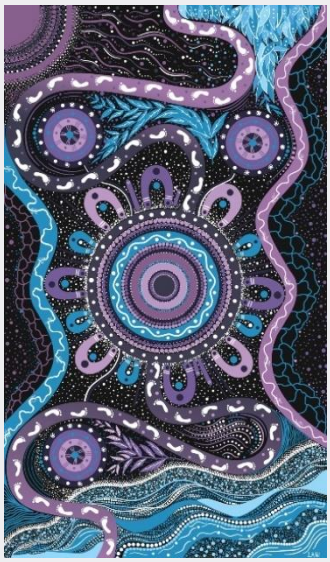
Preliminary Report: NEM Market Suspension on 5 September 2024

September 2024

A preliminary operating incident report for the National Electricity Market – information as at 13/09/2024



We acknowledge the Traditional Custodians of the land, seas and waters across Australia. We honour the wisdom of Aboriginal and Torres Strait Islander Elders past and present and embrace future generations.

We acknowledge that, wherever we work, we do so on Aboriginal and Torres Strait Islander lands. We pay respect to the world's oldest continuing culture and First Nations peoples' deep and continuing connection to Country; and hope that our work can benefit both people and Country.

'Journey of unity: AEMO's Reconciliation Path' by Lani Balzan

AEMO Group is proud to have launched its first Reconciliation Action Plan in May 2024. 'Journey of unity: AEMO's Reconciliation Path' was created by Wiradjuri artist Lani Balzan to visually narrate our ongoing journey towards reconciliation - a collaborative endeavour that honours First Nations cultures, fosters mutual understanding, and paves the way for a brighter, more inclusive future.

Important notice

Purpose

AEMO has prepared this preliminary report as part of its review of the 5 September 2024 National Electricity Market (NEM) market suspension, as a first step in reporting under clauses 3.14.3(c) and (d) and 3.14.4(g) of the National Electricity Rules.

Disclaimer

While AEMO has made reasonable efforts to ensure the quality of the information in this report, investigations may not be complete, and any findings expressed in it may change if further information becomes available and further analysis is conducted. Any views expressed in this report are those of AEMO unless otherwise stated and may be based on information given to AEMO by other persons.

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If you have any questions or comments in relation to this report, please contact AEMO at nemintervention@aemo.com.au.

Abbreviations

Abbreviation	Term
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
API	application programming interface
DAA	Day Ahead Auction
DC	direct current
EMMS	electricity market management system
FCAS	frequency control ancillary services
FOS	Frequency Operating Standard
GBB	Gas Bulletin Board
GSH	Gas Supply Hub
IT	information technology
kV	kilovolt/s
MN	market notice
MW	megawatt/s
NEM	National Electricity Market
NEMDE	National Electricity Market dispatch engine
NER	National Electricity Rules
NOFB	normal operating frequency band
NOFEB	normal operating frequency excursion band
PSSWG	Power System Security Working Group
QNI	Queensland – New South Wales Interconnector
SCADA	supervisory control and data acquisition
TI	trading interval
VNI	Victoria – New South Wales Interconnector

Contents

Tables

Figures

1 Overview

This preliminary report relates to a market suspension event[1] that occurred on 5 September 2024 in the National Electricity Market (NEM). The incident involved the suspension of the spot market in all NEM regions from trading interval (TI) 1355 hrs[2] to TI 1510 hrs. AEMO declared the market suspension due to an information technology (IT) failure which resulted in the failure of the dispatch process from shortly before 1325 hrs.

The IT failure impacted the entire dispatch process, including preventing the NEM dispatch engine (NEMDE) from solving and AEMO's electricity market management system (EMMS) from sending dispatch instructions to market participants (including generators) in all NEM regions. It also prevented AEMO from using some critical systems, impacting AEMO's ability to invoke and revoke power systems constraints, issue market notices (MNs) via the EMMS, and view the network outage scheduler. From 1325 hrs, generators were no longer receiving dispatch instructions from AEMO via the EMMS, and the first unpublished NEMDE solution was TI 1330 hrs. Consequently, AEMO formed the view that it had become impossible to operate the spot market in accordance with the provisions of the National Electricity Rules (NER) and suspended the market.

Following the failure of the dispatch process, mainland frequency was declining and AEMO's operational assessment[3] was that the Queensland – New South Wales Interconnector (QNI) was above its secure limit. At 1409 hrs, AEMO issued a direction to Snowy Hydro Limited for pump 4 and pump 5 at Tumut 3 to be taken out of service. Due to the response to AEMO's system security direction and dispatch requests, frequency remained within the limits specified in the frequency operating standard (FOS)[4] throughout the incident.

AEMO worked to restore the online market systems, and participants resumed receiving dispatch instructions from 1415 hrs. At 1426 hrs, the dispatch processes were functioning as they had been prior to the IT failure and AEMO determined that the issue had been resolved and was unlikely to re-occur. AEMO was satisfied that the direction to Snowy Hydro Limited was no longer required and cancelled the direction from 1440 hrs. At 1441 hrs, AEMO advised that the spot market in all NEM regions would resume from 1510 hrs (TI 1515 hrs). Following the event, AEMO revised the prices for TI 1355 hrs to TI 1510 hrs in accordance with AEMO's published Market Suspension Pricing Methodology[5].

The IT failure did not include any cyber security issues and the supply of electricity to consumers was not interrupted.

This preliminary report provides a summary of the known facts relating to the incident as known at the date of publication and does not attempt to provide any final analysis or recommendations.

NEM time (Australian Eastern Standard Time [AEST]) is used in this report.

[1] See NER 3.14.3 and 3.14.4.

[2] This refers to the 5-minute trading interval ending at 1355 hrs.

[3] Due to the time limitations associated with publication of this preliminary report, AEMO has not completed a post-incident system security assessment, and this will be completed as part of the final incident report.

[4] See https://www.aemc.gov.au/sites/default/files/2024-01/Frequency%20Operating%20Standard.pdf.

[5] See https://aemo.com.au/-/media/files/electricity/nem/data/mms/market-suspension-pricing-methodology.pdf.

2 Pre-event conditions

Prior to the event, AEMO was working on a planned EMMS transfer at the active site. This activity is performed primarily as part of business as usual activities so maintenance activities can be performed. AEMO had issued MN 118146 at 1031 hrs to advise market participants of the planned transfer. All rigorous business reviews and approvals had been completed according to standard practice and AEMO identified this task as low risk. Works commenced earlier in the day, with the transfer scheduled to start at 1300 hrs.

Prior to and during the event, ongoing network outages limited the flows between regions. An outage of the Liddell – Muswellbrook 330 kilovolt (kV) No. 83 line was limiting QNI flow. Terranora Interconnector flow was limited due to an outage of one of three direct current (DC) systems at Directlink. The Murraylink DC link was out of service prior to and throughout the event.

The interconnector solution for TI 1325 hrs identified an import limit on QNI of 339 megawatts (MW) from Queensland to New South Wales due to Queensland 6-second lower frequency control ancillary services (FCAS) requirements. This frequency limit was invoked because during the outage of the Liddell – Muswellbrook 330 kV No. 83 line, a loss of the Liddell – Tamworth 330 kV No. 84 line would have caused islanding of Queensland.

Prior to the event, pump 4 and pump 5 at Tumut 3 were consuming approximately 197 MW and 191 MW respectively.

Table 1 Interconnector solution for TI 1325 hrs

Interconnector	Flow at 1320 hrs (MW)	TI 1325 hrs target (MW)	Import limit (MW)	Import constraint	Export limit (MW)	Export constraint
Terranora	97	97	97	F_Q++LDMU_L6	97	N>Q-NIL_757_758
QNI	-366	-339	-339	F_Q++LDMU_L6	-10	F_Q++LDMU_R60
Basslink	-299	-362	-362	F_T++NIL_MG_RECL_R6	-168	F_T++NIL_ML_L60
Murraylink	0	0	0	V>>NIL_ELML_BAML2	0	VSML_ZERO
Heywood	-192	-267	-267	V^^V_NIL_SWVIC	523	V_S_NIL_ROCOF
VNI[A]	146	207	207	V>>NIL_ELML_BAML2	727	N>>NIL_YSTX_051

[A] VNI: Victoria – New South Wales Interconnector.

3 Event

3.1 Sequence of events

Table 2 outlines the timeline of key events which formed part of this market suspension. The information in Table 2 is based on AEMO's operational logs.

Table 2 Sequence of key events on 5 September 2024

Time (hrs)	Event
1300	• The planned EMMS transfer commenced.
1320	• The dispatch solution for TI 1325 hrs was published as expected.
1325	• The dispatch process failed. • AEMO became aware that it was no longer able to use some critical systems associated with the EMMS, including systems that allow AEMO to invoke and revoke power system constraints, issue MNs via the EMMS, and view the network outage scheduler. • Generators were no longer receiving dispatch instructions from AEMO via EMMS.
1350 to 1355	• AEMO suspended the market in all NEM regions from TI 1355 hrs.
1405	• In response to QNI flow exceeding the secure import limit calculated for TI 1325 hrs and declining frequency: – AEMO commenced contact with Snowy Hydro Limited in relation to directions for power system security. – AEMO began contacting synchronous generators and requested they follow pre-dispatch targets, instead of the last good quality supervisory control and data acquisition (SCADA) dispatch instruction from TI 1325 hrs.
1409	• AEMO issued a system security direction to Snowy Hydro Limited to take pump 4 and pump 5 at Tumut 3, which were consuming 197 MW and 191 MW, out of service until further notice.
1415	• Participants started receiving dispatch instructions again via EMMS.
1418	• As AEMO was not able to issue MNs via EMMS, AEMO manually published a MN on its website advising of the market suspension in all NEM regions. The MN incorrectly identified that the suspension was to start at 1555 hrs.
1424	• Interconnector dispatch targets updated.
1426	• Market processes resumed functioning as they were prior to the incident. • AEMO determined that the issue had been resolved and was unlikely to re-occur.
1428	• AEMO updated the manual MN uploaded to the AEMO website at 1418 hrs, changing the stated market suspension start time to 1400 hrs.
1431	• AEMO issued MN 118149 advising the market was suspended in all NEM regions with market suspension pricing schedule prices set from TI 1355 hrs on 5 September 2024 until further notice. This notice superseded the manual MN issued at 1418 hrs and updated at 1428 hrs.
1440	• AEMO cancelled the direction to pump 4 and pump 5 at Tumut 3.
1441	• AEMO issued MN 118150 to advise the spot market suspension was to be lifted at 1510 hrs.
1451	• AEMO removed the superseded manual MN originally issued at 1418 hrs from the AEMO website.
1455	• The Liddell – Muswellbrook 330 kV No. 83 line returned to service. This reduced constraints on QNI.
1510	• AEMO lifted the market suspension in all NEM regions.
1920 hrs on 6 September 2024	• Prices for all NEM regions were revised for TIs from 1355 hrs to 1510 hrs on 5 September 2024 in accordance with the market suspension pricing schedule.

3.2 IT failure and NEM impact

At 1300 hrs on 5 September 2024, AEMO began the EMMS transfer at the active site. During this transfer, shortly before 1325 hrs, an IT failure occurred affecting the new and old locations at the active site simultaneously which prevented the service from failing back to the previous good state. Intervention was required to either address the IT failure or prepare an emergency movement of the EMMS service to the back-up site. Before the activation and movement of the EMMS service to the back-up site was completed, the service at the active site was successfully restored.

The IT failure impacted the entire dispatch process, including preventing the NEMDE from solving and AEMO's EMMS from sending dispatch instructions to market participants (including generators) in all NEM regions. It also prevented AEMO from using some critical systems, impacting AEMO's ability to invoke and revoke power systems constraints, issue MNs via the EMMS, and view the network outage scheduler. Consequently from 1325 hrs, generators were no longer receiving dispatch instructions from AEMO via the EMMS, and the first unpublished NEMDE solution was TI 1330 hrs. This IT failure led to power system security issues in the NEM as discussed in Section 4 and suspension of the NEM in all regions as discussed in Section 5.

3.3 Gas market impacts

The Gas Supply Hub (GSH), Day Ahead Auction (DAA) and Gas Bulletin Board (GBB) were also impacted to varying degrees following the IT failure. GSH orders that were submitted during the outage did not flow through AEMO systems fully and needed to be resubmitted so they could be properly processed. Participants making submissions via the AEMO application programming interface (API) and manually via the markets portal experienced interruptions during the IT failure and intermittent disruptions up to 24 hours after the event due to persistent instabilities in downstream GSH IT services. These issues were resolved by 1730 hrs on 6 September 2024.

3.4 Rectification

After identifying the cause of the IT failure, AEMO immediately worked to complete a manual intervention to restore service. The cause of the IT failure was resolved at approximately 1415 hrs and services were progressively becoming available. At 1426 hrs, the market processes were functioning as they were prior to the IT failure and AEMO determined that the IT failure had been resolved and was unlikely to re-occur.

AEMO will complete further steps to mitigate the risk and/or impact of occurrence of any similar event (see Section 6).

4 Power system security

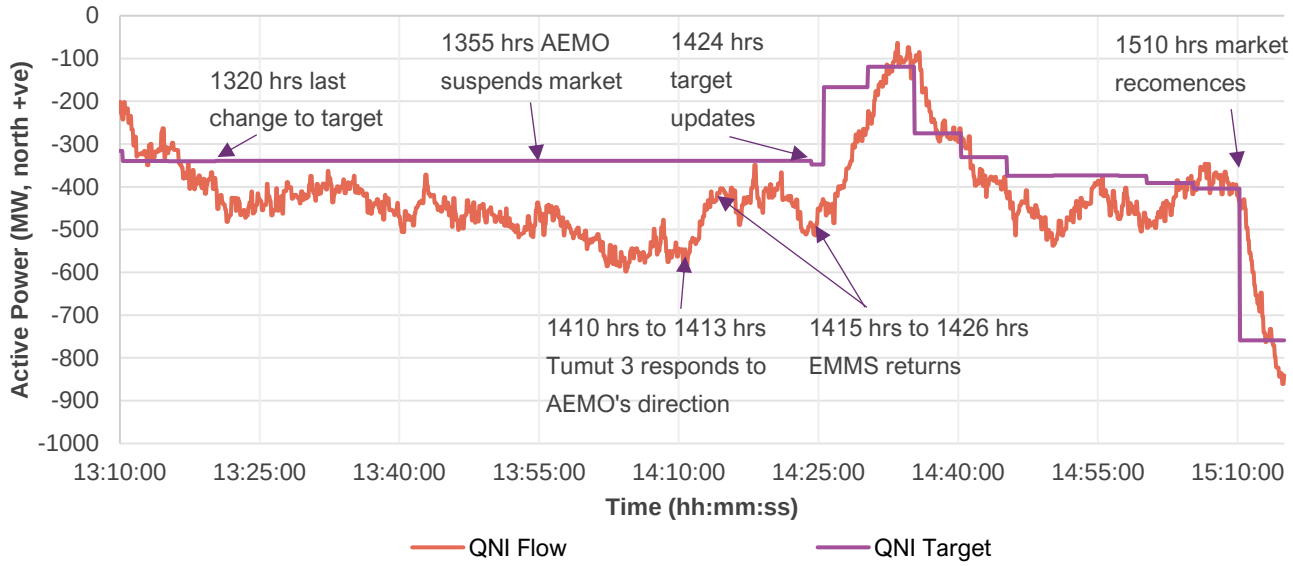
4.1 Generation dispatch during the IT failure

Between 1325 hrs and 1415 hrs on 5 September 2024, scheduled resources were not able to receive dispatch instructions using AEMO's EMMS. Standard practice from industry in these circumstances is to hold the last good quality dispatch target (TI 1325 hrs), however this is not documented in the power system operating procedures. This risk had previously been identified by the Power System Security Working Group (PSSWG), and at the time of the incident the PSSWG was engaging on an update to the Power System Security Guidelines (SO_OP_3715)[6] to clarify the requirements during communications failures.

4.2 Power system response

As scheduled resources were not receiving EMMS dispatch targets from 1325 hrs on 5 September 2024, changes to supply and demand were not compensated for by EMMS dispatch instructions during the IT failure. As NEMDE relies on EMMS inputs, NEMDE solutions were also not available to display the real time limits via constraints to AEMO. TI 1325 hrs set the QNI target to the import limit of -339 MW (see Section 2) and this target was exceeded by up to 250 MW (see Figure 1). With the absence of constraints to confirm, AEMO determined that the secure QNI limit had been exceeded, and that in the absence of dispatch instructions to correct the interconnector drift, AEMO was required to take action to restore the power system to a secure operating state.

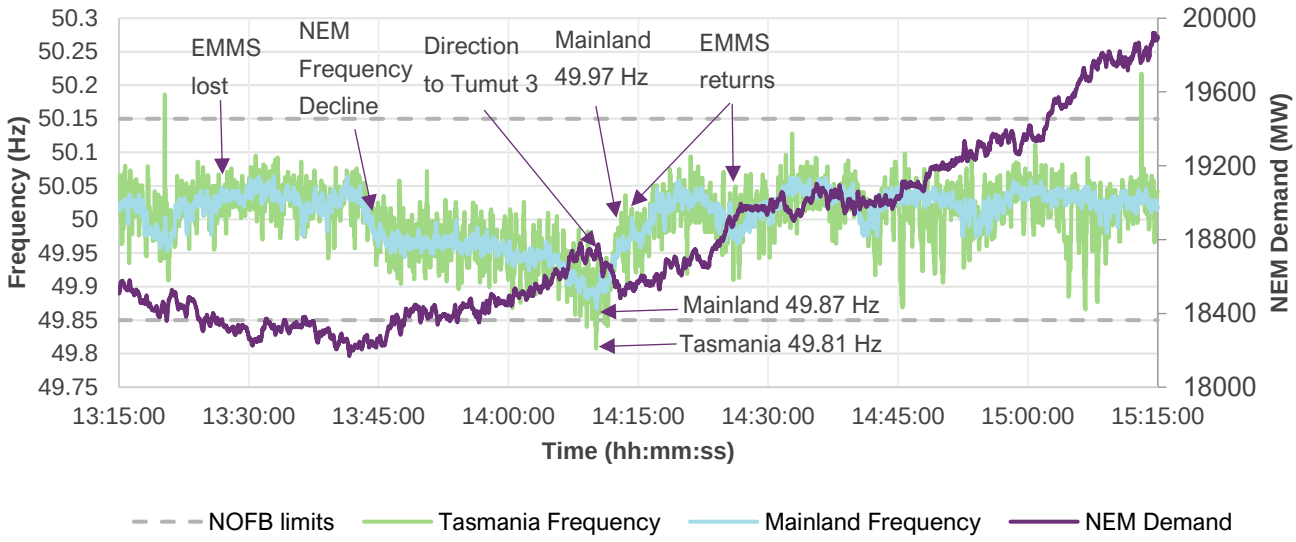
Figure 1 Queensland – New South Wales Interconnector flow on 5 September 2024



[6] At https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/procedures/so_op_3715-power-system-security-guidelines.pdf?la=en.

In assessing options available to address the limits on QNI, AEMO took into consideration power system frequency. Frequency on the mainland and in Tasmania was declining and reached approximately 49.87 Hz and 49.81 Hz at 1410 hrs (see Figure 2).

Figure 2 NEM frequency vs NEM demand on 5 September 2024



Preliminary analysis indicates that this reduction in frequency was caused by rising NEM demand.

To reduce QNI flow towards New South Wales, and increase frequency, AEMO subsequently directed pump 4 and pump 5 at Tumut 3 to maintain 0 MW (see Section 4.3). The reduction in load at Tumut 3 resulted in a decrease in QNI flow towards New South Wales and an increase in mainland frequency to 49.97 Hz, which was approaching the normal operating frequency band (NOFB) lower limit of 49.85 Hz.

Mainland frequency remained within the NOFB (49.85 Hz to 50.15 Hz) throughout the incident. There were momentary frequency excursions of the NOFB in Tasmania, but frequency stayed within the normal operating frequency excursion band (NOFEB, 49.75 Hz to 50.25 Hz). As a result, the FOS was met for this incident.

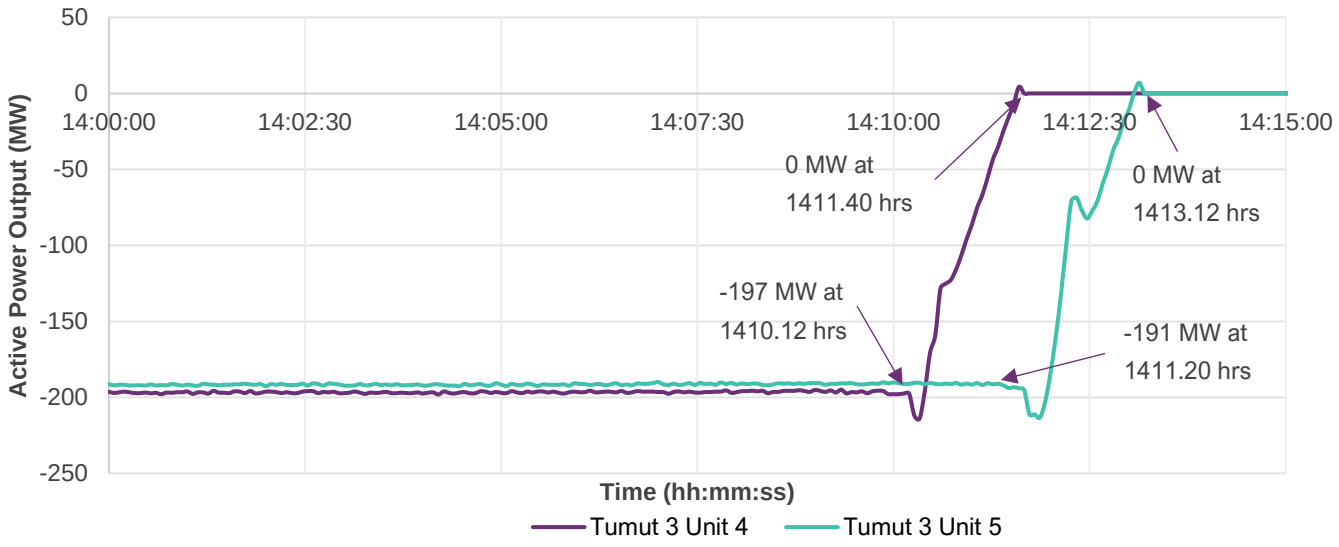
4.3 Direction to Tumut 3

At 1409 hrs on 5 September 2024, AEMO issued a verbal direction[7] under NER 4.8.9(a)(1) to Snowy Hydro Limited to take pump 4 and pump 5 at Tumut 3 out of service until further notice. The direction was issued to reduce QNI flows to within secure limits, and also to arrest the declining NEM frequency.

Following AEMO's direction, pump 4 load consumption at Tumut 3 reduced from 197 MW to 0 MW by 1411 hrs and pump 5 load consumption at Tumut 3 reduced from 191 MW to 0 MW by 1413 hrs.

[7] As required by section 4 of the Procedures for Issue of Directions and Clause 4.8.9 Instructions (SO_OP_3707), at https://aemo.com.au/-/media/files/electricity/nem/security_and_reliability/power_system_ops/procedures/so_op_3707-procedures-for-issue-of-directions-and-clause-4-8-9-instructions.pdf.

Figure 3 Tumut 3 pump 4 and pump 5 output on 5 September 2024



Market actions in relation to the direction were delayed until EMMS was returned to service. These actions included the re-bid of Tumut 3, invoking direction constraints, and advising the market of the intervention event and direction. Following the return of EMMS, AEMO invoked direction constraints at 1435 hrs.

After observing the response of the power system to the return of market systems, AEMO was satisfied that the direction was no longer required and cancelled the direction and intervention from 1440 hrs on 5 September 2024.

AEMO issued MNs 118151, 118152, 118153 and 118154 between 1512 hrs and 1515 hrs to advise the market of the intervention event, the direction, and their cancellations (see Section 5.4).

4.4 Request to follow pre-dispatch targets

At 1405 hrs on 5 September 2024, AEMO was observing a frequency decline in all NEM regions and decided that the likely cause was a mismatch between supply and demand as a result of scheduled generators holding to targets from TI 1325 hrs as expected (see Section 4.1). AEMO decided that pre-dispatch targets were more suitable for the operational conditions than the dispatch targets being held from TI 1325 hrs. Subsequently, from 1405 hrs AEMO began contacting synchronous generators and requested they follow pre-dispatch targets.

5 Market impact

5.1 Declaration of market suspension

The market suspension was triggered by an IT failure that resulted in a failure of the dispatch process (see Section 3.2). AEMO became aware of the IT failure at 1325 hrs on 5 September 2024.

AEMO determined that the failure of the dispatch process meant that it was no longer possible to operate the spot market in all participating jurisdictions in accordance with NER clauses 3.8 and 3.9. The guidance criteria provided in the Market Suspension and Systems Failure procedure (SO_OP_3706)[8] states that if an IT failure has resulted in the failure of the dispatch process, AEMO will consider suspending the spot market where:

- at least 30 minutes have elapsed since AEMO became aware of the IT failure; and
- the IT system is not expected to be restored within a further 10 minutes.

AEMO made the decision to suspend the market in all NEM regions from TI 1355 hrs. AEMO attempted to issue a MN to advise the market of its decision to suspend the market, however this was not successful due to the ongoing IT failure also affecting the issue of MNs. Subsequently at 1418 hrs, AEMO manually published a MN on its website informing the market of the suspension. This notice had an error, which stated the market had been suspended from TI 1555 hrs on 5 September 2024 until further notice. At 1428 hrs AEMO updated this MN to state that the market was suspended from TI 1400 hrs on 5 September 2024 which was also in error.

Following the restoration of the market processes impacted by the IT failure, AEMO issued MN 118149 at 1431 hrs (3 minutes after the manual website update), advising that:

- the spot market in New South Wales, Queensland, South Australia, Tasmania and Victoria was suspended from TI 1355 hrs on 5 September 2024 until further notice.
- market suspension pricing schedule prices would apply.
- prices for the first one or two trading intervals of this market suspension would be reviewed manually.

At 1451 hrs, AEMO removed the manual MN from its website to avoid confusion, as MN 118149 had since been published with correct information.

For this market suspension on 5 September 2024, missed TIs started to appear in the EMMS from TI 1330 hrs, with the internal market portal displaying errors. By 1355 hrs, TIs continued to be missed and AEMO attempted to commence a market suspension from the internal market portal, but the portal also failed due to the IT failure. A missed TI is a TI for which AEMO has not successfully ran the NEMDE.

[8] See section 8.1, at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3706%20Failure-of-Market-or-Market-Systems.pdf.

5.2 Pricing during the event and the market suspension

During a spot market suspension, prices may be determined in accordance with NER 3.9, or in accordance with the market suspension pricing schedule published under NER 3.14.5(e). In accordance with AEMO's published Market Suspension Pricing Methodology[9], this market suspension pricing schedule is based on a four-week rolling average of historic regional prices, separated into business and non-business days, with a half-hourly resolution[10].

During the event, the EMMS brought forward the last good TI (TI 1325 hrs) dispatch results and prices for TI 1330 hrs to TI 1410 hrs, which includes TIs where the market was suspended (TI 1355 hrs to TI 1410 hrs). Due to the IT system failure, the EMMS market suspension functionality was not able to assign suspension flags to the affected trading intervals in AEMO's systems during the market suspension. Consequently, prices were not automatically set in accordance with the market suspension pricing schedule and prices in all TIs during the suspension period needed to be manually reviewed and overwritten[11].

Following the event, AEMO manually reviewed and overwrote all TIs between 1355 hrs and 1510 hrs on 5 September 2024 and issued MN 118170 at 1920 hrs on 6 September 2024 advising the market that prices were revised.

The manual review also included checking whether the prices in any other regions require scaling under NER 3.14.5(f). NER 3.14.5(f) applies only to suspended regions connected by one or more regulated interconnectors to a neighbouring region. AEMO updated the revised New South Wales and Queensland spot prices where manual scaling was required for TI 1440 hrs, and the revised Queensland spot prices for TI 1505 hrs and TI 1510 hrs during the market suspension using the market suspension pricing schedule published on 17 August 2024 and applying to the week beginning 2 September 2024, meeting the NER requirements.

All NEM regions' spot price outcomes resulting from applying the market suspension pricing schedule during the affected TIs were, on average, higher compared to what they would have been, had the market not been suspended, with Queensland, New South Wales, Victoria, South Australia, and Tasmania prices $92.80, $62.25, $34.05, $47.93, and $72.84 higher on average, respectively.

Table 3 Adjusted spot prices for the market suspension period (TI 1355 hrs to TI 1510 hrs on 5 September 2024)

Trading Intervals	NSW	QLD	SA	TAS	VIC
5/09/2024 13:55	71.75	31.41	-13.38	76.07	34.49
5/09/2024 14:00	71.75	31.41	-13.38	76.07	34.49
5/09/2024 14:05	68.92	39.92	-2.94	85.35	40.69
5/09/2024 14:10	68.92	39.92	-2.94	85.35	40.69
5/09/2024 14:15	68.92	39.92	-2.94	85.35	40.69
5/09/2024 14:20	68.92	39.92	-2.94	85.35	40.69
5/09/2024 14:25	68.92	39.92	-2.94	85.35	40.69
5/09/2024 14:30	68.92	39.92	-2.94	85.35	40.69

[9] See https://aemo.com.au/-/media/files/electricity/nem/data/mms/market-suspension-pricing-methodology.pdf.

[10] See https://www.nemweb.com.au/REPORTS/CURRENT/MKTSUSP_PRICING/.

[11] AEMO is usually required to manually review prices for the first one (or in some cases, two) intervals of a market suspension.

Trading Intervals	NSW	QLD	SA	TAS	VIC
5/09/2024 14:35	76.26	55.14	10.45	92	43.7
5/09/2024 14:40	45.43	40.08	10.45	92	43.7
5/09/2024 14:45	76.26	55.14	10.45	92	43.7
5/09/2024 14:50	76.26	55.14	10.45	92	43.7
5/09/2024 14:55	76.26	55.14	10.45	92	43.7
5/09/2024 15:00	76.26	55.14	10.45	92	43.7
5/09/2024 15:05	77.12	65.25	36.77	95.71	53.41
5/09/2024 15:10	77.12	65.76	36.77	95.71	53.41

Table 4 Spot price outcomes during market suspension period (TI 1355 hrs to TI 1510 hrs on 5 September 2024)

Region	Average adjusted spot price	Average spot price without market suspension and scaling	Average price difference
QLD	$46.82	-$45.98	$92.80
NSW	$71.12	$8.87	$62.25
VIC	$42.63	$8.58	$34.05
SA	$5.74	-$42.19	$47.93
TAS	$87.98	$15.14	$72.84

Scaling was not required in relation to any FCAS prices during the market suspension. All the NEM FCAS prices were overridden by the FCAS prices in the market suspension pricing schedule applying to the week beginning 2 September 2024.

Table 5 Average FCAS prices during the market suspension period (TI 1355 hrs to TI 1510 hrs on 5 September 2024)

Market	NSW		QLD		VIC		SA		TAS	
	Original price	Adjusted price	Original price	Adjusted price	Original price	Adjusted price	Original price	Adjusted price	Original price	Adjusted price
RAISE1SEC	1.22	0.58	1.22	0.58	1.22	0.58	1.22	0.58	1.22	0.55
RAISE6SEC	0.29	0.19	0.29	0.19	0.29	0.19	0.29	0.19	0.38	0.76
RAISE60SEC	0.23	0.16	0.23	0.16	0.23	0.16	0.23	0.16	0.35	0.48
RAISE5MIN	0.11	0.16	0.11	0.16	0.11	0.16	0.11	0.16	0.22	2.36
RAISEREG	9.41	5.79	9.41	5.79	9.41	5.79	9.41	5.79	5.45	10.54
LOWER1SEC	4.74	0.18	4.74	0.18	4.74	0.18	4.74	0.18	4.62	0.03
LOWER6SEC	1.11	0.47	23.54	1.33	1.11	0.47	1.11	16.62	0.75	1.74
LOWER60SEC	6.33	2.85	39.83	3.12	6.33	2.85	6.33	9.01	6.11	1.51
LOWER5MIN	0.62	1.13	0.62	1.23	0.62	1.13	0.62	1.16	0.45	0.10
LOWERREG	4.07	6.72	4.07	6.82	4.07	6.72	4.07	6.75	4.27	4.30

5.3 Recommencement of the market

At 1426 hrs on 5 September 2024, the market processes were functioning as they were prior to the IT failure, and AEMO determined that the issue had been resolved and was unlikely to re-occur. In accordance with NER 3.14.4(d), AEMO issued MN 118150 at 1441 hrs on 5 September 2024 declaring that the spot market in all NEM regions would resume from 1510 hrs (TI 1515 hrs) on 5 September 2024.

The market restoration timing was 29 minutes after the notice, which was one minute less than the minimum notice period outlined in the general principle in Section 10.2(b) of the Market Suspension and System Failure procedure (SO_OP_3706).

The decision to resume the spot market was consistent with Section 10.1(c) of the same procedure. This requires AEMO to assess the likelihood of having to suspend the spot market within the next 24 hours due to the same cause before lifting a suspension. As the cause of the IT failure had been identified and resolved, AEMO deemed that re-occurrence was not likely.

5.4 Market notices

Table 6 below outlines the MNs AEMO issued for this market suspension. AEMO was unable to issue MNs via EMMS during the IT failure. At 1418 hrs, AEMO manually updated its website to advise the market of the spot market suspension. Due to the manual process used, this update did not have a MN number. AEMO subsequently published MN 118149 via the EMMS following its restoration and removed the "manual" MN to avoid confusion. AEMO considers that MN 118149 correctly identifies the time of spot market suspension.

Table 6 Summary of relevant market notices

MN	Issued	Summary of content
118146	1031 hrs 5 September 2024	AEMO advised the market of the EMMS transfer between 0800 hrs on 5 September 2024 and 1730 hrs on 6 September 2024.
Manually published	1418 hrs on 5 September 2024	AEMO advised that the spot market had been suspended in the NEM from TI 1555 hrs on 5 September 2024 until further notice.
	1428 hrs on 5 September 2024	AEMO modified the previous MN to advise that the spot market had been suspended in the NEM from TI 1400 hrs on 5 September 2024 until further notice.
	1451 hrs on 5 September 2024	AEMO removed this MN from the website as MN 118149 had been published and the information was superseded with correct information.
118149	1431 hrs 5 September 2024	AEMO advised the spot market had been suspended in all NEM regions with market suspension pricing schedule pricing from TI 1355 hrs on 5 September 2024 until further notice.
118150	1441 hrs 5 September 2024	AEMO advised that the suspension of the spot market in all NEM regions would end at 1510 hrs on 5 September 2024.
118151	1512 hrs 5 September 2024	AEMO advised it had issued a direction (under NER 4.8.9(a)(1)) to Snowy Hydro Limited to maintain 0 MW on pump 4 and pump 5 at Tumut 3 from 1405 hrs[A] until further notice to maintain the power system in a secure operating state.
118153	1513 hrs 5 September 2024	AEMO advised of the declaration of an intervention event as AEMO had issued a direction under NER 4.8.9(a)(1). AEMO declared all TIs during the event to be intervention TIs, commencing from TI 1410 hrs on 5 September 2024.
118152	1514 hrs 5 September 2024	AEMO advised the market that it had cancelled the direction to Snowy Hydro Limited from 1440 hrs (see MN 118151).
118154	1515 hrs 5 September 2024	AEMO advised the market that the intervention event and all associated directions were cancelled from 1440 hrs on 5 September 2024.

MN	Issued	Summary of content
118170	1920 hrs 6 September 2024	AEMO advised the market that the prices for TI 1355 hrs to TI 1510 hrs on 5 September 2024 had been revised as per the market suspension pricing schedule (see MN 118149 and MN 118150).

[A] AEMO issued the direction by phone at 1409 hrs and the direction was to take effect immediately.

6 Next steps

- IT system failures result in additional risks to power system operation and cause market impacts given the criticality of these systems. As such, to mitigate the risk and/or impact of occurrence of any similar event:
  - AEMO is conducting a full review of the site transfer and EMMS transfer procedures and will progress the identified rectification activities relating to people, process and technology.
  - AEMO plans to share the root cause of this IT failure and factors that impacted the time to restore EMMS services with the PSSWG and the Supervisory Control and Data Acquisition (SCADA) Working Group.
  - AEMO is reviewing its current communication methods and protocols during IT failures impacting the electronic issue of MNs.
  - AEMO recommends the PSSWG complete the in-progress update to the power system operating procedures to clarify the requirements during communications failures.
- AEMO will publish a report in accordance with NER clauses 4.8.9(f) and 3.13.6A(a) in relation to the direction to Tumut 3 pump 4 and pump 5.
- AEMO will publish a final report on this market suspension incident. The report is expected to include:
  - assessment of adequacy of the provision and response of facilities or services, and the appropriateness of actions taken to restore or maintain power system security.
  - reasons for the suspension and the effect that the suspension had on the operation of the spot market.
  - details of the payments made to each Market Suspension Compensation Claimant under the market suspension pricing schedule, or under NER clauses 3.14.5A, 3.14.5B and 3.15.7B.
  - details of the share of compensation costs payable by each Market Customer in each suspended region and each region in which spot prices were affected in accordance with NER 3.14.5(f).