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Mr Ian Woodward
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Australian Energy Market Commission
PO Box A2449
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Dear Mr Woodward, Ian,

Response To Draft Report On Reliability Panel's Review of a Nationally Consistent Framework For Transmission Reliability Standards

VENCorp welcomes the opportunity to respond to the RP's review of Nationally Consistent Framework for Transmission Reliability Standards.

VENCorp is broadly supportive of a nationally consistent framework for transmission reliability standards. In particular VENCorp supports:

- a framework containing nationally consistent and central planning criteria; and
- the adoption within that framework of technical and economic criteria (including economic cost benefit analysis, valuation of customer reliability, treatment of credible contingencies, assumptions relating to probability of exceedance of forecast; and credible market scenarios).

However, VENCorp believes that further work is required on the following element:

- the RP should only provide a *framework* on which the jurisdictions can base their planning standard;
- ensure that planning standards based on the contents of the framework must be derived from economic cost benefit analysis as well as technical parameters; and
- give jurisdictions the option to express the resulting planning standard as a deterministic equivalent **OR** apply the framework's criteria directly to planned augmentations on a case-by-case basis without converting them to a deterministic equivalent.

Finally, determination of reliability standards or their formulation and make-up are matters that require considerable jurisdictional input rather than solely among the asset owners who have other performance indicators to deliver and other drivers influencing them.

Should you have any questions on anything in the submission please do not hesitate to contact Franc Cavoli on (03) 8664 6616 or Louis Tirpcou on (03) 8664 6615.

Yours sincerely

M. Zema

Matt Zema
Chief Executive Officer

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1. Introduction

On 24 April 2008, the Reliability Panel (RP) of the AEMC released its Draft Report on its review of a Nationally Consistent Framework for Transmission Reliability Standards. The Draft Report sets out the RP's draft consideration of the matters raised by interested parties in response to its Issues Paper of December 2007.

This submission makes the case that transmission planning using probability analysis to forecast loss of load and the economic evaluation of augmentations using an explicit value of customer reliability (VCR) has delivered economically efficient transmission investment results in Victoria and resource allocation than would have been the case if a deterministic planning standard or a hybrid standard were adopted with no appreciable deterioration of transmission network reliability.

In addition, this submission concludes that a Nationally Consistent Framework (**Framework**) should:

- only provide a *framework* on which the jurisdictions can base their planning standard (this is consistent with the MCE's direction to AEMC[1]);
- ensure that planning standards based on its contents must be derived from economic cost benefit analysis as well as technical parameters; and
- give jurisdictions the option to express the resulting planning standard as a deterministic equivalent or apply the Framework's criteria directly to planned augmentations on a case-by-case basis without converting them to a deterministic equivalent.

Before proceeding, it is worthwhile revisiting ERIG's comments in its January 2007 report on Energy Reform. In that report ERIG concluded in respect of transmission planning:

> "... the planning processes and the information that is provided to stakeholders through this planning process are crucial to the efficient operation of the system as a whole ... ERIG considers transparent information provision to be a critical element of an efficient national energy market ... It is therefore the view of ERIG that the framework for transmission planning should, to the greatest extent possible, facilitate the *efficient delivery of appropriately located and timed transmission capacity* .... Further, given that the electricity transmission network is in fact a single system, transmission planning should at the very least be co-ordinated across that entire system." (emphasis added) [2]

There are two points to note about this statement. The first is that ERIG noted the connection between efficiency and timing of capacity. It is noteworthy (and this submission shows) that a probabilistic planning standard generally allows better timing of transmission investments. Secondly, ERIG only refers to "co-ordination" of transmission planning rather than a common standard or conversion of standards. The MCE in its direction to the AEMC seemed to reinforce the concept of a "framework" rather than a compulsory nationally consistent "planning standard". This submission supports the concept of adopting a Framework rather than mandating a consistent planning standard.

Finally, we should clarify a statement made in VENCorp's previous submission in this review. The RP's Draft Report claimed that VENCorp supported a particular hybrid deterministic model (Option B). This was not the case. VENCorp supports a probabilistic approach justified by a cost benefit analysis using an explicitly stated VCR. The relevant statement in that submission was that if a TNSP were to use a deterministic standard to justify an augmentation, then it should be justified by a sound cost benefit analysis. The statement was not meant to be read as proposing or giving support to a hybrid solution.

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[1] The MCE in its letter to AEMC dated 3 July 2007 required the AEMC to conduct "a review into electricity transmission network reliability standards, with a view to *developing a consistent national framework* for network security and reliability."

[2] Energy Reform - The way forward for Australia. A report to the Council of Australian Governments by the Energy Reform Implementation Group, p. 153

2. Description of VENCorp's planning approach

In order to understand the arguments made in this submission, it is first useful to understand how planning is undertaken in Victoria and its valuation and use of VCR. We have therefore set out that analysis in an attachment to the submission (Attachment A - VENCorp's planning approach and Attachment B - VENCorp's VCR).

In addition, we clarify a statement made by KEMA in its report that could be potentially misleading. KEMA stated:

> "In Victoria, VENCorp uses a combination of deterministic and probabilistic criteria. It is our understanding that they use deterministic criteria to establish the need for any network improvements and identify the best solution. VENCorp then use [sic] probabilistic techniques to justify the specific timing of any needed improvements. This is different from using fully probabilistic planning criteria to evaluate the system and develop plans as discussed above."[3]

From this it seems that KEMA believes that:

- VENCorp uses a combination of deterministic and probabilistic criteria;
- the deterministic criteria establish the need for, and the best solution;
- the probabilistic criteria justify the timing of this best solution; and
- VENCorp's planning approach is not full probabilistic planning as described earlier in KEMA's paper.

VENCorp responds as follows:

- VENCorp uses probabilistic techniques to assess the need, analyse all solutions, and determine the preferred solution and preferred timing.
- VENCorp only uses contingency analysis to assess longer term (i.e. 10 year) network constraints and simulate system operations as a trigger for further exploration. It does not use deterministic criteria to determine the need for, and the best solution. Such contingency analysis is normal practice in probabilistic methodologies, as indicated in KEMA's discussion on probabilistic planning[4]; and

3. VENCorp's proposed Framework

In this submission we conclude that a cost benefit approach as described above is a very effective way of achieving the RP's criteria. Furthermore, the adoption of an alternatively expressed standard (such as a hybrid equivalent) would not achieve the efficiencies of investment and utilisation currently enjoyed in Victoria for the same reliability. However, VENCorp recognises that other TNSPs may not be in a position to apply the cost-benefit approach in the way it is in Victoria or that it will deliver the same efficiency outcomes as it has in Victoria given the nature of their systems.

Flexibility in expression

The submissions to the RP's Issues Paper and the Draft Report itself did not reveal any major disagreement among the TNSPs with the economic principles that should appear in a Framework or for that matter, the principles that underpin the South Australian hybrid model (we discuss below the criteria the Framework should contain). Rather, it seemed as though TNSPs were uncomfortable with the application of those criteria directly to actual and potential augmentations on a case-by-case basis.

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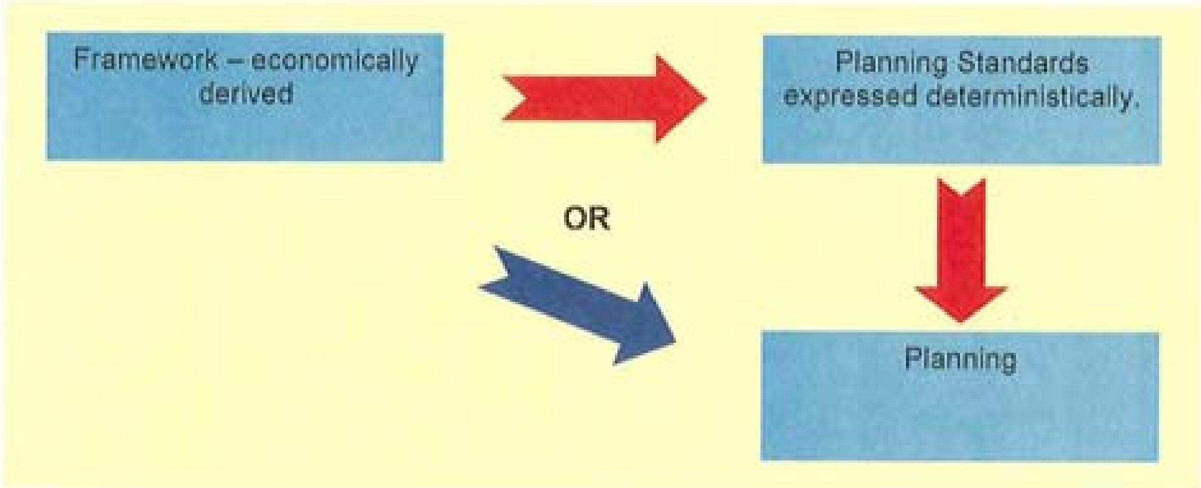
[3] KEMA, "International Review of Transmission Reliability Standards", 27 May 2008, p. 14.

[4] KEMA, "International Review of Transmission Reliability Standards", 27 May 2008, p. 13, where it states "a probabilistic analysis evaluates the system under a variety of expected future initial conditions, and then failures of individual components ... are evaluated.".

The main attraction of the South Australian hybrid model was that the criteria were then expressed in a format that jurisdictions would be comfortable with.

VENCorp does not propose that all jurisdictions plan in the same manner as it does. In fact, having a common set of planning principles in the Framework is more important than the manner in which the standard it eventually expressed. Since many of the TNSPs have expressed concern over the appropriateness of a pure probabilistic approach in all jurisdictions, VENCorp proposes that jurisdictions be given the option to apply the Framework principles directly to each actual or potential augmentation (such as happens in Victoria) or to convert those principles into an equivalent deterministic standard for each connection point for a fixed period (say five years). In other words, jurisdictions should have the option of taking the extra step of expressing the Framework as a deterministically expressed equivalent before applying that standard to all potential augmentations (red pathway in the diagram below) **OR** to apply the Framework's criteria to each potential augmentation on a case-by-case basis (blue pathway in the diagram below).



The fundamental principles of the Framework and any equivalent deterministic standards that are developed from these principles would be subjected to regular reviews. Furthermore, if a jurisdiction has elected to adopt equivalent deterministic standards they would need to conform to a consistent format. This should allow for a meaningful comparative analysis of actual and effective standards at each connection point.

Framework principles

As noted above, VENCorp considers that the economic and technical principles underpinning both its approach and the South Australian model are similar. As such, these principles should be considered the basis for developing the Framework. In VENCorp's opinion, the following criteria would form the basis of the Framework:

- **VCR**. The VCR principle (value of customer reliability) would define the economic value of involuntary and unexpected loss of supply to customers such that the cost of augmentations can be economically assessed. To allow for a meaningful comparison of this value across jurisdictions, this would be defined for various customer types e.g. residential, commercial, agricultural, industrial.

  Network level VCRs could then be determined for various network locations based upon the customer make-up for that location. These network VCRs could cover individual connection points, connection point groups, and state level.

  This differs from VoLL in that VCR is a true value of energy to consumers after which they would be willing to switch off. VoLL is a price cap in the market that attempts to mitigate commercial exposure. Further details on VENCorp's VCR standard is contained in Attachment B.

- **The economic and technical principles.** These criteria underpin the approach and assumptions that must be applied to either assess investments or to derive and review equivalent deterministic standards:
    - a cost-benefit analysis;
    - the use of maximum demand forecasts and development of applicable demand profiles;
    - network and generation outage statistics and the data sources and methodologies determining them;
    - network ratings and relationships with operations ratings;
    - contingencies (to be studied) and limits of materiality in contingency analysis;
    - methodologies to determine appropriate market conditions (e.g. generation dispatch patterns); and
    - other operational considerations (e.g. spares, network re-configurations).

Assessment of Framework approach against the Reliability Panel's criteria

VENCorp believes that a Framework that contains the above planning principles, would meet the RP's criteria for a planning standard:

- Transparency

  Provided that the principles are clearly stated in the Framework and the Framework itself is publicly available, each TNSP's planning process should be transparent and auditable.

- TNSP accountability

  The most effective way of delivering TNSP accountability without having to first experience a deterioration of reliability is to have transmission plans developed or scrutinised by independent transmission planning authorities that have power to direct amendments to transmission plans (as happens in PJM and Alberta[5]). A slightly different model is applied in British Columbia where it seems that the British Columbia Transmission Corporation (BCTC)[6] is responsible for transmission planning along similar lines to Victoria. It seems as though an accountability model based on scrutiny at the time of planning would be a far more effective way of holding TNSPs accountable for their planning investments since it is capable of picking up problems at the planning stage. A planning standard on its own has great difficulty doing this.

- Specificity

  VENCorp has proposed that each jurisdiction can choose to apply the principles in the Framework directly to each augmentation or convert it to an equivalent deterministic expression. Provided both options' outcomes are directly referable to and measurable against the principles set out in the Framework, they will meet this objective.

- Effectiveness

  On the basis of Grid Australia's definition of "effectiveness" (a standard that meets customer expectation of reliability and minimises disputes), use of a published planning criteria, economic cost benefit assessment and verifiable VCR explicitly derived from customers' stated expectations of level of reliability should make the planning process very effective since customers know what to expect and therefore disputes are minimised.

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[5] KEMA, International Review of Transmission Reliability Standards, 27 May 2008, p. 16.

[6] The British Columbia Transmission Corporation is a government owned body that like VENCorp has responsibility for the planning of the transmission network in British Columbia, Canada

- Robustness

  We disagree with the notion that application in overseas jurisdictions necessarily makes an approach robust. For example, there are many different forms of electricity markets around the world, each one designed to meet differing local needs. The fact that Australia's market design differs from many North American models does not make Australia's market design any less robust. Far from it, it is strongly argued that Australia's different topography makes it critical that a different market approach is adopted.

  Further, VENCorp disputes Grid Australia's assertion that adoption of the same reliability standard would hold TNSPs immune from claims of negligence in their planning function. On the contrary, if overseas standards are followed without question or scrutiny for appropriateness, claims that TNSPs acted negligently in the event that reliability deteriorated would only be strengthened.

  However, if an example of an overseas jurisdiction using probabilistic criteria to plan is necessary, then the BCTC would be the prime one. Like the Australian transmission network, British Columbia's main grid is linear (i.e. not meshed) and has most, if not all generation capability geographically located a distance away from major load centres similar to many parts of the NEM.

- Technological neutrality

  There should be nothing in the principles in the Framework that would favour any particular technological outcome.

- No worse

  While this sounds like a reasonable objective, if the system or parts of the system are already overbuilt, then this can lead to continued inefficiencies.

We also make the point that the further the RP moves from the development of a Framework towards requiring how the criteria should be expressed, the closer it gets to mandating a particular level of reliability. This is not a matter for the TNSPs to be involved in. TNSPs should only plan to specific planning criteria such as that contained in the proposed Framework not assist in the setting of those criteria. Clearly, therefore, it should be the responsibility of each jurisdiction to determine whether the analyses done for connection points using the Framework criteria should be converted to a deterministic equivalent and the level of redundancy required.

Form of transmission reliability standards

For those jurisdictions electing to express their planning standards as a deterministic equivalent, the n-x form appears to be the most appropriate. Therefore, TNSPs would be required to develop transmission reliability standards applicable to its jurisdiction in a n-x form based upon the economic and technical principles in the Framework.

The Framework should also define the format of these deterministic standards, such that the application of these standards is clear and transparent, and they are in a suitable form for comparative analysis. Factors that would need to be clearly defined would include (without limitation):

- credible contingencies;
- maximum demand forecast, particularly the probability of exceedance of the forecast; and
- credible market scenarios, including the assumptions on available and unavailability generation that is local to the supply.

Each customer connection point would have the deterministic standards applicable to it clearly identified. Further, any specific assumptions particular to that connection point or group would be defined.

A key consideration in the assignment of the deterministic standard will relate to the intra-TNSP scope of any standards. This will be important in ensuring that deterministic standards concerning the redundancy of connection point assets do not influence shared network needs in an inappropriate way. If deterministic standards are to have scope into the shared network then additional standards, with more appropriate criteria, may be required for these specific circumstances.

Regular review and comparative assessment

As would have been the case with any of the options put forward by the RP in the Draft Report and consistent with the transparency and accountability principles, all TNSP's should be required to develop the VCR standard, economic and technical principles, and transmission reliability standards into a publicly available policy document. This would be subject to a regular review and comparative analysis.

The RP's proposed national reference standard could still be developed for comparative purposes. In this way, the effective reliability standard determined by those TNSPs applying the cost-benefit approach directly can be compared against this reference standard and other TNSP's deterministic equivalent standards.

4. Comparison of cost benefit analysis against deterministic and hybrid models in Victoria

This section will show the following:

- VENCorp's cost-benefit approach is achieving efficient investments in Victoria and achieving appropriate supply reliability.
- The economic principles that underpin the RP's hybrid approach are equivalent to the principles that underpin VENCorp's cost-benefit approach. However, applying these principles to derive an equivalent deterministic standard will tend to introduce material inefficiencies into VENCorp's transmission investment decisions in Victoria compared to the present.
- The adoption of deterministic standards will tend to introduce inconsistencies between the planning approaches between VENCorp and the Victorian DNSPs.

The option proposed by the RP is similar in form to that presently used in South Australia. Therefore, it is helpful to compare a deterministic standard and the South Australian model with the cost benefit approach used by VENCorp.

As VENCorp understands it, each connection point in South Australia is assigned a deterministic standard that defines the level of redundancy of transformers and lines that supply a particular connection point. Compliance with that standard is assessed against a maximum demand agreed with the customers at each connection point. In reviewing their planning standards, ESCOSA adopted a cost-benefit approach, involving assumptions of the VCR, network outage rates, and investment costs to change the redundancy level.

It is clear that, at least in principle, the two approaches - the cost benefit approach and the South Australian model - are based upon the same economic considerations. Furthermore, the VCR appears to be the fundamental standard that is consistent across the approaches. That said, VENCorp considers a hybrid approach based upon the South Australian regime or as suggested by the RP would, if applied to the Victorian network, lead to less efficient planning outcomes. This is discussed further below.

Efficiency

VENCorp supports a level of planning standardisation, but that standardisation must not be at the expense of restricting planning approaches that have already been demonstrated to achieve efficient investment outcomes. As discussed above, we have concerns that the imposition of deterministic standards will lead to less efficient transmission investments in Victoria. Clearly, imposing this form of a Framework on Victoria would not be in accordance with the NEM objectives.

With regard to the scale of the efficiencies that could be lost from VENCorp adopting a deterministic or hybrid approach, VENCorp has assessed the impact of moving to a strict n-1 deterministic standard during a review of its planning approach conducted in 2001. This analysis showed that VENCorp's cost-benefit approach, on average, resulted in a 3-year deferment in an investment from the n-1 timing. Across VENCorp's augmentation at that time, this resulted in a $32.4M total present value cost saving (in 1991 dollars) over all projects over an n-1 approach.[7]

Furthermore, to illustrate the kind of inefficiencies that could result in Victoria of relinquishing its cost benefit methodology for pure deterministic or proposed hybrid, VENCorp has undertaken indicative analysis of a known future transmission need. This need relates to the level of tie-transformer capacity (500/220 kV transformation) required to supply Melbourne's metropolitan connection points. When the need arises, the major transmission augmentation may require the installation of a new 1000 MVA 500/220 KV tie-transformer, with an estimated project cost of approximately $35 million.

The example was then compared against a "pure" deterministic/redundancy standard of n-1 and based upon our understanding of the South Australian model, a n-1 redundancy level equivalent hybrid. VENCorp's analysis indicates that applying the n-1 standard would require the augmentation to be in place for 2008/09. However, VENCorp's probabilistic approach indicates that the efficient timing be deferred considerably, to about 5 years. This level of deferral results in a $11.2 million cost saving to customers using a 8% discount rate on this single project.

Table 1 Comparison of Cost Benefit approach to Deterministic and Hybrid approaches

	Cost Benefit	Deterministic (n-1)	Hybrid (n-1)
Option	New transformer	New transformer	New transformer
Cost	$35m	$35m	$35m
Timing	20013/14	2008/09	2008/09
Total cost savings	$11.2m	n/a	n/a

A more detailed analysis appears in Attachment C of this submission where the above example is compared against a n-1 deterministic approach. As stated above, in our comparison we have assumed that the hybrid model (based on the South Australian model) uses a n-1 standard. The reason for this is can be found in ElectraNet's statements in its recent Annual Planning Report:

> The interconnected transmission network is planned so that 100% of the peak forecast load at each substation or connection point can be supplied during both normal and first-contingency (N-1) emergency conditions.[8]

Since the above example deals with a shared network example and, in any event, VENCorp does not plan for connection points (that responsibility falls on the DNSPs), we could only assume a redundancy standard of n-1 for comparison.

We should clarify that we do not believe the South Australian model or a hybrid model per se to be deficient or defective, rather, given the Victorian system, VENCorp's planning responsibility for the

[7] VENCorp, "Consultation Paper - Electricity Transmission Network Planning Criteria", 2001, p. 19

[8] ElectraNet Annual Planning Report, 2007, p.10. Compare this with its statement on the reliability standard in respect of connection points ElectraNet states that the "ETC [Electricity Transmission Code] assigns reliability standards for each connection (exit) point or group of connection points within the transmission network and thereby imposes specific requirements on ElectraNet for planning and developing its transmission network." See p. 6.

shared network portion only and the way that the network has been planned in the past, the South Australian model, like a pure deterministic/redundancy standard, would seem to achieve a less efficient investment result for no discernable difference in transmission network reliability.

In conclusion, deferral of the augmentation under the cost benefit approach does not, at least for Victoria, impose unacceptable risks on customers compared with the alternatives. Rather, the approach inherently allows a number of mitigating factors, specific to this potential augmentation, to be accounted for in its analysis. These factors relate to the actual supply arrangements, which involve single-phase units and the installation of barriers between phases to avoid a common-mode failure of multiple units; the availability of a common spare transformer phase; and the short-term overload ability of the existing transformer. These factors reduce both the likelihood of the need for load shedding and the length of time load shedding would be required should the need arise. Moreover, some of these factors, such as the short-term overload ability and barriers between phases are a direct result of VENCorp's cost-benefit approach to planning. The justification of these types of augmentation, which reduce risks significantly but do not impact the redundancy, may be far more difficult if a deterministic standard is imposed in Victoria.

Relationship with connection planning and sub-transmission planning in Victoria

The Victorian transmission planning arrangements uniquely require the relevant DNSP to plan any augmentations of connection assets. In the context of this review, this means that the DNSPs are responsible for planning the transformation capacity from transmission network to the distribution network. Moreover, as the majority of connection points in Victoria have a meshed arrangement with other connection points, nearly all transmission lines in Victoria are part of the "shared" network.

The South Australian model is focused on connection point redundancy. The Victorian transmission planning arrangements require the DNSPs to plan augmentation to connection assets – essentially plan the connection transformation capacity. Also, the majority of connection points are meshed at the transmission level with other connection points, and therefore, the transmission lines supplying any single connection point are part of the shared transmission network. As such, standards like the South Australian ones may not be applicable for the Victorian system.

Further, the RP has stated that the hybrid approach retains consistency between transmission and distribution standards. VENCorp disagrees with this position. The planning approach applied by Victorian DNSPs to the connection assets and their sub-transmission systems is similar to VENCorp's cost-benefit approach. Clearly, if VENCorp were required to move to a hybrid model or deterministic standard – even if this had been derived through economic considerations for every connection point – it is most likely that there will be an inconsistency in planning decisions between VENCorp and the Victorian distributors.

Finally, with regard to the importance to the RP of consistency for the development of the Framework, the following two points appear relevant:

- the economic considerations in determining a deterministic equivalent from the economic criteria may well result in the standard changing. If a distribution deterministic standard can impose a constraint on the transmission standard, then it is not clear what purpose the economic considerations serve; and
- standards of supply reliability, not redundancy, are the issues of concern in this review.

5. Comparison of VENCorp's proposed Framework and the RP option

Section 5 of the RP Draft Report discussed various Framework options resulting from the submissions to its issues paper. One of these options was based upon the RP's analysis of the submission (Option E). The main features of these options are summarised in Table 1 of the RP paper.

To assist in the RP's understanding of the Framework proposed in this submission, this section provides a comparative analysis of the Framework and Option E. This analysis is summarised in the table below. The format of this table is based upon Table 1 in the RP draft paper.

The main points from the table below are:

- VENCorp's proposal is the same in its "features" to RP's Option E (and Option A), particularly for any jurisdiction electing to use deterministic standards; and
- it will not result in inconsistencies between TNSP and DNSP planning approaches in Victoria or other jurisdictions.

Table 2 Comparison of VENCorp's proposed Framework with Option E

Features	Option E	VENCorp proposal
Form of standard	Hybrid form, common across NEM	The VENCorp proposal is consistent with Option E (and Option A) for any jurisdiction electing to use deterministic equivalent standards.. Alternatively, a TNSP may opt to undertake the cost-benefit approach, which is more consistent with Option B and C. However, the VCR standard is the most fundamental standard defined within the Framework. This standard would be defined in a consistent way across the NEM, but each jurisdiction may be required to determine the particular VCR standards relevant to its customers.
Scope of Standard	Allowance for connection point standards to differ between sector type. Introduce "national reference standard".	The VENCorp proposal is consistent with Option E (and Option A) for any jurisdiction electing to use deterministic equivalent standards. VENCorp sees no reason why any TNSP opting to undertake the cost benefit approach cannot provide the *effective* reliability for each connection point. Further, this effective standard can be used for any comparative analysis with a national reference standard. However, VENCorp considers that the RP will need to give further thought to the intra-TNSP scope of any deterministic standards and the relationship with a national reference standard. Our concerns on this matter relate to how a transmission reliability standard that defines the redundancy requirements of the connection point, can also influence the planning of the *shared* network.
Where are the standards specified	Framework expressed in NER.	The VENCorp proposal is consistent with Option E with regard to the framework. However, a distinction may be required between where the Framework is specified and where TNSP deterministic standards are defined, depending on what scope a jurisdiction is allowed to define the deterministic standard.
Process for setting standards	Clear transparent process for setting standards	The VENCorp proposal is consistent with Option E.
Who sets the level of the standard	Jurisdictional authority separate from the TNSP Establishment of information base of standards Format, structure and level of standards reviewed every 5 years	The VENCorp proposal is consistent with Option E (and Option A) for any jurisdiction electing to use deterministic equivalent standards. Further, for TNSPs that have opted to undertake the cost-benefit approach: • the jurisdictional authority would have responsibility for assessing the cost-benefit approach and its consistency with Framework; and • reviewing any effective standards prepared by the TNSP that are used for comparative purposes.

Features	Option E	VENCorp proposal
Accountability of standard setting body	To jurisdictional government	The VENCorp proposal is consistent with Option E
Accountability of TNSP	To jurisdictional authority and the AER	The VENCorp proposal is consistent with Option E
Retains consistency between TNSP and DNSP standards	Yes	VENCorp disagrees that Option E retains consistency, as this would not be the case in Victoria. VENCorp's proposal can retain consistency, provided the jurisdictional authority requires this to be the case.
Likely changes	Significant changes, including the NER, NEL, state legislation, regulations and licences.	The VENCorp proposal is consistent with Option E.

6. Conclusions

The objective of this submission was to:

- reinforce the view that the MCE and ERIG objectives were to develop a Nationally Consistent Framework rather than a planning standard itself;
- propose such a Framework so that TNSPs could base their planning standards in consistent criteria. In addition, the Framework should contain economically objective and verifiable criteria on which planning may be conducted;
- show that adoption of a deterministic (or hybrid) standard in Victoria would lead to the forfeiture of efficiencies gained in transmission investment by the adoption of a cost benefit analysis while maintaining a high level of transmission system reliability;
- propose criteria that a Framework should contain (technical and economic parameters (e.g. cost benefit analysis, VCR, generation patterns, disclosure, explanation and treatment network assumptions, etc)) so that planning proposals and augmentations can be easily compared against each other no matter the jurisdiction;
- propose a way forward by allowing jurisdictions to choose whether they will convert their analysis under the Framework to a deterministic equivalent for each connection point (as is done in South Australia for connection points) or apply the Framework on a case by case basis to all potential and actual network augmentations (like Victoria); and
- the Framework proposed by VENCorp meets the RP's criteria or transparency, accountability etc and its "features" criteria.

We believe that the suggested approach would allow for more cohesive approach to planning to take place throughout the NEM without being too prescriptive in the manner in which planning takes place.

Attachment A VENCorp's planning approach

In this section we provide some background on VENCorp's approach to transmission investment planning. To assist in the understanding of this approach and its relationship with transmission reliability standards, we first set out our views on the aim of transmission planning and the historical difficulties in undertaking evaluations.

Planning aim

The primary aim of investment planning of monopoly services is to ensure investments result in customers receiving a service at the economically efficient cost. Determining this for electricity networks is not a trivial matter and requires an appreciation of the future performance of the power system and the costs customers place on the performance over a number of possible scenarios. For most of the historical development of electricity networks, computers and supporting data systems were not up to the task of evaluating such problems. Therefore, simplified approaches (such as deterministic standards (such as n-x redundancy, etc.) were adopted. These approaches set aside the complications of balancing certain aspects of performance and costs. Instead, they were based upon ensuring that a desired standard of service was achieved. The underlying assumption here was that the adopted simplified standard broadly represented the balance between the value of the service and the cost to achieve the standard.

Deterministic standards

A key element of transmission service concerns the **reliability of supply to customers**. However, there were problems in planning transmission networks through reliability standards that were specified directly as customer reliability metrics (e.g. SAIDI or USE). As a result, transmission standards were adopted that focused on the reliability of the transmission network itself rather than customer supply. Moreover, to simplify the relationship of the standards to analysis techniques and the design of transmission networks, deterministic standards (such as n-x redundancy, etc.) were adopted. As acknowledged in the RP paper, these deterministic standards are not strictly customer reliability or even transmission reliability standards; rather they are "redundancy" standards - this being considered as an appropriate proxy for customer reliability[9].

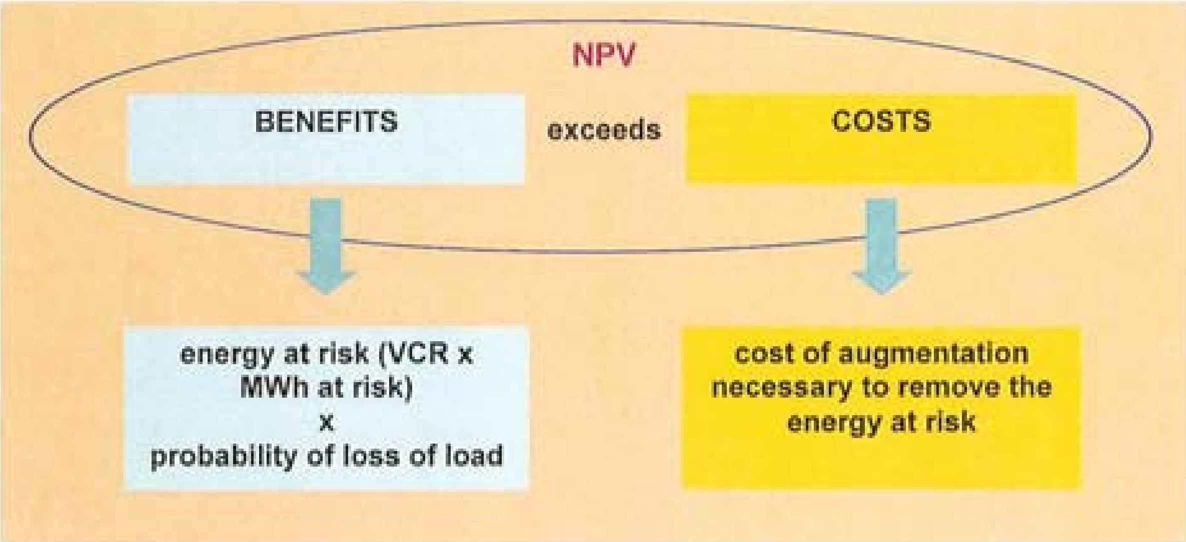
Cost benefit approach

The historical difficulties with forecasting and valuing customer reliability described above have been largely solved via the increased power of modern computers, improved asset databases, the development of reliability based asset management practices, and research into the value that customers place on supply reliability.

The cost benefit approach takes advantage of these modern developments to enable the primary aim of planning to be met i.e. service performance at the efficient cost. In this way, the need for simplified reliability standards is largely removed.

The cost benefit approach is often described as "probabilistic" to differentiate it from "deterministic" approaches. However, in the context of this review it is important to demystify this technical term. The cost benefit approach is, as the name implies, simply a **cost-benefit** technique, which involves the following key elements.

[9] It is also worth noting that these redundancy standards also allowed for flexibility in generation dispatch patterns and transmission operations e.g. maintenance planning.



- **Market benefits**. In accordance with the market benefits limb of the existing reliability test, the approach seeks to maximise the positive net-benefits arising from:
  - **Costs** associated with a network investment option or non-network alternative (e.g. capital and operating costs associated with the investment); and
  - **Benefits** that will result from the investment (e.g. improved customer reliability, reduced congestion and ancillary service costs, reduced losses)
- **Risk assessment.** The approach incorporates reliability methods to deal with the uncertainty in future power system conditions. These methods allow the most-likely benefits resulting from any investment to be determined.
  - This involves the development of a range of market scenarios to allow for the uncertainty in customer demand profile and generation dispatch patterns.
  - Each scenario is then assessed to determine the system actions, including the loss of supply to customers, that would occur to ensure NEM operational obligations are complied with. This assessment involves studies examining both normal and contingency conditions. The contingency studies may allow for assessments up to the 2nd, 3rd or even higher outage event.
  - The benefits of any investment option are determined from the difference between the system actions required following the investment option and the actions required without any investment. Probabilities are assigned to the market scenarios and the contingency condition such that the most-likely benefits resulting from any investment option are determined. A worked example of a typical augmentation assessment is set out in Attachment C.
- **Value of customer reliability.** A key concern of RP's review is supply reliability and the benefits that result from changes in reliability. Forecasts of supply reliability are a key output of the risk assessments described above, whereby forecasts of unsupplied energy are produced. VENCorp had undertaken research to determine the economic value of unsupplied energy for various Victorian customer groups: the value of customer reliability (VCR). The appropriate VCR is applied to the forecasts of customer reliability to determine the value of the benefits in supply reliability that result from any investment option.

  The key point from the above is that every individual investment should have the optimal balance between the investment costs, the customer reliability, and other market benefits. In this way, the optimal solution and optimal timing should be selected (including non-network options).

VENCorp's approach and the NEM objectives

In this section we discuss VENCorp's cost-benefit approach in the context of the NEM objectives and conclude that it achieves the NEM objectives. Moreover, if a Framework is introduced that requires deterministic standards to be applied in Victoria then it is our view that VENCorp's task of efficiently delivering transmission reliability to Victorian customers will suffer. This clearly would not meet the NEM objectives.

In the context of this review, the two key matters within the NEM objectives are:

- the reliability of supply to customers; and
- the promotion of **efficient investment** in electricity services to ensure this reliability.

In the discussion below, we first set out our understanding of **reliability** in the context of this review, and then explain how the cost benefit approach ensures this reliability is achieved. Following this, we explain how VENCorp's approach ensures efficient investment in the NEM. In addition, we also discuss the cost benefit approach in the broader context of the NEM objectives on efficiency. Finally, VENCorp's approach is assessed against the RP's criteria defined in the draft paper.

Reliability and the cost benefit approach

The aspect of reliability that is of concern in this discussion is that of the electricity supply to customers (supply reliability), specifically the reliability of the supply to end-use consumers of electricity due to transmission network limitations. At the most basic level this is simply the probability that consumers are supplied their required demand for electricity. All elements of the physical supply chain affect this supply reliability, including generation capacity and network capacity.

As discussed above, the cost benefit approach directly evaluates customer supply reliability for **every** potential transmission network limitation. The assessment determines the probability of the loss of supply and the amount of energy not supplied (i.e. USE). It also evaluates the impact on supply reliability of each investment option considered.

The cost benefit approach does not require deterministic standards. Rather, the appropriate reliability level for any connection point is determined through the reliability analysis and the economic assessment which is based on VCR, which is discussed further below. Therefore, VENCorp considers that the cost benefit approach is in accordance with the NEM objectives concerning the reliability of supply to customers.

Efficiency and the cost benefit approach

As discussed above, the advantage in VENCorp's approach is that every individual investment should have the optimal balance between the investment costs and the improvement in supply reliability. In this way, the optimal solution and timing should be selected.

The key to the efficiency benefits that can arise through this approach is that a relationship is always maintained between the forecast supply reliability and the costs to change the reliability for each and every network limitation being assessed.

This is not the case if deterministic standards are applied. Such standards involve an up-front assumption of the acceptable supply reliability, which may itself be derived from other assumptions of costs and customer risks. However, when the standard is actually applied to a particular problem, it is free of the actual costs and risks associated with this problem. Any difference between the **assumed** costs and risk, and the **actual** cost and risk, can introduce inefficiencies in investment decisions.

For example, a low cost option, which has a positive benefit through its reduction in supply reliability, may be inefficiently delayed until compliance with a deterministic standard is breached. Conversely, a high cost option, which has a negative benefit through its reduction in supply reliability, may be inefficiently advanced if it is the least-cost solution to ensure strict compliance.

The potential for such inefficiencies is exacerbated if deterministic standards are express in the n-x form. These forms of standard break the relationship further, whereby the level of redundancy does not have a simple relationship with the supply reliability for any particular problem. For example, other assumptions, which must be specified with the deterministic standards, can have as significant an impact on the actual supply reliability resulting from the standard as the value of *x* itself.

Furthermore, inherent properties of the network limitation and demand profile can significantly influence the effective supply reliability for any particular problem. For example, the length of transmission lines, the age of transformers, environmental conditions of the network, network maintenance practices, all affect the reliability of the network components, and as such, the supply reliability resulting from this. A purely deterministic standard fails to take these factors into account.

These inefficiencies can be increased even further if the intra-TNSP scope of a standard related to a connection point extends into the shared transmission network. The scale of these inefficiencies is discussed further Section 5.

Attachment B VENCorp's Value of Customer Reliability (VCR)

As discussed in the main body of this submission, in VENCorp's opinion, the VCR should be the fundamental standard within the Framework. Therefore, it is helpful to consider VENCorp's use of this standard. In this attachment, we first set out the form of the VCR applied in the VENCorp approach. Following this, we provide some background on the process VENCorp applied to determine the appropriate values for the VCR standard.

VENCorp's value of customer reliability (VCR)

The primary standard in VENCorp's approach is the VCR. It is this standard that allows the benefits in customer reliability due to any investment decisions to be economically assessed.

The VCR defines the economic cost of the involuntary (and unexpected) loss of supply. For transmission planning, such involuntary losses of supply normally occur due to the load shedding required to comply with operational obligations. However, in some cases it may simply result from the loss of the transmission supply path to a customer group.

The VCR adopted by VENCorp is defined in terms of the customer value ($) per the unit of energy not supplied, normally defined as $/MWhr[10]. VENCorp has determined four VCR values that are applicable to the following customer types:

- Residential
- Commercial
- Agricultural
- Industrial

For planning studies, VENCorp determines the appropriate VCR for any particular supply problem based upon the proportions of the four customer types affected by the supply problem. In this way, VCR's can be developed that are applicable at the state level, connection point level, or to a group of connection points.

VENCorp's process to determine the VCRs

The VCRs presently applied by VENCorp were developed through a fairly robust process, involving internal reviews, independent research and public consultations. This process is discussed below.

- **VENCorp's planning review.** In 2001 VENCorp undertook a review of its planning approach, including a public consultation on the approach. At this time, the approach was essentially the approach described here, but the wholesale market price cap (VOLL) was used as the VCR for any planning studies.

  This review found that VENCorp's approach was appropriate; however, it recommended further research into the appropriate VCR for transmission planning.

- **VCR Research.** VENCorp engaged an independent expert, CRA, to undertake research into the appropriate VCR for transmission planning. The basis of the study involved quantitative surveys of the market to obtain data on the cost impacts of unplanned electricity supply interruptions. This survey was conducted directly with a wide cross section of Victorian customers. This data was then used to estimate the value that various customer types placed on supply reliability.

  The output of this study was a VCR for each of the customer types and for the State as a whole. These VCRs were greater than the VOLL based value applied by VENCorp in its planning studies at

[10] The *expected* amount of unsupplied energy in the future is determined through the probabilistic assessment within VENCorp's planning approach – see section #.

that time, whereby the research indicated that state wide VCR was $29,600 per MWhr compared to VOLL value of $10,000 per MWhr.

- **Public consultation on the VCR**. Due to the increase in VCR suggested by VENCorp's research, in 2003, VENCorp held a public consultation to determine the appropriate VCR for transmission investment planning.

  The review found that the VCR, based upon VENCorp's research, was more appropriate for transmission investment planning. As such, VENCorp has adopted these VCRs.

Attachment C An example of VENCorp cost-benefit assessment for electricity network augmentation

Background	The Melbourne metropolitan tie transformers at Cranbourne, Rowville, South Morang, and Keilor terminal stations constrain electricity supply from the 500 kV and 330 kV electricity transmission networks to greater Melbourne and surrounding areas.
Potential impact	Overloading of a Cranbourne, Rowville or South Morang transformer only occurs during peak demand conditions, if a critical network element is out of service. However, the transformers remain within their short time ratings, so generation rescheduling and/or demand curtailment is restricted to a few hours during an unplanned network outage. A spare single phase unit is available to replace a failed single phase transformer unit. This would reduce the impact of generation rescheduling and/or demand curtailment significantly.
Load forecast	10% POE summer maximum forecast demand is expected less than three hours per year. Less than 95% of maximum demand is expected for 99.9% of the year. 50% POE summer maximum forecast demand is about 91.5% of 10% POE summer maximum demand. Load varies hour-by-hour.
Deterministic assessment	With all plant in service (n), the loading on the transformers would remain within continuous rating until summer 2016/17. Following the worst credible contingency, the loading on the transformers would remain within their short-term rating. In summer 2008/09, with 10% POE summer forecast demand, a prior outage of Rowville No.2 transformer would increase the loading of Cranbourne 500/220 kV transformer to more than 100% of its continuous rating. The amount of overload can be reduced by switching reconfiguration of network and generation rescheduling. About 10 MW load is expected to be shed to maintain the power flows within the transformer continuous rating.
Probability of transformer outage	500/220 kV 1000 MVA transformers are three single phase units. There is a spare single phase unit available for replacement of any of failed single phase transformer bank at Cranbourne, Rowville or Moorabool. Replacement period of a failed transformer unit is about four weeks. The probability of a forced outage of the Rowville A2 transformer is determined by the mean time to repair of 31 days and the failure rate of 1 tank every 150 years, giving a forced outage rate of 3*31*24/(8760*150) = 0.1699%.
Do nothing option	Market simulation studies not undertaken. Say energy at risk is 5,000 MWh over one year with transformer out of service. Expected energy at risk = 5,000 * 0. 1699/100 = 8.5 MWh Value of expected energy at risk at a VCR of $29,600 = $0.25M
Options	Installation of an additional new 500/220 kV transformer Cost of new additional transformer and associated plant is approximately $35M.
Benefit	Say the new transformer removes all the energy at risk. i.e. expected benefit of installation of an additional transformer is $0.25M (in year 1).
Cost	Estimated cost of a new 500/220 kV 1000 MVA transformer and associated plant is $35M.
Cost-Benefit assessment	Annualised cost of the transformer is about $2.5M (45 years life with 8% discount rate) To justify the transformer in year 1, the benefit must exceed the annualised cost. In this example benefit $0.25M and the annualised cost is $2.5M. Hence Cost >> Benefit
Indicative timing of augmentation based on cost-benefit assessment	Detailed Probabilistic assessment and Regulatory test not undertaken. • Timing based on deterministic approach: 2016/17 (N-0) system secure & 2008/09 (N-1) system secure • Indicative timing based on cost-benefit assessment – about 2014/15
Indicative timing based on (N-1) deterministic approach	Year 2008/09