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Dear Mr Henderson

Comments on Reliability Standards and Settings Review Draft Report

Thank you for this opportunity to contribute to the Reliability Standards and Settings Review.

The Australian Energy Market Operator (AEMO) operates the National Electricity Market (NEM), the Victorian Declared Wholesale Gas Market (DWGM) in Victoria and the Short Term Trading Markets (STTM) for gas at hubs in Adelaide, Sydney and Brisbane.

Both the reliability standard and settings are important parameters for AEMO's operation of the NEM affecting the need for intervention, market pricing as well as participant market risks and associated prudentials. AEMO is therefore pleased to assist the Panel in any practical way towards reaching its conclusions.

AEMO generally supports the recommendations of the draft report including maintainting the current form and level of the reliability standard. AEMO has in addition provided a number of suggestions for the Panel to consider related to the communication of the standard, the methodology review and the relationship between the reliability settings and the administered price cap. The attached submission provides AEMO's detailed considerations on the draft report.

AEMO notes the importance of the value of customer reliability (VCR) study currently being undertaken by AEMO on future determinations of the market price cap and offers to brief the Panel on the work to date and expected findings should that be of use for this review.

If you would like to further discuss any matters raised in this submission, please contact Magnus Hindsberger, Specialist - Market Policy Development on (07) 3347 3041 or by email: magnus.hindsberger@aemo.com.au.

Yours sincerely

David Swift

Executive General Manager, Corporate Development

Attachments: AEMO submission

AEMO Submission to Draft Report: Reliability Standards and Settings Review 2014

1. General Comments

AEMO generally supports the recommendations published in the Reliability Panel's Draft Report - Reliability Standards and Settings Review 2014. The sections below will provide further discussion around each recommendation and in a number of cases list suggestions for the Reliability Panel to consider for inclusion in its final report.

2. Reliability Standard

2.1. Form of the reliability standard

AEMO supports the current form, i.e. based on unserved energy (USE), which has worked well since market start. AEMO notes that the last comprehensive review that looked at the form of the standard was in 2007 and that changes in composition of generation mix and growth in customer self-generation and demands-side participation (DSP) may warrant the next review to look at the form of the standard in more detail. This could also look at any potential benefits from imposing additional criteria in the standard.

The next review would also benefit from having the results of the value of customer reliability (VCR) study currently being undertaken by AEMO to strengthen the link between the standard and the value consumers place on reliability. AEMO's planned publication dates for the current VCR study are listed in Section 3 below.

2.2. Level of the reliability standard

AEMO agrees it is appropriate to keep the current level of 0.002% as the maximum expected USE allowed.

AEMO would like to raise the issue around communication of the level of the reliability standard. This is often referred to without the context of it being an expected outcome (basically an average based on a probabilistic assessment covering different demand levels and power plant availability), potentially leading to wrong expectations being set. The Draft Report excludes the word 'average' throughout the document and is thus inconsistent with the wordings of the current standard[1].

AEMO suggests the Final Report clarify this is a probabilistic standard where year-by-year outcomes can vary significantly, with the majority of years seeing no USE while USE in a few years may exceed the standard. Overall, the standard is still considered met if it is expected to be met on average in the longer term taking into account any trends in demand (such as climate change impacts) and plant performance (changes in plant reliability).

Figure 1 below shows the probabilistic nature of the standard illustrating how a number of different simulations forecast USE outcomes well below the reliability standard, approximately 65% of the time, but at other times the standard may be exceeded substantially. The overall expectation, shown as the orange line, is however just below the reliability standard, which is shown by the grey line.

AEMO propose the discussion of compliance is added to the current description of the standard as per the suggestion in Appendix A when reissued following this review.

[1] See: http://www.aemc.gov.au/Australias-Energy-Market/Market-Legislation/Electricity-Guidelines-and-Standards?type=2&publisher=2

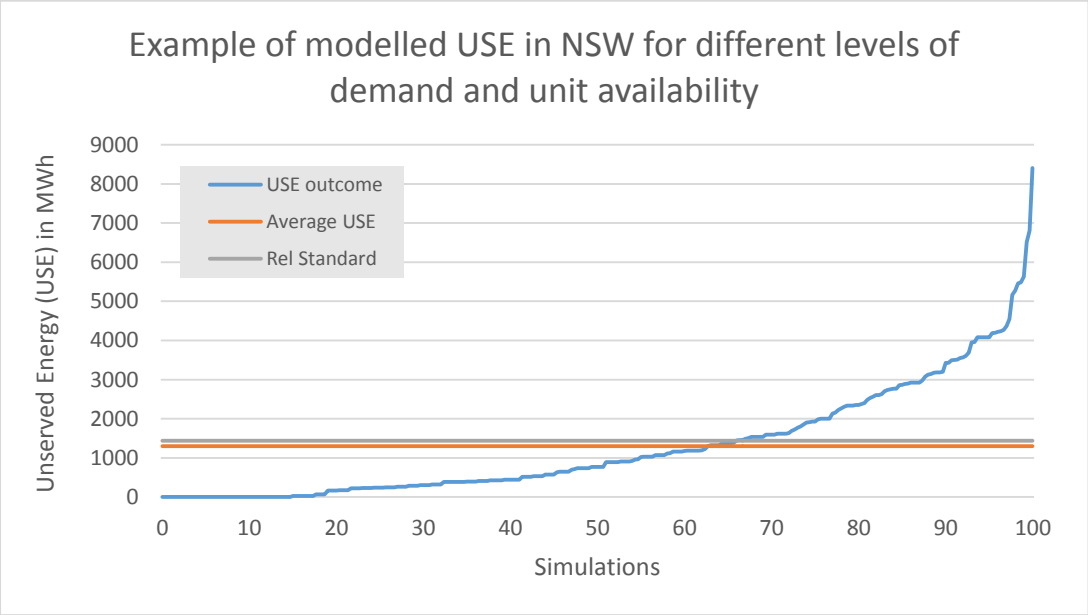

Figure 1 – Example of modelled USE based on monte-carlo based plant outages and using a mix of 10% and 50% probability of exceedance demand forecasts.

3. Value of customer reliability

AEMO supports the Reliability Panel's recommendations of developing a methodology for calculating an appropriate VCR estimate to determine the efficient reliability standard before the next review.

AEMO currently expects to publish the VCR values for all NEM regions in September 2014 alongside a document explaining how these values should be used. An update on both will be provided at a stakeholder workshop in mid 2014.

4. Market Price Cap (MPC)

AEMO finds the application of the two approaches: 'Extreme peaker' and 'Cap defender' useful in terms building understanding of the appropriate value of MPC. The two approaches are discussed further below followed by commentary to the recommendations made in relation to the MPC.

4.1. Extreme peaker approach

The Extreme peaker approach is well understood having been used in previous reviews and including this in the review also provides easy comparison with previous Reliability Standard and Settings review findings, which was based on this approach only.

The approach is seen to determine a high estimate of the required MPC as the peaking generator is considered to earn no revenue apart from periods where the wholesale price reaches the MPC. It therefore forms an upper bound of what the appropriate MPC should be.

A high MPC incentivises market self-clearing, but as there are a number of issues with setting it too high. In particular, this relates to the trading risk for retailers (buyers) and the fact that the larger proportion of customers are not directly exposed to wholesale price

outcomes and cannot therefore react to prices that are above their willingness to pay. Using the upper bound as a recommended MPC may therefore be inappropriate[2].

4.2. Cap defender approach

The Cap defender approach is substantially different from the Extreme peaker approach, not just because of it being based on dynamic generator bidding strategies[3], but also because it will generate an income for peaking generators when the wholesale price increases above $300/MWh. The outcome will therefore close in but not converge with the results of the Extreme peaker approach even if perfect competition was assumed under the Cap defender approach.

AEMO forms the view that the Cap defender approach is conceptually a more realistic assessment of the MPC level needed for the reliability standard to be met.

AEMO notes, however, the sensitivity of results of the bidding engine, assumed market structure (ownership) and contracting levels, and other assumptions needed for the assessment.

It is currently unknown whether this will lead to the MPC estimate being too high or too low MPC. Modelling assumptions may create either, so treating the outcome as a central estimate would be incorrect.

ROAM's draft report lists some assumptions and how they may create a bias:

- Locational assumption: All investments are assumed at the Regional Reference Node (RRN) with a marginal loss factor (MLF) of 1. Generally, many investments would see a lower MLF resulting in a bias towards a lower MPC.
- Incremental unit size: Investment in the marginal Open-Cycle Gas Turbine (OCGT) plant needed is assumed to be a 1 MW unit. Larger units may increase competition and lower market prices creating a potential small bias towards a lower MPC.
- Half-hourly time resolution: Not modelling price outcomes at 5 minute resolution and excluding plant ramping constraints can create a bias in either direction.
- Assumed no contract premium over fair value: Based on historical pricing, which has seen a premium on cap contracts, this assumption can be seen as a bias towards a higher MPC, as a premium would allow a lower MPC to meet the reliability standard. However, for a system with overcapacity, this may no longer be the case.

Additional aspects that were not discussed by ROAM, but which could create a bias, are:

- Ownership structure: Current ownership has been assumed to continue. Any further consolidation, including as a result of privatisation of government owned assets, is likely to lead to an increased market concentration. This will increase the ability of market participants to lift prices during periods with little excess capacity. That would create a bias towards a higher MPC.
- Start-up (cycling) costs: Excluding these costs could potentially lead to an MPC bias in either direction: high if wholesale price outcomes are underestimated and low if no allowance has been made for these costs to be covered.

[2] AEMO notes the arguments against setting the MPC too high will diminish with increasing levels of DSP, in particular retail offerings allowing customers to response to high price event.

[3] This aim to mimic realistic generator bidding behaviour resulting in bid stacks that clear at prices well above short-run marginal costs at time of capacity scarcity.

- Perfect foresight: The economics of the marginal OCGT plant is assessed ex-post. The uncertainty face by investors, who must take a decision ex-ante, might be different. A risk adverse investor will require higher revenue expectations potentially creating a bias towards a low MPC.
- Reaction to market entry: No consideration of reaction by incumbent generators to new entry is considered. It is noted that unit entry above the 1 MW size assumed may increase competition, but the potential response from incumbents have not been considered.

AEMO is of the view that more testing is needed to understand the robustness of Cap defender results to changes in base assumptions and whether the results are biased in one way or another. A comprehensive 'backcasting' analysis against historical outcomes could be one element of such a study. AEMO suggests this to be part of the work included with developing the methodology before the next review (see Section 4.4).

As the direction of any potential bias is unknown, it will be prudent to assume a bias towards a lower MPC and select an MPC in the higher end of the range of Cap defender modelling outcomes, including those of the sensitivity studies undertaken.

4.3. Market Price Cap conclusion

AEMO supports the recommendation to keep the MPC at its current level in real terms as this is in the higher end of the range of the Cap defender outcomes. This is consistent with AEMO's recommendation above in relation to the current lack of understanding of any bias.

AEMO also consider that the MPC needs to be set above an 'expected' outcome to account for periods with OCGT costs increasing faster than CPI as per the discussion of indexation in Section 4.6.

Finally, AEMO notes the importance of stability and predictability for investors, which was mentioned in the AEMC's draft report page 36.

4.4. Methodology for future reliability standard and settings reviews

AEMO supports the recommendation to develop the methodology for future Reliability Standard and Setting reviews prior to the next review expected to start in 2017.

The methodology should align with the new VCR estimates becoming available later in 2014 (see Section 3).

It should be noted that changes in computation power (through developments of both hardware and algorithms) means the studies that can be undertaken change over time. So the review should focus on the high-level approach rather than a prescriptive design.

Also changes in the external environment can affect what the 'optimal' methodology would be. Increase generation from intermittent renewable energy sources is one such area. Using 5 years of historical wind data in this study is a substantial improvement over the previous review. Any future reviews should address the uptake of rooftop solar PV systems too.

In addition, an expected increase in demand side participation and potential uptake of distributed energy storage systems may mean that focussing solely on the cost of an OCGT as a proxy for the MPC may no longer be appropriate and that should be a particular consideration in the development of the methodology.

4.5. Regional MPCs vs one NEM-wide MPC

AEMO supports maintaining one NEM-wide MPC based on the the view that the complexity and potential peculiar market incentives created by different MPCs for the different NEM regions outweighs any positive benefits.

This is consistent with the outcomes of a number of previous discussions of the issue, the latest one from the Extreme Weather review[4], which concluded:

> *"…based on our preliminary analysis which has identified some problematic implementation issues and negative impacts on NEM efficiency, and the overwhelming negative response to this concept in submissions, we do not recommend that an arrangement enabling different MPCs in each region be pursued further."*

4.6. Indexation

AEMO supports ongoing indexation of the MPC to ensure the reliability standard will continue to be met as the cost of OCGTs changes over time.

In 2011 SKM studied[5] OCGT cost trends and tested the nominal cost index of OCGT plants over time (red line in figure reproduced below) against CPI, PPI and the non-residential construction index (1998 = index 100).

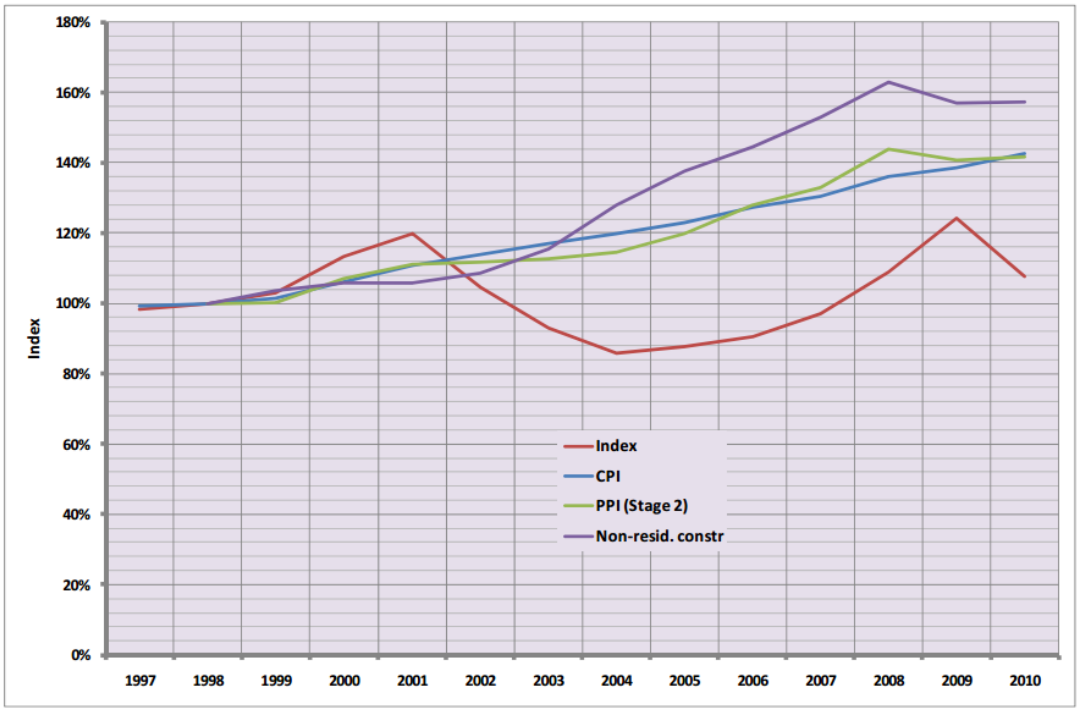

Figure 2 – Annualised cost index for OCGT compared with price indices

[4] AEMC: "Review of the Effectiveness of NEM Security and Reliability in light of Extreme Weather Events – Final Report", 31 may 2010. See Section 6.4. Website: http://www.aemc.gov.au/Media/docs/Final%20Report%20no%20appendices-c35402b0-06dd-4aaf-9033-15b67a441bd0-0.pdf

[5] SKM: "ERC0115 - Data for simple cycle costs for developing an index for the Market Price Cap". See: http://www.aemc.gov.au/Media/docs/SKM%20Report-4c9ee715-1d1e-4925-b15f-04ce42824db8-0.pdf

SKM concluded that "*the PPI (Stage 2) index has a higher correlation coefficient and covariance with the OCGT index than the CPI or non-residential construction indices however this evaluation is based on only 11 data points*". From the figure above, there does not appear to be any substantial difference between using CPI or PPI.

It does show that there are periods where OCGT costs increase above CPI (and PPI) and other periods where the increase is slower; or even declining.

It can be seen to move within a band as illustrated in the conceptual figure below. AEMO suggests it would be appropriate to base the MPC on an OCGT cost equivalent to the upper bound estimate to ensure the system supports investments in new generation also at times with rapid escalation of prices, and bound by the fact that the settings are only reviewed infrequently and should be relatively stable over the longer term.

Selecting a higher MPC than the central estimate gives is similar to basing the MPC on a higher cost OCGT. Future reviews should look further into how wide the band is between the upper and lower bound estimates and what impact this should have on the MPC estimate.

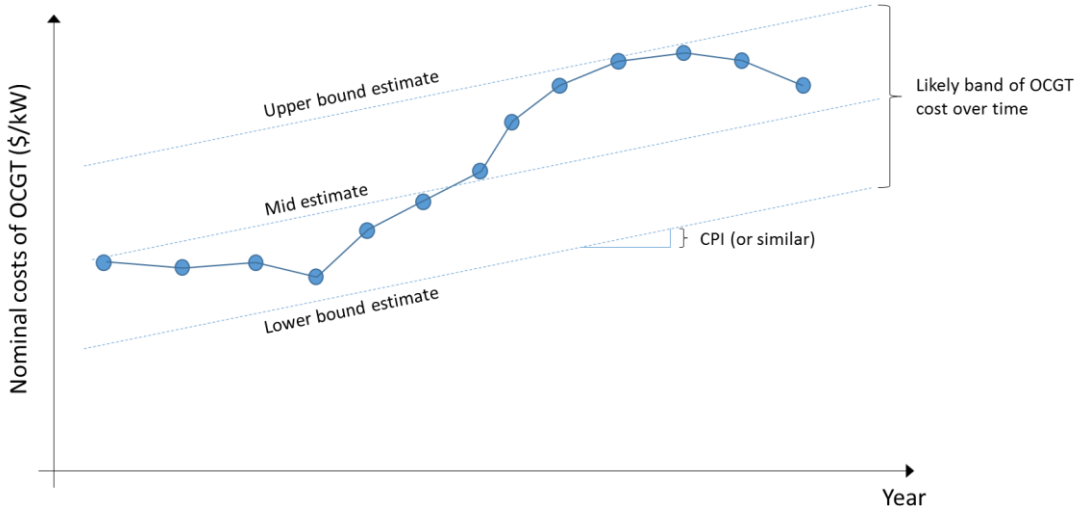

Figure 3 – The nominal cost of an OCGT moves within a band around its mid estimate costs.

5. Cumulative Price Threshold

5.1. Cumulative Price Threshold (CPT) recommendation

AEMO supports the CPT as a means of limiting the financial risks to market participants.

Also, AEMO support the Panel's view that there is no evidence coming from ROAM's modelling suggesting that a higher or lower level would be better and it therefore should maintain its current level with yearly indexation with CPI to ensure it keeps it value in real terms.

5.2. Administered Price Cap (APC) discussion

While the APC is not covered by this review[6], it is closely related to the CPT and AEMO would therefore like to comment on the current level of the APC.

[6] The APC is specified in a schedule that is developed, authorised, published and varied by the AEMC. It is available on the AEMC website: www.aemc.gov.au.

The APC is currently set at ±$300/MWh for all regions of the NEM, for all time periods. AEMO notes that the short-run marginal costs (SRMC) for some plants are forecast to be above $300/MWh in particular if accounting for start-up costs for meeting short-term peaks.

AEMO's analysis indicates that ~750 MW of OCGT plant fuelled by diesel/kerosene and ~150 MW of diesel fuelled reciprocating engines have an SRMC above the APC. An additional ~500 MW of dual fuel OCGTs will during a gas contingency (which may have trigged the CPT to be breached in the first instance) also have generating costs above the APC. In total this sums up to between 900-1400 MW, which may have insufficient price signals to mitigate the risk of USE[7] during periods where prices are capped by the APC. To this comes DSP with a higher cost that the APC. AEMO's 2013 DSP forecast showed a substantial difference in potential DSP for different wholesale price levels.

The AEMC 2008 determination of the APC found[8]:

> *An APC level of $300/MWh is likely to mitigate the frequency and magnitude of compensation because: (a) the APC level is not significantly lower than the highest estimated SRMC in the NEM; and (b) the total generation capacity, with estimated SRMCs above the APC level, is assessed by the Commission to be minor compared to the total generation capacity in the NEM.*
>
> *For example, in 2008/09, only 177 MW of the existing generation capacity have SRMCs above the APC level of $300/MWh. This is in contrast with the case for the APC level of $100/MWh, where 514 MW of generation capacity are above this APC level.*

It is noted that 514 MW of generation with SRMC above the APC was considered too much at that point.

Also, the lack of indexation has substantially lowered the real value of the APC and changed its relative value against the MPC and CPT, which are both indexed. By 2015/16 the MPC is likely to be close to $14,000/MWh with indexation, or about 40% above what the MPC was at the time of the 2008 review. A similar increase in the APT would result in an APC of $420/MWh instead.

5.3. CPT/APC recommendation

AEMO suggests that the Panel recommends to the AEMC that the appropriate level of the APC, including any ongoing indexation of this, is included in its suggested review of the current form of the CPT to be done prior to the next Reliability Standard and Settings review. This would have to include any considerations of financial contracts that may be implicitly linked to the APC level, such as the $300 Cap contracts.

Due to the strong relationships with the MPC and CPT, AEMO suggests that the Panel recommends to the AEMC to change the APC to be a reliability setting. That will improve consistency of these settings in the longer term as they will be reviewed together.

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[7] AEMO notes that might still operate following a RERT tender or a direction from AEMO to operate, though the RERT process is due to expire by 2016 and a while a direction from AEMO will allow a generator compensation for operating, it is administrative burden and it will only cover proved costs and is therefore not incentivising these generators to be available to the market.

[8] AEMC: "Determination of Schedule for the Administered Price Cap – Final Report", 20 may 2008, see: http://www.aemc.gov.au/Media/docs/Final%20Determination-a3507611-7df0-49d6-ba84-afbf1062393f-0.pdf

6. Market Floor Price (MFP)

AEMO supports the Panels view that there is no strong reason for changing the MFP and that it should be kept at -$1000/MWh.

This will facilitate market self-clearing as it is well below the economic value for thermal generators to reduce output, accounting for their cycling costs, or for wind generators to reduce output, taking into account the value of LGCs generated. In particular, it will encourage flexible operation of plant—including investments in increasing the flexibility of plants—during time of oversupply.

Inefficient market outcomes related to participants bidding at MFP at various times appears to be infrequent and may potentially be addressed through the AEMCs Optional Firm Access initiative[9] or other congestion management designs that could be adopted.

[9] See: http://www.aemc.gov.au/Markets-Reviews-Advice/Optional-Firm-Access,-Design-and-Testing

Appendix A – Proposed rewording of standard (see *italics*)

NEM Reliability Standard – Generation and Bulk Supply

This Reliability Standard for Generation and Bulk Supply was determined by the Reliability Panel (Panel) as part of its "Review of the Reliability Standard and Settings", which completed in [*date completed*]. This Reliability Standard forms part of the power system security and reliability standards and was determined in accordance with clauses 8.8.1(a)(2) and 8.8.3 of the National Electricity Rules (Rules).

Form of the Reliability Standard

The NEM Reliability Standard for Generation and Bulk Supply is expressed in terms of the maximum expected unserved energy (USE), or the maximum amount of electricity expected to be at risk of not being supplied to consumers, per financial year. The USE is measured in GWh and should be expressed as a percentage of the annual energy consumption for the associated region or regions.

Level of the Reliability Standard

The maximum expected unserved energy (USE), or the maximum amount of electricity expected to be at risk of not being supplied to consumers, is 0.002% of the annual energy consumption for the associated region or regions per financial year.

Operational Implementation of the Reliability Standard

Operationally, it should be planned to achieve an expected USE that is within this Reliability Standard for Generation and Bulk Transmission in each financial year and for each region, which means that it should also be achieved for the NEM as a whole.

Compliance with the Reliability Standard

Year-by-year performance against this Reliability Standard for Generation and Bulk Transmission should be considered using the actual observed levels of annual USE for the most recent financial year.

Compliance with the Reliability Standard is based an assessment of whether the standard is expected to be met on average in the longer term. This should take into account actual plant performance and demand characteristics and any trends these are following.

Scope of the Reliability Standard

This Reliability Standard for Generation and Bulk Supply includes unserved energy associated with power system reliability incidents that results from:

- a single credible contingency on a generating unit or an inter-regional transmission element, that may occur concurrently with generating unit or inter-regional transmission element outages; or
- delays to the construction or commissioning of new generating units or inter-regional transmission network elements, including delays due to industrial action or 'acts of God'.

This Reliability Standard for Generation and Bulk Supply excludes unserved energy associated with power system security incidents that results from:

- multiple or non-credible contingencies;
- outages of transmission or distribution network elements that do not significantly impact the ability to transfer power into the region where the USE occurred; or
- industrial action or 'acts of God' at existing generating or inter-regional transmission facilities.