LIMITS ADVICE GUIDELINES

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Approved for distribution and use

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1	30 March 2012	Ben Blake	Michael Lyons, Edmund Hon, OPWG members	Michael Lyons	Initial version

This document has been created by the System Operations Division and will be reviewed from time to time.

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GLOSSARY

(a) In this document, a word or phrase *in this style* has the same meaning as given to that term in the NER.

(b) In this document, capitalised words or phrases or acronyms have the meaning set out opposite those words, phrases, or acronyms in the table below.

(c) Unless the context otherwise requires, this document will be interpreted in accordance with Schedule 2 of the *National Electricity Law*.

TERM	MEANING
Constraint Equation	The mathematical representation that *AEMO* uses to manage power system limitations and FCAS requirements in NEMDE.
LHS	Left Hand Side of a constraint equation. This consists of the variables that can be optimised by NEMDE. These terms include *Scheduled Generators*, *Semi-Scheduled Generators*, *scheduled loads*, regulated Interconnectors, *Market Network Service Providers* (MNSPs) or regional FCAS requirements.
Limit Equation	A mathematical expression describing a limitation on a part of the transmission or distribution network. These are provided to *AEMO* by both *Transmission Network Service Providers* (TNSPs) and *Distribution Network Service Providers* (DNSPs).
NEMDE	National Electricity Market Dispatch Engine
RHS	Right Hand Side of a constraint equation. The RHS is pre-calculated and presented to the solver as a constant; these terms cannot be optimised by NEMDE.
SCADA	Supervisory Control And Data Acquisition. Information such as line flows and generator outputs are delivered via SCADA.
System Normal	The configuration of the power system where: • All transmission elements are in service; or • The network is operating in its normal network configuration.

1 Introduction

a) This document provides an explanation/background to the provision of limit advice to *AEMO* from TNSPs
b) This document may be amended from time to time.
c) If there is any inconsistency between this document and the NER, the NER will prevail to the extent of that inconsistency.

2 Purpose

The purpose of this Guide is to provide *AEMO* and *Network Service Providers* (NSP) with guidelines on what *AEMO* requires for the limit equations which describe the technical envelope of the power system.

AEMO is reliant on the expertise of each local TNSP for the advice on the limitations of the power system for system normal, outage and reclassification of credible contingency cases.

3 Related Policies and Procedures

- Constraint Formulation Guidelines: http://www.aemo.com.au/electricityops/170-0040.html
- Constraint Naming Guidelines: http://www.aemo.com.au/electricityops/200-0141.html
- Constraint Implementation Guidelines: http://www.aemo.com.au/electricityops/0100-0015.html
- Confidence Levels, Offsets & Operating Margins: http://www.aemo.com.au/electricityops/170-0051.html
- Congestion Information Resource: http://www.aemo.com.au/electricityops/congestion.html

4 Responsibilities

AEMO is responsible for conducting due diligence on the limit equations provided by the NSP and constructing the constraint equations based on the limit equation in accordance with the constraint formulation guidelines (CFG). *AEMO* applies operating margins as per the Operating Margins document.

NSPs are responsible for providing *AEMO* with limit equations, ratings and information on control schemes for both system normal and outage conditions. NSPs are responsible for applying confidence levels or offsets in the limit equations provided to *AEMO*.

5 Requirements

5.1 Communication

All limit advices are to be emailed to limits.advice@aemo.com.au. This email address is the primary repository used by AEMO for limit advices. The limit advice should clearly indicate whether it is draft or final and (for major limit advice) the final version should be formally signed off by the TNSP.

5.2 Timeframes

AEMO requires limit advices to be provided at least 30 business days ahead of time to allow due diligence, constraint equation construction and testing to be performed. In situations where AEMO believes these tasks will take longer, *AEMO* will discuss the timeframe for providing advice with the

TNSP. If the TNSP requires the limit advice to be expedited this can be discussed with AEMO on a case by case basis.

In general a wholesale revision of a complex system normal limit can take the full the 6 weeks and minor changes to existing limits can take a shorter time (dependent on AEMO resourcing at the time and the number of limits advices outstanding).

In the case of short notice outages, the limit advice needs to be provided at least 4 business days ahead of the outage. If this is not possible, there is a risk that the due diligence cannot be completed in time, and the outage may need to be deferred.

5.3 Thermal Overloads

For thermal limits *AEMO* requires:

- A list of the monitored and tripped lines/transformers/generators for which constraint equations need to be constructed. Lines and transformers need to include the direction of flow.
- The rating to use under no contingency (N) and contingency (N-1) cases
    - Where two ratings can be used the TNSP is to advise which rating to use and under which operating conditions
    - Where a very short time (< 15 minute) rating is to be used, detail is required on the control scheme or other approach that would be used to reduce flow(s) post contingency. If the rating is shorter than 10 minutes an automatically initiated response would be required.
- TNSPs to ensure any line and transformer ratings (continuous, short-time or dynamic) required for the first dot point are provided to AEMO via the existing process to supply ratings to AEMO's EMS

AEMO will calculate the participation factors for thermal limits for the generators and interconnectors as per *AEMO*'s constraint formulation guidelines.

5.4 Stability

For stability (transient, voltage or oscillatory) limits *AEMO* requires a limit equation or offset to an existing limit equation; graphs or tables will not be accepted. The fault or tripped element(s) should be clearly stated along with any assumptions about the operating conditions (such as particular reactive plant being in or out of service).

5.5 Control Schemes

Information on the operation of control schemes, whether these are for generator runback or power system protection, is required so constraint equations can be modelled to take into account control scheme actions. In particular, the following advice is required:

- Monitored element(s) and whether these elements only consider a particular direction of flow
- The power system conditions needed to activate the control scheme action(s). This includes parameters and thresholds of the elements included in the control scheme. Examples include line ratings, line flows and generator outputs
- Control scheme action(s). Examples include generator runback or tripping of load blocks.
- What action is to be taken when the control scheme is out of service

- What actions are to be taken to reactivate the control scheme once it has operated and any restrictions on its reactivation

5.6 Limit Equations

All terms in the limit equation are to be clearly defined (such as what constitutes the South East or Armidale load). The values specified also need to be made available to AEMO via SCADA.

The limit equation should only be for a single limit type, combinations (such as transient and voltage stability or stability and thermal) will be rejected.

The LHS of constraint equations can only accept linear terms. AEMO would prefer that scheduled generators and interconnectors are not included in non-linear calculations (such as quadratic calculations).

AEMO also constructs separate RHSs for the Dispatch, Pre-dispatch, ST PASA and MT PASA timeframes. Outside Dispatch AEMO needs to use estimates of terms in the limit equation. Guidance from TNSPs as to how to estimate these terms at times of high load / high transfers is required. Cases include status of reactive plant or units on-line at aggregated units.