Limit Advice Development

WEM Procedure

Version 1.0

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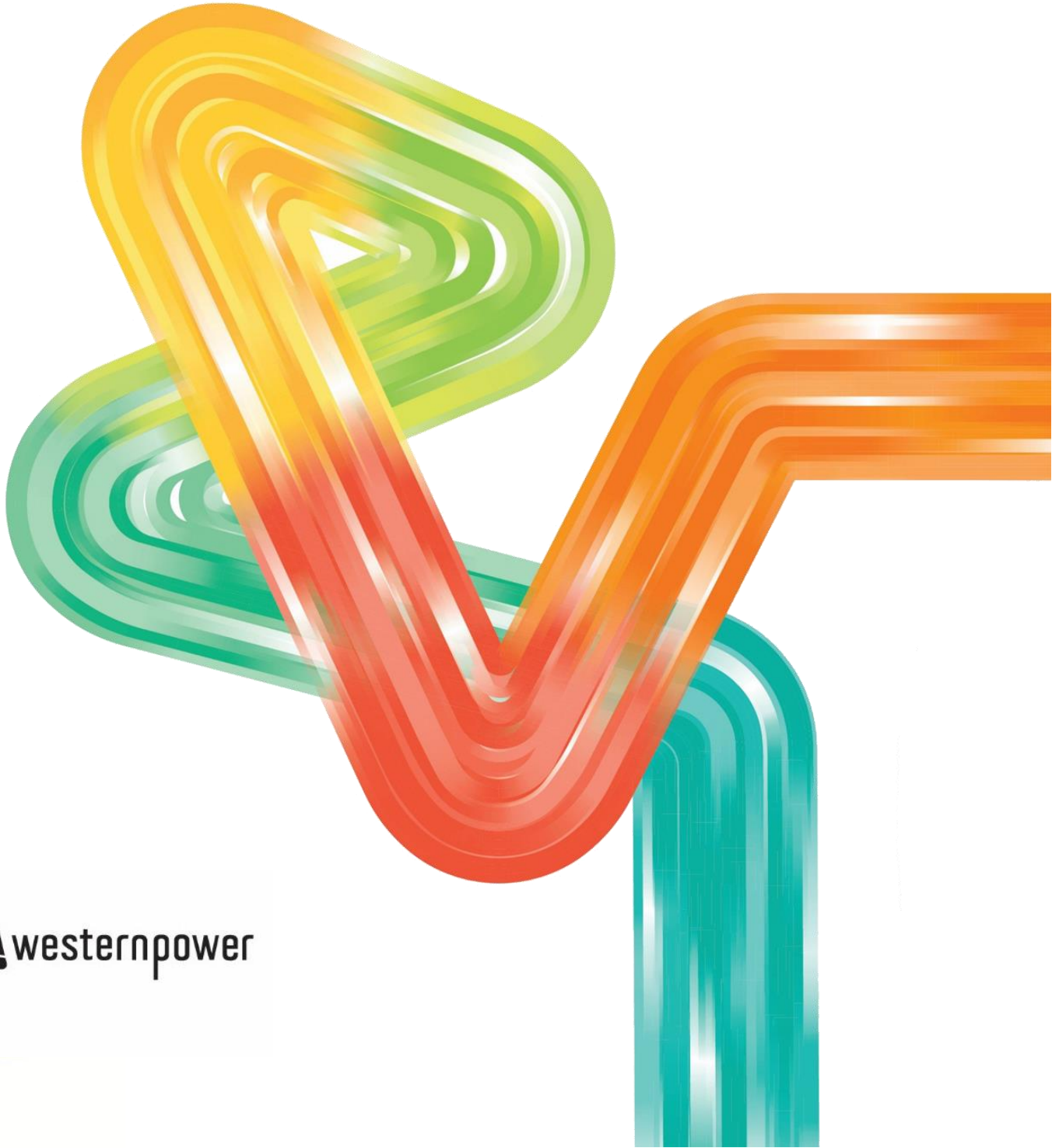
1 July 2022



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ELECTRICITY INDUSTRY ACT 2004
ELECTRICITY INDUSTRY
(WHOLESALE ELECTRICITY MARKET)
REGULATIONS 2004
WHOLESALE ELECTRICITY MARKET RULES

This WEM Procedure took effect from 8:00 AM (WST) on 1 July 2022

Authorisation

	Title	**Name**	**Date**
Approver:	Head of Regulation & Investment Assurance	Zahra Jabri	1 July 2022

Version Release History

Version	**Effective Date**	**Summary of Changes**
1.0	01 July 2022	WEM Procedure Limit Advice Development – first publication

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1 Overview

1.1 Relationship with the Wholesale Electricity Market Rules

1.1.1 This Wholesale Electricity Market (WEM) Procedure: Limit Advice Development (Procedure) is made in accordance with clauses 1.33.1(b) and 2.27A.11 of the WEM Rules.

1.1.2 The following transitional provisions apply to this Procedure:

1.1.3 Clause 1.33.2(b) of the WEM Rules, which deems this Transitional Procedure developed under clause 1.33.1(b)(i) to be the WEM Procedure under clause 2.27A.11 from the New WEM Commencement Day; and

(a) Clause 1.33.3 of the WEM Rules which, except in respect of other obligations under section 1.33 of the WEM Rules, does not require Western Power to comply with its obligations:

i. to develop and update Limit Advice under section 2.27A or 2.27B of the WEM Rules; and

ii. to respond to any requests issued by the Economic Regulation Authority (ERA) under clause 2.27C.7 of the WEM Rules,

until the New WEM Commencement Day.

(b) Notwithstanding clause 1.33.3, clause 1.48A.2 of the WEM Rules requires Western Power to comply with its obligations under section 2.27A in performing their obligations under, or in connection with, section 4.4B.

1.1.4 References to particular WEM Rules within this Procedure in bold and square brackets **[clause XX]** are included for convenience only and are not part of this Procedure.

1.1.5 The purpose of this Procedure **[clauses 2.27A.9, 2.27A.11, 4.4B.3 and 4.4B.5]** is to document the processes to be followed by Western Power and the matters it must consider in developing and updating the Limit Advice (including RCM[1] Limit Advice), including the approach taken by Western Power in applying:

(a) a Limit Margin;

(b) the Wholesale Market Objectives; and

(c) good electricity industry practice,

and providing Limit Advice and information pertaining to Limit Advice to AEMO **[clauses 2.27A.4 and 2.27A.5]** and the ERA **[clause 2.27C.7(a)]**.

1.1.6 This Procedure applies to Western Power in its capacity as the Network Operator in the SWIS.

1.1.7 This Procedure does not apply to other Network Operators, or Western Power in capacities other than as the Network Operator in the SWIS.

1.1.8 In this Procedure, where obligations are conferred on a Rule Participant, that Rule Participant must comply with the relevant obligations in accordance with clauses 2.9.7A, 2.9.7B, 2.9.7C and 2.9.8 of the WEM Rules, as applicable.

1.1.9 References to particular Technical Rules within this Procedure in bold and braces **{rule XX}** are included for convenience only and are not part of this Procedure.

1.2 Definitions and interpretation

1.2.1 The following principles of interpretation apply to this Procedure unless otherwise expressly indicated:

(a) terms that are capitalised, but not defined, have the meaning given in the WEM Rules;

(b) to the extent that this Procedure is inconsistent with the WEM Rules, the WEM Rules prevail to the extent of the inconsistency;

(c) a reference to the WEM Rules or WEM Procedures, includes any associated forms required or contemplated by those WEM Rules or WEM Procedures; and

(d) words expressed in the singular include the plural and vice versa.

1.2.2 In addition, the words, phrases and abbreviations in Table 1.1 have the meanings set out opposite them when used in this Procedure.

Table 1.1: Defined terms

Term	Definition
Block Load[2]	A net Withdrawal that is not expected to vary significantly for different SWIS load levels, for the purpose of paragraph 5.2.4.
Cutset	A group of Network Elements connecting two or more areas of the Network, and having voltage and rotor angle stability dependence on the power transfer between that group of Network Elements and either: • another group of Network Elements; or • the rest of the Network. Cutset boundaries are defined to allow the transfer capability of the SWIS to be simplified for the purpose of developing Network Limits and Non-Thermal Limit Equations.
Marginal Transfer Limit	The value defining the maximum Power Transfer Capability across a particular Network Element or group of Network Elements after which the SWIS will be operating outside of its technical limits.
Network Element	A single identifiable major component of the Network, involving an individual circuit or phase of that circuit, or a major item of Network equipment, necessary for the functioning of a particular circuit or connection point.
Network Operating Case	A scenario reflecting various operational aspects of the Network, used for the purposes of simulating, modelling and assessing Network outcomes.
Network Reinforcement Scheme (also referred to as special protection schemes)	An automatic protection system designed to detect abnormal or predetermined system conditions, and take corrective actions other than and/or in addition to the isolation of faulted components to maintain system reliability. This may include, for example, generator runback schemes and inter-tripping schemes.

1 Reserve Capacity Mechanism

2 This definition of Block Load is specific to this WEM Procedure and may differ to other usages of the term.

Non-Thermal Limit Equation	A mathematical equation defining the maximum Power Transfer Capability between Cutsets to prevent network voltage or power system stability problems during normal operating conditions or following a Network contingency.
RCM Thermal Network Limit	A Thermal Network Limit at an ambient temperature of 41 degrees Celsius.

1.3 Related documents

1.3.1 The following WEM Procedures and documents are associated with this Procedure and are available on the WEM Website:

(a) WEM Procedure: Limit Advice Requirements;

(b) WEM Procedure: RCM Limit Advice Requirements;

(c) WEM Procedure: Constraint Formulation;

(d) WEM Procedure: Congestion Information Resource;

(e) WEM Procedure: IMS Interface;

(f) WEM Procedure: Network Modelling Data; and

(g) WEM Procedure: Power System Security.

1.3.2 The Technical Rules also provide background information to this Procedure and are available on the ERA's website.

2 Overview of Limit Advice

2.1.1 In accordance with clause 2.27A.1 of the WEM Rules, Western Power must provide Limit Advice in respect to its Network to AEMO, including **[clause 2.27A.2]**:

(a) Limit Equations in respect of Network Limits, excluding Limit Equations for Frequency Co–optimised Essential System Services or, if, in respect of a particular Network Element, a mathematical expression is not appropriate, the Network Limit for that particular Network Element;

(b) Limit Advice Inputs; and

(c) supporting information and data specified in the WEM Procedure: Limit Advice Requirements.

2.1.2 In accordance with clause 4.4B.1 of the WEM Rules, Western Power must also provide RCM Limit Advice in respect to its Network to AEMO, including **[clause 4.4B.5]**:

(a) the estimated proportion of the peak demand of its Network as at 1 October of Year 3 of the Reserve Capacity Cycle determined under clause 4.4B.3 at each Electrical Location on its Network;

(b) its estimate of the Thermal Network Limits of its Network taking into account all new Network augmentations that will be in-service by the relevant Capacity Year specified in applications for Early Certified Reserve Capacity under section 4.28C of the WEM Rules, including separate Thermal Network Limits for Facilities nominated to be classified as Network Augmentation Funding Facilities;

(c) the Electrical Location and identity of any new load, or increase of an existing load, equal to or greater than 10 MW that the relevant Network Operator expects to be connected to its Network and in-service by 1 October of Year 3 of the Reserve Capacity Cycle;

(d) in the form of RCM Limit Advice, its estimate of the configuration and associated Thermal Network Limits of its Network as at 1 October of Year 3 of the current Reserve Capacity Cycle determined under clause 4.4B.3; and

(e) an explanation for any changes to the RCM Limit Advice provided to AEMO for the Reserve Capacity Cycle from the RCM Limit Advice provided to AEMO for a previous Reserve Capacity Cycle.

2.1.3 To meet these requirements, Western Power must develop three forms of Limit Advice in relation to its Network:

(a) Thermal Network Limits (see section 3 of this Procedure);

(b) Non-Thermal Limit Equations (see section 4 of this Procedure); and

(c) RCM Thermal Network Limits (see section 5 of this Procedure).

2.1.4 Western Power must, in respect of **[clause 2.27A.6]**:

(a) for RCM Limit Advice:

i. use its reasonable endeavours to ensure that all necessary RCM Limit Advice is complete, current and accurate at the time it is provided to AEMO;

ii. if it forms the view that any RCM Limit Advice is no longer complete, current or accurate prior to the latest date the applicable RCM Limit Advice is required to be provided to AEMO, promptly provide updated RCM Limit Advice to AEMO; and

iii. update Limit Advice required to be updated under clause 2.27A.6(a)(ii) in accordance with the WEM Procedure: RCM Limit Advice Requirements; and

(b) for all other Limit Advice:

i. use its reasonable endeavours to ensure that all necessary Limit Advice is complete, current and accurate at the time it is provided to AEMO;

ii. promptly notify AEMO if it forms the view that any Limit Advice is no longer complete, current or accurate, including where Limit Advice is no longer required; and

iii. update Limit Advice in accordance with the WEM Procedure: Limit Advice Requirements.

2.1.5 Where:

(a) AEMO, under clause 2.27A.4 or 2.27B.5 of the WEM Rules; or

(b) the ERA, under clause 2.27C.7(a) of the WEM Rules,

requests additional information related to the Limit Advice provided, Western Power must provide that information in the requested form and in the requested timeframe (see section 8 of this Procedure).

3 Developing Thermal Network Limits

3.1 Overview

3.1.1 Western Power must develop Thermal Network Limits for each Network Element, to define the maximum capacity for electrical throughput related to the capability. This is based on the limitations of various Network equipment and protection settings.

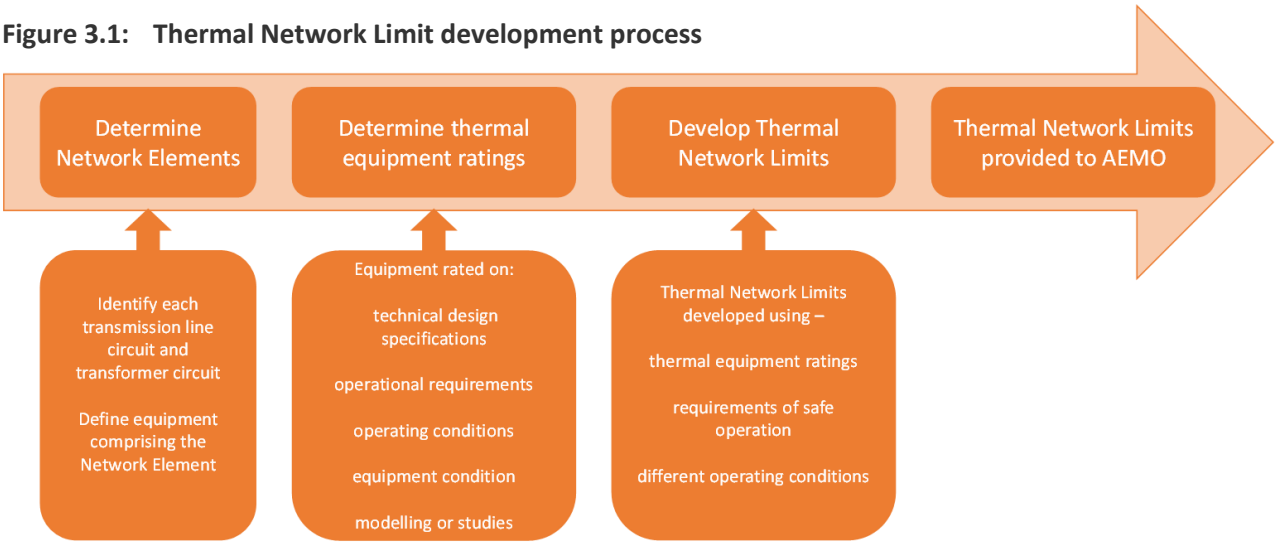
3.1.2 To develop these Thermal Network Limits for each Network Element, Western Power must:

(a) define appropriate groups of Network equipment as Network Elements (see section 3.2 of this Procedure);

(b) determine thermal equipment ratings for each piece of Network equipment in a Network Element (see section 3.3 of this Procedure); and

(c) set the Thermal Network Limit for each Network Element (see section 3.4 of this Procedure).

Figure 3.1: Thermal Network Limit development process



3.2 Defining Network Elements

3.2.1 Western Power must group the various pieces of equipment comprising the transmission system, including any part of the distribution system that Western Power considers is used for the transmission of electricity as part of the secure operation of the transmission system or the SWIS (Network Elements).

3.2.2 Western Power must define the relevant Network equipment comprising each transmission line circuit and transformer circuit as an individual Network Element.

3.2.3 Western Power must:

(a) create a new Network Element, where a new line or transformer circuit is added to the Network; and

(b) update the definition of the Network Element, where any Network equipment comprising that Network Element is removed or replaced for any reason.

3.3 Determining thermal equipment ratings

3.3.1 Western Power must determine thermal equipment ratings for each piece of Network equipment comprising a Network Element.

3.3.2 Western Power must determine the thermal equipment rating for each piece of Network equipment comprising a Network Element considering the following:

(a) the technical design specifications of the 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;

(b) operational requirements for the Network equipment such as criticality, availability requirements, load flows and protection settings;

(c) operating conditions, that may include coincident ambient conditions (summer and winter) and geographic location;

(d) equipment condition, where appropriate and available; and

(e) the outcomes of any modelling or studies performed by Western Power.

3.4 Developing Thermal Network Limits

3.4.1 When determining the Thermal Network Limit for each line circuit, Western Power must consider, as a minimum, the:

(a) individual thermal equipment ratings for each item comprising the Network Element;

(b) ambient temperature;

(c) current transformer metering limit of accuracy;

(d) relay thermal rating;

(e) minimum line protection; and

(f) protection operating limits.

3.4.2 When determining the Thermal Network Limit for each transformer circuit, Western Power must consider, as a minimum, the:

(a) cooling mode;

(b) load profile;

(c) ambient temperature;

(d) current transformer metering limit of accuracy;

(e) relay thermal rating;

(f) transformer long time emergency rating;

(g) ratings and limits of each of the internal and external components; and

(h) protection operating limits.

3.4.3 Western Power must:

(a) determine the Thermal Network Limit for each line and transformer circuit as the lowest limiting factor; or

(b) document any alternative method for determining the Thermal Network Limit, with reasons.

3.4.4 Western Power must provide the Thermal Network Limits determined under paragraph 3.4.3 of this Procedure to AEMO as part of the Limit Advice in accordance with section 6 of this Procedure and the WEM Procedure: Limit Advice Requirements **[clause 2.27A.1]**.

4 Developing Non-Thermal Limit Equations

4.1 Overview

4.1.1 Western Power must create Non-Thermal Limit Equations for each Cutset, to define, where required, the maximum capacity for electrical throughput across the Cutset and the rest of the Network related to the impact on power system security and stability. This includes, but is not limited to:

(a) the operating standards in the WEM Rules **[chapter 3]**; and

(b) voltage and stability standards in the Technical Rules **{rules 2.2.2, 2.2.7, 2.2.8, 2.2.9, 2.2.10 and 2.2.11}**.

4.1.2 To develop Non-Thermal Limit Equations, Western Power must:

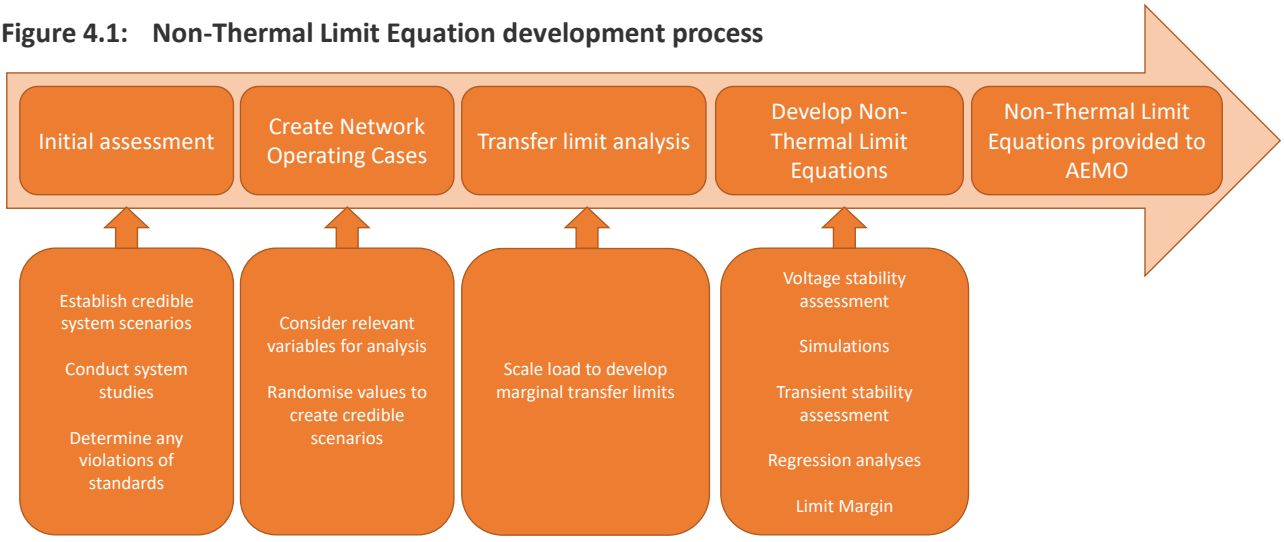
(a) conduct an initial assessment to determine whether there are any violations of the standards (see section 4.2 of this Procedure);

(b) create Network Operating Cases under which to assess the limits (see section 4.3 of this Procedure);

(c) conduct transfer limit analysis to determine the power transfer limit for voltage and transient stability (see section 4.4 of this Procedure); and

(d) develop marginal transfer limits (see sections 4.5 and 4.6 of this Procedure) and apply a Limit Margin (see section 4.7 of this Procedure).

Figure 4.1: Non-Thermal Limit Equation development process



4.2 Initial assessment

4.2.1 Western Power must set up a number of credible system scenarios under system normal and outage conditions, to provide the maximum export from and import to each applicable Cutset. This may include consideration of:

(a) operational conditions such as equipment availability, generation, demand and protection settings;

(b) seasonal operational conditions, including coincident ambient conditions, based on geographic location;

(c) the outcomes of any modelling or studies performed by Western Power;

(d) relevant engineering standards, including to adjust for seasonality; and

(e) applicable Australian and International standards, guidelines and good industry practice.

4.2.2 Western Power must undertake system studies for credible system scenarios developed in paragraph 4.2.1 of this Procedure to determine whether any of the standards in paragraph 4.1.1 of this Procedure are violated.

4.2.3 Where Western Power assesses:

(a) there is no violation of the standards in paragraph 4.1.1 of this Procedure, no further action is taken; or

(b) one or more violations of the standards in paragraph 4.1.1 of this Procedure, Western Power uses the process in sections 4.3 to 4.7 of this Procedure for developing all Non-Thermal Limit Equations for the Network.

4.3 Network Operating Case creation

4.3.1 Western Power must develop a number of Network Operating Cases for each Cutset reflecting credible system conditions.

4.3.2 In developing the Network Operating Cases in paragraph 4.3.1 of this Procedure, Western Power must consider, as a minimum, the following variables:

(a) generation scheduling, including new committed Facilities where relevant;

(b) generation loading levels;

(c) reactive device availability or status;

(d) load power factor;

(e) bus voltages;

(f) network configuration including prior Network Outages where applicable; and

(g) any applicable Network support arrangements e.g. NCS or NCESS contracts.

4.3.3 Western Power must randomise values for each of these variables to create a series of Network Operating Cases to assess multiple credible system load and generation conditions.

4.4 Transfer limit analysis

4.4.1 Western Power must undertake transfer limit analysis to determine the power transfer limit for voltage stability and transient stability for each of the violations identified in paragraph 4.2.3 of this Procedure. This is done by progressively scaling load in each Cutset until it results in a marginally stable power system outcome for the relevant limit (Marginal Transfer Limit).

4.5 Voltage stability Network Limit formulation

4.5.1 Western Power must undertake a voltage stability assessment for each of the violations identified in paragraph 4.2.3 of this Procedure to determine the maximum power transfer limits through each Cutset that will result in a marginally secured condition and meet the voltage and reactive power margin requirements specified by the Technical Rules, including as a minimum:

(a) steady state voltage requirements - following a contingency event, the minimum steady state voltage on the Network must be 90% of nominal voltage and the maximum steady state voltage must be 110% of nominal voltage. The step changes in steady state voltage levels resulting from a switching operation must not exceed +6% and -10%. **{rule 2.2.2(b)}**

(b) reactive power margin requirements - Western Power determines a power transfer limit across relevant Cutsets so that sufficient reactive power margins are achieved at all locations across the Network. This assessment is performed using a standard load flow approach. The 95% of this power transfer limit (corresponding to zero reactive margin) is used for regression in determining the limit equation. **{rules 2.3.8(b) and 2.2.11}**

4.5.2 Wester Power must then perform regression analysis on the marginal transfer limits determined in paragraph 4.4.1 of this Procedure to determine a contribution factor, or coefficient, for each of the variables identified as relevant in the particular limit, which collectively form the Non-Thermal Limit Equation.

4.6 Transient stability Network Limit formulation

4.6.1 Western Power must undertake a transient stability assessment for each of the violations identified in paragraph 4.2.3 of this Procedure to determine the maximum power transfer limits through each Cutset that will result in a marginally secured condition and:

(a) no loss of synchronism between one or more generators, or groups of generators, following a credible contingency **{rules 2.2.7}**; and

(b) no undervoltage recovery or temporary overvoltage on the Network, or rotor angle instability, following a credible contingency **{rules 2.2.8, 2.2.9 and 2.2.10}**.

4.6.2 Western Power uses a time domain dynamic simulation to assess transient stability. This assessment includes, where applicable, consideration of:

(a) rotor angle transient instability, including where:

i. the maximum relative rotor angle between any two machines in different areas moves to exceed 180 degrees following a contingency event; or

ii. the halving time is greater than 5 seconds, based on comparison of initial and subsequent maxima and minima, following a contingency event;

(b) the post-contingent voltage at every network location, which must recover to 0.9 pu within 10 seconds after a fault is cleared following a contingency event;

(c) the actual reactive capability of generating units;

(d) the impact of generator governors; and

(e) the use of dynamic load models.

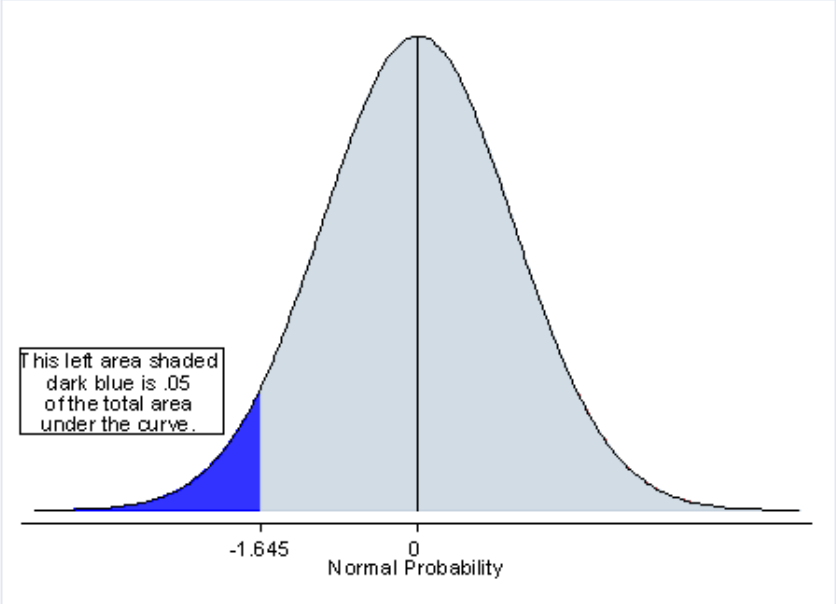
4.6.3 Western Power then must perform regression analysis on the Marginal Transfer Limits determined in paragraph 4.4.1 of this Procedure to determine a contribution factor, or coefficient, for each of the variables identified as relevant in the particular limit, which form the Non-Thermal Limit Equation.

4.7 Application of Limit Margins

4.7.1 Western Power must apply a Limit Margin to all Non-Thermal Limit Equations produced in paragraphs 4.5.2 and 4.6.3 of this Procedure.

4.7.2 Western Power determines the Limit Margin by using a 95 per cent confidence level of a normal distribution and the corresponding z value of 1.645 (shown in Figure 4.2). This method reflects standard industry practice in Australia[3].

Figure 4.2: Confidence level used by Western Power to determine Limit Margins



4.7.3 Western Power determines the Limit Margin for each Non-Thermal Limit Equations as follows:

Limit Margin = 1.645 x the Standard Error of the Non-Thermal Limit Equations

4.7.4 Western Power must provide the Non-Thermal Network Equations determined under this section 4.7 to AEMO as part of the Limit Advice in accordance with section 6 of this Procedure and the WEM Procedure: Limit Advice Requirements **[clause 2.27A.1]**.

[3] For example: *Confidence Levels, Offsets & Operating Margins - Policy (aemo.com.au)*

5 Development of RCM Thermal Network Limits

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 paragraph 5.1.1 of this Procedure, by email to WEMLimitAdvice@westernpower.com.au unless otherwise agreed by Western Power. The notification must include in the subject that the request is for RCM Limit Advice, and specify the capacity year relevant to the advice requested.

5.1.3 Upon receipt of the notified Facility information in paragraph 5.1.1 of this Procedure, 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 is 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 paragraph 5.1.4 of this Procedure 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)]**.

5.2 Estimating proportion of peak 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 loads, or loads with changes in demand 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 in MW 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; and

(b) 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 Western Power must propose a list for each:

(a) Block Load in the Western Power Network, the:

i. identity;

ii. Electrical Location; and

iii. estimated demand; and

(b) new load in the Western Power Network with demand equal to or greater than 10 MW and existing load in the Western Power Network with a change in demand of more than 10 MW, the:

i. identity;

ii. Electrical Location;

iii. estimated demand and comparison with the previous year; and

iv. impact on the estimated proportion of peak demand.

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.

5.3 Determining RCM Thermal Network Limits

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

5.3.2 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) necessary 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).

5.3.3 Western Power must determine the RCM thermal equipment rating for each relevant Network Element identified under paragraph 5.3.1 of this Procedure, 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.

5.3.4 When determining the RCM Thermal Network Limit for each existing line circuit identified in paragraph 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.

5.3.5 When determining the RCM Thermal Network Limit for each existing transmission transformer circuit identified in paragraph 5.3.1(a)(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) current transformer metering limit of accuracy;

(e) relay thermal rating;

(f) transformer long time emergency rating;

(g) ratings and limits of each of the internal and external components; and

(h) protection operating limits.

5.3.6 Western Power must:

(a) determine the RCM Thermal Network Limit for each:

i. existing transmission line and transformer circuit identified in step paragraph 5.3.1(a) of this Procedure as the lowest limiting factor;

ii. proposed Network Element identified under paragraph 5.3.1(b) of this Procedure as the Network Element rating determined in paragraph 5.3.3(b) of this Procedure; or

(b) document any alternative method for determining the RCM Thermal Network Limit, with reasons.

5.3.7 Western Power must provide the RCM Thermal Network Limits in paragraphs 5.3.1 and 5.3.6 of this Procedure 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)]**.

6 Provision of Limit Advice

6.1.1 Western Power must provide the Limit Advice relating to Thermal Network Limits to AEMO with detail and information including, as a minimum:

(a) Thermal Network Limits for the Network; and

(b) any other information required under the WEM Procedure: Limit Advice Requirements.

6.1.2 Western Power must provide the Limit Advice relating to Non-Thermal Limit Equations to AEMO in a report. This report must include:

(a) Non-Thermal Limit Equations;

(b) the Limit Margin forming part of the Non-Thermal Limit Equations; and

(c) any other information required under the WEM Procedure: Limit Advice Requirements.

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 of this Procedure;

(b) estimates of the RCM Thermal Network Limits as determined in section 5.3 of this Procedure;

(c) the Electrical Location and identity of any new load or increase in an existing load equal to or greater than 10 MW as listed in section 5.2 of this Procedure;

(d) the estimated configuration of the Network as determined in section 5.1 of this Procedure;

(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.

6.1.4 Western Power must provide the Limit Advice produced in paragraphs 6.1.1 to 6.1.3 of this Procedure to AEMO in the time and manner required, as appropriate, under the:

(a) WEM Procedure: Limit Advice Requirements;

(b) WEM Procedure: RCM Limit Advice Requirements;

(c) WEM Procedure: Network Modelling Data; and

(d) WEM Procedure: IMS Interface.

7 Maintaining and updating Limit Advice

7.1.1 Western Power must review the relevant Thermal Network Limits and Non-Thermal Limit Equations developed under section 2.27A and 4.4B of the WEM Rules, when requested by AEMO, or as soon as practicable where it identifies significant changes that may affect Limit Advice.

7.1.2 Western Power must review and update Thermal Network Limits where Western Power identifies any new or changed information that may affect Limit Advice, including but not limited to variation in operating, maintenance or equipment conditions.

7.1.3 Western Power must review and update Non-Thermal Limit Equations where it identifies significant changes that may affect Limit Advice, including but not limited to those affecting:

(a) system configuration including connection of new generators or loads;

(b) generation system models and parameters;

(c) new or amended Network Reinforcement Schemes (also referred to as special protection schemes);

(d) Network configuration;

(e) long-term load forecasts; and

(f) performance of generators or loads resulting for example from a disturbance event, or notified by a Rule Participant.

7.1.4 Where Western Power's review under paragraphs 7.1.1 or 7.1.3 of this Procedure identifies any Limit Advice is incomplete, not current, or inaccurate, it must advise AEMO promptly, update the Limit Advice in accordance with section 3 or 4 of this Procedure as relevant, and provide that updated advice to AEMO in the time and manner required **[clause 2.27A.6]**, as appropriate, under the:

(a) WEM Procedure: Limit Advice Requirements;

(b) WEM Procedure: Network Modelling Data; and

(c) WEM Procedure: IMS Interface.

8 Supporting information and data

8.1.1 Where additional or supporting information related to Limit Advice is requested:

(a) under clause 2.27A.4 or 2.27B.5 of the WEM Rules, by AEMO for it to perform its functions in formulating, developing, maintaining and updating Constraint Equations and Constraints Library; or

(b) under clause 2.27C.7(a) of the WEM Rules, by the ERA where it considers that information is relevant to its Limit Advice review,

Western Power must provide that information in the requested form and in the requested timeframe (see section 6 and 7 of this Procedure).

8.1.2 AEMO and the ERA must provide Western Power any requests for information specified in paragraph 8.1.1 of this Procedure by email to WEMLimitAdvice@westernpower.com.au, including in the subject the nature of the request and date of the Limit Advice to which the request relates.

8.1.3 All information provided by Western Power in response to a request by AEMO under paragraph 8.1.1(a) of this Procedure is considered as Limit Advice **[clause 2.27A.5]**.