# Operating Protocol for Coordination of Power System Security and Power System Reliability Responsibilities – AEMO and Western Power

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| **Approved by:** | Kate Ryan |
| **Title:** | Executive General Manager Western Australia and Strategy |
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| 1.0 | 01 October 2022 | First version developed in accordance with clause 3.1A.1 of the WEM Rules |
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# 1. Introduction

## 1.1. Purpose and scope

1.1.1. This Operating Protocol is jointly developed and maintained in accordance with clause 3.1A.1 of the Wholesale Electricity Market Rules (WEM Rules).

1.1.2. The purpose of this Operating Protocol is to describe how AEMO and Western Power will coordinate their performance of relevant Power System Security and Power System Reliability related responsibilities under the WEM Rules.

1.1.3. The Electricity Industry Act 2004, the WEM Regulations and the WEM Rules prevail over this Operating Protocol to the extent of any inconsistency.

## 1.2. Definitions

1.2.1. Terms defined in the Electricity Industry Act 2004, the WEM Regulations and the WEM Rules have the same meanings in this Operating Protocol unless the context requires otherwise.

1.2.2. The following definitions apply in this Operating Protocol unless the context requires otherwise.

| Term | Definition |
|---|---|
| AEMO Controller | An AEMO controller, located in AEMO's control room. |
| AEMO Information Zone | The AEMO information zone described in Appendix B. |
| AEMO Operating Zone | The AEMO operating zone described in Appendix A. |
| Credible Contingency | Has the meaning given in the WEM Procedure: Power System Security. |
| Hazard Management Agency or HMA | Has the meaning given in the *Emergency Management Act 2005* (WA). |
| Non-Credible Contingency | Has the meaning given in the WEM Procedure: Power System Security. |
| SWIN | Has the meaning given to "South West Interconnected Network" in the Technical Rules. |
| Technical Rules | The Technical Rules (as defined in the Access Code) that apply to the SWIN. |
| Western Power Network Controller | A controller of Western Power's transmission or distribution network, located in Western Power's control room. |

1.2.3. The following abbreviations apply in this Operating Protocol unless the context requires otherwise.

| Abbreviation | Meaning |
|---|---|
| EMS | Energy management system |
| PTP | Permission to proceed |
| PTR | Permission to restore |

## 1.3. Interpretation

1.3.1. The following principles of interpretation apply in this Operating Protocol unless the context requires otherwise.

(a) Clauses 1.3 to 1.5 of the WEM Rules apply in this Operating Protocol.

(b) References to time are references to Australian Western Standard Time.

(c) Terms that are capitalised, but not defined in this Operating Protocol, have the meaning given in the WEM Rules.

(d) A reference to the WEM Rules or the WEM Procedures includes any associated forms required or contemplated by the WEM Rules or WEM Procedures.

(e) Words expressed in the singular include the plural and vice versa.

(f) A reference to a paragraph refers to a paragraph of this Operating Protocol.

(g) A reference to a clause refers to a clause or section of the WEM Rules.

(h) The body of this Operating Protocol prevails to the extent of any inconsistency with the figures, diagrams, appendices, schedules, annexures or attachments contained within this document.

# 2. Governance arrangements – clause 3.1A.2(a)

2.1.1. AEMO is responsible for administering and publishing this Operating Protocol.

2.1.2. AEMO and Western Power must consult each other regarding proposed amendments to this Operating Protocol. Amendments to this Operating Protocol must be approved by AEMO and Western Power through their respective internal approval processes before they take effect

# 3. SWIS Operating Zones – clause 3.1A.2(b)

3.1.1. The AEMO Operating Zone is used to coordinate operational activities associated with SWIN equipment that may affect Power System Security or Power System Reliability. The AEMO Operating Zone incorporates SWIN elements that are likely to affect Power System Security or Power System Reliability, and comprises the majority of the Western Power transmission system.

3.1.2. The AEMO Information Zone is used to identify operational activities associated with SWIN equipment outside of the AEMO Operating Zone that may affect Power System Security or Power System Reliability. The AEMO Information Zone incorporates primary and secondary SWIN elements that are not in the AEMO Operating Zone but which, in the opinion of AEMO or Western Power, may affect Power System Security or Power System Reliability under certain SWIS operating conditions.

3.1.3. AEMO and Western Power must share the following information regarding the AEMO Operating Zone and the AEMO Information Zone:

(a) the operational status of equipment in the AEMO Operating Zone, and any change in the operational status;

(b) the operational status of equipment in the AEMO Information Zone, and any change in the operational status; and

(c) any information relating to the AEMO Operating Zone or the AEMO Information Zone that identifies an actual or perceived threat to the SWIN that may affect Power System Security or Power System Reliability.

# 4. Processes – clause 3.1A.2(c)-(k)

## 4.1. Communication Processes

4.1.1. All communications relating to real-time operations must be in the form of recorded telephone conversations. Any electronic records created in connection with a telephone conversation (eg log entry) must be maintained and accessible for audit and investigation purposes.

4.1.2. All communications relating to non-real-time operations (such as the identification of new or revised Security Limits, or incident investigations) must be provided electronically through the nominated contacts.

4.1.3. If a Western Power Network Controller identifies an issue that may impact Power System Security or Power System Reliability in the AEMO Operating Zone, or that requires coordination with AEMO, the Western Power Network Controller must notify the AEMO Controller and respond to any resulting directions from the AEMO Controller. As stated in clause 3.4.6 (High Risk Operating State and clause 3.5.9 (Emergency Operating State), Western Power is not required to comply with a direction issued by AEMO if such compliance would endanger the safety of any person, damage equipment, or breach any applicable law.

4.1.4. Communication between the Western Power Network Controller and the AEMO Controller for the purposes of paragraph 4.1.3 is conducted with the aim of coordinating the resolution of the issue identified. The AEMO Controller may issue a direction to the Western Power Network Controller in relation to the issue identified in accordance with clause 3.4.6 (High Risk Operating State) or clause 3.5.5 (Emergency Operating State) as applicable.

4.1.5. If Western Power identifies an issue in the SWIN that requires an immediate response, Western Power may act in the first instance to address the issue and then subsequently notify AEMO as soon as practicable, subject to appropriate risk assessments being conducted by Western Power.

4.1.6. Western Power must continue to keep AEMO informed as to the state of the SWIN, including any switching performed to mitigate any issue identified for the purposes of paragraph 4.1.4 or 4.1.5.

4.1.7. Western Power will notify AEMO where it considers large-scale or widespread load issues may affect AEMO's ability to forecast or dispatch generation.

## 4.2. Island management processes

4.2.1. Where multiple Islands (except to the extent they relate to a distribution network, a microgrid or a customer connection) exist in the SWIS, AEMO will manage each Island (and Power System Security for each Island) independently, with one or more generators providing frequency control.

4.2.2. When synchronising two separate AEMO-managed Islands, AEMO will direct Western Power in accordance with an agreed process.

## 4.3. Emergency management processes and responsibilities

4.3.1. AEMO will take the lead role in supporting the relevant HMA in dealing with SWIS-level emergencies, such as a SWIS blackout or significant fuel supply issues.

4.3.2. Western Power is responsible for managing electricity network emergencies in accordance with procedures for emergency management, and will be the primary point of contact with any HMA during such emergencies.

4.3.3. Western Power will inform AEMO of active or pending network emergencies that significantly affect or have the potential to significantly affect:

(a) Power System Security or Power System Reliability;

(b) AEMO's ability to monitor, manage or control the power system; or

(c) Market Participants' ability to participate fully in the market.

4.3.4. To the extent that a network emergency creates a security issue that requires active management by AEMO, AEMO will coordinate activities with Western Power to resolve the security issue. This may include directing the Western Power Network Controller. Any directions issued to the Western Power Network Controller would be subject to any constraints on network operation as a result of the emergency condition, as advised to AEMO by Western Power.

4.3.5. Western Power will maintain its visibility of generators, and its ability to dispatch them, for emergency frequency control purposes.

4.3.6. AEMO will provide Western Power Network Controllers with periodic generator dispatch training and documentation to enable Western Power to carry out certain activities in the event of a network emergency.

## 4.4. Voltage control and management principles and processes

4.4.1. In relation to voltage control, AEMO is accountable for Power System Security, including ensuring that voltages in the AEMO Operating Zone remain within the Technical Envelope (including for the next Credible Contingency).

4.4.2. Western Power is responsible for regulating voltage in accordance with the Technical Rules.

4.4.3. Unless otherwise advised by AEMO of specific voltage limits to apply, Western Power is responsible for determining secure voltage limits for the SWIN in accordance with clauses 5.4.1(b) and 5.4.1(c) of the Technical Rules, for use by AEMO.

4.4.4. Where necessary, the Western Power Network Controller and the AEMO Controller will manage the reactive power output of specific generators under their respective control, to coordinate with network reactive power devices and ensure voltage levels are maintained within normal operating ranges (as described in the Technical Rules).

4.4.5. When required, AEMO will adjust the voltage(s) of generator step-up transformers to facilitate synchronisation of Synergy generating units, before transferring operational control to Western Power.

4.4.6. At network customer connection points (including generator connection points), the Western Power Network Controller is responsible for:

(a) operating the network to maintain customer voltage within Technical Rule limits; and

(b) responding to network customer requests for voltage adjustments.

4.4.7. Where an AEMO Controller is required to issue a direction requiring (or to directly control, in the case of some facilities) a generator to adjust its MVAr output, the AEMO Controller will ensure that the resultant voltage change at the generator connection point remains within allowable voltage limits in the Technical Envelope.

4.4.8. The Western Power Network Controller, in conjunction with the AEMO Controller, will monitor voltage levels across the SWIN.

4.4.9. AEMO will monitor and assess the controls it has within the SWIS to identify any shortfalls where static voltage levels may not recover to normal operating levels in the case of a Credible Contingency Event. If the available controls are not sufficient, the AEMO Controller will contact the Western Power Network Controller to discuss an appropriate response.

4.4.10. Where reactive power availability is insufficient to manage voltage, real power dispatch alterations may be required to manage the situation. This may result in the AEMO Controller providing a direction to the Western Power Network Controller regarding voltage or reactive power adjustments, or to Market Participants requiring them to adjust their real or reactive power dispatch. For clarity, AEMO has the ultimate accountability for making this decision, and for its outcomes, within the AEMO Operating Zone.

4.4.11. In general, with regards to voltage control, AEMO:

(a) determines generation pre-dispatch and dispatch quantities;

(b) assesses voltage security within the AEMO Operating Zone;

(c) determines any specific voltage limits that may be required and notifies Western Power; and

(d) advises Western Power of any known or potential issues with voltage control that may affect Power System Security and which require coordination.

4.4.12. To support Western Power, AEMO will advise Western Power of the following matters as soon as practicable:

(a) generator Planned Outages in accordance with the WEM Procedure: IMS Interface;

(b) expected generator planned commitment and decommitment based on the market scheduling process that may have a material impact on voltage levels;

(c) WEM demand forecasts in an agreed format via AEMO's secure web portal; and

(d) any known or potential issues that may affect Western Power's ability to control voltage securely.

4.4.13. Western Power will operate voltage equipment that it controls, which may include other Market Participants' equipment, and will liaise with AEMO in relation to Market Participants' equipment that AEMO controls for voltage control purposes.

4.4.14. At all times, both the AEMO Controller and the Western Power Network Controller will monitor generating units and other reactive power devices for operation within their MVAr limits relevant for the conditions of the SWIS.

4.4.15. AEMO Controller and the Western Power Network Controller will inform each other of any MVAr limitations after becoming aware of them.

4.4.16. If Western Power identifies a voltage issue in the real power output of a Market Participant's generator it will notify AEMO, and if appropriate, AEMO will direct the relevant Market Participant to change its output to resolve the issue.

## 4.5. Load shedding and restoration principles and processes

**UFLS**

4.5.1. Western Power will make an estimate of the quantity of load to shed on each UFLS stage available to AEMO, in real time.

4.5.2. AEMO may request confirmation of under frequency relay settings, or information on the operation of these relays. Western Power will use reasonable endeavours to provide this information to AEMO within an agreed timeframe.

4.5.3. When an automatic load shedding scheme operates, the Western Power Network Controller must advise the AEMO Controller that the scheme has operated and the extent of its operation as soon as practicable after the event, and must follow any directions from the AEMO Controller with regards to restoration of the load.

**Manual load shedding**

4.5.4. When required AEMO will develop manual load shed plans, and will inform Western Power of these plans. In developing manual load shed plans, AEMO will determine:

(i) the aggregate quantity of load requiring to be shed; and

(ii) the timeframe over which the load shedding is to occur.

4.5.5. AEMO may specify a specific or general location for the load shedding to occur. The location specified may be a particular substation, a local or general area, or across the entire SWIN.

4.5.6. Restoration of load, once shed, will be at the direction of the AEMO Controller.

**Manual load shedding directions**

4.5.7. The AEMO Controller will issue manual disconnection directions to the Western Power Network Controller when manual load shedding is required.

4.5.8. The Western Power Network Controller is responsible for selecting and interrupting suitable loads to match the quantity of load to be shed, as advised by the AEMO Controller.

4.5.9. The AEMO Controller will issue load restoration directions to the Western Power Network Controller, which will specify the quantity, the specific or general location, and when restoration is to commence. The Western Power Network Controller is responsible for selecting and restoring suitable loads to match the quantity of load to be restored, as advised by the AEMO Controller.

## 4.6. Security management and coordination principles and processes

4.6.1. Western Power and AEMO will inform each other of any Credible Contingency violations identified in their respective EMSs, and will work together to rectify the violation by following an agreed process.

4.6.2. AEMO uses a real-time System Inertia application to estimate and manage the impact of the largest Credible Contingency on system frequency.

4.6.3. AEMO also uses the System Inertia application to inform the Short Term PASA and reactive power studies, in order to generate a Dispatch Plan for each Scheduling Day.

4.6.4. AEMO and Western Power will coordinate the management of the minimum demand threshold for the SWIS, based on agreed processes, including the curtailment of distributed photovoltaic (DPV) generation if required.

## 4.7. Information sharing processes to support operational planning and maintenance of Power System Security and Power System Reliability

4.7.1. AEMO and Western Power will maintain communications concerning the condition of the SWIS and Western Power's network in accordance with this Operating Protocol. Western Power will promptly advise AEMO after becoming aware of any circumstances that could reasonably be expected to adversely affect Power System Security or Power System Reliability, excluding Western Power's responsibilities associated with customer and network reliability.

4.7.2. AEMO will advise Western Power after becoming aware of circumstances that could reasonably be expected to cause Western Power's network equipment to be operated outside of operational limits as advised to AEMO.

4.7.3. AEMO and Western Power use different EMSs. AEMO's EMS receives operational data from Western Power's EMS via an Inter-Control Centre Communications Protocol link. It is critical that the two power system models are kept synchronised to ensure safe and secure operation of the power system.

4.7.4. AEMO and Western Power will coordinate with each other regarding planned changes to the power system models and timelines. AEMO and Western Power will manually reflect system changes prior to the model changes taking effect, where appropriate.

4.7.5. Unplanned changes will be addressed in AEMO's model in the next production update, once Western Power has submitted the required documentation.

4.7.6. AEMO may not have full visibility of the state of the distribution network connections relating to distribution-connected Market Participants. The Western Power Network Controller will coordinate with the AEMO Controller in relation to supporting the active monitoring of these Market Participants.

4.7.7. The Western Power Network Controller may communicate updated Equipment Ratings (such as the temporary re-rating of equipment) directly to the AEMO Controller. The Western Power Network Controller may also communicate updated Security Limit information directly to the AEMO Controller in real time.

4.7.8. If AEMO becomes aware of an item of equipment operating, or potentially operating, above its ratings, AEMO may discuss with Western Power whether a temporary equipment re-rating can be established within agreed timeframes. If the equipment item cannot be temporarily re-rated within that timeframe, AEMO will use the last-known limit value as the basis for any decision making.

4.7.9. Western Power may declare short-term emergency ratings for AEMO to apply for power transformers and conductors. In the absence of such ratings, AEMO will apply the relevant seasonal limits unless the Western Power Network Controller has provided an equipment re-rating.

4.7.10. Western Power must notify AEMO of seasonal changes to Equipment Ratings and Security Limits.

4.7.11. The Western Power Network Controller must notify the AEMO Controller as soon as practicable if an Equipment List item is affected by a Forced Outage.

## 4.8. Network outage review processes

4.8.1. Western Power and AEMO will meet to discuss and coordinate proposed network outages and operational experiences. These meetings will be administered by AEMO.

4.8.2. Outage requests will be processed in accordance with the WEM Rules, having regard to agreed assessment criteria.

4.8.3. In relation to in-service work:

- A PTP must be requested immediately prior to disabling any associated protection devices or schemes. For Planned Outages of items on the Equipment List, unless otherwise stated in the Outage approval, PTP is required to commence operational switching.
- Unless otherwise requested, PTR from AEMO is not required to commence operational switching. However, the Western Power Network Controller will advise the AEMO Controller that return to service of the equipment has been completed as soon as practicable after the event.

- For clarity, subject to the identification of any risks to Power System Security or Power System Reliability, PTP/PTR is not required within the AEMO Operating Zone for routine operational switching that is not associated with Planned Outages of Equipment List items.

4.8.4. In relation to out-of-service work:

- A PTP must be requested immediately prior to the switching that will reduce or remove the load-carrying capability of the equipment.
- The Western Power Network Controller must request a PTR prior to the switching that will restore the load-carrying capability of the equipment.

## 4.9. Reporting requirements to support processes

4.9.1. Following a significant incident or excursion, or an unusual or unexpected event, AEMO may request Western Power to provide further information on the relevant matter.

4.9.2. Western Power will provide further information as soon as practicable to AEMO when requested.

# 5. Other matters – clause 3.1A.2(l)

## 5.1. Commissioning and testing

5.1.1. When coordinating generator performance testing and Commissioning Tests for registered facilities, Western Power will coordinate with AEMO to ensure that the commissioning and testing is conducted in accordance with the Technical Rules and the WEM Rules.

## 5.2. Synchronising generators

5.2.1. In the event of synchronising a generator to the SWIS, AEMO is responsible for the overall coordination of synchronisation, including coordination with Market Participants in relation to the preparation of their Facilities for synchronisation. At the appropriate time AEMO will direct initiation of the synchronisation process.

5.2.2. If necessary, AEMO may adjust the SWIS Frequency to facilitate the synchronisation of a generator.

5.2.3. If necessary, AEMO may direct Western Power to change SWIS voltages to facilitate synchronisation of a generator.

## 5.3. Fault level management and System Strength

5.3.1. Western Power will manage fault levels on the SWIN, in consultation with AEMO, having regard to the impact on System Strength.

5.3.2. Where a fault level issue is identified and a Security Limit has not been established, the Western Power Network Controller will contact the AEMO Controller to advise of the issue and agree steps for resolution.

5.3.3. In the case of Planned Outages, it may be necessary for Western Power to temporarily exceed fault levels for short periods during a switching sequence. For such cases, Western Power will use good industry practice to minimise risks. This includes ensuring subsequent switching steps are taken as soon as practicable to reduce the fault levels to within equipment fault limits.

5.3.4. Western Power must also notify AEMO where it considers large-scale or widespread load issues that may affect AEMO's ability to forecast or dispatch generation, or which may push the SWIS outside the Normal Operating Frequency Excursion Band.

## 5.4. System Restart

5.4.1. AEMO is accountable for planning, preparation and coordinating the restoration of the SWIS following a complete or partial system shutdown event

5.4.2. The AEMO Controller will provide directions to the Western Power Network Controller regarding the system restart process.

5.4.3. The Western Power Network Controller is responsible for the management of load and customer reenergisation in accordance with directions from AEMO.

# Appendix A. (Redacted in accordance with clause 3.1A.7)

# Appendix B. (Redacted in accordance with clause 3.1A.7)