Appendix A5

Evans & Peck Supplementary Report, "Risk Review of Capital Works Program", January 2008

ElectraNet

Risk Review of Capital Works Program – Supplementary Report

Response to AER's Draft Determination

January 2008

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1 EXECUTIVE SUMMARY

ElectraNet has requested that Evans & Peck (E&P) review and comment on the issues raised by the Australian Energy Regulator (AER) as part of its draft revenue determination for ElectraNet.

This supplementary report examines and provides additional information to address the issues identified by the AER.

In its original report, Evans & Peck advised that a P50 probability represents a very optimistic view of the likely capital expenditure. Normal business practice relating to large capital projects is to budget for a minimum of a P80 at the project level, which represents an 80% chance that the final expenditure will not exceed the estimate, and only a 20% chance that the final expenditure will exceed the estimate.

For a portfolio of projects that are being estimated up to seven years ahead of the expenditure occurring, and where the timing is dependent on the level of economic growth in the State, Evans & Peck considered that a 5.2% risk adjustment is '*at or below the lower bound of normal business practice'*.

The Australian Energy Regulator (AER)'s consultant, Sinclair Knight Merz (SKM), advised that ElectraNet's P50 risk adjustment of 5.2% is '*within the range SKM expects based on industry experience'*, and recommended that the AER accept the 5.2% risk adjustment.

Evans & Peck and SKM concur that '*risk within the capital works program can never be completely eliminated and therefore should be quantified in order to be accounted for, and thereby properly managed'*.

In November 2007, the Australian Energy Regulator (AER) made its Draft Determination on ElectraNet's Revenue Proposal. The AER chose to act against the advice of its consultant, and allow ElectraNet only half of the risk adjustment sought, at 2.6%. It appears that the AER has based this decision on a previous determination made for Powerlink in Queensland.

ElectraNet and the AER have agreed to transfer the Adelaide CBD Project – line component from the Portfolio of Projects and reclassify this as a contingent project. This Project represented approximately 20% of the overall capital expenditure. As part of the quantification process the risks and opportunities associated with this project were specifically examined. The transfer of the project has resulted in a reduction of the P50 risk factor from 5.2% to 4.6%.

The table below provides the revised risk adjustment applicable to the portfolio of projects proposed by ElectraNet as part of its revised Revenue Proposal to the AER.

	P50 (Risk Factor)	P80 (Risk Factor)
% of Base Estimate	4.6%	6.4%

2 INTRODUCTION

ElectraNet has requested that Evans & Peck (E&P) review and comment on the issues raised by the Australian Energy Regulator (AER) in its draft revenue determination for ElectraNet. This supplementary report addresses each of the issues identified by the AER in its draft determination. These include:

- Projected risk profiles and costs were based on the outcomes of a risk workshop and not any systematic evaluation of past evidence of actual occurrences or the actual cost impact. In the absence of such evidence the risk profiles and costs were considered to be reliant on arbitrary projections;
- ElectraNet has not attempted to moderate the risk workshop outcomes to take account on new initiatives;
- The 22% overrun on historical costs is not directly related to the risk factor, however it does provide an indication that there is a tendency for projects to exhibit higher out-turn costs;
- The process inappropriately transfers typical operational business risks that are normally considered as being within the control of ElectraNet's management to users;
- ElectraNet's risk assessment has only identified two instances of cost saving opportunities and the AER is not satisfied that ElectraNet has sufficiently identified and accounted for all possible gains from projects that could come under budget.

The AER concluded that based on deficiencies identified above, the methodology does not lend itself towards the intended outcome of accurately providing allowances for likely costs. Therefore, the 5.2% nominated in the original ElectraNet submission is inappropriate and excessive and that a risk factor of 2.6% in line with the Powerlink determination is more appropriate.

Following the AER's draft determination, Evans & Peck was requested by ElectraNet to review the points identified above and where appropriate provide any further supporting information to address the AER's specific concerns raised in its draft decision.

This report provides this additional supporting information to clarify any misconceptions or uncertainties contained in the original submission. Each of the points identified above is specifically addressed in the following sections.

3 SYSTEMATIC EVALUATION & WORKSHOP PROCESS

The SKM report and AER draft determination noted that '*like any modelling technique the output was dependent on the quality of the inputs'*. In addition '*the risk workshop was not based on any systematic evaluation of past evidence of actual occurrences or the actual cost impact. In the absence of such evidence the risk profiles and costs is reliant on arbitrary projections rather than actual past outcomes'.*

3.1 USE OF AD-HOC APPROACH

Where systematic risk management techniques are not applied to the procurement and delivery of infrastructure projects, it could be described as an "ad-hoc" approach. Such an "ad-hoc" approach has traditionally relied upon judgment, experience and sound commercial sense of the project proponent and management team.

Traditionally this ad-hoc approach involved calculating a contingency (an allowance added to an estimate which represents the best judgement of undefined or uncertain items of work), based on a percentage of the most likely base estimate. The size of this percentage depends on the stage of the estimate in the procurement cycle, with earlier estimates requiring larger contingencies because of the large number of unknowns, while later estimates require smaller contingencies because there are few if any unknowns.

This method also only provides a single deterministic estimate, in other words, there is no indication of the probability of the estimate being met, or the range of other possible cost values.

The AER has previously rejected this ad-hoc approach and allocation of a single contingency amount.

3.2 SYSTEMATIC RISK BASED EVALUATION

It was on this basis that both Powerlink and subsequently ElectraNet approached Evans & Peck to assist in the development of an alternative approach to understand the risks associated with the portfolio of projects and develop a risk based estimate as part of the regulatory submission.

Risk based estimating is performed after the base estimate has been developed with upper and lower boundaries identified to reflect the uncertainties associated with the estimate. The base estimate represents the reference estimate from which the probable out-turn cost is developed using simulation modelling.

This risk method involves breaking the construction cost of a project into smaller components which are probabilistic (non deterministic) in nature. Each of these components is then quantified either subjectively (using the judgement of estimators, the project team and risk experts) or objectively (using relevant statistics and data from

previous projects). The experience of estimators intuitively transfers objective information to subjective judgement.

This provides a systematic method of identifying and quantifying risk and provides a potential range of cost estimates and their associated probabilities in the form of an “S” curve. The outcome of this process enables the proponent (in this case ElectraNet) to make an informed decision about where on the risk curve they consider appropriate to estimate and what level of residual or business risk they are prepared to accept. A different position may be selected depending on the stage of the project procurement cycle.

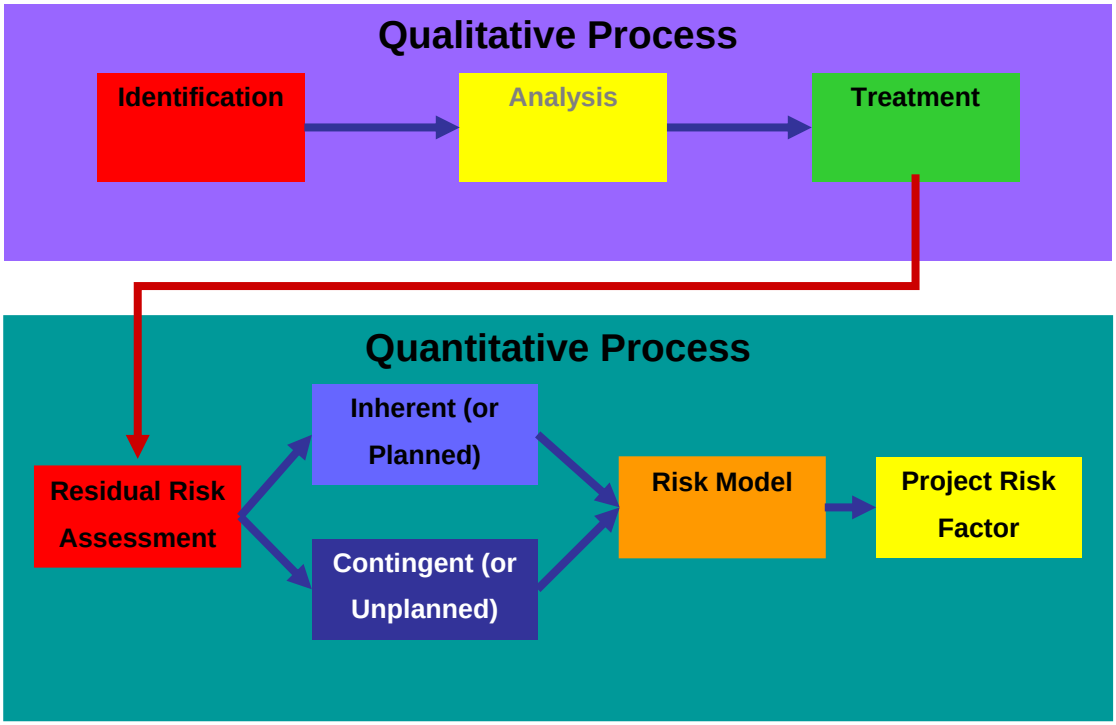
The real value in risk based estimating is that it forces participants to:

- Focus on Project Objectives;
- Identify the Desired Outcomes;
- Identify the Scope;
- Document any Assumptions;
- Identify Constraints on the Project;
- Analyse Project Risks; and
- Develop appropriate Response Plans.

And leads to:

- Consistency of the Estimating Process;
- More realistic Contingency Provisions;
- Understanding of Risk Allocation; and
- More informed decision making.

The approach adopted in developing the risk based estimates for ElectraNet was systematic and undertaken in the context of the flowchart process as follows.



3.3 HISTORICAL DATA

The examination by Evans & Peck of historical costs indicated a 22% increase in the actual costs when compared with the reference estimates. The ability to rely on this data with any certainty was questioned. The AER confirmed in its draft determination that '*all that it provides is some indication that there is a tendency for the projects to exhibit higher out-turn costs*'. On this basis this historical information could only be used for reference purposes and as a sensibility check. To this extent there was limited historical information available to support the revenue reset process for forecasting cost estimation risk.

Without the availability of historical actual cost information to support the revenue reset process, the process adopted was largely subjective. The workshop and review process sought the most experienced personnel from within and outside of ElectraNet to provide the quality of information necessary to obtain valid and reliable outputs from the modelling process.

3.4 ESTIMATES

Typically the estimates developed by ElectraNet for its Revenue Proposal were based on two different approaches depending on the stage of the project in the procurement process. They were either, Level A / level 1 estimates based on Base Planning Object Estimates, or Level 2 baseline estimates built up from first principles.

In both these cases the estimates were undertaken by different personnel, with different levels of experience and understanding of the project. In particular, the BPO's were based on a desk top analysis of the project (by Powerlink) with little consideration of the site and

complexity of undertaking the project. The estimates have been developed by individuals and may include some variability.

3.5 BENCHMARKING

One of the methods to improve the reliability of estimates is by taking an outside view of the project at hand and comparing it to a reference class of similar projects. This benchmarking approach counteracts the personal and organisational sources of optimism or pessimism that may act to bias the estimate.

The use of risk workshops provides an external perspective on the estimates. By involving a range of people with different skills, who generally know more about the project than the estimating team and have been actively been involved in the actual delivery of the projects in a workshop environment permits the development of a much better understanding of the real risks associated with the project. The logic is that each participant's opinion is shaped by a combination of their training and experience in past projects, which means that it is likely to differ significantly to the opinions of other participants. This means that when each participant contributes an opinion during the workshop, it effectively constitutes an external view. The combination of experience and training provides a peer review of the estimate with a "fresh set of eyes" to check for significant errors, completeness, etc. Typically this workshop and peer review process would involve challenging and testing of:

- Assumptions, Qualifications and Exclusions ;
- Construction methodology;
- Computations;
- Rates;
- Quantities;
- Benchmarking;
- Missing items (or double ups);
- Time related and fixed costs;
- Risk & opportunity analysis;
- Margins and On-Costs; and
- Client Costs.

In summary, the use of collective experience mitigates the effects of any bias (optimism or pessimism) and strategic misrepresentations on the estimate in two ways. The aggregation of opinion from multiple sources ensures less personal opinion is reflected in the estimate. Secondly, it enables the workshop participants to contextualise the project at hand in light of their past experiences.

3.6 WORKSHOP APPROACH

A two day workshop was undertaken by ElectraNet and facilitated by Evans & Peck, with subsequent follow-up discussions. The documented objectives of the workshop were to:

- Develop a transparent and defendable risk adjusted cost estimate for the various scenarios identified;
- Develop a risk adjusted cost estimate in accordance with the Australian Energy Regulator requirements;
- Provide a framework for development of risk adjusted cost estimates in projects with considerable uncertainty;
- Develop from the portfolio of projects a framework that realistically captures the uncertainty associated with the projects;
- Identify the areas of cost uncertainty (inherent risks – variance in planned events inherent in the scope of work and contingent risks – unplanned events); and
- Undertake both qualitative and quantitative risk analysis for the portfolio of projects.

The workshop involved senior management, estimators, project managers, operations and maintenance personnel as well as experts in specific fields such as communications. The opinions were sought from this broad spectrum of personnel with different experience and knowledge to develop the ranges for each of the cost categories.

In the workshop conducted on the 21-22 November 2006, as the ranges for each inherent risk and opportunity were being debated, workshop representatives provided practical examples of actual risks or opportunities that had been experienced in delivery of projects and should be considered when determining appropriate ranges.

The ranges identified in the level 2 estimates were reduced in comparison to the level A/1 estimates to reflect the improved understanding of the scope associated with these projects and the fact that these estimates had been developed from first principles.

Of the 138 projects identified, only 4 of the projects were at the stage where estimates had been developed from first principles. These projects represent approximately 7% of the total value of work identified in the portfolio of projects.

The workshop specifically examined the Adelaide CBD project in detail, given the size of the project proportionately with the remainder of the portfolio of projects, even though the line component of this project has now been identified as a Contingent Project and as such it dealt with separately by the AER in the forthcoming regulatory period.

A key benefit of risk based estimating and the workshop process is that it enables the key risks and opportunities to be identified. Those risks and opportunities which have the

greatest impact can be identified and appropriate measures established to mitigate the risk or realise the opportunity. This is equally applicable for the risks / opportunities inherent in the estimate and those identified as contingent risks. The process also enables the risks / opportunities to be reassessed during the procurement and delivery phase to better understand the likely out-turn cost and establish appropriate treatment plans to address any issues identified. This systematic approach enables the best use and allocation of resources in those areas which are likely to have a material impact on the out-turn cost.

3.7 CONCLUSION

The examination of historical cost data indicated a 22% variance between the reference estimate and the out-turn cost. The ability to directly compare and rely on the historical information was questioned. However, it does provide a sensibility check and an indication that there has been a tendency for projects to exhibit higher out-turn costs.

The output from the Risk Based Approach, like all modelling exercises is reliant on the quality of the input. However, the approach adopted by E&P is systematic and follows a structured process in understanding the objectives and assumptions used in the development of the reference estimate. The identification and quantification of risks using a workshop process, involving a broad spectrum of experienced personnel is common practice in industry. The use of the collective experience mitigates the effects of any bias of the estimator with the aggregation of opinion and past experiences brought to the fore. This peer review process results in more consistency in the estimating process, more realistic contingency provisions, a better understanding of the risk allocation and a basis for making informed decisions.

The conclusion to draw from this is that the approach adopted in developing risk based estimates for ElectraNet, including the risk workshop, was systematic and based on the best information available. It would be a mistake to conclude that the cost estimates are based on arbitrary projections.

4 MODERATED POSITION AS A RESULT OF NEW INITIATIVES

The AER noted in its draft determination that ElectraNet '*had introduced new initiatives to overhaul its previous project management and cost estimation practices, which resulted in significant overruns in the past. ElectraNet has not demonstrated any attempt to moderate the risk workshop outcomes to take account of these new initiatives. Therefore, the AER considers that if the risk workshop outcomes had been moderated to take account of the new initiatives the risk factor is likely to have been lower than the proposed 5.2%.*'

4.1 UNDERSTANDING OF NEW INITIATIVES

The personnel involved in the workshop were aware of the change in the internal processes and the change in estimating practices. The risk and opportunity boundaries debated and ultimately adopted during the workshop were reflective of the changed processes. The process assumes that appropriate treatment plans are in place, however notwithstanding these plans there remains a residual risk which needs to be quantified. In all instances the 'Most Likely' figure which is reflective of the revised estimating process has not been adjusted. The primary question asked during the risk workshop for the inherent risks was given your experience what are the upper and lower boundaries applicable to each of the categories identified. The probabilistic profile is determined by the experience of the workshop participants.

4.2 POST WORKSHOP ADJUSTMENTS

ElectraNet reduced certain risks post-workshop, to further moderate key risks to recognise improved estimating and project management practices. The risks that were reduced post-workshop were:

Identified Risk	Workshop Risk Value (Level 1/A Estimate)	Moderated Risk Value
Preliminaries (Maximum):	135%	130%
Easements (Maximum):	300%	150%
Civils (Maximum):	150%	130%

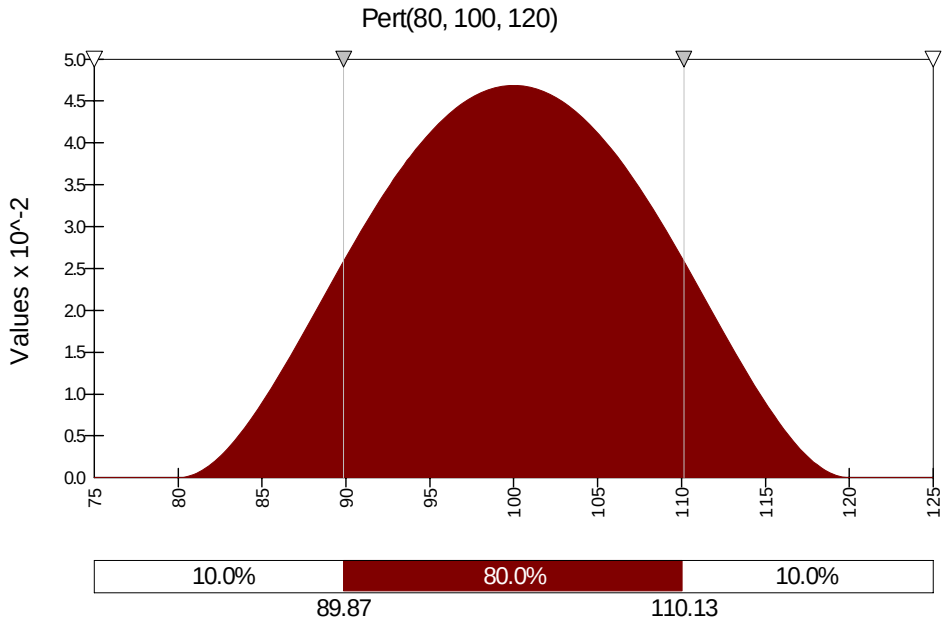
This moderation (reduction) of these risks has the effect of reducing the overall portfolio risk profile, recognising improved estimating and project management practices.

4.3 SELECTION OF DISTRIBUTION

When it comes to assigning risk profiles, the 'Pert' distribution was chosen. The Pert distribution is based on minimum, maximum, and most-likely values. The use of the 'Pert' distribution by its nature tends to be conservative and is heavily weighted towards the

'Most Likely' value. This means that the PERT distribution is implicitly conservative (ie. optimistic) in determining the likely final cost outcome. This implicit conservatism provides the appropriate driver to ensure that prudent project management and control is applied to mitigate cost overrun, and is therefore an appropriate distribution to apply to ElectraNet's regulatory situation.

In the example identified below using a symmetrical Pert Distribution (for demonstration), 80% of the curve falls between the values 90 and 110, with only 20% outside of these boundaries.



A more extreme distribution would have adopted a 'Uniform' (equal probability of occurrence anywhere between the identified ranges) or an 'AltPert' distribution (nominates the P10 as the lower and P90 as the upper boundary with the more extreme values outside of this range included in the model).

4.4 IMPACT OF PORTFOLIO OF PROJECTS

The use of this risk based estimating approach across a portfolio of projects with multiple line items results in a more moderate overall position. A portfolio of projects such as ElectraNet's Capital Works Program will have a combined level of risk that is less than the arithmetic sums of the component projects. The modelling process assumes each line item to be mutually exclusive of any other line item. The range of the 'Risk Curve', the output of the modelling process, is highly dependent on the number of line items in the model (i.e. the number of capital projects). This occurs because for a high number of line items the '@ Risk' model results effectively cancel each other out.

The effect that this has on the model output is to reduce the effect of the upper and lower boundaries with the effective range reduced. This in turn provides a more moderate position for the overall outcome. This is one of the primary reasons, when recommending a position for a portfolio of projects Evans & Peck recommends the P80 value as being appropriate.

4.5 CORRELATION

One method to counter this effect with a portfolio of projects is to include a correlation factor. The use of correlation between line items or projects, recognises that the realisation of some risks or opportunities tends to be felt across all projects. To this extent they are not mutually exclusive. For example, if the Base Planning Object is found to be understated or overstated for any category of work, the impact of this could be reflected across many projects. In developing the model for ElectraNet, we selected not to use a correlation factor, due to the difficulties of identifying what correlation was appropriate and the difficulty providing the transparency required by the process. This has resulted in the output of the model having a lower range than would normally be anticipated and produces a more moderated position.

4.6 CONCLUSION

The ElectraNet personnel who participated in the risk workshop had significant knowledge and understanding of the capital delivery and project scoping and cost estimation processes including the new initiatives adopted and reflected their knowledge and experience in the probabilistic risk profiles identified.

The process adopted by E&P in development of the risk based estimated produces an inherently moderated position. The combination of:

- adjustments to the model after the initial workshop which resulted in some of the upper boundaries being reduced;
- the selection of the ‘Pert’ distribution, which is implicitly conservative;
- the effect of the portfolio of projects effectively cancelling each other out; and
- the decision not to correlate projects,

has provided an output with the extreme boundaries removed and resulted in a concentrated or moderated position.

5 HISTORICAL OVERRUNS

The AER stated in the draft determination that '*the 22% overrun on historical costs is not directly related to the risk factor, however it does provide an indication that there is a tendency for projects to exhibit higher out-turn costs*'.

The historical underestimation of 22% highlighted in ElectraNet's Revenue Proposal provides an indicator of the magnitude of improvement represented by the revised 4.6% risk provision sought by ElectraNet. While ElectraNet has acknowledged that this historical analysis is not directly comparable, its use as a sensibility check is appropriate. In this respect, the outcome sought by ElectraNet is significantly moderated when compared to the previous practices.

The AER in its draft determination confirmed the tendency for projects to exhibit higher out-turn costs. This is the exact point of risk based capital budgeting. The purpose of risk based estimating process pursued by ElectraNet was to understand the magnitude of potential over-runs and factor this into the revenue reset submission.

6 RISK TRANSFER

The AER in the draft determination notes that *'the process inappropriately transfers typical operational business risks that are normally considered as being within the control of ElectraNet's management to users*'.

Evans & Peck supports the view that unreasonable risk should not be transferred to customers. However, out-turn cost in excess of budget is a real cost of doing business, even in a well-run business. Allowances for reasonable risks should be built into budgets. Our approach to diversification of that risk explicitly results in a reasonable value for risk allowance.

ElectraNet has based the majority of its estimates (all Level 1 and Level A estimates) on Powerlink's Base Planning Objects (BPOs). In the analysis of Powerlink's Revenue Reset Submission, PB Associates found the following:

"PB generally found that Powerlink's BPO costs to be within the benchmark range and that the majority of BPO's were either close to the average benchmark cost or below it. PB therefore considered each of Powerlink's key BPO's to be reasonable. In addition it found no evidence that Powerlink had inflated its BPO's significantly from those used in the current regulatory period."

Since these Powerlink BPOs form the basis of ElectraNet's estimating, it should be considered that each of ElectraNet's BPOs are also reasonable.

We believe that an undesirable alternative is to implicitly weight BPO prices to incorporate a risk premium. As noted above, Powerlink's BPO prices (which form the basis of ElectraNet's estimates) tend to be lower than industry average. This fact, and the request for a risk adjustment, should not be treated in isolation.

The risk process adopted by ElectraNet assesses the residual risk after the implementation of appropriate treatment plans. The contingent risks identified in the workshop and used in development of the risk factor are external risks which are generally outside of the control of ElectraNet. The BPO's used in the development of the reference estimate specifically exclude any provision for risk, particularly those risks outside of the documented scope.

Provisions for external risks outside of the estimates are a real cost of doing business and requires budgetary provision. The contingent risks identified in the model were documented in the original E&P Report 'Risk Review of Capital Works Program'.

As noted earlier, the process of identification of risks, probability and magnitude enables ElectraNet to better understand the impact that these risks have on the out-turn cost and provides a prioritisation of those risks. This enables appropriate allocation of resources and treatment plans to mitigate those risks with the greatest influence on the out-turn cost.

All risks will incur a cost to mitigate and opportunities a cost to realise. This is a real cost of operating a business which is not captured within the individual reference estimates. The process adopted by ElectraNet is prudent and provides an effective and systematic approach to identification, quantification and management of risks. This process does not result in the inappropriate transfer of risk to end users, but provides a structure to ensure there is accountability and responsibility for management of risks. The outcome of this process should result in better management of risks and reduced exposure for the end user in the future.

7 GAINS & OPPORTUNITIES

The AER also noted in its draft determination that '*ElectraNet's risk assessment has only identified two instances of cost saving opportunities and the AER is not satisfied that ElectraNet has sufficiently identified and accounted for all possible gains from projects that could come under budget'*.

Evans & Peck consider that the above statement is inaccurate. As shown in the following table, each of the inherent risks identified in the model incorporates an opportunity. Each of the minimum values identified is below the 'Most Likely' value. In all cases, the potential gain or reduction in cost is included in the model.

Category / Asset Classes	Level A / Level 1		Level 2	
	% of Baseline Cost		% of Baseline Cost	
	Min	Most Likely	Min	Most Likely
Preliminaries	80%	100%	90%	100%
Overhead Lines	95%	100%	95%	100%
Underground Cables (internal to substations)	80%	100%	90%	100%
Easements & Land Acquisition	50%	100%	80%	100%
Civils	95%	100%	95%	100%
Site Establishment	80%	100%	90%	100%
Buildings	90%	100%	95%	100%
Switchgear	90%	100%	95%	100%
Power transformers	95%	100%	95%	100%
Primary Plant Ancillaries	90%	100%	90%	100%
Reactive Plant	95%	100%	95%	100%
Secondary Systems	90%	100%	90%	100%
Telecoms & IT	85%	100%	90%	100%
Approvals	90%	100%	90%	100%
Decommissioning/Demolition	75%	100%	80%	100%
Inventory and Spares	90%	100%	95%	100%
Security System (Concept 4000)	90%	100%	90%	100%
Minor projects (<$2million)	80%	100%	85%	100%

Furthermore, as detailed in the sensitivity analysis (in Section 9), if each of the above minimum values was doubled, with no change to the Most Likely, Maximum or Contingent Risk items the net effect would result in the P50 value reducing from 4.6% to 3.2%. In our opinion and those of the personnel involved in the workshop, any further gains (further reductions) in the minimum value would be unreasonable and not reflect the circumstances likely to be encountered in the delivery of the portfolio of projects.

Each category of asset, in every project contained within the portfolio of projects includes an opportunity. In respect of Level A estimates this opportunity is between 5% and 50% below the reference estimate. In exactly the same way that the workshop identified

specific examples of risk, the group also identified examples of opportunities that may be realised. We would expect that diligent estimators to have already identified obvious cost savings, even in their base estimates. As a consequence, the likelihood of substantive decreases in cost is less than the possibility of increases arising from other factors. Evans & Peck is satisfied that the process adopted equally examined possible opportunities and risks with the model accounting for all possible gains from elements of projects that may come under budget. We would also expect that, even at the concept design stage, a prudent planner/ estimator would have selected options toward the lower end of the cost range. This, in part, explains why asymmetry exists in the risk profile.

8 OUTPUT OF MODEL

The AER concluded that '*based on deficiencies identified…, the methodology does not lend itself towards the intended outcome of accurately providing allowances for likely costs. Therefore, the 5.2% nominated in the original ElectraNet submission is inappropriate and excessive and that a risk factor of 2.6% in line with the Powerlink determination is more appropriate*'.

8.1 VARIABILITY IN PROJECT COSTS OVER TIME

Until a project has been completed there is potential for the cost at completion to change. Provided project budgets are readjusted as certainty increases, the amount of potential change will reduce as the project develops, as the potential for risk and opportunities to impact on a project is decreased. Forecast ranges of the out-turn cost can and do regularly vary at various phases of projects due to:

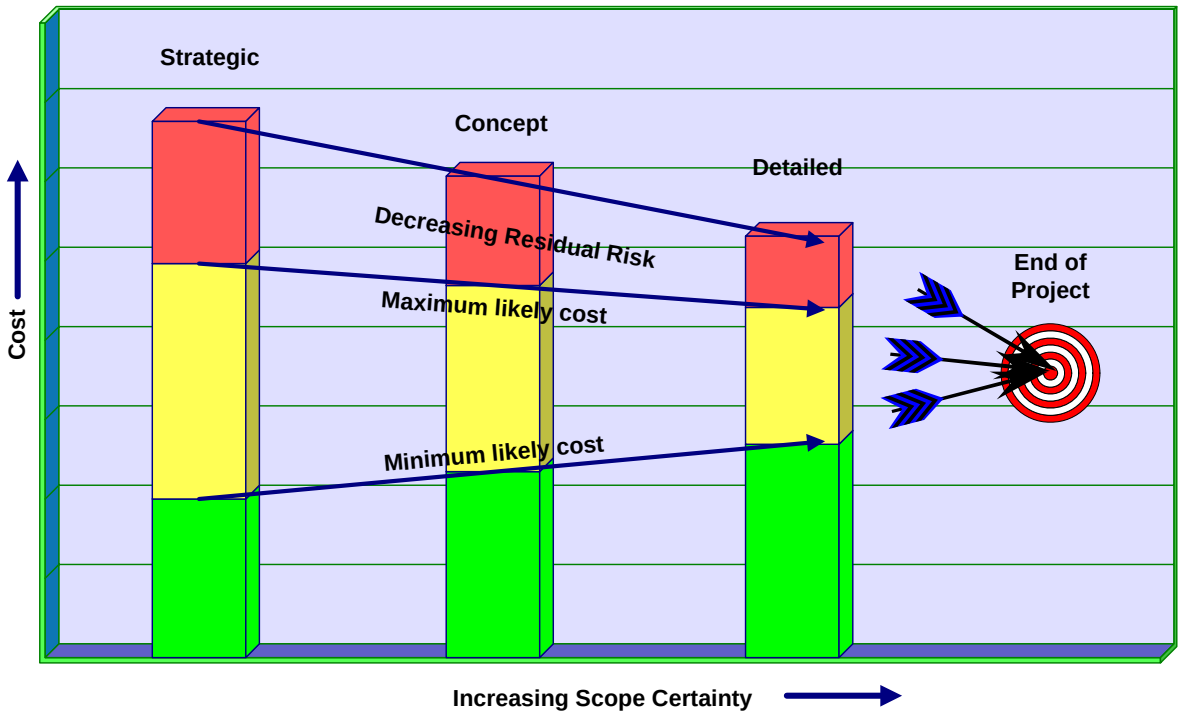
- Measurement errors being identified;
- Unforeseen risk or opportunities arising;
- Invalid qualifications to the forecasts being discarded; or
- Project briefs or scopes being changed, often as a result of external influences.

The long duration and exposure of construction projects to outside influences means that at any point in time up until all costs have been resolved, the forecast cost at completion will be a range, rather than a single number. The uncertainty is directly related to the risk profile of a project. Expressing outturn cost as a range of values is not an uncommon approach.

Infrastructure developers typically use a multi stage estimating process with varying levels of accuracy as the project develops.

This is represented graphically below.

Risk Modelling in Budgeting



The Range of Estimate & Contingency will reduce as:

- Project Risks are further defined;
- Scope and Constraints are further defined;
- Further Engineering Analysis is undertaken; and
- Any assumptions are tested.

8.2 USE OF RISK BASED ESTIMATING IN INDUSTRY

ElectraNet is required to develop a capital expenditure forecast for projects up to seven years in advance of their required commissioning dates. Given the considerable uncertainty about scope, growth patterns etc., the use of a risk based approach is not unreasonable in this environment and widely accepted and adopted within the construction industry.

Evans & Peck has extensive experience in undertaking risk management assignments throughout Australia.

Our Government clients include AUSaid, NSW Department of Primary Works (DPWS), South Australian Department of Transport Environment & Infrastructure (DTEI), Tasmanian Department of Transport (DOT), Main Roads WA, NSW Fire Brigade, Parramatta Rail Link Company, Qld Main Roads Department, NSW Road Traffic Authority, Sydney Airports Corporation, Sydney Ports Corporation, Sydney Water, WA Water Authority and VICRoads. We have provided Risk Management services in all states and territories in Australia.

The following table provides a select summary of Risk Management assignments undertaken by Evans & Peck. For each project, the approximate project cost and project stage(s) in which the risk management service was undertaken, is provided. The development of Risk Based Estimates has been a core component of the risk management work undertaken by Evans & Peck.

Client	Project / Assignment	Project Value A$	Project Feasibility	Project Procurement	Project Delivery	Acquisitions	Business Support
AGL	Gas Turbine Power Project	$200m+			✓		
AUSaid	Lae City Roads Upgrade Scheme	$50m	✓				
	PNG Teacher Education Project	$60m		✓			
Derby Hydro Power	Tidal Power Scheme, N.W. Western Australia	N/A		✓			
DPWS	Shoalhaven Northern Regional Effluent Management Scheme	$160m	✓				
	Hume Dam – Priority Remedial Works	$5m		✓			
D.O.T South Australia	Berri Bridge (Private Sector D&C Initiative)	$18m		✓	✓		
	Adelaide to Crafers Highway	$160m	✓	✓			
	Southern Expressway	$40m		✓			
D.O.T. Tasmania	Bass Highway, Penguin to Chasm Creek	$50m	✓	✓			
Hawker de Havilland	Embraer ERJ 170/190 Aircraft Project	$500m		✓			
	Develop Process for Risk Assessment of New Business Opportunities	N/A					✓
	Business Relocation Risk Assessment	N/A					✓
Main Roads Western Australia	Performance Specified Maintenance Contracts	$100m p.a.	✓	✓			
	Great Eastern Highway, Sawyers Valley to The Lakes – Delivery Process	$33m		✓			
	Busselton Bypass – Project Delivery Options	$18.6m		✓			
	Reid Highway, Carine Section – Project Delivery Options	$15m - $18m		✓			
	Coalfields Package 1999/2000	$6m		✓			
	Albany Hwy; Gordon South	$10m		✓			
	Great Eastern Hwy; Roe Hwy to Scott Street	$7m		✓			
	Roe Highway, Stages 4 & 5	$96m		✓			
	Eyre Highway; 370SLK to 415 SLK	$12.5m	✓	✓			
Montgomery Watson/SWC	North Head Sewage Treatment Plant Upgrade Project		✓				
Northside Storage Tunnel Alliance	Northside Storage Tunnel	$400m			✓		
NSW Fire Brigade	Risk Assessment of Sydney Harbour and Foreshores – Fire and HAZMAT incidents	N/A	✓				
Powerlink	Regulatory Reset Program (AER)	N/A	✓	✓			
Parramatta Rail Link	Parramatta to Chatswood Rail Project	$1.8bn		✓			
Qld MRD	Gatton Bypass	$50m		✓			
	Tugun Bypass Pacific Hwy	$3000m		✓			
	Douglas Arterial Project (Bruce Hwy) – Townsville	$45m		✓			
	Kurunda Range Freeway	$350m	✓				
	Barclay Highway	$100m	✓	✓			
Resitech	Corporatisation Risk Assessment	N/A					✓
RTA / NSW	Silverwater Road	$22m		✓			
	Warrell Creek Bypass – Pacific Hwy	$20m		✓			

Client	Project / Assignment	Project Value A$	Project Feasibility	Project Procurement	Project Delivery	Acquisitions	Business Support
	M5 East Motorway	$800m		✓			
	Pacific Highway, Chinderah Bypass	$20m		✓			
	Pacific Highway Deviation, Bulahdelah to Coolongolook	$120m		✓			
	Karuah Bypass –Pacific Highway Upgrade	$120m	✓	✓			
	Yelgin to Chinderah – Pacific Highway Upgrade	$250m		✓			
	Sydney Harbour Bridge Approaches	$3m		✓			
	Albury Bypass	$150m+	✓				
	Cross City Tunnel	$650m		✓			
	Western Sydney Orbital	$1.4bn		✓			
	Lane Cove Tunnel	$800m		✓			
Shell Coal/CS Energy	800MW Merchant Power Station	$600m	✓				
Sydney Airports Corporation Limited	Sydney International Terminal Upgrade	$600m			✓		
Sydney Ports Corporation	Proposed Port Botany Expansion	$300M	✓				
Sydney Water	Warragamba Dam Auxiliary Spillway	$100m		✓			
	North Head Sewerage Treatment Plant Upgrade	$100m	✓				
	Priority Sewerage Projects	$50m	✓	✓	✓		
	Upgrade of Sewer Pumping Stations	$100m		✓	✓		
	Priority Sewerage Program Alliance	$30m		✓			
	Vaucluse, Diamond Bay & Rose Bay Sewerage Improvements	$50m	✓	✓			
Tenix Defence	Anzac Ship Project – Delivery Risk	$5bn			✓		
	Information Systems Y2K Software Upgrade Project	$10M		✓			
	Project SEA 1405 – Combat Systems Upgrade for Sea Hawk Helicopters	$150m			✓		
	Upgrade of Combat Systems for FFG Frigates	$1bn		✓			
	Develop a Corporate Risk Management System	N/A					✓
	Development and Provision of a RM Training Program for all Divisions.	N/A					✓
	ADI Acquisition Due Diligence Risk Assessment	N/A				✓	
	Replacement Patrol Boats Project	$400m+		✓			
	NNZAC Ship ISS Program	N/A		✓			
	Due Diligence Risk Assessment for the Acquisition of two Defence Systems Businesses	N/A				✓	
Tenix/SAAB/CoA Alliance (ANZAC Ship Alliance)	Anti Ship Missile Defence Project	$500m+		✓			
	Harpoon Missile System Project	$100m+		✓			
	Development of Risk Management Plan						✓
Tenix	Due Diligence Risk Assessment for the Acquisition of a Helicopter Maintenance & Manufacturing business with operations in Australia & the US	N/A				✓	
Transfield Construction	Modernisation of Explosives Plant	$180m	✓				
	ANSTO Replacement Research Reactor Project	$250m		✓			
	ADI – Mulwala Explosives Replacement Project	$180m	✓				
WA Water Authority	Upgrade of Woodman Point Sewage Treatment Plant	$40m			✓		
Vic Roads	Mitcham Frankston Tollway	$1bn+	✓				
	Eastern Freeway Project	$320m	✓				

8.3 "TYPICAL" GOVERNMENT AND INDUSTRY RISK FACTORS

A number of major public utilities and industry companies use quantified risk analysis to determine capital project budgets, indicating that risk-adjusted cost estimates are useful in determining the expected cost of a project or portfolio of projects. Some recent examples that Evans and Peck are aware of include:

Project	Type of Contract	Base Estimate	Risk Factor (P80)	Risk Factor (P50)	Comment
Sewer Replacement (NSW)	Alliance	$15-20m	5.5%	4.4%	Target Estimate (Risk factor only on Contractor costs)
Refit of Dam (Tasmania)	D then C	$30 - 40m	6.0%	4.0%	Pre Tender
Replacement of bridge (SA)	ECI	$30-40m	10.9%	9.8%	Negotiation Phase
New Dam (QLD)	N/A	$70 -80m	13.6%	8.6%	Option Analysis
Road Duplication (QLD)	D then C	$60-70m	9.9%	7.3%	Funding Approval
Sewer replacement (NZ)	D&C	$30-40m	9.6%	7.8%	Pre Tender
Utility Provider (VIC)	Various	$700-800m	10.1%	8.0%	Regulatory Reset
Pipeline Project (VIC)	Alliance	$50-60m	8.9%	6.6%	Pre Award

The projects identified represent typical outcomes from Risk Based Estimates. The P50 values identified range from a low of 4% to a high of 9.8%. The projects identified are at different stages of the procurement cycle, include a combination of project types and involve different delivery methods. Evans & Peck can identify additional examples of risk factors applied in government and industry if required, however, due to confidentiality obligations specific project details would be withheld.

In addition, '*The Engineers Cost Handbook*' typically identifies the following contingencies for various stages of estimating:

Estimate Type	Order of Magnitude	Feasibility	Preliminary	Detailed
Contingency	30 – 40%	15 – 29%	9 – 14%	3 – 8%

Discussions with ElectraNet in relation to the various levels of estimates developed for the Revenue Reset identified that:

- Level A estimates would be best regarded as 'Feasibility';
- Level 1 estimates would be best regarded as 'Preliminary' and
- Level 2 estimates would be best regarded as 'Detailed'.

Only 7% of the estimates developed by ElectraNet for its revenue reset submission were Level 2 Estimates. The majority of project estimates (Level a / Level 1) would be regarded as 'Feasibility' or 'Preliminary', which based on the Engineers handbook could reasonably expect a typical allowance of between 9 – 29%. It is noted that the above table would be for a single project and the effect of the Portfolio of projects would result in a reduction of this percentage.

Regardless of the utilities and companies employing risk analysis to determine budget allowances, Evans & Peck is familiar with numerous project outcomes that have been in the range of 80 per cent of forecast cost to 250 per cent (net of escalation) of forecast cost, with overruns arising because of various risk factors. While risk analysis assists in the quantification of potential ranges of cost over/under-runs, it does not remove the likelihood of the risk occurring.

The conclusion to draw from the above information is that the revised P50 value of 4.6% is not unreasonable and is in fact at the lower end of industry expectations.

8.4 COMPARISON OF ELECTRANET AND POWERLINK RISK PROFILE

The AER seems concerned that ElectraNet has sought a higher risk premium than that sought by Powerlink in its recent determination. It should be noted that following the AER's Draft Decision relating to Powerlink, the risk adjustment factor was re-examined in the context of the increased availability of historical performance data. Evans & Peck stated:

'In preparing our original report, we acknowledged that the preferred approach would have been to base the analysis on Powerlink's historical performance. At that point in time, Powerlink was not able to provide data for a large enough sample of projects to constitute a sufficiently robust sample on which to base the analysis….We therefore prepared an analysis based on the experience of our company. In adopting such an approach, we were at pains to be extremely conservative in our assessment so as not to overstate the risk adjustment'.

Detailed analysis of historical data, also reported in the above reference, showed a shift in out-turn cost over budget cost of 9.4%, confirming the extreme conservatism embodied in our original 2.6% estimate.

The robust and rigorous risk approach used by ElectraNet should not be discounted by comparing it with Powerlink's process.

8.5 COMPARISON OF ELECTRANET AND POWERLINK PROJECT PORTFOLIOS

ElectraNet has a different make-up of projects than Powerlink, a smaller network, and is operating with a different labour force. These factors combine to provide ElectraNet with a smaller portfolio with less diversity than Powerlink. (Powerlink has over three times the forecast capex of ElectraNet).

A portfolio with less diversity assumes a higher risk. Less diversity in projects, and less projects, means that the impact of realised risks on a single project will have more of an impact on the overall portfolio of projects. (This only applies for project-specific risks, and not for common risks such as labour strikes). With a smaller number of projects, ElectraNet has less scope to divert resources and equipment to other projects in the event of a realised risk.

The difference in project portfolio size and diversity between ElectraNet and Powerlink means that ElectraNet could reasonably be expected to have a somewhat higher risk profile than Powerlink.

8.6 CONCLUSION

The use of risk based estimating is commonly used in the procurement of infrastructure projects throughout Australia across a broad spectrum of industries and projects. It is used at various stages of the procurement cycle, to reflect the variability in costs over time.

Evans & Peck has been engaged to undertake risk based estimates and has significant experience across a broad spectrum of industries. This experience, coupled with documented literature such as the '*Engineers Cost Handbook'* provides a sound basis from which to compare the output of the ElectraNet process with other infrastructure programs. Based on our experience the revised P50 value of 4.6% is not unreasonable and is in fact at the lower end of industry expectations.

Direct comparisons and use of the Powerlink Risk Factor are inappropriate. Based on the documented extremely conservative approach adopted for Powerlink and the difference in project portfolio size and diversity we would reasonably expect ElectraNet to have a somewhat higher risk profile than Powerlink.

9 SENSITIVITY

In addition to the above commentary, specifically addressing the points raised in the AER Draft Determination, Evans & Peck was also requested to undertake a sensitivity analysis to better understand the drivers and effect on the out-turn cost of the risks and boundaries identified in the original submission.

The project risk profiles were constructed using the inherent risks tabulated in the ElectraNet Revenue Proposal. For the less certain estimates (Level 1 and Level A

estimates), 7 out of 18 risk profiles were symmetrical (an equal likelihood of cost under-estimation or over-estimation, or an equal likelihood of risk and opportunity). For the estimates with more certainty (Level 2 estimates), 11 out of 18 risk profiles were symmetrical.

Based on this symmetrical position, over **one-third** of the inherent risks identified effectively have no net effect (positive or negative) on the risk profile of the portfolio, as at the P50 value there is an equal probability of the costs increasing as there is decreasing.

A sensitivity analysis reveals that the three risks with the most significant influence on the total capex out-turn cost are as identified below. The benefit of the approach adopted is it provides ElectraNet with an indication of the key risks that need to be managed to minimise the impact on the out-turn Capex cost.

For example the identified risks associated with easement and land acquisition relate to the uncertainty over the final alignment given the distance has been based on aerial maps, which do not take into consideration the contour of the land, or the need to detour around sensitive environmental areas. There is also significant variability in the timing and price of land required for acquisition, which is strongly influenced by the value added to properties by owners.

Identified Risk	**Approximate Influence on Total Capex**
Secondary Systems (Inherent Risk)	0.4%
Easements and Land Acquisitions	0.2%
ElectraNet Preliminaries	0.2%

To assess the impact of these risks on the model, the risk profiles for each of these risks were removed in turn and the risk model re-run. The impact of removing these risks on the portfolio P50 risk factor was:

Identified Risk	**Effect on Portfolio P50 Risk Factor when Individual Risk Removed**
Secondary Systems (Inherent Risk)	- 0.5%
Easements and Land Acquisitions	- 0.3%
ElectraNet Preliminaries	- 0.2%

It can be seen from the above results that the removal of the most significant risks has a maximum impact of 0.5% on the P50 of the portfolio risk profile.

Furthermore, we have analysed the sensitivity of the outcomes from the workshop and modified the risk boundaries and probabilities derived to understand the nature of the impact on the portfolio risk factor. For the purposes of the sensitivity the outcome for both P50 and P80 values have been identified.

Description of Adjustment to Baseline Risk Model	P80	P50
Baseline (As Submitted)	7.0%	5.2%
Revised Baseline (**Omission of Adelaide CBD project** – shifted to Contingent Project)	6.8%	4.6%
Revised Baseline with adjustment to the inherent risk boundaries (Both the **Minimum & Maximum boundaries halved** – No change to the Most Likely value)	5.4%	4.1%
Revised Baseline with adjustment to the inherent risk boundaries (Both the **Minimum & Maximum boundaries doubled** – No change to the Most Likely value)	9.8%	6.3%
Revised Baseline with adjustment to the inherent risk boundaries (**Only the Maximum boundary doubled** – No change to the Minimum boundary and Most Likely value)	9.1%	8.0%
Revised Baseline with adjustment to the inherent risk boundaries (**Only the Minimum boundary doubled** – No change to the Maximum Value and Most Likely value)	5.8%	3.2%
Revised Baseline with no change to the inherent risk boundaries **The probability for the Contingent risk doubled**)	8.2%	5.8%
Revised Baseline with no change to the inherent risk boundaries. **Contingent risks completely omitted**.	5.0%	2.9%

The revised baseline for the sensitivity analysis excluded the Adelaide CBD project – line component, which the AER and ElectraNet have agreed is to be treated as a contingent project. With this project deleted the revised baseline risk factor @ P50 is 4.6%. This reference point provides the basis for comparison for the various scenarios to demonstrate the sensitivity of the model to specific changes.

When the maximum value for the inherent risks was doubled (e.g. 120% to 140%, 130% to 160%) the net effect on the risk factor @ P50 was an adjustment to 8.0%. This was the maximum value recorded in the sensitivity analysis.

The further moderation of the inherent risk boundaries with the maximum and minimum values halved resulted in a risk factor @ P50 of 4.1%. The net effect of either, doubling the inherent boundaries or halving the inherent boundaries results in a variance of between 6.3% and 4.1% @ P50, compared to the boundaries identified from the workshop of deriving a risk factor of 4.6% @ P50.

The doubling of the probability of the contingent risks occurring resulted in a 1.2% increase in the risk factor from 4.6% to 5.8% (or 25%).

The key conclusion to draw from this sensitivity analysis is that due to the selection of the 'Pert' Distribution and the moderating effect of the portfolio of projects, significant alterations to the identified upper and lower boundaries does not have a significant impact on the out-turn capex cost. The sensitivity analysis tested boundaries well beyond the reasonable limits, yet in the most extreme case (the maximum boundary doubled) the effect was an increase in the risk factor to only 8.0%.

10 CONCLUSIONS

The key conclusions from this report in response to points raised by the AER in the draft determination can be summarised as follows:

- The output from the Risk Based Approach, like all modelling exercises is reliant on the quality of the input. However, the approach adopted for developing risk based estimates for ElectraNet is systematic and follows a structured process in understanding the objectives and assumptions used in the development of the reference estimate. The identification and quantification of risks using a workshop process, involving a broad spectrum of experienced personnel is common practice in industry. The use of the collective experience mitigates the effects of any bias of the estimator with the aggregation of opinion and past experiences brought to the fore. This peer review process results in more consistency in the estimating process, more realistic contingency provisions, a better understanding of the risk allocation and a basis for making informed decisions.
- The ElectraNet personnel present at the workshop had significant knowledge and understanding of the capital delivery and project scoping and estimation processes including the new initiatives adopted. The upper and lower boundaries identified by the workshop participants take into account the initiatives and new estimating processes adopted.
- The process adopted by ElectraNet in development of the risk based estimate produces an inherently moderated position. The combination of:
    - adjustments to the model after the initial workshop which resulted in some of the upper boundaries being reduced;
    - the selection of the 'Pert' distribution, which is implicitly conservative and is heavily weighted towards the 'Most Likely' value in determining the likely final cost outcome.
    - a portfolio of projects will have a combined level of risk that is less than the arithmetic sums of the component projects. The modelling process assumes each project to be mutually exclusive of any other project which effectively cancel each other out providing a conservative position; and
    - the decision not to correlate projects,

  provides an output with the extreme boundaries removed and resulted in a more concentrated or moderated position.
- Evans & Peck supports the view that unreasonable risk should not be transferred to customers. However, allowances for reasonable risks should be built into

budgets. All risks will incur a cost to mitigate and opportunities a cost to realise. This is a real cost of operating a business which is not captured within the individual reference estimates. The process adopted by ElectraNet is prudent and provides an effective and systematic approach to identification, quantification and management of risks. This process does not result in the inappropriate transfer of risk to end users, but provides a structure to ensure there is accountability and responsibility for management of risks. The outcome of this process should result in better management of risks and reduced exposure and improved certainty in the future.

- The statement that only two opportunities were identified in the model is incorrect. Each category of asset, in every project contained within the portfolio of projects includes an opportunity. In respect of Level A estimates this opportunity is between 5% and 50% below the reference estimate. In exactly the same way that the workshop identified specific examples of risk, the group also identified examples of opportunities that may be realised. We would expect that diligent estimators to have already identified obvious cost savings, even in their base estimates. As a consequence, the likelihood of substantive decreases in cost is less than the possibility of increases arising from other factors. Evans & Peck is satisfied that the process adopted equally examined possible opportunities and risks with the model accounting for all possible gains from elements of projects that may come under budget.
- Any direct comparison between the ElectraNet and Powerlink risk factor is inappropriate. Based on the documented extremely conservative approach adopted for Powerlink and the difference in the smaller portfolio size and reduced diversity we would reasonably expect ElectraNet to have a somewhat higher risk profile than Powerlink.
- The key conclusion to draw from the sensitivity analysis undertaken is that due to the selection of the 'Pert' Distribution and the moderating effect of the portfolio of projects, significant alterations to the identified upper and lower boundaries does not have a significant impact on the out-turn capex cost. Over one third of the inherent risks / opportunities identified effectively have no net effect on the risk profile of the portfolio. The sensitivity analysis tested boundaries well beyond the reasonable limits, yet in the most extreme case (with only the maximum boundary doubled) the effect was an increase in the risk factor to 8.4%.
- The use of risk based estimating is commonly used in the procurement of infrastructure projects throughout Australia across a broad spectrum of industries and projects. It is used at various stages of the procurement cycle, to reflect the variability in costs over time. The further along the procurement cycle, there is increased scope certainty with the assumptions, scope, risks and constraints better understood.

- Evans & Peck has been engaged to undertake risk based estimates and has significant experience across a broad spectrum of industries. This experience, coupled with documented literature such as the 'Engineers Cost Handbook' provides a sound basis from which to compare the output of the ElectraNet process with other infrastructure projects. The risk factor from a selection of other infrastructure projects produced a risk factor (P50) of between 4.0 and 9.8%. Based on our experience the P50 value of 4.6% is not unreasonable and is in fact at the lower end of industry expectation.