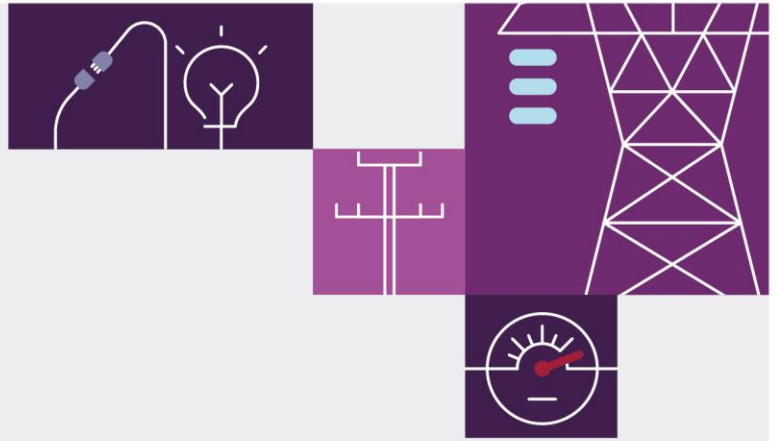


# Preliminary Report: South Australia market suspension on 18 February 2022

March 2022

A market event report for the  
National Electricity Market –  
information as at 4/3/2022





# Important notice

## Purpose

AEMO has prepared this preliminary report as part of its review of the 18 February 2022 South Australian market suspension, as a first step in reporting under clause 3.14.3(c) and 3.14.4(g) of the National Electricity Rules.

The observations in this report will be updated in AEMO's final report, where new information becomes available.

## Disclaimer

AEMO has been provided with preliminary data by Registered Participants as to the performance of some equipment leading up to, during and after the event in accordance with clause 3.14.3(f) of the National Electricity Rules. In addition, AEMO has collated preliminary information from its own systems. Any analysis and conclusions expressed in this document are also of a preliminary nature.

While AEMO has made every reasonable effort to ensure the quality of the information in this report, its investigations are incomplete, and any findings expressed in it may change as 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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## Contact

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## Abbreviations

Abbreviation	Term
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
BGP	Border Gateway Patrol
EMS	Energy Management System
FCAS	Frequency Control Ancillary Service
ICCP	Inter-Control Centre Communications Protocol
MN	Market Notice
NEM	National Electricity Market
NEMDE	National Electricity Market Dispatch Engine
NER	National Electricity Rules
MMS	Market Management System
RTU	Remote Terminal Unit
SA	South Australia
SAPN	South Australia Power Networks
SCADA	Supervisory Control and Data Acquisition
TI	Trading Interval
TNSP	Transmission Network Service Provider



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# 1 Overview

This preliminary report relates to a market suspension on 18 February 2022 in South Australia. From 1339 hrs on 18 February 2022, ElectraNet's Supervisory Control and Data Acquisition (SCADA) system in South Australia (SA) failed, with ElectraNet having only approximately 20% system visibility<sup>1</sup>. In response to this SA SCADA failure, AEMO suspended the spot market in SA from 1420 hrs to 1610 hrs.

AEMO has concluded that the power system remained in a secure operating state throughout the market suspension, and no generation or load was lost because of the incident. During the event South Australian prices were set using market suspension schedule pricing.

This report provides a summary of the known facts relating to the incident as known at the date of publication, 4 March 2022.

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

## 2 Pre-event conditions

Prior to the SA SCADA failure the power system was in a secure operating state, no reserve conditions existed, and no abnormal risks to the power system had been identified.

## 3 Event

Table 1 below outlines the timeline of key events which formed part of this market suspension. The information in Table 1 is based on AEMO's operational logs. A full sequence of events will be included in the final incident report.

**Table 1 Sequence of key events on 18 February 2022**

Time	Event
1339 hrs	AEMO became aware of a SCADA failure in the South Australia region through AEMO's Energy Management System (EMS) and IT PI displays.
1339 hrs	AEMO started to investigate the source of the issue, and confirmed that all Inter-control Centre Communications Protocol (ICCP) and Border Gateway Protocol (BGP) Network links were in service.
1403 hrs	ElectraNet informed AEMO that ElectraNet had only approximately 20% SCADA visibility in the SA region.
1421 hrs	AEMO declared the spot market suspended in South Australia with market suspension schedule pricing from trading interval 1425 hrs onwards. Market Notice 94690 issued.
1531 hrs	AEMO issued Market Notice 94693 confirming that the spot market suspension in the SA region was due to a SCADA service interruption.
1531 hrs	ElectraNet confirmed with AEMO that essential SCADA in the SA region had been restored.
1538 hrs	AEMO declared that the suspension of the spot market in South Australia would end from 1610 hrs on 18 February 2022. Market Notice 94694 issued.
1824 hrs	ElectraNet informed AEMO that full SCADA redundancy had been restored to all ElectraNet control centres and data centre.
19/02/2022 1039 hrs	Prices for TI 14:25, the first trading interval of the suspension, adjusted to the market suspension pricing schedule. Market notice 94707 issued.

<sup>1</sup> ElectraNet is the transmission network service provider (TNSP) in SA.

## SCADA failure

ElectraNet's initial investigation has identified that an ElectraNet contractor mistakenly disconnected live cables from a decommissioned plant that supported the redundant communication between the main and backup SA SCADA systems. This left some backup Remote Terminal Units<sup>2</sup> (RTUs) connected to main systems and some to backup systems. The SCADA system is unable to function correctly when in this arrangement.

## Declaration of market suspension

The market suspension was triggered by a SCADA failure in South Australia. AEMO became aware of the SA SCADA failure at 1339 hrs on 18 February 2022 through AEMO's EMS and IT PI displays.

AEMO conducted its own initial tests to identify the problem and contacted ElectraNet to better understand the situation. After this initial testing AEMO assessed that the ongoing lack of SCADA meant it was no longer possible to operate the spot market in accordance with NER 3.8 and 3.9.

AEMO issued Market Notice (MN) 94690 at 1421 hrs on 18 February 2022, declaring that:

- The spot market in South Australia was suspended from Trading Interval (TI) 1425 18 February 2022 until further notice; and
- Prices in South Australia would be set using market suspension schedule pricing.

MN 94690 complied with National Electricity Rules (NER) 3.14.4(a).

The time between first detecting the SCADA failure in South Australia and suspension of the spot market in that region was approximately 40 minutes. This aligns with the recommended timing in SO\_OP\_3706 Market Suspension and Systems Failure<sup>3</sup>. SO\_OP\_3706 provides guidelines on the steps that should be taken if the spot market needs to be suspended. The guidelines state that if a large number of SCADA points have failed, AEMO will consider suspending the spot market if:

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

## Pricing during 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).

As outlined in MN 94690, market suspension schedule pricing was used to set the SA market price during the market suspension. In accordance with AEMO's published Estimated Price Methodology<sup>4</sup> this market suspension pricing schedule was based on a four-week rolling average of historic regional prices, separated into business and non-business days, with a half-hourly resolution<sup>5</sup>.

<sup>2</sup> A Remote Terminal Unit monitors digital and analogue parameters from the system and transmits this information to the SCADA system

<sup>3</sup> See Section 8.2 of [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](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).

<sup>4</sup> See <https://aemo.com.au/-/media/files/electricity/nem/data/mms/2017/estimated-price-methodology-suspension-ner-3-14-5.pdf?la=en&hash=F453C4B671F51E98C683489CA4D9E16B>.

<sup>5</sup> See [https://www.nemweb.com.au/REPORTS/CURRENT/MKTSUSP\\_PRICING/](https://www.nemweb.com.au/REPORTS/CURRENT/MKTSUSP_PRICING/).



## Power system operation during the market suspension

Investigation by AEMO has concluded that the power system remained in a secure operating state and the Frequency Operating Standard<sup>6</sup> was met throughout the market suspension. No generation or load was shed or disconnected and there were no unplanned outages of transmission equipment during the SA SCADA failure.

Additionally, the National Electricity Market Dispatch Engine (NEMDE) remained operating, and generators in SA followed their dispatch targets from the Market Management System (MMS) portal.

During the market suspension, SA Power Networks (SAPN) monitored network voltages and tap positions as a proxy for transmission voltages. No actions were required to maintain transmission voltages.

Finally, the flow on the Heywood interconnector remained within 50 megawatts (MW) of its dispatch target and no operational actions were needed to control its flow.

## Market operation during the market suspension

The use of market suspension schedule pricing during the SA market suspension created counter-price flows on the Heywood and Murraylink interconnectors.

Net interconnector flow was consistently from SA to Victoria before, during, and after the market suspension. SA spot prices were also consistently lower than Victorian spot prices before and after the market suspension.

However, during the market suspension, the market suspension pricing schedule raised SA spot prices above Victorian spot prices for 21 of the 22 TIs, meaning there were counter-price flows from SA to Victoria during most of the market suspension.

The use of market suspension schedule pricing during the SA market suspension also caused a small amount of frequency control ancillary services (FCAS) recovery costs which would not have otherwise existed. During the market suspension there were three TIs where mainland lower 5-minute FCAS prices would have been zero except for the use of the market suspension pricing schedule. The market suspension pricing schedule created non-zero prices for lower 5-minute FCAS in those TIs in SA, which meant there were FCAS costs to be recovered for those TIs that would not otherwise have existed.

## Further information during the market suspension

AEMO issued MN 94693 at 1531 hrs on 18 February 2022 stating that the cause of the market suspension was a SCADA service interruption in SA, and at that stage there was no impact to supply in any of the National Electricity Market (NEM) regions.

## Restoration of SA SCADA

Once ElectraNet identified the SCADA failure, it took the following actions:

- Identified priority severed cables for repair to reinstate SA SCADA as quickly as possible. This information was passed to the ElectraNet contractor on site. Cables required to maintain SCADA system redundancy were then repaired, and ElectraNet informed AEMO that full SCADA system redundancy had been restored at 1824 hrs on 18 February 2022.

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<sup>6</sup> See <https://www.aemc.gov.au/sites/default/files/2020-01/Frequency%20operating%20standard%20-%20effective%201%20January%202020%20-%20TYPO%20corrected%2019DEC2019.PDF>.

- Dispatched an engineer to the backup SCADA system site to investigate why RTUs had failed to automatically connect to the backup system. This engineer identified a firewall rule issue which was preventing RTUs connecting the backup system correctly. Discussions on how to rectify this firewall issue were ongoing when essential SA SCADA services were returned to service. ElectraNet has confirmed that a rectification to the firewall issue was completed on 28 February 2022.

At approximately 1531 hrs on 18 February 2022 essential SCADA in the SA region was restored. The detailed actions undertaken by ElectraNet to restore SA SCADA will be outlined in the final incident report.

## Resumption of the spot market

At 1531 hrs on 18 February 2022, ElectraNet confirmed to AEMO that SCADA in the SA region had been restored. In response, AEMO issued MN 94694 at 1538 hrs on 18 February 2022 declaring that the spot market in SA would resume from 1610 hrs 18 February 2022. MN 94694 complied with NER 3.14.4(d).

The time between declaring the resumption of the spot market in South Australia and the spot market resuming was about 30 minutes. This aligns with the recommended timing in Section 10.2(b)(ii) of SO\_OP\_3706.

AEMO suspended the spot market in SA from 1420 hrs to 1610 hrs on Friday 18 February 2022. The spot market in SA was suspended for one hour and 50 minutes.

## Power system operation after the market suspension

At 1824 hrs on 18 February 2022, ElectraNet informed AEMO that full SCADA redundancy had been restored to all ElectraNet control centres and its data centre.

## Market operation after the market suspension

AEMO's central dispatch system automatically applies market suspension schedule prices to a region when required, as well as performing any further price scaling, capping or flooring required by the NER. However, prices in the first one (or possibly two) intervals during a market suspension usually require manual review. The reason for this is outlined below.

A declaration of market suspension happens partway through a TI, but applies from the start of that TI (when the prices for the TI were published). If market suspension schedule pricing is used, the prices published at the start of the TI need to be overwritten. AEMO's central dispatch system does not allow this retrospective action to be performed automatically. The prices must therefore be reviewed by AEMO manually<sup>7</sup>.

Manual review also includes checking whether the prices in any other regions require scaling under NER 3.14.5(f). In TI 1425 on 18 February 2022 the net interconnector flow was away from SA, and no price scaling in other regions was required.

Under NER 3.14.5(h), AEMO was required to review the prices for the first TI of the market suspension by the end of Monday 21 February 2022. On Saturday 19 February 2022, AEMO uploaded the revised SA prices for TI 1425, using the market suspension pricing schedule published on 29 January 2022 and applying to the week beginning 14 February 2022, meeting the NER requirements. This triggered MN 94707 at 1039 hrs that day, advising the market of the revised prices in SA.

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<sup>7</sup> If the declaration of market suspension happens sufficiently far through a TI that the pricing run for the next TI has been triggered, the prices for the second TI also require manual review. This did not happen during this event.



## 4 Market notices

Table 2 Summary of relevant market notices

MN	Summary of content
94690	Declared the spot market in the SA region suspended with market suspension schedule pricing from TI 1425 on 18 February 2022 until further notice. (This market notice did not specify a reason for the market suspension. The notice also erroneously referred to dispatch intervals as well as trading intervals.)
94693	Stated that the reason for the market suspension was a SCADA service interruption in SA, and that there was no impact on supply in the NEM.
94694	Declared that the market suspension in SA would end at 1610 hrs on 18 February 2022.
94707	Published the revised prices in SA for TI 1425 18 February 2022. (Based on the market suspension pricing schedule and any price scaling required under NER 3.14.5(f).)

## 5 Next steps

Based on the findings of this preliminary report:

- AEMO will improve the formatting of MNs declaring market suspension, so that in the event of future market suspensions being declared, the MNs:
  - Will include the reason for the market suspension,
  - Will refer only to trading intervals, and
  - Will be more easily readable.
- ElectraNet has advised that in-service redundant communication cables will be re-routed away from the decommissioned plant to ensure they have different physical paths/cable trays to prevent a similar incident reoccurring.
- ElectraNet is investigating why some field RTUs failed to connect to the backup system when both systems were operating as masters, and whether this resulted in suspect data being sent to AEMO.
- AEMO recommends that TNSPs review their SCADA systems to ensure that, wherever possible:
  - Communication cables between main and backup SCADA systems have different physical paths/cable trays, and
  - In-service SCADA communication cables are routed away from decommissioned plants.
- AEMO is also preparing market suspension compensation payments and funding under NER 3.14.5A and 3.15.8A:
  - The suspension compensation payments may apply to scheduled generating units and loads, scheduled ancillary services generating units and wholesale demand response units.
  - In this event, compensation will be payable to three generating units.
  - The suspension compensation funding comes from Market Customers.
  - Directed Participants will receive market suspension compensation rather than direction compensation.



AEMO will also undertake further analysis relating to this event and prepare a final incident report in due course. The final report will include all the market suspension reporting requirements specified in NER 3.14.3(c)-(d) and 3.14.4(f)-(g).