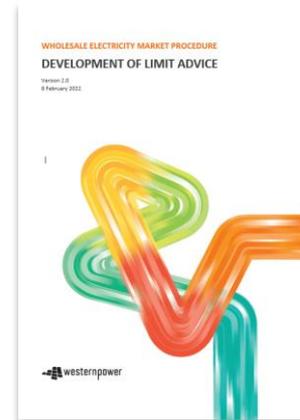


WEM Procedure limit advice development – amendments
related to provision of RCM limit advice



Agenda

- Background
- Context – Thermal limits, Non-thermal limits and RCM thermal limits
- RCM limit advice
- Amendments proposed to WEM procedure limit advice development
 - Summary and detail
- Next steps
 - Industry consultation
 - Contact for queries/further information



Background

- Western Power has an existing transitional procedure *WEM Procedure Limit Advice Development* which we presented to the WRIG in 2020. This is the procedure we are using for the development of thermal and non-thermal limit advice we provide to AEMO to enable them to formulate constraint equations required for security constrained economic dispatch. At the new WEM commencement date the transitional procedure will become the WEM Procedure
- The changes to the WEM rules require Western Power to amend the procedure to include the additional items related to provision of RCM limit advice to AEMO for the Reserve Capacity Mechanism and Network Access Quantity purposes.
- WEM Procedure to be published with the amendments suitable for the RCM 2022 cycle timeframe which requires publication in March after 3 week public consultation in Feb.

Types of limits

Network Limit: A limitation or requirement affecting the capability to transfer power in a part of a Network, such that it would be unacceptable to transfer electricity across that part of the Network at a level or in a manner outside the limit or requirement

Thermal Network Limit: Means a Network Limit that describes the maximum capacity for electrical throughput of a particular Network element due to temperature or related effects.

Non-Thermal Network Limit: Means a Network Limit that is not Thermal Network Limit.

RCM Thermal Limit is a thermal limit determined at an ambient temperature of 41C.

Thermal limits

- Limits for equipment list items used operationally
- Multiple limits assuming varying ambient temperatures by geographic location and different ratings, for example summer and winter ratings
- Fortnightly updates AEMO
- Input to AEMO to formulate constraint equations for WEMDE
- Triggered by changes in the network due to new equipment, upgrades, condition of asset

Non-thermal limits

- In the form of limit equations to operate the network securely for items such as voltage stability.
- Identified through complex network simulation and load flow studies incorporating various generation and load scenarios
- Updated as required.
- Input to AEMO to formulate constraint equations for WEMDE
- Triggered by changes to network configuration, generator performance, technical requirements

RCM Thermal limits

- Applies to a subset of equipment list items – transmission lines and transformers impacting market participants
- Triggered once per year by RCM EOI process
- A single rating – a thermal limit assuming an ambient temperature of 41 degrees
- Based on estimated configuration of the network Year 3 of capacity cycle
- Calculated and revised annually
- Input to AEMO to NAQ/RCM processes (not used operationally)

RCM Limit Advice

AEMO will develop the RCM Constraint Equations to determine the Network Access Quantity. Western Power will provide the following information in RCM Limit Advice to assist AEMO in developing RCM Constraint Equations.

- Estimate the configuration of the electricity network during the system peak demand to connect EOI facilities— taking into account new network augmentations, network assets scheduled to be retired, new facilities or facilities expected to be retired
- Estimate the proportion of the peak demand at each Electrical Location (zone substations) in the network – including identifying new or increasing loads equal to or greater than 10MW
- Thermal network limits assuming an ambient temperature of 41 degrees Celsius (termed “RCM thermal limits” as distinct from thermal limits and non-thermal limits)

(Rules extract) 2.27A.11. Each Network Operator must document in a WEM Procedure:

(b) the processes to be followed by a Network Operator for:

- i. estimating the configuration and Thermal Network Limits of its Network in accordance with clause 4.4B.3; and Chapter 2
- ii. allocating the value referred to in clause 4.4B.5(a) for each Electrical Location in accordance with clause 4.4B.5(b).



Amendments proposed to the WEM Procedure

New section 5 “Development of RCM Thermal Network Limits”

- 5.1 - Estimating the configuration of the network
- 5.2 - Estimating proportion of demand in the network
- 5.3 - Determining RCM Thermal Network Limits

Section 6 revision - Provision of limit advice

Some other minor changes to defined terms table and other clauses.

A clean copy and a copy with tracked changes will be made available.

Estimating the configuration of the network

5.1 Estimating the configuration of the Network and providing asset information

5.1.1 In accordance with clause 4.4B.2 of the WEM Rules, by 5:00 PM on the last Business Day falling on or before 8 March, AEMO must provide Western Power with the details of each Facility for which AEMO has received, in relation to 1 October of Year 3 of the Reserve Capacity Cycle:

- (a) an Expression of Interest;
- (b) a notice where the intention is for the Facility to cease operation permanently; and
- (c) an Early Certified Reserve Capacity application.

5.1.2 AEMO must provide Western Power the information in step 5.1.1, by email to WEMLimitAdvice@westernpower.com.au, including in the subject that the request is for RCM Limit Advice, and specifying the capacity year relevant to the advice requested.

5.1.3 Upon receipt of the notified Facility information in step 5.1.1, Western Power must collate the relevant planning and design documents for each notified Facility, to extract information including but not limited to the:

- (a) proposed connection arrangement;
- (b) project status; and
- (c) forecast in-service date.

5.1.4 Western Power must extract the list of transmission Network assets from the physical asset register, as specified in the WEM Procedure: RCM Limit Advice Requirements, and update the list to include all new, reconfigured and removed Network assets described in the relevant planning and design documents for each notified Facility. The information captured in this list will include but not limited to the:

- (a) new asset name or identification number;
- (b) asset ratings:
 - i. for existing transmission lines and transformers, at an ambient temperature of 41 degrees Celsius;
 - ii. for all other existing Network equipment comprising a Network Element, the nameplate rating; and
 - iii. for all proposed Network Elements, the ratings provided in the relevant planning and design documents where available, otherwise Western Power's estimate based on a similar existing Network Element;
- (c) removed or reconfigured existing assets; and
- (d) any other information required in WEM procedure: RCM Limit Advice Requirements.

5.1.5 Western Power must provide the list in step 5.1.4 to AEMO as part of the RCM Limit Advice in accordance with section 6 of this Procedure and the WEM Procedure: RCM Limit Advice Requirements **[clause 4.4B.5(d)]**.

Estimate the configuration of the electricity network and provide asset information during the system peak demand in Year 3— taking into account new network augmentations, network assets scheduled to be retired, new facilities or facilities expected to be retired

Estimating proportion of demand in the network

5.2 Estimating proportion of demand in the network

- 5.2.1 Western Power must estimate the proportion of peak demand at each Electrical Location on the Network [clause 4.4B.5(a)] and new or upgraded loads equal to or greater than 10 MW [clause 4.4B.5(c)].
- 5.2.2 Western Power must use the most up-to-date version of its SWIS model applicable to Year 3 of the Reserve Capacity Cycle, from which it must extract the estimated demand at each Electrical Location coincident to the system peak demand during the Hot Season in Year 3 of the Reserve Capacity Cycle, based on Western Power's 10 per cent probability of exceedance forecast.
- 5.2.3 In calculating the proportion of peak demand at an Electrical Location, Western Power must assume:
 - (a) the estimated proportion of the peak demand at an Electrical Location is the demand at that location divided by the sum of the demand at all Electrical Locations in the Network
 - (b) the estimated demand of each Block Load in MW; and
 - (c) demand at any Electrical Location that is forecast to have a zero or negative demand (i.e. it is a net exporter to the Network) equals zero
- 5.2.4 AEMO must treat all information marked confidential by Western Power as AEMO Confidential under Chapter 10 of the WEM Rules, and must not publish or otherwise share this information.
- 5.2.5 Where a Block Load is co-located with a substation, Western Power must subtract the estimated demand for the relevant load(s) from the substation demand, and document each separately.
- 5.2.6 Western Power must provide the information in this section to AEMO as part of the RCM Limit Advice in accordance with section 6 of this Procedure and the WEM Procedure: RCM Limit Advice Requirements.

Estimate the proportion of the peak demand at each Electrical Location (zone substations) in the network – including identifying new or increasing loads equal to or greater than 10MW

Determining RCM Thermal Network Limits

5.3 Determining RCM Thermal Network Limits

5.3.1 Western Power must determine thermal equipment ratings at an ambient temperature of 41 degrees Celsius [clauses 4.4B.5(b) and 4.4B.5(d)] for each Network Element that is:

- (a) physically part of the Network at the time of developing the RCM Thermal Network Limits (existing Network equipment); and
- (b) required to be in-service in Year 3 of the Reserve Capacity Cycle to facilitate network expansion and the connections of notified Facilities, including but not limited to new, modified and replaced assets (proposed Network Elements).

5.3.2 Western Power must determine the RCM thermal equipment rating for each relevant Network Element identified under step 5.3.1, considering:

- (a) for existing Network equipment:
 - i. the rating of each transmission line and transformer at an ambient temperature of 41 degrees Celsius; and
 - ii. the rating of all other equipment comprising the Network Element as the nameplate rating;
- (b) for proposed Network Elements, the rating of the element overall as provided in the relevant planning and design documents where available, otherwise Western Power's estimate based on a similar existing Network Element;
- (c) the technical design specifications of the relevant Network equipment using applicable Australian and International standards (including for example those developed by the International Electrotechnical Commission), relevant guidelines (including for example those developed by Energy Networks Australia) and good industry practice; and
- (d) operational requirements for the relevant Network equipment such as criticality, availability requirements and protection settings.

5.3.3 When determining the RCM Thermal Network Limit for each existing line circuit identified in step 5.3.1(a) of this Procedure, Western Power must consider, as a minimum, the:

- (a) individual thermal equipment ratings at an ambient temperature of 41 degrees Celsius for transmission lines, or otherwise the nameplate rating for each item comprising the Network Element;
- (b) current transformer metering limit of accuracy;
- (c) relay thermal rating;
- (d) minimum line protection; and
- (e) protection operating limits.

5.3.4 When determining the RCM Thermal Network Limit for each existing transmission transformer circuit identified in step 5.3.1(a) of this Procedure, Western Power must consider, as a minimum, the:

- (a) cooling mode;
- (b) load profile;
- (c) individual thermal equipment ratings at an ambient temperature of 41 degrees Celsius for transmission transformers, or otherwise the nameplate rating for each item comprising the Network Element;
- (d) transformer long time emergency rating;
- (e) ratings and limits of each of the internal and external components; and
- (f) protection operating limits.

5.3.5 Western Power must then:

- (a) determine the RCM Thermal Network Limit for each:
 - i. existing transmission line and transformer circuit identified in step 5.3.1(a) of this Procedure as the lowest limiting factor;
 - ii. proposed Network Element identified under step 5.3.1(b) of this Procedure as the Network Element rating determined in step 5.3.2(b) of this Procedure; or
- (b) document any alternative method for determining the RCM Thermal Network Limit, with reasons.

5.3.6 Western Power must identify separate RCM Thermal Network Limits for each Facility nominated to be classified as a Network Augmentation Funding Facility.

5.3.7 Western Power must provide the RCM Thermal Network Limits in steps 5.3.5 and 5.3.6 to AEMO as part of the RCM Limit Advice in accordance with section 6 of this Procedure and the WEM Procedure: RCM Limit Advice Requirements [clause 4.4B.5(b)].

Describe how Western Power will determine the RCM thermal equipment rating and what needs to be considered specifically for existing transmission lines and terminal transformers. Describe approach for equipment not yet in service.

Provision of RCM Limit Advice

- 6.1.3 Western Power must provide RCM Limit Advice to AEMO in a report by 5:00 PM on the last Business Day falling on or before 15 April in Year 1 of a Reserve Capacity Cycle. This report must include **[clause 4.4B.5]**:
- (a) the estimated proportion of peak demand at each Electrical Location as determined in section 5.2;
 - (b) estimates of the RCM Thermal Network Limits as determined in section 5.3;
 - (c) the Electrical Location and identity of any new load or increase in an existing load equal to or greater than 10 MW;
 - (d) the estimated configuration of the Network as determined in section 5.1;
 - (e) an explanation of the reasons for any changes to the RCM Limit Advice provided for the most recent previous Reserve Capacity Cycle; and
 - (f) any other information required under the WEM Procedure: RCM Limit Advice Requirements.

Timing and items of RCM limit advice to be provided to AEMO

Industry Consultation

- Following the WRIG presentation Western Power will circulate the transitional procedure with the inclusion of the RCM limit advice related sections – we will provide both a clean version and one with track changes from the existing procedure that only covers the thermal and non-thermal limit advice.
- We seek any feedback on the RCM items added to the procedure in February
- We will consider the feedback received when finalising the procedure which we are currently targeting in March 2022
- A summary of the feedback received and how it was taken into account will be prepared and presented back at a following WRIG
- We will update and publish the procedure on the Western Power website

If anyone has any comments or questions in follow-up to this presentation please contact Western Power at Regulatory Reforms RegulatoryReforms@westernpower.com.au



Head office

363 Wellington Street
Perth, WA 6000

westernpower.com.au

