5 June 2020

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Brisbane QLD 4122
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Mr Mark Feather
General Manager
Policy and Performance
Australian Energy Regulator

By email: AERInquiry@aer.gov.au

Dear Mr Feather

Submission to the AER's Consultation Paper – Values of Customer Reliability Review – Widespread and Long Duration Outages

The Australian Energy Market Operator (AEMO) welcomes the opportunity to provide feedback on the Consultation Paper, Values of Customer Reliability (VCR) – Widespread and Long Duration Outages (WALDO).

AEMO acknowledges the AER's efforts in the development of VCRs and understands it is a challenging task. We encourage robust development of a model to estimate the values which we apply in the planning and operational environments. This will ensure investment decisions to address power system needs appropriately consider customers' expectations on reliability and resilience in a changing NEM environment where over 30 GW of new grid-scale renewables is needed by 2040 to replace the approximately 15 GW (or 63%) of Australia's coal-fired generation that will reach the end of its technical life, and so likely retire by that time[1].

In relation to WALDO VCRs, while such outages do have a lower risk of occurrence than shorter duration outages, it is still critical for these values to be developed in a manner that reflects current and forecast NEM conditions. This will provide a level of confidence that the values are fit-for-purpose for application in the planning and operational contexts, namely, to justify sound investment outcomes across the NEM.

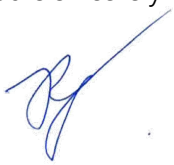
It is for these reasons AEMO is of the view that the approach taken to develop the model described in the Consultation Paper for WALDO VCRs is inappropriate for their application in the NEM. Our submission is outlined in more detail in Attachment 1, and Attachment 2 incorporates our feedback to the specific questions raised in the Consultation Paper.

AEMO encourages further collaboration with the AER and other stakeholders to develop a model for WALDO VCRs that will result in values that are more reflective of the NEM environment and therefore more suitable for NEM use.

Should you wish to discuss any of the matters raised in this submission, please contact Kevin Ly, Group Manager - Regulation on kevin.ly@aemo.com.au

[1] In all but the slow-change scenario from AEMO's draft 2020 Integrated System Plan.

Yours sincerely



Peter Geers
Chief Strategy and Markets Officer

ATTACHMENT 1: AEMO'S CONSIDERATION OF THE CONSULTATION PAPER

ATTACHMENT 2: AEMO'S RESPONSES TO THE CONSULTATION PAPER QUESTIONS

ATTACHMENT 1:

AEMO'S CONSIDERATION OF THE CONSULTATION PAPER

AEMO welcomes the opportunity to provide feedback on the AER's Consultation Paper and related model. AEMO is very supportive of the development of an estimate for the Value of Customer Reliability for Widespread and Long Duration Outages (WALDO VCR). A WALDO VCR would have numerous current and future applications within cost benefit analysis consistent with the National Electricity Objective. Correctly developed and implemented, a WALDO VCR would help minimise societal consequences of high impact outages. While high impact outages are low probability, use of the WALDO VCR would help justify the expenditure commensurate with that risk, while reflecting consumer expectations.

Throughout the AER's WALDO VCR consultation process, AEMO has advocated for the use of primary research to study the economic and social implications of observed and theoretical WALDO events. Because WALDO events are, by their nature infrequent and difficult to observe, survey techniques are not appropriate and new research is more appropriate and required to determine local factors and consumer preferences. The AER has instead decided to extrapolate the results of its short duration VCR study using factors based on extremely outdated international research without consideration for the consumer preferences of a modern Australian society.

To expand on the above, AEMO has two predominant concerns with the approach proposed by the AER and the AER's consultants:

1. The use of simple multipliers for social cost and extent of outage means that the downward sloping shape of the short duration VCR curve remains.

   AEMO considers that averaged costs do not continue falling as the outage duration increases, and at some point, would increase as the outage duration reaches tipping points. e.g. communication and water services shut down after certain durations; the health impacts of an extended heatwave would become severe after a certain duration without power.

   The social cost multiplier proposed is poorly justified and based on a single outdated international event. It ignores the role of electricity in the effective operation of modern societies and the likely timing of some Australian outages with high temperature events that intensify social impacts.

2. The range of unserved energy, which the proposed WALDO VCR has been designed for, is too narrow for many AEMO applications, including protected event analysis and the System Restart Standard Review.

The study was designed for a range of 1 to 15 GWh with a minimum outage length of 3 hours. The last System Restart Standard review assessed events up to 50 GWh of unserved energy. Further, the 2018/19 average demand in New South Wales, a single sub-network for System Restart Standard purposes, was 7.7GW. This load would exceed the 15GWh threshold in less than two hours, which is less than the three hour minimum.

The AER justified the narrow range relative to the South Australian system black indicating 'total state-wide blackouts in other regions are not plausible'. However, AEMO is of the view that outages greater than 15 GWh are plausible, which is further explained in section 4.

While there are often limitations and nuances associated with outcomes of analyses or studies, the risk of a poorly estimated WALDO VCR is that it can ultimately lead to incorrect investment and operational decisions, the impact of which can have undesirable consequences for consumers in the longer-term. Hence, for this study to be suitable for the NEM, new primary research of Australian WALDO events must be undertaken to better understand and account for their likely impact.

As an interim measure in the absence of an appropriately estimated WALDO VCR, AEMO recommends that the AER declare that bodies assessing WALDO cost benefit analysis should consider the evidence presented by the applicant for value of USE other than 1 x short duration VCR, and not immediately revert to 1 x short duration VCR by default.

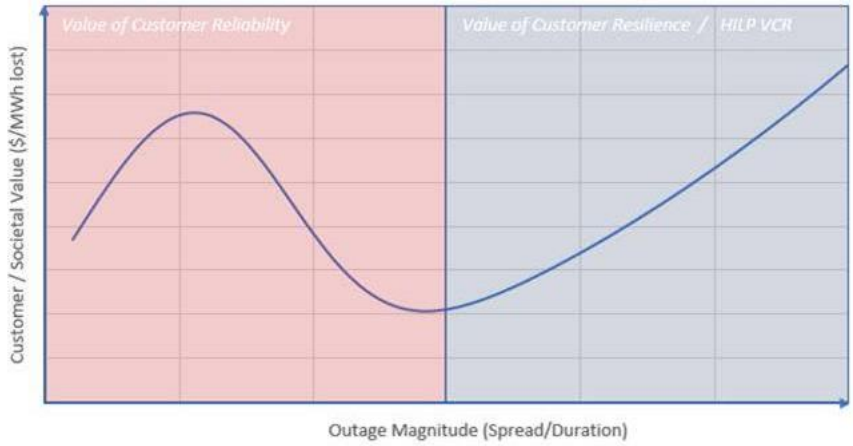
1. Model structure

AEMO has participated throughout the VCR consultation process and supported the development of a VCR for WALDO, otherwise known as High Impact, Low probability outages (HILP VCR), or a value of System Resilience. The HILP sub-committee was formed for consultation purposes on what would become the WALDO VCR.

The sub-committee was presented with a conceptual framework for VCR values early in the consultation[2] [adapted below]. This framework recognises the downward slope in the standard VCR range shown in pink. It however also includes an expectation of rising average costs beyond a particular point, that extends beyond the standard VCR range, shown in blue. This increase could be due to the cascading failure of other utility and societal services including transport, water, telecommunications and health impacts, or damages incurred directly by residential and business customers. While the slope of the curve is subject to debate, the sole purpose of the WALDO VCR study was to capture what could be a different slope that reflects the full societal value of a high magnitude outage.

[2] P. Mancarella. 2019. Draft for comments and discussion - HILP events and power system resilience

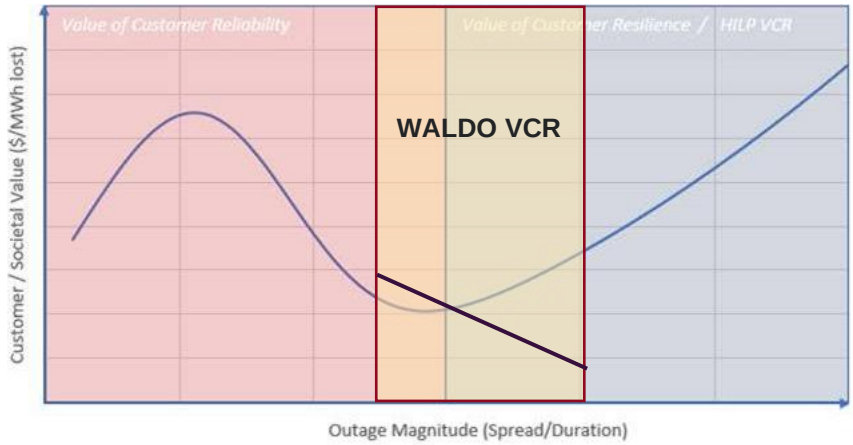
Figure 1: Theoretical value framework



Later in the consultation, the AER narrowed the 'high impact' range to 1-15 GWh, the upper end being consistent with an 8-hour outage in South Australia. This narrowed range excludes many of the true widespread and long duration outages AEMO needs to consider to comprehensively carry out our responsibility of maintaining power system security and reliability.

The economic analysis developed for this narrow range extends the short-duration survey-based residential VCR analysis, uses economic modelling to estimate loss of value added, and the social costs are imposed through a multiplier. By extending the standard VCR concepts with multipliers applied, the WALDO VCR continues to trend downward and subsequently, the model structure is unable to consider how impacts may change as the magnitude grows. The limited range chosen combined with modelling structure is shown in the diagram below, by the range shown in yellow.

Figure 2: Theoretical value framework (updated)



While the WALDO model has proven its ability to replicate the standard VCR, it does not fulfil its intended purpose as mentioned above; to study and understand how the shape of the VCR

curve changes as outage magnitude rises. AEMO believes this limitation results by trying to extend standard VCR concepts with simple multipliers.

2. Restart Costs

The commercial and industrial component of the WALDO VCR is developed using I-O modelling to capture the economic value lost, which are combined with estimated restart costs to estimate total costs.

Business restart costs were taken from the short-duration business VCR. It is reasonable to assume that as an outage duration extends, a business will be exposed to higher stock losses and damages beyond unrecoverable value added. Other than the impact on smelters, the impact of increasing stock losses and damages is not captured in the model. Additionally, the residential model is an extension of the short-duration VCRs and therefore has similar shortcomings.

The model effectively assumes that stock losses and damages will be the same whether the outage duration is one or 18 hours. The exclusion of the potential increases to stock losses and damages can have a material impact on the calculated VCR and therefore can contribute to the downward sloping VCR curve.

As such, AEMO considers extending the short-duration VCR is inadequate and the impact of outage duration on restart costs to be a critical consideration for a WALDO VCR model for a relevant value to result.

3. Social Costs

The Consultation Paper outlines the social cost multiplier has been proposed to capture societal costs beyond the individual experience. It is AEMO's view that, by design, the use of a multiplier does not capture the potential for an alternative slope to the underlying value and therefore does not capture increasing direct and indirect impacts as utility and societal services shut down.

The social cost multiplier proposed is based on a single study of the 1977 New York City blackout, that identified the direct and indirect costs at that time. This analysis was adjusted to remove factors specific to New York City, that are less likely to occur in Australia, namely looting and rioting. The application however failed to consider factors relevant to modern Australian societies, including the enhanced role of electricity in society, heat and geography.

Since 1977, electricity systems have become substantially more critical to the effective operation of modern societies. While energy consumption has also risen, the interconnected nature of utilities and services means that extended outages are likely to impact social outcomes more substantially. For example, telecommunication services may discontinue beyond eight hours, and some sewerage services overload beyond two hours. Therefore, further consideration must

be given to the societal impacts during a long duration outage to the interconnected nature of utilities and services including water, telecommunications, transport and health.

Additionally, the New York outage occurred during summer but would not have incurred the degree of impact of an Australian summer outage. Throughout the AER's review process, AEMO indicated on numerous occasions that heat impacts during outages required special consideration, to account for Australian summers and the fact that some WALDO events are more likely during this period. AEMO recently commissioned a study, "Power outages during heatwaves: Predicting mortality burden in Australian cities"[3], to understand the role of electricity in heatwave mortality rates which was provided to the AER for their process, however we understand this has not been considered in the model development.

Numerous studies (including many discussed in the Consultation Paper) conclude that indirect costs are up to five times direct costs, however it is acknowledged that VCRs already include some indirect costs. In the AER Consultation Paper, the AER provides an additional report as supporting evidence of a low social cost multiplier. It was written by NOUS for the Victorian Department of Primary Industries[4]. The chapter in question is included in full below:

> *Based on research commissioned by VENCorp in 1998 and 2002, the likely direct cost to electricity customers was of the order of $235 million. However, on the 16 January 2007, there were significant disruptions to public infrastructure services especially to transport, telecommunications and healthcare, which in turn created further adverse impacts, including costs to many people not directly affected by loss of supply. A conservative estimate of 25% additional costs caused by these indirect impacts has been used to derive the total direct cost of $300 million.*
>
> *The total economic impact is estimated at around $500 million when the normal economic multipliers are applied to account for the full on-flow impacts to the State's economy*

The authors used the full standard VCR estimate of the time, which was developed by VENCorp, AEMO's predecessor. However, from the above excerpt, it is clear that the authors thought total costs were more than two times the estimated VCR at that time, indicating that the social cost multiplier used was too low. This further suggests that the multipliers chosen are underestimated and may not capture increasing average costs as outage magnitude rises.

4. Model range

In the current design, the proposed WALDO tool has a minimum outage length of three hours, with an acceptable unserved energy (USE) range of 1-15 GWh. However, this limited range excludes any application of the model to the larger regions as shown in Table 1. New South Wales and Victoria are single sub-regions for the purposes of the System Restart Standard.

[3] Nairn, J & Williams, S. 2019. Power outages during heatwaves: Predicting mortality burden in Australian cities. https://www.aemo.com.au/-/media/files/initiatives/strategic-partnerships/2020/power-outages-and-mortality-burden-australian-cities.pdf

[4] See https://www.energy.vic.gov.au/safety-and-emergencies/past-energy-emergencies/january-supply-interruptions-executive-summary

Table 1: WALDO VCR model application range

Region	18/19 Average Demand	WALDO VCR application range
New South Wales	7.7 GW	None. A three-hour minimum outage exceeds the maximum GWh range.
Queensland	5.8 GW	None. A three-hour minimum outage exceeds the maximum GWh range.
Victoria	4.7 GW	3h to ~3.2hour outage in average conditions.
South Australia	1.4 GW	3h to ~11hour outage in average conditions.
Tasmania	1.2 GW	3hr to ~13hour outage in average conditions.

The Consultation Paper suggested the 15 GWh limit is applied because the AER:

> *do not consider it plausible for any sub-network to experience outages greater than 15 GWh*[5]

AEMO believes that events with greater than 15 GWh USE are in fact plausible. A specific plausible event that would have USE greater than 15 GWh is a system black of Queensland. However, the AER have explicitly discounted this as:

> *Queensland has groupings of generation and load, with control systems to automatically island the region into sub regions under extreme events*[6]

While the risk of a Queensland system black is currently low, in a rapidly changing environment, it cannot be guaranteed that islanded subregions would always be viable, or that existing control schemes could prevent cascading outages leading to system black under certain network conditions for 'plausible' non-credible contingencies (such as a double circuit line trip). For example, the 2018 Power System Frequency Risk Review[7] identified a need to modify the Central Queensland – Southern Queensland (CQ-SQ) generation shedding scheme to increase its effectiveness under changing network conditions to reduce the risk a double circuit trip could cause cascading outages leading to Queensland system black.

[5] AER, Widespread and Long Duration Outages - Values of Customer Reliability Consultation Paper, p 11, available: https://www.aer.gov.au/system/files/AER%20-%20Values%20of%20Customer%20Reliability%20Review%20-%20Widespread%20and%20Long%20Duration%20Outages%20Consultation%20Paper%20-%20Updated%2021%20April%202020.pdf

[6] AER, Widespread and Long Duration Outages - Values of Customer Reliability Consultation Paper, p 11, available: https://www.aer.gov.au/system/files/AER%20-%20Values%20of%20Customer%20Reliability%20Review%20-%20Widespread%20and%20Long%20Duration%20Outages%20Consultation%20Paper%20-%20Updated%2021%20April%202020.pdf

[7] AEMO, Power System Frequency Risk Review Report, June 2018, p22, available: https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/psfrr/2018_power_system_frequency_risk_review-final_report.pdf

Subsequently, AEMO is of the view Queensland system black is plausible and the likelihood of occurrence could increase over-time as the Queensland system changes through increasing levels of variable renewable generation and DER, declining minimum demand, changing intra-regional transfer patterns and upgrades to QNI transfer capacity and it will be critical to continue to monitor the risk profile of a Queensland system black to determine whether additional mitigation measures are necessary. If investments are identified that can reduce this risk, their expense should be assessed against an appropriately calculated WALDO VCR.

Performing cost/benefit analysis for these larger system black events using the standard VCR risks under-valuing net benefits, and could lead to the network missing out on "low hanging fruit" investments such as new/modified control schemes or network constraints that could lower the risk of major disruptions at low cost.

Furthermore, a 15 GWh cap on the WALDO VCR is too low for use to review the System Restart Standard (one of the intended applications of the WALDO VCR). The System Restart Standard:

> *specifies the time, level and reliability of generation and transmission capacity to be available for the restoration process following a major supply disruption (or black system event) that results in an uncontrolled power outage in one or more electrical sub-networks in the NEM. As such the Standard provides a target for the procurement of SRAS by AEMO*[8]

Therefore, in conducting cost/benefit analysis to determine appropriate values for these quantities it must take system black of each assessed region/sub-region as given. The last review in 2016 considered USE of up to 50 GWh to assess NSW, and even the assessment of Southern Queensland alone considered 17 GWh[9].

For these reasons the 15 GWh cap is clearly not fit-for-purpose for a range of required uses of the WALDO VCR. In fact, AEMO recommends that there should be no cap. Any cap that is introduced should be based strictly on concerns that the theoretical basis for the values cease to be reliable beyond a certain point, rather than trying to pre-judge what end users will apply the tool for and to pre-emptively exclude certain avenues of investigation.

5. WALDO Applications

The Consultation Paper highlights the following applications of the WALDO VCR:

1. Protected Events

[8] Reliability Panel, Final Determination – Review of the System Restart Standard, December 2016, p ii, available: https://www.aemc.gov.au/sites/default/files/content/7e20d52d-c0ef-498e-8232-a76c71c0ac36/REL0057-Review-of-the-System-Restart-Standard-Final-Determination.PDF

[9] Deloitte Access Economics, Economic Assessment of System Restart Ancillary Services in the NEM, November 2016, p14 and p35, available: https://www.aemc.gov.au/sites/default/files/content/9c0a445c-2766-4fc8-ac50-2de2ccb5702d/Deloitte-Access-Economics-Economic-Assessment-of-System-Restart-Ancillary-Services-in-the-NEM-Revison-1.PDF

2. System Restart Standard Review
3. Input to recommendations arising from the AEMC's Black System Event Review
4. RIT-T assessment

The Consultation Paper notes that WALDO VCRs could be used in RIT-T assessments to capture the economic impacts of WALDO events, with a number of caveats to this usage, based on principles recorded in the RIT Guidelines[10]. One caveat stipulates:

> *If the appropriate VCR for the HILP event is a WALDO VCR, the RIT–T proponent should have supporting evidence to clearly justify this. We would expect the RIT–T proponent to consult directly with both us and the customers to whom the WALDO VCR applies[11].*

AEMO considers this additional consultation for application to the RIT-T to be unnecessary and duplicative of the current RIT-T process. The relevant criteria for whether a WALDO VCR applies will be whether an outage is being assessed that is outside the scope of the set of standard survey derived VCRs. Additionally, consultation with "the customers to whom the WALDO VCR applies" will be redundant if the WALDO VCR values/tool is robust and will be impractical where those customers constitute an entire state of millions of individual customers. It is appropriate to treat WALDO VCR calculations the same as standard VCR calculations in consultation under the RIT-T, which is already an open and consultative process.

Further, the Consultation Paper states that:

> *VCR is a critical input for identifying efficient levels of network expenditure[12]*

but also:

> *the primary use of WALDO VCRs is not Regulatory Investment Tests for Transmission (RIT-T)[13]*

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[10] AER, Final decision - Application guidelines for the regulatory investment tests, December 2018, p30-32, available: https://www.aer.gov.au/system/files/AER%20-%20Final%20decision%20-%20RIT%20application%20guidelines%20-%2014%20December%202018.pdf

[11] AER, Widespread and Long Duration Outages - Values of Customer Reliability Consultation Paper, p 11, available: https://www.aer.gov.au/system/files/AER%20-%20Values%20of%20Customer%20Reliability%20Review%20-%20Widespread%20and%20Long%20Duration%20Outages%20Consultation%20Paper%20-%20Updated%2021%20April%202020.pdf

[12] AER, Widespread and Long Duration Outages - Values of Customer Reliability Consultation Paper, p 5, available: https://www.aer.gov.au/system/files/AER%20-%20Values%20of%20Customer%20Reliability%20Review%20-%20Widespread%20and%20Long%20Duration%20Outages%20Consultation%20Paper%20-%20Updated%2021%20April%202020.pdf

[13] AER, Widespread and Long Duration Outages - Values of Customer Reliability Consultation Paper, p 11, available: https://www.aer.gov.au/system/files/AER%20-%20Values%20of%20Customer%20Reliability%20Review%20-%20Widespread%20and%20Long%20Duration%20Outages%20Consultation%20Paper%20-%20Updated%2021%20April%202020.pdf

AEMO agrees with the first statement but believe the second statement needs to be reconsidered. The use of a WALDO VCR to justify efficient network investment to mitigate the risk of WALDO USE, is just as important as justifying investment to mitigate the risk of a localised area short duration outage USE.

AEMO is of the view such an application would not inevitably lead to inefficient expenditure, as the obligation would remain to find the least cost option to mitigate the WALDO risk. In the context of a RIT-T project for example, this could take the form of budget to implement an emergency control scheme in conjunction with network investment to increase inter-regional transfer limits. The expenditure to increase the inter-regional transfer limits could be justified due to lowering generation dispatch costs, while the control scheme could be justified by mitigating WALDO risk (which may increase with greater inter-regional transfer) using a WALDO VCR.

Additionally, the WALDO VCR could be useful to discriminate between two options assessed in a RIT-T with very similar net market benefits based on standard calculations. If one option provides greater WALDO mitigation net benefits than the other, it will be more efficient for consumers overall to proceed with that option.

Further, while the Consultation Paper mainly focuses on applications of a WALDO VCR to protected events and the System Restart Standards review, AEMO envisages the WALDO VCR as being relevant to any cost/benefit analysis of an expenditure that will reduce the likelihood or severity of an outage that falls outside the scope of the set of standard survey derived VCRs. Additional applications for such analysis may include, but are not limited to:

1. Power System Frequency Risk Reviews (note a Power System Frequency Risk Review can recommend investment independent of a protected event);
2. Emergency Control Scheme assessment by TNSPs as per their obligations under NER clause S5.1.8;

Therefore, it is recommended the final determination on WALDO VCR should not prescribe its application to stakeholders, other than to exclude its application to outages that fall within the scope of the set of standard survey derived VCRs.

6. Conclusion

While AEMO acknowledges the efforts by the AER to develop a model for a WALDO VCR, we are of the view that the model has a number of shortcomings that have been explained above, and throughout the AER's process via the HILP sub-committee. Such shortcomings include:

- The use of simple multipliers for social cost and extent of outage are underestimated and do not capture increasing direct and indirect impacts as utility and societal services shut down;
- Lack of consideration to the heat-related societal impacts during long duration outages;

- The multipliers applied for the model are based on a single outdated international event and are not reflective of NEM conditions;
- The 15 GWh cap of USE for outages excludes application of the tool for investigation of outages of larger regions and for the System Restart Standard review; and
- Unnecessary and impractical restrictions placed on the application of WALDO VCRs to RIT-Ts.

AEMO suggests that the assumptions and approach underlying the model outlined in the Consultation Paper is revisited so that one that is more reflective of the NEM's consumers' expectations on reliability and resilience in the current and forecast environment is developed. This will ensure WALDO VCRs that can be used with confidence to inform planning and operational decisions, and justify expenditure in the NEM will result.

As an interim measure, AEMO recommends that the AER declare that bodies assessing WALDO cost benefit analysis should consider the evidence presented by the applicant for value of USE other than 1 x short duration VCR, and not immediately revert to 1 x short duration VCR by default.

ATTACHMENT 2:

AEMO'S RESPONSES TO THE CONSULTATION PAPER QUESTIONS

Are there additional factors that the AER should consider in developing the range of outages used in the WALDO modelling?

Yes. As detailed in Attachment 1, in as far as possible there should be no upper GWh limit on WALDO VCR. Any limit that is introduced should be based strictly on concerns that the theoretical basis for the values cease to be reliable beyond a certain point. If these concerns arise at a level of USE that is less than needed by end users of the WALDO VCR (such as 15 GWh) than analysis should be adjusted until results are reliable over the full range required by end users.

Is the 15 GWh limit sufficient for the Reliability Panel to make determinations of AEMO requests for the declaration of protected events?

No. As detailed in Attachment 1, WALDO events with USE greater than 15 GWh are plausible and will need to be periodically assessed as part of the protected events framework. In present form, AEMO does not view the WALDO tool as being suitable for use, and does not believe it should be applied to protected event analysis.

Is the 15 GWh limit sufficient for estimating the economic value of procuring different levels of System Restart Ancillary Services?

No. As detailed in Attachment 1, review of the System Restart Standard takes system black of each region/sub-region as given. Hence in the last review it assessed up to 50 GWh USE. In present form, AEMO does not view the WALDO tool as being suitable for use, and does not believe it should be applied to System Restart Standard analysis or decision making.

Should we publish VCRs for a number of WALDO scenarios in addition to publishing the final WALDO model?

If the WALDO tool was robust and reliable, yes that would be helpful. However as stated previously AEMO does not view the WALDO tool as being suitable for use in present form and therefore oppose publication of WALDO VCR values or the WALDO Tool until its shortcomings are rectified.

Noting the limitations in the model, are stakeholders comfortable using the model and applying its outputs in applications such as reviews of the System Restart Standard and declarations of protected events. If not, what other steps could be taken to evaluate the costs of a WALDO related event

No, for the reasons outlined in Attachment 1, AEMO does not view the model's outputs as being suitable for review of Protected Events, the System Restart Standard or the other applications a robust WALDO would be useful for (e.g. cost benefit analysis of investments proposed under a

Power System Frequency Risk Review which do not involve a Protected Event application, cost benefit analysis of control schemes under TNSPs NER S5.1.8 obligations etc).

Ultimately primary research to study the economic and social implications of widespread and long duration outages is needed to create a robust and reliable WALDO VCR calculation tool and methodology. This will be a large piece of work that will take time. In the interim the need to assess WALDO events will remain. For these assessments, the short-duration VCRs will need to serve as a starting point multiplied by sensitivity factors based on whatever evidence is available, such as AEMO did in the South Australian Protected Event application.

This approach will increase uncertainty. For example, in the case of a Protected Event application, it shifts the decision of what value to place on WALDO USE to the Reliability Panel. In the case of the South Australian Protected Event determination, the Reliability Panel said the following regarding AEMO's approach of using a value of 2 x VCR:

> *The Panel is also satisfied that AEMO has provided sufficient reasoning to justify the use of 2 x VCR to estimate the costs of widespread outages in South Australia during a black system event. In any case, the Panel has determined that applying an input assumption of 1 x VCR to the relevant calculations still results in an overall weighted annual net benefit of $1.9 million for AEMO's recommended option.*
>
> *On that basis, the Panel is satisfied that AEMO has undertaken an accurate and comprehensive assessment of the costs and benefits of its recommended option*[14]

It is unclear whether the Reliability Panel would have approved the Protected Event request, had it depended on the 2 x VCR valuation to achieve positive net market benefits.
AEMO therefore recommend as an interim measure, that the AER declare that bodies assessing WALDO cost benefit analysis should consider the evidence presented by the applicant for value of USE other than 1 x VCR, and not immediately revert to 1 x VCR by default.

Are there additional issues that the AER should consider in setting the social cost factor?

As discussed in Appendix 1, AEMO does not believe that either the model construct, or evidence for the social cost calculation are appropriate. In current form, the model excludes numerous considerations that would be critical to the analysis of WALDO events. A robust WALDO VCR would consider:

- Increases in stock losses and damages as duration increases.
- Potential increases in averaged social costs as outage magnitude increases.
- The integrated role of electricity systems in the effective function of a modern society.
- The unique climate, geography and culture of Australia.

In current form, AEMO does not believe the proposed WALDO VCR is suitable for use.

[14] Reliability Panel, Final Report AEMO Request for Protected Event Declaration, June 2019, p20, available: https://www.aemc.gov.au/sites/default/files/2019-06/Final%20determination%20-%20AEMO%20request%20for%20declaration%20of%20protected%20event.pdf

Are there circumstances unique to Australia that need to be considered in the calculation of social costs?

Much of Australia is prone to extreme heat waves during summer and this should be incorporated into the calculation of societal costs because of the risk to health that they pose. In the last two years Adelaide and western Sydney have experienced temperatures of 48°C which would have seemed implausible only a few years ago. A short duration outage is inconvenient but if the outage extends beyond a few hours there is an increasing risk to life particularly for vulnerable members of society.

If so, how should these circumstances be incorporated into the modelling?

As described in Attachment 1, AEMO believes the proposed modelling approach is not suitable for use and requires comprehensive revision before it will be suitable. For this study to be suitable, new primary research of Australian WALDO events must be undertaken to understand the likely impact, and the possible VCR slopes that may result.