

Non-Co-optimised Essential System Services Trigger Submission

April 2023

Low Load

A submission to the Coordinator of Energy





Important notice

Purpose

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

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Version control

Version	Release date	Changes
1	18/04/23	First issue

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Notes

This document uses many terms that have meanings defined in the Wholesale Electricity Market Rules. The WEM Rules meanings are adopted unless otherwise specified. Terms which are defined in the WEM Rules are capitalised.

Demand refers to operational demand unless otherwise specified. A definition of operational demand vs system demand can be found in Appendix A1.

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 minimum demand operating conditions from October 2023 to October 2024. These risks are emerging due to several factors, including but not limited to:

- Increased penetration of Distributed Photovoltaics (DPV), which reduces Forecast Operational Demand below AEMO's forecasted Power System Security threshold (hereafter referred to as minimum demand threshold (MDT) of 500 MW.
- Lack of load participation during system minimum demand events.
- Lack of alternatives to existing emergency mechanisms such as emergency solar management (ESM).

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 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 Minimum demand

The SWIS minimum Operational Demand level continues to reduce, as generation from uncontrolled DPV increasingly contributes to offsetting underlying demand.

AEMO identified this issue as a priority action in the *Renewable Energy Integration – SWIS Update* report¹ 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 (MDT). 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 an operational forecast that (if it were to eventuate) would require AEMO to frequently issue directions under the WEM Rules (as applicable from 1 October 2023) to restore or maintain Power System Security, including directions to the Network Operator, meets the threshold for AEMO’s request to trigger an NCESS procurement process under 3.11A.2A(a) of the WEM Rules.

1.3.2 Reliability NCESS for 2024-25 Capacity Year

This submission follows AEMO’s request to trigger an NCESS procurement process for Power System Reliability services (a peak demand service and a minimum demand service) for the 2024-25 and 2025-26 Capacity Years. The timing of that NCESS reflected the lead-time for construction of new Facilities to mitigate the identified peak and minimum demand risks. AEMO has now further explored the residual risks in the 2023-24 Capacity Year, which we expect may only be mitigated by existing capabilities from facilities and equipment, necessitating a separate process for short-term mitigation of minimum demand risks.

1.4 Services required

The services AEMO seeks to procure, in the event that the Coordinator decides to trigger an NCESS procurement process, is a minimum demand service (capability to increase Withdrawal or decrease Injection). The service would carry availability obligations for the appropriate Dispatch Intervals, which AEMO considers include minimum demand intervals between 10 am and 2 pm.

The NCESS Contract term for the proposed services would commence on 1 October 2023 with a one-year duration, with quantities of service set at the forecasted shortfalls for the 2023-24 Capacity Year described in Section 1.5 for a minimum demand service. AEMO expects to gain feedback under the Expressions of Interest (EOI) process to understand any economic or technical benefits associated with a longer NCESS Contract duration or a change to the commencement date.

NCESS 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 Contract². 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.

¹ Available at https://aemo.com.au/-/media/files/electricity/wem/security_and_reliability/2021/renewable-energy-integration--swis-update.pdf.

² See Clause 5.2A.2 of the WEM Rules.

AEMO considers that services will more likely be procured from unregistered generation or load equipment activated through alternative methods³, rather than new Registered Facilities due to the short lead-time associated with the NCESS service requirements. Should AEMO receive NCESS Submissions that do not collectively yield a sufficient quantity of minimum demand service to meet the requirements outlined in Section 1.5, AEMO may determine that the best option would be not proceeding with the NCESS.

If the Coordinator decides to trigger an NCESS procurement process, the draft NCESS Service Specification released alongside a request for EOIs would outline the full requirements for minimum demand services.

1.5 Analysis

An analysis of minimum 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.

1.5.1 Inputs

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 for 2023-2024 Capacity Year identified in the 2022 WEM ESOO (5 total).
- Minimum Demand Threshold: Energy Policy WA's Low Load Project Stage 1 report⁴ explored minimum demand across a range of scenarios according to fleet availability and capability, assessing a range of thresholds from 550 MW to 650 MW of Operational Demand. AEMO has assumed the most optimistic scenario (that is, 550 MW) and incorporated the assumed contribution of the Kwinana Battery Energy Storage System⁵ to set a forecast future MDT of 500 MW⁶. This is consistent with the MDT that AEMO used for analysis in the Flexible Reliability NCESS Trigger Submission from December 2022.

1.5.2 Analysis results

Given the 50% POE load profiles and using an MDT of 500 MW, the analysis results of minimum demand service requirements for Capacity Year 2023-24 were calculated. Table 1 summarises forecast occurrences and magnitude of demand below the MDT (excluding ESM) for the 2023-24 Capacity Year. Figure 1 details the expected utilisation of 125 MW of minimum demand service.

³ Subject to AEMO's operational review of the nominated activation process.

⁴ Available at: <https://www.wa.gov.au/system/files/2022-08/EPWA-SWIS%20Low%20Demand%20Project%20Stage%201.pdf>.

⁵ 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.

⁶ 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 MDT

Capacity Year	Number of Breaches	Maximum Service Required (MW)	Longest Activation (h)	Total Hours required (h)	Annual Energy (MWh)
2023-24	8.4	125	3.4	18	917.6

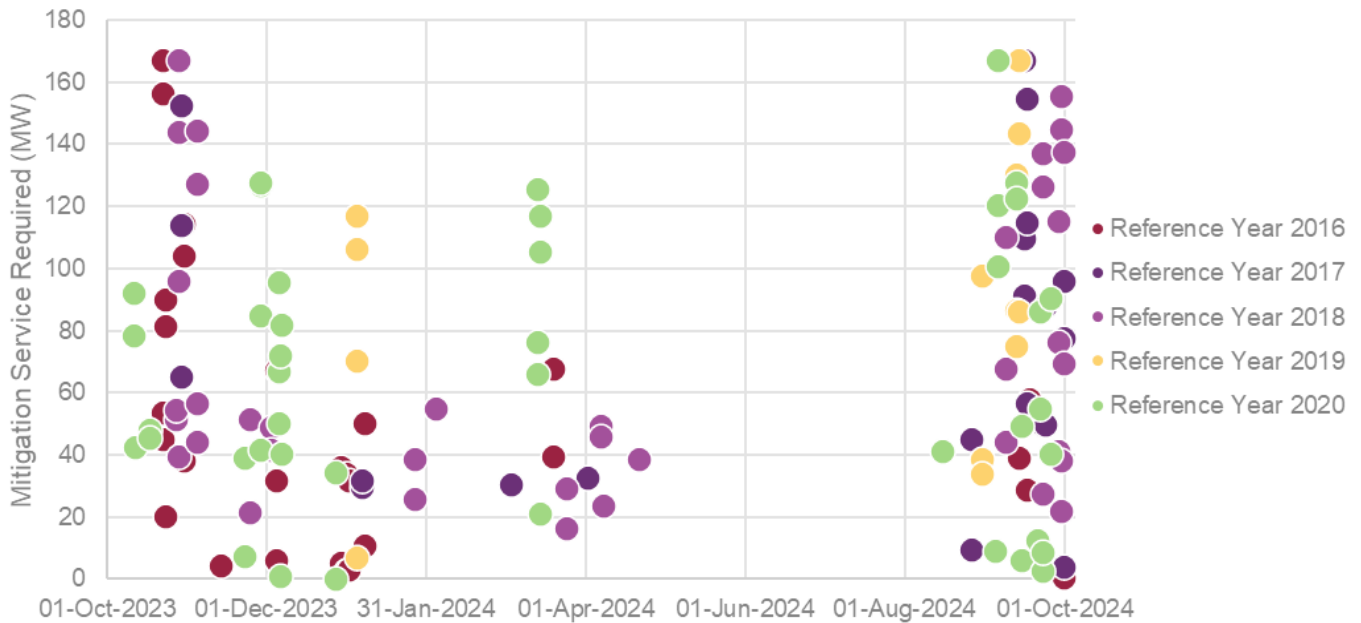


Figure 1 Combination of five simulations (50% POE) showing hours below MDT in capacity year 2023-24

1.5.3 Regional minimum demand risks

As part of AEMO’s analysis we have identified locational minimum demand risks associated with those areas of the network supported by a Network Control Service contract with Western Power. Whilst AEMO does not consider locational risks to be triggers under AEMO’s obligations under the WEM Rules, AEMO considers there may be market benefits in mitigating both system minimum demand and locational demand risks. AEMO is therefore proposing to encourage service provision located in areas north of the Three Springs terminal.

1.5.4 Minimum demand valuation

The value to the market of maintaining SWIS minimum demand above the MDT has been calculated using emergency operating interventions⁷, 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.

AEMO expects to set the upper price limit for the peak service using assumptions detailed in Appendix A2.

⁷ AEMO assumes Emergency Solar Management is not relied upon.

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* report⁸ 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

⁸ Available at https://aemo.com.au/-/media/files/electricity/wem/security_and_reliability/2021/renewable-energy-integration--swis-update.pdf.



A2. Redacted