ElectraNet transmission network revenue proposal

Report prepared by CHC Associates Pty Ltd

for the Australian Energy Regulator

Readmission of optimised assets

to the Regulated Asset Base

September 2007

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1 Summary

The AEMC recognised in its November 2006 Rule determination that a TNSP should, under defined circumstances, be allowed to reinstate certain assets that are not currently included in the RAB. New rules were included in chapter 6A[1].

ElectraNet owns a number of transmission network assets that were "optimised out" of the valuation of its regulatory assets when this was first determined in 1998. In most cases these were assets that were determined to have a lower value than the asset that is actually in place, and each was notionally "replaced", for revenue determination purposes, by an alternative asset that provided the required level of service at lower cost, as assessed at that time.

As part of its preparation for its 2002 revenue proposal, ElectraNet engaged SKM[2] to review the optimisation of some assets that were made in 1998. SKM recommended that some of these optimisations be reversed, and that others be retained. In its 2002 revenue cap decision for ElectraNet the ACCC allowed the readmission of a number of the 1998 optimised assets into the RAB.

As part of its 2007 revenue proposal ElectraNet engaged GHD to review the remaining optimisations and to recommend those optimised assets that should be readmitted to the RAB at their real value in accordance with Rule 6A. In chapter 7.5 of its revenue proposal ElectraNet has proposed that GHD's recommendation[3] that all the remaining assets be readmitted should be implemented in full.

ElectraNet also engaged GHD to estimate the modern replacement costs of both the optimised and real assets that are proposed for reinstatement. ElectraNet has recommended that the asset values in GHD's report[4] should be used as a basis to calculate a depreciated adjustment to the starting RAB for the next revenue reset.

CHC Associates was engaged by the AER to review the evidence put forward by ElectraNet, and to make an independent recommendation on the treatment of these assets.

A list of documents considered by CHC in making the recommendations is given in the Appendix.

The first issue addressed by CHC is whether to recommend to the AER that these optimised assets should be readmitted to the RAB. This requires consideration of both the physical properties and services provided by the assets, and their valuations.

[1] Specifically clause S6A.2.1(f)(8) in schedule 6A.2
[2] Report by SKM for ElectraNet: 2001 Optimisation Review Final Report, February 2002
[3] Appendix P to ElectraNet's Transmission Network Revenue Proposal: GHD Asset Optimisation Review Report May 2007
[4] Appendix Q to ElectraNet's Transmission Network Revenue Proposal : Report Transmission Line Replacement Cost by GHD, May 2007

CHC has considered the evidence presented by GHD in its two reports, together with the detailed information that was supplied by ElectraNet to assist GHD's analysis.

In section 5 of the report CHC assessed the historical reasons for constructing the subject assets in their present form, and the circumstances that may have resulted in their optimisation. However, the assessment of the merits of the arguments for readmission of the assets is based on the application of the new chapter 6A. This required a review of the current and potential usage of both the real assets and the optimised assets in the current context of a hypothetical planning decision, assuming that the assets are commissioned in their real form at the start of the reset period. This is considered to be a reasonable viewpoint in the context that the difference in value of the real assets and the optimised assets would only be funded from this time onwards, if the readmission of the assets is approved. The assessment is guided by the *capital expenditure objectives* as defined in clause 6A.6.7(a).

CHC has concurred with the recommendations for readmission of assets that were made in GHD's assessment[5]. However in some cases CHC's reasons differ in detail from those advanced by GHD, or they include additional considerations, as discussed in section 5 of the report. Specifically the following readmissions are recommended:

- Tailem Bend to Keith 132 kV transmission line – the double circuit line optimisation is to be reversed, and the two Tailem Bend to Keith 132 kV transmission lines readmitted as single circuit lines on two separate routes, and valued accordingly;
- Tungkillo to Tailem Bend 275 kV transmission line – the previous optimisation of the asset to a single circuit line is to be reversed, and the asset readmitted as a double circuit line with one circuit strung, and valued as constructed;
- Davenport to Cultana 275 kV transmission line – the previous optimisation of the asset to a 275 kV single circuit line is to be reversed, and the asset should be readmitted as a 275kV double circuit line, and valued as constructed; and
- Tungkillo to Cherry Gardens 275 kV transmission line – the previous optimisation of the asset to a double circuit 275kV line with one conductor per phase is to be reversed, and the asset readmitted as a double circuit 275kV line with twin conductors per phase, and valued as constructed.

CHC examined a report[6] by the Allen Consulting Group (ACG) that discussed how those assets recommended for readmission to the RAB should be valued for regulatory purposes. On the basis of a detailed assessment of two possible methods, that would give the same results if applied consistently, AGC recommended a simplified approach that was stated to be conservative, and ElectraNet has stated that it is willing to accept this approach. This matter is discussed in section 6 of the report.

CHC's brief does not extend to assessing the economic merits of ACG's proposal.

[5] Appendix P to ElectraNet's Transmission Network Revenue Proposal: GHD Asset Optimisation Review Report May 2007,

[6] Appendix R to ElectraNet's Transmission Network Revenue Proposal : Treatment of Previously Optimised Transmission Assets by AGC, May 2007

According to the methodology proposed by the ACG, if the optimised assets are readmitted into the RAB then the amount that should be added to the RAB is the difference between the current replacement cost of the non-optimised asset (i.e. the actual asset in service) and the optimised asset (as reflected in the regulatory asset value at present) adjusted for age using straight-line depreciation. Valuations would be calculated in dollar values that are consistent with the RAB calculation.

This part of the calculation is outside CHC's brief for this review.

In section 7 of the report CHC reviewed the valuation of both the optimised assets and the real assets that had been prepared by GHD[7]. A number of errors were identified that were corrected by ElectraNet to CHC's satisfaction. CHC substantiated the validity of many of the proposed asset valuations, but has recommended both positive and negative adjustments to three asset values. These changes have the combined effect of reducing the present day total of the adjustment to the RAB from $46.74 million in the original proposal, $42.082 million using the ElectraNet amended data, to $40.327 million based on CHC's recommendation, with the components as summarised below.

Modern equivalent replacement costs for readmitted assets - $2006/07

Transmission Line	Optimised network configuration	Real network configuration	Difference in replacement costs
Tailem Bend to Keith 132kV	$41,023,000	$63,882,000	$22,859,000
Tungkillo to Tailem Bend 275kV	$21,968,000*	$25,041,000*	$3,073,000
Davenport to Cultana 275kV	$20,543,000	$29,064,000	$8,521,000
Tungkillo to Cherry Gardens 275kV	$25,423,000	$31,297,000*	$5,874,000
All assets	$108,957,000	$149,284,000	$40,327,000

* Replacement cost as adjusted by CHC.

According to the method proposed by ACG these figures must the adjusted to the appropriate dollar values, and depreciated in accordance with the remaining life of assets, in order to determine the addition to the starting asset value for the next reset period.

[7] Appendix Q to ElectraNet's Transmission Network Revenue Proposal : Report Transmission Line Replacement Cost by GHD, May 2007

2 Background

2.1 Optimisation of ElectraNet's assets

ElectraNet has a number of network assets that were "optimised out" of its regulatory asset value when this was first determined in 1998. In most cases these were assets that were determined to have a lower value than the asset that is actually in place, and they were notionally "replaced," for the purposes of revenue determination, by alternative assets that provided the required level of service at lower cost, as assessed at that time.

2.2 Readmission of some assets

As part of its preparation for its 2002 revenue proposal, ElectraNet engaged SKM[8] to review the optimisation of some assets that were made in 1998. SKM recommended that some of these optimisations be reversed, and that others be retained. In its 2002 revenue cap decision for ElectraNet the ACCC allowed the readmission of a number of the 1998 optimised assets into the RAB.

2.3 ElectraNet's proposal

ElectraNet commissioned GHD to review the remaining optimisations and to recommend those optimised assets that should be readmitted to the RAB "on the basis of load growth and well accepted optimisation principles" as part of its 2007 revenue proposal.

GHD's report[9] has recommended that all the assets that were reviewed be readmitted to ElectraNet's RAB for the next regulatory period (2008–13). GHD described these as follows:

- Tailem Bend to Keith 132 kV transmission line – the double circuit line optimisation is to be reversed and the two Tailem Bend to Keith 132 kV transmission lines readmitted as single circuit lines and valued accordingly;

- Para (Tungkillo)[10] to Tailem Bend 275 kV transmission line – the previous optimisation of the double circuit to single circuit be reversed so that the line is valued as constructed;

- Davenport to Cultana 275 kV transmission line – the previous optimisation of the transmission line from double circuit to single circuit to be reversed and the line valued as a 275kV double circuit line; and

[8] Report by SKM for ElectraNet: 2001 Optimisation Review Final Report, February 2002
[9] Appendix P to ElectraNet's Transmission Network Revenue Proposal: GHD Asset Optimisation Review Report May 2007
[10] The line originally terminated at Para, but only the portion between Tailem Bend and Tungkillo is optimised.

- Robertstown (Tungkillo)[11] to Cherry Gardens 275 kV transmission line – the previous optimisation of the twin conductor to single circuit per phase to be reversed and valued as twin conductor per phase from Tungkillo to Cherry Gardens.

These lines are shown on the geographic map on the following page.

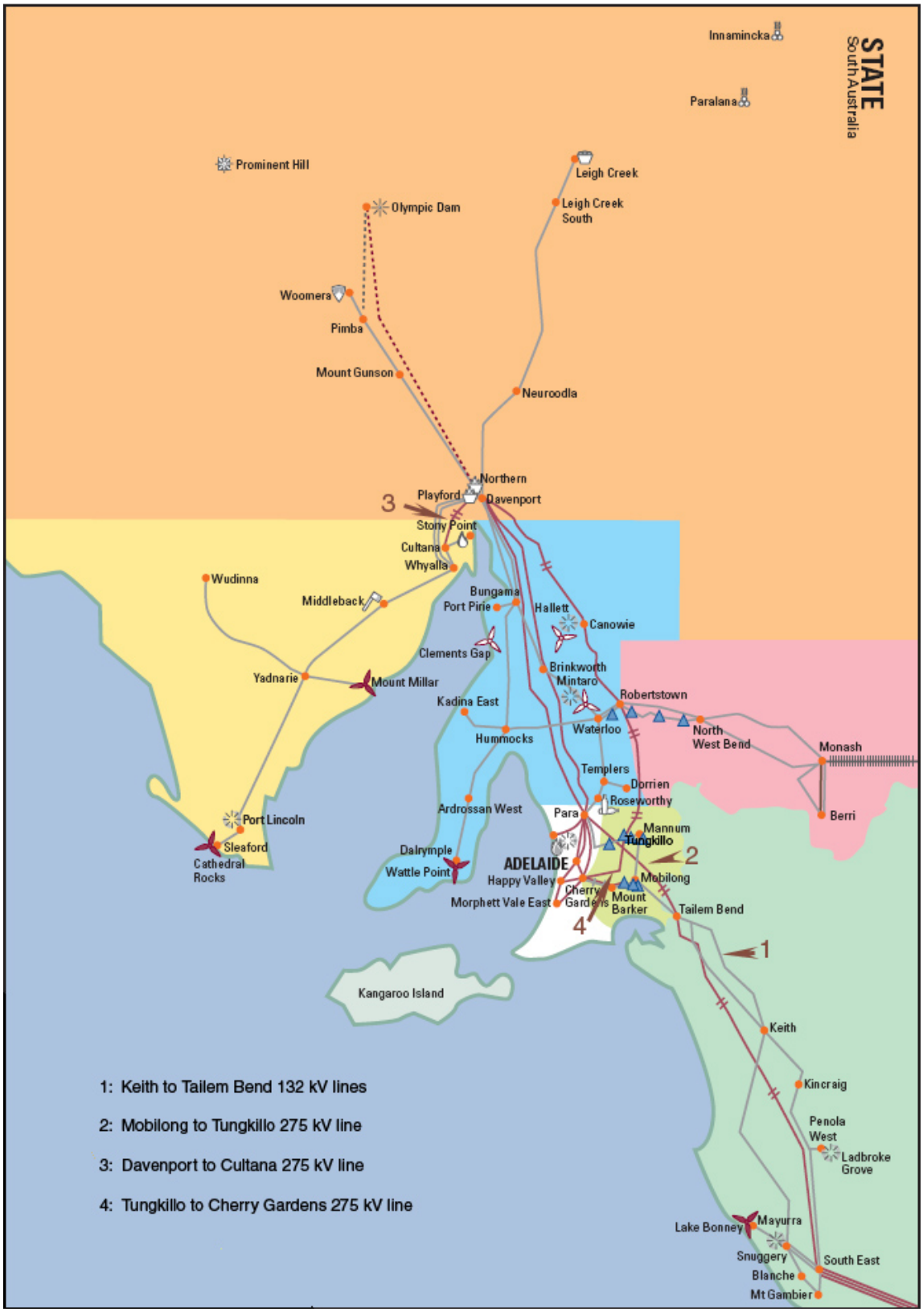
In chapter 7.5 of its revenue proposal ElectraNet has proposed that GHD's recommendations should be implemented in full.

ElectraNet also engaged GHD to estimate the modern replacement costs of both the optimised and real assets that are proposed for reinstatement. GHD's report[12] is also appended to ElectraNet's revenue proposal, and ElectraNet has recommended that the values therein should be used to calculate a depreciated adjustment to the starting RAB for the next revenue reset.

Finally ElectraNet engaged AGC to provide a report[13] on the treatment of revalued assets for regulatory purposes.

In its Revenue Proposal ElectraNet[14] has adopted a "minimum" approach that was stated in the AGC report to be conservative.

[11] The line originally came from Robertstown, but only the portion between Tungkillo and Cherry Gardens has twin conductor per phase construction and is optimised.
[12] Appendix Q to ElectraNet's Transmission Network Revenue Proposal : Report Transmission Line Replacement Cost by GHD, May 2007
[13] Appendix R to ElectraNet's Transmission Network Revenue Proposal : Treatment of Previously Optimised Transmission Assets by AGC, May 2007
[14] ElectraNet Revenue Proposal Section 7.5



Base Map: ElectraNet Annual Planning Review 2007-2017

2.4 Rule requirements

The AEMC recognised in its November 2006 Rule determination that, in defined circumstances, a TNSP should be allowed to reinstate certain assets that are not currently included in the RAB. New rules were included in chapter 6A that do not apply exclusively to previously optimised assets, but which supersede the considerations that applied when these assets were last optimised.

Specifically, in Schedule 6A.2[15] clause S6A.2.1(f)(8) allows the following adjustment to be made to the previous value of the RAB when establishing the opening regulatory asset base for a regulatory control period:

> Without prejudice to the application of any other provision of this paragraph (f), the previous value of the regulatory asset base may be increased by the inclusion of:
>
> (ii) past capital expenditure that has not been included in that value, but only to the extent that such past capital expenditure:
>
> (A) relates to an asset that is used for the provision of *prescribed transmission services*;
>
> (B) is considered by the *AER* to be reasonably required in order to achieve one or more of the *capital expenditure objectives*;
>
> (C) is properly allocated to *prescribed transmission services* in accordance with the principles and policies set out in the *Cost Allocation Methodology* for the relevant *Transmission Network Service Provider*; and
>
> (D) has not otherwise been recovered.

The *capital expenditure objectives* referred to in this clause are defined in clause 6A.6.7(a) as follows:

> (1) meet the expected demand for *prescribed transmission services* over that period;
>
> (2) comply with all applicable *regulatory obligation*s associated with the provision of *prescribed transmission services*;
>
> (3) maintain the quality, reliability and security of supply of *prescribed transmission services*; and
>
> (4) maintain the reliability, safety and security of the *transmission system* through the supply of prescribed transmission services.

In its report to ElectraNet the Allen Consulting Group[16] suggested that the AER's decision might also be guided by:

- the market objective[17], which emphasises economic efficiency; and

[15] Schedule 6A.2 is entitled "Regulatory Asset Base"

[16] Appendix R to ElectraNet's Transmission Network Revenue Proposal : Treatment of Previously Optimised Transmission Assets by AGC, May 2007

[17] National Electricity Law, section 7: The national electricity market objective is to promote efficient investment in, and efficient use of, electricity services for the long term interests of consumers of electricity with respect to price, quality, reliability and security of supply of electricity and the reliability, safety and security of the national electricity system.

- the specific guidance for pricing[18], which emphasises financial incentives and cost recovery as two mechanism for encouraging economic efficiency.

3 CHC's approach

As discussed in section 2.4 the new rules set out specific tests that are to be applied to the assets under consideration. These tests do not specify the formal application of the ODRC methodology that was originally used to optimise the assets. Rather the current and potential utilisation of the assets to provide prescribed transmission services is to be assessed in the context of prudent design and economic efficiency of the network as expressed in the *capital expenditure objectives* listed in section 2 of the report.

In this report CHC's approach has firstly been to consider the historical reasons for constructing the assets in their present form, and the circumstances that may have resulted in their optimisation. In most cases it was found that the documentation of the previous decision that was placed in the public arena was insufficient to verify that it was based on sound principles, or that it was consistent with the optimisation of the assets of other TNSPs. While this exercise gives an indication of past thinking, it is not entirely relevant to the task of assessing the current situation under the new rules.

CHC's assessment of the merit of readmitting the assets is based on a review in the context of a hypothetical planning decision, assuming that the assets are being considered for re-commissioning from their optimised form to their real form at the start of the next reset period. The assets are sunk investments, but are treated as though the unfunded portion of their value, and the corresponding physical characteristics that this represents, are a potential investment. This is considered to be a reasonable basis in the context that the difference in valuation between the real assets and the optimised assets would only be funded from the time of their readmission, and that the regulatory framework does not require that the network assets be subject to periodic optimisation.

The assessment is guided by Rule S6A.2.1(f)(8)(ii) and the *capital expenditure objectives* as defined in clause 6A.6.7(a). It is noted that the first-mentioned rule requires that the asset must be considered by the *AER* to be reasonably required in order to achieve one or more of the *capital expenditure objectives*.

This report provides an opinion to the AER on the degree of compliance of the four previously optimised assets with the new Rules discussed above.

GHD proposed[19] that a planning horizon of 15 years should be used for the analysis. In its 2002 Report[20] SKM had acknowledged that this may be appropriate, but pointed to practical difficulties in applying its methodology beyond the 10 year period for which forecasts are published and network development proposals are developed.

[18] National Electricity Law, section 16.
[19] Appendix P to ElectraNet's Transmission Network Revenue Proposal: GHD Asset Optimisation Review Report May 2007, section 2.1
[20] Report by SKM for ElectraNet: 2001 Optimisation Review Final Report, February 2002, section 2.3.2

CHC considers that the horizon should be at least the break-even time period for each optimisation. This is the time after which the network development that incorporates the real asset would have a higher NPV cost than if the optimised asset was incorporated instead. CHC has estimated an indicative time horizon for each case using a 7% discount rate, having noted that the results are not very sensitive to the discount rate assumption.

In all cases studied for this review it is not necessary to look beyond a ten year horizon to reach the recommendations made.

4 Characteristics of all assets under consideration

In all four cases it is evident that the assets under consideration have the following three characteristics as specified in the Rule clause S6A.2.1(f)(8)(ii):

> In respect of test (A) all of the assets are used for the provision of *prescribed transmission services*. Each real asset forms part of the shared *transmission network,* and transfers *energy* according to their respective real capabilities. Their service is properly classified as a *prescribed transmission use of system (TUOS) service*.
>
> In respect of test (C) CHC has assumed, in view of the above, that other reviews of ElectraNet's revenue proposal will demonstrate that all of these assets are properly allocated to *prescribed transmission services* in accordance with the principles and policies set out in the *Cost Allocation Methodology* for the relevant *Transmission Network Service Provider*.
>
> In respect of test (D) CHC has assumed that the assets have been treated in accordance with the defined optimisations in previous revenue determinations, and consequently that the full value has not been otherwise recovered during the period in which the optimisation has been in force.

It is not evident, without further examination, that they will pass test (B), namely that the asset must be considered by the *AER* to be reasonably required in order to achieve one or more of the *capital expenditure objectives*. This test is the subject of the assessments described in section 5.

5 Consideration of test B for specific assets

According to test B of clause S6A.2.1(f)(8)(ii), for an asset to be restored to the RAB it is necessary for the AER to determine that it is reasonably required to achieve one or more of the *capital expenditure objectives* as listed in section 2.4.

This chapter assesses evidence that is relevant to this determination under test B. At the same time economic efficiency, as expressed in both the electricity market objective[21] and the guidance given to the AER under part 16 of the National

[21] National Electricity Law, part 7.

Electricity Law[22], is addressed by considering the relative capabilities and costs of the optimised and real assets.

5.1 Tailem Bend to Keith 132 kV transmission lines

5.1.1 History

In the early 1960's a single circuit 132 kV transmission line was constructed from Adelaide to provide the first transmitted supply to the south east of the State, supplementing wood-fired thermal local generation. This line was routed via Tailem Bend, Keith and Snuggery to Mt Gambier. Within a few years growth that was attracted by, amongst other considerations, the availability of transmitted supply, caused demand in the south east to rise to the extent that a second 132 kV line was required. In the early 1970's this line was built on a separate route from Tailem Bend. A separate route provided secure supply to Mt Gambier in the event of conditions that would otherwise place both lines in danger of being opened by a common event, for example thunderstorms or bushfires. This development was in accordance with standard industry practice of the day. To provide a more secure system the second line was turned in to Keith, so delaying a subsequent development and further enhancing the secure design.

This construction sequence was typical of that adopted by all supply authorities at that time, when they were faced with the task of replacing high cost local generation with economical transmitted supply. Double circuit construction was not considered to be an option.

The second line was built using a larger conductor size, and was designed to operate at a higher temperature, and so has a higher thermal rating than the first. However because of the configuration of the network only a relatively small amount of this additional power transfer capability has been utilised.

5.1.2 Current situation

The consultant that undertook the optimisation that currently applies noted that there were two single circuit lines between Tailem Bend and Keith, and decided to optimise this to a double circuit line. The optimised line had a conductor size intermediate between those of the two single circuits.

The methodology used for the optimisation applied an optimisation "rule" based on the fact that a second line was commissioned less than 10 years after the first was sufficient evidence that a double circuit line should have been constructed. Security considerations or demand forecast expectations at the time of the original decision were not included in the methodology. According to this rule if the second line had not been turned in to Keith, or if this connection had subsequently been removed, no optimisation would have occurred.

[22] National Electricity Law part 16: Manner in which AER must perform or exercise AER economic regulatory functions or powers.

5.1.3 GHD's assessment

GHD[23] reviewed ElectraNet's evidence regarding the history of the projects that are now subject to optimisation. It noted that different routes had been selected for the two 132 kV lines that connected Tailem Bend to Mt Gambier so that intermediate load points could be more readily supplied, although both lines had been connected to Keith to delay the construction of a 275 kV line. It also noted that double circuit 132 kV lines were not considered at that time, and ETSA had no design for such a line, because this configuration was not considered to provide N-1 security.

GHD also recorded that ElectraNet has plans for the future connection of two additional intermediate loads, one to each of the lines, and that there would be an economic benefit from the fact that different routes are used.

GHD[24] concluded by saying that it:

> "is of the opinion that the reasoning for the last optimisation does not take into account the historical planning that deliberately selected different routes for both security and possible future planning purposes, including projects that are in the current plan".

5.1.4 ElectraNet's position

ElectraNet has stated[25] that on the basis that there were good historical reasons why the two lines were constructed as single circuits, the fact that, on new information, the lines appear to have been constructed over periods from 1961 to 1963 and 1970 to 1973 (i.e. it cannot be confirmed that the lines were constructed within a 10 year period), and that ElectraNet has plans to make additional use of both lines as separate entities with the 10-year planning horizon, the optimisation should be removed and the regulated asset value restored to that based on the two single circuit constructions.

5.1.5 CHC's assessment

CHC reviewed the break-even time that makes a decision to use the current construction (two single circuits constructed at intervals) more economic than using the optimised construction (double circuit) from the outset. Using the costs proposed by ElectraNet and summarised in section 7.3, this is about 20 years at 7% discount rate[26]. Viewed solely as an economic decision in the early 1960's, and ignoring other factors, double circuit construction may have been preferred.

However, CHC considers that a prudent planner in the early 1960's would not have established a double circuit line to provide transmitted supply to a remote isolated system. Nor would the planner have established a double circuit line with one circuit strung, as the technology at the time would not have permitted the stringing of a

[23] Appendix P: GHD Asset Optimisation Review Report May 2007, p5
[24] Appendix P: GHD Asset Optimisation Review Report May 2007, section 3.1 p6
[25] Written advice from ElectraNet to its consultants, GHD.
[26] On this basis the "10 year rule" used in the original optimisation of these assets was conservative.

second circuit while keeping the remaining circuit alive. Further there is evidence that it would not have been obvious under the circumstances that a second line would be required so soon after the first. CHC agrees that the historical development of these lines was prudent given the circumstances at the time, and considering good industry practice regarding diversity of routes to improve security of supply.

Turning to the current circumstances, CHC considers that the presence of the real configuration has a moderate potential value in the medium term that is greater than that of the optimised asset, and that there is a reasonable probability that this potential could be utilised in the next regulatory period. The two reasons for this opinion are outlined below.

Firstly, ElectraNet has included a project in its revenue proposal that will connect a new Distribution Network Service Provider (DNSP) supply substation to the Keith to Tailem Bend number 2 line at an intermediate location identified as "Coonalpyn West." ElectraNet has advised that this will occur in the next reset period, and the ElectraNet Annual Planning Review[27] indicates a date of 2012. This connection will alter the configuration, such that there will no longer be two single circuit lines directly between Keith and Tailem Bend. It was that configuration that prompted the original optimisation.

GHD also mentioned a future connection from the Keith to Tailem Bend number 2 line to a new Geranium supply point. This development is not supported by the Annual Planning Review, which indicates that Geranium would be supplied by a new double circuit line from Coonalpyn West. However this does not materially change the conclusion, because the configuration is sufficiently altered by Coonalpyn West alone.

As context for the second reason it is necessary to understand that the 132 kV network between South East (near the Victorian border and Mt Gambier) and Tailem Bend is operated in parallel with the double circuit 275 kV line that forms part of the "Heywood" interconnector between Victoria and South Australia. The 132 kV network shares in the power transfer, and contributes to the total interconnection power transfer capability. This 132 kV system is heavily utilised in providing prescribed services, but the interconnection power transfer can be limited by the thermal capacity of the first (smaller conductor) 132 kV line under some conditions.

In addition to supporting interconnection, the 132 kV network supplies local load areas in the south east area, and provides a connection for new generation sources (gas turbine and wind power) to the Adelaide area via Tailem Bend and Tungkillo. With the completion of the Lake Bonney stage 2 wind farm the total wind capacity will be 287 MW, and gas turbine generation totalling 142 MW is also connected.

The ROAM Report for ElectraNet[28] indicates that there is a high probability of new generation in this area. Consequently it is reasonable to assume that, in the next regulatory period, the combined output of gas and wind generation at times of good

[27] ElectraNet Annual Planning Review 2007-2017, June 2007 p68

[28] Appendix C to ElectraNet's Transmission Network Revenue Proposal: ROAM Consulting Report: 2007 South Australian Generation and Load Scenario Analysis, 28 May 2007

wind strength will begin to load up the 132 kV system to the extent that the import capability from Victoria on the 275 kV system may be further constrained.

The fact that wind energy is very variable presents NEMMCO and ElectraNet with two problems in regard to supply security. The first is that, based on experience, there is a sufficiently low probability that wind generation will be available at periods of peak demand to warrant discounting its value in the supply versus demand assessment. Therefore ElectraNet must plan to meet the demand using transmitted supply from sources other than wind. However at other times, when there is a high availability of wind generation, it may also be important that this energy is not excessively constrained by network capacity in offsetting more expensive (and more greenhouse gas intensive) generation. In other words wind must be treated as an energy source, rather than a contributor to peak power demand. This second factor needs to be assessed by a market benefit analysis.

The current actual configuration of the 132 kV lines, compared with the optimised assets, gives ElectraNet some relatively low cost options to address this problem within the context of a market benefits test. For example the 132kV line that has the larger conductor is relatively less utilised, and the network could possibly be configured at relatively low cost to cause this to accept a greater proportion of the power transfer.

5.1.6 CHC's recommendation

CHC considers that the Tailem Bend to Keith lines satisfy two of the capital expenditure objectives. Specifically they:

- meet the expected demand for *prescribed transmission services*;
- comply with all applicable *regulatory obligation*s associated with the provision of *prescribed transmission services*;

The additional services that the real assets provide above the optimised asset have a potential value in providing for connection of loads to support DNSP systems in the next regulatory period, and also options for augmentation of the network if justified by a market benefit test.

They should therefore be valued according to their actual configuration of two different 132 kV single circuit lines.

5.2 Tungkillo to Mobilong 275 kV transmission line[29]

5.2.1 History

A single circuit 275 kV line was constructed from Para to Tailem Bend in 1976, as the first stage of upgrading supply capacity from Adelaide to the south east of the State. The second stage of this upgrading was overtaken by ETSA's decision to develop the 275 kV interconnection with Victoria. This was constructed around 1989 as a double circuit line between the Victorian border and the Tungkillo site, except that only one circuit was strung between Tailem Bend and Tungkillo because the original single circuit line provided the second circuit that was required.

The unstrung side of the 275 kV line between Tailem Bend and Tungkillo was considered by ETSA to be a prudent provision to provide for future upgrading of interconnection capacity, recognising that the Victorian network to Heywood is capable of supporting much higher transfers. Opposition to construction of lines through this area was another factor.

5.2.2 Current situation

Both the original single circuit 275kV line and the single-sided double circuit line between Tailem Bend and Tungkillo were originally optimised by combining them into a double circuit 275kV line. In 2002 this was changed on account of recognition of historical development by restoring both circuits to single circuits, but the second circuit was optimised to the value of a single circuit line. At the same time the portion of this line between Tailem Bend and the site of a proposed 275/132 kV Eastern Hills substation near Mobilong was readmitted in recognition of the fact that a second circuit would be strung on the towers between these two locations when the substation is built. Currently the optimised line comprises 33.3 km of notional single circuit line and 32.3 km line valued according to the real construction of double circuit line with one circuit strung.

In the event the pattern of urban development has been such that this site for the Eastern Hills substation is no longer the preferred option: rather a substation near Mt Barker near the Tungkillo to Cherry Gardens line is more likely to be built in the next regulatory period. While this puts a question mark over the 2002 optimisation decision there is no mechanism for it to be reversed, if this was considered desirable under the current circumstances.

In recent years the maximum permitted interconnection transfer from Victoria into SA has been reduced from 500MW to 460MW because of a reduction in the assessed rating of the 500/275 kV tie transformers, which are located in Victoria, by SPAusnet. This means that the maximum power transfer from Tailem Bend to Tungkillo due to interconnection has also been reduced.

[29] This was previously identified as the Para (Tungkillo) to Tailem Bend 275 kV transmission line, but only the portion of this line between Mobilong and Tungkillo is currently subject to optimisation.

5.2.3 GHD's assessment

GHD reviewed information provided by ElectraNet, and noted that provision had been made by ETSA, when constructing lines to achieve interconnection with Victoria in 1989 for eventual addition of a third 275 kV circuit between Tailem Bend and Para because of difficulties of obtaining approvals and public opposition at the time. This provision was made by constructing a double circuit line, with conductors strung on one side only.

GHD noted that ElectraNet had identified several triggers that would require stringing the third circuit to avoid overloading one of the existing circuits in the event of a single contingency removing the other from service. These included:

- Eastern Hills 275 kV injection loading up the Tungkillo-Cherry Gardens line
- The committed Lake Bonney wind farm;
- Vic-SA interconnection upgrade to either 630 MW or 760 MW; and
- Tailem Bend generation connected to the SEA Gas pipeline.

GHD reviewed the ROAM Report regarding the need for new generation or imports from Victoria, and the possible nature and location of developments under a variety of scenarios. For scenarios involving increased generation in the south east it reviewed analyses by ElectraNet that demonstrated the need to construct an additional circuit from Tailem Bend to Tungkillo to prevent overloads.

GHD stated that in its opinion "this asset meets the optimisation principle that the reasonably expected level of use, based on the required level of service potential, is consistent with both the reasonably foreseeable future use and the objective of minimising the whole of life cost of assets", and that the previous optimisation should be reversed.

5.2.4 ElectraNet's position

On the basis that there are foreseeable developments within the 10-year planning horizon that will warrant the stringing of this vacant section on the existing double circuit structures, ElectraNet's position[30] is that the optimisation should be removed and the asset value restored to that based on double circuit construction for the remainder of the line from Mobilong to Tungkillo.

ElectraNet stated that it is relevant that it has proposed two contingent projects[31] in the next regulatory period that would require the addition of the second circuit to this line. These are both triggered by successful application of a market benefits test and are:

- Generation at Tailem Bend or between Tailem Bend and Tungkillo; or
- Heywood interconnection capacity upgrade to 630MW.

[30] Written advice from ElectraNet to its consultants, GHD.
[31] Appendix H Proposed Contingent Projects 1 July 2008 to 30 June 2013

5.2.5 CHC's assessment

The interconnection between Victoria and SA has two points of relative weakness, the more serious one at this time being the 500/275 kV transformers across the border in Victoria and the connecting lines to South East. However expected developments described below could result in the second weak point between Tailem Bend and Tungkillo becoming the more serious one under some NEM dispatch conditions. The portion of the interconnection between South East and Tailem Bend is stronger than this because there is a stronger underlying 132 kV system that transfers a useful portion of the total power.

Essentially the power to be transferred from Tailem Bend towards Adelaide is the sum of the interconnection flow from Victoria plus the generation in the south east of SA, nett of the load. The maximum South East load demand will be in the vicinity of 200 MW by the end of the regulatory period and, of course, this demand is less at off-peak times. Generation output in excess of the demand at any time will result in higher transfer from Tailem Bend to Tungkillo than the transfer into South East from Victoria.

There are now several generating stations in the south east that depend on the Tailem Bend to Tungkillo lines for access to the Adelaide area, and these compete in the market with imports. Another wind farm is committed for construction.

South east generators include gas turbines at Snuggery (60 MW effective), Ladbroke Grove (84 MW), and wind farms at Lake Bonney (81 MW) and Canunda (46 MW). A second stage of Lake Bonney (160 MW) is committed. With completion of this development the balance is in favour of generation, particularly at off-peak times and when there is good wind strength.

Analysis by NEMMCO, in its Statement of Opportunity, by ESIPC and ROAM all confirm that South Australia will need to source additional generation either locally or via interconnection or both over the next regulatory period. At issue here is where this will be located, and whether this will require another 275 kV circuit between Tailem Bend and Tungkillo.

The generation development scenarios proposed by ROAM Consulting[32] include a high (95%) probability that one or more substantial gas turbine developments will occur in the next regulatory period in the vicinity of Tailem Bend, where a gas pipeline is adjacent to the 275 kV network. The potential development of at least one 150MW station is an inclusion in all 16 development scenarios, and most have more than one. However, as these are uncommitted projects any associated transmission developments have been treated in ElectraNet's proposal as contingent projects, and would be triggered by a successful regulatory test.

The issue of the treatment of wind generation was discussed in section 5.1.5 in relation to the Keith to Tailem Bend optimisation, and the same considerations apply here. If the Tailem Bend to Tungkillo constraint significantly reduces the competition between the south east generators and those around Adelaide and to the north it is

[32] Appendix C to ElectraNet's Transmission Network Revenue Proposal: ROAM Consulting Report: 2007 South Australian Generation and Load Scenario Analysis, 28 May 2007

quite likely that a market benefit analysis would give a positive result, and it is almost certain that the preferred option would be the stringing of the second circuit on the Tailem Bend to Tungkillo line. This option could be implemented quickly, and with very little environmental impact. The availability of this option therefore makes the real asset more valuable than the optimised asset.

If the optimised asset had actually been in place instead of the real asset, ElectraNet would not have access to this option, but would need to obtain a third single circuit line route between Tailem Bend and Tungkillo. Advice from ElectraNet is that this would be difficult and, being a less environmentally responsible development, would attract public opposition.

This advice by ElectraNet has been tested by CHC through desk-top studies using Google Earth images. At several locations on the current route areas of potentially high environmental impact have been observed[33]. It is therefore problematic whether the option to obtain another route that would be forced by the optimised asset would be achievable. This fact reflects on the prudence of the real asset.

GHD also mentions an Eastern Hills 275 kV injection loading up the Tungkillo-Cherry Gardens lines as a possible driver for the Tailem Bend to Tungkillo line. CHC has reviewed this, and has concluded that it is less relevant than the location of generation in the south east, and the requirement of this generation to compete with other generation in SA in order to achieve market benefits. However this does not substantially lessen the argument for reversing the optimisation.

CHC has also estimated the break-even time that makes a decision to use the current construction (double circuit with one circuit strung) more economic than using the optimised construction (single circuit) initially and adding another single circuit line later. Using the costs proposed in section 7.3, this is about 20 years at 7% discount rate. Viewed from the perspective of the original construction in 1989 this is likely to be marginal if the line is required during the next reset period. However, viewed from the perspective of the current construction not being rewarded with income due to the optimisation, the current construction is now prudent.

5.2.6 CHC's recommendation

CHC considers that the Mobilong to Tungkillo line in its current real configuration satisfies the first two capital expenditure objectives. Specifically it:

- meets the expected demand for *prescribed transmission services*; and
- complies with all applicable *regulatory obligation*s associated with the provision of *prescribed transmission services*.

The line also has the potential, if justified by a market benefits test in the next or following regulatory period to do the following that would not be possible with the optimised asset:

[33] Examples are at the following three map references: 35° 02' 16.19"S 139° 15' 55.84"E (both existing lines); 34° 44' 47.62"S 138° 51' 09.27"E (double circuit towers); and 34° 43' 45.08"S 138° 49' 13.10"E (double circuit line)

- maintain the quality, reliability and security of supply of *prescribed transmission services*; and
- maintain the reliability, safety and security of the *transmission system* through the supply of prescribed transmission services.

The line should therefore be valued according to its actual configuration of a double circuit 275 kV line with one circuit strung.

5.3 Davenport to Cultana 275 kV transmission line

5.3.1 History

The Davenport – Cultana double circuit 275 kV line was constructed in 1993 as the first stage of reinforcement of the Eyre Peninsular region, previously supplied at 132 kV. Davenport is the connection point for the northern thermal power stations, and Cultana is near a major load area.

Given the forecast loads at the time that indicated the need for two separate circuits within 4 years, and having regard for difficulties of obtaining approvals to construct a line (which includes a complex, high cost crossing of Spencer Gulf and passes through a restricted army training reserve with risk of unexploded ordnance along a significant part of the route), the line was constructed as a double circuit with both sides strung, but operated as a single circuit with the two circuits bonded together. The intention was to separate the circuits when justified by reliability (now Electricity Transmission Code (ETC)) requirements, to provide a relatively simple, prudent and approvals-free reinforcement to Cultana. The alternative was to build a single circuit line followed by second single circuit line that, at the time, was thought to be needed well within 10 years if, indeed, a second line route could be obtained.

5.3.2 Current situation

The line was optimised to a single circuit 275 kV line, and the difference in value was removed from ElectraNet's asset base. There is no record of the reason for this optimisation, which seems at variance with that for the Keith to Tailem Bend lines.

Development of the network did not proceed as envisaged when the original decision was made. Generation was added, some loads did not develop as rapidly as expected, while others were split off and supplied at 275kV. In addition the 132kV network was reconfigured, and additional loads were added. The end result of many changes has been that the reinforcement from Davenport to Cultana has not yet been committed. However it is planned at the end the next revenue reset period.

5.3.3 GHD's assessment

GHD reviewed the history of the project and surmised that the optimisation had been carried out because the reconfiguration of the line to double circuit operation was not required by load growth within 10 years from the initial construction.

It noted that, based on forecast demands, the planned reconfiguration was now required at the end of the next reset period at the latest, and that ElectraNet would

only achieve this late date by purchasing grid support from generators on the Eyre Peninsula to cover contingencies.

GHD stated that its opinion is that, given that the Davenport-Cultana 275kV line is required as a double circuit line within the 10 year planning horizon, the previous optimisation of the transmission line from double circuit to single circuit should be reversed to that of the existing system i.e. a 275kV double circuit line.

5.3.4 ElectraNet's position

ElectraNet[34] has included the Cultana reinforcement in its capex forecast, timed for commissioning in 2013. As this project requires the separation of the circuits, utilising the double circuit construction as originally intended, the optimisation should be removed and the regulated asset value restored to that based on double circuit construction.

5.3.5 CHC's assessment

CHC has estimated the break-even time that makes a decision to use the current construction (double circuit with both circuits strung) more economic than using the optimised construction (single circuit) initially and adding another single circuit line later. Using the costs proposed in section 7.3 this is about 13 years at 7% discount rate[35]. Viewed from the perspective of the original construction in 1993 the timing has turned out be marginally uneconomic due to the many changed circumstances. However, if viewed from the perspective of the current construction not being rewarded with income due to the optimisation, the extra investment could still be prudent.

CHC has examined the documentation that ElectraNet made available to its consultants, GHD. This included the results of load flow analysis that demonstrated the loading conditions that would lead to the necessity to separate the two circuits on the double circuit line to form two circuits between Davenport and Cultana[36].

CHC undertook a desk-top study to verify claims about the route constraints that affect the ability to form a second line between Davenport and Cultana. In particular claims about the complexity of the Gulf crossing, and the fact that the route traverses a restricted army training area, were verified.

In view of the route constraints CHC considers that the original decision to use double circuit 275 kV construction and to string both circuits was prudent, given that the demand forecasts at the time indicated that the second circuit would be required soon after the first.

There is no record of ETSA considering the option of constructing a double circuit line with one circuit strung. It would have been reasonable for them to reject this option, because the second circuit was thought to be needed in 4 years, and the route

[34] Written advice from ElectraNet to its consultants, GHD.
[35] This also shows that if a "10 year rule" was applied to the optimisation it was invalid.
[36] This development also requires other works at both terminals, including a second 275/132 kV transformer at Cultana.

had difficult access. Further there are considerable technical difficulties in safely stringing the second circuit with the first alive. There are only short windows throughout the year to do this while maintaining secure supply to the Eyre Peninsula. Consequently this work could extend over a long period.

A second possible alternative could have been to only string the second circuit over parts of the route where this would have been difficult to achieve later. However this would have required multiple connections to parallel the two circuits, and would have been more costly and more difficult to reverse. The option has the same problems with live line stringing. Therefore this alternative can be discounted in practical terms.

Turning to the current situation it is evident that the Cultana augmentation will be required in the next regulatory period, although there are a number of unrelated developments that could influence the exact timing. The timing is driven by a number of overloading and quality of supply issues that occur when the existing single 275kV line or 275/132kV transformer are disconnected. By 2013 the currently contracted grid support generation can no longer relieve these. While the growth of demand (and amount of demand at risk of not being supplied) is small, the situation would breach ElectraNet's ETC obligations.

The ROAM Consulting scenarios[37] do not directly impact on this reasoning, although the presence of additional generation on the Eyre Peninsular that is reliable enough to contract to provide additional Network Support Services could delay the need for the augmentation. Wind generation would probably not satisfy this requirement.

5.3.6 CHC's recommendation

CHC considers that the Davenport to Cultana line satisfies the capital expenditure objectives. Specifically it:

- meets the expected demand for *prescribed transmission services*; and
- complies with all applicable *regulatory obligation*s associated with the provision of *prescribed transmission services*.

The line also has the potential, in the next regulatory period to continue to do the following, which would not be possible with the optimised asset, which is a single circuit line, because it cannot be configured as two separate circuits:

- maintain the quality, reliability and security of supply of *prescribed transmission services*; and
- maintain the reliability, safety and security of the *transmission system* through the supply of prescribed transmission services.

The line should therefore be valued according to its actual configuration of a double circuit 275 kV line with both circuits strung.

[37] Appendix C to ElectraNet's Transmission Network Revenue Proposal: ROAM Consulting Report: 2007 South Australian Generation and Load Scenario Analysis, 28 May 2007

5.4 Robertstown (Tungkillo) to Cherry Gardens 275 kV transmission line

5.4.1 History

Associated with the development of the Northern Power Station, located south east of Port Augusta, a double circuit 275 kV line was constructed in 1989 from Davenport to Cherry Gardens substation, via Robertstown and the Tungkillo switching station site.

Cherry Gardens was chosen as a major point of distribution for the south western suburbs of Adelaide (until then supplied by lines from the north that passed through the urban areas), and to provide for high growth areas in the hinterland.

At Tungkillo the line from the north crossed the lines between Tailem Bend and Para that were built to interconnect with Victoria. The concept was that, when needed, a switching station would be built at Tungkillo to terminate the incoming 275 kV lines from the north and south, together with the lines into Adelaide via Para and Cherry Gardens.

The original line from Davenport via Robertstown was constructed as a double circuit line, and used a single conductor for each of the six phases to the north of Tungkillo, from which point twin bundled conductors were used for each phase for the remainder of the route to Cherry Gardens.

The reason for changing to a two conductor bundle was to make provision for the future growth in demand expected to take place in the southern suburbs of Adelaide.

5.4.2 Current situation

The line between the Tungkillo site and Cherry Gardens was optimised to a double circuit line with a single conductor per phase, and was valued accordingly.

The construction of the Tungkillo switching station has commenced, and this will begin to implement the original vision described above.

5.4.3 GHD's assessment

GHD reviewed the history of the project, and noted that the planning that resulted in the decision to use twin conductors on the final section of the line from the northern power stations was based on the eventual formation of a switching station at the Tungkillo site, where the interconnection line from the south east crossed the line from the northern power stations.

GHD noted ElectraNet's advice that additional power input would be required to Tungkillo in order for the twin conductor Cherry Gardens lines to have advantages over the single-conductor optimised line. It identified the Lake Bonney stage 2 development, or 300 MW of new peaking generation near Tailem Bend, or a Heywood interconnection upgrade, or some constrained combination of Heywood and additional generation as potential triggers. GHD reviewed ElectraNet's analysis that demonstrated that the twin conductor line to Cherry Gardens prevented overloading of one of the Tungkillo to Para lines under contingency conditions that would otherwise be present if only single conductors were used.

GHD noted that ETSA had experienced difficulty in obtaining approvals for the line due to public opposition, and that this was evidenced by the fact that triple circuit construction had been used over a substantial length to avoid obtaining an additional line route.

GHD's opinion was that "the asset meets the optimisation principle that the reasonably expected level of use based on the required level of service is consistent with both the reasonably foreseeable future use and the objective of minimising the whole of life cost of assets".

5.4.4 ElectraNet's position

ElectraNet stated[38] that on the basis that:

- Tungkillo switching station is currently under construction;
- Real and reactive power loss savings are accruing due to the actual twin conductor construction;
- Tungkillo's existence allows for the splitting of the two parts of the Robertstown to Cherry Gardens lines to realise the full potential of the four 275 kV circuits supplying Adelaide from Tungkillo[39] as originally intended;
- There are a number of plausible triggers in the near future that will develop the Tungkillo site to its ultimate configuration; and
- The current optimisation fails to recognise the mismatch in capacity either side of Tungkillo;

the optimisation should be removed, and the regulated asset value restored to that based on the original twin conductor construction.

5.4.5 CHC's assessment

CHC has examined the documentation that ElectraNet made available to its consultants, GHD. This included the results of load flow analysis that demonstrated the shortcoming of the optimised assets in providing secure supply to Adelaide after the construction of Tungkillo switching station and the addition of higher power input to Tungkillo from the south east that will require construction of the third Tailem Bend to Tungkillo line. This potential development is the same as that which influenced CHC's recommendation for this line in section 5.2.5.

The two power transmission paths away from Tungkillo towards Adelaide go via Para and Cherry Gardens, but are joined together within Adelaide, so that the relative power transmission levels on these two paths are inter-related. Consequently the transfers on the lines to Cherry Gardens depend on the total load demand of the Adelaide area, its distribution within Adelaide and the location of the dispatched generation on the network. Thus the route taken by the total power entering Adelaide via Tungkillo is influenced by generation near Adelaide and that entering via other

[38] Written advice from ElectraNet to its consultants, GHD.
[39] Two circuits from Tungkillo to Cherry Gardens and beyond, plus two circuits from Tungkillo to Para and beyond.

routes from the north and south east. Twin conductor lines between Tungkillo and Cherry Gardens will attract a larger portion of the total transfer, because they offer a path that offers less impedance than a single conductor.

ElectraNet's analysis concentrated on the contingent developments, discussed in section 5.2.4 that would increase the total power transfer via Tungkillo, particularly additional generation in the south east of SA, or additional imports that might be facilitated by a small or large scale augmentation of the interconnection with Victoria. The analysis showed that the extra power that flows via Cherry Gardens with twin conductors in place was important in preventing overloads in the Tungkillo to Para section (where single conductors are used), under contingency conditions. ElectraNet showed that if there was enough extra power transfer from the south east to justify the third Tailem Bend to Tungkillo circuit, then this would also be enough to require twin conductors to Cherry Gardens rather than single conductors.

It is also evident that, if and when a third circuit is required between Tailem Bend and Tungkillo, there would be a mismatch between the total capacity from power stations into Tungkillo and the capacity on the load side out of Tungkillo, unless twin conductors are used to Cherry Gardens. This would be because there would be five circuits into Tungkillo and only four circuits out.

CHC's analysis also shows that there would also be a mismatch on the output side of Cherry Gardens, where 275 kV lines carry the power onwards to Morphett Vale East and Happy Valley. The ultimate expectation is that there will need to be four circuits out of Cherry Gardens to these locations, and possibly another two from this area to the Fleurieu Peninsula[40]. This would be matched by twin conductors on the Tungkillo–Cherry Gardens lines. With only one conductor per phase there would be a need in the near future for either construction of a second double circuit line into Cherry Gardens or the live-line changeover to twin conductors.

The growth potential of the urban development area served by Cherry Gardens is clearly sufficient to justify a high capacity line to serve it. This assessment is supported by the fact that there is now a freeway serving the area's growth.

CHC has done a desk-top study to assess whether the construction of two single-conductor double circuit lines between Tungkillo and Cherry Gardens (as implied by the optimised configuration) would have been feasible. It has been concluded that it would be difficult to obtain environmental and community approval for this, given the characteristic of the current route. In particular Google Earth images[41] show that the line traverses areas of high value, and in some areas the urban development footprint has moved very close to the existing line, such that underground cable may be required for a second line, at high potential cost.

ElectraNet has claimed that the twin conductor line configuration is already saving losses, and CHC substantiates this claim. This arises because the twin conductor line tends to move power transfer from other parallel lines to themselves, where the losses

[40] See Appendix H Proposed Contingent Projects

[41] For instance three Google Earth map references are 35° 05' 03.22S 138° 46' 19.08"E; 35° 04' 51.96"S 138°47' 53.64"; and 35° 05' 05.09"S 138° 51' 07.39" (line near Mt Barker urban area)

are lower because of lower conductor resistance and reactance. This is a valuable property of the actual configuration.

CHC has also estimated the break-even time that makes a decision to use the current construction (double circuit with twin conductor bundles) more economic than using the optimised construction (double circuit with single conductors) initially and adding second (similar) double circuit, single conductor line later. Using the costs proposed in section 7.3 this is about 20 years at 7% discount rate. Viewed from the perspective of the original construction in 1989 the timing is likely to be marginal if the requirement arises in the next reset period. However, if viewed from the perspective of the current construction not being rewarded with income due to the optimisation, the extra investment is prudent.

5.4.6 CHC's Recommendation

CHC considers that the 275 kV line between Tungkillo and Cherry Gardens satisfies the capital expenditure objectives. Specifically it:

- meets the expected demand for *prescribed transmission services*; and
- complies with all applicable *regulatory obligation*s associated with the provision of *prescribed transmission services*.

The line also has the potential in the next or following regulatory period to continue to provide services which will become impossible to provide with the optimised asset. This is the case because the optimised asset has only a single conductor per phase, which means that it will divert less power away from the lines that overload under post-contingency conditions, and furthermore it has a lower capacity to supply the load area in the long term. For these reasons the real asset will continue to:

- maintain the quality, reliability and security of supply of *prescribed transmission services*; and
- maintain the reliability, safety and security of the *transmission system* through the supply of prescribed transmission services.

The line should therefore be valued according to its actual configuration of a double circuit 275 kV line with both circuits strung using twin conductors.

6 Methodology for readmission of assets

6.1 ACG's report[42]

ElectraNet engaged the Allen Consulting Group (ACG) to provide economic advice on how those assets recommended for readmission to the RAB should be valued for regulatory purposes.

[42] Appendix R to ElectraNet's Transmission Network Revenue Proposal : Treatment of Previously Optimised Transmission Assets by AGC, May 2007

The conclusions of ACG's report are as follows[43].

- Two methods are appropriate for valuing the previously surplus capacity in ElectraNet's network, namely the future expenditure that is avoided as a result of having that greater capacity or the value that would be assigned to that surplus capacity in a regime that set (and reset) the regulatory asset value at ODRC. If applied correctly, both methods deliver the same result.

- Putting aside age-related depreciation, the value for the previously surplus assets that is derived with reference to avoided cost or the value under an ODRC regime is the sum of:

  – the difference between today's construction cost of the asset that was previously considered optimal (i.e. the one that is reflected in the regulatory asset value at present) and today's construction cost of the higher-capacity asset that is now considered optimal (assumed to be the actual asset); and

  – an amount that reflects the economies of scale that now are being realised as a result of the higher-capacity asset having been built (this is the difference between what it would now cost to serve demand using the previous optimal asset and the next (incremental) expansion and what it would cost to serve demand using the single, higher-capacity asset).

- ACG noted that the second of the amounts set out above may not be simple to estimate, however, as it requires knowledge of how the network would have been augmented if the TNSP actually had the hypothetical optimised asset rather than its actual asset. It would not be expected that a TNSP naturally would have (or could easily generate) this information, given that networks are planned on the basis of the assets that actually are in place. If the second of the elements is ignored, then the value assigned to the previously surplus assets would be likely to understate the avoided costs and the value that would be implied by an ODRC regime.

- The value calculated using the method above needs to be depreciated to reflect the difference in the forward-looking cost of operating the actual asset compared to the "new" asset used in the calculations. In principle, this should reflect a consideration of the differences in costs of operating (and renewing) the actual asset compared to the asset in place. In practice, such a calculation is complex, and straight line depreciation is often used for simplicity. However, ACG considered it likely that straight line depreciation would over-depreciate the asset, and hence lead to the value of the surplus capacity being understated.

6.2 ElectraNet's approach

In its Revenue Proposal ElectraNet[44] has adopted what it terms a "minimum" approach, which is that which ACG describes in the above discussion as being conservative. Specifically ElectraNet has discounted the possibility of estimating the

[43] ibid, p ix
[44] ElectraNet Revenue Proposal Section 7.5

value of the second amount suggested by the AGC, and it has applied straight line depreciation.

6.3 CHC's approach

It is beyond CHC's brief to comment on such economic matters. CHC has therefore accepted that the value at which assets should be readmitted into the RAB is the difference between the current replacement cost of the non-optimised asset (i.e. the actual asset in service) and the optimised asset (as reflected in the regulatory asset value at present) adjusted for age using straight-line depreciation. This means that valuations should be calculated in dollar values that are consistent with the RAB calculation, and the depreciated incremental value would be added to ElectraNet's opening asset base as of 1 July 2008.

7 Increased value of assets

7.1 GHD's report[45]

ElectraNet commissioned GHD to value the assets that were proposed to be readmitted, based on Modern Replacement Cost and "industry accepted valuation principles".

GHD performed this valuation in 2006/07 dollars for the network configurations represented by the:

- Year 2001 Optimisation configuration; and
- Recommended readmitted configuration.

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

The asset valuations recommended by GHD are listed in table 1 in section 7.3.

7.2 ElectraNet's review of Asset Values

In response to questions posed by CHC about some possible inconsistencies in GHD's Report (Appendix Q), ElectraNet later advised some corrections, as follows:

In Appendix Q of the revenue proposal GHD valued the single circuit 132 kV Keith to Tailem Bend lines as though the two real lines have the same conductors, whereas this is not the case, as the line first constructed has a smaller conductor than the

[45] Appendix Q to ElectraNet's Transmission Network Revenue Proposal : Report Transmission Line Replacement Cost by GHD, May 2007

second. ElectraNet provided separate costs for the two lines, which are added together in the summary tables.

For the same asset (Keith to Tailem bend) ElectraNet advised CHC that GHD had used a conductor size for the optimised double circuit line that is intermediate between the sizes of the two real lines. ElectraNet revised this valuation, using an alternative conductor type that has a similar size, but lower cost.

For the Tailem Bend to Tungkillo line GHD incorrectly assumed in Appendix Q, that the entire line length remained optimised after the last review, and this was corrected by ElectraNet, who advised that only 33.5 km of the 65.6 km length is now optimised. ElectraNet provided revised valuations for the whole line, on the basis that it has hybrid optimised and real construction.

These changes are recorded in table 1 in section 7.3 below.

7.3 CHC's assessment

CHC carried out an independent analysis to support the valuation of both the real assets and the optimised alternatives for all four of the assets proposed for readmission into the asset base. It is noted that there are assumptions and potential inaccuracies in doing this, particularly when conducted as a desk-top exercise with hypothetical optimised assets. These potential inaccuracies affect some valuations more than others. For example assumptions about the terrain and accessibility are not relevant where the valuation considers different conductor configuration on the same towers.

Overall CHC's valuations of individual assets have a range that lies both above (by +11.1%) and below (by -7.7%) those determined by GHD or as revised by ElectraNet. However the range of the difference between the real and optimised assets, being the difference between two large numbers, was greater. It ranged between +58.2% and -40.8% and had a weighted average of -4.7%[46]. CHC has proposed adjustments as described below that reduce the upper limit of the individual difference to +9.3%, and the range of difference between real and optimised costs to +8.5% and -10.6% with a weighted average of 0%.

CHC has the following specific observations about the valuations prepared by GHD:

- The base date year should be the same as that for the starting RAB calculation as a whole. GHD has used 2006/07 dollars, and CHC has adopted this for ease of comparison.
- For the Tailem Bend to Keith 132 kV lines the valuations advised by ElectraNet for the real and optimised assets are acceptably close to those estimated by CHC, and CHC proposes no change.
- For the Tailem Bend to Tungkillo line the corrected valuations proposed by ElectraNet were used as the basis of the evaluation. ElectraNet did not change the valuation assumptions that GHD had used, but corrected the length of

[46] A negative weighted average means that GHD/ElectraNet's estimate of the difference is greater than CHC's.

optimised assets. GHD used a rule of thumb adjustment to a standard base planning object (BPO) to determine a valuation for a double circuit line with one of the two circuits not strung. Using costs of component material CHC estimates that there would be a saving of 11% rather than the round figure change of 15% assumed by GHD by not stringing the second circuit. CHC recommends that the correction to the difference in costs be achieved by assigning a value to the real double circuit line with one conductor strung of $25.041 million[47] instead of $24.041 million. CHC also recommends a reduction in the value of the optimised asset of $0.245 million due to double counting in one of the terrain adjustment factors used by ElectraNet when reviewing the asset. The overall effect is to increase the difference in valuation between the real and optimised assets to $3.073 million.

- CHC found that GHD's valuations for the Davenport to Cultana line were acceptably close to its own, and proposes no change.
- For the Tungkillo to Cherry Gardens line CHC considers that GHD has over-estimated the additional cost of twin conductors compared to single conductors. Using component costs for conductors, fittings and stringing CHC has estimated that single conductors would save 16%, while GHD has estimated a saving of 26% (using twin conductors as the reference). To correct for this CHC recommends that the real double circuit twin conductor line be assigned a valuation of $31.297[48] million instead of $34.297 million, reducing the difference in valuation between the real and optimised assets to $5.874 million.
- In both cases where CHC has proposed a change it considers that it can be confident in its assessment because the cost differentials for different numbers of strung conductors do not require assumptions about matters such as terrain or construction difficulties, being based solely on material quantities and labour costs that are relatively easy to estimate.
- The proposed changes represent a compromise between the valuations made by Electranet/GHD and CHC. They pay particular attention to the differences between the values of the optimised and real assets, because this is the basis for the increment that would be applied to ElectraNet's RAB if the assets are readmitted. This difference is more accurately calculated than the total valuations, because common factors that are difficult to estimate are removed from the calculation.

Table 1 below summarises the valuations recommended by GHD, the valuations after adjustments advised by ElectraNet, the valuations assessed by CHC, and the valuations that are recommended by CHC for use in calculating the adjustments to ElectraNet's RAB if the assets are readmitted.

[47] This approximately averages the impact of not stringing the second circuit as estimated by CHC and GHD.
[48] This approximately averages the impact of optimisation as estimated by CHC and GHD.

Table 1: Summary of modern equivalent replacement costs ($2006/07) proposed by the entities listed

Transmission Line	GHD Report	ElectraNet Revision	CHC Estimate	Value Recommended by CHC
Tailem Bend – Keith Optimised	$42,754,000	$41,023,000	$44,852,000	$41,023,000
Real asset	$68,015,000	$63,882,000	$67,422,000	$63,882,000
Tungkillo – Tailem Bend Optimised	$19,957,000	$22,213,000	$23,436,000	$21,968,000
Real asset	$24,041,000	$24,041,000	$26,716,000	$25,041,000
Davenport – Cultana Optimised	$20,543,000	$20,543,000	$18,954,000	$20,543,000
Real asset	$29,064,000	$29,064,000	$28,197,000	$29,064,000
Tungkillo – Cherry Gardens Optimised	$25,423,000	$25,423,000	$26,694,000	$25,423,000
Real asset	$34,297,000	$34,297,000	$31,944,000	$31,297,000

7.4 CHC's recommendation

CHC recommends the adoption of the following replacement costs for the readmitted assets:

Table 2: Modern equivalent replacement costs for readmitted assets - $2006/07

Transmission Line	Optimised network configuration	Real network configuration	Difference in replacement costs
Tailem Bend to Keith 132kV	$41,023,000	$63,882,000	$22,859,000
Tungkillo to Tailem Bend 275kV	$21,968,000*	$25,041,000*	$3,073,000
Davenport to Cultana 275kV	$20,543,000	$29,064,000	$8,521,000
Tungkillo to Cherry Gardens 275kV	$25,423,000	$31,297,000*	$5,874,000
All assets	$108,957,000	$149,284,000	$40,327,000

* ElectraNet/GHD's replacement cost has been adjusted by CHC as described in section 7.3

8 Appendix: Documents reviewed by CHC Associates

National Electricity Law, especially part 7 and part 16.

National Electricity Rules, especially Chapter 6.

Decision by ACCC : South Australian Transmission Network Revenue Cap 2003-2007/08, 11 December 2002.

Report by SKM for ElectraNet: 2001 Optimisation Review Final Report, February 2002

ElectraNet Transmission Network Revenue Proposal, especially Section 7.5

Appendix C to ElectraNet's Transmission Network Revenue Proposal: ROAM Consulting Report: 2007 South Australian Generation and Load Scenario Analysis, 28 May 2007

Appendix H to ElectraNet's Transmission Network Revenue Proposal: Proposed Contingent Projects 1 July 2008 to 30 June 2013

Appendix P to ElectraNet's Transmission Network Revenue Proposal: GHD Asset Optimisation Review Report May 2007

Appendix Q to ElectraNet's Transmission Network Revenue Proposal: Report Transmission Line Replacement Cost by GHD, May 2007

Appendix R to ElectraNet's Transmission Network Revenue Proposal: Treatment of Previously Optimised Transmission Assets: Report by AGC, May 2007

Compendium of written advice from ElectraNet to its consultants, GHD (confidential).

ElectraNet Annual Planning Review 2007-2017, June 2007

ESIPC: Annual Planning Report, June 2007

ETSA Utilities: Electricity System Development Plan Issue 1.4, June 2006 (Web version)

Commerce Commission of NZ ODV Handbook, 30 August 2001 and Companion Report, 31 August 2004

NSW Treasury: Valuation of Electricity Network Assets – A Policy Guideline for NSW DNSPs, July 2001

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