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Dear Mr Popple

Definition of unserved energy Consultation Paper – AEMO Submission

AEMO welcomes the opportunity to contribute to the Reliability Panel's (Panel) review of the current definition of unserved energy for the purposes of the reliability standard in the National Electricity Rules (NER). AEMO acknowledges that this review seeks to clarify and simplify the definition of unserved energy used in post-event analysis of wholesale supply interruptions.

AEMO is cognisant that the way unserved energy is defined can have an impact on the effectiveness of the reliability framework as a whole. As part of our power system operator role, AEMO forecasts and publishes reserve conditions for the short, medium and longer term, to identify to the market when additional capacity may be required. If the market does not respond to any low reserve conditions, AEMO can intervene in the market, namely through the reliability and emergency reserve trader (RERT) or by using directions to generators and large loads.

So that the reliability standard is expressed in a way that is reflective of the true capacity required in the NEM, we believe it is timely to revisit the definition of unserved energy to account for the changes that have been occurring and continue to occur in the NEM. This is particularly the case when there have been more instances of wholesale supply interruptions than there were in the past decade.

Our submission below outlines our views that should be considered by the Panel for a revised definition of unserved energy. We welcome the opportunity to discuss these further with the Panel if needed.

Should you have any questions on the matters raised in our submission, please contact Reena Kwong via email (reena.kwong@aemo.com.au).

Yours sincerely



Peter Geers
Chief Strategy and Markets Officer

Key Recommendations

To ensure the definition of unserved energy remains fit for purpose in the current and future NEM environment, AEMO makes the following key recommendations:

Definition of unserved energy in the NER

- Unserved energy for reliability purposes should measure the amount of demand not met by the market, including in the impact of:
 - Intra-regional constraints or outages; and
 - Rooftop solar photovoltaic (PV) penetration.

Contingency-based framework

- The range of contingencies defined under clause 3.9.3C(b) should be broadened to include events that will result in unmet demand because the market was unable to deliver the required capacity.
- The level of guidance for considering the amount of unserved energy initially resulting from reliability events that subsequently turn into security events, causing further load shedding, should be improved.

Power system security events

- Load shedding directly as a result of system security issues should be excluded from the unserved energy definition, unless the unserved energy could be apportioned in the instance it results from both a reliability and security event.

Reliability-related interventions

- To incentivise sufficient in-market supply to meet the reliability standard and so that the overall effectiveness of the reliability settings framework can be assessed, AEMO prefers the Panel's third option:
 - The first metric should reflect the customer's actual experience of electricity supply, which excludes involuntary load shedding avoided by intervention from the calculation of unserved energy;
 - The second metric should include the effect of AEMO intervention in the calculation of unserved energy, to the extent that the intervention avoided involuntary load shedding.

1. Definition of unserved energy in the NER

AEMO acknowledges the Panel's discussion on the concept of unserved energy, with respect to wholesale-level reliability, "*is applied to measure any supply interruptions consumers experience from generation and interconnection inadequacy*"¹. AEMO is of the view the principle to be applied in consideration of the definition is that unserved energy for reliability purposes should measure the amount of demand not met by the generation sector, that is, the market.²

We would also like to note however that the location and type of generation and demand is changing. While interconnectors were traditionally the primary thermal constraint limiting the flow of electricity in the NEM, intra-regional constraints are becoming prominent and therefore should now be considered in the definition. For example, in north-western Victoria, supply from renewable generation in the area currently exceeds the capacity of transmission. This affects the reliability requirements in the area and therefore it would be appropriate to consider the impact of such intra-regional constraints or outages on unserved energy that could result.

As the NEM experiences continued rise in rooftop solar PV penetration, another aspect for improvement to the definition is clarification of the type of demand used to inform the amount of total energy demanded in a region; that is, operational demand³, native demand⁴ or an alternative to these. An example to highlight this difference is an event that occurred on 25 January 2019 where Victoria experienced load shedding of 250 MW around midday. This amount could not be delivered by the power system, however, customer PV systems were also tripped during this event which means the actual unserved energy could have been higher⁵. While the current intent of the reliability standard is not to account for additional unserved energy arising from rooftop PV systems tripping, this was based on the introduction of the standard many years ago when PV systems were not prevalent. Going forward however, AEMO believes this is a matter that warrants consideration by the Panel with the current and forecast large uptake of rooftop PV on the power system; that is, for both the numerator and denominator in calculating unserved energy to potentially incorporate this element.

We welcome the opportunity to further discuss the above matters with the Panel.

2. Contingency-based framework

When considering the contingency-based framework that applies to the definition of unserved energy, AEMO is of the view that any framework must be fit for purpose for the existing NEM environment as well as adaptable to changes that may occur. AEMO considers that the framework can best achieve this by providing guidance as to the inclusion or exclusion of unserved energy, while recognising that it is infeasible for the framework to cover every possible scenario.

¹ Page 10, AEMC's Consultation Paper – Definition of Unserved Energy.

² Section 4 of this submission discusses specific inclusions and exclusions that should apply when assessing the effectiveness of different elements of the reliability frameworks.

³ The electrical energy supplied by scheduled, semi-scheduled, and significant non-scheduled generating units.

⁴ The electrical energy supplied by scheduled, semi-scheduled, significant non-scheduled, and small non-scheduled generating units.

⁵ The amount would be dependent on PV system size and penetration in Victoria at the time of the event.

To support this goal, AEMO considers there is merit in broadening the range of contingencies that will result in unserved energy under clause 3.9.3C(b) to include any events that result in unmet demand because the market was unable to deliver the required capacity. This would enable the reliability standard to appropriately consider non-credible contingencies, such as the coincident failure of multiple generating units.

For example, on 10 February 2017 some load was shed in NSW due to Colongra failing to start all four of its units during the afternoon peak time⁶. The cause of the trip was due to the generator switching its supply from gas to diesel as the generator's gas supply was exhausted earlier in the day. As the trip is classified as a multiple contingency event, load shedding that results from such events does not count towards unserved energy under clause 3.9.3C(b)(2)(i). However, AEMO's view is that unserved energy measures the reliability performance of the market, and in this example the participant's operational decision unfortunately led to an undersupply in the market which should be included in the calculation of unserved energy. We therefore suggest that the Panel consider a more appropriate approach for such types of events as the current single credible contingency framework can underestimate the true extent of the amount of energy not delivered by the market. This is particularly relevant as changing market conditions lead to an increase in tail-end risks (including multiple unit failures) which can increase the likelihood of large amounts of load shedding.

Additionally, there is merit in reviewing the level of guidance that the framework provides for determining the extent to which an event should or should not contribute to unserved energy. The current drafting of clause 3.9.3C(b) appears to classify all unserved energy associated with an incident as included or excluded, whereas it is conceivable that an incident could have a combination of reliability (included) and security (excluded) impacts.

Consider an example where multiple generating units with a total capacity of 1000 MW fail within a very short time frame (i.e. within frequency restoration timeframes), triggering under frequency load shedding and also a capacity shortfall of 200 MW. Under the current framework, this incident would likely be excluded from unserved energy calculations as it would be classified as a multiple contingency event or non-credible contingency (subject to the underlying causes) due to the short time between unit failures. However, as reliability planning includes the risk of concurrent generation outages, the unserved energy associated with the 200 MW capacity shortfall should be included in unserved energy calculations.

AEMO would welcome working with the Panel and other stakeholders on an appropriate approach for these circumstances.

3. Power system security events

AEMO is of the view that load shedding directly as a result of system security issues should be excluded from the unserved energy definition.

However, as in the previous section, AEMO acknowledges the challenge of codifying the appropriate approach for including or apportioning unserved energy associated with incidents that are initially triggered by a reliability event but which result in subsequent system security issues that lead to further load shedding.

⁶ System Event Report New South Wales, 10 February 2017, pp5-8.

AEMO also notes that the increasing variability of both supply and demand is blurring the boundary between reliability and security incidents. Recent updates to the FOS have included large short-term fluctuations as frequency contingency events.

AEMO would also like to draw attention to our rule change proposal – application of the regional reference node test to the RERT⁷ which the AEMC has recently initiated. There may be opportunities to align this approach with the Panel’s consideration on how to manage such events. AEMO welcomes further discussion with the Panel on this matter.

4. Reliability-related interventions

AEMO acknowledges the three options presented by the Panel on the extent of including reliability-related interventions. AEMO is of the view that the measurement of reliability should reflect two purposes, which should be measured with different metrics. Therefore, of the three options, AEMO’s preferred approach that would most appropriately represent unserved energy for reliability-related events is the third option – that two values be calculated. We also suggest that the Panel consider using two distinct terms for the two metrics to avoid confusion.

The first metric should reflect the customer’s actual experience of electricity supply, which excludes involuntary load shedding avoided by intervention from the calculation of unserved energy. This measure would allow assessment of the combined performance of the market and intervention frameworks against the reliability standard.

The second metric should include the effect of AEMO intervention in the calculation of unserved energy, to the extent that the intervention avoided involuntary load shedding. It is preferable that the reliability settings incentivise sufficient ‘in-market’ supply to meet the reliability standard without interventions, so this metric would allow the effectiveness of the reliability settings to be assessed.

In relation to the inclusion of mandatory restrictions, we suggest deferring consideration of this until the AEMC’s intervention mechanisms review is complete.

5. Other matters

The Panel incorporated two other aspects for consideration in the definition of unserved energy which were raised by stakeholders through the reliability frameworks Review:

- a) Matching consumer experience of supply interruptions; and
- b) Voluntary curtailment or demand response.

AEMO agrees with the Panel that both of these matters should remain excluded from the unserved energy definition. In relation to the former, it is important that unserved energy metrics are available to support an unobscured assessment of the performance of the NEM’s reliability frameworks. In relation to the latter, such actions represent customers exercising discretion rather than a market reliability failure.

⁷ AEMO’s rule change proposal on Application of the Regional Reference Node Test to the RERT - <https://www.aemc.gov.au/rule-changes/application-regional-reference-node-test-reliability-and-emergency-reserve-trader>