



# Wholesale Electricity Market

Procedure Change Proposal No:  
AEPC\_2023\_03

Dispatch Algorithm Formulation Updates

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New South Wales | Queensland | South Australia | Victoria | Australian Capital Territory | Tasmania | Western Australia

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## Executive Summary

<b>Change requested by:</b>	AEMO
<b>Date submitted:</b>	26 October 2023
<b>Type of Procedure Change Proposal:</b>	Amendment
<b>WEM Procedures affected:</b>	Dispatch Algorithm Formulation Updates

The publication of this Procedure Change Proposal and the accompanying notice of call for submissions commences the Procedure Change Process conducted by AEMO under section 2.10 of the Wholesale Electricity Market Rules (**WEM Rules**). This Procedure Change Proposal relates to proposed amendments to the WEM Procedure: Dispatch Algorithm Formulation Updates.

This Procedure Change Proposal addresses changes arising from:

- Allowances on ESS Trapezia: because of mandatory droop response, AEMO has observed multiple facilities were becoming unavailable for ESS when they dipped below their Enablement Minimum. AEMO proposes to modify the ESS Pre-Processing calculations in paragraph 2.5 of the Dispatch Algorithm Formulation.
- Removal of lower bound on Contingency variables: certain Network Contingencies can become negative when large loads occur (e.g. the Contingency is non-existent). To avoid violations, we are removing the lower bound on the Contingency variable. These changes will commence immediately after publication of the Procedure Change Proposal.
- Several implementation bugs: AEMO has resolved several bugs and has made some minor clarifications to other areas of the formulation.

These changes were implemented on 12 October 2023 to address system issues and improve market outcomes.

AEMO invites stakeholders to suggest alternative options or drafting where they consider that these would improve the proposed WEM Procedure or better meet the Wholesale Market Objectives specified in section 122(2) of the *Electricity Industry Act 2004* (WA) (and clause 1.2.1 of the WEM Rules).

AEMO also requests that stakeholders identify any unintended adverse consequences of the proposed WEM Procedure.

Stakeholders are invited to submit written responses on the proposed WEM Procedure by 5.00 pm (Perth time) on 23 November 2023, in accordance with the notice of call for submissions published with this Procedure Change Proposal.

# 1. Procedure Change Process

Section 2.10 of the WEM Rules outlines the Procedure Change Process (Note: terms that are capitalised in this document, but not otherwise defined in this document or capitalised for any other reason, have the meaning given in the WEM Rules).

AEMO may initiate the Procedure Change Process in respect of WEM Procedures for which it is responsible by developing a Procedure Change Proposal. Rule Participants may notify AEMO where they consider an amendment or replacement of a WEM Procedure would be appropriate.

If an Amending Rule requires AEMO to develop new WEM Procedures or to amend or replace existing WEM Procedures, then AEMO is responsible for the development, amendment, or replacement of WEM Procedures so as to comply with the Amending Rule.

Clause 2.9.3 of the WEM Rules states that WEM Procedures:

- (a) must:
  - (i) be developed, amended or replaced in accordance with the process in the WEM Rules;
  - (ii) be consistent with the Wholesale Market Objectives; and
  - (iii) be consistent with the WEM Rules, the *Electricity Industry Act 2004 (WA)* and the WEM Regulations; and
- (b) may be amended or replaced in accordance with section 2.10 of the WEM Rules and must be amended or replaced in accordance with section 2.10 of the WEM Rules where a change is required to maintain consistency with Amending Rules.

The Wholesale Market Objectives are:

- (a) to promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system;
- (b) to encourage competition among generators and retailers in the South West interconnected system, including by facilitating efficient entry of new competitors;
- (c) to avoid discrimination in that market against particular energy options and technologies, including sustainable energy options and technologies such as those that make use of renewable resources or that reduce overall greenhouse gas emissions;
- (d) to minimise the long-term cost of electricity supplied to customers from the South West interconnected system; and
- (e) to encourage the taking of measures to manage the amount of electricity used and when it is used.

AEMO has published this Procedure Change Proposal in accordance with the Procedure Change Process.

AEMO's indicative timeline for this consultation is outlined below. Dates may be adjusted depending on the number and complexity of issues raised in submissions and any meetings with stakeholders.

Process Stage	Indicative Date
Publication of Procedure Change Proposal	26 October 2023
Closing date for submissions on Procedure Change Proposal	23 November 2023
Publication of Procedure Change Report	12 December 2023
Proposed commencement of amended WEM Procedure version 2.0	12 December 2033

Before the closing date for submissions, stakeholders may request a meeting with AEMO to discuss the issues and proposed changes raised in this Procedure Change Proposal.

## 2. Background

### 2.1. Regulatory requirements

This WEM Procedure: Dispatch Algorithm Formulation (**Procedure**) is made in accordance with AEMO's functions under clause 2.1A.2(h) of the WEM Rules.

Clause 7.2.3 of the WEM Rules provides:

Where AEMO reasonably determines that an urgent change to the Dispatch Algorithm is required to maintain Power System Security and Power System Reliability in accordance with Chapter 3, AEMO may implement the change. Where AEMO makes a change to the Dispatch Algorithm in accordance with this clause 7.2.3, AEMO must:

- (a) publish the change on the WEM Website, and the reasons the change was required in order for AEMO to maintain Power System Security and Power System Reliability in accordance with Chapter 3; and
- (b) if the Power System Security and Power System Reliability issue that is being addressed by the change is not temporary, AEMO must as soon as practicable, submit a Procedure Change Proposal for revisions to the WEM Procedure referred to in clause 7.2.5.

The purpose of this Procedure is to document:

- (a) the Dispatch Algorithm used by AEMO for the purpose of the Central Dispatch Process and setting Market Clearing Prices and the mathematical formulation of the Dispatch Algorithm, including **[clause 7.2.5(a)]**:
  - (i) the calculation of the required quantity of Contingency Reserve Raise **[clause 7.2.5(a)(iii)]**;  
In a form that:
  - (ii) sets out the form, scope and construction of each type of Constraint Equation **[clause 7.2.5(a)(v)]**;

- (iii) describes and quantifies the mechanism by which different Constraints are taken into account and prioritised, including in accordance with clauses 3.12.2 and 7.6.25 **[clause 7.2.5(a)(vi)]**; and
- (iv) AEMO reasonably considers will enable a third party, such as the Market Auditor or the Economic Regulation Authority, to replicate the results of the Dispatch Algorithm by using the same inputs **[clause 7.2.5(a)(vii)]**;
- (b) the processes to be followed by AEMO and Market Participants in accounting for Inflexible Facilities **[clause 7.2.5(c)]**;
- (c) the methodology AEMO will use, and any assumptions it may be required to make, to determine the Market Clearing Prices during AEMO Intervention Events under clauses 7.11C.7, 7.11C.8 and 7.11C.10. The methodology must, wherever reasonably practicable **[clause 7.11C.11]**:
  - (v) be consistent with the principles for the determination of Market Clearing Prices set out in section 7.11A **[clause 7.11C.11(a)]**; and
  - (vi) enable AEMO to determine and publish such prices in accordance with the applicable timeframes for the publication of the Market Clearing Prices under these WEM Rules **[clause 7.11C.11(b)]**;
- (d) the processes to be followed by AEMO for the relaxation of Constraints under clause 7.2.6 **[clause 7.2.8]**; and
- (e) the process to be followed by AEMO when issuing Dispatch Instructions that override the output of the Dispatch Algorithm for Dispatch Intervals where the Dispatch Algorithm determines a Degenerate Solution pursuant to clause 7.6.23 **[clause 7.6.27(a)]**.
- (f) Situations that are deemed significant for the purposes of clause 7.6.24(b) **[clause 7.6.27(b)]**.

## 2.2. Context for this consultation

This Procedure Change Proposal addresses changes arising from:

- AEMO addressing several issues relating to the WEM implementation and Dispatch Algorithm Function.

These changes are discussed in further detail in Section 3.1.

## 3. Proposed procedure change

### 3.1. Detail of the proposed procedure change

#### 3.1.1. Allowances on ESS Trapezia

Due to the mandatory droop response, AEMO has observed multiple facilities were becoming unavailable for ESS when they dipped below their Enablement Minimum. In some cases, this meant the inadvertent decommitment of the Facility in question. To address the errors in SCADA measurement, and potential drift due to droop response, AEMO has modified the ESS Pre-Processing calculations in paragraph 2.5 of the Dispatch Algorithm Formulation.

### 2.5.3. For the purpose of paragraph 2.5.4:

*IF EnablementMin<sub>f,m</sub> ≥ 0*

$$EnablementMinPreProcessing_{f,m} = EnablementMin_{f,m} - MAX(0.06 * EnablementMin_{f,m}, 3)$$

*ELSE*

$$EnablementMinPreProcessing_{f,m} = EnablementMin_{f,m} + MIN(0.06 * EnablementMin_{f,m}, -3)$$

*and,*

*IF EnablementMax<sub>f,m</sub> ≥ 0*

$$EnablementMaxPreProcessing_{f,m} = EnablementMax_{f,m} + MAX(0.06 * EnablementMax_{f,m}, 3)$$

*ELSE*

$$EnablementMaxPreProcessing_{f,m} = EnablementMax_{f,m} - MIN(0.06 * EnablementMax_{f,m}, -3)$$

*for f in F, for m in M where m ≠ energy*

### 2.5.4. ESS Flag Condition 1:

$$EnablementMinPreProcessing_{f,m} \leq EnergyInitialMW_f \leq EnablementMaxPreProcessing_{f,m}$$

*for f in F, for m in M where m ≠ energy*

### 3.1.2. Removal of Lower Bound on Contingency Variable

Certain Network Contingencies can become negative when large loads occur (e.g. the Contingency is non-existent). To avoid violations, AEMO is removing the lower bound on the Contingency variable. The Largest Contingency variable retains a  $\geq 0$  bound, meaning no impact on actual dispatch or settlements.

- 2.3.5. **Contingency:** A variable representing each Credible Contingency Event for Injection in megawatts.

*Contingency<sub>c</sub> for c in C*

*where Contingency<sub>c</sub> ∈ ℝ*

### 3.1.3. Addition of Slack to Essential System Service Enablement Constraint

Addition of a slack variable to constraint 2.4.17 to allow discretionary constraints to force ESS Enablement in situations requiring directions.

### 2.4.17. Essential System Service Enablement Constraint:

*IF ESSFlag<sub>f,m</sub> = True*

*SKIP CONSTRAINT*

*ELSE*

*TrancheSum<sub>f,m</sub> – ESSEnablementSurplus = 0*

*for f in F, for m in M where m ≠ energy*

### 3.1.4. Other changes

#### Fast Start Implementation Bugs

AEMO has identified several bugs in the fast start implementation that were affecting its use in dispatch. These will be resolved as part of the next deployment. AEMO will issue communications to registered Fast Start Facilities to advise once this fix is confirmed in Production. No formulation change is required.

#### Avoiding duplication Constraint Equations

Some of the Constraint Equations belong to multiple Constraint Sets. AEMO has made a change to avoid the same Constraint Equation being invoked twice.

#### Constraining on Facilities without In-Service Energy Offers

WEMDE is designed to allow the constraint-on of Facilities, even if they have zero (or non-existent) offer quantities for energy. AEMO notes this was working for zero offer quantities, but not for non-existent offers. AEMO has made a change to fix this.

These changes were implemented on 12 October 2023. As required under the Rules, AEMO is consulting on the changes through the Procedure Change Process process.

AEMO has published a draft version of the WEM Procedure: Dispatch Algorithm Formulation for consultation, incorporating the changes that AEMO proposes. Clean and change-marked versions are available at: <https://aemo.com.au/energy-systems/electricity/wholesale-electricity-market-wem/procedures-policies-and-guides/procedures/ongoing-procedure-change-proposals>

## 4. Summary of matters for consultation

AEMO invites stakeholders to suggest alternative options for drafting, where they consider these would improve the WEM Procedure or better meet the Wholesale Electricity Market Objectives.

Stakeholders with questions in relation to the proposed amended WEM Procedure or this Procedure Change Proposal should contact AEMO via email at [wa.rtm@aemo.com.au](mailto:wa.rtm@aemo.com.au)

Stakeholders are invited to submit written responses on the proposed amended WEM Procedure to [wa.marketdevelopment@aemo.com.au](mailto:wa.marketdevelopment@aemo.com.au) by 5:00 pm (Australian Western Standard Time) on 23 November 2023, in accordance with the call for submissions published with this paper.

All correspondence in relation to this Procedure Change Proposal must be entitled “AEPC\_2023\_03: WEM Procedure: Dispatch Algorithm Formulation – [Name of the submitting company or individual]”.