AEMO NEM Reliability Forecasting guideline and methodology consultation

Consultation paper

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Australian Energy Market Operator Ltd ABN 94 072 010 327

Explanatory statement and consultation notice

This consultation paper commences the first stage of consultation conducted by AEMO to review a number of reliability forecasting guidelines and methodologies.

This consultation is intended to satisfy AEMO's requirements under:

- The 'Enhancing information on generator availability in MT PASA' rule change[1].
- AEMO's commitment to review processes used for projecting supply adequacy over the medium term, as specified in the market event and reviewable operating incident report for the National Electricity Market (NEM) market suspension and operational challenges in June 2022[2].
- The AER's Forecasting Best Practise Guidelines, and AEMO's Reliability Forecast Guidelines (to review AEMO's forecasting methodologies at least once every four years).
- National Electricity Rules (NER) 3.9.3D(e) (to review the Reliability Standard Implementation Guidelines at least once every four years).

Further, AEMO will implement minor and administrative changes related to the 'Integrating energy storage systems into the NEM' rule change (IESS Rule Change)[3]. Administrative changes may also apply to other AEMO documents, such as the Spot Market Operations Timetable.

The terms used in this consultation paper have the same meaning as the equivalent defined terms in NER Chapter 10, including under the IESS Rule Change.

The following guidelines and methodologies are subject to review in this consultation:

Guidelines and methodologies subject to consultation	Primary rule
Reliability Standard Implementation Guidelines (RSIG) [A]	NER 3.9.3C NER 3.9.3D
Energy Adequacy Assessment Projection (EAAP) Guidelines	NER 3.7C
Generation Information Guidelines	NER 3.7F
Medium Term Projection Assessment of System Adequacy (MT PASA) Process Description	NER 3.7.2
ESOO & Reliability Forecast Methodology	NER 3.13.3A NER 4A Parts A-C

A. AEMO intends to undertake targeted consultation required by the 'Updating Short Term PASA' rule change[4] in early 2023. RSIG elements specifically relating to ST PASA will therefore not be the focus of this consultation.

Several key issues and requirements are addressed in this consultation, and are discussed below. For the purpose of this consultation, AEMO uses the term 'reliability forecasts' to collectively describe the Electricity Statement of Opportunities (ESOO), Energy Adequacy Assessment Projection (EAAP) and Medium Term Projected Assessment of System Adequacy (MT PASA) forecasts.

[1] See https://www.aemc.gov.au/rule-changes/enhancing-information-generator-availability-mt-pasa

[2] See https://www.aemo.com.au/-/media/files/electricity/nem/market_notices_and_events/market_event_reports/2022/nem-market-suspension-and-operational-challenges-in-june-2022.pdf

[3] See https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem

[4] See https://www.aemc.gov.au/rule-changes/updating-short-term-pasa

Energy adequacy scenarios

The electricity sector is currently experiencing a transformational shift from supply sources with predictable and reliable energy supplies (i.e. thermal generation with stockpiles of, or pipeline access to, generating fuel sources) to a mix of electricity generators with variable fuel resources and limited reserves of energy (i.e. variable renewable energy generators and energy storage systems). The variable availability of new electricity supply sources requires increased consideration for energy limits that may impact the reliability of supply. The impact of energy limits has been observed in June 2022, where limited gas, coal, and renewable energy resources impacted the capability for generators to operate. AEMO requires additional inputs and model changes to appropriately understand the risks of energy limits, and to effectively and efficiently model the impact of energy limits as required by NER 3.7C. AEMO proposes methodology changes and additional Generator Energy Limitations Framework (GELF) information required from participants. It seeks stakeholder input to minimise likely costs that may be incurred by scheduled generators and integrated resource systems in preparing and providing the information.

Current scenarios specified in the EAAP Guidelines predominantly relate to drought situations, however NER 3.7C allows AEMO to consider other situations such as gas, coal or diesel shortfalls. Extremely low gas and coal availability events observed in June 2022 demonstrate the importance of such considerations in future energy adequacy projections. AEMO proposes different EAAP scenarios to better capture these risks and seeks stakeholder input to define the scenarios and their data collection requirements.

AEMO proposes various energy adequacy methodology changes, including the application of relevant GELF and generator operational parameters to all reliability forecasts.

New generation, storage, aggregated DER and transmission commitment criteria implementation

The commitment criteria and implementation determines whether a generation, integrated resource system, aggregated distributed energy resources (DER) or transmission project has made a formal commitment to construct, and therefore meets the criteria to be included in AEMO's central scenario reliability forecasts. Should the implementation be too lax, AEMO risks underestimating the required market response in the event that projects do not proceed, or are delayed. Should the implementation be too strict, AEMO risks overestimating the required market response (by ignoring projects that are already under active development). AEMO seeks stakeholder input to determine an appropriate balance of these risks.

Random outage parameters

AEMO's reliability forecasting models use random outage parameters to simulate a variety of outage categories for scheduled generation or integrated resource systems, and key inter-regional transmission flow paths. In recent reserve shortfall events, including those that occurred in June 2022, outages have been observed that do not fall within the categories that AEMO considers for reliability forecasts. AEMO proposes to collate additional outage parameters to reflect these additional outage categories from participants and include these additional outage categories in its reliability forecasts.

MT PASA Generator status and recall times

From October 2023, scheduled generator and integrated resource system participants will be required to provide status codes and recall times for periods of generator unavailability. AEMO proposes status codes consistent with the IEEE standard 762-2006, and recall times under a variety of unit status codes.

Reliability gap calculation

The 2022 ESOO identified issues with the existing process for calculating reliability gaps, gap periods and likely trading intervals. AEMO proposes to adjust the calculation method for reliability gap periods, likely trading intervals and the size of reliability gaps in megawatts (MW).

Other changes

A variety of other minor changes and issues are noted in the detailed sections of this consultation paper, as well as more information on the above proposals including AEMO's reasoning.

Consultation notice

AEMO is consulting on this proposal and invites written submissions from interested persons on the issues identified in this consultation paper to energy.forecasting@aemo.com.au by 5:00 pm (Melbourne time) on 28 November 2022.

Submissions may make alternative or additional proposals that you consider may better meet the objectives of this consultation and the national electricity objective in section 7 of the National Electricity Law. Please include supporting reasoning.

Please note the following important information about submissions:

- All submissions will be published on AEMO's website, other than confidential content.
- Please identify any parts of your submission that you wish to remain confidential, and explain why. AEMO may still publish that information if it does not consider it to be confidential, but will consult with you before doing so. Material identified as confidential may be given less weight in the decision-making process than material that is published.
- AEMO is not obliged to consider submissions received after the closing date and time. Any late submissions should explain the reason for lateness and the detriment to you if AEMO does not consider your submission.

Interested persons may request a meeting with AEMO to discuss any particularly complex, sensitive or confidential matters relating to the proposal. Meeting requests must be received by the end of the submission period and include reasons for the request. AEMO will try to accommodate reasonable meeting requests. Subject to confidentiality restrictions, AEMO will publish a summary of matters discussed at stakeholder meetings.

Given the preliminary status of the consultation topics, AEMO is not including draft or proposed methodology and guideline documents with this consultation paper. Proposed guideline and methodology drafting will be released with the draft report.

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As required by the 'Enhancing information on generator availability in MT PASA' rule change[5], the Australian Energy Regulator's (AER's) Forecasting Best Practise Guidelines (to review forecasting methodologies at least once every four years), AEMO's Reliability Forecast Guidelines (to review at least once every four years), and National Electricity Rules (NER) clause 3.9.3D(e), AEMO is consulting on its reliability forecasting guidelines and methodologies.

Note that this consultation paper uses terms defined in the NER, which are intended to have the same meanings.

AEMO's indicative process and timeline for this consultation is outlined below. Future dates may be adjusted and additional steps may be included if necessary, as the consultation progresses.

Consultation steps	Date
Consultation paper published	**31 October 2022**
Workshop on commitment criteria	7 November 2022
Workshop on energy scenarios and energy limit modelling	7 November 2022
Workshop on random outage parameters and MTPASA status codes	8 November 2022
Submissions due on consultation paper	28 November 2022
Draft report published	28 January 2023
Submissions due on draft report	27 February 2023
Final report published	30 April 2023

Given the preliminary status of the consultation topics, AEMO is not including draft or proposed methodology and guideline documents with this consultation paper. Proposed guideline and methodology drafting will be released with the draft report.

[5] See https://www.aemc.gov.au/rule-changes/enhancing-information-generator-availability-mt-pasa

2. Background

This consultation paper commences the first stage of consultation conducted by AEMO to review a number of reliability forecasting guidelines and methodologies.

This consultation is intended to satisfy AEMO's requirements under:

- The 'Enhancing information on generator availability in MT PASA' rule change[6].
- AEMO's commitment to review processes used for projecting supply adequacy over the medium term, as specified in the market event and reviewable operating incident report for the National Electricity Market (NEM) market suspension and operational challenges in June 2022[7].
- The AER's Forecasting Best Practise Guidelines, and AEMO's Reliability Forecast Guidelines (to review AEMO's forecasting methodologies at least once every four years).
- National Electricity Rules (NER) 3.9.3D(e) (to review the Reliability Standard Implementation Guidelines at least once every four years).

Further, AEMO will implement minor and administrative changes related to the 'Integrating energy storage systems into the NEM' rule change (IESS Rule Change)[8]. Administrative changes may also apply to other AEMO documents, such as the Spot Market Operations Timetable.

The terms used in this consultation paper have the same meaning as the equivalent defined terms in NER Chapter 10, including under the IESS Rule Change.

The following guidelines and methodologies are subject to review in this consultation:

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ESOO & Reliability Forecast Methodology	NER 3.13.3A NER 4A Parts A-C

A. AEMO intends to undertake targeted consultation required by the 'Updating Short Term PASA' rule change[9] in early 2023. RSIG elements specifically relating to ST PASA will therefore not be the focus of this consultation.

2.1. Context for this consultation

In addition to the regulatory framework outlined above, AEMO is undertaking the consultation to address areas for potential improvement identified following the June 2022 market event and the 2022 Electricity Statement of Opportunities (ESOO). It is not the purpose of this consultation to review the

[6] See https://www.aemc.gov.au/rule-changes/enhancing-information-generator-availability-mt-pasa

[7] See https://www.aemo.com.au/-/media/files/electricity/nem/market_notices_and_events/market_event_reports/2022/nem-market-suspension-and-operational-challenges-in-june-2022.pdf

[8] See https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem

[9] See https://www.aemc.gov.au/rule-changes/updating-short-term-pasa

events of June 2022, or the outcomes of the 2022 ESOO, but rather to consult on forecasting guidelines and methodologies to ensure they remain appropriate in future.

The identified areas for potential improvement include:

- Better consideration of energy limitations, and the potential for greater thermal fuel information to improve reliability and energy adequacy forecasting. This includes potential refinement of energy limitation scenarios in current guidelines.
- Better representation of operational generation characteristics in current reliability forecasting models to support AEMO to more accurately and comprehensively identify supply adequacy issues should participants advise of significant energy limits.
- The inclusion of certain generation outage categories in relevant methodologies, that were key contributors to the June 2022 market event and other recent actual market events.
- Improved consistency in AEMO's commitment criteria affecting new generator, integrated resource system, aggregated distributed energy resources (DER) and/or transmission assets to improve timely identification of reliability risks considering the timely availability of these assets.
- Improvements in the methodology for calculating a reliability gap period, indicative trading intervals, and reliability gap size.

2.2. The national electricity objective

Within the specific regulatory requirements applicable to this consultation, AEMO will seek to make a determination that is consistent with the national electricity objective (NEO) and, where considering options, to select the one best aligned with the NEO.

The NEO is expressed in section 7 of the National Electricity Law as:

> *to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:*
>
> *(a) price, quality, safety, reliability and security of supply of electricity; and*
>
> *(b) the reliability, safety and security of the national electricity system.*

3. Proposed improvements for consultation

AEMO proposes minor and administrative changes to guidelines and methodologies to ensure they reflect current NER definitions including those related to the 'Integrating energy storage systems in the NEM' rule change[10]. Material changes are proposed as discussed in the five following sections. AEMO also welcomes comment on any other issues related to the methodologies and guidelines under consultation.

3.1. Energy adequacy methodology and scenarios

When energy limits arose in operational timeframes in June 2022, AEMO reliability forecasting models did not identify impacts arising from the energy constraints provided by participants. In many cases, the short-term energy limits observed – for example, challenges obtaining coal, gas or diesel – were not anticipated by participants, and were therefore not provided to AEMO in advance.

AEMO has identified opportunities to improve reliability forecasting models to model the impact of energy limits more effectively and efficiently should participants advise of material energy limits in future circumstances.

While all reliability forecasts allow for various considerations of energy limitations, the EAAP is specifically defined in NER 3.7C to explore energy adequacy. The rules state that the purpose of the EAAP is to:

> *'make available to Market Participants and other interested persons an analysis that quantifies the impact of energy constraints on energy availability over a 24 month period under a range of scenarios.'*

AEMO publishes an EAAP annually, consistent with the EAAP Guidelines, however recent EAAP publications have not identified any impact arising from the energy constraints provided by participants.

Current scenarios specified in the EAAP Guidelines predominantly relate to drought situations, however NER 3.7C allows AEMO to consider other situations such as gas, coal or diesel shortfalls. Extremely low gas and coal availability events observed in June 2022 demonstrate the importance of such considerations in future energy adequacy assessments.

Further, AEMO requires additional inputs and model changes to appropriately understand the risks of energy limits, and to model the impact of energy limits effectively and efficiently.

AEMO proposes methodology changes and additional Generator Energy Limitations Framework (GELF) information required from participants.

NER 3.7C(k) requires AEMO to develop and publish EAAP guidelines that :

- define the scenarios that AEMO must study in preparing an EAAP, which may include:
  - Water conditions such as normal rainfall and drought;
  - Material restrictions on the supply of a significant fuel source;
  - Other limits on a fuel source for a major form of generation; and
  - Any other scenario that AEMO reasonably considers will have a material impact on the EAAP.

[10] See https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem

- The GELF components that Scheduled Generators must submit to AEMO when requested for the purposes of an EAAP.
- The variable GELF parameters likely to have a material impact on the EAAP, which may include:
  - Hydro storage including pump storage;
  - Thermal generation fuel;
  - Cooling water availability; and
  - Gas supply limitations.
- Define modelling assumptions for the EAAP.

EAAP scenarios

Three scenarios are specified in the current EAAP Guidelines that all relate to rainfall and drought. No scenarios relate specifically to thermal fuel limitations, although limitations that apply to thermal generators consistent with the scenarios (for example drought conditions) must be submitted:

1. *Low rainfall* – based on rainfall experienced in a specific historical period.
2. *Short-term average rainfall* – based on the average rainfall recorded over the past 10 years.
3. *Long-term average rainfall* – based on the average rainfall recorded over the past 50 years, or the longest period for which rainfall data is available should this be less than 50 years.

AEMO considers that scenarios relating to thermal fuel shortfalls should be explicitly included in the EAAP guidelines. Further, AEMO proposes scenario flexibility to avoid the need for rules consultation in future, allowing a more rapid response to future energy limitation issues.

The following scenarios are proposed:

1. *Central* scenario (previously the *short-term average rainfall scenario*) – most likely fuel availability from gas, coal, diesel, hydrogen and water resources (based on the average rainfall recorded over the past 10 years).
2. *Low Rainfall* scenario – based on the most likely fuel availability for thermal generators (as per the *Central* scenario) and considering water availability reflecting rainfall recorded in a specific historical period.
3. *Low Thermal Fuel* scenario – based on worst-case coal, gas, diesel and hydrogen availability for thermal generators and considering a high rainfall scenario reflecting the maximum rainfall recorded over the past 10 years, that may trigger water release challenges for hydro-electric generators.
4. Any other scenario that AEMO reasonably considers will have a material impact on the EAAP.

AEMO proposes discontinuing the *Long-term average rainfall* scenario, on the basis that no risks arising from low rainfall have been identified in any recent EAAP.

AEMO anticipates using the fourth scenario option to provide insights on energy adequacy risks relating to fuel supply chains, and short-term market price-exposed fuel supply challenges. Additionally, AEMO proposes to collect and model energy limits that apply to multiple generators simultaneously, for example gas supply limitations identified in the Gas Statement of Opportunities (GSOO).

While AEMO proposes to include numerous scenarios, it is proposed that AEMO continues to only declare Low Reserve Conditions (LRC) for scenarios that are reasonably probable. For example, expected unserved energy (USE) was forecast above the reliability standard in the 2018 EAAP for one of the scenarios, but AEMO did not declare LRC on the basis that this scenario was unlikely to occur.

GELF parameters

Currently AEMO can obtain GELF parameters, as specified in the EAAP Guidelines, only for the defined scenarios (the three scenarios relating to drought conditions). These GELF parameters include:

- Information about planned outages that are not flexible.
- Monthly generation output limits in gigawatt hours (GWh) for non-hydro power stations.
- Reservoir storage, inflow and operational parameters for hydro power schemes.

Operational parameters relating to thermal fuel limitations are not currently specified as GELF parameters.

AEMO proposes to collect alternative GELF parameters that would be specified in the EAAP Guidelines for the proposed scenarios:

- For hydro power schemes:
  - Reservoir storage and projected inflows (per scenario).
  - Operational parameters including minimum and maximum levels, limits on continuous operation, seasonal parameters, and outflow requirements or restrictions.
- For non-hydro power stations:
  - Current and most likely projected onsite storage of primary and secondary fuels (where applicable) (in joules).
  - Most likely projected inflows of primary and secondary fuels (where applicable) (in joules).
  - Currently contracted inflows of primary and secondary fuels (where applicable) (in joules).
  - Cooling water and demineralised water storage availability and limits.
  - Energy output limits per scenario (in megawatt hours [MWh]).
  - Operational parameters including minimum and maximum storage levels per fuel type, limits on continuous operation, seasonal parameters, and requirements or restrictions to operate.

The above proposed GELF information will allow AEMO to understand and model energy adequacy risks more appropriately, including site-specific and multi-site risks relating to fuel supply, supply chains, and fuel market scarcity as anticipated by NER 3.7C.

Energy modelling assumptions

The modelling assumptions specified in the current EAAP Guidelines predominantly align with MT PASA modelling assumptions, with the EAAP model based on the most recent MTPASA run model. Planned outages submitted to MT PASA are moved away from periods of supply scarcity should the scheduled generator specify that this outage is flexible.

AEMO proposes numerous changes to the energy modelling assumptions to increase the alignment between reliability, energy adequacy, and planning models – specifically the ESOO, EAAP, MT PASA and Integrated System Plan (ISP) modelling assumptions:

- EAAP methodology and model to predominantly align with the ESOO, where GELF parameters will be added to the ESOO model, instead of the most recent MTPASA run model.

- EAAP to apply material outages submitted to MT PASA that are not recallable.
- EAAP to apply ISP operational assumptions – as documented in AEMO's Inputs, Assumptions and Scenarios Report (IASR) – that are relevant to each EAAP scenario. This may include minimum stable level, ramp rates, and/or minimum operational timeframes.
- Relevant GELF and ISP operational assumptions may be applied to all reliability forecasts.
- MT PASA submitted energy limits to be applied to the MT PASA Loss of Load Probability (LOLP) run.

By aligning the EAAP methodology to the ESOO methodology, AEMO will gain speed and flexibility in the modelling approach. This flexibility will be required to transition the EAAP to provide strategic insights about energy adequacy risks in the NEM with rigour and accuracy. Similarly, the MT PASA LOLP run is used to provide insights about risks in the medium-term timeframe under worst case assumptions. By including energy limits, the LOLP run will better provide insights about worst case risks.

Current EAAP guidelines specify that the EAAP is to be scheduled for publication at the end of November each year. GELF parameters are acquired from participants prior to this date, in October, annually. Unless an update is required, to improve efficiencies and consolidate insights, AEMO proposes to target annual GELF collection in March-April, consistent with other ESOO data collection (for example, Forced Outage Rates and Generation Information surveys) and will incorporate the EAAP analysis within the ESOO, published by the end of August each year.

Consultation questions

1. **Do you agree that current energy adequacy scenarios and methodologies are inadequate and require modification?**
2. **Do the proposed EAAP scenarios improve the breadth and strategic and operational insight on energy adequacy risks in the NEM?**
3. **Are the proposed expanded GELF parameters appropriate for the scenarios and energy adequacy insights proposed?**
4. **Are there alternative GELF parameters that AEMO should consider that would better achieve the NER and proposed EAAP scenario intent?**
5. **Is the proposed methodology for EAAP and other energy adequacy issues appropriate?**
6. **Are there any other issues AEMO should consider when assessing energy adequacy?**

3.2. Increasing consistency of commitment criteria

AEMO's commitment criteria implementation presently determines whether a generation, integrated resource system or transmission project has demonstrated sufficient commitment to construct. If classified as committed, AEMO includes the relevant projects in AEMO's central scenario reliability forecasts, applying technical parameters provided by the relevant proponent.

Should the criteria be too lax, AEMO risks underestimating the relevant reliability gap that may emerge, and thereby underestimate the required market response in the event that projects do not proceed, or are delayed. Should the criteria be too strict, AEMO risks overestimating the required market response by identifying a reliability gap that does not present as significant a reliability risk to consumers. AEMO seeks stakeholder input on an appropriate balance of these risks.

The reliability forecast in the 2022 ESOO newly identified reliability risks due to delays of projects that had met AEMO's commitment criteria. Additionally, some advanced projects were not included in the reliability forecast in the 2022 ESOO as they had not met AEMO's commitment criteria, but stakeholders suggested they were certain to proceed in their submissions to the AER on RRO instrument requests.

In assessing commitment criteria, AEMO considers:

1. Whether there is sufficient commitment from the project developer, such that it is unlikely that they will cancel plans to develop.
2. Whether there is sufficient planning and progress from the project developer, such that it is unlikely that the commissioning timeline provided by the developer will be delayed.

Current generator and integrated resource systems commitment criteria

AEMO's current commitment criteria for generator and integrated resource systems considers five criteria, where the commitment criterion is deemed to be fully met if all questions have been answered in the positive, and partially met if deemed to have answered only some questions in the positive[11]. The five criteria are shown in Table 1.

Table 1 Five commitment criteria for generator and integrated resource system projects

Criteria	Description
Land	• Have the rights been secured for the land or sea that is required for construction of the generating unit(s)? • Have the rights been secured for the land or sea that is required for easements of new lines to connect the generating system to the transmission/distribution network?
Contracts	• Has the detailed design been completed to the extent required for a connection enquiry to be made to the relevant network service provider (NSP)? • Are contracts for the supply and construction of major plant or equipment finalised and executed (officially signed), including any provisions for cancellation payments? (Major plant and equipment include components such as generating units, turbines, boilers, transmission towers, conductors, and terminal station equipment, as relevant to the project.)
Planning	• Has an application to connect been made with a NSP? • Has a connection agreement with a NSP been signed? • Have you received AEMO's official letter of acceptance of the generator performance standards? (This is confirmed with AEMO Registrations.) • Have all relevant environmental approvals for construction and operation been obtained? • Have all relevant planning and licensing approvals, from local and state government authorities, been obtained?
Finance	• Does the project/project stage/generating unit(s) have an associated Power Purchase Agreement (PPA)? • Besides a PPA, are there other financing arrangements in place (such as merchant financing and/or long term State or Federal Government funding)? • Has the Final investment Decision (FID) been reached (signed off), under the usual commercial definition of official Board financial approval regarding when, where and how much capital is being spent?
Construction	• Has a firm construction start date (or range) been set? Provide the earliest likely date, and the latest likely date, for commencement of construction or installation at the Site. • Has construction or installation commenced at the Site? If so, provide the actual date that construction commenced. • Has a Full Commercial Use Date (or range) been set, that is, the date from which the generating system is planned to have received official approval (sign-off) of all commissioning tests, from AEMO and the NSP? If so, provide the earliest likely date, and the latest likely date, for Full Commercial Use.

[11] See the 'Background Information' tab of the Generation Information publication https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information

The criteria are then converted to commitment status and implemented in the reliability forecasts[12] as follows:

1. **Committed** developments are those that have fully met all of the above criteria. They are included in all reliability forecasts using the last full commercial use date provided by the developer.
2. **Committed*** developments are those that fully meet at least four of the above criteria but may only partially meet either contracts or planning criteria. They are included in all reliability forecasts at the latest of either the first day after the T-1 financial year for Retailer Reliability Obligation (RRO) purposes[13], or the last full commercial use date provided by the developer.
3. **Anticipated** developments are those that fully meet at least three of the above criteria, and have updated their submission in the previous six months. They are not included in the reliability forecasts but may be included in sensitivities.
4. **Publicly announced** developments are those that do not meet any of the above commitment status requirements. They are not included in the reliability forecasts.

Generating and integrated resource systems commissioning analysis

AEMO assessed project progression by analysing Generation Information publications between August 2019 and August 2022. During this time, 30 projects were identified as being in both the 'Committed' and 'In service' status during the analysis timeframe, indicating that commissioning was completed during this period.

As part of the survey process, developers are required to submit the range of dates in which they expect to fully complete commissioning, often referred to as a the 'full commercial use date' (FCUD). AEMO publishes and utilises the last date provided in the range. On average, projects took 576 days from becoming 'Committed' to becoming 'In service', while on average, developers assumed this would only take 150 days, indicating an average delay against developer provided information of over 400 days. No committed project was identified as not having progressed.

As a result of the information provided to AEMO by the developers of committed projects, the forecast availability of generation in AEMO's reliability forecasts has routinely been overstated by greater than 1 gigawatt (GW). Table 2 shows the one-year ahead capacity forecast in the last three ESOO publications, against the capacity available throughout summer, incorporating commissioning hold points.

Table 2 Installed capacity forecast accuracy assessment

Publication	Forecast operational capacity (MW)	Actual operational capacity (MW)	Difference (MW)
2019 ESOO (2019-20 summer period)	53,204	52,156	-1,048
2020 ESOO (2020-21 summer period)	55,997	53,887	-2,090
2021 ESOO (2021-22 summer period)	56,872	55,592	-920

In this analysis timeframe, no 'Anticipated' project was identified as having completed commissioning, but the FCUD provided by some developers at the time of becoming 'Anticipated' is already in the past.

[12] See section 2.6 of the ESOO and Reliability Forecast methodology https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2022/esoo-and-reliability-forecast-methodology-document-2022.pdf

[13] For example, 1 July 2024 is the first day after the T-1 financial year as applied to the 2022 ESOO.

In the last three years, only one 'Anticipated' project has become 'Publicly Announced' and has not yet become 'Anticipated' again.

There are multiple explanations for why generators may complete commissioning later than the date provided to AEMO by the developer. These could include:

- Poor estimation of commissioning timeframes by developers
- Unforeseen construction and commissioning delays due to parts or labour unavailability
- Unforeseen commissioning delays due to complexities in the connections process.

AEMO has been working with the Clean Energy Council to implement the Connections Reform Initiative[14] to address concerns with delays and increasing complexity in connections to the NEM. This project has a vision to:

- Provide a connections process which is consistent, predictable and which delivers repeatable outcomes.
- Improve efficiency, including by reducing (eliminating) re-work, improving the quality coming into the process and addressing information asymmetry.
- Enable a collaborative working model between industry, AEMO and network service providers (NSPs).

Additionally, AEMO will continue to work with generator and integrated resource system developers through the Generation Information process to encourage the provision of more accurate FCUD information.

Proposed generator and integrated resource systems commitment assessment

AEMO proposes to balance the risk of over- or under-estimating the reliability risks, and therefore the required reliability market response, by adjusting the interpretation of the commitment criteria so as to adjust the inclusion of projects in the reliability forecasts. While AEMO does not propose any changes to the five commitment criteria and questions, changes are proposed to how these categories are used.

AEMO proposes the following methodology changes for generation and integrated resource systems:

1. Committed projects that have met the commissioning requirements of their first hold point to be included in reliability forecasts at:
   (a) the FCUD submitted by the developer.
2. Committed projects that have not met the commissioning requirements of their first hold point to be included in reliability forecasts at:
   (a) Six months after the FCUD submitted by the developer.
3. Committed* projects to be included in reliability forecasts at the furthest date of either:
   (a) The first day after the T-1 year for RRO purposes[15], or
   (b) The FCUD submitted by the developer.
4. Anticipated projects to be included in the reliability forecast at the furthest date of either:

[14] See https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/connections-reform-initiative

[15] For example, 1 July 2024 is the first day after the T-1 financial year as applied to the 2022 ESOO.

(a) the first day after the T-1 year for RRO purposes[16], or

(b) One year after the FCUD submitted by the developer.

These proposed changes seek to include a greater number of projects that are sufficiently likely to proceed, while sufficiently delaying developments that are less advanced and more prone to delays.

Transmission developments

AEMO's current commitment criteria for transmission developments in the ESOO reliability forecast consider whether the development has successfully completed a Regulatory Investment Test for Transmission (RIT-T), or equivalent for smaller projects[17]. All dates are implemented as provided by the developer.

Transmission developments in MT PASA and EAAP are only included where captured in operational constraints. No changes are proposed for MT PASA, however it is proposed that EAAP utilise ESOO methodologies (see section 3.1).

AEMO proposes to deploy a criteria consistent with the ISP methodology[18] and the CBA Guidelines (and the RIT-T instrument[19]). If the transmission project has satisfied all five criteria (similar to generation above), it is defined in the glossary of the RIT-T instrument as a committed project. If the project is in the process of meeting at least three of the criteria, it is defined as an anticipated project.

AEMO proposes the following application of commitment criteria for transmission developments:

1. Committed projects to be included in the ESOO and EAAP reliability assessments at the:
    (a) commissioning dates provided by the developer.
2. Anticipated projects to be included in the ESOO and EAAP reliability assessments at:
    (a) One year after the commissioning dates provided by the developer.

These proposed changes seek to include a greater number of projects that are likely to proceed, while sufficiently delaying developments that are less advanced and more prone to delays. They will improve the alignment with the application of the criteria with other generator and integrated resource system projects.

Aggregated DER developments

AEMO's current approach is to include all aggregated DER developments forecast in the central scenario in the ESOO reliability forecast. Applying all forecast developments is standard in AEMO's forecasting approach for most components of demand forecasting, except demand side participation (DSP) which is treated as a supply side component. Aggregated DER is however also a supply side component and is modelled by AEMO as being available for simulated dispatch alongside generators, integrated resource systems and DSP.

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[16] For example, 1 July 2024 is the first day after the T-1 financial year as applied to the 2022 ESOO.

[17] See section 3.5 of the ESOO and Reliability Forecast Methodology, at https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2022/esoo-and-reliability-forecast-methodology-document-2022.pdf

[18] See https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-isp-methodology.pdf?la=en

[19] See https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20investment%20test%20for%20transmission%20-%2025%20August%202020.pdf

This current approach (of not applying commitment criteria) is inconsistent with that applied to generation and integrated resource systems, transmission developments, and DSP. Further, Section 6.2 of the 2022 ESOO highlighted the potential reliability impact of this inconsistency.

Aggregated DER developments are not included in MT PASA or EAAP, unless registered as a generator or integrated resource system participant. AEMO does not propose to change this approach for MT PASA.

AEMO proposes to include only those aggregated DER developments that can be identified as having committed in the ESOO and EAAP forecasts. Forecast DER that is not yet deemed committed will be modelled without aggregation.

Consultation questions

7. **Do you agree that AEMO's current commitment criteria require revision?**
8. **Does AEMO's proposed generation and integrated resource system commitment criteria implementation balance the risks of over or underestimating the required reliability market response?**
9. **Does AEMO's proposed transmission commitment criteria implementation balance the risks of over or under estimating the required reliability market response?**
10. **Does AEMO's proposed application of the commitment criteria to aggregated DER balance the risks of over or under estimating the required reliability market response?**
11. **Are there any other issues AEMO should consider in its commitment criteria and implementation?**

3.3. Random outage parameters

AEMO's reliability forecasting models use random outage parameters to simulate a variety of outage categories for scheduled generators, integrated resource systems, and key inter-regional transmission flow paths. In recent low reserve events, including those that occurred in June 2022, outage categories that have not previously been considered in AEMO's reliability forecasts were observed to have affected supply availability. To more accurately forecast reliability risks, AEMO proposes to include these outage categories in its reliability forecasts, and collect additional outage parameters from participants to enable this inclusion.

Generator and integrated resource system outages

For scheduled generators, AEMO currently collect outage parameters for five different outage categories from generator and integrated resource system participants (see Table 3).

Table 3 Current outage categories collected from generator and integrated resource system participants

Outage category	Description
1. Full forced outage, committed state	An unplanned outage where the unit is fully unavailable, that occurred when the unit was in operation.
2. Full forced outage, available but not committed state	An unplanned outage where the unit is fully unavailable, that occurred when the unit was available for operation, but not actually in operation.
3. Partial forced outage, committed state	An unplanned outage where the unit is only partially unavailable, that occurred when the unit was in operation.

Outage category	Description
4. Partial forced outage, available but not committed state	An unplanned outage where the unit is only partially unavailable, that occurred when the unit was available for operation, but not actually in operation.
5. Failed start	An unplanned outage where the unit is unavailable because it failed to start.

AEMO models generator and integrated resource system outages in all reliability forecast models, in which the rate is applied only to the time when a unit is simulated to operate. As such, AEMO requires the information on whether the unit was in a committed state, or available but not committed state, to align the rate with the simulation approach. Planned outages, and outages that occur in an uncommitted state, are not currently modelled by AEMO in reliability forecasts, as they are assumed to be able to be shifted if required to avoid or reduce reliability risks.

In calculating historical rates, and in applying the outage rates to forecast periods, AEMO currently applies only outages that occurred in a committed state, and those during a failed start (categories 1, 3 and 5). AEMO removes long duration outages from included categories (categories 1, 3 and 5) – greater than 5 months – for separate treatment, then derives outage rates using the following equations:

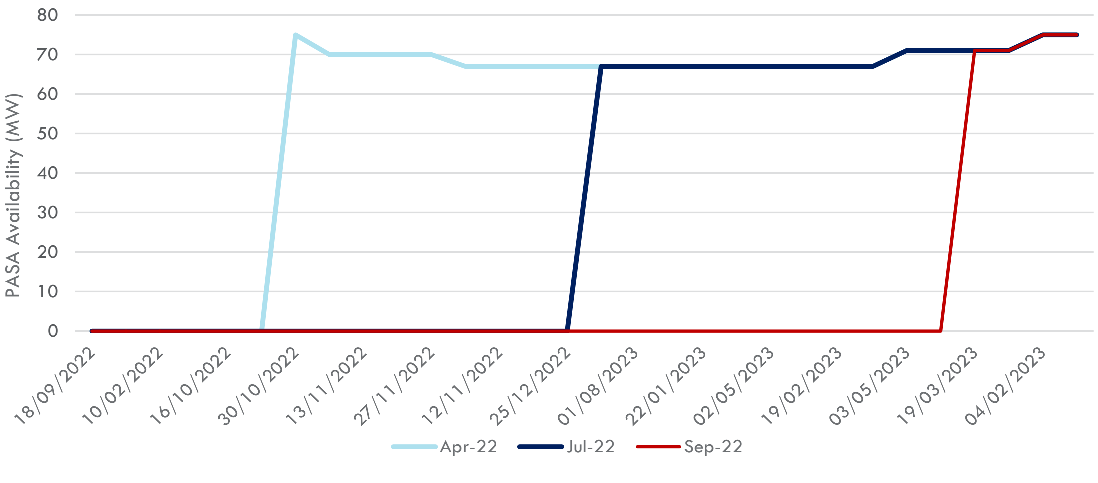
$$\text{Full Unplanned Outage Rate} = \frac{\text{Total hours in (full forced outage, committed state + failed start state)}}{\text{Total hours in (committed state + full forced outage state + failed start state)}}$$

$$\text{Partial Unplanned Outage Rate} = \frac{\text{Total hours in (partial forced outage, committed state)}}{\text{Total hours in (committed state + partial forced outage, commited state)}}$$

The operators of coal-fired and large gas-fired generators are asked to provide 10-year projections of outage rates, calculated on the same basis as the above equations. AEMO applies these provided projections in most cases unless they are not sufficiently justified. For all other generators, the last four years of historical rates are applied to the forecast period.

Figure 1 shows an example where a generator participant has rescheduled the return to service of a particular unit due to unexpected complications. Forecasts based on the original method overestimate supply availability for affected periods because the possibility of future outage extensions is not simulated.

Figure 1 Generator changed availability while in maintenance



This process captures the majority of unplanned outages that are impacting supply availability in reliability forecasts. It excludes, however, outage categories which have been contributors to recent market events, including those observed in June 2022:

- Unplanned outages, which have occurred while the unit was available, but not committed. This may include maintenance outages as defined by IEEE 762-2006.
- Planned outages that have extended beyond their original timeframes due to complications and unexpected issues.

AEMO considers that planned outages that proceed as planned should be excluded from ESOO and EAAP forecasts, on the basis that planned outages will predominantly be scheduled outside periods of supply scarcity. Failure to include the additional outage categories listed above in ESOO and EAAP simulations may, however, result in persistent gaps between forecast and actual supply availability.

To improve its reliability forecasting for scheduled generators in reliability forecasts, AEMO proposes to collect seven different outage categories from generator and integrated resource system participants (see Table 4).

Table 4 Proposed outage categories to be collected from generator and integrated resource system participants

Outage category	Description
1. Unplanned outage, committed state	An unplanned outage where the unit is fully unavailable, that occurred when the unit was in operation.
2. Unplanned outage, available but not committed state	An unplanned outage where the unit is fully unavailable, that occurred when the unit was available for operation, but not actually in operation.
3. Partial unplanned outage, committed state	An unplanned outage where the unit is only partially unavailable, that occurred when the unit was in operation.
4. Partial unplanned outage, available but not committed state	An unplanned outage where the unit is only partially unavailable, that occurred when the unit was available for operation, but not actually in operation.
5. Failed start	An unplanned outage where the unit is unavailable because it failed to start.
6. Full planned outage extension	Periods where a planned outage has been extended.
7. Partial planned outage extension	Periods where a planned derating has been extended.

The first five categories are the same as current categories, but have been renamed to make it clear that all unplanned outages should be included, not just those that were forced. The sixth and seventh categories are additional, which AEMO believes are important to include in its assessment when considering reliability.

In applying the outage rates to forecast periods, AEMO proposes a methodology that considers all relevant outage categories. Consistent with the current approach, AEMO proposes to remove long duration outages from all categories – greater than five months – for separate treatment, then derive outage rates using the following equations:

$$\text{Full Unplanned Outage Rate} =$$

$$\frac{\text{Total hours in (full unplanned outage, committed state + failed start state)}}{\text{Total hours in (committed state + full unplanned outage, committed state + failed start state)}}$$

$$+ \frac{\text{Total hours in (full unplanned outage, available but not commited state + full planned outage extension state)}}{\text{Total hours in year}}$$

$$\text{Partial Unplanned Outage Rate} = \frac{\text{Total hours in (partial unplanned outage, committed state)}}{\text{Total hours in (committed state + partial unplanned outage, commited state)}} + \frac{\text{Total hours in (partial unplanned outage, available but not committed state + partial planned outage extension state)}}{\text{Total hours in year}}$$

AEMO proposes to retain all other elements of the current approach, including the obligation for coal-fired and large gas-fired generator participants to provide 10-year outage rate projections, consistent with the updated equations.

Long duration outage rates are modelled by AEMO as a separate parameter, which takes into consideration the historical data of at least the past 10 years. AEMO proposes that long duration outages will be applied to all technologies (if applicable) and will consider all types of unplanned outages and extended planned outages.

$$\textit{Long Duration Outage Rate} = \frac{\sum \text{Long Duration outage hours}}{\sum \text{Total Hours in all states}}$$

Inter-regional transmission unplanned outages

In January 2022, AEMO consulted on its methodology for modelling inter-regional transmission unplanned outages in the ESOO[20].

In response to the 2022 ESOO and associated RRO requests published in August 2022, some stakeholders suggested that the methodology used by AEMO overstated the risks and magnitudes of USE.

AEMO's current approach is to calculate an outage rate that considers the historical rate of occurrence for both single credible contingencies and reclassifications on identified inter-regional flow paths. When the rate is applied to simulated outcomes in forecast years, however, the outage is simulated by using constraints applied during a single credible contingency only. As the constraints applicable during single credible contingencies are typically more onerous than those applicable during reclassifications, it was suggested by stakeholders this incorrectly increases the forecast volume of USE.

In AEMO's T-1 Reliability Instrument Request for South Australia[21] to the AER, AEMO indicated that inter-regional transmission unplanned outage rates were of low materiality to the forecast reliability gap, with an estimated 1 MW impact on average forecast USE in South Australia in 2023-24. AEMO considers that this forecasting input is of sufficiently low materiality that it does not justify additional granularity and that the current methodology is fit for purpose.

AEMO instead proposes to include provision in the ESOO methodology that would require AEMO to apply both single credible contingency and reclassification constraint sets to its ESOO and EAAP simulations only in circumstances where the outage rates forecast is likely to have a material impact on expected USE.

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[20] See https://aemo.com.au/-/media/files/stakeholder_consultation/working_groups/other_meetings/frg/consultations/2022/frg-consultation---unplanned-transmission-outage-rates.zip?la=en

[21] See https://www.aer.gov.au/system/files/AEMO%20-%20Reliability%20Instrument%20Request%20SA%20T-1.pdf

Consultation questions

12. Do you agree that AEMO's current outage rate methodology requires revision?

13. Does AEMO's proposed generator and integrated resource system outage rate methodology appropriately capture reliability risks?

14. Does AEMO's inter-regional transmission outage rate methodology appropriately capture reliability risks?

15. Are there any other outage categories AEMO should consider in its reliability forecasts?

16. Are there any other issues AEMO should consider in its outage rate methodology?

3.4. MT PASA generator status and recall times

The 'Enhancing information on generator availability in MT PASA' rule change was one of the Energy Security Board's (ESB's) post-2025 recommendations to improve resource adequacy outcomes in the NEM. The final rule was published by the Australian Energy Market Commission (AEMC) on 18 August 2022. The rule builds on existing MT PASA requirements, which require generators and integrated resource systems to indicate how many megawatts they could make available each day over the medium-term horizon (between seven days and 36 months into the future). In addition to providing the megawatt availability, the final rule requires scheduled generators to also provide a:

- *Unit state* – that is, a scheduled generating or integrated resource system's availability or unavailability and the reason for its availability or unavailability. The unit state must distinguish between a physical and economic reason for unavailability.
- *Unit recall time* – to indicate the period in which the plant could be made available under normal conditions after a period of unavailability.

AEMO is required to consult with stakeholders to identify the process for, and the form of, reason code and recall time information. AEMO must update the Reliability Standard Implementation Guidelines (RSIG) and the MT PASA process description by 30 April 2023 to reflect the consulted-on reason code and recall time information requirements. The first element of this rule commences on 9 October 2023.

Reason codes

In response to participant feedback, the AEMC's final rule change determination suggested a preference for fewer reason codes, to minimise participant costs. New clause 3.7.2(d1)(1) of the NER requires that reason codes distinguish between a physical and economic reason for unavailability. Stakeholders have often suggested to use outage categories consistent with IEEE standard 762-2006 which AEMO proposes for this purpose. AEMO seeks participant suggestions regarding the form of reason codes that would best meet the NER, NEO and PASA objective.

Recall times

Recall times will apply to certain outage reason codes, and not to others. In some cases, an optional recall time may be preferable. AEMO seeks participant suggestions regarding the application of recall times that would best meet the NER, NEO and PASA objective.

Proposed solution

AEMO proposes a solution that considers the NER requirements and feedback regarding the use of IEEE 762-2006, as shown in the following table.

Table 5 Proposed MT PASA reason codes and recall time requirements

Reason code category	Reason code	Economic or physical	Recall time requirements
Deactivated shutdown	Inactive reserve	Economic	Mandatory
Deactivated shutdown	Mothballed	Economic	Mandatory
Deactivated shutdown	Retired	Economic	None
Available	No deratings	Not applicable	None
Available	Basic planned deratings	Physical	Mandatory if available
Available	Extended planned deratings	Physical	Mandatory if available
Available	Unplanned forced deratings	Physical	Mandatory if available
Available	Unplanned maintenance deratings	Physical	Mandatory if available
Unavailable	Basic planned outage	Physical	Mandatory if available
Unavailable	Extended planned outage	Physical	Mandatory if available
Unavailable	Unplanned forced outage	Physical	Mandatory if available
Unavailable	Unplanned maintenance outage	Physical	Mandatory if available

AEMO proposes that all definitions from IEEE 762-2006 apply to the proposed reason codes. Further, the ‘No deratings’ category should be used when submitted PASA availability represents ‘Dependable capacity’ not just ‘Maximum capacity’ as defined in the standard, which would therefore include ‘Seasonal derating’.

Consistent with all other MT PASA inputs, AEMO proposes that recall times be expressed in whole days. Recall times submitted for a specific day should represent the advance notice required to make the unit available on the day for which the recall time has been submitted. Recall times should not be submitted to represent the number of days following the day for which the recall time has been submitted until the unit is expected to be next available.

For many reason codes, AEMO recognises that recall times may not be available. For example, a unit may not be able to be brought back to service in a timely manner once planned maintenance has begun. In these cases where AEMO has proposed ‘Mandatory if available’ recall times, AEMO proposes that these are mandatory only where recall information applies, and NULL submissions are therefore valid if recall is not possible.

How reason codes and recall times may work in practise

The following example demonstrates how the above reason codes could work in practice. The table depicts an example MT PASA submission for a combined cycle gas turbine with a 110 MW maximum capacity and a 100 MW dependable capacity in summer, considering seasonal deratings. Due to fuel supply and operational limitations, the unit is subject to weekly energy limits approximately equal to a 20% average capacity factor. The submission covers the following events:

- 31/12/2023 to 2/1/2024 – Plant expected to be fully available, considering summer derating.
- 3-5/1/2024 – Planned boiler maintenance, plant expected to be part-available as open-cycle gas turbine with two-day recall to full availability.

- 6-7/1/2024 – Plant expected to be fully available, considering summer derating.
- 8-9/1/2024 – Planned major plant upgrade, expected to be unavailable, no recall time required due to complex physical works.
- 10-12/1/2024 – Market conditions expected to be unfavourable, plant in reserve shutdown with two-day recall.
- 13/1/2024 – Plant expected to be fully available, considering summer derating.

Table 6 Indicative MT PASA submission

Trading date	PASA availability (MW)	Weekly energy limit (MWh)	Reason code	Recall time (days)
31/12/2023	100	3,408	No Derating	
01/01/2024	100		No Derating	
02/01/2024	100		No Derating	
03/01/2024	70		Basic Planned Derating (Physical)	2
04/01/2024	70		Basic Planned Derating (Physical)	2
05/01/2024	70		Basic Planned Derating (Physical)	2
06/01/2024	100		No Derating	
07/01/2024	100	960	No Derating	
08/01/2024	0		Basic Planned Outage (Physical)	
09/01/2024	0		Basic Planned Outage (Physical)	
10/01/2024	0		Inactive Reserve (Economic)	2
11/01/2024	0		Inactive Reserve (Economic)	2
12/01/2024	0		Inactive Reserve (Economic)	2
13/01/2024	100		No Derating	

Consultation questions

17. Do the proposed reason codes and recall times appropriately balance market needs for information against the costs and challenges for generators in providing the information?

18. Are there any other issues AEMO should consider when determining the reason codes and recall times?

3.5. Reliability gap calculation

Part 2A of the National Electricity Law (NEL) requires AEMO to forecast the occurrence of reliability gaps in future years, where:

- NEL14G(1) – A *forecast reliability gap* occurs when the amount of electricity forecast for a region, in accordance with the Rules, does not meet the reliability standard to an extent that, in accordance with the Rules, is material.
- NEL14G(2) – A *forecast reliability gap period* is the period during which a forecast reliability gap is forecast to occur.

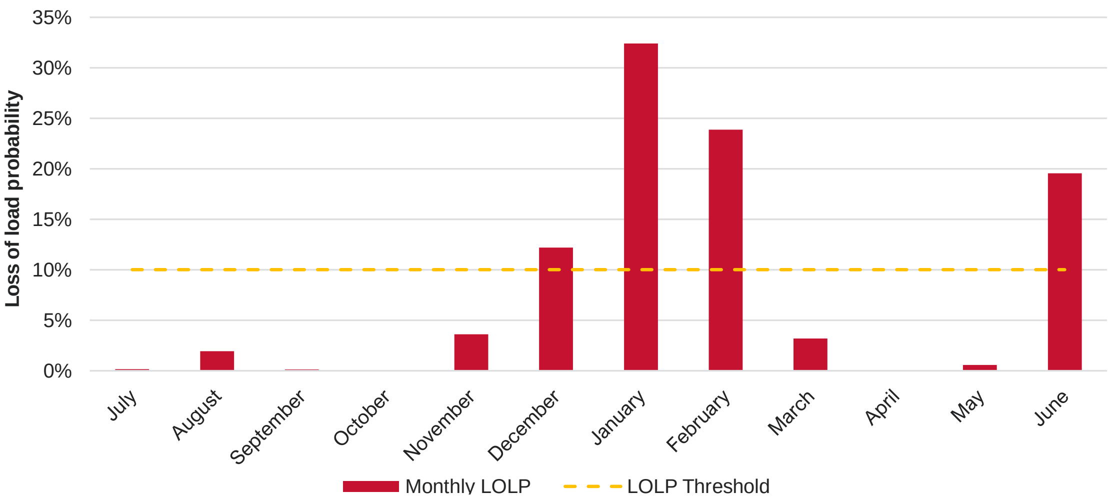
Further, AEMO's reliability forecast must include "*the trading intervals during the forecast reliability gap period in which the forecast unserved energy observed during the forecast reliability gap is likely to occur*" (NER clause 4A.B.2(c)).

Given the probabilistic nature of the reliability assessment deployed by AEMO, a methodology is required for identifying the likely trading intervals of the reliability gap period, and reliability gap in megawatts. Should this methodology be indiscriminate in identifying gaps, it has the potential to increase costs to retailers. Conversely, should this methodology be too narrow in identifying gaps, it will not capture the periods where reliability risks to consumers are likely to occur, and will therefore not meet the requirements of the NEL and NER.

Current reliability gap calculation methodology

AEMO has previously consulted on a methodology[22] for defining reliability gap periods, likely trading intervals and reliability gaps, which is reflected in AEMO's current ESOO and Reliability Forecast Methodology. The methodology identifies time periods that form reliability gap periods or indicative likely trading intervals as those that exceed specified LOLP thresholds as shown in Figure 2. The reliability gap (in megawatts) is calculated as the capacity required to reduce expected USE to the applicable reliability standard during the likely trading intervals of the reliability gap periods only. As per the methodology, AEMO is to use a 10% LOLP threshold unless the reliability gap is incalculable, then decrease in 2% increments only until it is calculable. In the example shown, December, January, February and June exceed the threshold and are therefore considered part of the reliability gap period.

Figure 2 Conceptual loss of load probability assessment showing months relative to LOLP threshold



The 2022 ESOO modelling incorporated higher variable renewable energy uptake than was assumed when this methodology was developed, which has resulted in some outcomes of the application of the LOLP thresholds that no longer meet the requirements of the NEL and NER, because so much of the forecast USE fell outside the identified likely trading intervals of the reliability gap period. Table 7 and

[22] See https://aemo.com.au/en/consultations/current-and-closed-consultations/reliability-forecasting-methodology-issues-paper

Table 8 show the calculated reliability gap periods, likely trading intervals, and reliability gaps for a variety of LOLP thresholds for South Australia in 2023-24 and New South Wales in 2025-26 respectively.

Table 7 Forecast reliability gaps for various LOLP thresholds, South Australia, 2023-24

LOLP threshold	10%	8%	6%	4%	2%	All periods
Reliability gap period	Incalculable	8 Jan – 31 Jan	8 Jan – 31 Jan	8 Jan – 31 Jan	8 Jan – 29 Feb	All periods
Likely trading intervals		6:00 pm – 8:00 pm working weekdays	6:00 pm – 9:00 pm working weekdays	5:00 pm – 9:00 pm working weekdays	5:00 pm – 9:00 pm working weekdays	
Expected USE for the gap period (GWh)		0.07	0.10	0.11	0.12	0.14
Percentage of expected USE captured within the gap period		54%	72%	80%	87%	100%
Reliability gap size (MW)		500	320	270	230	170

Table 8 Forecast reliability gaps for various LOLP thresholds, New South Wales, 2025-26

LOLP threshold	10%	8%	6%	4%	2%	All periods
First reliability gap period	**Dec – Feb**	**Dec – Feb**	**Dec – Feb**	**Dec – Feb**	**Nov-Mar**	All periods
First likely trading intervals	2:00 pm – 9:00 pm weekdays	2:00 pm – 10:00 pm weekdays	1:00 pm – 10:00 pm weekdays	1:00 pm – 10:00 pm all days	1:00 pm – 10:00 pm all days	
Second reliability gap period	Jun	Jun	Jun	Jun	Jun	
Second likely trading intervals	5:00 pm – 9:00 pm weekdays	5:00 pm – 9:00 pm weekdays	5:00 pm – 9:00 pm weekdays	4:00 pm – 9:00 pm weekdays	4:00 pm – 10:00 pm weekdays	
Expected USE for the gap periods (GWh)	3.28	3.31	3.34	3.50	3.84	3.90
Percentage of expected USE captured within the gap period	84%	85%	86%	90%	98%	100%
Reliability gap size (MW)	790	770	760	690	590	570

In the 2022 ESOO, AEMO identified numerous deficiencies with the consulted-on methodology. The methodology was prescriptive, which did not allow AEMO the flexibility to respond to observations in the data. AEMO deviated from the consulted-on methodology on the basis that the 2023-24 gap periods identified in South Australia by the methodology (using the 8% LOLP threshold) were not consistent with the requirements of the NEL or the NER.

Identified deficiencies included:

- The indicative trading intervals of the reliability gap periods did not capture the majority of forecast USE.
- The limited sampling of 12 reference years resulted in bias amongst forecast USE. For example, maximum demand forecasts indicated the possibility of maximum demand events between December and March, whereas the reliability risks identified from the limited sample of only 12 reference years predominantly arose in January. AEMO considers it prudent that a greater gap period, to cover forecast maximum demand projections would have been more appropriate.
- The calculated reliability gap in megawatts was not reflective of the true capacity requirement given the methodology of identifying the gap as the capacity required to reduce the reliability forecast to within the relevant reliability standard through reduced reliability risks within the reliability gap period only. Extending this reliability gap period revealed a much lower reliability gap, commensurate with the size of capacity required if available throughout the year (as could be expected of a new development, or a newly flexible customer load).

Proposed reliability gap calculation methodology

AEMO proposes the following methodology changes:

1. AEMO calculates the reliability gap in megawatts as the capacity required to reduce expected USE to the relevant reliability standard, assuming the capacity is available in all periods of the year (rather than in a narrower reliability gap period).
2. AEMO calculates the likely trading intervals and the reliability gap period such that the likely trading intervals of the reliability gap period contain at least 90% of forecast USE. This methodology is to be flexible, such that AEMO may accurately represent the true nature of the identified reliability risk. When identifying the periods, AEMO must have regard to:
    (a) Periods within the year that have a high LOLP in reliability forecast modelling (monthly and hourly analysis similar to existing process).
    (b) Periods within the year in which maximum demand is forecast to approach (for example, 99^{th} percentile demand) the one-in-two year (50% POE) peak demand forecast (monthly and hourly analysis to complement LOLP analysis, in cases where limited sampling is biasing modelled results)
    (c) The availability of standard contract periods on a suitably liquid and transparent futures market, for example contracts available on the ASX Electricity Futures Market. This may include contract periods that exclude non-working weekdays and/or periods that fall outside available standard contract periods where feasible).

Consultation questions

19. Do you agree that the reliability gap methodology requires revision?

20. Does the proposed methodology for calculating the likely trading intervals of the reliability gap period, and reliability gaps in megawatts appropriately meet the requirements of the NEL and NER while not unduly increasing costs for retailers?

21. Are there any other issues AEMO should consider in its reliability gap methodology?

4. Summary of issues for consultation

Submissions may be made on any matter relating to the proposal discussion in this consultation paper. AEMO would welcome particular comment and feedback on the following matters. AEMO would also welcome additional feedback on relevant and material issues not described in this Consultation paper.

Consultation questions

Energy adequacy methodology and scenarios

1. **Do you agree that current energy adequacy scenarios and methodologies are inadequate and require modification?**
2. **Do the proposed EAAP scenarios capture the required breadth and provide the right level of strategic and operational insight on energy adequacy risks in the NEM?**
3. **Are the proposed GELF parameters appropriate for the scenarios and energy adequacy insights proposed?**
4. **Are there alternative GELF parameters that AEMO should consider that would better achieve the NER and proposed EAAP scenario intent?**
5. **Is the proposed methodology for EAAP and other energy adequacy issues appropriate?**
6. **Are there any other issues AEMO should consider when assessing energy adequacy?**

Increasing consistency of commitment criteria

7. **Do you agree that AEMO's current commitment criteria require revision?**
8. **Does AEMO's proposed generation and integrated resource system commitment criteria implementation balance the risks of over or underestimating the required reliability market response?**
9. **Does AEMO's proposed transmission commitment criteria implementation balance the risks of over or underestimating the required reliability market response?**
10. **Does AEMO's proposed aggregated DER commitment criteria implementation balance the risks of over or underestimating the required reliability market response?**
11. **Are there any other issues AEMO should consider in its commitment criteria and implementation?**

Random outage parameters

12. **Do you agree that AEMO's current outage rate methodology requires revision?**
13. **Does AEMO's proposed generator and integrated resource system outage rate methodology appropriately capture reliability risks?**
14. **Does AEMO's proposed inter-regional transmission outage rate methodology appropriately capture reliability risks?**
15. **Are there any other outage categories AEMO should consider in its reliability forecasts?**
16. **Are there any other issues AEMO should consider in its outage rate methodology?**

MT PASA generator reason codes and recall times

17. **Do the proposed reason codes and mandatory recall times appropriately balance the market needs for information against the costs and challenges for generators in providing the information?**
18. **Are there any other issues AEMO should consider when determining the reason codes and recall times?**

Reliability gap methodology

19. **Do you agree that the reliability gap methodology requires revision?**
20. **Does the proposed methodology for calculating the likely trading intervals of the reliability gap period, and reliability gaps in megawatts appropriately meet the requirements of the NEL and NER while not unduly increasing costs for retailers?**
21. **Are there any other issues AEMO should consider in its reliability gap methodology?**

General

22. **Are there any issues not described in the consultation paper that AEMO should consider in this review that materially influence the reliability forecasts AEMO produces?**