

The costs for overhead lines should relate to typical rural side-of-road overhead lines as multipliers would be recommended to be applied for specific conditions. Those companies that have significant cross country overhead lines should advise the influence and balance the reduction in cost of longer spans and increase in cost of additional surveying etc. in comparison with the typical rural side-of-road line costs.

Jointing costs for cables should not include the termination joint at equipment. Pole termination costs can be included at overhead line junctions. Independent lightning arrestors i.e. at cable/overhead line junctions are listed in equipment costs.

Lines

Survey

Survey of line route, design, drawings, specifications, Local Body approval.

Materials

Concrete/wood pole, crossarms, fittings, connectors, conductor.

Site work

Transport, site preparation, erection, stringing, traffic, commissioning, site dismantlement.

Cables

Survey

Survey of cable route, design, drawings, specifications, Local Body approval.

Materials

Cable size & type, ducts, backfill, protection, joints.

Site work

Transport, plant, trenching, laying, jointing, commissioning, site clearance.

Multipliers

It is not expected that these would be modified as a result of the review of base costs. Nevertheless any comments that are particularly relevant to special conditions that may have changed will be considered.

Equipment Costs

The columns for Equipment Costs should be completed with estimated costs from recent tenders/estimates for MEA assets. The Replacement Cost should represent a significant scale of construction and not based on piecemeal additions (clauses B.6 of the MED Handbook).

Worksheets for Switchgear and Zone s/s have a column "Item" which is the basic cost of the asset.

The composition of the costs should be appropriate to the purchase, installation and commissioning of the equipment for service at the designated operating voltage.

Switchgear

The Design column allows for fuse selection, relay settings etc.. The Automation column allows for equipment necessary for the major item operation by protective relay or operation by remote control by SCADA. The other columns are self-evident. For ground mounted assets cable terminations should be included.

Distribution Transformers

The Materials column should include only the transformer and the Installation covers the lifting of the unit into place. The construction of the structure is covered by the Distribution Substation category. Fuses and switchgear is covered by the Switchgear category.

Distribution Substation

The Design column allows for Local Body/land-owner approval and preparation of documentation for this process. The materials should include all components for installing the equipment at the substation.

Zone Substations

Typical sizes of transformers are listed and other sizes used should be listed. Units of higher voltage and larger are not listed as they incorporate characteristics that are particular to sites and utilisation. The first three columns should indicate if the facilities are included but a separate value is not necessary. It is assumed that the units would have gas protection, pressure relief device and winding/oil temperature monitor and alarm. Other protection is valued separately. The “Design” column is intended to make provision for the more complex specification, tender and contract process.

Switchgear (circuit breakers)

As an MEA would be SF₆ or vacuum. Associated structures, busbars and isolators are not to be included. However connection jumpers, for outdoor units, should be included in the “materials” column. Protection CTs, VTs and relays should be incorporated in the non-standard asset valuation. A similar approach should be made for indoor switchgear which would include the cable termination.

Ripple injection

Equipment should include values in the costs columns. The plant would cover the signal generator, isolating transformer and coupling cell. The Control/programmer covers the signal selection, initiation and duration process. As there are several methods of connection to the network this should be shown separately.

Standard Life

It is considered that the standard life for buildings should be extended in view of the life given to concrete poles. However there are some zone s/s buildings that are framed or pre-fabricated in materials not as substantial. Thus it would be realistic to separate “Site development” and “Buildings” for zone substations. The former would include not only the land works but also compound trenches, fences and gates.

Life extensions are applicable to certain asset categories and these should continue. However no other standard life changes are envisaged.

Lines & Cable Costs

Asset Description	Replacement Cost (\$000)			
	Survey	Materials	Site Works	Total
Subtransmission				
66kV Lines - Heavy (>150mm ² <300mm ² Al) concrete				
wood				
66kV Lines - Light (<150mm ² Al) concrete				
wood				
33kV Lines - Heavy (>150mm ² <300mm ² Al) concrete				
wood				
33kV Lines - Light (<150mm ² Al) concrete				
wood				
66kV Cables - (≤240mm ² Al)				
66kV Cables - Double circuit (≤240mm ² Al)				
33kV cables - (≤240mm ² Al)				
33kV Cables -Double circuit(≤240mm ² Al)				
Distribution				
MV Lines				
22kV O/H Heavy (>150mm ² <240mm ² Al) concrete				
wood				
22kV O/H Medium (.50mm ² <150mm ² Al) concrete				
wood				
22kV O/H Light(<.50mm ² Al) concrete				
wood				
22kV O/H Light(<.50mm ² Al) single ph concrete				
wood				
22kV O/H SWER concrete				
wood				
11kV O/H Heavy (>150mm ² <240mm ² Al) concrete				
wood				
11kV O/H Medium (.50mm ² <150mm ² Al) concrete				
wood				
11kV O/H Light(<.50mm ² Al) concrete				
wood				
11kV O/H Light(<.50mm ² Al) single ph concrete				
wood				
11kV O/H SWER concrete				
wood				
22kV O/H Heavy DCct concrete				
wood				
22kV O/H Medium DCct concrete				
wood				
22kV O/H Light DCct concrete				
wood				
11kV O/H Heavy DCct concrete				
wood				
11kV O/H Medium DCct concrete				
wood				
11kV O/H Light DCct concrete				
wood				
22kV O/H Underbuilt Heavy concrete				
wood				
22kV O/H Underbuilt Medium concrete				
wood				
22kV O/H Underbuilt Light concrete				
wood				
22kV O/H Underbuilt SWER concrete				
11kV O/H Underbuilt Heavy concrete				
wood				
11kV O/H underbuilt Medium concrete				
wood				
11kV O/H Underbuilt Light concrete				
wood				
11kV O/H Underbuilt SWER concrete				
wood				

Equipment Costs

Asset Description	Replacement Cost (\$000)						
	Item	Design	Materials	Automation	Earthing	Installation	Total
Subtransmission							
Air break switch 66kV 3ph							
Air break switch 33kV 3ph							
Links/Isolator 66kV 3ph							
Links/Isolator 33kV 3ph							
Outdoor circuit breaker 66kV							
Outdoor circuit breaker 33kV							
Independent Lightning arrestors 66kV 3ph							
Independent Lightning arrestors 33kV 3ph							
Distribution Switchgear (Excl. Pole)							
Disconnecter/links 22kV 3ph							
Disconnecter/links 11kV 3ph							
Disconnecter/links 22kV 2ph							
Disconnecter/links 11kV 2ph							
Load Break Switch 22kV 3ph Auto/remote							
Load Break Switch 11kV 3ph Auto/remote							
Load Break Switch 22kV 3ph							
Load Break Switch 11kV 3ph							
Dropout Fuse 22kV 3ph							
Dropout Fuse 11kV 3ph							
Dropout Fuse 22kV 2ph							
Dropout Fuse 11kV 2ph							
Sectionaliser 22kV 3ph							
Sectionaliser 11kV 3ph							
Recloser breaker 22kV Auto/remote							
Recloser breaker 11kV Auto/remote							
Recloser breaker 22kV							
Recloser breaker 11kV							
Independent Lightning arrestors 22kV 3ph							
Independent Lightning arrestors 11kV 3ph							
Indoor circuit breaker 22kV							
Indoor circuit breaker 11kV							
Ring main unit - 3 way metalclad oil filled							
Extra oil switch metalclad oil filled							
Extra fuse switch metalclad oil filled							
Ring main unit - 3 way mouldedepoxyresin base							
Extra isolator- moulded epoxyresin base							
Extra fuse unit- moulded epoxoyresin base							

Equipment Costs

Asset Description	Replacement Cost (\$000)		
	Materials	Installation	Total
Distribution Transformers (kVA)			
Single/Two Phase Units			
22kV/LV			
10			
15			
30			
50			
11kV/LV			
10			
15			
30			
50			
Three Phase Units (Pole Mounted - Bushing Terminations)			
22kv/LV			
15			
30			
50			
100			
200			
300			
500			
11kV/LV			
15			
30			
50			
100			
200			
300			
500			
Three Phase Units (Cable entry, one or both voltages)			
22kV/LV			
100			
200			
300			
500			
750			
1,000			
1,250			
1,500			
11kV/LV			
100			
200			
300			
500			
750			
1,000			
1,250			
1,500			
SWER Isolating Transformers			
22kV			
50			
100			
200			
11kV			
50			
100			
200			

Equipment Costs

Asset Description	Replacement Cost (\$000)				
	Design	Materials	Earthing	Installation	Total
Distribution Substation					
22kV/LV					
Pole Mounted 50 kVA or less					
Pole mounted 100 kVA or greater					
Ground mounted (covered)					
Ground mounted (masonry/block)					
On Customer's Premises with Feedout					
11kV/LV					
Pole Mounted 50 kVA or less					
Pole mounted 100 kVA or greater					
Ground mounted (covered)					
Ground mounted (masonry/block)					
On Customer's Premises with Feedout					

BASIS OF DERIVATION OF STANDARD REPLACEMENT COSTS

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	PwC Submission	Draft Handbook
Subtransmission				
33kV Lines – Heavy ($\geq 150\text{mm}^1 \leq 300\text{mm}^1$ A1)	km	51 – 69	64	56
33kV Lines – Light ($< 150\text{mm}^1$ A1)	km	42 – 65	48	40
33kV Lines – Double Cct Heavy	km	–	96 ²	90
33kV Lines – Double Cct Light	km	–	72 ²	70
33kV Cables - ($\leq 240\text{mm}^1$ A1)	km	164 – 187	176	175
33kV Cables - Double Cct ($\leq 240\text{mm}^1$ AL)	km	–	283 ¹	280
Pilot/Communications Ccts O/H	km		***	***
Pilot/Communications Ccts U/G	km		***	***
33kV Load Break Switch	No.	–	12 ³	n/a
33kV Air Break Switch	No.	8 – 9	9	9
33kV Links/Isolator	No.	4.5	4.5	n/a
33kV Outdoor circuit breaker	No.	19 – 39	39 ⁴	35
33kV Independent surge arrestors 3ph	Set	8	8	8

¹ Assessed/incremental cost based on single circuit.

² Incremental cost derived from single circuit values.

³ Additional cost for contact assembly \$3k above standard switch.

⁴ Stand-alone unit includes siteworks & ancillaries (23-30% of total), which were excluded from lower estimates.

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
Distribution				
MV Lines				
22kV O/H Heavy ($\geq 150\text{mm}^1 \leq 240\text{mm}^1$ A1)	km	42	34 ⁵	32
22kV O/H Medium ($> 50\text{mm}^1 < 150\text{mm}^1$ A1)	km	35	31	29
22kV O/H Light ($\leq 50\text{mm}^1$ A1)	km	24 – 32	29	27
22kV Single Phase (2 wire)	km		26 ⁶	23
22kV SWER	km	20.6	22 ⁷	23
		–		
11kV O/H Heavy ($\geq 150\text{mm}^1 \leq 240\text{mm}^1$ A1)	km	26.3 – 40	32	30
11kV O/H Medium ($> 50\text{mm}^1 < 150\text{mm}^1$ A1)	km	27.2 – 33	29	27
11kV O/H Light ($\leq 50\text{mm}^1$ A1)	km	22 – 38.7	27	25
11kV Single Phase (2 wire)	km	20 – 23.6	24 ⁶	21
11kV SWER	km	19 – 29	21 ⁷	21
MV Lines				
22kV O/H DCct Heavy	km	36	52 ⁸	50
22kV O/H DCct Medium	km	33	48 ⁸	46
22kV O/H DCct Light	km	29	44 ⁸	42
11kV O/H DCct Heavy	km	37.5 – 70	48	46
11kV O/H DCct Medium	km	36.2 – 53	44	42
11kV O/H DCct Light	km	32.9 – 50	40	38

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
Distribution				
22kV O/H Underbuilt Heavy	km	11	18 ¹⁰	17
22kV O/H Underbuilt Medium	km	10	17 ¹⁰	15
22kV O/H Underbuilt Light	km	8	15 ¹⁰	14
22kV O/H Underbuilt Single Phase (2 wire)	km		12 ⁶	n/a
22kV O/H Underbuilt SWER	km	4	10 ⁷	n/a
11kV O/H Underbuilt Heavy	km	10 ⁹ – 27	16	15
11kV O/H Underbuilt Medium	km	9 ⁹ – 21	15	14
11kV O/H Underbuilt Light	km	8 ⁹ – 21.7	13	12
11kV O/H Underbuilt Single Phase (2 wire)	km		10 ⁶	n/a
11kV O/H Underbuilt SWER	km	3.5 – 14.1	9 ⁷	n/a

¹ Assessed/incremental cost based on single circuit.

⁵ Incremental cost to 11kV value for insulators, crossarms and clearance.

⁶ Reduced cost of 3ph (3w light) line.

⁷ Deletion of crossarm and insulator from single phase (2 wire).

⁸ Additional cost of conductor, insulators, crossarms, some poles plus installation from single circuit.

⁹ Not appropriate for cost of base circuit.

¹⁰ Cost of conductors, insulators, crossarms plus installation without poles. Consistent with 22kV single circuit.

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
Distribution				
MV Cables				
22kV U/G Heavy (>240mm ¹ ≤300mm ¹ A1)	km	120	166 ¹¹	155
22kV U/G Medium (>50mm ¹ ≤240mm ¹ A1)	km	85	124 ¹¹	118
22kV U/G Light (≤50mm ¹ A1)	km	65	99 ¹¹	94
11kV U/G Heavy (>240mm ¹ ≤300mm ¹ A1)	km	120 – 132	126	125
11kV U/G Medium (>50mm ¹ ≤240mm ¹ A1)	km	90 – 128	100	97
11kV U/G Light (≤50mm ¹ A1)	km	65 – 81	81	77
22kV U/G DCct Heavy	km	170	232 ¹²	210
22kV U/G DCct Medium	km	135	179 ¹²	140
22kV U/G DCct Light	km		144 ¹²	n/a
11kV U/G DCct Heavy	km	170	170	170
11kV U/G DCct Medium	km	135 – 145	140	135
11kV U/G DCct Light	km	–	121	n/a

¹ Assessed/incremental cost based on single circuit.

¹¹ Based on incremental cost from 11kV value.

¹² Incremental cost of cable and laying added to single circuit.

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
MV Switchgear				
22kV Disconnecter/links 3ph (Excl Pole)	No.	2.5 – 3	4.0 ¹³	3.5
11kV Disconnecter/links 3ph (Excl Pole)	No.	2 – 5.7	4.0 ¹³	3.5
22kV Disconnecter/links 2ph (Excl Pole)	No.	–	3	n/a
11kV Disconnecter/links 2ph (Excl Pole)	No.	–	2	n/a
22kV Load Break Switch (Excl Pole)	No.	8	8.0 ¹⁴	6.5
11kV Load Break Switch (Excl Pole)	No.	4 – 6	6.0 ¹⁵	6.5
22kV Dropout Fuse 3 Ph (Excl Pole)	No.	2.5 – 3	3.0 ¹⁶	2.5
11kV Dropout Fuse 3 Ph (Excl Pole)	No.	1.5 – 2	2.0 ¹⁷	2.5
22kV Dropout Fuse 2 Ph (Excl Pole)	No.	–	2	n/a
11kV Dropout Fuse 2 Ph (Excl Pole)	No.	0.5 – 2	1.5	n/a
22kV Dropout Fuse SWER (Excl Pole)	No.	–	1.5	n/a
11kV Dropout Fuse SWER (Excl Pole)	No.	–	1	n/a
22kV Sectionaliser (Excl Pole)	No.	19	19	18
11kV Sectionaliser (Excl Pole)	No.	6 – 20	19	18
22kV Recloser (Excl Pole)	No.	23	29 ¹⁸	26
11kV Recloser (Excl Pole)	No.	20 - 36	27	26

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
MV Switchgear				
Independent surge arrestors 22kV 3ph	Set	–	3	n/a
Independent surge arrestors 11kV 3ph	Set	0.9 – 2	2	n/a
22kV Indoor Circuit Breaker	No.	30	30	30
11kV Indoor Circuit Breaker	No.	25 – 39	30	30
Voltage Regulator	No.	–	***	***
Ring Main Unit metalclad oil-filled – 3 Way	No.	15 – 25	19	16
Extra Oil Switch metalclad oil-filled	No.	5 – 12	8	6
Extra Fuse Switch metalclad oil-filled	No.	8	8	8
Ring Main Unit moulded epoxy resin base – 3 Way	No.	15	15	n/a
Extra isolator moulded epoxy resin base	No.	5	5	n/a
Extra fuse unit moulded epoxy resin base	No.	8	8	n/a

¹³ Appropriate value of links for 22kV and 11kV.

¹⁴ Higher fault level and voltage from 11kV.

¹⁵ Contact configuration is about \$1.5k – \$2.0k more than links therefore \$6k is realistic.

¹⁶ Fuse element more expensive and setting cost requires higher value.

¹⁷ Allows for setting cost and value of reliable unit.

¹⁸ Incremental insulation and fault level cost over 11kV unit.

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
Distribution Transformers (kVA)				
Single/Two Phase Units 22kV/LV & 11kV/LV Up to and including 50kVA				
75	No.	2 – 5	4.0 ¹⁹	2.6 – 4.0
100	No.	–	5	5
	No.	–	7	7
Three Phase Units (Pole Mounted – Bushing Terminations) 22kV/LV				
15	No.	6	6	6
30	No.	6	6	6
50	No.	8	8	8
100	No.	12	12	11
200	No.	17	17	14
300	No.	20	18	17
500	No.	18	21	20

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
11kV/LV				
15	No.	2.9 – 5	4	4
30	No.	3.2 – 6	4	4
50	No.	4.7 – 7	6	6
100	No.	6.7 – 9	8	8
200	No.	11 – 15	13	12
300	No.	12.9 – 18	16	15
500	No.	18 – 20	19	18
Three Phase Units (Cable entry, one or both voltages) 22kV/LV				
100	No.	10.2 – 13	12	11
200	No.	14 – 21	18	15
300	No.	18.75 – 24	22	18
500	No.	21 – 26	24	22
750	No.	29	29 ²⁰	26
1000	No.	31.5 – 38	38 ²⁰	31
1250	No.	48	48 ²⁰	40
1500	No.	57	57 ²⁰	49

¹⁹ This is an assessed average value for units up to 50 kVA.

²⁰ Larger sizes require heavy LV connections.

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
11kV/LV				
100	No.	7.5 – 13	10	9
200	No.	11.5 – 21	16	13
300	No.	13.3 – 24	17	16
500	No.	18.5 – 26	22	20
750	No.	22 – 29	26	23
1000	No.	24.9 – 38	30	26
1250	No.	48	42 ²⁰	34
1500	No.	57	50 ²⁰	42
SWER Isolating Transformers				
22kV				
50	No.	7	7	n/a
100	No.	9	9	n/a
200	No.	–	13 ²¹	n/a
11kV				
50	No.	7	6 ²²	n/a
100	No.	10	7 ²²	n/a
200	No.	–	12 ²¹	n/a

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
Distribution Substations				
22kV/LV & 11kV/LV				
Pole Mounted (up to 50kVA)	No.	1	1	1
Pole Mounted (above 50kVA)	No.	2	2	2
Ground Mounted (Covered)	No.	4	4	4
Kiosk (Masonry or block enclosure)	No.	9	9	9
On Customer's Premises with Feedout	No.	2	2	2
Land	No.	–	***	–
LV Reticulation				
Overhead – LV 4 wire only large	km	37 – 47	48 ²³	45
Overhead – LV 4 wire only medium	km	37 – 47	42 ²⁴	42
Overhead – LV only 2 wire medium	km	28.5 – 43.2	38	n/a
LV underbuilt 4 wire large	km	12 – 26	26 ²³	24
LV underbuilt 4 wire medium	km	12 – 26	22 ²⁴	21
LV underbuilt 2 wire medium	km	12.8 – 26.6	18	n/a
Streetlighting O/H 2 wire	km	30.3 – 33.9	30	n/a
Streetlighting O/H underbuilt	km	6 – 6.9	7	n/a

²⁰ Larger sizes require heavy LV connections.

²¹ Incremental value for large size.

²² Estimated value for less insulation compared with 22kV.

²³ Estimated for large conductor.

²⁴ Assessed size for medium conductor.

Asset Description	Unit	Standard Replacement Cost (\$000)		
		Range from submitters	Our Submission	Draft Handbook
Underground – LV only large	km	55 – 75	75 ²⁵	72
Underground – LV only medium	km	55 – 75	65 ²⁶	63
Underground – with MV large	km	25 – 56	52	40
Underground – with MV medium	km	25 – 56	37	32
Streetlighting U/G 2 core	km	21.7 – 43.6	40	16
Streetlighting U/G 2 core joint trench	km	10 – 21.7	16	n/a
LV Network Link Pillar	No.	12 ²⁷	6.2	4.0
Customer Service Connections Excluding Meters and Relays				
HV overhead	No.	0.56	0.6	n/a
HV underground	No.	4	4	n/a
LV – 1 ph O/H	No.	0.065 – 0.085	0.08	0.07
LV – 1 ph U/G Shared Service Pillar	No.	–	0.3	n/a
LV – 1 ph U/G	No.	0.19 ²⁸	0.6	0.5
LV – 3 ph O/H	No.	0.18	0.18	0.18
LV – 3 ph U/G	No.	–	0.98	0.80
LV – 3 ph O/H (> 200 amp)	No.	–	0.92	n/a
Other System Fixed Assets				
SCADA and Comms (Central Facilities)	Lot		-	–
Easements	No.		***	–
Strategic Spares	Lot		***	–

²⁵ Value specific to large conductor.

²⁶ Intermediate value for medium conductor.

²⁷ Cost represents the value of elaborate configured pillar.

²⁸ Does not include service pillar.