

NEM VAR DISPATCH SCHEDULE SYSTEM TRIAL PLAN

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FINAL

(Web site version)

Important Notice

AEMO has prepared this document to provide a plan to participants in relation to the VAr Dispatch Scheduling System Trial, including; assumptions, scope, systems, communications, criteria, roles and responsibilities and conduct of the Trial.

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Abbreviations

AEMO	Australian Energy Market Operator
RPO	Reactive Plant Operator
VAr	Volt-Ampere reactive
VDS	VAr Dispatch Schedule

Special Terms

VDS System	AEMO's VAr Dispatch Schedule System
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History

VERSION	DATE	BY	CHANGES
0.1	09/11/2015	Chris Stewart	First draft
0.2	26/11/2015	Chris Stewart	Further details added.
0.3	02/12/2015	Chris Stewart	Review and update following Q & A session on 01/12/2015
1.0	07/12/2015	Chris Stewart	Finalise for issue (website version).

1 Summary

The VAr Dispatch Schedule (VDS) System Trial will be an “as-real” operational trial of all market systems and processes for the VDS.

The Trial commences on 14 December 2015 and transitions to go-live on 04 April 2016 (to be confirmed). It will give Reactive Plant Operators and AEMO an opportunity to validate operations and processes prior to the VDS becoming operational.

It will allow the reactive plant operators to receive electronic instructions for the relevant reactive power devices.

Once implemented in production, AEMO may send test data as part of the Trial. Reactive Plant Operators **ARE NOT TO ACT UPON THESE ELECTRONIC INSTRUCTIONS** until further notice from AEMO.

The VAr Dispatch Schedule Trial will consist of four phases:

- **Preparation Phase:** The three-week period from 23 November 2015 to 13 December 2015 leading up to Trial commencement, during which AEMO will deploy to production, establish the necessary framework, resources, tools, and materials to define and operate the Trial. This will include establishing the environments for trial operation. Registration for the Trial is not required.
- **Open-loop Trial Phase:** The six-week period from 14 December 2015 to nominally 31 January 2016 (to be confirmed) that simulates open-loop operation in parallel with current manual voltage control processes. RPOs should not respond to electronic instructions during this Open-loop Trial phase. There will be automatic live-feed of instructions that shadows the current manual VAr dispatch processes.
- **Closed-loop Trial Phase:** The nine-week period from nominally 01 February 2016 to 03 April 2016 (to be confirmed) simulates closed-loop operation. When advised by AEMO, RPOs should respond to electronic instructions during this Closed-loop Trial phase and only when advised by AEMO. There will be automatic live-feed of real-time instructions. Manual VAr dispatch processes by telephone are available as back-up if required.
- **Transition Phase (if required):** Trial-related activities will cease after the transition from Trial to live operation on 04 April 2016 (to be confirmed). Consideration will be given at an appropriate time to moving directly from Closed-loop Trial Phase to Go-live Operation.

Trial participation is free. While participation in the Open-loop Trial is not mandatory, all RPOs are strongly encouraged to participate. During the Closed-loop Trial, participation of all relevant RPOs is required to facilitate completeness of the Trial.

Participant staff, processes, and systems should be ready to operate as-real at the start of the trial.

Entry and exit criteria for the Trial are described in sections 7 and 8 respectively. The entry criteria are designed to ensure that: the necessary infrastructure for the Trial has been established and communicated and AEMO and RPOs are ready to conduct the Trial.

AEMO will monitor successful execution of the Trial and report against a set of defined Trial metrics. These metrics, along with AEMO and RPO readiness, will inform the go-live decision. The go-live decision will be communicated to participants on 28 March 2016.

Communication during the Trial Phases will be comprehensive to maximise the learning experience. AEMO’s Support Hub, in coordination with the VAr project team, will handle both technical and non-technical (business) enquiries.

Planned communications include; tri-weekly conference calls (as required) and weekly NEM VAr Trial Industry Reference Group to discuss any issues; weekly status reports, market notices, a sharepoint collaboration site and emails providing any updates as necessary.

2 Purpose of the Trial

The Trial is a full-scale, as-real operational trial of all VAr Dispatch Schedule systems and processes.

The Trial will provide a framework within which RPOs and AEMO can exercise their processes and systems.

The purpose of the Trial is to provide:

- A period of as-real trialling, during which RPOs can freely test their systems and processes.
- An opportunity for RPOs to become familiar with the VDS System and electronic instructions
- An opportunity for RPOs to observe VDS System operation.
- A period of as-real operation so AEMO can test its processes and VAr systems.
- Streamlining and aligning AEMO's databases with data relating to currently dispatched reactive devices.
- Tuning of VDS System parameters.
- Quality of the system based on metrics.
- Reliability of the system based on metrics.
- Confirm Trial key performance indicators.
- Confirm performance is equivalent to current manual processes.
- AEMO to monitor performance and confirm acceptance of quality and reliability.
- RPOs to monitor performance and confirm acceptance of VAr instructions.
- Full end-to-end process – the Trial is the first opportunity to exercise the full end-to-end process of the VAr Dispatch Schedule System and its electronic instructions. During the Closed-loop Phase and only after advice from AEMO, the RPOs will act upon the electronic instructions.

3 Trial Assumptions

Trial planning was based on a set of core assumptions used to construct timelines, define components, and outline support requirements. The core assumptions include:

- The Trial will run for eighteen weeks, commencing 9:00 market time on 14 December 2015 and concluding on 03 April 2016 (to be confirmed).
- The Trial will operate seven days a week, including any state-based public holidays that fall during the trial period.
- Staff, processes, and VDS systems will be ready to operate as-real at Trial start. All parties will confirm connectivity to AEMO prior to trial commencement.
- AEMO operational personnel responsible for the execution of processes and VDS systems safter becoming operational will be responsible for running the Trial.
- The Trial is not a validation of the VDS System design.
- All participating organisations will appropriately staff their operations to test all relevant types of VAR electronic instructions.
- Trial access and activities will cease after the transition from Trial to live operation.

4 Scope and Structure of the Trial

4.1 Phases

The Trial will consist of four phases as illustrated in Figure 1 and discussed below.

Figure 1: Timeline of Trial Phases

Actual dates will be determined based on progress.

Week commencing	23 Nov	30 Nov	07 Dec	14 Dec	21 Dec	28 Dec	04 Jan	11 Jan	18 Jan	25 Jan	01 Feb	08 Feb	15 Feb	22 Feb	29 Feb	07 Mar	14 Mar	21 Mar	28 Mar	04 Apr		
Activity																						
Preparation Phase																						
Open-loop Trial Phase																						
Closed-loop Trial Phase																						
Transition Phase (if required)																						
Go-Live																						

4.1.1 Preparation Phase

RPOs and AEMO will prepare for the Trial prior to the planned start. During this phase, AEMO will develop the framework, resources, tools, and materials necessary to operate the trial.

Those wishing to participate in the Trial should inform AEMO at VArProject@aemo.com.au by close of business 8 December 2015.

Following confirmation, actions required of RPOs in this phase include:

- Confirming MarketNet access and/or SCADA arrangements in place
- Establishing a connection to the Trial environment, firstly in pre-production for testing, then in the production environment for the Trial.
- Establishing electronic instructions by SCADA, where relevant to individual RPOs.

Trial metrics will not be collected and tracked during this phase. Preparation Phase activities are described in Table 1 below.

Table 1: Preparation Phase Activities

Activity	Date
Release AEMO's production VDS systems (Trial will be conducted in the production system). Once implemented in production, AEMO may send test data as part of the Trial. Reactive Plant Operators ARE NOT TO ACT UPON THESE ELECTRONIC INSTRUCTIONS until further notice from AEMO.	26 November 2015 (EMMS) through 10 December 2015 (EMS)
Access to Market Systems enabled for participant connectivity testing	From week commencing 30 November 2015

Full production environment available to participants	From week commencing 07 December 2015
Ensure all RPOs intending to participate in the Trial can connect to production VAR Dispatch Schedule systems.	By 9 December 2015
Trial commences	14 December 2015

4.1.2 Open-loop Trial Phase

This is the six week period commencing 14 December 2015 where RPOs are able to test their interfaces and confirm receipt of electronic instructions.

Once implemented in production, AEMO may send test data as part of the Trial. Reactive Plant Operators ARE **NOT** TO ACT UPON THESE ELECTRONIC INSTRUCTIONS until further notice from AEMO.

The focus of the Open-loop Trial Phase is to shadow the current manual VAR dispatch processes.

4.1.3 Closed-loop Trial Phase

This is the nine week period commencing nominally 1 February 2016 (to be confirmed) where RPOs are able to continue testing their interfaces and confirm receipt of electronic instructions. Non-conformance processes may be tested.

Following advice from AEMO, the intention is for RPOs to act upon the electronic instructions.

Manual VAR dispatch processes by telephone are available as back-up if required.

Unforeseen circumstances may arise where it becomes necessary to return to Open-loop Trial operation. If this occurs AEMO will inform RPOs.

4.1.4 Transition Phase

If required, a Transition Phase will be conducted. Consideration will be given at an appropriate time to moving directly from Closed-loop Trial Phase to Go-live Operation. The decision will be based on an evaluation at the time. Trial activities will cease during this phase, if required, as AEMO prepares for transition from the Trial to live operation on 04 April 2016. If a Transition Phase is conducted, RPOs may not be required to respond to electronic instructions during this phase.

4.2 Scope

The Trial, being an “as real” exercise, will operate whenever possible in accordance with current operational practices and protocols. However, there may be exceptions for pragmatic and operational reasons.

The following sub-sections provide an overview of the scope under the Trial.

4.2.1 Dispatch Information

Information flows in the Trial will be consistent with typical VAR dispatch and live processes to the greatest extent possible.

5 VAr Dispatch Schedule Systems

All VAr Dispatch Schedule systems will operate in the Trial. These systems will be identical to those that will run in live operation.

5.1 Setup of Trial Systems

5.1.1 Systems Preparation Phases

The Trial will be conducted on the production VAr Dispatch Schedule systems from 14 December 2015 to 03 April 2016 (to be confirmed).

MarketNet access and/or SCADA will be required for RPOs to receive VAr electronic instructions. All RPO connectivity requirements for the Trial will be the same as those for the live operation.

5.1.2 Trial Data Establishment

Trial data establishment involves configuring market and system parameters.

The VAr Dispatch Schedule systems available during the Trial will be the same as those available in the live operation.

AEMO will clean out the trial data from the internal MMS database and delete any trial files generated and stored in file servers during the trial.

Participants may opt to clean out their MMS data on their side.

5.2 Transition to the Live Operation

Trial activities will cease at 03 April 2016, subject to Go Live, or earlier if a Transition Phase is conducted to allow AEMO to focus on the transition from the Trial to live operation.

6 Trial Communications

Effective communication is vital to establishing and operating the Trial.

Previously nominated RPO Trial Coordinators will act as the primary contact point with AEMO and will disseminate information about the Trial within their organisation.

AEMO's Support Hub is the first point of contact for participants during the Trial. RPOs can submit defect reports, lodge queries about the Trial throughout the preparation and execution phases using the standard contact details.

6.1.1 Trial Communications

Communication during the Trial phase will consist of the following.

Table 2: Trial Communications

Communication	Description
Regular (initially Tri-weekly) Conference Calls	Regular (initially Tri-weekly) calls with RPOs that will run up to an hour and allow a review of activities to date, and discussion of any issues. The date and time of these will be communicated closer to the commencement of the Trial.
Regular NEM VAr Trial Industry Reference Group Meetings (initially weekly)	The VAr project team will provide updates to the VAr Trial Industry Reference Group, as they are scheduled, regarding Trial preparation and progress.
SCADA Working Group	The VAr project team will provide updates to the SCADA Working Group, as they are scheduled, regarding Trial preparation and progress.
VAr Dispatch Scheduler Collaboration Sharepoint Site	VAr Dispatch Scheduler – Participant Dashboard. [Access details will be provided on request].
Market Notice	Key information will be issued by Market Notice. For example, commencement of Trial, suspension of Trial, completion of Trial, RPOs act/do not act in response to electronic instructions and so on.

6.1.2 Advising RPOs to act or not act on electronic instructions

AEMO will use the communication channels in Table 2 to advise RPOs of periods during which they;

- (a) should act upon electronic instructions, or
- (b) should not act upon electronic instructions.

6.1.3 VAr Web Page

The VAr web page on AEMO's Web Portal provides participants with access to all VAr electronic instructions issued by AEMO. The VAr web page is accessed from the energy market systems web portal, and will be available to participants throughout the Trial.

Participants can use the VAr web page to perform the following tasks:

- Access all VAr electronic instructions issued by AEMO.
- Filter to view particular VAr electronic instructions
- View conformance status of reactive power devices.

PRE-PRODUCTION platform EMMS Web Portal: [Access details provided on request] [This web portal is used for Testing]

PRODUCTION platform EMMS Web Portal: [Access details provided on request] **[This web portal is used for the Trial]**

Instructions for accessing the VAr web page were previously provided to RPOs and on request will be provided again.

7 Entry Criteria

VAr Dispatch Scheduling System Trial commencement depends on the readiness of AEMO and RPOs. The VAr project team will periodically measure readiness for the Trial against the entry criteria.

If any of the entry criteria have not been unambiguously met, a risk assessment will be performed to understand any risk of starting the Trial. Contingency measures will be sought to mitigate the resulting impact.

There are three forms of entry criteria for the Trial:

- **Trial Commencement Criteria:** Determine whether the Trial as a whole is ready to commence.
- **Participant Entry Criteria:** Determine whether individual RPOs are ready to join the Trial.
- **Closed-loop Trial Commencement Criteria:** Determine whether RPOs may act on the electronic instructions.

7.1 Trial Commencement Criteria

In summary, the following requirements need to be satisfied to start the Trial:

- AEMO, as power system operator, is ready to commence Trial operation.
- Sufficient RPOs are ready to enter the Trial and commence Trial operation.
- The infrastructure for Trial coordination (such as tools, facilities, and materials) is in place and communicated.

These high-level requirements result in the entry criteria detailed in Table 3 below. The VAr project team must confirm that these criteria have been satisfied for the Trial to commence.

Table 3: Commencement Criteria for the Trial

#	Type	Criterion
M1	Market Systems and Energy Management Systems	Trial VDS Systems infrastructure adequately established, configured, and ready.
M2	Market Systems and Energy Management Systems	Successful completion of all planned VAr Dispatch Schedule systems development and testing activities.
M3	Market Systems and Energy Management Systems	Business verification and approval of VAr Dispatch Schedule systems Trial Data Establishment Plan and Values.
M4	Market Systems and Energy Management Systems	Finalisation of Trial RPO arrangements.
M5	Market Systems and Energy Management Systems	Successful shakeout of VAr Dispatch Schedule systems Pre-Production and Production Application, Web and Database server configurations and SCADA.
M6	Real Time Operations	Minimum staffing levels have been reached to support AEMO operations during the Trial (i.e., staff in place and trained).
M7	Market Operations	Trial Support Hub arrangements confirmed and operational.
M8	Real Time Operations	Voltage Control and VAr dispatch procedures developed and ready for operation (e.g. regional operating procedures).
M9	Participants	A sufficient number of RPOs have satisfied the Participant Entry Criteria for the Trial. Note: The failure of any single participant to be ready will not, in and of itself, constitute reason for delay.

7.2 Participant Entry Criteria

Entry criteria for individual participants to join the Trial are detailed in Table 4 below.

Table 4: Entry Criteria for Individual Participants to Join the Trial

#	Criterion	Responsible for confirming
P1	Inform AEMO by email to VArProject@aemo.com.au of your intention to participate in the Trial.	Participant
P2	People and facilities are in place to operate in the Trial	Participant
P3	Established connectivity to at least one VAr Dispatch Schedule System interface	Participant
P4	Logons to VAr web page received and can login to system, and/or	Participant
P5	Confirmed receipt of VAr electronic instructions in market files, and/or	Participant
P6	Confirmed receipt of VAr electronic instructions by SCADA	Participant

7.3 Closed-loop Trial Commencement Criteria:

Entry criteria for Closed-loop Trial commencement are detailed in Table 5 below.

Table 5: Entry criteria for Closed-loop Trial Commencement

#	Criterion	Responsible for confirming
P1	Relevant metrics are met	AEMO
P2	People and facilities are in place to operate in the Closed-loop Trial	Participant

8 Exit Criteria

The successful execution of the Trial will be monitored and reported against a set of defined Trial metrics. These metrics will inform the operational go-live decision and consequent completion of the Trial, and as such represent part of the exit criteria for the Trial.

Tracking and reporting metrics is the responsibility of the VAR project team as part of its Trial Coordination role.

8.1 Approach to Measurement

The Trial is essentially a demonstration of VAR dispatch schedule systems and processes.

The successful execution of VAR dispatch processes, as well as the completion of key Trial milestones, will be measured by the Trial Metrics.

In particular, this measurement seeks to confirm that:

- The process step has been executed as required.
- The process step has been executed in accordance with defined timings.

Monitoring points will be selected, with a particular focus on interactions between RPOs and AEMO.

The measurement of metrics will commence at the beginning of the Execution phase of the Trial.

8.2 Tracking and Reporting Tools

AEMO will track and measure:

- VAR Dispatch Scheduling System performance against defined metrics throughout the Trial.
- Issues that arise during the Trial and their resolution.

Tools will include:

- **Trial Metrics Report:** Used to gather and report Trial metrics on a weekly basis, utilising a dashboard style format. This report will be distributed to Readiness Coordinators, and will be discussed at the Trial conference call.

Participant Readiness Assessment Surveys and Readiness Reports: Gathered as part of the Trial Readiness work stream, these will track the Trial progress and the readiness of RPOs.

8.3 Trial Metrics

This section outlines the metrics that will be tracked and reported during the Trial.

8.3.1 Overall Metrics

Table 6: Overall Metrics

Indicator	Metric	Target Level
AEMO competence	AEMO Control Room Operators competent in using VDS application.	All control room operators in a voltage control role have completed VAR Dispatch Schedule System Workshop
VDS Soft limits management	Effort to manage VDS soft limits	Less than 1 hour per 12 hour shift

8.3.2 VAR Dispatch Schedule System Metrics

Table 7: VAR Dispatch Schedule System Metrics

Indicator	Metric	Target Level
VDS level of automation	VDS application achieved an acceptable level of automation	No more than one intervention required in four consecutive runs of VDS dispatch cycle at 15 minutes per cycle
Issues	Number of open issues reported during the Trial.	Maximum 100
Defects unresolved	Number of critical priority defects raised against VDS System application software.	Maximum Nil.
Defects unresolved	Number of high priority defects raised against VDS System application software.	Maximum 5.
VAR Dispatch Schedule systems	Percentage availability of VAR Dispatch Schedule systems for the Trial.	Maximum 90%
Market interfaces	Percentage availability of market interfaces for the Trial.	Maximum 95%
SCADA	Percentage availability of SCADA for the Trial.	Maximum 95%
Customer support	Number of Support Hub incidents related to the Trial.	Maximum 500
	Number of Support Hub incidents related to the Trial that remain open.	Maximum 50

8.3.3 Voltage Limit Metrics

Table 8: Voltage Limit Metrics

Indicator	Metric	Target Level
Base Case Voltage Limits	Instances of exceedance of base-case voltage limits for more than 30 minutes	Maximum Nil
Contingency Voltage Limits	Instances of exceedance of contingency voltage limits for more than 30 minutes	Maximum Nil

8.3.4 Reactive Power Device Non-conformance Metrics

The reactive power device non-conformance metrics become relevant from the commencement of the Closed-loop Trial, following advice from AEMO that RPOs should act on the electronic instructions.

Table 9: Reactive Power Device Non-conformance Metrics

Indicator	Metric	Target Level
Non-conformance Reports	Percentage of non-conformance in weekly reports.	Maximum 15%

8.4 Closed-loop Trial Decision

Taking into account the above metrics, RPO readiness and AEMO readiness, AEMO will decide whether to proceed to the Closed-loop Trial. AEMO will communicate this decision to participants by 27 January 2016.

8.5 Go-live Decision

Taking into account the above metrics, RPO readiness and AEMO readiness, AEMO will decide whether to proceed or delay go-live on an operational basis. AEMO will communicate this decision to participants by 30 March 2016.

9 Roles and Responsibilities

During the Trial, all RPOs will potentially be issued VAr electronic instructions, regardless of whether they intend to participate in the Trial. Reactive Plant Operators ARE **NOT** TO ACT UPON THESE ELECTRONIC INSTRUCTIONS until further notice from AEMO.

Specifically:

- **AEMO** will execute the functions necessary to manage voltage control in the NEM. The Trial will be operated by AEMO staff that will be responsible for live operation. The power system will be operated as live, with the following exceptions:
- Market notifications may be restricted to those participating in the Trial.
- RPOs are encouraged to use the Trial as an opportunity to exercise their own processes and systems (if developed), though this is not a formal requirement of the Trial.
- **After AEMO has advised, RPOs** will execute the functions necessary to interact with AEMO. RPOs are encouraged to use this as an opportunity to trial their own processes and systems (if developed), though this is not a formal requirement of the Trial.

9.1 Responsibilities during Preparation Phase

Table 10 outlines the activities AEMO must undertake to prepare for the trial.

Table 10: Preparation Phase Responsibilities – AEMO

Activity	AEMO
General Preparation	<ul style="list-style-type: none"> • Ensure adequate resourcing for VAr Dispatch Schedule System Trial operations. • Provide communication infrastructure including website, market notices, and telecommunication facilities. • Issue logon details and passwords for VAr web page to RPOs prior to commencement of the Trial. • Execute and oversee preparation based on Trial Plan, including: <ul style="list-style-type: none"> ○ Plan and coordinate preparation activities. ○ Design and develop reporting process, report formats, and tracking tools. ○ Prepare communication infrastructure for Trial, including website preparation, conference call capabilities. ○ Report status of Trial preparation. • Track and monitor Trial risks and issues. • Ensure market systems and SCADA are ready for operation and are populated with data. • Track and facilitate RPO readiness for Trial.

Table 11 outlines the activities RPOs should undertake to prepare for the Trial.

Table 11: Preparation Phase Responsibilities – Reactive Plant Operators

Activity	Reactive Plant Operators
General Preparation	<ul style="list-style-type: none"> • Make and test necessary system changes, including implementation of interfaces to AEMO. • Define and revise business processes. • Staff key operational roles related to the VAr dispatch. • Prepare and deliver any other required internal training. • Complete participant registration (including acceptance of Trial terms and conditions). • Review Trial materials and provide feedback to AEMO. • Provide regular updates on readiness (via participant readiness surveys).

9.2 Responsibilities during Execution Phase

Table 12 outlines the activities AEMO must undertake during execution of the Trial.

Table 12: Execution Phase Responsibilities – AEMO

Activity	AEMO
General	<ul style="list-style-type: none"> • Oversee and monitor daily execution of Trial. • Track and report on performance against Trial metrics. • Identify, log, track, and resolve issues. • Manage ongoing communications regarding the Trial (e.g. activities, progress, outcomes, and issues). • Coordinate and manage status updates and conference calls regarding the Trial. • Plan, prepare, and execute transition to live operations. • Address any change requests arising from the Trial.¹ • Carry out VAr dispatch operational processes. • Manage participant queries • Monitor and analyse Trial outcomes.

Table 13 outlines the activities reactive plant operators should undertake to participate in the Trial.

Table 13: Execution Phase Responsibilities – Reactive Plant Operators

Activity	Reactive Plant Operators
General	<ul style="list-style-type: none"> • Participate in regular (initially tri-weekly) Trial debrief and planning calls. • Execute VAr dispatch-related functions and processes. • Download and review information. • Monitor execution of internal tasks, capturing detailed metrics. • Report progress, feedback, and issues to AEMO.

¹ The NEM VAr Trial Industry Reference Group will consider any change requests that arise as per standard processes and timelines.