Appendix Q

Report Transmission Line Replacement Cost

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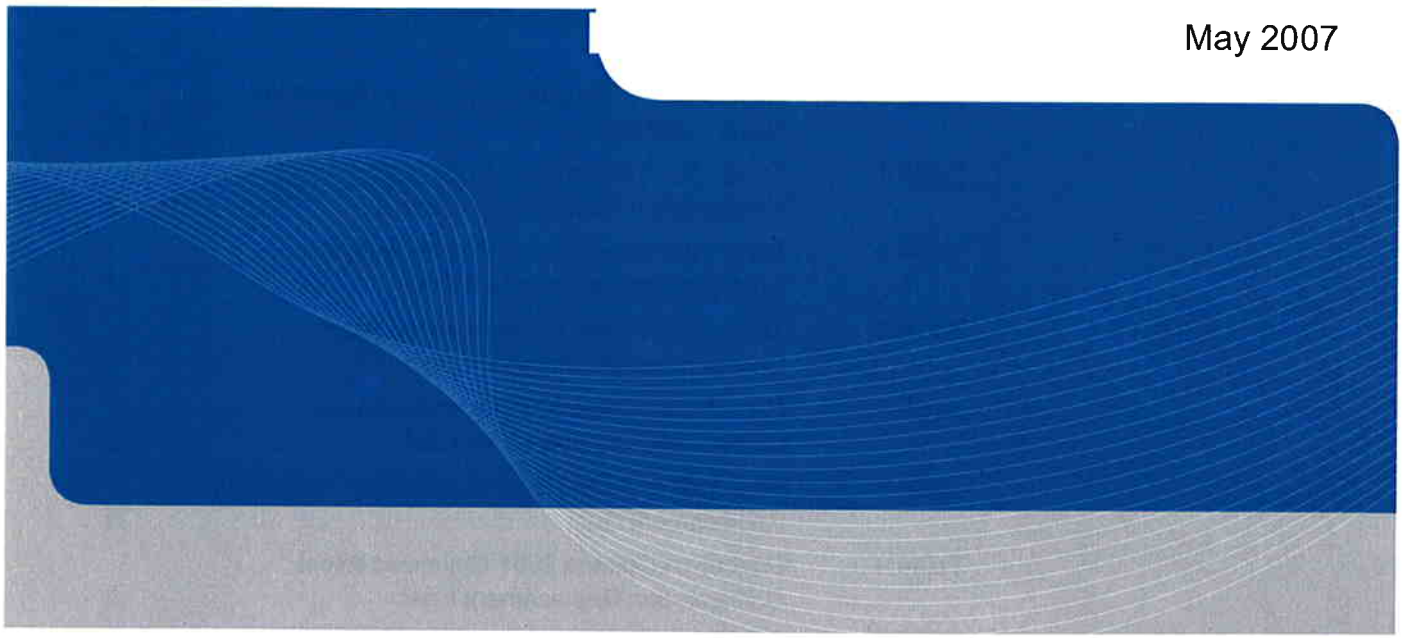
Report Transmission Line Replacement Cost

May 2007



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Contents

Table Index

Appendices

Executive Summary

GHD's Scope

ElectraNet has completed a review of its assets and seeks to readmit four previously optimised assets into its Regulatory Asset Base for the next regulatory period, as provided in the National Electricity Rules (NER). The proposed readmission is based on a combination of load growth factors and reconfiguration of the network.

As an independent review, GHD has analysed the rationale and network configuration for the four assets previously optimised out and has recommended that the four assets be readmitted into the Regulatory Asset Base.

ElectraNet subsequently commissioned GHD to value the readmitted assets based on Modern Replacement Cost using industry accepted valuation principles.

GHD's Assessment of Replacement Costs

GHD has calculated replacement costs for the four assets using industry accepted principles for ODRC valuations and modern replacement unit cost rates in 06/07 dollars for the network configurations represented by:

- 2001 Optimisation configuration
- Recommended readmitted configuration

ElectraNet has adopted the Base Planning Objects (BPOs) of Powerlink Queensland. Powerlink has extensive recent experience constructing new transmission lines and has developed detailed Base Planning Objects (BPOs) which are unit cost rates based on recent industry experience. GHD has reviewed the applicability of these unit rates and has calculated additional unit rates for construction factors not included in the BPOs such as extra strain towers, rugged ground and remoteness.

The replacement costs are summarised in the following table:

Table 1 Modern Equivalent Replacement Costs for Readmitted Assets – 2006/07

Transmission Line	2001 Optimisation Network Configuration ($06/07)	Readmitted Assets Network Configuration ($06/07)	Difference in replacement costs ($06/07)
Tailem Bend to Keith 132kV	$42,754,000	$68,015,000	$25,261,000
Para (Tungkillo) to Tailem Bend 275kV	$19,957,000	$24,041,000	$4,084,000
Davenport to Cultana 275kV	$20,543,000	$29,064,000	$8,521,000
Robertstown (Tungkillo) to Cherry Gardens 275kV	$25,423,000	$34,297,000	$8,874,000

1. Introduction

1.1 Background to this Review

ElectraNet engaged SKM to undertake a review of the Asset Valuation Optimisation process for assets up to 30 June 2001 in preparation for the ACCC regulatory reset of 1 January 2003. SKM recommended that the Replacement Cost of the regulated network assets be reduced by $25M.

GHD has undertaken a review of the optimised assets and has recommended four of the assets be readmitted.

1.2 Scope

GHD was commissioned by ElectraNet to determine the Modern Equivalent Replacement Cost of the assets that were recommended for readmission. The replacement cost valuation has been assessed for the 2001 optimised configuration, when assets were optimised out and the recommended readmitted asset configuration. The valuations are in $2006/07 and do not include depreciation, which will be separately calculated by ElectraNet.

The assets valued are:

- Tailem Bend – Keith 132kV Transmission Lines.
- Para (Tungkillo) – Tailem Bend 275 kV Transmission Line.
- Davenport – Cultana 275kV Transmission Line.
- Robertstown (Tungkillo) – Cherry Gardens 275kV Transmission Lines.

1.2.1 GHD's Qualifications

GHD has carried out a number of asset valuations in the electricity transmission and distribution industry including:

- ElectraNet SA - In 2001 GHD carried out check estimates for 12 substations and 3 transmission lines as part of ElectraNet revenue reset application.
- NSW Treasury - GHD produced A Policy Guideline for NSW DNSPs – Valuation of Electricity Network Assets. This Guideline was to be used for future Optimised Depreciation Replacement Cost (ODRC) valuation submissions to the Independent Pricing and Regulatory Tribunal (IPART).
- Snowy Mountains Hydro Electric Authority - GHD reviewed and updated the 1991 valuation of the Snowy Scheme as well as producing an ODRC valuation with transmission assets separated for potential redistribution to TransGrid and VenCorp.
- Brunei - GHD prepared an ODRC, NPV and Liquidation Valuation of the Berakas Power System consisting of gas generation, transmission and distribution.
- Queensland Electricity Review Unit - GHD carried out an ODRC valuation of Powerlink's assets.
- Powerlink – GHD carried out a review of a selection Powerlink's Base Planning Objects (BPOs) used by them in project cost determination.
- Energex/Ergon Energy - GHD carried out the ODRC valuation of the electricity distribution and subtransmission assets for a revenue reset application.

- NSW Treasury - GHD carried out the ODRC valuation of the electricity assets of the NSW Distributors, TransGrid and the transmission assets of Snowy Mountains Hydro-electric Authority for application to IPART.

1.2.2 GHD's Independence

GHD's opinions expressed in this Report have been formed independently. ElectraNet has not sought to fetter or direct GHD's judgement in forming its opinions.

1.3 Data

In determining the replacement cost, GHD has relied on the following:

- Knowledge gained in the completion of past engagements.
- Discussions with ElectraNet staff listed in Appendix A
- A desktop review of documentation listed in Appendix A.

1.4 Reliances and Limitations

In considering the valuation of ElectraNet's assets, GHD has been provided with information requested of ElectraNet. In addition GHD has interviewed members of ElectraNet's Network Planning and Revenue Reset Team to understand the previous optimisation outcomes and details of the assets being valued.

GHD has developed its opinion with reference to soundly based and objective analytical tools and decision aids, a range of publicly available material and material supplied by ElectraNet and its own professional judgement and experience in this area.

GHD has not:

- Had access to detailed calculations underlying ElectraNet's BPOs
- Physically seen the assets being valued
- Interrogated details of construction that may be available in ElectraNet's asset management or other systems.

1.5 Replacement Cost Methodology

As per industry accepted practices the replacement cost is based on modern equivalent assets. For ODRC valuations standard costs are allocated to asset groups and subgroups on a per unit rate basis. This ensures consistency across the industry. However as each area has unique issues such as topography, remoteness and CBD locations the unit rates are modified to take these factors into account.

ElectraNet use BPOs to calculate base project cost estimates for transmission lines and substations. These BPOs are essentially the same as unit rates used in Optimised Replacement Cost valuations. They are determined by a detailed cost estimate based on real project costs and cost for core materials such as steel, copper, aluminium and labour. They are updated on a regular basis.

GHD has carried out the replacement cost estimates based on ODRC principles using unit rates, modified for local variation factors.

To be satisfied with the BPOs currently used by ElectraNet, GHD:

- Indexed the BPOs previously reviewed by GHD in the 2000 valuation of Powerlink. This was also based on BPOs
- Reviewed recent determinations by the Australian Energy Regulator and consultant findings on the use of BPOs
- Reviewed unit rate building blocks.

1.5.1 Indexing

GHD was involved in determining the suitability of Powerlink's BPOs in the 2000 revenue determination. GHD has indexed the BPOs on the basis of two key indices: the steel index, which is a large component of transmission lines; and building indices from Rawlinson's Australian Construction Handbook edition 25, 2007, to cover labour and other materials

Table 2 compares 1999 Powerlink BPOs, indexed Powerlink BPOs and proposed ElectraNet BPOs for 2006/07.

Table 2 Comparison of Business Planning Object Unit Rates – 2006/07

Circuit type	Powerlink BPO $000 / km (99/00)	Indexed Powerlink BPO $000 / km (06/07)	ElectraNet BPO $000 / km (06/07)	ElectraNet BPO / Indexed BPO %
132kV single circuit steel tower oxygen conductor	133	220	254	115%
132kV double circuit steel tower oxygen conductor	166	270	320	118%
275kV single circuit steel tower sulphur conductor	175	290	299	103%
275kV double circuit single steel tower sulphur conductor	245	400	425	113%
275kV double circuit single steel tower twin sulphur conductor	320	520	578	111%

Table 2 shows that ElectraNet BPOs exceed the indexed rates by between 3% and 18% for all four assets. Recent price increases in steel and aluminium, a significant component of transmission lines and towers, has resulted in cost increases above index rates.

Table 3 compares the indexed rates against a sample range of BPOs calculated in 2005/06, which shows that the indexed rate tracked fairly closely to the ElectraNet BPO up to 2005/06. The divergence in 2006/07 BPO rates can be attributed to increases in steel prices of more than 20% (ABS indices). This compares with average annual increases of 5% during the preceeding period.

Table 3 Comparison of Business Planning Object Unit Rates – 2005/06

Circuit type	Powerlink BPO $000 / km (99/00)	Indexed Powerlink BPO $000 / km (05/06)	ElectraNet BPO $000 / km (05/06)	ElectraNet BPO / Indexed BPO %
132kV single circuit steel tower oxygen conductor	133	190	192	1%
275kV double circuit single steel tower sulphur conductor	245	350	316	-10%
275kV double circuit single steel tower twin sulphur conductor	320	460	452	-1%

In its recent submission to the AER, SPAusNet included a report by SKM that examined escalation factors affecting capital expenditure in the power industry. SKM examined a number of cost factors affecting the costs in the power industry and concluded:

- 'transmission line costs increased more rapidly than CPI due to the input cost effects of steel and aluminium, and also local labour and construction costs.'
- AAC and AAAC overhead conductor costs were stagnant between 2002 and 2004 (decreasing slightly in 2003), but have risen by 27% in the past two years, with most of this increase occurring in 2006.'[1]

1.5.2 Current AER determinations

GHD has reviewed the AER's recent draft decision for Powerlink and consultant reports on BPO rates.

On the 8th of December 2006 the AER has released its draft decision for Powerlink's revenues for the period 1 July 2007 to 30 June 2012. As part of that process AER engaged Parsons Brinckerhoff Associates (PB) to review Powerlink's Revenue Proposal. PB in its report advised:

"Project cost estimates are underpinned by Base Planning Objects (BPOs), which are essentially unit rates for different asset types. We benchmarked some of Powerlink's key BPOs against external data and we consider the BPOs used in developing Powerlink's capex forecast to be reasonable."[2]

The AER in its Draft Decision commented:

"The AER accepts PB's advice that Powerlink's BPOs are reasonable and provide it with an appropriate basis on which to estimate the cost of its forecast capital works program."[3]

[1] SKM Escalation Factors Affecting Capital Expenditure Forecasts 21 February 2007 – pp 7 and 14

[2] PB Asscociates - Powerlink Revenue Reset Review of Capital Expenditure, Operating and Maintenance Expenditure and Service Standards Dec 2006 pp 2

[3] AER Draft Decision—Queensland transmission network revenue cap 2007–08 to 2011– 12 8 Dec 2006 pp 76

1.5.3 Standard Rates used

From the limited indexing carried out by GHD and the recent AER draft decision and acceptance of the BPOs used by Powerlink, GHD concludes that the BPOs, as supplied by ElectraNet, can be validly used for the replacement cost assessment.

1.5.4 Variation Factors

As indicated earlier the BPOs represent standard unit rates and assume standard conditions encountered in construction, eg minimal clearing, straight runs, flat country. Variation factors are usually applied to the standard unit rates to determine the modern replacement costs. For the transmission lines GHD has used the rates determined in its rewrite of the NSW Treasury ODRC valuation guidelines. The factors chosen in 06/07 dollars were:

- Traffic control – rate used $5,337 per km
- Heavy clearing - rate used $7,624 per km
- Rugged terrain - rate used $3,050 per km

As well costs were applied for extra foundations in swampy areas ($40,000 per km) and additional strain towers ($35,000 each) where the transmission lines deviate from straight runs. GHD determined costs for these based on a differential cost basis, eg. strain tower incremental cost over a suspension tower.

The application of these factors to the assets identified for readmission involved:

- Assessment of location and terrain using Google maps
- Estimate the % of line affected by identified variation factors
- Applied variation factors to lengths affected
- Applied location factor from Rawlinsons Australian Construction Handbook - edition 25,2007
- Calculated revised replacement cost

1.6 Replacement Costs

1.6.1 Tailem Bend to Keith 132kV line

This line was optimised by SKM in 2001 to a double circuit single tower line. GHD has recommended readmission as two single circuit steel towers.

Table 4 Tailem Bend Keith 2001 Optimisation Asset Configuration Replacement Cost

Description	Unit Rate	Units	Replacement cost
Standard unit rate	$320,000 per km	121[1] km	$38,720,000
Variation factors			
Traffic control	$5,337 per km	1% of route = 1.21	$6,458
Heavy Clearing	$7,624 per km	0%	$0
Rugged Terrain	$3,050 per km	0%	$0
Swamp ground	$40,000 per km	0%	$0
Extra strain towers	$35,000 each	4	$140,000
Location factor	%	10%	$3,886,646
		TOTAL (rounded)	**$42,754,000**

1. As optimised doesn't physically exist, average of two existing line lengths used

Table 5 Tailem Bend Keith # 1 – Readmitted Asset Configuration Replacement Cost

Description	Unit rate	Units	Replacement cost
Standard unit rate	$254,000 per km	121.2 km	$30,784,800
Variation factors			
Traffic control	$5,337 per km	1% of route = 1.21	$6,458
Heavy Clearing	$7,624 per km	0%	$0
Rugged Terrain	$3,050 per km	0%	$0
Swamp ground	$40,000 per km	0%	$0
Extra strain towers	$35,000 each	4 towers	$140,000
Location factor	%	10%	$3,093,127
		TOTAL (rounded)	**$34,025,000**

Table 6 Tailem Bend Keith #2 Readmitted Asset Configuration Replacement Cost

Description	Unit Rate	Units	Replacement cost
Standard unit rate	$254,000 per km	120.8 km	$30,683,200
Variation factors			
Traffic control	$5,337 per km	1% of route = 1.2	$6,458
Heavy Clearing	$7,624 per km	0%	$0
Rugged Terrain	$3,050 per km	0%	$0
Swamp ground	$40,000 per km	0%	$0
Extra strain towers	$35,000 each	6 towers	$210,000
Location factor	%	10%	$3,089,965
		TOTAL (rounded)	**$33,990,000**

1.6.2 Para (Tungkillo) to Tailem Bend 275kV line

This line was optimised by SKM in 2001 to a single circuit steel tower line. GHD has recommended readmission as double circuit single steel tower (strung one side only).

Table 7 Para Tailem Bend 2001 Optimised Asset Configuration Replacement Cost

Description	Unit Rates	Units	Replacement cost
Standard unit rate	$299,000 per km	65.6	$19,614,400
Variation factors			
Traffic control	$5,337 per km	2% of route = 1.31	$7,002
Heavy Clearing	$7,624 per km	10% of route = 6.56	$50,013
Rugged Terrain	$3,050 per km	20% of route = 13.12	$40,016
Swamp ground	$40,000 per km	0%	$0
Extra strain towers	$35,000 each	7 towers	$245,000
Location factor	%	0%	$0
		TOTAL (rounded)	**$19,957,000**

Table 8 Para Tailem Bend Readmitted Asset Configuration Replacement Cost

Description	Unit Rates	Units	Replacement cost
Standard unit rate	$361,250[1] per km	65.6 km	$23,698,000
Variation factors			
Traffic control	$5,337 per km	2% of route = 1.31	$7,002
Heavy Clearing	$7,624 per km	10% of route = 6.56	$50,013
Rugged Terrain	$3,050 per km	20% of route = 13.12	$40,011
Swamp ground	$40,000 per km	0%	$0
Extra strain towers	$35,000 each	7 towers	$245,000
Location factor	%	0%	$0
		TOTAL (rounded)	**$24,041,000**

1. BPO of $425,000 has been adjusted to reflect one side of double circuit has not been strung, based on conductor around 15% of cost

1.6.3 Davenport to Cultana 275kV

Table 9 Davenport Cultana 2001 Optimised Asset Configuration Replacement Cost

Description	Unit Rates	Units	Replacement cost
Standard unit rate	$299,000 per km	61.2 km	$18,298,800
Variation factors			
Traffic control	$5,337 per km	1% of route = 6.12	$3,266
Heavy Clearing	$7,624 per km	0%	$0
Rugged Terrain	$3,050 per km	5% of route = 3.06	$9,332
Swamp ground	$40,000 per km	2% of route = 1.22	$48,960
Extra strain towers	$35,000 each	5 towers	$175,000
Extra for river crossing two large towers piled footings	$70,000 ea	2 towers	$140,000
Location factor	%	10%	$1,867,536
		TOTAL (rounded)	**$20,543,000**

Table 10 Davenport Cultana Readmitted Asset Configuration Replacement Cost

Description	Unit Rates	Units	Replacement cost
Standard unit rate	$425,000 per km	61.2 km	$26,010,000
Variation factors			
Traffic control	$5,337 per km	1% of route = 6.12	$3,266
Heavy Clearing	$7,624 per km	0%	$0
Rugged Terrain	$3,050 per km	5% of route = 3.06	$9,332
Swamp ground	$40,000 per km	2% of route = 1.22	$48,960
Extra strain towers	$35,000 each	5 towers	$175,000
Extra for river crossing two large towers piled footings	$70,000 ea	2.5[1]	$175,000
Location factor	%	10%	$2,642,156
		TOTAL (rounded)	**$29,064,000**

1. Extra 25% for double tower construction, optimised was single tower construction

1.6.4 Robertstown (Tungkillo) to Cherry Gardens 275kV

Table 11 Tungkillo Cherry Gardens 2001 Optimised Asset Configuration Replacement Cost

Description	Unit Rates	Units	Replacement cost
Standard unit rate	$425,000 per km	58 km	$24,650,000
Variation factors			
Traffic control	$5,337 per km	2% of route = 1.16	$6,191
Heavy Clearing	$7,624 per km	15% of route = 8.7	$66,329
Rugged Terrain	$3,050 per km	20% of route = 11.6	$35,375
Swamp ground	$40,000 per km	0%	$0
Extra strain towers	$35,000 each	19 towers	$665,000
Location factor	%	0%	$0
		TOTAL (rounded)	**$25,423,000**

Table 12 Tungkillo Cherry Gardens Readmitted Asset Configuration Replacement Cost

Description	Unit Rates	Units	Replacement cost
Standard unit rate	$578,000 per km	58 km	$33,524,000
Variation factors			
Traffic control	$5,337 per km	2% of route = 1.16	$6,191
Heavy Clearing	$7,624 per km	15% of route = 8.7	$66,329
Rugged Terrain	$3,050 per km	20% of route = 11.6	$35,375
Swamp ground	$40,000 per km	0%	$0
Extra strain towers	$35,000 each	19 towers	$665,000
Location factor	%	0%	$0
		TOTAL (rounded)	**$34,297,000**

2. Conclusion

GHD has been asked to calculate modern replacement costs (not including depreciation) for assets ElectraNet is proposing to readmit to the regulatory asset base.

Powerlink in Queensland has had the most significant growth in new transmission assets in Australia and ElectraNet has adopted these unit cost rates (Base Planning Objects) for transmission components. The Powerlink BPO rates have recently been accepted by the AER on the advice of PB Associates.

GHD has compared these unit cost rates with previous valuation studies and indexes for key cost drivers including steel and construction labour and concluded that these are reasonable rates. GHD has also assessed the local environment and terrain for the optimised assets under consideration and has calculated variation factors for the standard unit rates based on the specific asset conditions.

Table 13 compares the modern equivalent replacement costs in $2006/07 for the alternate network configuration options. If assets are readmitted as proposed the incremental optimised replacement value will be $46,740,000 adjusted for depreciation.

Table 13 Modern Equivalent Replacement Costs for Readmitted Assets – 2006/07

Transmission Line	2001 Optimisation Network Configuration ($06/07)	Readmitted Assets Network Configuration ($06/07)	Difference in replacement costs ($06/07)
Tailem Bend to Keith 132kV	$42,754,000	$68,015,000	$25,261,000
Para (Tungkillo) to Tailem Bend 275kV	$19,957,000	$24,041,000	$4,084,000
Davenport to Cultana 275kV	$20,543,000	$29,064,000	$8,521,000
Robertstown (Tungkillo) to Cherry Gardens 275kV	$25,423,000	$34,297,000	$8,874,000

Appendix A

Information Supplied to GHD

Staff interviewed and Information Supplied by ElectraNet

List of ElectraNet Staff Interviewed

Bill Jackson - Senior Regulatory Consultant

Bob Adams – Compliance and Pricing

Documents Used

Table 14 Documents Used in the Review of ElectraNet's Assets Valuation

Document	Author
ElectraNet SA – 2001 Optimisation Review Final Report February 2002	Sinclair Knight Merz Pty Limited
Spreadsheet Job No. QM53104 ElectraNet Tx Lines 111001 for optimisationupdate.xls	ElectraNet
System diagrams for ElectraNet network	ElectraNet
Base Planning Objects used by ElectaNet for 132kV and 275kV transmission lines	ElectraNet
Summary documents on optimisation and asset history for: • Tailem Bend to Keith 132kV transmission line • Para (Tungkillo) – Tailem Bend 275 kV transmission line • Davenport – Cultana 275 kV transmission line • Robertstown (Tungkillo) – Cherry Gardens 275 kV transmission line	ElectraNet
LayerEnetOptLines.kmz file (Google earth map with transmission route overlaid)	ElectraNet
SP AusNet Revenue Proposal – SKM Escalation Factors affecting Capital Expenditure Forecasts	SKM
AER Draft Decision—Queensland transmission network revenue cap 2007–08 to 2011–12	AER
Powerlink Revenue Reset Review of Capital Expenditure, Operating and Maintenance Expenditure and Service Standards Dec 2006	PB Associates

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