Proposed Pricing Methodology

1 July 2008 to 20 June 2013

31 May 2007

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1. Introduction

ElectraNet Pty Ltd (ElectraNet) is the principal electricity transmission network service provider (TNSP) in South Australia.

This proposed pricing methodology is for the regulatory period from 1 July 2008 to 30 June 2013, and is submitted to the Australian Energy Regulator (AER) in accordance with the requirements of Chapter 6A of the National Electricity Rules (Rules) and the Agreed Interim Requirements issued by the AER pursuant to clause 11.8 of the Rules.

ElectraNet is confident that its proposed pricing methodology fully satisfies the requirements of the Rules and the agreed interim requirements.

2. Prescribed Transmission Services

ElectraNet's proposed pricing methodology relates to the provision of prescribed transmission services by ElectraNet and Murraylink[1] . These services include:

- Shared transmission services provided to customers directly connected to the transmission network and connected network service providers (prescribed TUOS services);
- Connection services provided to connect the ETSA Utilities distribution network to the transmission network (prescribed exit services);
- Grandfathered connection services provided to generators and customers directly connected to the transmission network that were in place on 9 February 2006 (prescribed entry and exit services); and
- Services required under the Rules or in accordance with jurisdictional electricity legislation that are necessary to ensure the integrity of the transmission network, including through the maintenance of power system security and assisting in the planning of the power system (prescribed common transmission services).

For the avoidance of doubt the proposed pricing methodology does not relate to the provision of negotiated transmission services or other transmission services provided by ElectraNet (non-regulated transmission services) that are not subject to economic regulation under Chapter 6A of the Rules.

3. Rules Requirements

Clause 6A.24.1 of the Rules states that the pricing methodology is a methodology, formula, process or approach that when applied by a TNSP:

(1) *allocates the aggregate annual revenue requirement (AARR) for prescribed transmission services to:*

[1] In accordance with Clause 6.3.2 of the Rules, ElectraNet is the co-ordinating transmission network service provider for South Australia and collects both ElectraNet's and the Murraylink Transmission Company's regulated revenue entitlement via ElectraNet's transmission services prices.

(i) the categories of prescribed transmission services; and

(ii) transmission network connection points; and

(2) *determines the structure of the prices that a Transmission Network Service Provider may charge for each of the categories of prescribed transmission services.*

The Rules also require that the pricing methodology satisfy principles and guidelines established by the Rules. In particular, clause 6A.10.1(e) of the Rules requires that the proposed pricing methodology must:

(1) give effect to and be consistent with the Pricing Principles for Prescribed Transmission Services (that is to say, the principles set out in rule 6A.23); and

(2) comply with the requirements of, and contain or be accompanied by such information as is required by, the pricing methodology guidelines made for that purpose under rule 6A.25.

For the purposes of the 1 July 2008 to 30 June 2013 regulatory period, ElectraNet is subject to interim requirements (as opposed to pricing methodology guidelines) in accordance with clause 11.8.4 of the Rules. The AER published these interim requirements on 16 February 2007[2], including the following summary of the AER's approach:

"The AER believes that in lieu of the AER's pricing methodology guidelines, it is appropriate for the relevant provider's proposed pricing methodology to be assessed against the provisions in Part C of Chapter 6 of the NER (as in force immediately before the commencement of the National Electricity Amendment (Economic Regulation of Transmission Services) Rule and as reflected in version 9 of the NER), to the extent those provisions are not inconsistent with the pricing principles in Part J of the NER."

ElectraNet is required to submit a proposed pricing methodology that complies with the agreed interim requirements. Section 2.1 of the agreed interim requirements provides that:

(a) Subject to the proposed pricing methodology being consistent with the pricing principles in rule 6A.23 of the National Electricity Rules, the proposed pricing methodology must be:

(1) *to the extent applicable, consistent with clause 9.8.4F of the National Electricity Rules; and*

(2) *consistent with Part C of Chapter 6 of the old National Electricity Rules.*

(b) In accordance with paragraph (a), the proposed pricing methodology must demonstrate:

[2] AER, "Agreed interim requirements for relevant providers pursuant to rule 11.8 of the National Electricity Rules", 16 February 2007.

> *(1) the allocation of the aggregate annual revenue requirement and the delineation of assets to classes of transmission services is consistent with rule 6.3 of the old National Electricity Rules;*
>
> *(2) the allocation of the aggregate annual revenue requirement among all assets used in the provision of transmission services in order to allocate the costs involved in the provision of transmission services is consistent with rule 6.4 of the old National Electricity Rules; and*
>
> (3) *the conversion of the allocated costs in rule 6.4 of the old National Electricity Rules into prices and charges is consistent with rule 6.5 of the old National Electricity Rules.*

Section 2.2 of the agreed interim arrangements requires ElectraNet to submit with its proposed pricing methodology:

- a detailed explanation of the proposed pricing methodology including where appropriate, worked examples; and
- a description of the differences between the pricing methodology applied during the current regulatory control and the proposed pricing methodology.

ElectraNet considers that this proposed pricing methodology includes sufficient explanation to satisfy the explanation requirements of Section 2.2 of the agreed interim arrangements.

The key differences between the pricing methodology applied during the current regulatory period and the proposed pricing methodology are summarised in section 5.

The AER is currently developing pricing methodology guidelines under clause 6A.25 of the Rules and must publish these guidelines by 31 October 2007. Under the agreed interim arrangements, ElectraNet may, within 10 business days of the AER publishing its guidelines, elect to have its proposed pricing methodology assessed against the pricing methodology guidelines instead of the agreed interim arrangements.

This provides the opportunity for ElectraNet to revisit its proposed pricing methodology and to move to the new pricing arrangements developed by the AER in consultation with stakeholders for the forthcoming regulatory period.

4. Proposed Pricing Methodology

4.1 Background

ElectraNet's existing transmission pricing methodology has been developed in accordance with Part C of Chapter 6 of the Rules[3].

As discussed in Section 3, subject to ElectraNet's proposed pricing methodology being consistent with the pricing principles in clause 6A.23 of the Rules, the proposed pricing methodology must be consistent with Part C of Chapter 6 of the old Rules[4].

[3] www.electranet.com.au/transmission_prices.html

ElectraNet has developed its proposed pricing methodology to be consistent with the pricing principles in clause 6A.23 of the new Rules and has applied the provisions of Part C of Chapter 6 of the old Rules where these supplement the pricing principles.

In effect the provisions of Part C of Chapter 6 of the old Rules are used to provide needed guidance in the absence of the pricing methodology guidelines to be developed by the AER under clause 6A.25 of the Rules.

ElectraNet believes that this approach is consistent with the requirements of the AER's agreed interim requirements.

4.2 Aggregate Annual Revenue Requirement

The revenue that a TNSP may earn in any regulatory year of a regulatory period from the provision of prescribed transmission services is known as the maximum allowed revenue[5].

The Aggregate Annual Revenue Requirement (AARR) is calculated in accordance with clause 6A22.1 of the new Rules as:

> *"the maximum allowed revenue referred to in clause 6A.3.1 adjusted:*
>
> *(1) in accordance with clause 6A.3.2, and*
>
> *(2) by subtracting the operating and maintenance costs expected to be incurred in the provision of prescribed common transmission services."*

The costs referred in (2) above are derived from budget projections and include[6]:

- network switching and operations;
- administration and management of the business;
- network planning and development; and
- general overheads.

4.3 Categories of Service

ElectraNet's and Murraylink's AARRs are recovered from transmission charges for the following categories of transmission service[7]:

- Prescribed entry services which include assets that are fully dedicated to serving a Generator or group of Generators at a single connection point and are deemed prescribed by virtue of the operation of clause 11.6.11 of the Rules;

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4 Throughout this document the term *old Rules* means version 9 of the National Electricity Rules as defined in the agreed interim requirements

5 Clause 6A3.1 of the Rules.

6 As defined in the old Rules Schedule 6.2.

7 Also consistent with clause 6.3.1 of the *old Rules*

- Prescribed exit services which include assets that are fully dedicated to serving a Transmission Customer or group of Transmission Customers at a single connection point and: (a) are deemed prescribed by virtue of the operation of clause 11.6.11 of the Rules; or (b) are provided to Network Service Providers at the boundary of the prescribed transmission network;

- Prescribed transmission use of system (TUOS) services which include assets that are shared to a greater or lesser extent by all users across the transmission system and are not prescribed common transmission services, prescribed entry services or prescribed exit services; and

- Prescribed common services, which are services that benefit all Transmission Customers and cannot be reasonably allocated on a locational basis.

4.4 Cost Allocation

The first step in calculating prescribed transmission service prices is to classify each asset utilised in the provision of prescribed transmission services into one of the above categories of service.

The delineation between the assets that provide prescribed entry services, prescribed exit services, prescribed TUOS services and prescribed common services is set out in schedule 6.2 of the *old Rules*.

The cost allocation process assigns the optimised replacement cost (ORC)[8] of all prescribed assets to either common services (assets that benefit all transmission customers) or individual network branches (transmission lines and transformers). Each branch is then defined as entry, exit or shared network. This process of cost allocation is explained in more detail in Appendix A: Details of Cost Allocation Process.

4.5 Calculation of the attributable cost share for each category of service

The second step in calculating prescribed transmission service prices is the calculation of the attributable cost shares. The attributable cost share for each category of service is calculated in accordance with clause 6A.22.3 of the new Rules as the ratio of:

- the costs of the transmission system assets directly attributable to the provision of that category of prescribed transmission services (as determined in 4.4 above); to

- the total costs of all the TNSP's transmission system assets directly attributable to the provision of prescribed transmission services (as determined in 4.4 above).

4.6 Calculation of the Annual Service Revenue Requirement (ASRR)

The third step in calculating prescribed transmission service prices is to allocate the AARR to each category of prescribed transmission service in accordance with the attributable cost share for each such category of services.

[8] Consistent with clause 6A.22.3(b) of the new Rules

This allocation results in the annual service revenue requirement (ASRR) for that category of services.

4.7 Allocation of the ASRR to transmission network connection points

The fourth step in calculating prescribed transmission service prices is to allocate the ASRR for each category of prescribed transmission services to each transmission network connection point in accordance with the principles of clause 6A.23.3 of the new Rules.

4.7.1 Prescribed entry services

The whole of the ASRR for prescribed entry services is allocated to transmission network connection points in accordance with the attributable connection point cost share for prescribed entry services that are provided by the TNSP at that connection point.

The connection point cost share for prescribed entry services is the ratio of the costs of the transmission system assets directly attributable to the provision of prescribed entry services at that transmission network connection point; to the total costs of all the TNSP's transmission system assets directly attributable to the provision of prescribed entry services.

4.7.2 Prescribed exit services

The whole of the ASRR for prescribed exit services is allocated to transmission network connection points in accordance with the attributable connection point cost share for prescribed entry services that are provided by the TNSP at that connection point.

The connection point cost share for prescribed exit services is the ratio of the costs of the transmission system assets directly attributable to the provision of prescribed exit services at that transmission network connection point; to the total costs of all the transmission system assets directly attributable to the provision of prescribed exit services.

4.7.3 Prescribed Transmission Use of System (TUOS) services

The TUOS (shared network) ASRR is recovered from:

- Prescribed TUOS services (locational component); and
- Prescribed TUOS services (the adjusted non-locational component[9]).

Clause 6A.23.3(c)(1) of the new Rules requires that:

> *"a share of the ASRR (the locational component) is to be adjusted by subtracting the estimated auction amounts expected to be distributed to the TNSP under clause 3.18.4 from the connection points for each relevant directional interconnector and this adjusted share is to be allocated as between such connection points on the basis of the estimated proportionate use of the relevant transmission system assets by each of those customers,*

9 TUOS General under the old Rules

and the CRNP methodology and modified CRNP methodology represent two permitted means of estimating proportionate use".

Consistent with ElectraNet's pricing methodology published on 15 May 2003 and clause 6A.23.3(c)(1) of the new Rules the locational share of the TUOS ASRR is adjusted for estimated inter-regional settlements residue proceeds by converting the estimated proceeds to an equivalent asset replacement cost[10] that is offset against the asset replacement cost of the appropriate interconnector network branches for input to the cost reflective network pricing (CRNP) process[11].

The adjusted share is allocated between connection points on the basis of the estimated proportionate use of the relevant transmission system assets by each customers using the modified CRNP methodology.

ElectraNet obtained approval from the ACCC to use a modified CRNP methodology to determine TUOS Usage (locational) charges and prices in conjunction with its 2002 revenue cap decision.

ElectraNet's proposes to continue applying the modified CRNP methodology as described in the section 4.8.

CRNP assigns a proportion of shared network costs to individual customer connection points. ElectraNet does this using the TPRICE cost reflective network pricing software used by most TNSPs in the NEM.

The CRNP process requires three sets of input data.

- An electrical (loadflow) model of the network;
- A cost model of the network (the results of the cost allocation process described in Appendix A); and
- An appropriate set of load/ generation patterns.

Appendix B describes the CRNP methodology in more detail.

The remainder of the ASRR (the pre-adjusted non-locational component) is to be adjusted:

- by subtracting the amount (if any) referred to in clause 6A.23.3(e);
- by subtracting or adding any remaining settlements residue (not being settlements residue referred to in the determination of the locational component but including the portion of settlements residue due to intra-regional loss factors) which is expected to be distributed or recovered (as the case may be) to or from the TNSP in accordance with clause 3.6.5(a);
- for any over-recovery amount or under-recovery amount from previous years;

[10] Using the same rate of return that is subsequently used to determine prescribed TUOS charges – locational component (TUOS Usage charges under old Rules).

[11] In this way estimated settlements residue auction proceeds recover a portion of the AARR allocated to shared network costs on a locational basis.

- for any amount arising as a result of the application of clause 6A.23.4(h) and (i); and

- for any amount arising as a result of the application of prudent discounts in clause 6A.26.1(d)-(g),

4.8 Modified Cost Reflective Network Pricing Methodology

The essential difference between standard CRNP and modified CRNP is that in calculating the network costs to be recovered on a locational basis (i.e. prescribed TUOS – locational component):

- The standard CRNP allocates shared network costs to connection points on the basis of optimised replacement costs and assumes a 50/50 split between the locational and postage stamped components of network charges;

- The modified CRNP uses utilisation adjusted replacement costs. An average rate of return[12] is applied to the resulting costs allocated to each connection point to determine its share of the locational component of shared network charges (i.e. the arbitrary 50/50 split used with the standard CRNP is removed). prescribed TUOS – non locational charges recover the balance of network costs (the costs not recovered by prescribed TUOS– locational charges).

Modified CRNP is intended to encourage better utilisation of existing assets by discounting the costs allocated to under-utilised elements relative to those that are more heavily utilised.

TPRICE calculates utilisation factors based on the maximum loading of each network branch over the range of operating conditions analysed and branch ratings provided as input to TPRICE.

Schedule 6.4.1.6(b) of the *old Rules* requires that:

> *"The asset utilisation is to be based on the maximum flow allowed on elements within the normal operating constraints of the network".*

However, TPRICE performs its calculations based on system normal operating conditions (i.e. with all elements in service) and does not carry out contingency analysis that is representative of "*the normal operating constraints of the network*".

For this reason it is necessary to apply an adjustment factor reducing branch ratings for input to TPRICE to ensure that utilisation factors appropriately take into account network contingencies as required by the *old Rules.*

Appendix C describes the ratings adjustment for calculation of utilisation factors in more detail.

[12] The rate of return is calculated so that prescribed TUOS – locational charges recover the full cost of the shared network when all network elements are assumed to be 100% utilised.

4.8.1 Load and Generation Data

The *old Rules* requires that the operating conditions used in CRNP calculations[13]:

- be based on actual operating conditions from the previous complete financial year;
- include "*all operating scenarios which result in most stress in the network and for which network investment may be contemplated*"; and
- must include operating conditions "*which impose peak loading conditions on particular elements, recognising that these may occur at times other than for peak demand*".

The capacity method of cost allocation (used by ElectraNet) automatically captures the peak loading conditions on network elements from the sample of operating conditions analysed.

ElectraNet has, therefore, used the full year of operating data (i.e. 365 days of half hourly data) to avoid the need for judgement concerning an appropriate set of operating conditions.

Where actual operating conditions from the previous complete financial year are unavailable for a connection point, as would be the case for a new connection point, an estimate based on the contracted demand and other characteristics of the load would be used to allocate costs to that connection point.

4.8.2 Network Support Costs

An estimate of network support costs is converted to an equivalent asset replacement cost[14] that is added to the asset replacement cost of the transmission assets these services support.

ElectraNet recovers these costs on a locational basis as part of its modified CRNP methodology.

4.9 Transmission Prices and Charges

4.9.1 Prescribed entry and exit services prices

Prescribed entry and exit prices are calculated to recover the prescribed entry and exit services ASRRs from the network users who are served by the relevant connection assets

The prescribed entry services ASRR is recovered as a fixed annual charge for each entry point, which is recovered on the basis of a fixed $/day entry price.

Similarly, the prescribed exit services ASRR is recovered as a fixed annual charge for each exit point, which is recovered on the basis of a fixed $/day exit price.

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13 O*ld Rules* Schedule 6.4, section 4.

14 Using the same rate of return that is subsequently used to determine prescribed TUOS charges – locational component (TUOS Usage charges under old Rules).

4.9.2 Prescribed TUOS services – locational component prices

The prescribed TUOS locational ASRR described in 4.7.3 is priced on a contract demand basis ($/MW/day), where the contracted demand represents the agreed maximum demand (AMD) specified in customer connection agreements.

TUOS locational prices must not change by more than 2% per annum at connection points relative to the load weighted average TUOS locational price for the region. The balance of any revenue shortfall or over recovery resulting from these price caps is recovered or offset as appropriate by adjusting TUOS non locational charges.

As provided for under clause 6A.23.4(g) of the Rules the change specified above *"may exceed 2 per cent per annum if, since the last prices were set:*

(1) the load at the connection point has materially changed;

(2) in connection with that change, the Transmission Customer requested a renegotiation of its connection agreement with the Transmission Network Service Provider; and

(3) the AER has approved the change of more than 2 per cent per annum."

The effect of this provision is to set the prescribed TUOS – locational price at a connection point with a material change in load on the same basis as a new connection.

In the event that a Transmission Customer requests a material increase in AMD at an existing connection point, ElectraNet will seek approval from the AER to set the prescribed TUOS – locational price as intended by clause 6A.23.4(g) of the Rules.

Prescribed TUOS locational charges are determined for each exit point by applying the prescribed TUOS – locational price to the maximum contract demand (agreed maximum demand) for that exit point, determined in accordance with the customer's connection agreement, and multiplying this amount by the number of days in the billing period.

4.9.3 Prescribed TUOS services –non-locational component prices

The method of recovery of the non-locational charges is specified in the *old Rules*[15]. Two prescribed TUOS – non locational prices are calculated, one based on contract demand and the other based on historical energy usage. These two prices are calculated in such a way that the customer exit point with median load factor would be indifferent to which price applies. The TUOS non locational prices are the same for each exit point on ElectraNet's transmission network.

Customers are charged at each exit point or group of exit points on the basis of the price that results in the lower estimated recovery from TUOS non locational charges at that point.

It is important to note that the *old Rules* do not allow the capacity price to apply at an exit point unless the relevant customers connection agreement or other enforceable instrument governing the terms of *connection* of the customer:

[15] *Old Rules* Clause 6.5.4A.

- nominates a fixed maximum demand for that *connection point*; and
- specifies substantial penalties for exceeding the nominated fixed maximum demand

Where these conditions are met, ElectraNet automatically applies the price that results in the lowest charge to the customer at each exit point.

Where TUOS non locational charges are calculated by using the capacity price, the charges are determined by multiplying the capacity price by the maximum contract demand (agreed maximum demand) determined in accordance with the customer's connection agreement and multiplying this amount by the number of days in the billing period

Where the charges are billed on the basis of energy, the monthly charge will be determined by multiplying the energy price by the total energy consumption at that exit point in the equivalent billing period in the financial year which came to an end twelve months prior to the commencement of the financial year in which the Customer TUOS non locational charge is to apply.

Where energy consumption history is unavailable for an exit point for the entire financial year which came to an end twelve months prior to the commencement of the financial year in which the Customer TUOS non locational charge is to apply, and ElectraNet has obtained approval from the AER[16], energy consumption within the current billing period will be used. ElectraNet will advise customers when current data rather than historical data is to be used.

4.10 Prescribed common service prices

The method of recovery of prescribed common service charges is specified in the *old Rules*[17] and is identical to that described for TUOS non locational charges in the previous section.

Prescribed common service prices are, therefore, the same for each exit point on ElectraNet's transmission network.

4.11 Excess Demand Charge

If the customer's actual maximum demand exceeds the agreed maximum demand level at any time during the financial year then an Excess Demand Charge applies and the actual maximum demand will become the maximum contract demand, in accordance with the customer's connection agreement.

In addition, ElectraNet will recover from the customer the incremental charges the customer would have paid to ElectraNet during the entire financial year if the maximum contract demand had been the actual maximum demand.

The Excess Demand Charge is determined by multiplying the charge rate specified in ElectraNet's published Transmission Service Price Schedule ($/kW) by the amount by which the maximum contract demand has been exceeded (kW).

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16 *Old Rules* Clauses 6.5.4A(e)(1)(i)(B) and 6.5.6(e)(1)(i)(B)

17 *Old Rules* Clause 6.5.6.

The charge rate ($/kW) is calculated as three times the maximum revenue, which ElectraNet can earn from prescribed services during the pricing period ($), divided by the aggregate of all contracted demands connected to the transmission network.

5. Description of Pricing Methodology Differences

The key differences between the proposed pricing methodology and the pricing methodology applied in the current regulatory period are summarised below.

5.1 Costs that could be allocated to more than one category of service

ElectraNet's existing cost allocation methodology allocates substation costs that are directly attributable to entry, exit, common and TUOS services and then allocates the residual costs, known as substation local costs, to entry, exit and TUOS services on the basis of the number of pricing branches (transmission lines and transformers) as described in ElectraNet's existing transmission pricing methodology[18].

Clause 6A.23.2(d) has introduced a priority ordering concept for the allocation of those costs which could be attributable to more than one category of prescribed transmission services.

The cost allocation methodology has been modified to allocate the substation local costs in accordance with the provisions of clause 6A.23.2(d) having regard to the stand alone costs associated with the provision of prescribed TUOS services and prescribed common services with the remainder being allocated to prescribed entry and exit services.

This modification may result in minor reallocations of charges between the categories of service. ElectraNet does not expect that the changes to prices resulting from this modification will be material.

5.2 Provision for relaxation of TUOS locational side constraints

The implementation of 6A.23.4(g) allows for the relaxation of the 2% side constraint for material changes in connection point load or renegotiation of connection agreements, subject to AER approval (discussed in section 4.9.2).

In the event that a Transmission Customer requests a material increase in AMD at an existing connection point, ElectraNet will seek approval from the AER to set the prescribed TUOS – locational price as intended by clause 6A.23.4(g) of the Rules.

6. Conclusion

ElectraNet has submitted this proposed pricing methodology for the regulatory period from 1 July 2008 to 30 June 2013 in accordance with the requirements of Chapter 6A of the Rules and the Agreed Interim Requirements issued by the AER pursuant to clause 11.8 of the Rules.

ElectraNet is confident that its proposed pricing methodology fully satisfies the requirements of the Rules and the agreed interim requirements.

[18] www.electranet.com.au/transmission_prices.html

As noted earlier, the AER is currently developing pricing methodology guidelines under clause 6A.25 of the Rules and must publish these guidelines by 31 October 2007. Under the agreed interim arrangements, ElectraNet may, within 10 business days of the AER publishing its guidelines, elect to have its proposed pricing methodology assessed against the pricing methodology guidelines instead of the agreed interim arrangements.

This provides the opportunity for ElectraNet to revisit its proposed pricing methodology and to move to the new pricing arrangements developed by the AER in consultation with stakeholders for the forthcoming regulatory period.

Appendix A: Details of Cost Allocation Process

A detailed cost allocation process is used to assign the ORC of all regulated assets to either common service (assets that benefit all transmission customers) or network branches (transmission lines or transformers)[19].

The cost allocation process is summarised as follows:

Step 1: Initial Asset Cost Allocation

Assets and their ORCs are assigned to one of the following primary asset categories:

- transmission lines;
- transformers;
- circuit breakers;
- common service assets (communications, reactive support, office buildings etc.); and
- substation local assets (ancillary equipment, civil work, and establishment).

In conducting this initial allocation the following plant item costs will be allocated to associated primary items above:

- Bus work;
- Secondary systems including protection and instrument transformers.

Step 2: Allocation to Classes of Service

Assets are allocated to the classes of prescribed service in accordance with the provisions of S6.2 of the old Rules. In the case of circuit breakers each circuit breaker has its replacement cost divided evenly between the branches to which it is directly connected. Any circuit breaker that does not directly connect to a branch becomes a substation local cost.

In the case of those costs which would be attributable to more than one category of prescribed transmission services, specifically the substation local assets identified in Step 1 and those circuit breakers identified as substation local costs in Step 2, costs will be allocated in accordance with the provisions of clause 6A.23.2(d) having regard to the stand alone costs associated with the provision of prescribed TUOS services and prescribed common services with the remainder being allocated to prescribed entry and exit services.

The shared network costs resulting from the cost allocation process are used as input to TPRICE, the cost reflective network pricing software that is used by most TNSPs in the NEM.

The entry, exit and common service costs are used as input to the calculation of charges and prices in ElectraNet's Transmission Pricing Model.

[19] ElectraNet maintains an optimised replacement cost (ORC) model of the transmission network to determine the appropriate ORC of individual transmission lines, transformers, circuit breakers, common service assets and residual (unallocated) substation local costs.

Appendix B: Cost Reflective Network Pricing Methodology

The Cost Reflective Network Pricing (CRNP) methodology generally involves the following steps:

(1) Determining the annual costs of the individual transmission network assets in the optimised transmission network;

(2) For modified CRNP, adjusting each asset's cost according to its expected utilisation;

(3) Determining the proportion of each individual network element utilised in providing a transmission service to each point in the network for specified operating conditions.

(4) Determining the maximum flow imposed on each transmission element by load at each connection point over a set of operating conditions.

(5) Allocating the costs attributed to the individual transmission elements to loads based on the proportionate use of the elements.

(6) Determining the total cost allocated to each point by adding the share of the costs of each individual network attributed to each point in the network.

Allocation of Generation to Load

A major assumption in the use of the CRNP methodology is the definition of the generation source and the point where load is taken. The approach is to use the "electrical distance" to pair generation to load, in which a greater proportion of load at a particular location is supplied by generators that are electrically closer than those that are electrically remote. In electrical engineering terminology the "electrical distance" is the impedance between the two locations, and this can readily be determined through a standard engineering calculation called the "fault level calculation".

Once the assumption has been made as to the generators that are supplying each load for a particular load and generation condition (time of day) it is possible to trace the flow through the network that results from supplying each load (or generator). The use made of any element by a particular load is then simply the ratio of the flow on the element resulting from the supply to this load to the total use of the load made by all loads and generators in the system.

Operating Conditions for Cost Allocation

The choice of operating conditions is important in developing prices using the CRNP methodology. ElectraNet has flexibility in the choice of operating conditions, but the *old NER* sets out the principles that should apply in determining the sample of operating conditions considered.

The use made of the network by particular loads and generators will vary considerably depending on the load and generation conditions on the network. For this reason a number of operating conditions are examined with different load and generation patterns.

The load and generation patterns used to establish transmission prices should include all operating scenarios that result in most stress in the network and for which network investment may be contemplated. Operating conditions will be included that impose peak

loading conditions on particular elements, recognising that these may occur at times other than for peak demand.

Consistent with these principles, the operating conditions to be used for the cost allocation process are as follows for the main transmission system:

- Load and generation conditions to be actual operating conditions from the previous complete financial year; and

- Operating conditions to be used are to include at least 10 days with high system demand, to ensure that loading conditions, which impose peak flows on all transmission elements, are captured.

The operating conditions chosen should broadly correspond to the times at which high demands drive network expansion decisions.

Appendix C: Ratings Adjustment for Calculating Utilisation Factors

When assigning a proportion of shared network costs to individual customer connection points the modified CRNP approach reduces the ORC of each shared network branch (line or transformer) by a utilisation factor that reflects the maximum loading of the branch with respect to its rating.

In determining the appropriate branch rating for entry into TPRICE (used to perform the CRNP calculations) it is important to understand that TPRICE only considers system normal operating conditions whereas the shared network must be able to withstand a single contingency outage without overloading any element consistent with the requirements of the National Electricity Code and the South Australian Transmission Code.

This means that utilisation factors calculated with respect to equipment ratings (thermal line ratings and transformer nameplate ratings) under system normal conditions would result in artificially low utilisation factors.

This problem can be overcome by reducing the equipment ratings to reflect the maximum flow on a network branch under system normal conditions that would not result in its absolute rating being exceeded in the event of the worst contingency.

The reduced ratings are calculated by examining flows in network elements over a range of peak system operating conditions first for system normal conditions, and then with each meshed network element out of service one at a time. For each network element, the ratio of maximum system normal flow to maximum contingency flow is used to scale down the absolute equipment rating to obtain the reduced rating for input to TPRICE.

This rating adjustment is consistent with Schedule 6.4.1.6(b) of the *old Rules*, which states in relation to modified CRNP that *"The asset utilisation is to be based on the maximum flow allowed on elements within the normal operating constraints of the network".*

This process can best be illustrated by an example. A line has an absolute (thermal) rating of 200 MV.A. Network analysis over a range of peak operating conditions shows that this line has a maximum system normal flow of 120 MV.A and a maximum single contingency flow of 160 MV.A. The reduced rating of this line (as input to TPRICE) is (120/160) * 200 giving 150 MV.A.

When TPRICE is run, analysis will consider flows on this line over a much wider range of operating conditions (than used in the contingency analysis) some of which may even exceed 120 MV.A. If say the highest usage of this line over the operating conditions assessed by TPRICE is 123 MV.A, then the utilisation factor used by TPRICE with modified CRNP will be 0.82 (123/150).