

# Important notice

## Purpose

AEMO has prepared this document under clause 3.11A.2A of the Wholesale Electricity Market Rules.

## Disclaimer

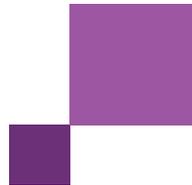
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## Version control

Version	Release date	Changes
1	9/12/2022	First issue
2	15/12/2022	Resubmission



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# 1 Reliability service

## 1.1 Proposal

AEMO has identified material risks that (in the absence of a targeted response) may prevent the secure and reliable operation of the South West interconnected system (SWIS) under peak demand and minimum demand operating conditions from October 2024 to October 2025. These risks are emerging due to several factors, including but not limited to:

- Peak demand risks:
  - the impact of fuel supply uncertainty and other factors on facility availability;
  - higher-than-expected Forced Outage rates; and
  - forecasted lack of new capacity in the 2022 Capacity Cycle to replace known facility retirements.
- Minimum demand risks:
  - increased penetration of Distributed Photovoltaics (DPV), which reduces operational demand below AEMO’s forecasted Power System Security threshold;
  - lack of load participation during system minimum demand events; and
  - lack of alternatives to existing emergency mechanisms such as emergency solar management.

## 1.2 Trigger

As a consequence of the risks identified, clause 3.11A.2A of the Wholesale Electricity Market Rules (WEM Rules) requires AEMO to develop this submission to request the Coordinator of Energy (Coordinator) to determine whether or not to trigger a Non-Co-optimised Essential System Service (NCESS) procurement process. This trigger submission must include sufficient information and analysis to allow the Coordinator to consider the following factors outlined in clause 3.11A.7:

- a) the extent to which an NCESS will address the issue;
- b) the extent to which an NCESS will minimise costs in the Wholesale Electricity Market (WEM);
- c) the relative merits between procuring an NCESS or augmenting the network;
- d) the outcome of any investigation of behaviour that reduces the effectiveness of the market, including behaviour related to market power;
- e) whether the procurement of an NCESS is consistent with the Wholesale Market Objectives; and
- f) whether procurement of an NCESS will be in the long-term interests of consumers.

AEMO’s analysis indicates there is a material risk that expected facility capability in the WEM will be insufficient to manage forecast demand at both peak and minimum demand levels. AEMO considers the existing mechanisms under the WEM Rules may not be sufficient to address this risk. This trigger submission summarises AEMO’s

technical and economic assessment of this risk and proposes procurement of services under the NCESS framework.

## 1.3 Background

This submission discusses demand in the context of operational demand. Appendix A1 describes the differences between system load and operational demand.

### 1.3.1 Peak demand

AEMO considers that emerging facility availability issues are a significant risk to Power System Security and the effectiveness of the Reserve Capacity Mechanism (RCM) for the 2024-25 Capacity Year.

The Certified Reserve Capacity process for the 2022 Reserve Capacity Cycle (2024-25 Capacity Year) is underway. If that process results in a capacity shortfall, then a supplementary capacity process for the 2024-25 Capacity Year may be required, but may not fully address the capacity shortfall.

As such, AEMO considers that the existing mechanisms under the WEM Rules may not be sufficient to address the risk identified above.

### 1.3.2 Minimum demand

The SWIS minimum operational demand level continues to reduce as generation from uncontrolled DPV increasingly contributes to underlying demand.

AEMO identified this issue as a priority action in the Renewable Energy Integration – SWIS Update report<sup>1</sup> published in September 2021. As a result of that report, the Western Australian Government introduced an emergency solar management scheme to enable AEMO, when the SWIS is in an Emergency Operating State, to direct Western Power to maintain demand above AEMO's Minimum Demand Threshold. Where insufficient emergency solar management is available, Western Power's last-resort mechanism to maintain demand levels is to curtail DPV at a feeder level, which also results in load-shedding.

AEMO considers that a regular forecast of an Emergency Operating State, with consequent management of Power System Security through Emergency Operating State powers, meets the trigger conditions for AEMO's request to trigger an NCESS procurement process under 3.11A.2A(a) of the WEM Rules.

As the WEM Rules do not provide other mechanisms for AEMO to ensure Power System Security in light of this risk, AEMO considers that existing mechanisms under the WEM Rules may not be sufficient to address the risk identified above.

## 1.4 Services required

The services AEMO seeks to procure, in the event that the Coordinator decides to trigger an NCESS procurement process, are:

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<sup>1</sup> Available at [https://aemo.com.au/-/media/files/electricity/wem/security\\_and\\_reliability/2021/renewable-energy-integration--swis-update.pdf](https://aemo.com.au/-/media/files/electricity/wem/security_and_reliability/2021/renewable-energy-integration--swis-update.pdf).

- a Peak Demand Service (capability to increase injection or decrease withdrawal)<sup>2</sup>; and
- a Minimum Demand Service (capability to increase withdrawal or decrease injection).

Each service would carry availability obligations for the appropriate Dispatch Intervals, which AEMO considers include:

- peak Dispatch Intervals specified in accordance with the WEM Rules as Electric Storage Resource Obligation Intervals; and
- minimum demand intervals between 9 am and 3 pm.

The contract term for the proposed NCESS services would commence on 1 October 2024 with a 2-year duration, with quantities of service set at the forecasted shortfalls for the 2024-25 Capacity Year described in Section 1.5.1 for a Peak Demand Service and Section 1.5.3 for a Minimum Demand Service. AEMO expects to gain feedback under the Expressions of Interest process to understand any economic or technical benefits associated with a longer contract duration or a change to the commencement date.

AEMO considers, subject to responses under an Expressions of Interest process, that these services may be provided concurrently or individually under each NCESS Contract. Proponents capable of delivering both services may present a superior operational dispatchability (able to be called upon in real-time or close to real-time) and/or maximum value for money, to be assessed under clause 3.11B.11 of the WEM Rules.

AEMO considers that services may be delivered by either new Registered Facilities through offer obligations for injection or withdrawal in the appropriate Dispatch Intervals, or by unregistered generation or load equipment activated through alternative methods<sup>3</sup>. Contracts will be structured in a manner that ensures availability and delivery of the service without exceeding the value of the service to consumers, by, for example, accounting for any relevant market revenues received outside of the NCESS Contract<sup>4</sup>. Given the size of the identified risks, AEMO will require that each service be operationally dispatchable, and will therefore set a minimum service size of 10 MW. Should AEMO not receive a sufficient quantity of each service, AEMO may determine that not proceeding with the NCESS is the best option.

If the Coordinator decides to trigger an NCESS procurement process, the draft NCESS Service Specification, released alongside a request for Expressions of Interest would outline the full requirements for these services.

### 1.4.1 Provision of flexible capacity

In light of the review of the RCM being undertaken currently by the Coordinator, AEMO expects modifications to the RCM will include provision of a capacity product to ensure flexible capacity – that is, sufficient capability in the SWIS fleet to manage ramping needs. At present, AEMO has not identified a need for such a flexible service for the 2024-25 Capacity Year. However, operational needs for ramping will be considered as part of the NCESS assessment, and AEMO will preference proponents with flexible capacity above non-flexible capacity.

<sup>2</sup> In the 1 February 2022 companion version of the WEM Rules, which shows changes that have been gazetted but not yet commenced, “injection” is defined as “the quantity of power or energy sent into a Network”, while “withdrawal” is defined as “the quantity of power or energy received from a Network”. Available at <https://www.wa.gov.au/government/publications/wem-rules-consolidated-companion-version>.

<sup>3</sup> Subject to AEMO’s operational review of the nominated activation process.

<sup>4</sup> See Clause 5.2A.2 of the WEM Rules.

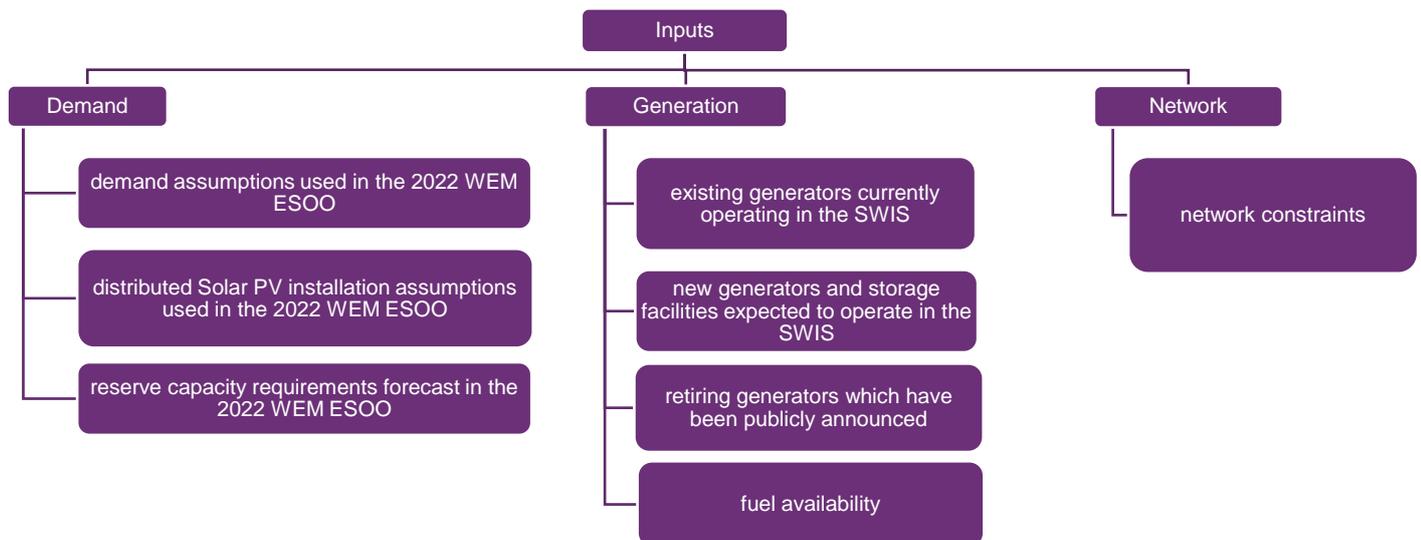
## 1.5 Analysis

An analysis of minimum demand and peak demand risks requires assumptions to be made regarding future SWIS operating conditions and how these will need to be managed in real time. AEMO has included details of these forecast operational assumptions in this section. AEMO continues to assess the inputs to this analysis to ensure risk factors are reflective of forecast operational conditions and expected operational practices. AEMO may refine this analysis during any NCESS procurement.

Additional information relating to the identified shortfalls will become available as the 2022 Reserve Capacity Cycle progresses, which may alter the input assumptions associated with quantification of this service. However, industry feedback and AEMO’s own assessment of the development time to deliver new capacity in the SWIS suggests that the NCESS procurement needs to be initiated ahead of completion of the 2022 Reserve Capacity Cycle to allow sufficient time for proponents to deliver capacity.

### 1.5.1 Peak demand

AEMO has assessed fleet sufficiency to meet peak demand through analysis of the Reserve Capacity Requirement for the 2024 Capacity Year according to the 2022 WEM Electricity Statement of Opportunities<sup>5</sup>. (2022 WEM ESOO) (assessed according to the Planning Criterion under clause 4.5.9 of the WEM Rules). Input factors are shown in Figure 1 and include new entrants, retirements and constrained access quantities.

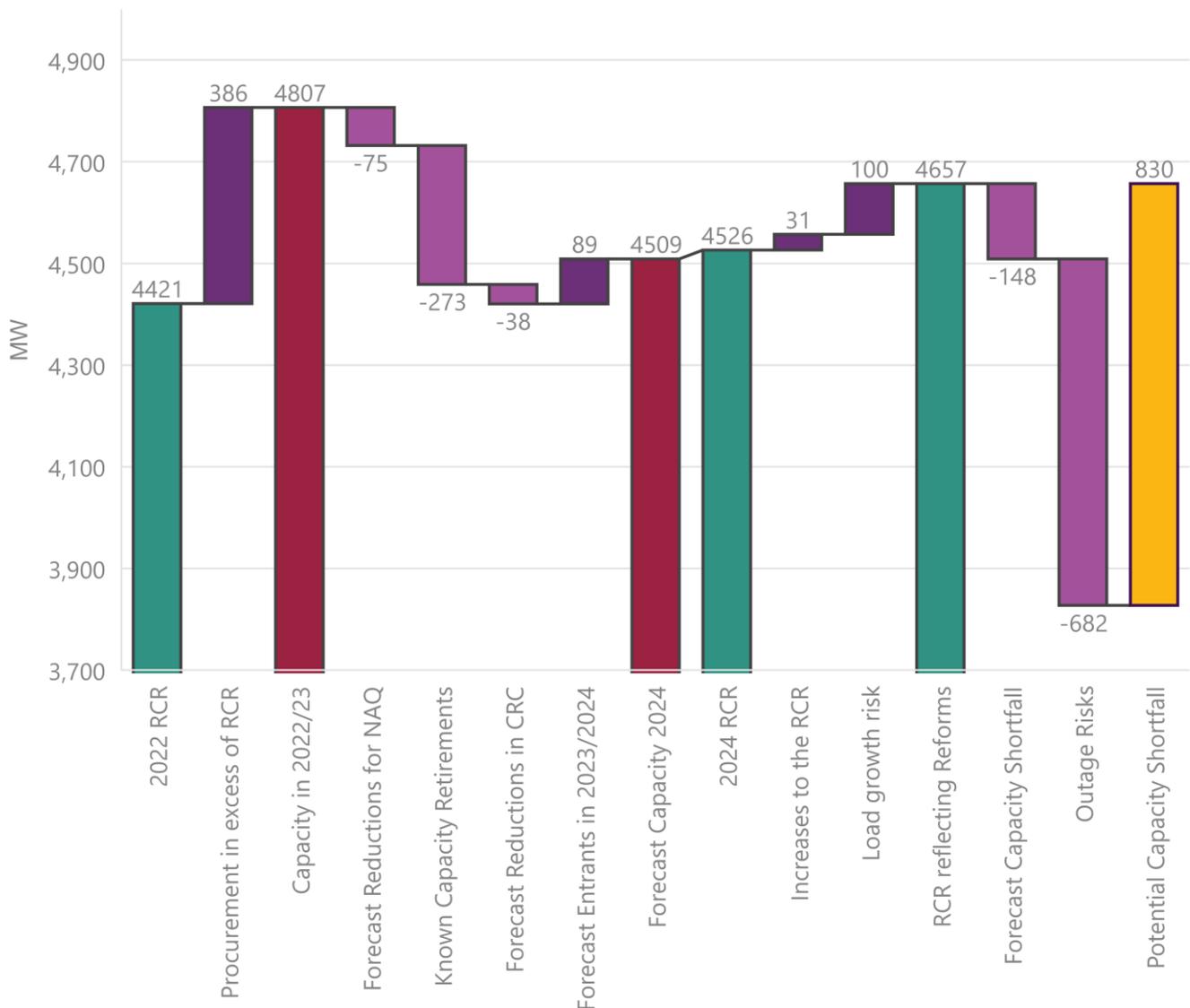


**Figure 1 Model inputs for peak demand**

Figure 2 shows changes to capacity forecasted for the 2024-25 Capacity Year from 2022-23 values and identifies a shortfall of up to 830 MW based on AEMO’s best estimates, at the time of drafting this submission, using the assumptions detailed in Figure 1, which are described in further detail below. Operationally available capacity in 2022 is currently reduced due to fuel supply limitations, forced outages and delays in the entry of new certified capacity for the 2022-23 Capacity Year, a situation that has resulted in the current supplementary capacity

<sup>5</sup> Available at: <https://aemo.com.au/en/energy-systems/electricity/wholesale-electricity-market-wem/wem-forecasting-and-planning/wem-electricity-statement-of-opportunities-wem-esoo>.

procurement for the 2022-23 Capacity Year and AEMO considers it likely that risks of these kinds will continue in future years, load assumptions considered as part of triggering supplementary capacity procurement are integrated into AEMO’s forecasts (including the increases in load for the 2022-23 Capacity Year identified in the 2022 WEM ESOO from the original RCR in the 2020 WEM ESOO) by virtue of leveraging the latest AEMO forecasts in the 2022 WEM ESOO. AEMO expects to refine this analysis following the Expressions of Interest phase of procurement, should the Coordinator determine to trigger an NCESS procurement process.



**Figure 2 Waterfall chart of forecast capacity for the 2024-25 Capacity Year**

AEMO’s assessment of capacity in the 2024-25 Capacity Year, shown in Figure 2, includes the following increases and decreases from current Capacity Credits in 2022-23:

- a conservative estimation based on known network limitations of the impacts of Constrained Access (as estimated by the Network Access Quantity (NAQ) framework on Certified Reserve Capacity using AEMO’s prototype NAQ model);

- announced plant retirements from October 2024<sup>6</sup>;
- reductions in capacity contribution from Facilities for the 2023-24 Capacity Year<sup>7</sup>;
- entry of new facilities for the 2023-24 Capacity Year<sup>8</sup> and forecast for 2024-25 Capacity Year<sup>9</sup>; and
- the risks associated with long-term availability of plant including as a result of persisting fuel issues and prolonged unplanned plant outages, represented by unavailability of coal and gas capacity; and
- a revised Reserve Capacity Requirement of 4,657 MW, described further in Appendix A2, including increases in frequency keeping requirements and the risk of load growth<sup>10</sup>.

It should be noted that this assessment doesn't include additional demand growth identified in the 2022 SWIS Demand Assessment being progressed by Energy Policy WA, which may increase the 2024-25 requirement.

### 1.5.2 Peak Demand Valuation

AEMO expects to set the upper price limit for the peak service using assumptions detailed in Appendix A3.

### 1.5.3 Minimum demand

AEMO has projected SWIS minimum demand using the following inputs and assumptions.

- Demand: AEMO scaled 2016-2020 operational load profiles to meet the 50% Probability of Exceedance minimum demand identified across relevant years of the 2022 WEM ESOO.
- Minimum Demand Threshold: Energy Policy WA's Low Load Project Stage 1 report<sup>11</sup> explored minimum demand across a range of scenarios according to fleet availability and capability, assessing a range of Minimum Demand Thresholds from 550 MW to 650 MW of operational demand. These thresholds indicate the lowest minimum demand range at which AEMO can ensure power system security. AEMO has assumed the most optimistic scenario (that is, 550 MW) and incorporated the assumed contribution of the Kwinana Battery Energy Storage System<sup>12</sup> to set a forecast future Minimum Demand Threshold of 500 MW<sup>13</sup>.

Table 1 summarises occurrences and magnitude of minimum demand below the Minimum Demand Threshold for the 2024-25 Capacity Year. Figure 3 details the expected utilisation of 269 MW of minimum demand service.

<sup>6</sup> Including the retirement of PPP\_KCP\_EG1 (80.4 Capacity Credits) and Muja 6 (193 Capacity Credits).

<sup>7</sup> Based on a linear projection of Capacity Credits for Solar and Wind intermittent Facilities and including other known reductions in Capacity Credits for the 2023-24 Capacity Year.

<sup>8</sup> Kwinana ESR1 (46.25 Capacity Credits).

<sup>9</sup> Based on feedback from Western Power and responses to AEMO's Expression of Interest for the 2022 Capacity Cycle.

<sup>10</sup> To be refined in 2023 WEM ESOO.

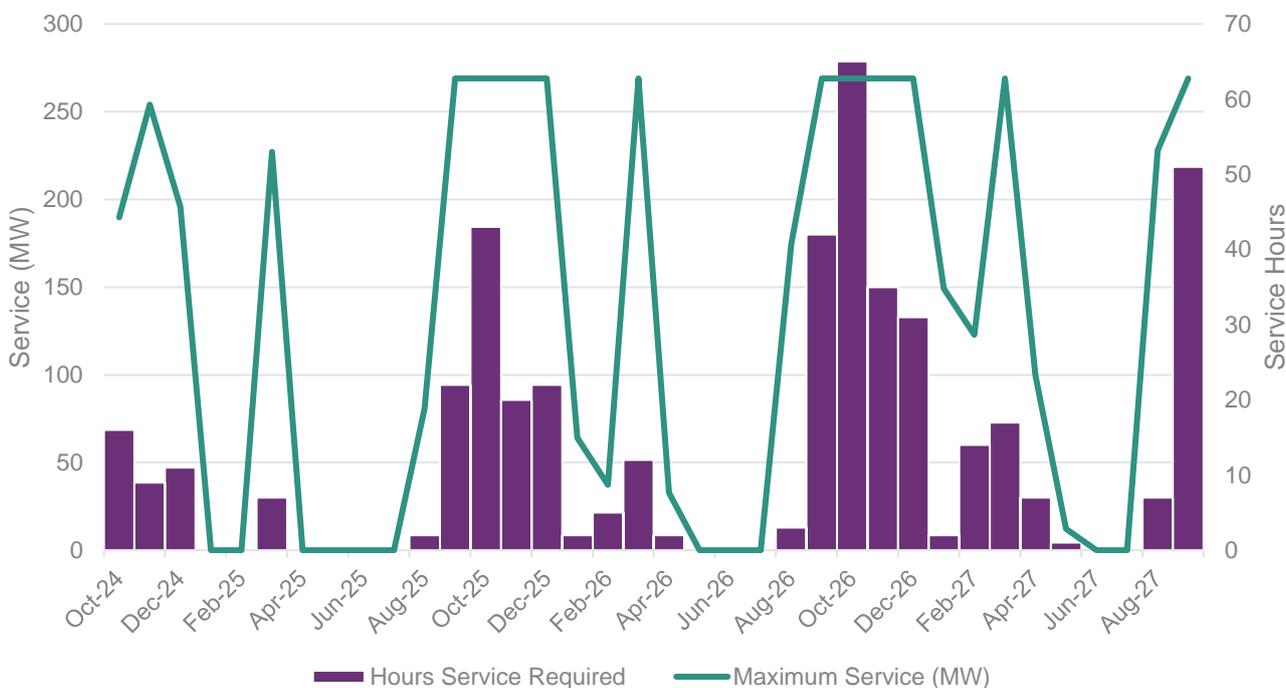
<sup>11</sup> Available at: <https://www.wa.gov.au/system/files/2022-08/EPWA-SWIS%20Low%20Demand%20Project%20Stage%201.pdf>.

<sup>12</sup> AEMO considers that the additional capability of the Kwinana Battery Energy Storage System may contribute to reducing the Minimum Demand Threshold either as a load (that is, 50 MW of additional demand across 4-hours) or in contributing to FCESS (subject to accreditation). The optimal dispatch of Essential System Services and energy for the facility at minimum demand will be determined in the WEM according to Security Constrained Economic Dispatch outcomes that will apply.

<sup>13</sup> The Kwinana Battery Energy Storage System is forecast to provide either 50 MW of demand over a 4-hour minimum demand event, or provide FCESS (subject to accreditation for relevant services).

**Table 1 Additional service required to ensure minimum demand exceeds the 500 MW Minimum Demand Threshold**

Capacity Year	Maximum Service Required (MW)	Hours Used (h)	Longest Activation (h)	Percentage (%)	Annual Energy (MWh)
<b>2024</b>	269	67	4	0.76%	5,907



**Figure 3 Forecasted hours and MW magnitude of NCESS Service from October 2024**

### 1.5.4 Minimum Demand Valuation

The value to the market of maintaining SWIS minimum demand above the Minimum Demand Threshold has been calculated using emergency operating interventions, AEMO’s only alternative to a NCESS service. AEMO may utilise emergency powers to direct Western Power to increase load. As a last resort, Western Power may trip distribution feeders which have greater DPV generation than underlying demand at that substation, which results in load-shedding of all underlying demand at that feeder.

## 1.6 Other factors for consideration

### Trigger Determination – Other factors

This section presents relevant analysis to allow the Coordinator to consider the extent to which an NCESS will meet factors under clauses 3.11A.7(c) – (f) of the WEM Rules:

- (c) the relative merits between procuring an NCESS or augmenting the network;
- (d) the outcome of any investigation of behaviour that reduces the effectiveness of the market, including behaviour related to market power;
- (e) whether the procurement of an NCESS is consistent with the Wholesale Market Objectives; and
- (f) whether procurement of an NCESS will be in the long-term interests of consumers.

#### 1.6.1 Considerations under 3.11A.7(c)

In making its assessment of the emergent risks to its ability to manage Power System Security, AEMO did not find any instances of relevant network augmentation able to mitigate the risks identified.

#### 1.6.2 Considerations under 3.11A.7(d)

AEMO is not aware of any market power aspects relating to the identified trigger.

#### 1.6.3 Considerations under 3.11A.7(e)

AEMO considers that the mitigation of issues identified in this submission are consistent with the Wholesale Market Objectives, and that the NCESS Service Specification can be developed in accordance with the Wholesale Market Objectives. Specifically:

- the specification can be developed such that the service can be delivered by a range of technologies, in accordance with the Wholesale Market Objectives under clause 1.2.1(c); and
- a competitive procurement process for the NCESS which will ensure the cost of the service is as efficient as possible, in accordance with the Wholesale Market Objectives in clauses 1.2.1(a), (b) and (d).

#### 1.6.4 Considerations under 3.11A.7(f)

AEMO considers that the mitigation of issues identified in this submission are in the long-term interest of consumers based on the alternative of insecure operation of the power system and the potential for load-shedding.

# A1. Operational demand vs system load

This submission discusses demand in the context of operational demand. The following extract from AEMO's Renewable Energy Integration – SWIS Update report<sup>14</sup> describes the differences.

**Table 2 System, operational and underlying demand**

Item	System load	Operational demand	Underlying demand
Application	System operation	Market reporting	Market reporting
Data source	SCADA	SCADA (sent-out MW quantities)	Operational demand plus estimate of behind-the-meter DPV generation
Measurement frequency	4-second instantaneous	30-minute average	30-minute average
Loss factor adjusted to Reference Node	No	No	No
Registered (Scheduled and Non-Scheduled) generation	Measured at generators terminals	Measured as 'sent-out' at the connection point	N/A
Unregistered generation	Not included / inferred	Not included / inferred	Not included / inferred
DER generation	Not included	Not included	Estimate included

<sup>14</sup> Available at [https://aemo.com.au/-/media/files/electricity/wem/security\\_and\\_reliability/2021/renewable-energy-integration--swis-update.pdf](https://aemo.com.au/-/media/files/electricity/wem/security_and_reliability/2021/renewable-energy-integration--swis-update.pdf).

## A2. Revised planning criteria

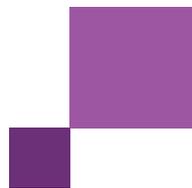
The Reserve Capacity Requirement is currently being reviewed as part of the Coordinator review of the Reserve Capacity Mechanism, which has identified recommended rule changes to the Reserve Capacity Requirement specified in clause 4.5.9 of the WEM Rules. The proposed changes reflect the need for AEMO to ensure sufficient additional capacity is procured to cover the largest supply contingency. From 1 January 2023, AEMO understands clause 4.5.9 will be revised as follows:

- 4.5.9. The Planning Criterion to be used by AEMO in undertaking a Long Term PASA study is that there should be sufficient available capacity in each Capacity Year during the Long Term PASA Study Horizon to:
- (a) meet the forecast peak demand (including transmission losses and allowing for Intermittent Loads) supplied through the SWIS plus a reserve margin equal to the greater of:
    - i. 7.6% of the forecast peak demand (including transmission losses and allowing for Intermittent Loads); and
    - ii. the ~~maximum capacity, measured at 41°C, of the largest generating unit size, in MW, of the largest contingency relating to loss of supply (related to any Facility, including a Network) expected at the time of forecast peak demand (including transmission losses and allowing for Intermittent Loads);~~

while maintaining the SWIS frequency in accordance with the Normal Operating Frequency Band and the Normal Operating Frequency Excursion Band. The forecast peak demand should be calculated to a probability level that the forecast would not be expected to be exceeded in more than one year out of ten; ...

AEMO has forecast the Reserve Capacity Requirement for the 2024-25 Capacity Year using the following assumptions:

- The Regulation requirement increases to 141 MW based on increased share of intermittent generation, from the current 110 MW of Load-Following Ancillary Services.
- The largest single peak contingency is unchanged from the largest generation contingency.
- The risk of load growth, represented by a 100 MW increase and expected to be refined through development of the 2023 WEM ES00.



## A3. Redacted