

19 January 2024

Charles Popple
Chair of Reliability Panel
Australian Energy Market Commission
Sydney South NSW 1235
REL0086

Dear Mr Popple,

Directions Paper – Review of Form of the Reliability Standard and the Administered Price Cap (APC)

This letter and attachment constitute AEMO's submission to the Directions Paper, published 30 November 2023, on the Review of the Form of the Reliability Standard and Administered Price Cap ('the review').

AEMO appreciates the opportunity to respond to the Directions Paper and actively participate throughout the review process. AEMO supports the Panel undertaking this review, the Panel's key modelling findings, and its characterisation of the changing nature of reliability risk.

Feedback to the Directions Paper is provided across the following:

- Modelling approach
- Modelling results
- Implications for the form of the standard
- Consideration of value of customer reliability (VCR)
- Administered price cap

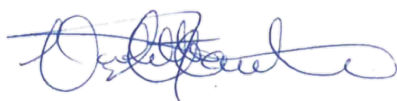
In summary, the Panel's modelling shows a clear shift to reliability risk that is characterised to large USE events. The form of the reliability standard should be updated to clearly describe the changing type of risk in the system. AEMO considers this review should prioritise:

1. recommending a form of the standard that communicates the nature of forecast reliability risks within the standard, and
2. speaks to reliability outcomes in terms on their tangible impact on consumers.

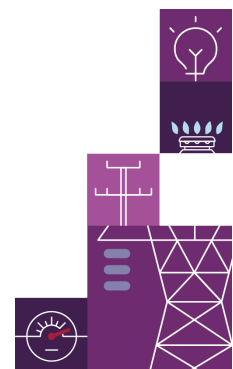
The Panel has also included two options for the form of the APC. AEMO considers that the form of the APC should be updated to index the APC to CPI as this is consistent with the indexation currently applied to the MPC.

If you have any questions regarding this submission please contact Kevin Ly, Group Manager – Reform Development & Insights on kevin.ly@aemo.com.au.

Yours sincerely,



Violette Mouchaileh
Executive General Manager – Reform Delivery



Key messages

AEMO is supportive of the Panel's approach to undertake this review and acknowledges the significance of the Panel's work to characterise the nature of reliability risk in the future. As the NEM transitions, reliability needs to be thought about differently with energy-limited technology and variable renewable energy leading to changes in the type of unserved energy (USE) events that may occur.

This submission summarises AEMO's consideration of the Directions Paper modelling results and implications on the form of the standard. AEMO appreciates the opportunity to continue to engage with the Panel throughout the review process. Key messages detailed in this submission are:

- The review of the form of the standard assesses the characteristics of reliability risk as the power system transitions. Even if average reliability risk remains stable, the Panel's modelling presents a future where deeper, and more prolonged events are more probable.
- This has important implications on the form of the standard. The current mean USE standard "averages out" deeper, more prolonged events, and therefore may tend to mask or accept risks that consumers may wish to avoid. It is difficult to understand because it does not represent the nature of risk in the system.
- The form of the standard should effectively communicate the type of risk within a reliability forecast. In doing so, this will better speak to customer experience of possible large events, effectively tying the reliability standard to possible customer outcomes of USE.
- AEMO considers the Panel's modelling indicates a clear need to update the form of the standard so that it tangibly describes the nature of risk within the future system. The Panel's framing of the modelling results, as the depth, duration, and frequency, clearly communicates this risk and the form of the standard should be updated to likewise describe the type of risk (of large events) in the system.

Modelling approach

AEMO is generally supportive of the modelling approach and appreciates the opportunity to engage on the Panel's modelling throughout the review. As noted throughout the Directions Paper, the modelling is not a forecast of USE outcomes and does not seek to provide insight on the likelihood of reliability outcomes occurring. Having said that, AEMO agrees with the approach to remove capacity in each financial year such that the model is deliberately under-resourced and acknowledges the significant amount of work undertaken to develop this approach. This provides a sample of USE to analyse the characteristics and types of USE events at marginal reliability outcomes.

The characteristics of USE are defined in the Directions Paper for the purpose of analysing modelling results as a function of USE duration (hours), depth (MW), USE (MWh) and frequency (probability mean time between events (average number of days between events or average return interval)). AEMO is supportive of this characterisation and welcomes the modelling findings broken down in this way. As discussed in submission to the Issues Paper, AEMO is of the view that considering USE as a function of depth, duration and frequency, instead of only average annual energy, is a practical way to characterise reliability risk and frame tail risk as the dimensions of potential outcomes felt by consumers.

Modelling results highlight the significant change in reliability risk in the system

AEMO agrees with the modelling findings and the Panel's interpretation of the modelling results that demonstrate a significant change in the nature of reliability risk as the system transitions. The shift from historic key drivers of forecast USE events and the spreading of the reliability risk across the year and time of day, aligns with what AEMO has forecast as what could reasonably be expected as the system transitions to an energy limited, higher VRE power system.

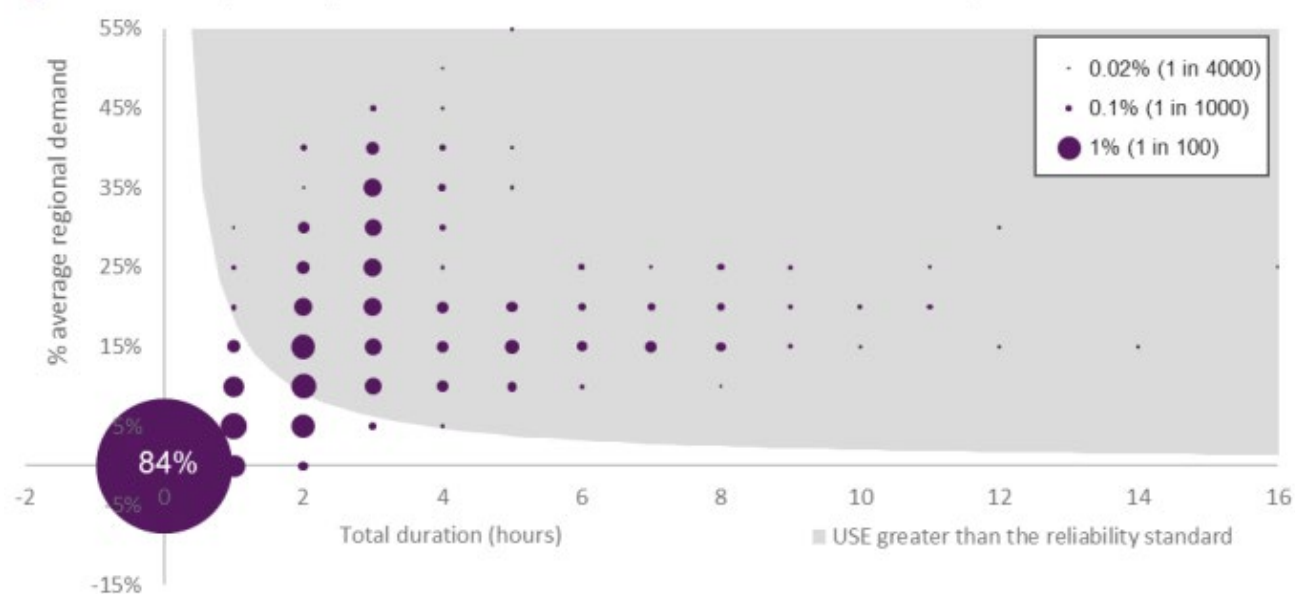
Reliability events may be longer and deeper

The proportion of large events¹ is shown in the Panel's modelling to increase as the NEM moves towards a higher penetration of VRE. This finding also highlights the future drivers of USE as, for example, available solar and wind resource may be affected by longer-periods of low wind conditions during the winter-months where solar resource is typically at lower level. This is a key finding that typifies future characteristics and drivers of reliability risk, and how the mix of VRE and flexible capacity will be critical to mitigating the effect of varied reliability events in the future. For example, long periods of low wind conditions during winter months may extend periods of reliability risk if long duration storage is not at sufficient levels.

AEMO is supportive of the Panel's characterisation of this finding and notes the importance of framing this finding as the depth and duration of USE to properly characterise and understand the nature of risk within the forecast.

¹ Large events are defined using AEMO's definition from the 2023 ESOO as when the level of expected USE is above the reliability standard. While AEMO supports this assumption, the large events do not need to be linked to the level of the existing reliability standard

Figure 81 Bubble plot of depth and duration of forecast USE in South Australia 2023-24, ESOO Central scenario



The Figure above shows a bubble plot from the 2023 ESOO of the depth, duration and frequency of USE forecast in South Australia for 2023-24. While this graph shows the most likely outcome is no USE (84%) there is a 16% probability of a USE outcome. For those outcomes which did have USE, the bubbles show the range of outcomes' depth and duration in the ESOO simulations. Bubbles in the grey section are individual USE outcomes that exceed the reliability standard of 0.002%USE. These outcomes are collectively 11% probable in the coming year in SA.

While the Figure above presents only this coming year, AEMO considers this highlights how important it is to communicate how the large events (shown in the grey section above) are likely to become increasingly diverse, longer and deeper as shown in the Panel's findings. Considering only the most probable outcome of 84% chance of no USE does not effectively demonstrate the embedded risk within this reliability forecast and the nature of the USE events that may occur.

AEMO considers that modelling findings highlight with reasonable robustness the nature of reliability risk is changing and there is an increased probability of large, varied USE events that represent a significant change from the way reliability is characterised today. While not commenting on the probability or likelihood of reliability events, modelling results clearly show that when reliability events do occur, they have the increased potential to be larger as the system transitions. This aligns with the changing technology mix and increased reliance on a range of resources to manage reliability in the future system. The shift of predominant USE from summer to winter also highlights the future power system's dependence on combined resources and the shift away from traditional characterisation of USE at peak demand and generator outages. While AEMO agrees with the Directions Paper that demand will shift away from being the primary driver of reliability risk, AEMO notes that demand levels will continue to remain an important factor when in managing weather driven energy shortages.

Modelling results also note the importance of weather reference years in the depth, duration, and frequency of large USE events. This is a key finding with implications on the nature of reliability risk as well as considerations for forecasting and modelling reliability risk into the future. AEMO places significant emphasis on the effect of different weather reference years when forecasting USE profiles, including a focus on ongoing

improvements to weather data, and modelling renewable generation outputs. For example, the 2023 ESOO details AEMO's updated approach to forecasting wind generation for wind farms where there is no or limited history via statistical downscaling of global or regional reanalysis to predict wind farm output.²

In summary, AEMO supports the Panel's key modelling findings and considers they highlight a significant change in the nature of reliability risk and USE events as the power system transitions.

Implications on the form of the standard – form of the standard should be updated to effectively describe tail risk

AEMO considers the changing nature of reliability risk has clear and direct implications on the form of the standard. The form of the standard should be updated to effectively communicate the risk that exists within a reliability forecast, to relate directly to expected customer outcomes of large events.

AEMO is supportive of the way the Directions Paper analysed and presented the findings, that is, describing the depth, duration and frequency of large events that were seen in the forecast. This is a clear and tangible way to describe the nature of reliability risk in the system – by describing the large events that are increasingly presenting the biggest reliability risk to consumers. It is therefore important that the form of the standard likewise communicate this risk in a way that tangibly characterises the potential for large events in the system.

Form of the standard should include risk of large events

The current form of the standard was developed for a capacity limited system where reliability risk was primarily driven by peak demand and thermal generator outages. This type of reliability risk is largely uniform, such that when USE events occur, they can be reasonably expected to be consistent, limited in duration and depth and specific to the supply outage occurring. This is seen in historic forecasts of USE distributions that are predominately made up of shorter duration reliability events.

The Panel's modelling demonstrates where USE occurs, it is increasingly characterised by lower probability, large events that will be experienced by customers differently to today and require a range of resources to manage that are different to the current supply mix (e.g., long-duration storage, or multiples of storage capacity). AEMO noted in submission to the Issues Paper, while large events are included in existing calculations of average annual USE, the current form of the standard does not effectively describe the nature of the risk of these large events and what they mean in terms of USE outcomes that may be experienced by consumers.³

Further, while the current reliability standard is set to 0.002% average annual USE, it is important to note that as the power system transitions and electrification increases demand, maintaining the reliability standard to 0.002% USE would result in an increase in the amount energy not supplied while keeping the reliability standard the same. Average annual USE does not provide any information about the type of reliability events that could be reasonably expected to occur within the reliability forecast and masks potentially worsening USE outcomes in terms of energy not supplied.

Communication of the nature of reliability risk

As the Panel's modelling shows, reliability risk is increasingly characterised by large events driven by weather that are increasing the 'tail' of the probability distribution. As such, AEMO considers the priority should be to

² AEMO, 2023 Electricity Statement of Opportunities, page 64 - https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2023/2023-electricity-statement-of-opportunities.pdf

³ Previously referred to as tail events or tail risk

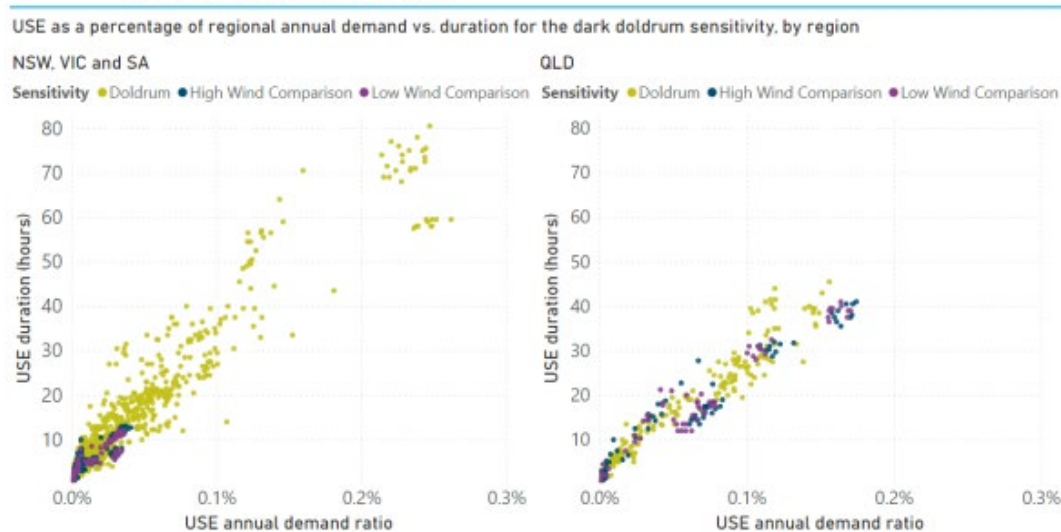
ensure that the form of the reliability standard explains the nature of large events that may occur, allowing governments and stakeholders to then make decisions and best manage their expectations of possible USE outcomes.

When undertaking stakeholder engagement on the ESOO, AEMO is frequently requested by governments and stakeholders to translate USE into something more meaningful and tangibly representing customer outcomes. As a measure of energy, average annual USE does not directly describe customer outcomes and may be easily misinterpreted as it does not reflect what could reasonably be expected.

In a power system with reliability risk characterised by large events, the reliability standard should tangibly describe the type of large events that may occur. The reliability standard and related reporting is and should continue to be, used to inform governments, procurement activities and management of required reliability response. If the nature of reliability risk is, as the modelling suggests, driven by large events – the nature of these large events should therefore be tangibly described within the reliability standard.

AEMO considers the communication of this risk within the form of the standard to be its priority for this review and is supportive of the way reliability risk was characterised in the Directions Paper. For example, Figure 5.6 from the Directions Paper below, frames the analysis of dark doldrum conditions on USE outcomes as events at different relative USE duration and annual demand ratio (percentage of annual demand could be considered as a proxy for depth).

Figure 5.6: In an under-resourced system, dark doldrum conditions impact USE outcomes significantly and the impact varies by region



By considering USE as a function of depth and duration, the Panel has shown the type of reliability events that are modelled to occur and allows for consideration of these events in terms of their impact on clear consumer outcomes. AEMO considers this is the most practical way to communicate the reliability risk in a system where the nature of risk is centred around large events, rather than a total annual amount of USE. Consumers and policy makers may then consider their tolerance to these events and manage any response to these events based on a clear description of what may occur and how it may be experienced by consumers.

In response to the Issues Paper, AEMO included consideration of a range of metrics for the form of the reliability standard. AEMO considers the Panel's modelling results provide strong evidence for the Panel to progress this review to develop and assess a list of metrics for the form of the standard.⁴

In this next phase of work, the Panel should continue to use the characterisation of large USE events in terms of the dimensions of events and the description of the nature of risk felt by consumers. The form of the reliability standard should therefore be updated to match the type of risk in the system with a key focus on characterising and clearly communicating tangible outcomes and risk for consumers. In doing so, the form of the standard should logically also describe reliability outcomes in terms of the level of individual high impact, low probability events that would seek to be limited by maintaining reliability to the level of the standard. Describing the specific average allowable large event as an outcome for consumers within the standard, better describes the potential consumer experience of the reliability risk in the system.

In summary, AEMO supports the Panel's characterisation of the modelling findings and notes that modelling results align with what AEMO is seeing in forecast outlooks as well. AEMO acknowledges the significant amount of work the Panel has undertaken to develop, model and analyse these findings and supports the methodology and rigour of these results. These results clearly demonstrate the nature of reliability risk is changing as USE outcomes trend towards larger USE events. This is an important finding and should be acknowledged as significant in terms of how industry and stakeholders characterise reliability risk in the future.

In submission to the Issues Paper, AEMO included detailed discussion of potential reliability metrics for consideration as the form of the standard. AEMO is looking forward to engaging with the Panel in the next phase of this review to assess a range of reliability metrics on different USE profiles for the form of the standard.

Value of customer reliability does not contradict changing the form of the standard

AEMO appreciates the Panel's work to structure a process that considers how the form of the standard and value of customer reliability (VCR) interact with the goal of delivering a form and level that is fit-for-purpose by July 2028.

The Directions Paper sets out the existing processes that need to be completed to implement any recommended change to the form of the standard including, this review of the form of the standard (**mid-2024**), AER VCR Review (**end 2024**), AEMC rule change process (**early 2025**), 2026 Reliability Standard and Settings Review (**April 2026**) and the subsequent AEMC rule change process (**by July 2028**). The Directions Paper notes the AEMC rule change process in early 2025 to enact any change to the form of the standard would have regard for insights from both the review of the form and the AER's VCR work with the AEMC to "*assess the costs of benefits of the proposed standard, how customers may value the new reliability risks*".⁵

While AEMO agrees it is important to understand the value customers place on avoiding USE and their risk tolerances to large events, how customers may value changing reliability risk should not be considered as a direct input into determining what the form of the standard should be.

The VCR is incorporated into the reliability framework when determining the level of the reliability standard - that is, the acceptable value of the standard that reflects how much consumers are willing to pay to avoid possible USE outcomes. The role of the VCR is, by design, separate from determining what the form of the standard should be and there is a clear delineation of roles between governing bodies who administer the

⁴ AEMO, Response to Issues Paper – Form of the Standard, page 14 - <https://www.aemc.gov.au/sites/default/files/2023-05/Rule%20Change%20Submission%20-%20REL0086%20-%20AEMO%20-%2020230505.PDF>

⁵ AEMC, Form of the Standard Directions Paper, page 12 - <https://www.aemc.gov.au/sites/default/files/2023-11/REL0086%20Directions%20Paper%20FINAL.pdf>

reliability framework – the form of the reliability standard is set in the rules, AER determines the VCR, Reliability Panel has regard for the VCR when setting the level of reliability settings and AEMO implements the reliability standard and settings through forecasting and operational processes.

AEMO notes and agrees with the Directions Paper's discussion that a change to the form of the standard should be driven by the need to reflect the changing reliability risk in the future power system. Page 22 of the Directions Paper states:

The Panel will consider if a change to the form is needed to reflect the changing nature of reliability over time. This does not mean that the value of the additional metric would impose would be substantially higher. Over time, through successive RSSR processes, this would be adjusted in the same way the standards and settings are adjusted today.

AEMO supports this approach and agrees that a change to the form of the standard should reflect the changing nature of reliability risk in the system but should not be thought as automatically leading to increased market price settings. The VCR and RSSR processes will continue to set the level of standard and settings regardless of the form of the standard and separately from recommendations in this review

The form of the reliability standard should reflect the nature of risk in the system and allow industry, consumers, and policy makers to consider the appropriate any actions or response based on a clear description and understanding of this risk. The level of the reliability standard weighs up the costs of different reliability response in relation to the VCR. AEMO supports the Panel's characterisation that recommendations from this review should be driven by the reliability risk in the system and the VCR should inform the level of the standard through normal RSSR processes.

Having said that, modelling results and key findings from this review should be used to inform the AER's 2024 VCR review by suggesting additional questions or further investigations required on societal impacts of large USE events. AEMO considers the upcoming VCR review is an opportunity to investigate and test approaches to quantifying consumer value of reliability centred around large USE events. One such approach may be to use deliberative processes for investigating consumer tolerance to events that have not yet been experienced by any customers. While AEMO notes these processes may be challenging and time consuming, Professor Pierluigi Mancarella's desktop analysis set out in Section 3.4 of Directions Paper, indicates there may be additional value in doing so. Professor Mancarella demonstrates that the VCR value is likely to differ and depend on consumer lived experience of large USE events and individual reliance on grid supply.

Given the VCR itself is likely to change as consumers and the system transition, the form of the reliability standard should be flexible and remain separate from specific VCR numbers to allow for changing level of customer willingness to pay.

Administered price cap (APC)

AEMO supports the Panel's approach to not consider alternative forms of the APC that link the APC to dynamic fuel prices or the gas APC. The APC needs to be sufficiently high to encourage participants to continue to offer into dispatch during periods of administered pricing. The form of the APC should prioritise consistency and stability to provide participants with confidence and minimise price risks to consumers.

AEMO notes that Panel has shortlisted two options for the form of the APC: retaining the current form and indexing the APC to CPI. AEMO considers indexing APC to CPI is preferable as this is consistent with the price indexation applied to the Maximum Price Cap (MPC).

