

# WEM PROCEDURE: SYSTEM RESTART

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## 1. INTRODUCTION

### 1.1. Purpose and scope

- 1.1.1. This WEM Procedure: System Restart (Procedure) is made in accordance with AEMO's functions under clause 2.1A.2(h) of the Wholesale Electricity Market Rules (WEM Rules).
- 1.1.2. The *Electricity Industry Act 2004*, the WEM Regulations and the WEM Rules prevail over this Procedure to the extent of any inconsistency.
- 1.1.3. In this Procedure, where obligations are conferred on a Rule Participant, that Rule Participant must comply with the relevant obligations in accordance with clause 2.9.7A or 2.9.8 of the WEM Rules, as applicable.
- 1.1.4. The purpose of this Procedure is to document:
- a) the methodology and processes AEMO uses to determine the System Restart Standard and System Restart Plan;
  - b) any matters, in addition to the requirements specified in clause 3.7.30, that the standard form contract for System Restart Service submissions may address;
  - c) the factors AEMO may consider when determining whether changes from the standard form contract are reasonably required for the purposes of clause 3.7.36B;
  - d) the processes to be followed by AEMO and Rule Participants in relation to the procurement of System Restart Services by AEMO;
  - e) the methodologies and processes to be followed by AEMO in:
    - i. determining whether a System Restart Service submission is valid;
    - ii. analysing and selecting System Restart Service submissions to meet the System Restart Standard; and
    - iii. accepting a System Restart Service submission to become an effective System Restart Service Contract;
  - f) the processes to be followed by AEMO in conducting a review under clauses 3.7.10 and 3.7.11 and consulting with Network Operators; and
  - g) any other matters AEMO considers as reasonably required in relation to System Restart Service provision or operation [clause 3.7.40].

1.1.5. Appendix A of this Procedure outlines the head of power clauses that this Procedure is made under, as well as other obligations in the WEM Rules covered by this Procedure.

## 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 Procedure unless the context requires otherwise.

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

**Table 1 Definitions**

Term	Meaning
Black Start Unit	A generating unit that can operate without support from a Network.
Electrical Sub-Network	A smaller section of a Network where the boundary is defined by AEMO in the System Restart Standard.
Trip to House Load Unit	A generating unit that can disconnect from a Network during a Major Supply Disruption and still supply power to the auxiliaries or local load.

## 1.3. Interpretation

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

- (a) Clauses 1.3 to 1.5 of the WEM Rules apply in this Procedure.
- (b) References to time are references to Australian Western Standard Time.
- (c) Terms that are capitalised, but not defined in this Procedure, have the meaning given in the WEM Rules.
- (d) A reference to the WEM Rules or 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 Procedure.
- (g) A reference to a clause refers to a clause or section of the WEM Rules.
- (h) References to WEM Rules in this Procedure in bold and square brackets [Clause XXX] are included for convenience only, and do not form part of this Procedure.
- (i) Text located in boxes and headed as Explanatory Note X in this Procedure is included by way of explanation only and does not form part of this Procedure. The Procedure prevails to the extent of any inconsistency with the explanatory notes contained within it.
- (j) The body of this Procedure prevails to the extent of any inconsistency with the figures, diagrams, appendices, schedules, annexures or attachments contained within this document.

## 1.4. Related documents

1.4.1. The documents in Table 2 are associated with this Procedure.

**Table 2 Related documents**

Reference	Title	Location
Local Black Start Procedure Guideline	SWIS Local Black Start Procedure Guideline	WEM Website <sup>1</sup>
SO_OP_WA_3808	WEM Procedure: Power System Security	WEM Website <sup>2</sup>
Technical Rules	Technical Rules Revision 3 (1 December 2016)	Economic Regulation Authority website <sup>3</sup>
State Hazard Plan	State Hazard Plan – Energy Supply Disruption	State Emergency Management Committee website <sup>4</sup>

## 2. SYSTEM RESTART FRAMEWORK

- 2.1.1. AEMO must use its reasonable endeavours to ensure the SWIS is restarted and restored in the event of a system shutdown or major supply disruption [clause 3.7.20].
- 2.1.2. AEMO must develop and maintain the System Restart Plan for the purposes of managing and coordinating restart and restoration of the SWIS in the event of a system shutdown or major supply disruption [clause 3.7.3].
- 2.1.3. AEMO must use its reasonable endeavours to procure System Restart Services to meet the System Restart Standard [clause 3.7.25].

### E[A] Explanatory Note – Power system restart and restoration stages

The restoration of the power system following a major supply disruption occurs in two stages:

- i. Restart – initial sequence of operations and pathways that are required to establish a secure and stable power system.
- ii. Restoration – sequence of operations and pathways to enable the power system to be re-energised and load to be restored

The System Restart Standard sets out the parameters for the restart stage only.

<sup>1</sup> <https://aemo.com.au/energy-systems/electricity/wholesale-electricity-market-wem/system-operations/ancillary-services/system-restart>

<sup>2</sup> [https://www.aemo.com.au/-/media/files/stakeholder\\_consultation/consultations/wa\\_wem\\_consultation\\_documents/2019/aepec\\_2019\\_08/final/psop-power-system-security-clean.pdf](https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/wa_wem_consultation_documents/2019/aepec_2019_08/final/psop-power-system-security-clean.pdf)

<sup>3</sup> <https://www.erawa.com.au/electricity/electricity-access/western-power-network/technical-rules/approved-technical-rules>.

<sup>4</sup> <https://semc.wa.gov.au/emergency-management/plans/state-hazard-plans>

### 3. DETERMINATION OF THE SYSTEM RESTART STANDARD

#### 3.1. Minimum time

- 3.1.1. The System Restart Standard must identify the minimum length of time for which a System Restart Service may be required to operate continuously following a system shutdown or a major supply disruption [clause 3.7.2(a)].
- 3.1.2. AEMO must use its reasonable endeavours to procure System Restart Services that are able to operate continuously for the duration of the restart stage.
- 3.1.3. AEMO must determine the minimum length of time that the System Restart Service must operate continuously, which must consider:
  - (a) the time it may take for AEMO to determine the cause of the major supply disruption and initiate the restart plan; and
  - (b) the time it may take for the Network Operator to configure the restart path.
- 3.1.4. The Network Operator must ensure adequate communication and remote switching capability is available on the agreed components in the restart pathway for a minimum amount of time as specified in the System Restart Standard.
- 3.1.5. Where the Network Operator does not have adequate communication and remote switching capability, the Network Operator must have contingency plans in place for manual switching and to maintain visibility on the agreed components of the network.

#### 3.2. Technical requirements

- 3.2.1. The System Restart Standard must specify the technical requirements that a Registered Facility must demonstrate to be eligible to provide a System Restart Service [clause 3.7.2(b)].
- 3.2.2. AEMO must set the System Restart Service technical requirements and must consider:
  - (a) Black Start or Trip to House Load Unit capability;
  - (b) active and reactive power control capability;
  - (c) frequency control capability;
  - (d) ability to operate in a stable manner during network switching and connection of load; and
  - (e) ability to maintain remote communication.

### 3.3. Diversity

- 3.3.1. The System Restart Standard must include guidelines addressing the diversity of System Restart Services, including diversity of locations within the SWIS [clause 3.7.2(c)].
- 3.3.2. AEMO must use reasonable endeavours to ensure there is electrical, technological, and geographical diversity in the System Restart Services that are procured.
- 3.3.3. For electrical diversity, AEMO must use reasonable endeavours to procure System Restart Services that do not share a single point of electrical or physical failure.
- 3.3.4. For geographical diversity, AEMO must use reasonable endeavours to procure System Restart Services that are situated in different geographic locations to minimise the potential impact of events such as natural disasters.
- 3.3.5. For technological diversity, AEMO must consider various technologies to minimise reliance of System Restart Services on common technological attributes where these attributes may impact the reliability of the service.
- 3.3.6. AEMO must seek to achieve diversity in at least two diversity factors where diversity in all three diversity factors cannot be achieved.
- 3.3.7. AEMO must determine Electrical Sub-Networks within the SWIS, and must use reasonable endeavours to ensure that at least one System Restart Service is procured in each electrical sub-network.
- 3.3.8. AEMO must consider various factors to determine the Electrical Sub-Networks, including:
  - (a) transmission corridors that connect the sub-network to the remainder of the SWIS;
  - (b) electrical distance between generation centres;
  - (c) quantity of generation in the sub-network;
  - (d) quantity of load in the sub-network across various scenarios; and
  - (e) location of synchronising facilities.

### 3.4. Reliability

- 3.4.1. The System Restart Standard must include requirements for mitigating against the risk of unavailability of any System Restart Service during a system shutdown or major supply disruption [Clause 3.7.2(d)].
- 3.4.2. AEMO must use reasonable endeavours to procure System Restart Services with a high level of reliability so that the services can be relied on to restart the SWIS when called upon by AEMO.
- 3.4.3. When determining the reliability of an individual System Restart Service, AEMO must consider:
  - (a) the availability of that service;



- (b) the start-up performance as determined through tests; and
- (c) the reliability of the transmission components in the restart path.

#### 4. DETERMINATION OF THE SYSTEM RESTART PLAN

4.1.1. AEMO must develop and maintain the System Restart Plan for the purposes of managing and coordinating restart and restoration of the SWIS in the event of a system shutdown or major supply disruption [clause 3.7.3].

4.1.2. The System Restart Plan must:

- (a) be consistent with the System Restart Standard;
- (b) cover the whole of the SWIS but may consist of one or more separable components; and
- (c) take into account any Local Black Start Procedures [clause 3.7.4].

4.1.3. AEMO must ensure the System Restart Plan contains the sections listed in Table 4:

Table 4 System Restart Plan Contents

Section	Description
Roles and Responsibilities	An overview and description of the responsibilities of key stakeholders such as AEMO, the Network Operator and System Restart Service Providers.
Communication Plan	A plan to describe how AEMO will communicate with key stakeholders and Market Participants.
Restart Strategies	<p>Specific guidance to AEMO staff regarding actions required to restart the SWIS using the contracted System Restart Services.</p> <p>Strategies may include multiple scenarios using the System Restart Services.</p> <p>The actions AEMO may take following a major supply disruption, include but are not limited to:</p> <ul style="list-style-type: none"> <li>(a) stabilising any remaining parts of the power system;</li> <li>(b) identifying the cause of the major supply disruption;</li> <li>(c) assessing the state of the power system – determine condition of energy and transmission infrastructure, load forecasts, fuel supply availability, and other matters that AEMO considers relevant;</li> <li>(d) selecting a restart strategy; and</li> <li>(e) executing the restart strategy.</li> </ul>

4.1.4. AEMO must document the restart strategy for each of the System Restart Services contracted in the System Restart Plan, taking into account any Local Black Start Procedures.

4.1.5. In determining the restart strategies under paragraph 4.1.4, AEMO must consider actions to:

- (a) target stable base load and restore in appropriate block sizes while operating with the System Restart Services;
- (b) establish a secure network configuration such as a complete loop network, as early as possible, so that contingency events can be managed;

- (c) manage network voltage by progressively increasing the load block sizes as larger generating units along the restart path are energised; and
- (d) operating the isochronous unit in the middle of its range to provide maximum flexibility.

## 5. REVIEWING THE SYSTEM RESTART STANDARD OR SYSTEM RESTART PLAN

### 5.1. Triggers to review the System Restart Standard or System Restart Plan

#### 5.1.1. Where AEMO:

- (a) has received a request from a Network Operator under clause 3.7.8; or
- (b) considers, for any reason, that the System Restart Standard (or any part of it) is no longer achievable or effective,

AEMO must review the System Restart Standard or the System Restart Plan, or both, if required, and make any revisions that AEMO considers are necessary to ensure that the System Restart Standard and the System Restart Plan are achievable and effective for restarting the SWIS in the event of a system shutdown or major supply disruption [clause 3.7.10.].

- 5.1.2. Without limiting the frequency of reviews AEMO may undertake in accordance with paragraph 5.1.1, AEMO must review the System Restart Standard and the System Restart Plan to ensure they are appropriate and consistent with the requirements of this section 3.7 within three years of the commencement of the System Restart Standard and System Restart Plan and then at least once in every three-year period from completion of the previous review [clause 3.7.11].

### 5.2. Process for reviewing the System Restart Standard

#### 5.2.1. The processes AEMO may undertake to review the System Restart Standard include:

- (a) identifying any operational differences in the SWIS such as network infrastructure or generating unit changes;
- (b) if relevant, performing power system modelling and simulation studies to assess whether the elements of the System Restart Standard are still valid with the differences identified;
- (c) reviewing the validity of the System Restart Standard against recent power system incidents that could have required the activation of the System Restart Plan;
- (d) amending any elements of the System Restart Standard as required, and publishing the System Restart Standard on the WEM Website; and
- (e) if required, initiating the procurement process to meet the revised System Restart Standard.

### 5.3. Process for reviewing the System Restart Plan

#### 5.3.1. The processes AEMO may undertake to review the System Restart Plan include:

- (a) reviewing the System Restart Plan against any new revisions of the System Restart Standard;
- (b) reviewing any recent Power System Security or Power System Reliability incidents that could have required activation of the System Restart Plan; and

- (c) performing power system modelling and simulation studies to ensure that the System Restart Plan can function as intended.
- 5.3.2. The Network Operator must review AEMO's proposed revision to the System Restart Plan and provide feedback to AEMO within a mutually agreed timeframe.
- 5.3.3. Each Network Operator that may be impacted by the System Restart Plan must conduct any studies or analyses that are reasonably required to provide input into the System Restart Plan, within a reasonable timeframe to be agreed with AEMO [clause 3.7.6].
- 5.3.4. AEMO must, in developing, and making revisions to, the System Restart Plan, take into account any input provided by a Network Operator under clause 3.7.6, including any information in relation to:
- (a) viable restart paths; and
  - (b) following a successful restart, the restoration of any sensitive Loads on the Network Operator's Network [clause 3.7.7].
- 5.3.5. Where the System Restart Plan, or any revision to it, requires a Network Operator to change or modify any Network equipment, AEMO and the Network Operator must agree a timeframe that is sufficient for the Network Operator to make any changes or modifications, including time to undertake appropriate and reasonable testing [clause 3.7.9].

## 6. SYSTEM RESTART SERVICE PROCUREMENT

### 6.1. Initiating the Procurement Process

- 6.1.1. AEMO may procure System Restart Services through an open competitive tender process where the System Restart Standard is not being met or is unlikely to be met from a given date.
- 6.1.2. AEMO must publish a call for submissions for the provision of System Restart Service, no later than 20 Business Days prior to the proposed closing date for submissions, on the WEM Website and at least one major tender portal [clause 3.7.28].
- 6.1.3. A Market Participant intending to make a submission in response to AEMO's call for submissions under paragraph 6.1.2 must ensure that the submission is made prior to the closing date for submissions.
- 6.1.4. AEMO must include in the call for submissions referred to in paragraph 6.1.2:
- (a) the date and time for lodgement of submissions;
  - (b) contact details for AEMO;
  - (c) a description of the technical requirements, including any locational requirements, for the System Restart Service;
  - (d) the location on the WEM Website of the standard form contract referred to in clause 3.7.30; and
  - (e) the location on the WEM Website of the specification prepared by AEMO in accordance with clause 3.7.27 for the System Restart Service [clause 3.7.29].

- 6.1.5. AEMO must prepare a specification for a System Restart Service requirements to meet the System Restart Standard [clause 3.7.27].
- 6.1.6. AEMO must include in the specification for a System Restart Service requirement:
- (a) the procurement objective;
  - (b) the location of the electrical sub-networks;
  - (c) a description of the technical requirements;
  - (d) the capacity requirements;
  - (e) individual reliability requirements; and
  - (f) testing requirements.
- 6.1.7. AEMO may include additional information in the specification for a System Restart Service where AEMO considers it necessary to meet the System Restart Standard.

## 6.2. Processing Submissions

- 6.2.1. AEMO considers a submission made by a prospective System Restart Service Provider valid where:
- (a) the submission is made before the closing date of AEMO's call for submission or an agreed extension time; and
  - (b) the submission is made in accordance with the requirements under clause 3.7.31.
- 6.2.2. AEMO must carry out a review of submissions to consider whether:
- (a) all required information has been provided; and
  - (b) the information provided is of sufficient detail.
- 6.2.3. Where AEMO requires clarification in relation to the information provided or requires additional information, AEMO must request clarification or additional information from the prospective System Restart Service Provider.
- 6.2.4. AEMO may request information from the Network Operator or request that the Network Operator conduct analysis to assess the capability of a proposed System Restart Service.
- 6.2.5. AEMO may reject a submission where:
- (a) the Registered Facility being offered does not meet the technical requirements specified in the System Restart Standard;
  - (b) the Registered Facility being offered is not expected to meet the individual reliability requirements specified in the System Restart Standard;
  - (c) the prospective System Restart Service Provider declines to provide clarification or additional information as requested in paragraph 6.2.3; and
  - (d) the submission does not include the cost information and any assumptions used to calculate the proposed offer for the provision of the System Restart Service.

6.2.6. AEMO may, as part of assessing a submission made under clause 3.7.31, provide details of the submission, except for the offer price and any other commercially-sensitive information, to each relevant Network Operator to assist AEMO to determine whether the proposal in the submission is technically feasible, including whether any augmentation of the Network would be required to make the proposal technically feasible [clause 3.7.35].

### 6.3. Selection of System Restart Service Submission

6.3.1. AEMO must evaluate valid submissions and identify the services that satisfies the System Restart Standard and the procurement objective as defined in paragraph 6.1.5.

6.3.2. To support with the evaluation, AEMO must determine evaluation criteria which may include but are not limited to:

- (a) technical capability of the facility;
- (b) availability and reliability; or
- (c) costs.

6.3.3. AEMO must assess the technical capability of a service or combination of services through power system modelling and simulation studies by:

- (a) confirming or validating technical capabilities of the submissions;
- (b) determining which services should be procured in order to satisfactorily meet the requirements of the System Restart Standard; and
- (c) confirming each Electrical Sub-Network can operate in a secure operating state before progressing to the restoration stage.

6.3.4. AEMO may assess the technical capability of a service or combination of services through power system modelling and simulation studies, or through other means where AEMO considers it necessary.

6.3.5. AEMO is not required to repeat power system modelling and simulation studies if:

- (a) AEMO has previously conducted studies for the proposed System Restart Service with identical restart paths and with the same combination of other System Restart Services; and
- (b) there have not been material changes to the relevant parts of the power system since those last studies.

### 6.4. Accepting a System Restart Service Submission

6.4.1. AEMO must analyse and select System Restart Service submissions in accordance with paragraph 6.3 and accept System Restart Service submissions that AEMO reasonably considers meet the requirements of clause 3.7.25.

6.4.2. Where AEMO accepts a submission made under clause 3.7.31, AEMO must:

- (a) notify the Market Participant within five Business Days of accepting the submission; and
- (b) publish a notice on the WEM Website within five Business Days of accepting the submission [clause 3.7.36].

- 6.4.3. AEMO and Market Participants, when entering into a System Restart Service, must use the standard form contract published on the WEM Website [clause 3.7.36A].
- 6.4.4. AEMO's acceptance of a submission made under clause 3.7.31 forms a binding System Restart Service Contract between the Market Participant and AEMO [clause 3.7.37].

## 7. STANDARD FORM CONTRACT FOR SYSTEM RESTART SERVICE

### 7.1. Standard form contract

- 7.1.1. AEMO must develop, maintain and publish on the WEM Website, a standard form contract for the provision of a System Restart Service which must include, at a minimum, the following fields:
- (a) the name of the Market Participant and its Registered Facility that is proposed to provide the System Restart Service
  - (b) the offer price for each cost component specified by AEMO, which may include, where applicable:
    - (i) a price to cover the cost of capital works;
    - (ii) a service availability price, including for ongoing maintenance works;
    - (iii) a service testing price; and
    - (iv) a service usage price;
  - (c) the proposed contract term for the System Restart Service;
  - (d) the availability requirements for the System Restart Service; and
  - (e) a standard list of terms and conditions to apply to the contract [clause 3.7.30].
- 7.1.2. AEMO may allow a System Restart Service contract to vary from the standard form contract where AEMO considers that those variations are reasonably required, having regard to the specific characteristics of the Facility providing the System Restart Service [clause 3.7.36B].
- 7.1.3. Where AEMO determines changes from the standard form contract are reasonably required, having regard to the specific characteristics of the Facility providing the System Restart Service, AEMO may consider:
- (a) the equipment, including supplementary equipment, used by the Facility during the restart stage;
  - (b) the proposed duration of the agreement;
  - (c) the minimum technical requirements;
  - (d) the contracted levels of performance;
  - (e) availability and reliability;
  - (f) special testing conditions; or
  - (g) prices and payments.
- 7.1.4. AEMO may consider additional factors when determining changes from the standard for contract under paragraph 7.1.3 where AEMO considers it reasonably required, having regard to the specific characteristics of the Facility providing the System Restart Service.

## APPENDIX A. RELEVANT CLAUSES OF THE WEM RULES

Table 5 details:

- (a) the head of power clauses in the WEM Rules under which the Procedure has been developed; and
- (b) each clause in the WEM Rules requiring an obligation, process or requirement be documented in a WEM Procedure, where the obligation, process or requirement has been documented in this Procedure.

**Table 5 Relevant clauses of the WEM Rules**

Clause
3.7.40(a)
3.7.40(b)
3.7.40(c)
3.7.40(d)
3.7.40(e)
3.7.40(f)

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