Meritec

Australian Competition and Consumer Commission

ElectraNet SA Capital Expenditure Review

July 2002

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ElectraNet SA Capital Expenditure Review

Prepared for

Australian Competition and Consumer Commission

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A review of ElectraNet SA's proposed capital expenditure for the period Jan 2003 to June 2008

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Summary of Findings

The Australian Competition and Consumer Commission (ACCC) is currently preparing its regulatory decision in regard to the South Australian Transmission Network Revenue Cap for the period from 1 January 2003 to 30 June 2008. As part of this process Meritec has been engaged by the ACCC to review the forecast capital expenditure put forward by ElectraNet SA (ElectraNet).

On the basis of our review, Meritec believes that the process followed, the scenarios considered, and the probabilities assigned to the scenarios in ElectraNet's preparation of the probabilistic capital expenditure forecast are reasonable.

Meritec believes that there is a potential risk of ElectraNet being unable to deliver the proposed capital expenditure program. This is due to large increases in capital expenditure over historical levels in the electricity industry and the resulting potential competition with other TNSPs for limited resources.

Subject to the above and the adjustments noted in Table 6 of the report, Meritec believes that ElectraNet's proposed capital expenditure should be accepted.

The material adjustments recommended by Meritec are as follows:

- The probabilities associated with the load forecast have been adjusted from 20% likelihood of a low forecast and 80% of a medium forecast, to 25% likelihood of a low forecast and 75% of medium. This results in a reduction of approximately $12 million ($2001/02) over the regulatory period in the capital expenditure proposed by ElectraNet.
- Refurbishment and some replacement expenditure has been added to the capital expenditure forecast, when it was previously included as operating expenditure in the ElectraNet submission. This has added approximately $80 million ($2001/02) over the regulatory period.
- Capital expenditure allowances for certain projects have been removed due to the limited probability that ElectraNet would be required to fund them. These include parts of the projects related to Robertstown/Monash/SNI and various augmentations to facilitate wind generation. Capital expenditure contingency sums were also removed on the basis that they were considered inappropriate in the context of a probabilistically derived capital expenditure forecast. These removals resulted in a reduction of approximately $90 million ($2001/02) over the regulatory period compared to the ElectraNet submission.

Aside from the material changes, Meritec found that:

- ElectraNet has an established planning process which adequately identifies new or increased load / generation requirements and models their impact on the transmission network. This process also takes into account the review of a number of different possible solutions, leading to recommendation of a preferred option. Planning criteria are applied based on National Electricity Code (NEC) requirements, SA Transmission Code requirements, and ElectraNet practices which have been developed based on their experience of local conditions. These are sound and consistent with transmission network planning practices elsewhere.
- An independent check estimate report, while identifying some inconsistencies between participant's project cost estimates, generally indicated that any variations from ElectraNet's estimates were within the bounds of materiality. (ie less than 5% overall).
- The probabilistic method used by ElectraNet to forecast their overall capital expenditure for the regulatory period is sound, and is very similar to the technique applied by Powerlink and accepted by the ACCC in the Queensland Transmission Revenue Cap Decision. ElectraNet used ROAM Consulting to assist them in this regard, as did Powerlink previously.
- ElectraNet's approach to identifying and prioritising its refurbishment and replacement expenditure is sound and is based on an appropriate level of input regarding the age of the equipment, its condition and its operating conditions.

The recommended capital expenditure provision for ElectraNet for the regulatory period January 2003 to June 2008 is:

	Jan – June 2003 ($000)	2003/04 ($000)	2004/05 ($000)	2005/06 ($000)	2006/07 ($000)	2007/08 ($000)	Total ($000)
Recommended Capex Adjusted for reduced load growth and excluded expenditure							
Construction Capex ($2001/02)	4.3	56.2	47.2	64.4	64.8	37.3	274.2
Refurbishment Projects (was Opex)	0.1	0.4	9.8	10.4	9.8	2.9	33.4
Other Refurbishment (was Opex)	6.7	14.4	4.5	3.7	4.5	10.3	44.0
Total Capex ($2001/02)	**11.1**	**71.0**	**61.5**	**78.5**	**79.1**	**50.5**	**351.6**
Total Capex ($nominal)	**11.4**	**74.3**	**65.9**	**86.1**	**88.8**	**58.0**	**384.4**

1.0 Introduction

In accordance with the requirements of the National Electricity Code (NEC), the ACCC will become the economic regulator of ElectraNet SA's (ElectraNet's) transmission network business from January 2003. In preparation for this role, the ACCC are preparing a revenue cap determination for ElectraNet's transmission network services covering the period from 1 January 2003 to 30 June 2008.

The revenue cap is built up from a number of building blocks, one of which is the increased allowance for return on capital and depreciation arising from additions to the asset base due to allowable capital expenditure over the regulatory period.

The purpose of this report is to review the capital expenditure forecast put forward by ElectraNet and provide comment on the methodology employed, the validity of the expenditure levels put forward and to identify any issues which might impact adversely on ElectraNet's ability to deliver their proposed capital expenditure levels.

1.1 Scope

Meritec was engaged to simultaneously review the asset base, operating expenditure and capital expenditure put forward by ElectraNet in their *Transmission Network Revenue Cap Application 2003 – 2007/08*. This report examines the capital expenditure section of ElectraNet's application. A separate report prepared in parallel examines the operating expenditure.

The Terms of Reference for the capital expenditure review were as follows:

1 The consultant is to undertake a review which analyses and comments on the assumptions, methodology and findings on capital expenditure contained in the ElectraNet application.

In particular, the consultant should address the following matters:

- the assumed level of materiality;
- the methodology for determining the adequacy of the ElectraNet's system for present and future duty;
- findings in relation to the security and reliability of the system *vis a vis* the criteria set out in the Code;
- the effectiveness of ElectraNet's asset management system in ensuring that only necessary (and efficient) capital expenditure occurs;
- the effectiveness of ElectraNet's capital works assessment criteria and process in identifying and evaluating alternatives to proposed expenditure (including

embedded generation, cogeneration, demand side responses and other non-build options); and

- findings in relation to the appropriateness of the major proposed capital works and the anticipated costs of those works.

2 In particular, the consultant must assess and comment on the appropriateness of ElectraNet's use of a probabilistic methodology to forecast capital expenditure scenarios and budgets. This is to include an assessment of:

- the methods ElectraNet will use to check the reasonableness of the forecasts and related expenditure;
- the allocation of individual capital expenditure projects to each scenario; and
- the identification of cost-effective alternatives to the proposed expenditure.

Meritec has addressed the requirements of the Terms of Reference in the following sections.

The project was conducted in a condensed timeframe due to the delayed submission of ElectraNet's Application and the need to meet the ACCC's deadlines for handing down a decision by October 2002. The timetable was as follows:

Date	Activity
16 April 2002	Initial project meeting between Meritec and ACCC ElectraNet lodged Application with ACCC
17 April – 22 April 2002	Prepare questionnaire detailing data requirements from ElectraNet and issue to ElectraNet.
10 May – 16 May 2002	Receive responses from ElectraNet and assess,
21 May – 23 May 2002	Site visit to ElectraNet to interview ElectraNet staff and view high-level evidence of the processes applied
24 May – mid July 2002	Analyse data received and develop draft reports

In the time available, it was not possible to carry out a comprehensive review of every aspect of ElectraNet's application. Instead, high-level review of the process has been undertaken, supported by a more detailed review of a number of significant capital projects, and analysis of a number of significant issues that affect the capital program.

1.2 Process

A similar process was followed for both operating and capital expenditure reviews. In both cases, Meritec prepared questionnaires covering the key issues relating to the expenditure programs. These were forwarded to ElectraNet for completion and return.

Following return of the questionnaires Meritec spent 3 days on-site at ElectraNet's offices in Adelaide. The questionnaires were used to identify areas for further examination during the site visit and to formulate further questions and data requirements from ElectraNet.

The site visit also allowed Meritec staff to view high-level evidence of the processes applied by ElectraNet in the development of their capital expenditure forecast.

Based on the information obtained, a general review and "sense check" was carried out on the processes followed by ElectraNet. A number of issues were also identified for further consideration. These were analysed and conclusions drawn regarding their impact on ElectraNet's submission.

1.3 Materiality

Meritec has taken the view that an item is to be considered material if its inclusion or exclusion would lead to a material change in the ACCC determination. Material in the context of general purpose financial reporting would generally be considered to be of the order of 5%. For the purposes of the review, we have considered items as material if they comprise 5% or more of the expenditure for the year in which they fall. Where several such items aggregate to 5% or more, we have considered them as material.

Against this, the inherent lack of accuracy in the capital expenditure forecasting process needs to be recognised. In our opinion, it would be misleading to pretend that the projections are accurate within +/- 10%.

2.0 Principles of the Review

In this section of the report, the general principles of capital expenditure (capex) review in electricity transmission businesses are outlined with particular reference to the present task. It is assumed that the reader has a sound general knowledge of electric power transmission systems and their operation and accordingly we generally do not go into descriptive detail.

In this section, we first discuss asset renewal expenditures in the context of lifecycle asset management. We then discuss expenditure for the augmentation of network capacity to meet growth in demand. These are the two principal determinants of capex. Other issues are then discussed.

2.1 Asset Renewal Expenditure

Asset renewal expenditures make up a significant component of the capital expenditure programme of electricity transmission businesses. They comprise two main types of expenditure, namely replacement and refurbishment. In this context, the latter generally comprise overhauls which are intended to restore the service life of the asset largely to an ''as new" condition. In each case, the need for renewal is brought about through the ageing of the assets. Renewals required in order to comply with statutory or safety obligations are discussed separately in Section 2.4.

Age profiles can provide a preliminary assessment of future capex needs for asset renewals and this approach is commonly adopted for distribution assets. However, in the case of a transmission network, the assets are few in number and detailed information is generally available on each one. This level of information enables more accurate assessments of renewals to be based on known problems and expected lives for each asset or, at the least, for each group or type.

Establishing the Need for Equipment Replacement

Review of transmission network asset renewal expenditures should therefore start with a review of the policies adopted for replacement and refurbishment. Factors that should be considered depend upon the nature of the equipment but generally include availability of spare parts, equipment reliability trends, levels of required maintenance, age, compatibility with associated equipment and modernisation strategies.

Equipment should be replaced when its condition becomes such that replacement can be economically justified. The condition of equipment can be measured by analysis of past reliability figures (industry statistics as well as the transmission network operator's own experience), the scale of past and projected maintenance and by condition monitoring including regular visual inspections. Monitoring techniques include diagnostic testing and real time monitoring, and are used to detect possible failures before they occur.

Standard of Maintenance

The second important determinant of asset replacement needs is the standard of maintenance carried out over the life of the asset. This may have more impact on certain classes of asset than on others.

For most purposes, it can be assumed that there is a match between industry accepted lives and the maintenance practices commonly applied and that higher or lower levels of maintenance would result in assets, on average, attaining longer or shorter lives respectively.

Replacement Costs

Thirdly, the determination of capital expenditures for asset replacement purposes is dependent on the unit replacement costs assumed. These should reflect the use of modern equivalent assets and efficient construction techniques.

A complication is that the total installed cost of an asset can vary significantly depending on its location and the terrain. An example is the construction of overhead lines along difficult routes where costs can be considerably greater than running lines in open country.

Most transmission network companies have detailed costing programmes, based on past tenders, for estimating the construction cost of new works. For the purpose of this review, their use can be accepted subject to scrutiny.

2.2 Growth Related Expenditure

The second major driver of capital expenditure is demand growth. Growth in demand results in the need for capital expenditure if the loading on components of the power system reaches the maximum capacity available or threatens security of supply criteria. Development of a horizon year load forecast enables the future configuration of a power system to be determined, making it possible to define a staged development programme for the intermediate years. Although the objective is to work towards an optimally planned system, optimality may not be achieved in the short term.

Prediction of the need to augment the capacity of a power network requires knowledge of load growth trends in each area of the network, daily, weekly and yearly load patterns and an assessment of likely future spot loads. In the case of transmission network operators, much of this information is developed by the distributors who then make requests for strengthened or additional points of supply.

Load Growth Trends & Changing Load Patterns

Future loads can be forecast by several methods, each subject to uncertainty. Extrapolation of historical growth trends, econometric forecasting and end-use analysis are three common methods, each with preferred uses. Changing load patterns also need to be taken into account, for example a shift in the time of day or season of peak demand, since certain equipment may have greater or less capacity under different ambient conditions.

Load growth forecasts can also be reviewed against the projections of local planning bodies plans and other information such as business forecasts, economic projections and census information to demonstrate that they are reasonable for planning purposes.

A complicating factor to be taken into account by power planners is "diversity". Expressed simply, the peak demands in different parts of the network are not coincident and cannot simply be aggregated. Therefore, suitable diversity factors must be correctly applied to represent the net affect of many loads.

Changing load patterns in the commercial and residential sector are likely to impact on future peak demand growth as the growing energy efficiency of appliances and a resurgence in the use of gas reduce the rate of growth in electricity use.

Future Spot Loads and Generation

New concentrated loads imposed generally by major direct supply customers may arise as a result of the development of industries or for other reasons. They can be difficult to predict and may place significant burdens on power systems at short notice. This may require the in-built provision of some slack capacity, the implementation of ad hoc strengthening measures or more likely a combination of the two. For the capital expenditure reviewer, they introduce an added level of uncertainty.

New generation may affect network capital expenditure since its presence will affect power flows and fault levels in the network. Power flows in the network may be increased or decreased by the presence of the generation and this can affect the dynamic stability of the network.

Planning Considerations

In order to ascertain whether an electrical power network has sufficient capacity to accommodate load growth it is necessary to understand the permissible loading capacities of network components, the requirements for satisfactory voltage regulation under normal and emergency conditions and the required security levels for the system. There are well defined national standards for security of supply in the National Electricity Code and in the South Australian Transmission Code. A detailed review of these and the issues that underpin them is beyond the scope of this review. We therefore limit ourselves here to the question of how these policies affect capital expenditure.

Expenditures Based On Capacity to Meet Load Growth

For planning purposes, it is normal for the power network to be modelled to determine the load on each component as demand increases. This can be done with various power system computer modelling programs available. Network augmentations are then considered, sufficient for the network to perform within its permissible load limits and security levels. Once a long-term network development plan is determined in this way, the corresponding capital expenditure projections can be deduced.

Effect of Inaccuracies in Growth Forecast

Variations in actual growth from the forecast figures are normally accommodated by varying the timing of implementation of the capital works that form part of the long term development plan. Slower than expected load growth can be accommodated by deferral of works. Faster load growth can be handled by advancement of works if adequate notice is available. Generally, however, deferral is more easily achieved than advancement. It is considered prudent to maintain some reserve against unexpected increases in demand in the short term.

Rolling Plan Concept

To counter the effects of inaccuracies in the forecast, periodic reviews of the network development plan should be undertaken. It is normal for them to be undertaken as part of a cycle of rolling plans updated every one or two years or more often if changing circumstances dictate.

Probabilistic Capex Forecast

Another method for dealing with the impact of uncertainties in the forecast is to prepare a probabilistic capital expenditure forecast. This relatively new approach identifies a number of possible development scenarios and applies probabilities to each. By multiplying the costs associated with a scenario by the likelihood of that scenario occurring, a probability weighted capital expenditure requirement can be estimated. This method is being employed by a growing number of transmission companies to estimate their forward capex requirements.

Detailed Justification of Capital Works

The detailed justification of augmentation projects follows on from the planning process and is not normally undertaken until one or two years before the planned start of implementation, depending an design/construction time.

2.3 Appropriate Reliability and Security of Supply

The main planning drivers for the development of a transmission network are :

- forecasts of future energy supply and demand;
- reliability and system security criteria;
- economic factors;
- environmental factors; and
- utilisation of assets.

In this section, we concentrate on the reliability and system security criteria part of the planning process as a principal determinant of capital expenditure.

The transmission network performance criteria to be met are detailed in the South Australian Transmission Code and the National Electricity Code -Chapter 5 (Network Connection). These codes require ElectraNet to have a suitable methodology for reviewing the capability of its network to meet the future needs of market participants. and to plan for future augmentations.

It should be noted here that even after South Australia comes under the ACCC's jurisdiction for economic regulation, the SA Transmission Code will continue to apply on technical issues as part of the state based licensing regime for transmission network service providers (TNSP's).

Reliability

The NEC defines reliability as:

"The probability of a system, device, plant or equipment performing its function adequately for the period of time intended, under the operating conditions encountered".

Further, the NEC considers the power system is assessed to be in a reliable operating state when:

- NEMMCO has not disconnected, and does not expect to disconnect, any points of load connection under clause 4.8.9 (supply shortfalls);
- no load shedding is occurring or expected to occur anywhere on the power system under clause 4.8.9; and
- in NEMMCO's reasonable opinion the levels of short term and medium term capacity reserves available to the power system are at least equal to the required levels determined in accordance with power system security and reliability standards.

Security

Furthermore, the NEC defines the power system to be in a secure operating state when:

- the power system is in a satisfactory operating state; and
- the power system will return to a satisfactory operating state following the occurrence of a single credible contingency event in accordance with the standards (approved "power system security and reliability standards").

A single credible contingency event is defined as an event for which a Code Participant (who is) adversely affected would reasonably expect under normal conditions, the design or operation of the relevant part of the meshed power system would adequately cater, so as to avoid significant disruption to power system security.

The NEC requires that, to the extent practicable, the power system should be operated such that it is and will remain in a secure operating state.

Planning for Appropriate Security Levels

In terms of setting security levels for specific customer connections it is normal practice to agree levels of security (power delivery within accepted standards and in the amount desired) directly with those customers. Depending on the customer, the level of security can be lower than that determined for the main network. The only limitation is that such an agreed lower level of security must not impinge on the main network nor other customers connected to the main network (and therefore fail to comply with the requirements of the NEC).

In setting security levels for main meshed transmission networks it is necessary to ensure that a single credible contingency event does not:

- cause load to be shed;
- cause thermal ratings of system components to be exceeded;
- cause voltage variations beyond defined limits;
- cause frequency excursions beyond defined limits; and

- cause synchronous instability.

(Note: It is also normal practice that a single credible contingency should not cause a restriction in generation. However, in terms of Chapter 5 of the NEC this is the subject of negotiation between the Network Service Provider and the Generator)

This is the minimum acceptable security level for the main meshed transmission grid. Spur lines, or those affecting a single customer may have lower security levels by agreement. Areas of very high load density may require higher levels of security (e.g. a CBD area should be secure for a single credible contingency whilst one transmission element is out of service for scheduled maintenance).

In the case of South Australia, each connection point to ElectraNet's transmission network is allocated to a category from one to five by the South Australian Independent Industry Regulator (SAIIR) Corresponding security levels for each category are mandated in the South Australian Transmission Code.

In order that the security level is achieved, the network must be kept in a reliable state to the extent practicable.

Most international transmission network utilities today plan network developments on the basis of the economic impact of outages in conjunction with a combined deterministic and probabilistic approach to the analysis of system reliability.

Deterministic analysis requires the power system engineer to identify, and analyse the effects of, specific and credible system events that would have a significant effect on system security. This requires a judgmental determination approach, and hence the word "deterministic".

Probabilistic analysis requires the engineer to analyse outages in terms of how probable they are. This requires a knowledge of the performance characteristics of the transmission network and its components. These characteristics can be used to derive measures of the reliability of the transmission network, and therefore rely less on judgement of the engineer and more on collection and analysis of historical performance data on network components.

The analyses involved in probabilistic analysis of a supply scenario are complex and their full assessment requires detailed study.

2.4 Works to Meet Statutory Obligations

There is a need from time to time for capital works to be undertaken to meet statutory obligations. These obligations may relate to the statutory security requirements described in Section 2.3 or works to address safety concerns, environmental concerns or specific local authority requirements.

It is not necessary to go into details here but two common examples are the removal of PCB's and the introduction of oil spillage containment at substations. Usually, such cases are clearly defined.

Works needed to comply with local authority bylaws and planning determinations are less easily able to be defined for the capital expenditure reviewer as ElectraNet's network extends over several such areas. Specific local authority preferences may include the use of underground construction as opposed to overhead lines but this is not always possible at transmission voltages.

2.5 Capex Evaluation and Approval Processes

Most transmission network companies have formal approval procedures and policies for control of their capital expenditure, reflecting the accepted international approach to capex approval, and summarised below:

Step 1 : Establish the Need

Generally, the technical justification of a project should "establish its need". If it fails to do this, then little is to be gained by proceeding further. Technical justifications should be competent and complete. They should be documented with supporting calculations since it is only through documentation that inconsistencies and shortcomings can be exposed.

Step 2 : Identify and Quantify Project Costs and Benefits

Project costs such as construction and operating costs are relatively easy to determine. Other costs such as the costs of demand not served if a project does not proceed are harder to quantify. Unserved energy costs should be calculated based on average outage durations (from historical outage statistics) and the network operator's $/kWh figure for assumed cost of unserved energy. Non-quantifiable benefits and costs should be listed.

Step 3 : Optimise Project Timing

Careful attention should be given to project timing. Construction should be undertaken as late as possible consistent with necessity, risk and economic justification.

Step 4: Consideration of Statutory, Safety and Environmental Obligations

As already mentioned, works may be necessary for statutory reasons, for example in cases where environmental protection or reinstatement is needed. Works may also be necessary for safety reasons should the safety of the public or company personnel be compromised.

Step 5 : Identify Least Cost Solution

The fifth step entails the identification of the least cost solution to the need, The least cost solution of two or more mutually exclusive options with similar benefits is normally determined by calculating the present value of lifetime project costs, discounted at the company's weighted average cost of capital (WACC).

Step 6 : Financial Evaluation and ACCC Regulatory Test

Once a preferred option is identified, it is standard business practice to assess its viability. In a non-regulated environment, this would primarily be achieved by calculation of the internal rate of return (IRR) and comparison with the organisation's hurdle rate (or minimum rate of return for which the organisation is prepared to proceed with the project).

In a regulated context, and especially for capital expenditure, the drivers are different, as once a capital asset is allowed, it automatically earns the regulated WACC and is allocated a depreciation allowance. Therefore, the method for assessing whether a project should proceed is somewhat different.

There is also a need to have a transparent process leading up to the inclusion of an asset in the regulated asset base. In the case of electricity transmission networks in the National Electricity Market (NEM) the ACCC Regulatory Test provides this process.

The test has two parts:

- Part A allows for projects that are required to meet the requirements of the National Electricity Code, and in the case of ElectraNet the South Australian Transmission Code; and

- Part B allows for projects which would provide a benefit to market participants and applies the market benefit test.

It would be expected that capex projects would pass one or the other of these tests prior to final commitment. However, at the point when a revenue cap application was made it would not be expected that these assessments would be complete for all projects which were nominated for inclusion in the capex program.

2.6 The Role of Asset Management in Reducing Capex

The impact of maintenance (and operational) practices on capital expenditure needs has already been mentioned (Section 2.2). The implementation of sound asset management practices will help result in network assets achieving or exceeding industry standard lives and will also aid the deferral of capital expenditure.

Over the last five to seven years, asset management plans have become recognised internationally as an important tool for the sound stewardship of electricity sector assets. Asset management plans should detail the practices (including maintenance) being employed over the life of the assets from purchase until disposal. The maintenance practices adopted will have an influence on asset lives. Different maintenance practices or combinations of these can be adopted and these should be selected and documented for each type of asset.

A well prepared asset management plan should also describe policies on risk management. Risk can be measured by the combination of probability and consequence of failure. There will be a particular level of risk which can be accepted by the network service provider and which will indicate the upper bound of projected capital expenditure.

3.0 Load Growth Planning Process

3.1 Load Forecast

A significant portion of ElectraNet's proposed capital expenditure is justified by the need to accommodate load growth on their transmission network. Therefore, the underlying load forecast is of similar significance.

South Australia experiences its highest peak loads during summer, when equipment ratings are also at their lowest. Therefore, it is considered sufficient that only a summer based load forecast is used for assessment of network capability.

The load forecast which ElectraNet have used as the basis of their Revenue Cap Application has been derived from two sources:

- ElectraNet has obtained 10-year demand forecasts from the sole South Australian Distribution Network Service Provider (ETSA Utilities) and from all customers who are directly connected to ElectraNet's transmission network. This process is as required by clause 5.6.1 of the NEC. These figures have been diversified based on historical connection point diversities.
- ElectraNet has also used the NEMMCO demand forecast from the 2001 Statement of Opportunities (SOO) for a 10% probability of exceedance. This forecast was prepared by the Electricity Supply Industry Planning Council of South Australia (ESIPC) with the assistance of independent econometric consultants NIEIR.

ElectraNet notes that the system loads developed from the aggregated customer connection point forecasts are generally higher than those of the NEMMCO forecast. They note that these loads are quite similar to the loads for the same location but two years later in the NEMMCO 2001 medium demand growth scenario. Therefore, they have applied a two year delay to the aggregated customer load forecast, resulting in an overall forecast which is broadly consistent with the NEMMCO forecast.

In their document *National Electricity Market Forecasting, Identification of Asset Development Scenarios*, 20 July 2001, prepared on ElectraNet's behalf, ROAM Consulting indicated that the relative probabilities of the low, medium and high 2001 NEMMCO SOO forecasts occurring were 25%, 60% and 15% respectively (p17, Theme Set #1 – Load Growth). In ElectraNet's application, which is based on the probabilities developed by ROAM, the 2001 SOO medium and low forecasts have been used with 80% and 20% probabilities respectively.

In order to retain consistency with ROAM Consulting's recommendations, Meritec has adjusted these probabilities to reflect a 25% probability of a low forecast and a 75% probability of the medium forecast occurring. This has resulted in a reduction of approximately $10 million in the capital expenditure over the regulatory period. This reduction is reflected in Table 6 contained in Section 9.0 - Adjustments to ElectraNet's Proposed Capital Expenditure.

Meritec believes that ElectraNet's general approach to forecasting load growth is fair and reasonable, and in accordance with sound industry practices.

However, Meritec recommends that the probabilities for the low and medium load growth forecasts occurring be changed from 20% and 80% to 25% and 75% respectively. This is reflected in the adjustments made to ElectraNet's capital expenditure in Section 9.0.

3.2 Planning Criteria

Two main planning criteria apply to transmission networks. That is, reliability, or proportion of the time that an acceptable supply is available, and security of supply, or the number of alternate supply sources available. These two quantities are related in that, in general, it would be expected that a higher level of security would result in a more reliable supply.

The South Australian Transmission Code (the Transmission Code) specifies high-level reliability goals, which are measured and reported at a global level. The figures provided indicate that ElectraNet are nominally meeting these goals, with some fluctuations due to variables such as weather. ElectraNet have stated that they have not proposed any capital expenditure aimed at increasing network reliability performance beyond the required levels.

In terms of influencing ElectraNet's capital expenditure, however, the supply security standards specified have a much more significant impact. The Transmission Code is quite prescriptive in terms of the level of supply security to be provided to transmission connected loads. All transmission-connected loads in South Australia are allocated to one of five categories by the ESIPC and various supply security related criteria are specified for each category. These include:

- Transmission line redundancy requirements (n, n-1 or n-2),
- Transmission line restoration times,
- Transformer capacity redundancy requirements (n, n-1 or n-2), and
- Transformer restoration times.

The security criteria have been appropriately applied by ElectraNet as the basis of assessing performance of various network elements and allow little discretion on ElectraNet's part. Meritec believe that the criteria have been applied appropriately.

In assessing an electricity supply network's performance against these security criteria, performance is measured in two areas. Firstly, the network assets must be sufficient to carry the required loads without exceeding their designed current carrying capacity and secondly, the assets must be capable of maintaining appropriate voltage levels while carrying these loads.

ElectraNet apply the relevant Australian Standards and or manufactures data to determine appropriate ratings for their assets. Meritec believes that this approach is appropriate and consistent with industry practice and prudent operation of a transmission network.

In addition, ElectraNet apply a minimum voltage limit of 95% of nominal voltage for 275 kV networks and 90% of nominal voltage for 132 kV and 66 kV networks.

NEC Schedule 5.1.4 specifies that voltages are to be kept within a range of ±10% of the nominal voltage. The 90% limit applied to 132kV and 66 kV lines is consistent with this requirement.

A somewhat tighter tolerance of 95% of nominal voltage has been applied to the 275 kV network, as this is the primary grid voltage, with no support offered by higher voltage levels, as would be the case for 132kV and 66 kV networks. Thus, the voltage stability of the grid as a whole is dependent on that of the 275 kV network.

This limit has been applied historically, and the specifications of the existing network have developed around it. It would be expected that any relaxation of this limit, and corresponding reduction in expenditure on the 275 kV network, would result in an increase in expenditure on the downstream 132/66 kV networks to compensate.

Meritec believes that the application of these voltage criteria is appropriate and consistent with industry practice and prudent operation of a transmission network.

The security of supply criteria have been used as the basis for justifying a number of network augmentations, both in terms of not exceeding the ratings of network assets and in the maintenance of acceptable voltage levels.

Based on these arguments, Meritec considers that the equipment ratings, voltage limits and security of supply criteria have been appropriately applied by ElectraNet.

3.3 Identification of Limitations

3.3.1 Internally Driven Works

ElectraNet have an established process for identifying the effects of future loads and generation on their network, then developing solutions to any shortcomings which are identified.

They take the forecast loads and generation, apply them to a PSS/E (network loadflow modelling computer package) model of their network, and use this to identify any existing and future system limitations. Macros are used to make the changes required to allow modelling of each year of the load forecast period. Different diversity factors are applied to loads depending on whether the part of the network being studied experiences a diversified load (shared network) or an undiversified load (connection points).

Limitations are typically identified in terms of unacceptable network voltage levels, or in terms of the rating of network components being exceeded. The methods used by ElectraNet for calculation of these ratings are generally in accordance with the relevant Australian Standards.

When a shortcoming is found, a number of possible solutions are identified and analysis is carried out to determine the most cost-effective outcome.

In the majority of cases, this would involve the identification of non-compliances with the requirements of the South Australian or National Codes and which, as noted earlier, leave little room for discretion by ElectraNet regarding the timing of the works. In other cases, the need is driven by the age/condition of equipment, or in one case the need to exit a site that is part of a disused power station. In these cases, there is more room for ElectraNet to exercise judgement regarding the method and timing of the solution. However, in both cases, the process would involve identification of the least cost method of addressing the particular issues identified.

In some cases, projects that are proposed by ElectraNet will be subject to Part B of the ACCC Regulatory Test and ElectraNet will be required to demonstrate that they provide a net market benefit. This would involve a trade-off between each project's costs and market benefits, possibly resulting in a situation where the least cost project may not necessarily be the preferred one. While a number of these projects are included in the proposed capex program, to Meritec's knowledge this process had not been undertaken for any of them as yet. Therefore, we cannot comment on the appropriateness or otherwise of ElectraNet's process in this regard. Meritec does not consider this a deficiency at this time. However, it will be important that ElectraNet undertakes this process in a timely manner in order to ensure that the projects are completed on time.

It should also be noted that the above limitations may fall into a number of categories:

1. Identification of a limit within ElectraNet's shared network arising from load or generation increase, or a change in interconnection arrangements (similar effect to a generation change), or
2. Identification of a limit associated with a specific connection to a distributor, transmission customer or generator.

In the case of point 1 above, ElectraNet can model the resulting network conditions internally, however for those customer's in case 2, additional steps are required. These are set out in the following sections.

3.3.2 Distributor / Customer driven works

These cases can be broken down into two groups, those where the existing supply has reached its capacity and requires to be augmented, and those where a new supply point is required. In either case, the basic process is the same.

ETSA Utilities is the largest customer of ElectraNet and the largest group of connection points are those supplying ETSA. ElectraNet and ETSA Utilities take part in an ongoing joint planning process to identify needs and solutions. This process consists of monthly meetings where issues are tabled for discussion and progress against outstanding issues is discussed. A significant outcome of these meetings is the "Connection Point Reinforcement Summary" which lists all outstanding connection points needing reinforcement along with project status and completion date. Separate meetings are held to discuss specific issues/projects when required.

It should be noted that both customers and generators pay for direct connection assets and that this component is not included in the regulatory capex requirement. However, the increased loadings on ElectraNet's shared transmission network can result in the need for upstream augmentations. These would usually be paid for by ElectraNet and included in the regulated asset base. Expenditure on this basis has been included in ElectraNet's capex application.

3.3.3 Generator / Interconnector driven works

At a technical level, generator or interconnector driven works are assessed in a similar way to load driven works. However, they have a number of important peculiarities in terms of their often mutually exclusive nature. That is, there may be a number of competing proposals where if one or more of the proposals become committed, then the need for others may be removed.

In addition, a specific generation proposal will be inherently less certain to proceed, per se, than the majority of forecast loads. This is due to the fact that they are heavily market driven and often somewhat speculative in nature.

Therefore, a TNSP may be reluctant to commit expenditure to each generation proposal, although it may have determined the works that would be required to connect each one. This forms one of ElectraNet's arguments for using a probabilistic method to prepare the capital expenditure forecast. This is discussed further in section 5.0, Probabilistic Capex Forecast.

3.4 Alternatives to Proposed Expenditure

The NEC requires TNSP's to consider the alternatives to capital expenditure in addressing network constraints. Alternatives may include embedded generation, cogeneration, demand side responses or other non-build options.

ElectraNet already has a number of network support contracts with generators at critical locations. Under these contracts, the generator is paid to operate in such a way as to support ElectraNet's network during contingencies such as line outages. It is ElectraNet's experience that these contracts are relatively costly and normally result in some delay before the support is available. This may be acceptable in some cases, but not in others.

ElectraNet states that it has made minimal allowance for demand side responsiveness in its own demand calculations, based on the assumption that any resulting demand reduction would be incorporated in the load forecasts provided by ETSA Utilities and the resulting requests for supply point augmentation. This assumption is based on ElectraNet's experience that the majority of demand management activity is undertaken at the distribution level.

It must be noted that while a network service provider has a responsibility to consider non-network alternatives, they also have an obligation to ensure that customers receive appropriate levels of supply security and reliability. Therefore, they must consider the viability of the various options being placed before them for addressing network needs. Given the relatively immature state of the market for demand management services, Meritec believes that it is appropriate that ElectraNet base their regulatory application on the mature technology of network reinforcement in order to ensure that they have a viable path for meeting customers needs. If viable non- network options for deferral of capex emerge during the regulatory period then this can be reflected at the next regulatory reset.

It should also be noted that each of the projects noted in ElectraNet's capex projections is subject to either part (a) or (b) of the ACCC's regulatory test. Meritec believes that the most appropriate time to consider whether non-network options have been adequately considered is during the application of that test when all project parameters are fully known and the state of the market for non-network options at that time is also known.

Meritec believes that the approach taken to the consideration of non-network alternatives is appropriate given the maturity of the market for these alternatives and ElectraNet's underlying obligations to provide an adequate standard of supply to its customers.

3.5 Review of Process

In the available timeframe Meritec was able to carry out a high level review of ElectraNet's capex planning process, to identify evidence of each stage noted above. Meritec was able to identify evidence of the various stages, although not necessarily all for the same project. This is reasonable given that the projects are at various stages of completeness and have been driven by a variety of issues.

On the basis of its review Meritec believes that the capex planning process followed by ElectraNet is satisfactory.

3.6 Review of Major Projects

ElectraNet provided a report to Meritec listing all identified regulated projects that they anticipated to be carried out until June 2008[1]. These projects were developed out of an assessment of the 24 scenarios arising from the work conducted by ROAM Consulting, and the report outlines all projects flagged as a result of that analysis. Meritec notes that due to the probabilistic nature of this analysis that not all projects will be required in this period, and that there may be some not yet identified. Those projects that will be required will depend on actual development of generation, interconnections and load growth.

The Projects Report separates out the capex projects into seven categories, namely:

1. Network Augmentation;
2. ETSA Utilities – pre EPO;
3. Strategic Communications Projects;

[1] Regulated Projects Report. Network Analysis & Development Department. 15 April 2002.

4. Asset Maintenance Projects;
5. Other Engineering Projects;
6. Corporate Capital Expenditure; and
7. ETSA Utilities – post EPO.

A breakdown of proposed projects by category from ElectraNet's 'Regulated Capex Roll in' spreadsheet is as follows:

Table 1 - ElectraNet's Proposed Capital Expenditure by Category

Project Category	Number of projects	Estimated Total Project cost ($ million)	Estimated Value of Reg Capex Roll In* ($ million)
1. Network Augmentations	57	548.4	255.7
2. ETSA Utilities – pre EPO	9	0.0	0.0
3. Strategic Communications Projects	18	16.5	8.7
4. Asset Maintenance Projects	6	4.3	4.3
5. Other Engineering Projects	9	0.0	0.0
6. Corporate Capital Expenditure	-	8.6	8.6
7. ETSA Utilities – post EPO	20	109.7	71.1
TOTAL (excl IDC)	113	687.5	349.0

Note: all values are in $2001/02
* Value of projects nominated by ElectraNet to be rolled into the asset base during the Regulatory period.

Meritec examined a number of significant projects that are proposed for roll-in during the regulatory period in order to better understand their drivers. These 13 projects accounted for $137 million ($2002/02) of ElectraNet's proposed roll in, or 39% of the $349 million total excluding interest during construction.

A summary of the key issues that influence the inclusion or exclusion of certain of these projects is set out below.

Bungama/Brinkworth 275/132 kV Project
ElectraNet Project Report No 1.1 and 1.55

These two mutually exclusive projects of similar value have been included for augmentation of the Bungama / Brinkworth network each with a 50% probability. One of the two projects will be required during the regulatory period, but not the other, depending on whether the SAMAG magnesium smelter proceeds. Project 1.1 has an estimated value of $24.7 million and Project 1.55 $28.5 million.

This project is driven by the age and condition of the Playford - Bungama 132 kV lines. These lines are in the worst condition of any in ElectraNet's system. ElectraNet have noted that rebuilding of these lines would be more expensive than the option proposed and would result in voltage collapse during an outage of the Hummocks to Waterloo line.

If the SAMAG smelter does not proceed, the project consists of the installation of one 275/132 kV, 160 MVA transformer at Bungama substation, and replacement of the existing 275/132 kV, 60 MVA transformer at Brinkworth with a 160 MVA unit. At the same time an existing 275 kV line would be turned into Bungama and the redundant sections of 132 kV line between Playford and Bungama removed.

If SAMAG was to proceed, then 3 x 275/132 kV, 160 MVA transformers would be required at Bungama and the Brinkworth transformer would not be uprated.

ElectraNet proposes to commence either of the projects in the second half of 2002, for completion and roll-in during 2003/04.

Meritec believes that this project is appropriate.

Playford – Davenport 132 kV Substation Supply Consolidation
ElectraNet Project Report No 1.2

This project has an estimated cost of $14.0 million with a probability of 1.0 of occurring within the regulatory period

The project is driven by the deteriorating condition of the Playford switchyard as well as the need to exit the site, which is part of the disused Playford A power station. It would allow consolidation of activities at the nearby Davenport substation.

The project involves rebuilding the Playford132 kV switchyard at the Davenport substation and installing new 275/132 kV, 160 MVA tie transformers at Davenport. The 132/33 kV transformers servicing ETSA Utilities would also be moved.

ElectraNet proposes to commence this project in the second half of 2002, for completion and roll-in during 2003/04.

Meritec believes that this project is appropriate.

3.7 Projects for Exclusion

Meritec has recommended that a number of specific projects be excluded from the capital expenditure proposed by ElectraNet for the regulatory period. These are outlined in the following paragraphs, along with the reasoning supporting their exclusion.

It should be noted that Meritec has not necessarily excluded these projects due to lack of technical merit. In most cases, it is recognised that the projects proposed were suitable responses to the particular network development scenario(s) for which they were put forward.

The main causes for exclusion are related to the regulatory management of the expenditure. These manifested themselves as uncertainty regarding whether a particular project would proceed during the regulatory period and/or uncertainty regarding whether ElectraNet would be required to fund the projects. These projects are discussed in the following paragraphs

3.7.1 Augmentations to the Robertstown/Monash/Berri Network

This work consists of two major projects, Project 1.36 – Monash – Robertstown 275 kV and Monash 275/132 kV substation and Project 1.52 – Monash – Victorian Border component of SNI.

Monash – Robertstown 275 kV and Monash 275/132 kV substation
ElectraNet Project Report No 1.36

This project has an estimated cost of $44.7 million. This total is made up of $9.8 million for Monash 275/132 kV substation and $34.9 million for the 275 kV line from Monash to Robertstown. ElectraNet has assigned this project a probability of 0.8 of proceeding within the regulatory period.

Both ElectraNet and the ESIPC have identified a need to augment the supply to the Riverland area due to ongoing load growth. This can be provided either by support from Murraylink or by the establishment of a new 275/132 kV injection point in the area.

ElectraNet states that by summer 2004/05 Murraylink has insufficient capacity to provide the level of support that is required. On this basis ElectraNet has proposed construction of a 275/132kV substation at Monash by 2004/05 to provide support to the existing 132 kV Riverland network.

The existing, approved version of SNI goes directly to Robertstown and does not pass through Monash. Therefore, ElectraNet has allowed for construction of a 275 kV connection from Robertstown to Monash by 2004/05.

Meritec makes the following points in relation to the above position:

- If a network support contract can be negotiated with the operators of Murraylink, then this can provide an adequate supply to the Riverlands area until 2007/08, when voltage limits would be experienced for outages of Murraylink. (Meritec independent report for ESIPC *Technical Review of Submissions to the ESIPC on the Riverland Augmentation,* September 2001).
- At that point an additional 275/132 kV injection point is required. ElectraNet has proposed the Monash 272/132 kV substation for this purpose, albeit earlier in the regulatory period.
- ElectraNet's proposed 275 kV connection from Robertstown to Monash has a length of 160 km.
- However, in its submission to ESIPC, TransGrid (proponents of SNI) have proposed a connection into SNI closer to Monash involving the construction of only 20km of dual circuit line. This was reviewed by Meritec in the above report and found to be a robust technical solution. It would also be significantly less expensive than a line from Robertstown to Monash.

Based on the above facts Meritec has recommended modifying the capital expenditure for supply in this area as follows:

- The substation component of Project 1.36 - Monash 275/132 kV substation and 275 kV line, should be allowed, but deferred until 2007/08 based on the use of Murraylink to support the network.
- The Robertstown – Monash 275 kV line component of this project should be excluded on the basis that TransGrid's proposal for diverting SNI to Monash is technically robust and less expensive. No allowance has been included for this work as TransGrid is the proponent.

Monash to SA Border Component of SNI
ElectraNet Project Report No 1.52

ElectraNet has also included a project covering the section of SNI from the South Australian Border to Monash in their capex program. This project has an estimated cost of $30.9 million and a probability of 0.45 of proceeding within the regulatory period. This project would be commenced in 2003/04 for roll in during 2004/05 or 2005/06.

However, it is noted that at present, TransGrid is the proponent of SNI and there is no requirement for funding from ElectraNet.

In relation to both of the above projects, and specifically the possibility that ElectraNet may have an increased involvement in SNI in the future, the ACCC's comments in relation to the inclusion of SNI expenditure in TransGrid's revenue cap application are relevant.

In their document, *Decision, NSW and ACT Transmission Network Revenue Caps, 1999/00-2003/04,* 25 January 2000, the ACCC disallowed TransGrid's projected expenditure on SNI (then SANI) on the basis of uncertainty about whether it would proceed. In response to TransGrid's comments regarding the disadvantage to them should the project later go ahead, the ACCC stated:

"The Commission believes that while it could rectify the temporary disadvantage suffered by TransGrid at the next regulatory re-set, it would be more difficult to rectify the disadvantage suffered by electricity consumers whose pattern of electricity consumption, and therefore liability for TUoS, changes over time." (p78)

Meritec believes that the principle stated above would also apply in this case and that expenditure for this project should therefore be excluded from ElectraNet's capex forecast.

3.7.2 Augmentation to Facilitate Connection of Distributed Generation

ElectraNet has proposed a significant level of expenditure to facilitate the future connection of distributed generation, primarily wind driven. These projects were as shown in Table 2.

Table 2 - Capex to Facilitate Distributed Generation

Project	Estimated Total Project Cost ($million)	Probability of Proceeding before June 2008	Proposed Construction Date
1.33 Eyre Peninsula	67.5	0.33	July 02 – 2007/08
1.44 South East 3rd 275 kV line to Tungkillo	101.4	0.13	2006/07 –2007/08
1.47 Split Cult-Davenport	8.0	0.12	2006/07 –2007/08
1.48 Mintaro Brinkworth 132 kV uprate protection (previously opex)	0.01	0.16	2007/08
1.49 Mintaro Waterloo 132 kV uprate protection (previously opex)	0.01	0.16	2007/08
1.53 Black Range	8.0	0.40	2006/07
Note: projects may have a range of construction dates with corresponding probabilities			

Given the fact that generation of this nature is the catalyst for such high levels of expenditure, the question must be raised as to whether this should be funded by ElectraNet (and its customers) or by the proponents of the generation. There is a risk that economic signals to the generators regarding their location would be lost if such expenditure is allowed.

Investment which ElectraNet has nominated as necessary for the connection of distributed generation has been excluded on the basis that if there is no other need for it, then it should be largely funded by the proponent.

It should also be noted that all of the proposals related to wind generation had relatively low probabilities of proceeding within the forthcoming regulatory period.

Given the uncertainty of whether the projects in Table 2 will proceed, and as to the source of their funding if they do, Meritec believes that the principle noted for the exclusion of SNI expenditure would apply equally to expenditure associated with distributed generation. Meritec recommends that these projects be excluded from ElectraNet's capital expenditure forecast.

3.7.3 Other Contingency Amounts

There are two cases where ElectraNet has allowed contingency amounts for work that has not yet been identified. These are Project 5.10 – Projects not yet identified and Project 7.21 – Other ETSA Utilities Connection Work – from 2007/08.

These contingency amounts are inconsistent with the probabilistic approach. That is, it is known that not all of the events included in the probabilistic forecast will occur, and it is this principle that will provide for contingencies.

It should also be noted, in the case of Project 7.21, the proposed expenditure falls in the final year of the regulatory period. It would therefore be a relatively simple matter to address an expenditure of this nature, should it occur, at the next asset roll forward with minimal detrimental effect on ElectraNet.

Meritec recommends that these contingency amounts be excluded from ElectraNet's capital expenditure forecast.

3.8 Conclusions

Meritec has reviewed the probabilistic planning process applied by ElectraNet and believes that it is a fair and reasonable process that is consistent with broad industry practice.

However, Meritec has recommended the exclusion of a number of projects based on uncertainty regarding ElectraNet's requirements to fund them, or because they represented contingency amounts that are inconsistent with a probabilistic forecast. The specific projects that are excluded on this basis are listed in Table 3.

Meritec believes that the planning and asset management processes applied by ElectraNet to the proposed capital projects are fair and reasonable, and in accordance with accepted industry practices. However, we recommend that the projects noted in Table 3 be excluded from the capex forecast.

Table 3 - Projects Excluded from Capex Forecast

Project No	Description	Roll In ($000 2001/02)	Reason
Robertstown/Monash/SNI			
1.36b	Robertstown - Monash 275 kV	27,910	Not required due to SNI connection
1.52	SNI Monash to Vic Border	13,840	Funded by TransGrid
Augmentation to Facilitate the Connection of Distributed Generation			
1.33	Eyre Peninsula	22,140	Wind generation driven
1.44	South East 3rd 275 kV line to Tungkillo	12,970	Wind generation driven
1.47	Split Cult-Davenport	960	Wind generation driven
1.48	Mintaro Brinkworth 132 kV uprate protection (previously opex)	2	Generation driven
1.49	Mintaro Waterloo 132 kV uprate protection (previously opex)	2	Generation driven
1.53	Black Range	3,200	Wind generation driven
Other Contingency Amounts			
5.10	Projects not yet identified	2,500	Contingency not consistent with probabilistic methodology
7.21	Other ETSA Utilities work	5,000	
Total Exclusions ($2001/02)		88,523	
The part project below was included, however it was deferred from 2003/04-2004/05 to 2007/08			
1.36a	Monash 275/132 kV substation	7,840	required by 2007/08
Total Deferrals ($2001/02)		7,840	

4.0 Basis of Cost Estimates

In conjunction with the preparation of options for the development of the South Australian network, ElectraNet carried out a three-way comparative costing exercise. The purpose of this was to enable ElectraNet to have confidence in developing the cost component of their capital expenditure program. Such an approach is considered good practice in ensuring that cost estimates produced and used in the capex were consistent, fair and appropriate.

In carrying out this exercise ElectraNet selected fifteen projects covering a wide range of scenarios, including various types of substation plant, protection, communications and design work. High level estimates were prepared for these projects by two independent industry consultants, Meritec and GHD, the results of which were compared with ElectraNet's own estimates.

Estimating Philosophy

ElectraNet's estimating methodology is based on identifying the major equipment items and then applying the following multipliers against aggregate plant costs:

- 10% for design;
- 30% for installation; and
- 5% for Project Management.

A 10% contingency amount and 0.25% insurance amount are then applied to the sub-total (plant, design, installation and project management) to determine the total estimated project cost.

Meritec's estimating philosophy in the September 2001 review used a bottom up approach by identifying in detail the project equipment requirements, then calculating the installation as labour, miscellaneous minor equipment and plant (i.e. cranes etc.) categories and then applying multipliers for contingency and overheads.

Project Estimate review

In attempting to verify the validity of the cost estimates used in the capex plan, Meritec reviewed ten of the fifteen projects from ElectraNet's estimating review, to determine whether their costs were considered to be realistic and appropriate.

It was noted in the estimates produced in this [fast-tracked] estimating review process undertaken in September 2001, that it has resulted in unrealistically low installation costs for some projects which included items such as panels, cubicles and control and LV power cabling. This was in part due to variations in assumptions made by the consultants in these areas when compared with ElectraNet's assumptions.

The projects whose costs were reviewed by Meritec are as follows (the non-sequential numbering arises because the projects have been taken from ElectraNet's complete list of identified regulated projects). It should be noted that these cost estimates are from the September 2001 Independent review process, and as such may differ from the final estimates included by ElectraNet in the Regulated Projects Report of April 2002, supporting their submission.

1.1 Bungama/Brinkworth 275/132kV

This project consists of the installation of one 275/132 kV, 160 MVA transformer at Bungama substation, and replacement of the existing 275/132 kV, 60 MVA transformer at Brinkworth with a 160 MVA unit. At the same time an existing 275 kV line would be turned into Bungama and the redundant sections of 132 kV line between Playford and Bungama removed.

The project is driven by the age and condition of the Playford - Bungama 132 kV lines, which Meritec understands are in a poor condition. ElectraNet have noted that rebuilding of these lines would be more expensive than the option proposed, and would result in voltage collapse during an outage of the Hummocks to Waterloo line. The project would enable ElectraNet to manage their SA Transmission Code reliability obligations at Bungama, Baroota and Yorke Peninsula in the most cost effective manner.

The substation component was the only part evaluated in the check estimates, and the estimated value of $15.8m for this component is considered to be realistic and appropriate. The project will proceed (either with or without SAMAG) in 2003/2004.

1.2 Playford relocation to Davenport

This project involves rebuilding the Playford132 kV switchyard at the Davenport substation and installing new 275/132 kV, 160 MVA tie transformers at Davenport. The 132/33 kV transformers servicing ETSA Utilities would also be moved.

The project is driven by the deteriorating condition of the Playford switchyard as well as the need to exit the site, which is part of the disused Playford A power station. It would allow consolidation of activities at the nearby Davenport substation.

The estimated value of $16.9m for the substation component is considered to be realistic and appropriate. The work is required and scheduled to take place in 2003/2004.

1.3 South East to Snuggery 132 kV Line

This project involves the construction of a new single circuit 132kV line from the South East Substation to Snuggery Substation. Appropriate switchgear, protection and communication equipment (OPGW in line with the Telecommunications Strategic Plan) should be included within the scope.

From the summer 2003/2004, 132kV voltages are predicted to fall to unacceptable levels on the lower South East 132kV network for an outage of the South East to Mount Gambier 132kV line, even with all Snuggery generation on line.

The estimated value of $8.6m is considered to be realistic and appropriate. The work is required in the regulatory period and is currently scheduled for 2005/2006.

1.5 Brinkworth to Western Tie 275 kV Line

This project involves connecting the 275kV Davenport to Para West circuit in and out of Brinkworth Substation. It is required for ElectraNet to provide a reliable supply (ie N-1) to the north of the state if the SAMAG project proceeds.

Meritec's transmission line sub-consultant from September 2001 has confirmed an error in their estimates, and now reports installation costs in similar proportions to the ElectraNet and GHD estimates. The estimated value of $2.3m considered to be realistic and appropriate. This project has a 50% probability of being required in the regulatory period, and is scheduled for 2005/2006.

1.18 Kincraig Capacitor 132 kV 20 MVAr

This project involves the installation of a 132kV 20Mvar capacitor bank at Kincraig substation, including switchgear, protection and communication components. ElectraNet appear not to have studied this project yet, which is expected to be required to maintain acceptable transmission voltages.

The estimated value of $1.3m is considered to be realistic and appropriate. The capacitors are not likely to be required until 2008/2009, which is outside of the regulatory period.

1.28 Hummocks Capacitor 132 kV 30 MVAr

This project involves the installation of a 132kV 30Mvar capacitor bank at Hummocks substation, including switchgear, protection and communication components. ElectraNet appears not to have studied this project yet, which is expected to be required to maintain acceptable transmission voltages.

The estimated value of $1.9m is considered to be realistic and appropriate. This project is required in the regulatory period, and is scheduled for 2003/2004.

1.13 East Terrace to Magill Second 275 kV cable and 275/66 kV 225MVA transformer

This projects involves installing a second East Terrace to Magill 275kV cable and a second 275/66kV 225MVA transformer at East Terrace with necessary switchgear, and protection and communication systems. At the same time current transformers will be changed on the existing cable, increasing the rating of this from 238MVA to 450MVA.

The project is driven by reliability guidelines outlined in section 2.2.2 of the SA Transmission Code, for an expected request from ETSA Utilities for an increase in their Agreed Maximum Demand at East Terrace.

This project with $7.2m of 275 kV power cable and $2.8m of 275/66 kV transformer results in a significant material cost subtotal. This warrants a more detailed assessment of the ElectraNet estimating methodology using multipliers. This assessment notes the following:

- The power cable cost does not include the cost of the cable joints, cable terminations or cable bonding system, therefore we consider an allowance of $2.1m should be included for both the 275 kV and 66 kV cable accessories.
- The '275 kV Cable Trenching & Installation Costs' of $13.8m is considered appropriate if the trenching is required for the full 8.5 km circuit length.
- The 'Installation Costs (Imported Expertise)' of $5.2m which is calculated by multiplier of 30% is considered high (i.e. when the 'Material Cost' includes $7.2m for power cable and $2.1m for cable accessories and the cable trenching and installation is addressed separately). Therefore a reduction of the multiplier to 10% is considered appropriate which results in an estimated cost of non-power cable installation of $1.9m.

In summary, the total estimated value of $45.3m for Project 1.13 (cable supply and installation, and transformer supply and installation) is considered to be realistic and appropriate. The project has been allocated an 80% probability of being required in the regulatory period, and is scheduled for 2005/2006.

1.6 Eastern Hills Project

The project consists of three key elements, and involves a) stringing a second 132kV circuit between Tailem Bend and Mobilong, b) rearranging the existing Mobilong to Tailem Bend 132kV circuit to bypass Mobilong and become Tailem Bend to Mannum circuit and c) upgrading the Tailem bend 275/132 kV transformer to 225 MVA capacity.

The project is required to prevent overloading of the existing Tailem Bend to Mobilong 132 kV circuit, enhance the interconnection flows through the 132kV network, and improve security of supply to the Eastern Hills 132kV network.

The estimated cost of the transformer at $2.5m is considered high and a figure of $2.2m is considered more appropriate. After applying the 'Material Cost' multipliers, a reduction of $0.5m to the project's estimated value, to $7.0m, would be considered to be more realistic and appropriate. The project has a 100% probability of occurring in the regulatory period, with 2004/2005 being the most likely commencement date.

7.8 Northfield Third 275/66 kV 225 MVA Transformer

This is an ETSA Utilities – Post EPO project, involving the installation of a third 225MVA 275/66kV transformer at Northfield with associated 275kV GIS CB. There is an error in the estimated value of the '275 kV Circuit Breaker GIS' which should total $1.2m (not $2.4m). The need for this project will be determined by ETSA Utilities.

After correcting the 'Material Cost' then applying the multipliers, the revised project estimated value of $11.9m would be considered to be more realistic and appropriate. The project has an 80% probability of proceeding in the regulatory period, and is currently scheduled for 2006/2007.

1.38 Heywood Substation (Black Range Substation)

This project involves the addition of series capacitors and associated control circuitry to increase the capacity of the Victorian interconnection to 650MW import. With $16m of 132 kV series capacitor banks, this results in a significant material cost subtotal. This warrants a more detailed assessment of the ElectraNet estimating methodology. This assessment notes the following:

- The 'Installation Costs' of $6.1m, which is calculated by multiplier of 30%, is considered high (i.e. because the 'Material Cost' includes the $16m for the series capacitor bank contract). Therefore, a reduction of the multiplier to 10% is considered appropriate which results in an estimated cost for the installation of $2m.

In summary, an estimated value of $28.5m is considered to be more realistic and appropriate for this project. This project has a 64% probability of occurring in the regulatory period, commencing in either 2004/2005 or 2006/2007.

Conclusion

While this review has resulted in reductions of between 7% and 14% for the last three projects, (totalling $6.8m), in total it is approximately 4% of the value of the ten projects considered and so beneath the threshold of materiality. It should also be noted that anticipated levels of accuracy for individual costs was in the vicinity of –20% to +20% for the two consultancy reviews.

Meritec considers that the process of check estimates undertaken was appropriate and to be good industry practice. However, Meritec found that the methodology used in preparation of these costings was flawed for those projects with a high plant content. It is also considered that there is a lack of definition in how some material costs, such as buildings, were developed.

Overall, Meritec believes that the project cost estimates developed by ElectraNet are generally appropriate and the total costs forming the capex program are within the bounds of accuracy of the estimating methodology (i.e. less than 5% overall).

5.0 Probabilistic Capex Forecast

ElectraNet have adopted a probabilistic method for deriving their capital expenditure projections for their Revenue Cap Application.

In support of this position, they have noted that, given the uncertainty associated with generation dispatch patterns, future generation development and future load development, a purely deterministic method of forecasting capital expenditure has limited usefulness.

Therefore, they have applied a methodology that is similar to that used by Powerlink in their revenue cap application and accepted by the ACCC in "Queensland Transmission Network Revenue Cap 2002-2006/07", 1 November 2001. ElectraNet have used the same consultants as Powerlink, ROAM Consulting, to assist them in this regard.

In their report for ElectraNet SA, "National Electricity Market Forecasting, Identification of Asset Development Scenarios", 20 July 2001, ROAM Consulting gave consideration to a range of factors including predicted load/generation balance in the Victorian/SA regions, generation technology employed, fuel sources and the effect of these factors on generation location and size. A number of scenarios were then developed using this information (top down), as well as consideration of existing generation proposals (bottom up). The probabilities of the various scenarios were developed on a case-by-case basis by ROAM.

They refined these into a number of different "themes" which represent plausible variations in the key drivers for development of ElectraNet's network. These include variations in generation levels to the south, variations in generation levels to the north and west, variations in the growth of demand for electricity and the impact of the SAMAG magnesium smelter proceeding or not proceeding. Various levels of wind generation were included in the generation themes.

When combined these variables give rise to 288 possible scenarios. ElectraNet have consolidated those scenarios which lead to similar transmission development outcomes leaving 24 scenarios. These 24 scenarios flow from the various combinations of the themes contained in Table 4 below, along with the relative probabilities applied by ElectraNet.

Table 4 - Probabilistic Scenario Themes

Possible Outcome	Notes	Probability
Additional Generation in the South of South Australia		
Low levels of additional generation	Only committed generation added (no wind generation)	20%
Medium levels of additional generation	340 MW of additional generation (including wind)	40%
High levels of additional generation	500 MW of additional generation (including wind)	40%
Additional Generation in the North and West of South Australia		
Low levels of additional generation	Only committed generation added (no wind generation)	80%
High levels of additional generation	490 MW of additional generation (including wind)	20%
Electricity Demand Growth		
Low demand growth	As in NEMMCO's 2001 Statement of Opportunities	20%
Medium demand growth	As in NEMMCO's 2001 Statement of Opportunities	80%
SAMAG Magnesium Smelter		
Proceeds	230 MW generation and between 20 MW and 170 MW load	50%
Doesn't Proceed		50%

For each of the 24 scenarios, the planning process outlined in Section 3.3 of this report, Identification of Limitations, was applied to determine the augmentations required to satisfy NEC, SA Transmission Code and ElectraNet planning criteria.

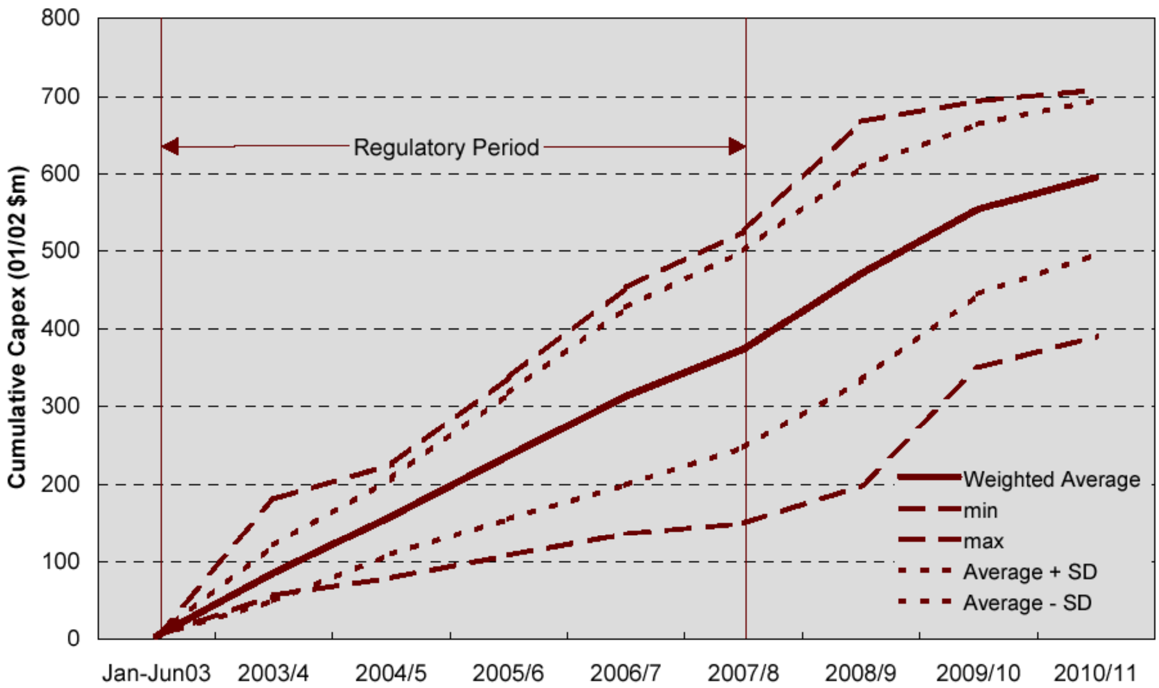
The augmentations associated with each scenario were costed and the costs weighted by the probability of each scenario. These probability-weighted expenditures were combined to arrive at the most likely expenditure in each year, as shown in Table 5. It should be noted that the augmentations included in the scenarios contained some expenditure that ElectraNet have elected not to capitalise in their application. This expenditure is not included in the following table. Also, a number of committed projects have been included in the analysis with probabilities of 1.

Table 5 - Scenario Weighted Average Capital Expenditure Requirement

	Jan-Jun 2003 ($m)	2003/04 ($m)	2004/05 ($m)	2005/06 ($m)	2006/07 ($m)	2007/08 ($m)
Lines	0.1	29.0	18.1	39.7	17.2	30.5
Substations	3.3	50.5	53.5	37.2	58.4	28.3
Other	0.9	2.0	1.3	0.4	1.6	1.7
Total Capex ($2001/02)	4.3	81.5	72.9	77.4	77.3	60.5
Total Capex (nominal)	4.4	85.3	78.1	84.9	86.8	69.5

ElectraNet SA Transmission Network Revenue Cap Application 2003 – 2007/08, April 2002, Table 6.2, p6-8.

Figure 1 below, shows the variation in expenditure between scenarios in 2001/2002 dollars.



Source: ElectraNet SA Transmission Network Revenue Cap Application 2003 – 2007/08, April 2002, Figure 6.5, p6-8.

Figure 1 - Cumulative Probabilistic Capital Expenditure ($2001/02)

It can be seen from Figure 1 that there is a wide variation possible in the capital expenditure which can be expected depending on which scenario eventuates. Therefore, the capital expenditure levels put forward by ElectraNet represent only the statistically most likely expenditure. It is highly likely that expenditure will vary from these figures to some degree.

Meritec notes that there is a degree of uncertainty involved with any forward projection of capital expenditure. ElectraNet have used this argument as the basis for their use of a probabilistic capex forecast, as have Powerlink in their previous submission. While this approach can be said to arrive at a more statistically defendable estimate of future capital expenditure, it offers less certainty as to the specific projects that will be constructed and subsequently included in the asset base. Essentially, acceptance of a capex forecast prepared in this way gives the proponent permission to spend that quantity on projects which are not necessarily identified at that stage, albeit subject to a regulatory test prior to proceeding.

The approach traditionally applied, and proposed by the ACCC in their *Draft Statement of Principles for the Regulation of Transmission Revenues*, 27 May 1999, for making adjustments of over-estimates of capex is the "clawback" mechanism. Meritec believe that this is effective for relatively small variations between approved and actual expenditure.

However, if large variations from the expected level are experienced, it may be less easy to recover these by clawback. For instance, ElectraNet's figure for the most likely expenditure over the regulatory period is $374 million ($2001/02). If the actual expenditure was one standard deviation (by ElectraNet's figures) below this level it would result in an expenditure of only $250 million ($2001/02). The resulting $120 million would need to be clawed back at approximately $25 million per annum, possibly in the context of ongoing capital expenditure of approximately $80 million per annum. This would have significant cashflows effects on the business concerned.

Conversely, if expenditure was to be one standard deviation above the predicted level, then this would equate to expenditure of $500 million ($2001/02). This equates to additional expenditure of $126 million. This would potentially be rolled into the asset base at the next regulatory reset, however it could result in a large step change in charges.

Consideration should be given to an appropriate mechanism for monitoring the variations between approved and actual capital expenditure on an ongoing basis, and making adjustments if required. This would minimise the potential need for large adjustments at the next regulatory reset.

It should also be noted that previous deterministic methods would also have only arrived at a single expenditure level, which was still subject to variation, but without the benefit of having included the likelihood of alternative options.

The projects identified as part of the probabilistic process are similar to those put forward in ElectraNet's previous document "*SA Transmission Development Ten Year Plan, 2001-2011*, 12 June 2001 which was prepared on deterministic basis.

Meritec would expect that there would be significant similarities between the projects identified. The deterministic development plan represents the most likely development scenario, while the probabilistic capital expenditure forecast represents a composite of a number of scenarios, weighted appropriately for their likelihood. Given their respective origins, it is logical that a probabilistic forecast would be most heavily influenced by the most likely scenario as used in the deterministic development plan.

In addition, the fact that a number of the variations between scenarios involved essentially the same works, but with varying timings, would also tend to contribute towards similarities between the deterministic and probabilistic forecasts.

The SA Transmission Development Ten Year Plan did not contain an overall capital expenditure forecast. If the expenditures noted against each project are compared, there are differences implied in the values of the respective programs. However, Meritec notes that there were a significant number of projects in the older SA Transmission Development Ten Year Plan which were identified but not costed, only roughly costed, or identified as needs without being scoped or costed. In addition, ElectraNet reviewed the scope and estimates for the projects included in their Revenue Cap Application in September 2001. This makes comparison of expenditure levels between the two programs difficult. It would tend to add to the importance of the review of project estimates carried out in Section 4.0 as these form one of the main bases for the overall cost of the proposed program.

Conclusion

Based on Meritec's understanding of the South Australian market and review of the research conducted by ROAM Consulting into future loads and generation we believe that the probabilistic approach is sound, that the scenarios considered are appropriate and that, in general, the probabilities applied to project timing were appropriate.

However, Meritec recommends that the probabilities applied to the various load forecasts be adjusted from ElectraNet's figures of a 20% probability of a low forecast and 80% probability of a medium forecast, to figures more consistent with those developed by ROAM Consulting, that is 25% and 75% respectively.

6.0 Asset Renewals

Asset renewal expenditures consist of both replacement and refurbishment expenditure.

In its submission, ElectraNet designated capital expenditure as that associated with growth of the network and some replacement of assets. It classified asset refurbishment, including some additional replacement expenditure as operating expenditure. The reasons for doing this are discussed in Section 8.0 of this report.

The ACCC has directed that ElectraNet's refurbishment expenditure be treated as capex and reviewed accordingly. Therefore, Meritec has included and assessed those expenditures in this report.

6.1 Asset Management Planning

The maintenance group of ElectraNet has been proactive in developing asset management techniques and, although not having a Board approved business plan, they have prepared the existing asset management plan to be in line with the policies and goals of the company as a whole.

The asset management plan, which is reviewed annually, provides details on;

- Asset Management drivers and planning process;
- Details on performance and asset age profiles;
- Proposals for asset augmentation and renewals; and
- Risk profiles of all assets so as to identify those assets most needing attention.

ElectraNet adopts a whole of life-cycle cost approach to asset management centred around the principle of reliability and risk management. This approach utilises preventative, scheduled, and condition-based maintenance techniques depending on the best mix for each asset.

To keep track of and evaluate the various requirements ElectraNet currently uses the MAXIMO maintenance package but will be changing to SAP in the near future, as well as some in-house or proprietary software tools for specific tasks not able to be supported in MAXIMO.

ElectraNet also undertakes detailed analysis of power system faults to determine their cause and identify corrective or preventative actions required. This process includes the investigation and reporting of each event so that the results are widely disseminated to all stakeholders.

ElectraNet's asset management plan is comprehensive in that it links asset management strategies to required levels of performance and other drivers. The planning approach is satisfactory and the tools used appear to be effective. ElectraNet should ensure that during the next review cycle the asset management plan is updated to reflect the company's business plans when approved by the Board.

6.2 Refurbishment and Replacement Expenditure

At present, the average age of the key high value assets (power transformers, circuit breakers, instrument transformers and transmission lines) on the ElectraNet system is 35-40 years. This leads to an increased need for replacement and refurbishment expenditure.

6.2.1 Asset Age Profiles

From information provided by ElectraNet the following age profiles have been produced for the major assets of power transformers (referenced to the HV winding), circuit breakers and transmission lines showing the number of assets in each age band.

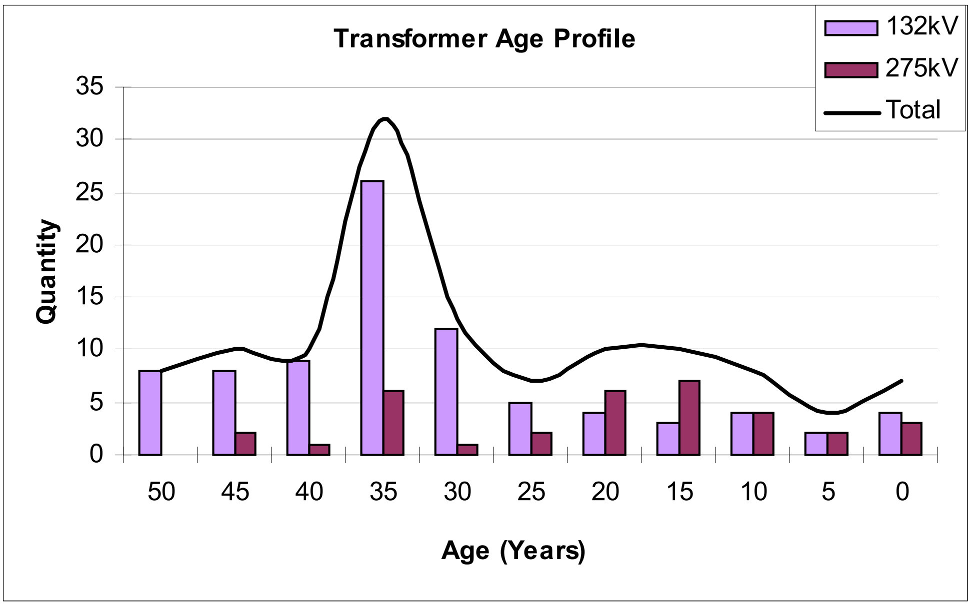


Figure 2 - Transformer Age Profile

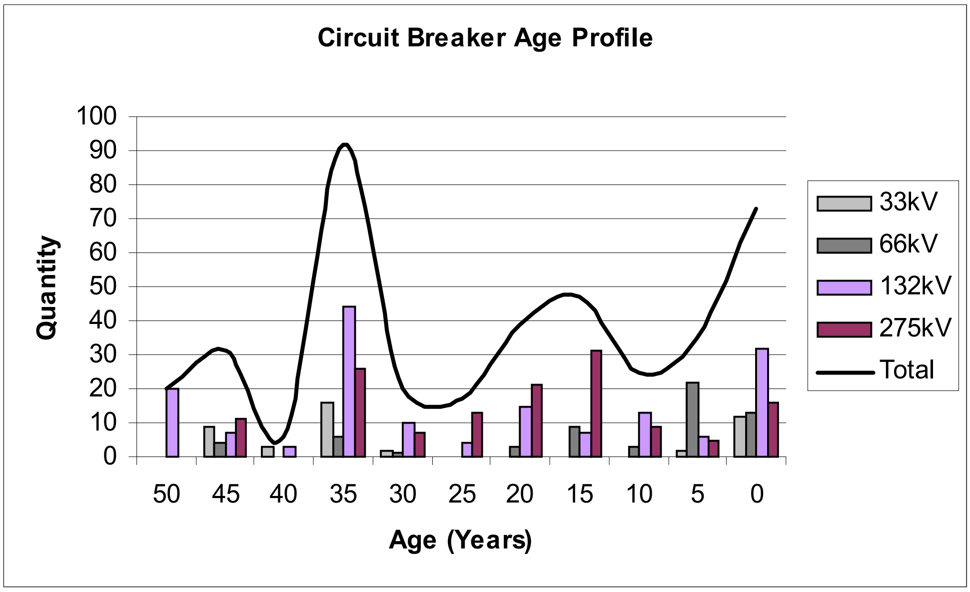


Figure 3 - Circuit Breaker Age Profile

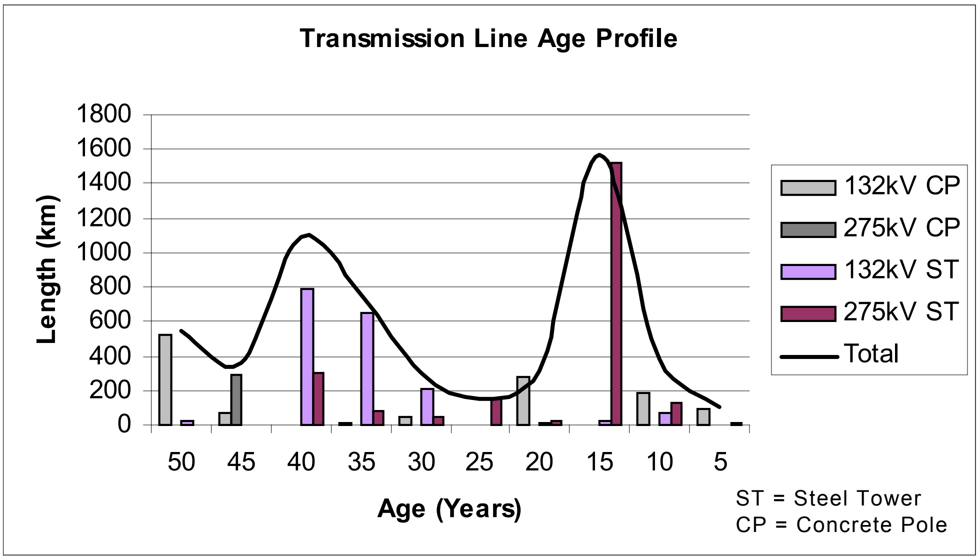


Figure 4 - Transmission Line Age Profile

The above figures indicate that ElectraNet has 50% of its transformers aged 35 years or greater. For circuit breakers the figure is 37% and for transmission lines 50%. These figures support ElectraNet's contention that a significant number of the assets are approaching the end of their nominal life.

ElectraNet states in its Asset Management Plan for 2003-2008 that it has "set a target to reduce the percentage of assets > 40 years to 10% or less over the next ten years" (Section 6.2.7 p17). This strategy is aimed at progressively removing older assets from service and thereby avoiding a sudden step change in expenditure when these assets simultaneously reach the end of their service lives.

Although there is no industry standard on what constitutes an appropriate age profile for network assets, we believe that this strategy is sound in seeking to optimise the cash flows of the business and thus minimise the potential for future price shocks. That is, the proposed expenditures on replacement and refurbishment will smooth out future Capex and Opex requirements.

Such a process should target high-risk assets first, and appropriate measures should be taken to ensure that the most cost effective choices are made between refurbishment or replacement of the various assets. In particular, ElectraNet should ensure that high capital value items such as power transformers and switchgear are subjected to condition assessment and testing to ensure that the optimum life is extracted from them.

6.2.2 Refurbishment and Replacement Due to Age

Refurbishment of assets consists of carrying out work on existing assets which allows extension of their service life, or an increase in their capacity or utility. In the case of aging electricity network assets, it is often possible to release significant benefits by appropriately targeted testing and/or refurbishment.

In a significant number of cases, life extension in this way results in a lower economic cost than the alternative of simply allowing the asset to reach its service life, then replacing it. This is particularly so with regard to power transformers.

Meritec have recent experience in the cost effective refurbishment of existing transformers that have been returned to service in a new location. These particular transformers, although being 40 years old, were tested to confirm their remaining life was circa 25 years.

With reference to Transpower New Zealand, a significant percentage of its transformer population is between 30 and 49 years of age, with the bulk of 110 kV and 220 kV lines being between 45 to 75 years and 25 to 45 years of age. With appropriate asset maintenance and refurbishment techniques these assets have been able to be cost effectively retained in service without affecting reliability performance indicators and deferring the need for significant capital replacement expenditure.

In those cases where refurbishment is not cost effective, replacement of the asset is undertaken. This would nominally be at the end of the asset's design service life. However, in practice, the timing of the removal/replacement may vary due to factors such as condition, failure, obsolescence or redundancy.

ElectraNet track the key parameters affecting the practical service life of each asset using MAXIMO, as noted above. This information is used to identify and prioritise the assets that are to be replaced or refurbished in each year.

Meritec believes that this is an appropriate approach to the identification and prioritisation of expenditure on refurbishment for life extension and that the general program developed in this way is acceptable.

6.2.3 Refurbishment and Replacement to Increase Capacity

In addition to refurbishment and replacement due to age and condition, it is often advantageous to carry out work of this nature to increase network capacity, particularly where the capacity of a number of linked assets is being limited by one element.

ElectraNet has proposed a number of refurbishment projects that fall into this category. They can be summarised into:

1. Uprating of existing transmission lines to operate at a higher conductor temperature and hence higher load carrying capacity;
2. Replacement of current transformers which have a lower current rating than the transmission line they are associated with, hence limiting its load carrying capacity;
3. Modifications to protection schemes where operating parameters currently limit the load carrying capacity of the associated transmission lines; and
4. Other miscellaneous work which will increase the load carrying capacity of network assets.

The need for these projects would normally be identified by the Growth Related Expenditure process previously outlined in Section 2.2. ElectraNet has then included these projects in its probabilistic forecast process, albeit marked as Opex and with a probability of 1.0

Meritec believes that the inclusion of expenditure to increase the rating of various network components is an appropriate approach, that delivers economic benefits by removing artificially restrictive elements from the system.

However, Meritec considers that Project 5.10 – Projects not yet identified, should be removed from the capital expenditure forecast as it is not consistent with a probabilistic forecast approach.

Conclusions

Meritec believes that correctly targeted refurbishment of assets can deliver economic benefits due to cost effective deferral of asset replacement. ElectraNet's approach to identifying and prioritising its refurbishment and replacement expenditure is robust and is based on an appropriate level of input regarding the age of the equipment, its condition and its operating conditions.

Meritec believes that ElectraNet's process for identifying required refurbishment and replacement expenditure is fair and reasonable and results in appropriate outcomes.

Therefore, Meritec recommends that, with the exception of Project 5.10 – Projects not yet identified, ElectraNet's proposed refurbishment and replacement expenditure is appropriate and should be included in the capital expenditure forecast.

7.0 ElectraNet's Ability to Meet the Requested Capex Levels

It must be noted that the annual capital expenditure amounts proposed by ElectraNet in its application represent a substantial increase on historical levels. ElectraNet has proposed a capex allowance of approximately $80 million per annum. The expenditure for 1999/2000 was $45.3m and projected expenditure for 2001/2002 is $39.2m. Prior to this, the capital expenditure was approximately $22m for 1997/98 and 1998/99. With such a large step change in capital, the question must be raised of whether ElectraNet is able to complete the proposed capital program.

In response to Meritec's enquiries, ElectraNet put forward the following position in support of its ability to deliver the expanded capital program:

- The structure of ElectraNet is that of an asset management and project management organisation. That is, it have no field staff but specialise in managing external resources to carry out their field-based work. This type of structure is more readily scalable than one that was heavily reliant on internal resourcing of field work.
- It currently carries out preliminary scoping, detail design, specification writing procurement and design review in house. The strategy for increasing throughput in these areas is to use external providers to prepare specifications and to carry out the later stages of design review. It is ElectraNet's belief that this will reduce their internal design group's workload by approximately 40% per project, thus freeing time to deliver a larger number of projects.

  ElectraNet notes that it has previously dedicated significant resource to documentation of design policies and standards in support of this strategy.
- It states that with this system it will be able to employ more project managers as required and thus scale up their project delivery capability as required.

Notwithstanding the above, Meritec believes that there are a number of factors that may increase the risk of the capital program not being met. These are as follows:

- A number of transmission network service providers (TNSP's) and the larger distribution network service providers are also planning significant increases to their capital expenditure programs (and operating expenditure levels in some cases). This is likely to lead to increased competition for limited resources.

- Resources which may be limited in supply include:
  - Suitably qualified and experienced service providers to carry out this relatively specialised work.
  - Major plant items. The existing lead times for these items are typically 6-12 months. A step change in demand for plant items has the potential to adversely affect delivery times.
  - Project management personnel. Meritec has noted that other TNSP's are currently advertising in several states to procure this resource. This would indicate that there may already be a shortage in this area.
- Further, a number of these projects are required to pass the ACCC Regulatory Test prior to being allowed. There have been significant delays for some projects that have been subject to this process in the past. As an example, ElectraNet has tens of millions of dollars of expenditure that are dependent on the final form and timing of the SNI interconnection. This project has been delayed and is currently under appeal.

As part of this review, Meritec investigated the status of a number of ElectraNet's proposed projects from 2003/04 and 2004/05 and determined that in the majority of cases it would be possible to complete the project definition and approval process without causing delays to the projects. In any case, it would be unlikely that these early projects would be delayed beyond the end of the regulatory period.

Conclusion

Meritec has not identified any issues that would lead us to the conclusion that ElectraNet is unable to deliver the proposed capital expenditure levels at this time, and therefore we do not recommend any changes on that basis.

However, Meritec notes that there is a potential risk of ElectraNet not being able to deliver the requested capital expenditure program due to the large increases in electricity network expenditure nationally and the resulting increase in competition between electricity network service providers for the required resources. This may be further compounded by delays associated with the regulatory approvals process for specific projects.

These issues have the potential to emerge as limiting factors in the future. However, if they are noted and effectively addressed by ElectraNet, it is possible to prevent them from having a material effect on capital expenditure levels.

Meritec recognises that there are some potential risks to the delivery of ElectraNet's proposed capital expenditure program.

8.0 Allocations to Opex and Capex

ElectraNet has taken a decision to treat a number of projects as operating expenditure in their Revenue Cap Application. These consist of refurbishment and replacement projects such as transmission line rating upgrades, either by increasing the design temperature or by replacing restrictive terminal equipment such as current transformers. In many cases in the past, expenditure of this nature would have been treated as capital.

ElectraNet has put forward the argument that refurbishment expenditure is subject to revaluation risk. That is, the mechanism used for the determination of the asset base makes no distinction between a line that has had this type of expenditure and one that has not. Therefore, even if such expenditure were allowed as capex in a review such as this, it would be at risk of not being recognised when standard asset values were applied in the next ODRC valuation.

ElectraNet has taken the decision to treat their refurbishment and replacement expenditure as operating expenditure in order to avoid this risk. ElectraNet has put forward a capitalisation policy (effective from 1 Jan 2003) that sets out a position in support of this strategy.

Treatment of these costs in this way will result in customers incurring the full cost of those works over the regulatory period, instead of a charge for WACC and depreciation if they were capitalised.

It should also be noted that if these costs were to be allowed as operating expenses, then some mechanism would be required to ensure that the resulting enhancements to the assets involved were not included as an increase in their value during subsequent asset base reviews.

The ACCC has directed that these expenditures be treated and assessed as capital expenditure and Meritec has done so in this review.

9.0 Adjustments to ElectraNet's Proposed Capital Expenditure

Meritec has recommended a number of changes to the capital expenditure forecast proposed by ElectraNet in their Revenue Cap Application. The changes are in the following areas:

- Inclusion of refurbishment and some replacement expenditure as capex, when it had been presented as operating expenditure in ElectraNet's application;
- Adjustment of the probabilities associated with the load forecast from 20% likelihood of a low forecast and 80% of a medium forecast, to 25% likelihood of a low forecast and 75% of medium; and
- Removal of a number of specific projects.

The adjusted capital expenditure forecasts are shown in Table 6. The various changes are shown to provide an indication of their relative impacts, however the last section of the table shows the total effect of the adjustments recommended in this report.

Meritec believes that the process followed, the scenarios considered, and the probabilities assigned to the scenarios in preparation of the probabilistic capital expenditure forecast are generally reasonable. Therefore, subject to the adjustments noted in Table 6 below, Meritec considers that ElectraNet's proposed capital expenditure should be accepted. Meritec recommends that the adjusted capital expenditure forecast shown in Part C of Table 6 be adopted.

Table 6 - Adjusted ElectraNet Capital Expenditure

	Jan – June 2003 ($000)	2003/04 ($000)	2004/05 ($000)	2005/06 ($000)	2006/07 ($000)	2007/08 ($000)	Total ($000)
A. Capex Proposed in ElectraNet's Application							
Capex ($2001/02)	4.3	81.5	72.9	77.4	77.3	60.5	373.9
Capex (nominal)	4.4	85.3	78.1	84.9	86.8	69.5	409.0
Indexation Factors over 2001/02	1.0233	1.0466	1.0713	1.0969	1.1229	1.1488	
Additions ($2001/02):							
Refurbishment Projects (was Opex)	0.1	0.9	10.3	10.9	10.3	3.3	35.9
Other Refurbishment (was Opex)	6.7	14.4	4.5	3.7	4.5	10.3	44.0
Total Capex ($2001/02)	**11.1**	**96.8**	**87.7**	**92.0**	**92.1**	**74.1**	**453.8**
Total Capex ($nominal)	**11.4**	**101.3**	**94.0**	**100.9**	**103.4**	**85.1**	**496.1**
B. Capex Adjusted for reduced load growth (20% low, 80% medium changed to 25% low, 75% medium)							
Construction Capex ($2001/02)	4.3	80.0	70.3	74.7	74.4	58.1	361.8
Refurbishment Projects (was Opex)	0.1	0.9	10.3	10.9	10.3	3.4	35.9
Other Refurbishment (was Opex)	6.7	14.4	4.5	3.7	4.5	10.3	44.0
Total Capex ($2001/02)	**11.1**	**95.3**	**85.1**	**89.3**	**89.2**	**71.8**	**441.7**
Total Capex ($nominal)	**11.4**	**99.7**	**91.2**	**97.9**	**100.1**	**82.5**	**482.8**
C. Capex Adjusted for reduced load growth and excluded expenditure (Recommended)							
Construction Capex ($2001/02)	4.3	56.2	47.2	64.4	64.8	37.3	274.2
Refurbishment Projects (was Opex)	0.1	0.4	9.8	10.4	9.8	2.9	33.4
Other Refurbishment (was Opex)	6.7	14.4	4.5	3.7	4.5	10.3	44.0
Total Capex ($2001/02)	**11.1**	**71.0**	**61.5**	**78.5**	**79.1**	**50.5**	**351.6**
Total Capex ($nominal)	**11.4**	**74.3**	**65.9**	**86.1**	**88.8**	**58.0**	**384.4**

10.0 References

ACCC, *Decision, NSW and ACT Transmission Network Revenue Caps, 1999/00-2003/04,* 25 January 2000

ACCC, *Decision, Queensland Transmission Network Revenue Cap, 2002-2006/07*, 1 November 2001

ACCC, *Draft Statement of Principles for the Regulation of Transmission Revenues*, 27 May 1999

ElectraNet SA, *Asset Management Plan*, 2003-2008, 16 April 2002

ElectraNet SA, *Transmission Revenue Cap Application, 2003-2007/08*, 16 April 2002

PB Associates, *Powerlink Queensland, Review of Capital Expenditure Requirements,* 10 April 2001.

ROAM Consulting, *Final Report to ElectraNet SA, NEM Forecasting, Identification of Asset Development Scenarios, 20 July 2001*

Appendix A – Summary of ElectraNet's Proposed Capital Projects > $10 million

Project Number	Project Name	Project Est. Total Cost ($million)	Prob. prior to June 2008	Proposed Roll-In ($million)	Stated Reason	Proposed to Commence
Section 1 - Network Augmentation						
1.1	Bungama/Brinkworth 275/132 kV (No SAMAG)	24.7	0.50	12.2	Required as alternative to rebuild of Playford – Bungama 132 kV lines which are in very poor condition	July – Dec 2002
1.2	Playford relocation to Davenport	14.0	1.00	14.0	Required due to age and condition of existing Playford switchyard	July – Dec 2002
1.3	South East to Snuggery 132 kV Line	10.2	1.00	10.2	Required to maintain adequate voltage levels during first level contingency	2004/05
1.4	Uprate all ElectraNet lines designed for 49°C operation	18.4	1.00	18.4	Required to release additional capacity in various lines in order to supply load growth	2004/05
1.6	Eastern Hills Project	12.1	1.00	11.9	Required to prevent overloading of lines during first level contingency	2004/05
1.13	East Terrace – Magill 2nd 275 kV cable, plus East Terrace 2nd 275/66 kV transformer	45.3	0.80	34.8	Required to supply load increases on the East Terrace supply point to Adelaide CBD	*2004/05*
1.21b	Southern reinforcement, Willunga – Network Part	17.7	0.67	11.8	Required to supply load increases in the area	*2005/06*
1.24	Establish Tungkillo 275 kV substation – Stage 1	11.0	0.40	4.4	Required to maintain network reliability to southern suburbs	*2005/06*
1.33	Eyre Peninsula 132 kV Reinforcement	67.5	0.33	22.1	Required to facilitate connection of wind generation. ElectraNet expect it to pass part (b) of ACCC's regulatory test	*2004/05*
1.36	Monash 275/132 kV substation and Robertstown – Monash 275 kV transmission line	44.7	0.80	35.8	Required to maintain adequate voltage levels during first level contingency	July – Dec 2002

Project Number	Project Name	Project Est. Total Cost ($million)	Prob. prior to June 2008	Proposed Roll-In ($million)	Stated Reason	Proposed to Commence
1.38	Heywood Augmentation	32.9	0.64	21.1	To facilitate connection of wind generation and to increase the capacity of the Victorian interconnection at Heywood to 650 MW	*2004/05*
1.44	South East to Tungkillo 275 kV circuit	101.4	0.13	13.0	To facilitate the connection of wind powered generation	*2006/07*
1.52	Victorian Border – Monash component of SNI	30.9	0.45	13.8	To provide additional interconnection capacity between SA and NSW	*2003/04*
1.55	Bungama/Brinkworth 275/132 kV (with SAMAG)	28.5	0.50	14.0	Required as alternative to rebuild of Playford – Bungama 132 kV lines which are in very poor condition (Note that this is a mutually exclusive alternative to Project 1.1.	July – Dec 2002
Section 7 - ETSA Utilities - post EPO						
7.8	Northfield third 225 MVA 275/66 kV transformer	11.6	0.80	8.6	To increase capacity at the Northfield ETSA Utilities supply point in response to load growth in the area.	2006/07

Notes
1) All values are in $2001/02
2) Commencement dates shown in italics are estimated by Meritec based on roll in date due to this data not being contained in ElectraNet's submission.
3) It should also be noted that a number of projects are included in ElectraNet's capex forecast with multiple roll-in dates with varying probabilities. In these cases, commencement dates are indicative only.