AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Reliability Standard Implementation Guidelines, MT PASA Process Description and EAAP Guidelines

September 2020

Final Determination

Executive summary

This Final Determination marks the conclusion of AEMO's 2020 consultation on its Reliability Standard Implementation Guidelines (RSIG or Guidelines), Medium Term Projected Assessment of System Adequacy (MT PASA) Process Description, and Energy Adequacy Assessment Projection (EAAP) Guidelines. This Determination also necessarily includes changes to the Spot Market Operations Timetable which were driven by changes to MT PASA. The consultation follows the National Energy Rules (NER) consultation procedure detailed in rule 8.9 of the NER.

This consultation is to inform the industry of changes to how AEMO implements the reliability standard, driven by:

- Updates to the Procedure for the Exercise of Reliability and Emergency Reserve Trader (RERT).
- The introduction of the National Electricity Amendment (Improving transparency and extended duration of MT PASA) Rule 2020 No. 1.
- The recently introduced Interim Reliability Measure.

The above changes impact on the following AEMO publications:

- RSIG.
- MT PASA Process description.
- EAAP Guidelines.
- Spot Market Operations Timetable

The changes to the above publications also include various minor improvements to the underlying processes, and ongoing efforts to ensure consistent methodologies and assumptions are applied.

AEMO received three submissions in the first stage of consultation and three in the second stage, all of which are noted in this document. In addition to various clarifications, the feedback topics included procurement of reliability reserves, modelling, the treatment of reliability changes, additional scenario development consultation and the provision of timing, duration and location of constraints in MT PASA data.

Alongside this Final Determination, revised RSIG, MT PASA process description, EAAP Guidelines, and Spot Market Operations Timetable documents are published on AEMO's website[1], reflecting updates resulting from the consultation.

[1] At https://aemo.com.au/consultations/current-and-closed-consultations/rsig-mtpasa-process-description-eaap-guidelines-and-spot-market-operations-timetable.

Contents

Tables

1. Introduction

1.1 Context for this consultation

AEMO's 'Enhancement to the Reliability and Emergency Reserve Trader' procedure changes were effective 26 March 2020[2] and allow the Electricity Statement of Opportunities (ESOO) to inform RERT contracts.

A final rule determination of the National Electricity Amendment (Improving transparency and extended duration of MT PASA) Rule 2020 No. 1 was made on 20 February 2020[3]. According to the original rule change submission, the changes were designed to:

- Improve transparency of the MT PASA process, reduce asymmetry of generation availability information in the market, and extend the period generation availability is published from two to three years, and
- Better inform the market at a granular level on projected assessments of reliability and generation availability, enabling participants to make more effective and efficient decisions in how they interact with the market.

AEMO's Issues Paper detailed the impact of the RERT enhancements and the MT PASA changes on the RSIG, MT PASA Process description, EAAP Guidelines and AEMO Spot Market Operations Timetable. Additionally, AEMO made various minor improvements to the underlying processes, including ongoing efforts to ensure consistent methodologies and assumptions are applied. This Final Determination responds to submissions received on these changes.

The Interim Reliability Measure was introduced in August 2020 and transitional provision NER 11.128.9 requires AEMO to amend the RSIG. The relevant amendments were made on 31 August 2020 in accordance with that provision and are outlined in this Final Determination and published in the RSIG with this Final Determination.

On 20 August 2020, AEMO released an interim solution for one of the changes arising from the MT PASA rule change, to publish generation availability of individual scheduled generating units. The published generation availability horizon for this interim solution is two years. A full solution for publishing generation availability of individual scheduled generating units, and remaining changes yet to be implemented, will be released by the proposed alternative go-live date of December 2020.

1.2 Consultation process

As outlined above, this consultation is conducted in accordance with rule 8.9 of the NER.

On 25 May 2020, AEMO initiated the first stage of the consultation with the publication of its RSIG, MT PASA Process Description, and EAAP Guidelines Issues Paper, which explained how AEMO has amended these documents. Through this consultation, AEMO was seeking feedback on the amendments.

On 14 August 2020, AEMO published the Draft Determination[4], addressing feedback on submissions to the issues paper.

This Final Determination outlines changes to the AEMO guidelines and process description, and addresses stakeholder submissions received during the consultation.

The publication of this Final Determination concludes the consultation.

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[2] See https://www.aemo.com.au/consultations/current-and-closed-consultations/enhancements-to-rert-rule-change-update-to-procedures.

[3] See https://www.aemo.com.au/consultations/current-and-closed-consultations/enhancements-to-rert-rule-change-update-to-procedures.

[4] Available at https://aemo.com.au/en/consultations/current-and-closed-consultations/rsig-mtpasa-process-description-eaap-guidelines-and-spot-market-operations-timetable.

2. Overview of changes

2.1 Topics raised in the issues paper

AEMO's RSIG, MT PASA Process Description, and EAAP Guidelines Issues Paper asked stakeholders about the appropriateness of the amendments to the RSIG, EAAP Guidelines and MT PASA process.

The box below outlines the amendments.

Consultation outline

- The amendments to the RSIG are minor in nature and are primarily to align the RSIG with other guidelines and procedures such as the most recent Reliability and Emergency Reserve Trader Guidelines and to reflect the Interim Reliability Measure rule change[5]. The other changes to the document align the RSIG with current procedures and methodologies.
- The updates to the MT PASA Process Description are predominantly to align with the MT PASA rule change. Other amendments are provided to clarify existing processes and published data. The document also outlines an amended approach to the calculation of daily peak demands as required in clause 3.7.2(f). The MT PASA methodology change focuses on the calculations of daily maximum demands. Greater clarity was also provided around how unserved energy (USE) outcomes from 90% probability of exceedance (POE) demand forecasts would be taken into account in calculating expected USE (consistent with other reliability assessments). Regarding the MT PASA inputs, generators are required to provide daily megawatt (MW) capacity for the next 36 months, updated from 24 months. MT PASA outputs are adjusted to reflect the rule change and increase transparency.
- The amendments to the EAAP Guidelines are more minor in scope with changes to reflect current processes, additional clarifications and minor corrections such as updating the name of input data sources.

2.2 Amendments to the Reliability Standard Implementation Guidelines

The RSIG outline the various approaches and assumptions used to evaluate the market against the reliability standard, and are made under clause 3.9.3D of the National Electricity Rules (NER).

The RSIG has been amended to align with AEMO's update to the Procedure for the Exercise of Reliability and Emergency Reserve Trader (RERT)[6], and to better reflect the methodologies AEMO uses in the ESOO, MT PASA and EAAP. The RSIG has also been amended to reflect the changes needed to implement the interim reliability measure.

Key changes include:

- Updating descriptions of how AEMO uses the ESOO to implement the reliability standard. The ESOO is used as an input in the RERT procurement process and forms the basis of the Reliability Forecast as part of the Retailer Reliability Obligation (RRO). The use of the ESOO to indicate whether RERT will be required was reflected in the update to the Procedure for the Exercise of RERT. Changes also include removing some descriptions of the details of RERT procurement which are related to rule changes rather than the process AEMO uses in implementing the reliability standard.
- Clarifying the methodology description, including:

[5] NER 11.128.9

[6] Consultation details available at https://www.aemo.com.au/consultations/current-and-closed-consultations/enhancements-to-rert-rule-change-update-to-procedures.

  - Changed description of planned outages in the ESOO from being scheduled and optimised during low demand periods, to the current approach of assuming they are scheduled at times of surplus supply. AEMO no longer models planned outages as these are assumed to be moved if they risk USE.
  - Described the approach to the inclusion of auxiliary load in ESOO, MT PASA and EAAP modelling.
  - Described the differences in approach used in modelling constraint equations and intermittent generation between EAAP and MT PASA.
- Detailing how AEMO will determine whether the interim reliability measure has been exceeded. The RSIG also adjusts the actions able to be taken by AEMO to reflect that AEMO may enter into contracts for interim reliability reserves if the measure is exceeded.
- Clarifying and outlining proposed improvements to the methodology related to modelling wind and solar generation. The updated RSIG clarifies that historical generation will not always be used where available, but rather where the use of historical generation is most appropriate. AEMO currently uses historical generation data to model many existing wind generators. However, for a number of reasons including increased levels of curtailment due to low prices or transmission constraints, and the potential impact of high wind or high temperature cut-outs, AEMO is moving toward a method which more heavily relies on meteorological data, which is converted to expected generation using the best available information. AEMO will consult on minor changes in the way intermittent generators are modelled across AEMO's various forecasting functions through consultation related to the forecasting improvement program.
- Clarifying that at least eight reference years will be used in conducting reliability assessments through the ESOO, EAAP and MTPASA.
- Noting that AEMO may supplement historical outage rate assessments with forward-looking assessments provided by participants and possibly consultants. This information may be requested for some generators such as in cases where deteriorating performance is observed.
- Documenting AEMO's considerations when determining whether an update to the ESOO or MT PASA is required based on a change in an underlying assumption.
- Updating links to references and links that have changed name or moved.

The submissions and determinations related to the above points are covered in Chapter 3 of this document.

2.3 Amendments to the MT PASA Process Description and the Spot Market Operations Timetable

MT PASA assesses the adequacy of expected electricity supply to meet demand across the two-year horizon through regular assessment of any projected failure to meet the reliability standard. This assists Registered Participants and other stakeholders making decisions about supply, demand and transmission network outages over that period.

The MT PASA Process Description documents information collection, analysis and disclosure of power system security and predicted supply reliability.

The National Electricity Amendment (Improving transparency and extending duration of MT PASA) Rule 2020 No. 1[7] has been approved. To comply with this rule change, AEMO has made several modifications to the MT PASA process. The sections below summarise and discuss the various amendments to reflect this rule change and/or to generally improve the clarity of the document.

[7] Available at https://www.aemc.gov.au/rule-changes/improving-transparency-and-extending-duration-mt-pasa.

The MT PASA rule change also requires minor changes to AEMO's Spot Market Operations Timetable to reflect the extension of generator's obligations to provide PASA availability and AEMO's data publishing responsibilities from 24 to 36 months. The changes include:

- Updating the requirement for participants to submit data for MT PASA to be "up to 36 months" instead of 24 months. This is due to the new requirement on scheduled generating units.
- Adding an additional row which describes the outputs related to aggregate PASA availability for each region and generating unit PASA availability published in the REGIONAVAILABILITY and the new DUIDAVAILABILITY reports. This covers a period of 36 months as per the rule change.

The following sections outline the MT PASA changes, while the submissions and determinations related to MT PASA are covered in Chapter 4 of this document. There were no submissions related to the Spot Market Operations Timetable.

2.3.1 Clarifications and updates

Proposed MT PASA Process Description amendments include general process clarifications and updates to references and links that have changed name or moved.

This includes clarification on how AEMO calculates intermittent generation traces where historical generation data is unavailable or unsuitable.

The document also clarifies AEMO's approach to the inclusion of auxiliary loads. The demand inputs used by AEMO in the reliability run are on a "sent-out" basis, but are adjusted by the auxiliary load that occurs within the simulation which is dependent on the generator dispatch in each interval.

Where appropriate, AEMO has generalised references to other documents and processes such that the MT PASA process description remains correct when other changes occur.

2.3.2 Changes in the MT PASA methodology

The updated document details AEMO's adjustment to the POE weightings which are applied to weight the USE outcomes from the 10%,50% and 90% POE simulations. Consistent with the approach used in the ESOO, AEMO is no longer assuming that USE outcomes from 90% POE simulations are the same as the 50% POE outcomes and is instead assuming zero USE outcomes from 90% POE simulations in most circumstances. In effect, the weighting applied to the 50% POE simulations has now reduced to reflect this assumption. The expected application date of this change is from December 2020.

The most significant change in the MT PASA methodology is the provision of additional information about the daily maximum demands. The existing approach to meet the requirement in 3.7.2(f)(1) is maintained, but is expanded as follows:

- Non-scheduled generation is subtracted from the demand traces to more clearly meet the requirement in 3.7.2(f)(1) which requires publication of peak load values that are net of non-scheduled generation. These values are on an as-generated basis to better match actual demand published by AEMO.
- For the daily peak demand values published under 3.7.2(f)(1), scheduled loads are considered off at time of peak if storage based, and considered on if large industrial loads. The possible reduction in demand from large industrial loads during high price events, including wholesale demand response, is captured in AEMO's demand side participation forecast.
- The calculations and publishing of the 10% POE peak load, the most probable peak load and the maximum and minimum values of the forecasts (to meet the new clause 3.7.2(f)(1A)) are all reflective of the actual demand traces used in MT PASA. These new values improve the transparency of the assessment, as they reflect the range of values in the actual demand traces used in the MT PASA reliability run, as opposed to the values published in 3.7.2(f)(1), which are not reflective of any of the inputs used in the MT PASA reliability run.

2.3.3 Medium Term PASA Inputs

The process description clarifies that in accordance with the rule change (Rule 2020 No. 1), generators are required to provide the expected daily MW capacity of each scheduled generating unit for the next 36 months, updated from 24 months.

The process description provides details around the inclusion of generation projects with a commitment to construct or install[8] in MT PASA. This is not a change in process, as MT PASA has always included these generators, but has been added for clarity.

2.3.4 Medium Term PASA outputs

The rule change (Rule 2020 No. 1) includes additional information that AEMO is required to provide under clause 3.7.2(f)(1A). AEMO must prepare and publish the maximum and minimum values of daily demand forecasts under both 10% POE and most probable peak demand conditions. This clause specifically refers to the input forecasts produced under 3.7.2(c)(1) and the calculated values are therefore reflective of the actual demand traces used in MT PASA.

To meet the publication requirement, AEMO has added several new fields to the published three-hourly report (all on an as-generated basis and excluding contribution from non-scheduled generation):

- DEMAND10MAX – calculated as the maximum daily demand across all 10% POE traces.
- DEMAND10MIN – calculated as the minimum daily demand across all 10% POE traces.
- DEMAND50MAX – calculated as the maximum daily demand across all 50% POE traces.
- DEMAND50MIN – calculated as the minimum daily demand across all 50% POE traces.

Other changes made to reflect the rule change include:

- PASA availability will now also be published at a unit level (as per the new clause 3.7.2(f)(5)).
- Availability will also be published for 36 months instead of 24 months due to the increased time period that generation availability must be provided by generators.
- Demand values published in the REGIONRESULT table will now be published on an 'as-generated' basis. This is to make it consistent with other demand data that is published by MT PASA.
- The DEMAND10 and DEMAND50 values published in the MTPASA_REGIONAVAILABILITY report are net of the contribution from non-scheduled generation.

Finally, other calculations have been added to the MTPASA_REGIONRESULT table to provide participants with more information on generator availability. The additional fields are to meet the new requirements in clause 3.7.2(f) (5C) and show the impact of the random forced outages on the capacity available. The new fields are:

- TOTALAVAILABILEGEN90 – the 90% percentile for total availability (Scheduled) across all iterations and half hours (MW)
- TOTALAVAILABILEGEN50 – the 50% percentile for total availability (Scheduled) across all iterations and half hours (MW).
- TOTALAVAILABILEGEN10 – the 10% percentile for total availability (Scheduled) across all iterations and half hours (MW).
- TOTALAVAILABILEGENMIN – the minimum for total availability (Scheduled) across all iterations and half hours (MW).

[8] Information on the criteria used by AEMO to classify projects as committed can be found at https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information.

- TOTALAVAILABILITYGENMAX – the maximum for total availability (Scheduled) across all iterations and half hours (MW).

The updated process description details all of the new output fields which will be provided once implemented[9], and also provides an example of an additional visualisation which will be made available.

The MT PASA rule change also requires minor administrative changes to AEMO's Spot Market Operations Timetable to reflect the extension of generators' obligations to provide PASA availability and AEMO's data publishing responsibilities from 24 to 36 months.

2.4 Amendments to the EAAP Guidelines

AEMO is required to develop and publish the EAAP Guidelines in accordance with Rule 3.7C.

The EAAP Guidelines have been amended to align with improvements in other AEMO processes, including MT PASA reliability modelling. Other amendments clarify methodology, and update links to references and any updated links. The amendments are minor in scope and do not materially impact the methodology for assessing reliability in the EAAP process.

Key changes are:

- Removed the statement that AEMO will only run simulations on the long-term average rainfall scenario if USE is over 0.002% in the short-term average rainfall scenario. AEMO will conduct simulations on all three scenarios (low rainfall, short-term average and long-term average rainfall), at a minimum.
- Removed descriptions of self-dispatch levels and generator ramp rates in the model. These features are no longer implemented in the Generator Energy Limitation Framework (GELF) and currently have minimal impact on the implementation of the reliability standard. As models such as the EAAP currently simulate dispatch on a half-hourly granularity and do not consider the impact of factors such as short-term forecast uncertainty, issues related to flexibility and ramping are currently not captured. In consultation with stakeholders; future developments in AEMO's forecasting models may be explored to better reflect the increasing reliability risks associated with lack of system flexibility.
- Removed references to interconnector FORs (Forced outage rates). This is to align with the approach used in MT PASA where unplanned network outages are not modelled. Capturing such outages in these processes would be extremely difficult as it would require changes to constraint sets that are automatically created from AEMO's market systems. Where relevant, the impacts of interconnector FORs are captured in the ESOO.
- Simplified the data on total energy production provided to owners of scheduled generating units or hydro schemes.
- Clarified the current process for deriving the demand traces modelled which are now fully aligned with the approach used in both ESOO and MT PASA. Similarly, the generation modelled (scheduled, semi-scheduled and large non-scheduled) and the approach to incorporating auxiliary load is also now aligned across these three processes.
- Updated naming conventions and links to other processes and documentation.

The submissions and determinations related to the above points are covered in Chapter 5 of this document.

2.5 Feedback received from stakeholders

In response to the issues paper, AEMO received written submissions from ERM Power, Energy Users Association of Australia (EUAA) and Major Energy Users (MEU). The EUAA and MEU both referenced ERM

[9] Expected implementation date of December 2020.

Power's comprehensive submission, indicating their support for it. AEMO would like to thank these stakeholders for their feedback.

In addition to Registered Participants and other interested persons, AEMO consulted with the Reliability Panel in relation to the RSIG, in accordance with clause 3.9.3D.

In response to the Draft Determination, AEMO received three submissions, from Energy Queensland, EUAA and ERM Power, and once again, the EUAA referenced ERM Power's more comprehensive submission. AEMO would like to thank these stakeholders for their feedback.

Responses to material issues from submissions to the issues paper and Draft Determination[1] are outlined in the following sections of this document. Minor points are addressed in Appendix A1.

3. Material issues raised regarding the RSIG

The following sections discuss the material issues raised by stakeholders along with AEMO's considerations and conclusions. Appendix A1 notes minor matters.

3.1 ESOO generation capacity

Issue summary and submissions

ERM Power noted its perception that AEMO shows a willingness to insert modelling bias by means of the statement in the RSIG that

> AEMO may further validate these assumptions through consultant peer review.

ERM Power remains concerned that this may imply AEMO could engage additional consultants to substitute the information provided by a registered participant at AEMO's request, if AEMO deems it invalid.

ERM Power went on to propose that even if AEMO needed to engage consultants, its should fully document the reasons for this and undertake stakeholder consultation prior. ERM Power clarified that it sought consultation prior to substitution, rather than prior to consulting. It also noted it did not seek revelation of confidential information, and that reasons for engaging external expertise could be provided without revealing confidential data.

Assessment and conclusion

This issue was raised by ERM Power in the first stage of consultation, and as noted in the Draft Determination:

AEMO may engage consultants because it:

- Needs expert judgement to assess whether the evidence provided by participants supports the proposed rate, and/or
- Finds participants are unable to provide their own forward-looking assessment of forced outage rates, and/or
- Seeks to cost effectively supplement its own team when needed.

Inputs and assumptions derived from external consultants are discussed at Forecasting Reference Group (FRG) meetings where practicable and time permitting. For example, in 2020, AEMO engaged consultants to assist with developing economic forecasts, distributed energy resource uptake and forward-looking forced outage rates. All consultants presented their analysis at FRG meetings, providing stakeholders with an opportunity to ask questions and raise alternate views.

In specific circumstances where consultant advice is inconsistent with information explicitly provided by a participant, AEMO provides the participant with an opportunity to provide further evidence in support of their view. Due to the confidential nature of these discussions, it is not possible to consult broadly, or publish this information, but a record of the discussion is documented internally.

The intent of the Forecast Accuracy Report is to provide stakeholders with confidence that any unintended modelling bias, driven by choice of inputs, is detected early.

3.2 ESOO intermittent generation

Issue summary and submissions

ERM Power reiterated its view that best practice was to fully document and justify the use of intermittent generation profiles based on meteorological variables when departing from historical profiles of existing generators when these are available. It proposed wording that causes AEMO to fully document the reasons and the expected level of improvement.

Assessment and conclusion

AEMO reiterates its response to this matter in the Draft Determination:

> *AEMO replaces historical traces for intermittent generation with traces derived from meteorological variables using power curves for many reasons. Historical traces are often missing entirely for new facilities, or compromised for existing facilities, due to commissioning hold points, asset failures, network constraints or market responsive behaviour. Missing data and compromised traces are too numerous for exhaustive reporting. Doing so would incur costs disproportionate with the benefit.*
>
> *AEMO does not believe the RSIG to be an exhaustive list of all assumptions used in implementing the reliability standard. As with other processes, AEMO will continue to document methodologies and assumptions which it considers material and valuable.*

The above, including the examples listed in the second sentence, clearly explains that the costs of providing a large amount of exhaustive detail is disproportionate with the benefit. Furthermore, it would not be possible to provide participant or site level detail due to confidentiality requirements. In the interest of transparency, the traces used for each intermittent generator are published with the ESOO database, allowing participants to do their own comparisons against history if desired.

3.3 ESOO energy constraints

Issue summary and submissions

ERM Power reiterated concerns about lack of clarity regarding:

- How the ESOO reliability forecast calculation includes the use of pumped storage hydro to supplement natural water inflows.
- How the calculation methodology allows for all hydro plant to be at rated capacity whenever USE is forecast.

ERM Power again queried AEMO's practice of modelling hydro storage such that initial and final hydro storage levels across a yearly period remain constant, and also noted that AEMO's assessment does not indicate that available hydro capacity is dispatched to full capability at times where forecast USE is recorded.

Finally, ERM Power noted that this matter was not under consultation at present.

Assessment and conclusion

The RSIG is a guideline for AEMO's implementation of the reliability standard, and not an entire approach to modelling methodology. AEMO's market modelling methodology[10] provides more detail on how hydro generation is dispatched by the power market modelling software. In short, the model attempts to utilise energy limited resources at times of highest value, subject to network constraints. While allocated through a deterministic linear programming approach, the hydro storage optimisation is very similar to 'peak shaving' that optimises the resource within each year of the simulation with perfect foresight of the system conditions during every USE event. Pumped hydro is also dispatched endogenously within the power market model with

[10] Available at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Inputs-Assumptions-Methodologies/2019/Market-Modelling-Methodology-Paper.pdf.

pumping and generation scheduled to minimise total system cost. Typically, hydro generation will be capacity constrained at times of USE. If, for some reason, a hydro generator was resource constrained during USE periods and this resource constraint could be addressed by pumping more water to the head pond ahead of time, then the model would automatically do this.

AEMO agrees with ERM Power that initial and final storage levels between any annual period do not remain constant. Hydro storage management is complex and influenced by a number of factors, not all of which are captured in a power market model. In any given year, a hydro generator may choose to store more water than it generates, or conversely, generate more than it stores. However, on average, AEMO considers that the expected annual hydro yield adequately represents hydro generation availability. Modelling the distribution of annual hydro energy usage is unlikely to materially impact the expected annual USE since, at times of USE, hydro generation will be dispatched as much as possible. If anything, capturing variations in annual hydro generation may increase the modelled tail risk under extreme drought conditions when water conservation is critical, but the impact of drought conditions is assessed explicitly in the EAAP. To do anything other than assume expected annual hydro yield (that is, setting final hydro storage levels to initial levels) would require extensive model redevelopment and impose additional compute burden. AEMO does not consider that the redevelopment cost is warranted for the reasons stated.

AEMO acknowledges that hydro capacity is sometimes not at full capacity at times where forecast USE is recorded but asserts the reduction is due to constraints and forced outage rates, not hydro generation or water availability modelling.

3.4 ESOO forecast demand

Issue summary and submissions

ERM Power resubmitted that in the interests of improved transparency, the forecast demand data published in the ESOO be based on the operational "as generated" definition to align with other AEMO data, including the MT PASA demand forecasts and real time operational demand. ERM stated that this will remove the level of confusion which occurs when ESOO published demand does not align with readily observable demand data.

Assessment and conclusion

As agreed in previous stakeholder consultations, AEMO makes both "as generated" and "sent out" data readily available to stakeholders through its forecasting portal.

3.5 Network constraints

Issue summary and submissions

ERM Power noted that under the NER, USE is calculated based on events associated with generation and inter-regional transmission elements. It asserted that AEMO has developed an alternative and inconsistent definition in the RSIG:

> Unplanned network outages in the transmission network that significantly impact the ability to transfer power between regions are stochastically modelled using probabilities derived from historical performance

ERM Power further claimed that the above 'definition' includes unplanned outages of intra-regional transmission elements which under the NER do not contribute to the calculation of USE, and that AEMO's methodology will therefore overstate the forecast level of USE.

Assessment and conclusion

AEMO disagrees with ERM Power's assessment. The sentence above does not purport to be an alternative definition of USE, and AEMO notes there is no reference in the sentence to intra-regional transmission.

AEMO follows NER 3.9.3C, including the definitions of terms such as 'unserved energy' and 'transmission element'. AEMO does not intend to repeat the wording of the NER in all its guidelines as they apply regardless.

3.6 Updates to the ESOO

Issue summary and submissions

ERM Power reiterated its preference for RSIG wording that expressly references positive and negative material changes to the reliability forecast as a reason for updating the ESOO. ERM Power requested AEMO reconsider its view on this matter following the Draft Determination to 'provide confidence to stakeholders that a balanced approach will be applied to a decision to issue an update to the ESOO.'

Assessment and conclusion

AEMO has reconsidered this matter, noting that while "material change" could be in either direction, AEMO understands that stating this explicitly may provide greater stakeholder confidence. Section 2.1.7 of the guidelines has been changed accordingly.

3.7 Factors in additional EAAP reporting

Issue summary and submissions

ERM Power made further detailed remarks regarding factors that AEMO considers in determining whether to publish an additional EAAP. ERM Power:

- Noted, further to the above Section 3.6, AEMO's changes regarding additional EAAP reporting, where AEMO has included "A major increase or decrease in operational consumption".
- Recommended the words 'energy adequacy projection' replace the word 'reliability' in the following sentence in Section 2.2.7 "Any other events or emerging events that may materially impact reliability by way of energy limitations".
- Proposed that 'The requirement for AEMO to exercise the RERT under rule 3.20' be deleted as a factor. ERM Power is unclear what benefit exists from AEMO having this factor as a consideration. ERM Power noted it is unaware of an updated EAAP report being issued following a decision to exercise RERT.

Assessment and conclusion

AEMO addresses the above points in order:

- In relation to ERM Power's point regarding a major increase or decrease in operational consumption, see above Section 3.6.
- AEMO agrees to ERM's suggested wording regarding the energy adequacy projection and has made this change.
- ERM Power appears to have misunderstood the purpose of the RERT reference in this factor. It is to allow for AEMO to declare a low reserve condition (LRC) in an updated EAAP, which may trigger the exercise of RERT – not to follow a decision to exercise RERT. It is more likely that a low reserve condition would be declared in some other way, but AEMO does not intend to limit its discretion as to where a low reserve condition is declared.

3.8 Projected Assessment of System Adequacy

Issue summary and submissions

ERM Power recommended that AEMO change the description of PASA as shown:

> Separate reserve assessments are applied for MT PASA and ST PASA processes. MT PASA identifies LRC (as does the ESOO and EAAP) while ST PASA identifies LOR conditions based on determined capacity reserve levels.

Assessment and conclusion

AEMO considered this further and now determines the adjusted words below, as the relevant passage in the RSIG relates to the difference between MT PASA and ST PASA and is not intended to be a general statement of where an LRC is declared:

> Separate reserve assessments are applied for MT PASA and ST PASA processes. MT PASA identifies LRC while ST PASA identifies LOR conditions based on determined capacity reserve levels.

3.9 Medium Term PASA (MT PASA)

Issue summary and submissions

In relation to dispatching contracted reserves, ERM Power noted AEMO's agreement in the Draft Determination to the words 'noting that AEMO may not specifically contract reserves for the purpose of maintaining power system security' were not changed in the amended RSIG.

Assessment and conclusion

AEMO agrees the updated wording better expresses the intent, and has amended accordingly.

3.10 MT PASA demand

Issue summary and submissions

ERM Power restated its previously recommended amendment to AEMO's text on MT PASA demand;

> At a minimum, a combination of the most probable daily peak load (50% POE) and 10% POE demand profiles are sampled probabilistically in the Monte-Carlo simulations to develop the expected USE. At AEMO's discretion and following consultation with stakeholders, more POE demand profiles (such as 90% POE) may be included, if USE outcomes are expected to be materially different from 50% POE outcomes.

ERM Power claimed that AEMO information indicates that the phrases 'most probable daily peak load' and '50% POE' are interchangeable, although the AEMO information is not referenced to enable an informed response.

Finally, ERM Power noted AEMO's statement that ESOO delivery timeframes make it impractical to consult on AEMO's decision to use the 90% POE demand profile in instances where AEMO considers that the expected USE from this profile could be great than zero, and questions how this shows best forecasting practice.

Assessment and conclusion

The 50% POE demand profile used to calculate expected USE is not the same as a trace that consists of the most probable daily peak loads every day in the year. For the purpose of calculating expecting USE, AEMO preserves the shape of historically observed demand profiles to the extent possible, to capture natural variations in demand and intermittent generation availability. Therefore, ERM Power's proposed wording does not accurately reflect the modelling.

AEMO has updated Table 1 in the MT PASA Process Description to better reflect NER 3.7.2(c), and to avoid perception of an interchangeable use of '50% POE' and 'most probable daily peak load'.

AEMO considers that a decision to explicitly calculate the USE arising from 90% POE demand rather than assume it is zero need not be consulted on each time. The current MT PASA calculation of expected USE is calculated using USE outcomes from the demand profiles as follows:

Expected USE = 30.4% * {10% POE demand outcomes} + 69.6% * {50% POE demand outcomes}

AEMO is undertaking improvements expected to be complete in December 2020 to update the calculation to align with other forecasting reports, using all three demand profiles weighted as follows:

Expected USE = 30.4% * {10% POE demand outcomes} + 39.2% * {50% POE demand outcomes} + 30.4% * {90% POE demand outcomes}.

In most instances, to avoid incurring unnecessary compute costs, AEMO will assume the 90% POE demand outcomes result in zero USE (in contrast, under current approach the 90% POE demand outcomes are assumed equivalent to the 50% POE demand outcomes). However, in instances where AEMO considers that assuming zero USE may not be an accurate assessment of USE, then the 90% POE demand outcomes will be modelled explicitly using the same method as applied to 50% POE and 10% POE demand profiles. This approach is consistently applied across all AEMO's reliability forecasts.

3.11 Using ESOO for directions and instructions

Issue summary and submissions

AEMO received submissions that did not support AEMO's proposal to issue Clause 4.8.9 directions or instructions from the ESOO due to its infrequent publication updates.

The MEU submitted:

> *The MEU observes that the ESOO is generated annually and that between the time the ESOO is generated and the potential need for implementing the IRM, significant change might have occurred in the wholesale market necessitating a different approach to delivering the required reliability. While the MEU accepts that the ESOO might be the initial document indicating a need for action, there are a number of other forecasting processes that AEMO undertakes that would provide a more up-to-date assessment and/or more detail for action to deliver wholesale market reliability to meet the Reliability Standard.*

Assessment and conclusion

AEMO understands the concerns raised by the MEU submission. As a result, AEMO has amended the RSIG such that the secondary action of a 4.8.9 instruction, RERT or direction is shared across all four processes, and added an additional point that AEMO will consider the most up to date relevant information when considering whether to take a secondary action.

4. Material issues raised regarding MT PASA

4.1 MT PASA semi-scheduled wind and solar generation forecasts

Issue summary and submissions

ERM Power has made the same comments as above in Section 3.2, but for MT PASA.

Assessment and conclusion

See Section 3.2 of this document.

4.2 MT PASA Reliability Run

Issue summary and submissions

ERM Power recapped and expanded on its concerns regarding what it sees as conservative limits on hydro generation output, whereby the modelling:

- Uses a requirement that storage at the end of the year must be equal to or greater than the storage at the start of the year.
- Subjects storage levels to a series of optimal storage targets for each weekly period.

On both points, ERM Power recapped on its previously suggested alternative wording but did not provide additional rationale beyond its earlier submission.

ERM Power also noted it was unclear on whether AEMO's practice of constraining hydro generation according to MT PASA weekly bids applies only to capacity availability or includes energy constraint bids.

Finally, ERM Power quoted AEMO – "*AEMO will clarify in the MT PASA Process Description that hydro generation is constrained according to both the PASA availability bid into MT PASA and any weekly energy constraints that are submitted*" – but noted that no changes were made in the MT PASA process description regarding annual, monthly and weekly storage targets.

In summary, ERM Power considered the methodology as implemented may result in a forecast of USE when hydro generating plant remains available but not dispatched in the model due to one of the various energy output constraints. Instead, ERM Power proposed that AEMO engage with hydro generation operators to ensure accuracy.

Assessment and conclusion

AEMO notes the similarity of the point raised with that discussed in Section 3.3, but for MT PASA in this instance. AEMO's response is also similar. The MT PASA process description states that annual storage targets are used as well as any weekly energy constraints provided. The MT PASA process description Section 4.3 now includes:

> Annual energy limits are implemented through the requirement that the storage at the end of the year must be equal to or greater than the storage at the start of the year. Storage levels must also remain within upper and lower bounds.

And,

In addition to the storage targets, hydro generation is also constrained according to both PASA availability and any MT PASA weekly bids submitted. Weekly energy constraints for all generation types are considered in both phase two and phase three, and cannot be violated.

There are no specific monthly constraints, only monthly inflows.

AEMO's market modelling methodology[11] provides more detail on how hydro generation is dispatched by the power market modelling software. In short, the model attempts to utilise energy limited resources at times of highest value, subject to network constraints. While allocated through a linear programming approach, it is very similar to 'peak shaving'. Pumped hydro is also dispatched endogenously within the power market model with pumping and generation scheduled to minimise total system cost. Typically, hydro generation will be capacity constrained at times of USE. If, for some reason, a hydro generator was resource constrained during USE periods and this resource constraint could be addressed by pumping more water to the head pond ahead of time, then the model would automatically do this.

4.3 MT PASA Loss of Load Probability (LOLP) Run

Issue summary and submissions

ERM Power reiterated its concern regarding the LOLP graph in Appendix E not including flow limit data from interconnected regions or large non VRE non-scheduled generators.

ERM Power requested AEMO explicitly state that interconnector support is included in the modelling process, namely via the following amendment to Section 3.2.2:

> "Each region is considered independently but allows for support from adjacent regions across interconnectors."

Assessment and conclusion

AEMO agrees that the proposed addition will improve clarity and has modified the MT PASA process description accordingly

4.4 Additional reporting data

Issue summary and submissions

ERM Power recapped the history of its correspondence on additional reporting data:

- ERM Power noted in its initial submission that it was unclear why the three additional adjusted aggregate scheduled generating unit PASA availability values for each region had been included or the reasoning for their inclusion.
- AEMO responded in the Draft Determination that AEMO has previously noted during the MT PASA rule change consultation that publishing the minimum aggregate scheduled capacity across all stochastic iterations is of limited value, because the minimum and maximum values are inherently outliers. MT PASA models up to 2,000 stochastic simulations to capture the full distribution of capacity outcomes and AEMO does not consider the single extreme minimum to be informative. Therefore, in the interest of improving transparency, AEMO is publishing information on the range of scheduled capacity which better reflects the impact of forced outage rates, using the same percentile methodology applied to a range of other MT PASA outputs

ERM Power stated that it is concerned that the additional data will increase confusion, and referred to AEMC's non-acceptance of AEMO's submission to the Improving Transparency and Extending Duration of MT PASA rule change.

[11] Available at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Inputs-Assumptions-Methodologies/2019/Market-Modelling-Methodology-Paper.pdf.

Assessment and conclusion

In the rule change proposal "Improving transparency and extending duration of MT PASA", AEMO submitted that 10% and 90% POE values were preferable to minimum and maximum values for representing the probability distribution of aggregate scheduled generation availability, given outliers that may be present. The AEMC determined that minimum and maximum values should be published, noting that AEMO's suggestion to replace minimum and maximum values was not supported by the rule change proponent (ERM Power) to "deliver the full range of possible available generation modelling outcomes"[12]. The AEMC did not reject provision of probabilistic values and AEMO maintains that provision of only minimum and maximum values is misleading relative to the underlying probabilistic process. AEMO sees the provision of the range of scheduled capacity as useful to those who seek improved understanding of the impact of forced outage rates. In implementing the rule change, work is underway to include a full array of aggregate availability values including minimum, 90%, 50%, 10% POE, and maximum, which is consistent with both NER 3.7.2 f (5C) and with good practice for representing probabilistic information. This is included in the MT PASA process description.

4.5 Generation capacity constraints

Issue summary and submissions

Energy Queensland requested increased transparency regarding generation reductions caused by transmission and distribution capacity constraints, submitting:

> We consider it would be beneficial for the market to be better informed of the timing, duration and location of these constraints to the dispatch of generation and forecast capacity reduction (percentage) or reduction in output (in MW). This information could be provided for each affected unit (or dispatchable unit ID (DUID)) in the MT PASA Process Description document in the table titled "MTPASA_CONSTRAINTSUMMARY".

Assessment and conclusion

AEMO acknowledges the potential value of this information to market participants. In some cases where constraints apply to a single DUID, this may be easily identifiable from existing constraint information in MTPASA_CONSTRAINTSUMMARY.

However, the complex interaction between constraints on meshed networks means that full constraint attribution to individual DUIDs is challenging. To do so would require substantial model redevelopment, incurring costs that may be disproportionate to the benefit. As such, AEMO does not intend to adopt this change at this stage.

[12] https://www.aemc.gov.au/rule-changes/improving-transparency-and-extending-duration-mt-pasa

5. Material issues raised regarding EAAP

5.1 Simulation cases

Issue summary and submissions

On the topic of EAAP simulation scenarios, ERM Power emphasised stakeholder consultation should be required before any additional scenarios are simulated and queried AEMO's position on this matter as a paragraph contained in the EAAP included struck-out text:

> If the need arises, AEMO will conduct simulations of 90% POE demand traces or additional scenarios as appropriate in future using the GELF information provided by Scheduled Generators in accordance with these EAAP guidelines. ~~Any extra scenarios that would require additional information from participants will be done in consultation with stakeholders.~~

Assessment and conclusion

Regarding the 90% POE demand traces, AEMO notes the similarity between this topic and Section 3.10. Please see that section for AEMO's response to the use of 90% POE demand traces.

Regarding consultation, AEMO has now edited the quoted paragraph such that the struck through text is now included in the document and added 'where practicable'.

A1. Summary of other issues raised

Table 1 Other issues raised (in second stage submissions)

Organisation(s)	Comment	AEMO response
ERM Power	RSIG – Interaction with the Interim Reliability Measure – ERM Power noted its understanding that if the proposed rules to implement the Interim Reliability Measure were not made or altered, the proposed amendments to the Guidelines related to the Interim Reliability Measure would be modified or withdrawn.	AEMO notes the IRM rule changes are made. Refer to Draft Determination Section 3.1.
ERM Power	RSIG – Interaction with the Interim Reliability Measure – ERM Power noted that "The proposed Interim Reliability Measure has an expiry date of 31 March 2025 and that the last date AEMO can enter into a 3-year contract for Interim Reliability Reserve will be 2022 for the 2024/25 summer. For clarity, we believe these details should also be included in section 1.5 of the Guideline."	AEMO has amended the guidelines to clearly delineate those amendments that relate to the interim reliability measure and to state that the amendments related to the interim reliability measure apply from the date the National Electricity Amendment (Interim Reliability Measure) Rule 2020 commences. Refer to Draft Determination Section 3.1.
ERM Power	RSIG – Changing the purpose of ESOO to procuring reliability reserves – ERM Power interpreted the RSIG amendments to be AEMO changing the purpose of the ESOO from 'inform the National Electricity Market of potential reliability issues in the future and request a retailer reliability obligation (RRO) reliability instrument if required' to 'AEMO may procure interim reliability reserves'.	AEMO disagrees with ERM Power's interpretation of the RSIG amendments. AEMO is not seeking to replace the purpose of the ESOO. The amendments to the RSIG add to the roles the ESOO already performs in that the USE forecasts are used as an input to the procurement of RERT. Refer to Draft Determination Section 3.3.
ERM Power	MT PASA – Reliability trends in historical data – ERM Power noted the potential for different treatment between improving and deteriorating generator reliability implied by AEMO's proposed amendment: The historical information may not be considered suitable in instances where a deteriorating or improving trend in reliability is evident in the historical data and there are reasonable grounds to indicate that this trend may continue.	AEMO agrees that its proposed change regarding historical information inadvertently implied an imbalanced treatment of generator reliability, and agrees with ERM Power's suggested wording to include the 'or improving' and 'reasonable grounds' in the sentence. Refer to Draft Determination Section 4.1.
ERM Power	MT PASA – Demand Side Participation – ERM Power's submission queried the use of the word 'committed' in the DSP section of the process document, where AEMO states "MT PASA uses the committed amounts of DSP…", as this could imply that only scheduled wholesale demand response is included in MT PASA.	AEMO agrees simply referring to 'committed' can be misleading and has updated text to refer to 'existing and committed' instead. AEMO has furthermore updated the wording to make clear it will use its most recent DSP forecast. This updated text has been moved to the RSIG, to consolidate where DSP assumptions are described. Refer to Draft Determination Section 4.6.

Organisation(s)	Comment	AEMO response
ERM Power	EAAP – Number of demand profiles – ERM Power believed there was inconsistency with the number of profiles, in that the MT PASA document said "at least ten different annual demand profiles" whereas the RSIG indicated the use of eight different historical load profiles.	AEMO agrees and has updated the Process Description to be consistent with the RSIG in the number of historical load profiles used. Refer to Draft Determination Section 5.1.
ERM Power	EAAP – Include reference to DSP in EAAP – ERM Power requested that AEMO include DSP assumptions in the EAAP Guidelines.	AEMO sees it as appropriate to have assumptions described in only one document. This approach avoids potential inconsistencies and the need to consult on multiple documents if a change is required. Thus, AEMO will continue to describe DSP assumptions in the DSP Forecasting Methodology. Refer to Draft Determination Section 5.2.
ERM Power	EAAP – Maximum Demand Capacity – ERM Power noted concern that use of the MT PASA submission values may understate capacity to meet forecast demand for average summer days and potentially unnecessarily consume energy from hydro power schemes that could otherwise be used to reduce forecast USE. ERM Power recommended consideration be given to incorporating higher capacity values for average summer days based on the process to be utilised for the 2020 ESOO.	As stated in clause 3.7C(b)(6)(A), the EAAP should take into account, where relevant, the information and MT PASA inputs referred to in clauses 3.7.1 and 3.7.2. As described in the Guidelines, this means that the EAAP uses MT PASA capacities for the purpose of its assessment. As is the case with MT PASA, the inclusion of the typical summer capacity used in the ESOO is difficult. MT PASA capacity offers can deviate from normal seasonal capacity offers due to the impact of partial outages. See Section 5.2 of the Draft Determination for more details.
ERM Power	ESOO methodology – ERM Power recommended that AEMO also consider a review of the ESOO Methodology Document to provide consistency with the RSIG, the MT PASA process and the EAAP Guidelines.	AEMO has consulted on the assumptions used in the ESOO throughout the year. The rule changes that have prompted updates to documents under this consultation do not impact the ESOO methodology. The ESOO methodology will be consulted on as part of the Reliability Forecast Guidelines consultation later this year. Refer to Draft Determination Appendix Table 5.
ERM Power	RSIG – Table 4 implementation summary – ERM Power note and accept AEMO's inclusion of "If not explicitly modelled, the USE values included in the probability weighted calculation of expected USE arising from 90% POE demand profiles are assumed to be zero.", in this Table.	The word immaterial has been used instead of the suggested "Zero" See Section 3.10 of the Draft Determination for more details.
ERM Power	EAAP – AAP principles – ERM Power were not aware that AEMO continues to publish an Annual National Transmission Statement. We understand the requirements of NER clause 5.6.5 were deleted in NER Version 30 commencing 1 July 2009.	Reference to NTP has been replaced with ISP. Refer to Draft Determination Appendix Table 4.
ERM Power	EAAP – Scenarios – ERM Power sought the use of the word 'must' regarding EAAP scenarios in Section 4.1 of the EAAP, that is, "The following scenarios must be included in the first EAAP to be published by 31 March 2010". ERM Power also sought remove 31 March 2010.	AEMO will not use 'must' because this is not a requirement. AEMO has removed reference to '31 March 2010'. Refer to Draft Determination Appendix Table 4.

Table 2 Other issues raised (in first stage submissions)

Organisation(s)	Comment	AEMO response
MEU	RSIG – Interim Reliability Measure – MEU noted concern that the proposed Interim Reliability Measures and/or reducing the trigger point impose unnecessary costs on consumers when "The reliability they see at their connection points is sufficient for their needs".	Not the subject of this consultation. Refer to Draft Determination Section 3.2.