

NEM EVENT – SCHEDULING ERROR – INTERMITTENT AGC FAILURES – DECEMBER 2012

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1 Summary

On nine occasions between 21 and 31 December 2012, AEMO’s automatic generation control system (AGC) failed to send new dispatch targets to generators for a single 5-minute dispatch interval, and instead used dispatch targets from the previous interval.

Snowy Hydro observed the issue and raised it with AEMO on 27 December 2012. AEMO identified the failure on 2 January 2013 during unrelated checks, and corrected it shortly after.

The failures were due to an intermittent hardware fault in an Open Access Gateway (OAG) server that exchanges data between AEMO’s market and real-time systems.

The spot market financial impact was small, with a maximum error of around 40 MW for 5 minutes.

2 Background

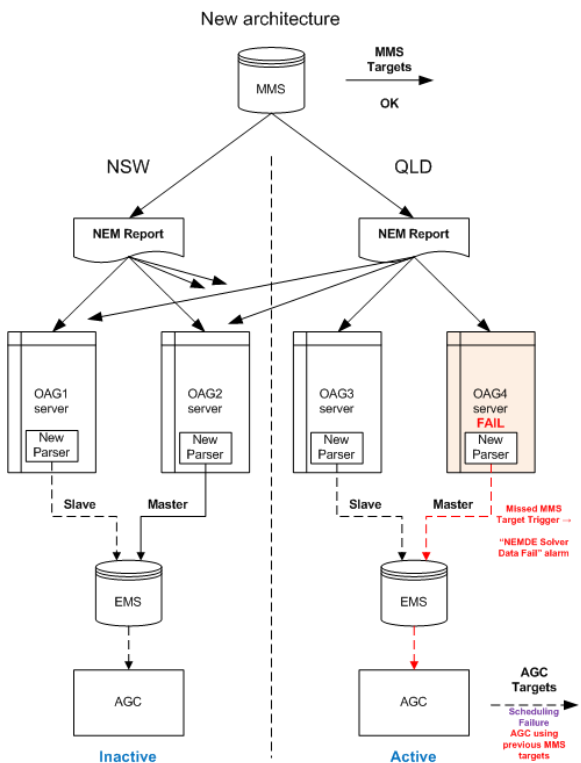
AEMO operates data centres in Queensland and NSW for the National Electricity Market (NEM). The data centres operate so that if market systems at one centre fail they can be transferred to the other data centre with minimal disruption to the 5-minute central dispatch process.

On 5 December 2012, AEMO implemented changes to improve the reliability of the interface for exchanging data between the market management system (MMS) and the energy management system (EMS), including a new market data parser application and dedicated OAG servers.

Figure 1 shows the new architecture for delivery of MMS targets to the AGC.

As part of the changes, a new “NEMDE Solver Data Fail” EMS alarm was implemented, indicating a total failure to receive MMS targets in time for upload to AGC. This alarm replaced the old “NEMDE Solver [x] Fail” alarm under the previous architecture, which only indicated a reduction in NEMDE solver redundancy. As the previous architecture was less reliable the old alarms were frequent and fleeting, and operating staff were not required to contact support staff unless there was other supporting evidence of a total failure.

Figure 1: New MMS target delivery architecture, the scheduling failure and its cause



3 Event Details

3.1 Scheduling Failure

On nine occasions between 21 and 31 December 2012, AEMO's AGC did not receive a timely trigger announcing the arrival of new 5-minute dispatch targets from the MMS, as determined by the NEM Dispatch Engine (NEMDE solver). The AGC was running on the Queensland EMS.

As a result, the AGC did not send the new MMS targets to generators, but continued to send instructions based on MMS targets from the previous dispatch run. Those generators would have observed differences between their MMS target and AGC target.

Figure 1 shows the scheduling failure and the system configuration at the time.

3.2 Identification

On each occasion the Queensland EMS initiated the new "NEMDE Solver Data Fail" alarm.

However, operating staff did not act on the new alarm because its description was similar to the old alarm (which only indicated a reduction in NEMDE solver redundancy) and hence did not require action unless accompanied by evidence of total loss. As the new alarm was not configured to send SMS alerts (by design), support staff were also unaware of the issue.

On 27 December 2012, Snowy Hydro observed the issue and raised it with AEMO, with a follow-up call on 3 January 2013.

AEMO did not identify the failures and their cause until 2 January 2013¹, during quality assurance checks by support staff of market data delivery and EMS alarms over the Christmas/New Year period. These checks were unrelated to the original call from Snowy Hydro.

3.3 Cause

The failures were due to an intermittent hardware fault in one of the Queensland OAG servers that exchanges data between AEMO's market and real-time systems.

The fault did not affect central dispatch until sometime after the implementation of AEMO's new data exchange architecture on 6 December 2012.

As shown in Figure 1 by the red dashed lines, the failed Queensland OAG server resulted in total loss of MMS target delivery to AGC.

3.4 Corrective Actions

Shortly after identifying the cause of the failures, AEMO transferred the AGC to the NSW EMS, rebooted both Queensland OAG servers and transferred to the non-faulty Queensland OAG server. The last action was completed at 1545 hours, and system integrity was confirmed.

AEMO has since replaced the faulty OAG server and is monitoring the performance of the other OAG server, which is currently considered adequate.

AEMO is investigating options to improve the reliability and performance of the Queensland OAG server. In the interim, there is an arrangement in place to operate the AGC from the NSW EMS whenever possible.

AEMO operating staff has received training on the new "NEMDE Solver Data Fail" alarm and the action required. The new alarm has been included in SMS alerts for support staff.

¹ A similar check on 24 December 2012 failed to identify the issue

4 Market Impact

AEMO has analysed the market impact of the issue in terms of dispatch, prices and spot market revenues.

The issue resulted in small differences between MMS targets and AGC targets, with a maximum difference (dispatch error) of around 40 MW for one dispatch interval.

AEMO has assessed that the spot market financial impact was small (less than \$100), noting there were no extreme spot prices during the affected trading intervals.

Table 1 shows the affected dispatch intervals, the affected generators and the estimated amount of error. Note the table only shows instances where the dispatch error was greater than 20 MW.

Table 1: Impact on Dispatch

Date	Dispatch Interval ending	Affected Generating Unit	Region ID	Actual AGC Dispatch (MMS target for prev DI) (MW)	What-If AGC Dispatch (MMS target for current DI) (MW)	Dispatch Error (Actual less What-If) (MW)
21 Dec 2012	09:35	Loy Yang B1	VIC1	497.4	520.5	-23.1
		Loy Yang B2	VIC1	497.4	520.5	-23.1
22 Dec 2012	16:25	Gladstone 6	QLD1	180	202.5	-22.5
23 Dec 2012	12:00	-		-	-	-
24 Dec 2012	20:20	Mount Piper 1	NSW1	505.2	483.5	21.7
		Mount Piper 2	NSW1	516.3	493.7	22.6
26 Dec 2012	07:55	Bayswater 2	NSW1	370.1	396.6	-26.5
27 Dec 2012	01:10	Loy Yang A4	VIC1	409.9	435.7	-25.8
		Tumut	NSW1	296.6	256.8	39.8
		Vales Point 6	NSW1	363.7	336.1	27.6
28 Dec 2012	09:15	Liddell 1	NSW1	426.3	450	-23.7
		Vales Point 6	NSW1	578.6	600	-21.4
29 Dec 2012	19:50	-		-	-	-
31 Dec 2012	20:20	Pelican Point	SA1	372.0	338.6	33.4

5 Scheduling Error Determination

Under clause 3.8.24(a)(2) of the National Electricity Rules (NER), a scheduling error occurs when AEMO determines that it has failed to follow the central dispatch process set out in rule 3.8.

AEMO has determined that a scheduling error occurred for the dispatch intervals shown in table 1, as it failed to issue dispatch instructions via the AGC in accordance with NER clause 3.8.21(d).

Under NER clause 3.16.2(a), specified Market Participants affected by a scheduling error may apply to the dispute resolution panel for a determination as to compensation.

6 Further Actions

AEMO is undertaking the following actions to mitigate the risk of similar issues occurring:

- Investigation of options to improve the reliability and performance of the Queensland OAG server

- Review procedures for implementing changes to alarms, particularly the training requirements for operating staff
- Review procedures for responding to IT-related alarms, particularly where they are intermittent but potentially indicate systemic issues.

Appendix 1 – Glossary

ABBREVIATION	TERM
AGC	Automatic Generation Control system
EMS	Energy Management System, AEMO's real-time power system monitoring system
MMS	Market Management System
MW	megawatt
NEMDE	National Electricity Market Dispatch Engine; the software underpinning the central dispatch process
NER	National Electricity Rules
OAG	Open Access Gateway
SCADA	Supervisory Control and Data Acquisition