# CONGESTION INFORMATION RESOURCE GUIDELINES

**FOR THE NATIONAL ELECTRICITY MARKET**

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

# IMPORTANT NOTICE

## Purpose

AEMO has prepared this document to provide information about the congestion information resource (CIR), as at the date of publication.

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# VERSION RELEASE HISTORY

| Version number | Release date | Author | Comments |
|---|---|---|---|
| 5 DRAFT | May 2014 | Ben Blake, Mahsa Ahmadi | Full document review. Updated for 2014 consultation, changed Interconnector Quarterly performance report section, updated Planned Electricity Network Outages to match current practice |
| 4 | 25 June 2013 | Ben Blake | Updated for 2013 consultation, updated URLs, updated list of CIR items, removed minimum information section |
| 3 | 27 June 2012 | Ben Blake | Converted to new AEMO template. Updated for 2012 consultation. Updated URLs for new AEMO website. Included updated CIR items list in Appendix 1 |
| 2 | 27 June 2011 | Ben Blake, Edwin Ong | Updated for 2011 consultation. Included revised disclaimer, revisions to match AEMO style guide. |
| 1.2 | 6 July 2010 | Ben Blake | Added AEMO disclaimer |
| 1.1 | 30 April 2010 | Ben Blake | Added heat map section to Appendix, minor corrections |
| 1 | 28 April 2010 | Ben Blake | Included extra fields for NOS, added NOS 24 hour summary |
| 1 DRAFT | 1 March 2010 | Ben Blake | Document tidy up, included changes for the Final CIR, removed references to interim CIR and NER 11.30.x |
| Interim | 28 October 2009 | Ben Blake, Michael Lyons | Original document for the Interim CIR |

# CONTENTS

# TABLES

# 1. OVERVIEW

The Congestion Information Resource Guidelines (CIR Guidelines) provide CIR users with a reference that:

- Readily identifies what information is available in the CIR and where to find it.
- Assists in interpreting information contained in the CIR.
- Assists in understanding how information in the CIR is derived.
- Assist with stakeholder consultation during CIR development.

This version (v5) of the CIR Guidelines is effective from 1 September 2015.

## 1.1. History of the CIR

Following completion of its Congestion Management Review in early 2008[1], the Australian Energy Market Commission (AEMC) recommended to the Ministerial Council on Energy (MCE) that AEMO establish and maintain a CIR.

The NER was subsequently changed to reflect the AEMC Rule titled “National Electricity Amendment (CIR Rule) No 16 2009”, effective 1 September 2009.

To meet its NER obligations AEMO:

- Established an interim CIR in October 2009.
- Established the first CIR in September 2011.
- Has undertaken annual consultations on the CIR development since 2010.
- Develop the CIR based on submissions to the annual consultations.

## 1.2. Description of the CIR

The objective of the CIR is to provide information, in a cost effective manner, to National Electricity Market (NEM) participants that enables an understanding of network congestion patterns and projections of market outcomes in the presence of network congestion.

## 1.3. Layout of this document

Each chapter in this document relates to one of the five sections on the CIR website. These are:

- Policy and Processes: Contains congestion-related policies and procedures used by AEMO to manage network congestion in the NEM.
- Educational Material: Contains information about AEMO’s constraint management course.
- Network Status and Capability: Contains information relating to forecast and past transmission outages, and the implications of those outages for electrical transfer capability.
- Statistical Reporting Streams: Contains routine analyses of specific aspects of transmission congestion, updated periodically.
- Issues and Transitional Arrangements: Contains information on aspects of congestion management currently under development or subject to change.

[1] AER. Congestion Management Review. Available at: http://www.aemc.gov.au/Markets-Reviews-Advice/Congestion-Management-Review. Viewed: 7 April 2014.

## 1.4. Location of the CIR

The CIR is available on AEMO's website at: http://www.aemo.com.au/Electricity/Market-Operations/Congestion-Information-Resource.

## 1.5. Future CIR development

AEMO continues to develop the CIR to match stakeholder needs in line clause 3.7A(d). To manage this process AEMO:

- Includes CIR development as a standing agenda item for NEM Wholesale Consultative Forum (NEMWCF) meetings. Item proposals for change, proposal viability, and priorities are discussed in some detail. AEMO and stakeholder groups are expected to undertake action items for analysis and discussion between meetings.
- Approximately once a year, distribute the NEMWCF's position for consultation in accordance with Rule 3.7A(d).
- Conducts formal stakeholder consultation in accordance with clause 3.7A(d) to determine how the CIR guidelines should be changed.
- Continues this process on an ongoing basis.

AEMO undertakes a cost–benefit analysis of proposals to change the CIR. This is managed using a release planning strategy similar to that used for AEMO's market systems. Under this approach:

- All proposals accepted through the consultation process are ranked in terms of relative benefit based upon certain criteria. This ranking is developed as part of the consultation process.
- Resources required to implement each proposal are identified. This includes both development costs, ongoing operational costs, and resources required by transmission network service providers (TNSPs) where appropriate.
- The proposals are then grouped into annual releases according to the ranking and the resources available for each release.

Some proposals may take several years to implement. If proponents considered this unacceptable, AEMO, in consultation with the NEMWCF, can assess whether the cost to accelerate the work is justified.

# 2. POLICY AND PROCESS DOCUMENTATION

The Policies and Process section of the CIR contains the policies and procedures AEMO uses to manage network congestion. A list of the policies and procedures is set out below, followed by a brief description of the information they contain.

## 2.1. Constraint Formulation Guidelines

AEMO follows the Constraint Formulation Guidelines when developing constraint equations. This document includes:

- The methodology used to develop constraint equation terms and co-efficients.
- The policy on what terms appear on the left or right hand side of a constraint equation to allow AEMO to control all the variables (i.e., a fully co-optimised constraint equation).
- The circumstances when AEMO would use an alternative constraint formulation.
- How AEMO receives information from market participants.
- The policy on negative residue management.
- The process for invoking and revoking constraint equations.

This document is updated via formal Rules consultation.

## 2.2. Constraint Naming Guidelines

Each constraint set, constraint equation, and constraint function stored in AEMO's market systems requires a unique identifier or name.

This document outlines the guidelines AEMO follows when creating the names. The names provide a quick way to identify the relevant purpose, system condition, and regional location.

This document is updated as required.

## 2.3. Constraint Implementation Guidelines

The Constraint Implementation Guidelines provide:

- The structure of constraint sets, equations, and functions in AEMO's market systems.
- Examples of how energy and frequency control ancillary service (FCAS) constraint equations are formulated.
- Examples of solutions to constraint equations.

This document is updated as required.

## 2.4. Schedule of Constraint Violation Penalty Factors

Occasionally, and particularly at times of power system stress, it is not possible for the national electricity market dispatch engine (NEMDE) or projected assessment of system adequacy (PASA) to identify a dispatch solution that satisfies all constraint equations and the regional energy balance requirements.

In these situations, the solution violates one or more constraint equations. Constraint equation violation penalty (CVP) factors provide NEMDE and PASA with information about the relative importance of all constraint equations. This enables appropriate decisions about which constraint equations should be violated, and by how much, when some degree of violation is unavoidable.

The CVP factors determine the priority of constraint equations by type (e.g., FCAS, network security, direction constraints, and ramp rate limits).

The CVP factors are listed in the constraint violation penalty factors document; changes to this are made through consultation with interested parties as and when issues with the current list are identified.

This document is updated as required.

## 2.5. Confidence Levels, Offsets, and Operating Margins: Policy Document

This document details the parties responsible for determining confidence levels, offsets, and operating margins as well as the factors considered when calculating these values.

This document is updated as required.

## 2.6. Over-constrained dispatch re-run process

An over-constrained dispatch (OCD) occurs when the cost of violating one or more constraint equations leads to a dispatch price that is either above the market price cap or below the market price floor.

NEMDE uses a linear programming optimisation method to solve a five-minute dispatch run. To find a feasible solution, NEMDE uses the CVP factor to determine the constraint priority order. If a feasible solution cannot be found without violating one or more constraint equations, NEMDE selects which constraint equations to violate based on their order of merit. This can lead to an OCD.

National Electricity Rule 3.8.1 (c) requires AEMO to develop procedures that resolve OCD cases so that the dispatch price is determined by bids and offers of scheduled plant and not by the relevant constraint violation penalty factors.

The procedure involves relaxing the violated constraint equations and re-running the dispatch process to obtain a revised dispatch price. The procedure has an automatic (real-time) component and a manual (next business day) component.

This procedure is amended through formal Rules consultation.

## 2.7. Constraint Frequently Asked Questions

This document contains a list of frequently asked questions (FAQ) about constraints and their operation in the NEM. It is updated as required.

## 2.8. Limits Advice Guidelines

The Limits Advice Guidelines provide market participants with information about what AEMO requires to convert limit advice into constraint equations.

This document is updated as required.

# 3. EDUCATIONAL MATERIAL

## 3.1. Training Courses

AEMO offers several NEM training courses designed to improve participant understanding of how the NEM works.

One of the courses AEMO offers is an interactive constraints management course (Network and FCAS Constraints in the NEM). This assists stakeholders understand how congestion is managed from a NEM operational perspective, and how it affects dispatch and pricing outcomes.

The course is run face-to-face over two days, and is scheduled regularly across NEM jurisdictions. A fee is charged to reflect the cost of running the course.

## 3.2. Videos

This section of the CIR contains brief videos explaining how constraint equations work.

New videos are updated as required.

# 4. NETWORK STATUS AND CAPABILITY

This section of the CIR contains information relating to the physical status of the electricity transmission network and its capability to transfer power between network locations.

This includes information about anticipated and historical transmission equipment outages, and the implications of those outages for power transfer capabilities.

Registered market participants can view this information to assist in projecting market outcomes.

## 4.1. Network Outage Scheduler

Under Rule 3.7A(p), TNSPs are required to submit their best estimates regarding planned network outages.

TNSPs meet this obligation by entering information about their network outages into the network outage scheduler (NOS) application. This includes information about all out-of-service work, and any secondary bookings forecast to constrain the dispatch process.

### 4.1.1. Inputs

Bookings for outages can be made up to two years in advance or at short notice in response to an emergency. TNSPs enter the following outage information into the NOS:

- The equipment affected by the outage.
- The planned start and end time of the outage.
- Whether it is secondary or in-service work.
- Any notes associated with the outage.

AEMO assesses the outage bookings and enters the following information into the NOS:

- Any constraint equations invoked associated with the outage.
- The assessment status of the outage.
- Any further notes associated with the outage.

### 4.1.2. Outputs

The NOS publishes a report, updated every 30 minutes, which contains the following information about each outage:

- Region name – NEM region name.
- Station name – the terminal or switching station at which the work is based.
- Equipment name – the element which is out of service to the system.
- Equipment type – e.g., Line, XFMR: transformer, CP: Capacitor, BUS: busbar.
- kV – the voltage level of the equipment.
- Start time – planned date and time for the outage commencement, or actual start time if an outage has commenced.
- End time – planned date and time for the outage completion.
- Recall time – the time required to recall the outage.
- Date/time of the original inclusion of the outage in the NOS.

- Date/time of the last change – This includes only a change to the outage date(s). It excludes minor changes to the NOS entry such as TNSP notes, outage time change on the same day, and outage status updates.
- TNSP that submitted the outage.
- Status – indicates the likelihood of the outage proceeding.
- Constraint set ID – constraint set identifier from constraint library.
- Secondary/in-service flag:
    - 1 = secondary or in-service work.
    - 0 = normal out of service.
- Recall time (D) – time required to return the out or service plan during the day.
- Recall time (N) – time required to return the out or service plan during the night.
- Date/time of original inclusion of outage.
- Date/time of last change.
- TNSP that submitted the change.
- Resubmit reason – TNSP's reason for the change in the outage.

## 4.2. Transmission Equipment Ratings

Under Rule S5.1.12, network service providers (NSPs) are required to advise AEMO of the rating of their transmission lines, distribution lines, and other equipment.

This can be provided as static data for use under specified conditions; telemetered dynamic real time data for use in dispatch timeframe; or be hand dressed in AEMO's EMS in urgent circumstances.

AEMO publishes two reports on the transmission equipment ratings (TER) section of the CIR. These reports contain information about static ratings for use under specified conditions:

- The first report, Altlimits, contains information on all plant ratings in use by AEMO. This report is updated when AEMO receives new information and loads it into the EMS.
- The second report, Public TER Daily, contains only those plant ratings used in constraint equations. It identifies the SPD ID[2] used by constraint equations to reference the rating, and whether the rating value is dynamically calculated (dynamically calculated values are not included in the file). This file is updated daily.

### 4.2.1. Inputs

NSPs provide information about their equipment including the rating application levels, application rules, and the rating values.

This information is provided if NSPs add new equipment into their network or if existing equipment ratings change.

### 4.2.2. Altlimits Report Outputs

The following information is published in the TER report:

- Site name – the substation, terminal station, or power station name.
- Plant type – transmission lines may be 'LINE', 'TIE', 'SUMM' for summated lines, or 'S_REACT' for series reactors. Transformers may be 'TRANS', 'TX', or 'TF'.

[2] A SPD ID is the identifier used in a constraint equation to represent a data quantity (such as a rating, line flow, or generator output).

- Plant ID – the equipment identifier.
- Region – the NEM region.
- Measurement – all values included in the publication process are MVA quantities.
- Level – NORM, EMER, or LDSH.
- Alternate value – an identifier which describes when the rating is applicable, such as summer or winter.
- Low and high – the low and high provide a directional feature in the application of the rating. When associated with the site name, the low and high are interpreted using the convention of a positive value represents power flow from the site into the equipment.

### 4.2.3. Public TER Daily Report Outputs

The following information is published in the Public TER Daily report:

- Site ID – the substation, terminal station, or power station name.
- Equipment type – transmission lines may be 'LINE', 'TIE', 'SUMM' for summated lines. Transformers may be 'TRANS', 'TX', or 'TF'.
- Equipment ID – the equipment identifier.
- Region – the NEM region.
- Rating Level – NORM, EMER, or LDSH.
- Alternate value – an identifier which describes when the rating is applicable, such as summer or winter.
- Rating – the rating value. Positive values indicate power flow from the site into the equipment.
- Rating Type – either STATIC or DYNAMIC. Ratings with the Rating Type of DYNAMIC have a real time telemetered rating value supplied by the asset owner. This report does not include the telemetered rating value in the Rating field. The dynamic rating value would normally be the rating applied in Dispatch (and in some cases for a number of Pre-dispatch intervals).
- SPD ID – the identifier used in a constraint equation RHS to reference the rating value.
- Effective From – the date and time the rating is active from and available as an input to constraint equations.
- Effective To – the date and time the rating is made inactive and unavailable as an input to constraint equations.

### 4.2.4. Using the Transmission Equipment Ratings

The information in the TER can assist participants with network analysis.

The ratings can also assist with constraint equation analysis as they can be used to determine what rating was used in a particular constraint equation.

## 4.3. Planned Electricity Network Outages

NER 3.7A(b)(1) requires AEMO to publish information about planned network events likely to materially affect network constraints in relation to a transmission system.

The CIR includes information on network outages planned for the next 13 months that, in the reasonable opinion of the relevant TNSP, will (or are likely to) have a material effect on transfer capabilities. TNSPs must provide AEMO with this information by the fifth business day of each month in accordance with the timetable for providing information for the medium term PASA.

### 4.3.1. Outputs

AEMO has two methods for publishing planned electricity network outages, depending on how the TNSP provides the information:

- Via the existing NOS data publication (see Section 9.1). This is AEMO's preferred method.
- Via spreadsheets published on the planned electricity network outage page.

AEMO provides an assessment of the projected impact of planned network outages on power transfer capabilities by including the constraint set ID in the NOS data and the spreadsheets.

Plain English descriptions of the constraint equations are available via AEMO's market management system (MMS) web portal (see Section 9.4.2).

### 4.3.2. Timeframe for publishing planned network event information

In accordance with the spot market operations timetable[3], AEMO publishes the planned network event information by 4.00 pm on the fifteenth business day of each month.

## 4.4. Electricity market data available via the MMS web portal

The MMS is a secure web portal that provides current market information to registered electricity market participant only. Each participant has access to these web pages and the security model allows participants to manage the rights of the users in their organisation.

AEMO provides information in the CIR about how participants can access and configure the MMS web portal.

### 4.4.1. Outputs

The congestion related outputs in the MMS web portal are the constraint equation and interconnector solution results. These results are available for the Dispatch, Pre-dispatch and short term PASA timeframes.

Where constraint equation IDs are listed a link is provided to the "plain English" converter.

## 4.5. Plain English Constraint Equations

The plain English constraint equation converter, available on the MMS web portal, produces a version of a constraint equation which can be more easily understood by participants.

The conversion tool changes the IDs used on the left and right hand sides of constraint equations to a description (e.g., Q_DIRLK_H31MDNR_TRFMR becomes "MW flow on Molendinar 275/110 kV transformer" and "NBAY1" is converted to "Bayswater unit 1").

It also converts reverse Polish notation (RPN) calculations into conventional algebraic form.

## 4.6. Transmission line diagrams

AEMO produces single line diagrams of the national transmission network as part of its National Transmission Network Development Plan (NTNDP). This information is updated annually. It includes:

- An interactive map providing information about modelled projects, market simulation outputs, and other information.
- A high-level overview of the main transmission networks and interconnections for each region.
- Detailed network diagrams containing further network details at the bus level.

[3] AEMO. Spot Market Operations Timetable. Available at: http://www.aemo.com.au/Electricity/Market-Operations/Dispatch/Spot-Market-Operations-Timetable. Viewed on: 3 March 2014.

# 5. STATISTICAL REPORTING STREAMS

This section of the CIR contains continuous reporting streams that provide stakeholders with regularly updated specific views of network congestion. The reports provide an analysis of available raw data, to reveal trends in specific reporting areas.

## 5.1. Comparison of Regional and Locational Prices

One of the AEMC's 2008 Congestion Management Review recommendations was to amend the Rules to "require AEMO to publish analysis on the extent and pattern of mis-pricing cause by congestion". This requirement is captured in Rule clause 3.7A(b)(2).

This analysis compares the regional reference price at reference nodes and the notional prices at connection points. The resulting Mis-pricing due to Network Congestion report provides an historical analysis of cases when regional and notional prices differed in the presence of network congestion. More information on the calculations used in the report is available via the Mis-pricing Information Resource.

The difference in prices occurs when a generator's dispatched quantity is directly subject to a binding constraint equation. The report ignores the impact due to transmission loss factors as it compares the regional reference price and not the price seen by the generator.

This information may assist market participants to understand and manage risks associated with network congestion.

### 5.1.1. Outputs

The information published mainly consists of graphs and tables showing the differences between regional and notional prices for the previous quarter and comparing this to the previous three quarters.

### 5.1.2. Inputs

The main input to the Mis-pricing Due to Network Congestion report is the data on the differences between regional and notional prices. Information required to obtain this base data includes:

- A list of all binding constraint equations with one or more scheduled generators, loads, or network service connection points on the left hand side.
- Raw marginal values of binding constraint equations in the dispatch scope.
- Information about the prior outage condition.

The above information is stored in AEMO's MMS database.

### 5.1.3. Other mis-pricing information

The raw data for each dispatch interval used to calculate the quarterly Mis-pricing Due to Network Congestion report is provided to all registered participants the following business day via the MMS data model.

## 5.2. Interconnector Quarterly Performance Report

NER clause 3.13.3(p) states that AEMO must publish, on a quarterly basis, the following details for each day of the preceding quarter (for all interconnectors):

- Interconnector transfer capability.
- The discrepancy between interconnector transfer capability and the capacity of the relevant interconnector in the absence of outages on the relevant interconnector only.

AEMO satisfies this requirement by publishing:

1. Guidelines to nominal interconnector capability.

2. A dispatch interconnector solution via the MMS data model.
3. A table in the monthly constraint report detailing the top binding interconnector limit setters.
4. A list of the constraint equations which set the interconnector limits, published along with the Annual NEM constraint report.

## 5.3. Interconnector Limits for MT PASA

This report is published to supplement the MT PASA outputs to meet AEMO obligations with regards to Rule 3.7A.

### 5.3.1. Outputs

The key outputs of this report are the forecasts of interconnector capabilities in the MT PASA timeframe. In addition, the report explains various power system characteristics that could determine the power transfer limits of the interconnectors.

### 5.3.2. Inputs

The interconnector power transfer capabilities determined in the Reliability LRC[4] calculation of the MT PASA process. These capabilities are determined using constraint equations designed to reflect maximum power transfer capabilities (without taking into account the planned network outages) and use the MT PASA 10% POE demand forecast where the constraint equation contains a demand term.

## 5.4. Annual Constraint Report

The main purpose of this report is to provide information to market participants on the performance of constraints and to highlight transmission congestion related issues in the NEM over the previous year.

The report contains, but is not limited to, the major binding/violating constraint equations, timing of major outages, and commentary on these. Where possible this information is represented graphically to highlight trends throughout the reporting year.

The Annual Constraint Report is published annually.

## 5.5. AEMO Incident Reports

AEMO produces reports on power system incidents and market incidents. While not all reports are related to congestion, the full list is linked to the CIR for completeness.

## 5.6. Monthly Constraint Reports

The Monthly Constraint Report details constraint equation performance and transmission congestion related issues for each month.

The report contains, but is not limited to, major binding constraint equations, investigations of violating constraint equations, usage of the constraint automation, and performance of pre-dispatch constraint equations.

Transmission and generation changes are also detailed along with the number of constraint equation changes made by constraint builders.

[4] Low reserve condition – see NER 4.8.4(a)

# 6. ISSUES AND TRANSITIONAL ARRANGEMENTS

NEM network congestion management is often the subject of development and change. The Issues and Transitional Arrangements section of the CIR provides users with information pertaining to significant current developments affecting network congestion.

## 6.1. National Transmission Network Development Plan

AEMO publishes the NTNDP annually as an indicator of the expected generation and transmission outcomes for the next 20 years.

The planning scenarios used in the NTNDP are based on information obtained through consultation with market participants and include rigid planning practices to account for variables such as the impact of carbon pricing policies and the Federal Government's renewable energy target.

## 6.2. TNSP Annual Planning Reports

The NER requires TNSPs to produce an Annual Planning Report, published around mid-year.

In these reports, TNSPs are required to analyse the future operation of their transmission network based on load forecasts developed through consultation with their distributors. Items that can be detailed in the reports are:

- Need for and location of new connection points.
- Forecasts of potential power system constraints and proposals to alleviate these constraints.
- Network assets requiring replacement.

## 6.3. TNSP network augmentations

Each TNSP has a list of current and recently completed network augmentation projects on their websites. This information includes details and current status of the project.

The CIR provides links to the relevant website.

# 7. APPENDIX 1: ITEMS REQUESTED FOR THE CIR

This appendix details items submitted to AEMO as part of its annual CIR consultations from 2010 to 2013. The current status of each item is indicated.

Items are detailed here for consideration in future versions of the CIR via the process outlined in Section 1.5.

**Table 7-1 — Items requested for the CIR**

| Year | Completed | Requested Item Description | Comments |
|---|---|---|---|
| 2010 | Oct 2011 | NOS Improvements: Recall times/original submit time/time of last change/TNSP. | |
| 2010 | | AEMO to work with TNSPs to publish outages via NOS instead of planned network outages. | Also submitted in 2011 consultation. AEMO is discussing this issue with the TNSPs. TransGrid and Transend are submitting their outages via NOS. |
| 2010 | Sep 2010 | Link CIR to the NTNDP. | |
| 2010 | Feb 2010 | Report on performance of constraint equations. | Published as the annual NEM Constraint Report in February 2010. |
| 2010 | Cancelled | Daily report summarising the changes in NOS over past 24 hours established. | AEMO consulted with the DPRG[5] and both agreed to cancel this in favour of providing NOS data via MMS Data Model. |
| 2010 | Sep 2010 | Link to incident reports from CIR. | |
| 2010 | Late 2010 | Summated LHS of constraint equations in Dispatch and Pre-dispatch. | |
| 2010 | Sep 2010 | CIR links to TNSP annual planning reviews. | |
| 2010 | Early 2011 | Changes to the MMS Web Portal to include the Dispatch / Pre-dispatch / PASA constraint and interconnector results. | |
| 2010 | | Add a heat map display of mis-pricing. | This proposal requires significant resources. AEMO is considering the most cost effective way to achieve this. |
| 2010 | | Visual image of NEM Outages. | This proposal requires significant resources. AEMO is considering the most cost effective way to achieve this. |
| 2010 | | Visual image of constraint equations. | This proposal requires significant resources. AEMO is considering the most cost effective way to achieve this. |
| 2011 | Feb 2012 | Include statistics on outage submit times in the annual constraints report (planned, short notices and unplanned outages). This is different to the statistics on the Planned Network Outages. | Implemented in the NEM Constraint Report 2011. |
| 2011 | | Include statistics on Planned Network Outages in the longer timeframe (1/3/6/9 months). | On hold until Planned Network Outages from all TNSPs are in NOS. |
| 2011 | Dec 2011 | Report on constraint performance on a monthly basis. | Monthly Constraint Report released with information on why constraint automation was used and information on violating constraint equations. |
| 2011 | Apr 2011 | Include more network diagrams in the CIR. | Link provided to NTNDP diagrams. |

[5] Dispatch Price and Reference Group – now part of the NEM Wholesale Consultative Forum.

| Year | Completed | Requested Item Description | Comments |
|---|---|---|---|
| 2011 | Sep 2011 | Add information on how constraint equations are constructed. | Constraint Implementation Guidelines released. |
| 2011 | | Link to MIP data from AER. | This is AER data and is currently not available on their website. When it is available it will be linked. |
| 2011 | Oct 2011 | NOS improvement: add outage change reason. | Combined with other NOS improvements |
| 2011 | Cancelled | Include statistics on the performance of network ratings in Pre-Dispatch. | Work has commenced on this and this should be completed by the end of 2012.<br>Statistics are being determined for specific lines as a part of the dynamic rating forecasting project |
| 2011 | June 2011 | Link to augmentation information from TNSPs. | |
| 2011 | Feb 2012 | Updating the existing video to the new format so it is viewable on more devices. | |
| 2011 | | Additional videos on constraints. | Will be addressed in as resources allow. Good suggestions in the CIR 2011 consultation: constraint automation examples, dynamic ratings and impacts in pre-dispatch, overview of annual report, use of interconnector limits in ST/MT PASA, ratings in 5 min pre-dispatch, constraint equations with all positive factors. |
| 2011 | Late 2011 | Publish NOS data via the MMS Data Interchange. | This will allow participants to have old copies of the files to compare with and re-download files. |
| 2011 | Feb 2012 | Publish TER data which includes information on SPD IDs used and whether the rating is dynamic. | Existing file on website will remain unchanged. |
| 2011 | May 2012 | Publish NOS and TER data via the MMS Data Model. | This will allow participants to use this data in the same way as any other market data - get historical data and integrate into their own systems. |
| 2012 | Late 2012 | Review resubmit reasons and work with TNSPs to identify any improvements. | TNSPs to review resubmit reasons and provide more appropriate fields where applicable. |
| 2012 | November 2012 | Discuss with TNSPs what additional information can be provided on reasons for outages. | Reason field which indicates Commissioning or Maintenance to be added to NOS data. |
| 2012 | June 2012 | Provide a link to the already published constraint equation result data. | |
| 2012 and 2013 | | Provide in a user friendly form in the CIR:<br>• Currently invoked constraint equation results.<br>• Constraint equations binding now and in pre-dispatch period.<br>• Identification of generators/interconnectors impacted by each binding constraint equation.<br>• Identification of which constraint equations are the limiting factors on interconnector flows. | Updated with Private Generators Group (PGG) request in 2013 CIR. |
| 2012 | | Provide Plain English descriptions outside the web portal. | |
| 2012 | | Consolidate Constraint Implementation Guidelines with FCAS constraint Equations, SO_OP_3709. | Planned for completion in 2014. |

| Year | Completed | Requested Item Description | Comments |
|---|---|---|---|
| 2012 | November 2012 | Publish mis-pricing information in near real time. | |
| 2012 | May 2013 | Provide dynamic rating values to participants in near real time. | |
| 2012 | February 2013 | Modify constraint report to identify top market impact constraints by region. | Included in the 2012 Constraint Report. |
| 2012 | November 2012 | AEMO planning team to publish market simulations on assessing the use of NSCAS to relieve the 10 most critical constraint equations. | Published on AEMO's website. |
| 2013 | | Provide a table of current outages along with the generators/interconnectors on the LHS of the invoked constraint equations. | |
| 2013 | | Extended pre-dispatch to assist TNSPs managing outages. | |
| 2013 | November 2013 | Add TNSP identifier to the published NOS data. | |
| 2013 | | Reduce the size of the local price tables to only include those LHS terms that are affected by a constraint equation. | Planned for completion in 2014. |
| 2013 | | Add a FCAS requirement table for 5-minute pre-dispatch. | |
| 2013 | | Publish the NRM_DI_AMT (used in the calculated of the automated negative residue constraint equations) in the MMS data model. | |

# MEASURES AND ABBREVIATIONS

## 7.1. Abbreviations

| Abbreviation | Expanded name |
|---|---|
| **CVP** | Constraint violation penalty factor |
| **DNSP** | Distribution network service provider |
| **EMS** | Energy management system |
| **FCAS** | Frequency control ancillary service |
| **LHS** | Left hand side of a constraint equation. This consists of the variables that can be optimised by NEMDE. These terms include scheduled or semi-scheduled generators, scheduled loads, regulated Interconnectors, MNSPs or regional FCAS requirements. |
| **MNSP** | Market network service provider |
| **MPC** | Market price cap (previously called VOLL) |
| **NEM** | National electricity market |
| **NEMDE** | National electricity market dispatch engine |
| **PASA** | Projected assessment of system adequacy |
| **RHS** | Right Hand Side of a constraint equation. The RHS is 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. |
| **TNSP** | Transmission network service provider |