

# NEM EVENT - DIRECTIONS TO THERMAL SYNCHRONOUS GENERATORS DURING SOUTH AUSTRALIA MARKET SUSPENSION – 9 AND 11 OCTOBER 2016

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FINAL

## Important Notice

### Purpose

AEMO has prepared this report in accordance with clause 3.13.6A(a) of the National Electricity Rules (NER), using information available as at 26 April 2017, unless otherwise specified.

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## Abbreviations and definitions

Abbreviation	Term
DI	Dispatch Interval
MN	Market Notice
NEM	National Electricity Market
NER	National Electricity Rules
TI	Trading Interval

This report uses several terms that have defined meanings in the National Electricity Rules (NER). They have the same meanings in this report.

## 1 Summary

On the 9 and 11 October 2016, the Australian Energy Market Operator (AEMO) issued two directions to South Australia (SA) Market Participants under clause 4.8.9 of the National Electricity Rules (NER) to maintain power system security during suspension of the SA spot market. There was a power system security requirement at this time, to maintain a minimum of three thermal synchronous generating units, each of not less than 100 MW installed capacity, on-line at all times.

AEMO issued the first direction to a Generator at 2054 hrs on 9 October 2016, instructing it to synchronise and run its synchronous generating unit to a minimum loading of 160 MW by 0000 hrs until 0530 hrs on 10 October 2016. The direction was cancelled at 0530 hrs on 10 October 2016 when the security violation no longer existed as per normal market outcome.

AEMO issued the second direction to a Generator at 1616 hrs on 11 October 2016, instructing it to synchronise and run its synchronous generating unit to a minimum loading of 60 MW. The direction was cancelled at 1906 hrs on 11 October 2016 when the security violation no longer existed due to the market response following resumption of the SA spot market. The direction was cancelled before the synchronous generating unit synchronised.

## 2 Background

Following SA's black system event on 28 September 2016, AEMO declared the SA spot market to be suspended under clause 3.14.3 of the NER with effect from the trading interval (TI) commencing at 1600 hrs on 28 September 2016. At 2039 hrs on 29 September 2016, the SA Government directed AEMO to maintain the market suspension until 1748 on 11 October 2016. AEMO lifted the market suspension at 2230 hrs on 11 October 2016<sup>1</sup>.

During the suspension, AEMO was still required to maintain power system security and reliability. From 3 October 2016 until resumption of the SA spot market at 2230 hrs on 11 October 2016, a power system security requirement was amended to maintain a minimum of three thermal synchronous generating units, each of not less than 100 MW installed capacity, on-line at all times.

More information about power system security and reliability during SA Market Suspension is provided in the power system operating incident report "*Black System in South Australia*"<sup>2</sup> published on AEMO's website as required by the Rules<sup>3</sup>.

All synchronous generating units discussed in this report from this point are units with installed capacity not less than 100 MW.

## 3 Purpose

Under clause 3.14.4 of the NER, when AEMO declares the spot market to be suspended in a region, AEMO is permitted to intervene in the market and issue directions and clause 4.8.9 instructions to a Registered Participant to:

- Maintain or restore the power system to a reliable operating state.
- Maintain or restore the power system to a secure operating state.
- Maintain public safety.

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<sup>1</sup> Market Notices for the suspension and resumption of South Australia Spot Market is available at: <https://aemo.com.au/Market-Notices>

<sup>2</sup> Available at: <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Market-notice-and-events/Power-System-Operating-Incident-Reports>

<sup>3</sup> The scope of the power system operating incident report is intended to meet the requirements of clause 4.8.15 of the NER for events prior to declaration of Market suspension, and of clauses 3.14.3 (c) and 3.14.4(g) of the NER for subsequent events.

- Other purposes, such as disconnection of a generating unit that is threatening power system security.

Where AEMO intervenes in the market through the issue of directions, AEMO must, in accordance with NER clause 4.8.9(f) and 3.13.6A(a), publish a report as soon as reasonably practicable.

This report meets that obligation.

## 4 NER Compliance with the intervention processes

### 4.1 Circumstances giving rise to the need for the directions

The circumstance giving rise to the two directions is the power system security requirement to maintain a minimum of three thermal synchronous generating units, each not less than 100 MW installed capacity, on-line at all times during the suspension of the SA spot market.

#### Direction on 9 October 2016

At 2030 hrs on 9 October 2016, one of three thermal synchronous generating units<sup>4</sup> online in SA advised AEMO that it would be unavailable from 0000 hrs on 10 October 2016 due to gas supply issues. At 2057 hrs, this generating unit bid unavailable in the energy market from 0000 hrs. Following this, the 2200 hrs Pre-dispatch run forecast a power system security violation where only two synchronous generating units<sup>4</sup> would be online from 0000 hrs on 10 October 2016. AEMO contacted all other offline thermal synchronous generating units<sup>4</sup> to seek their generation availability from 0000 hrs and determine the latest time to intervene. Only one confirmed it was able to meet the requirement to synchronise generation by 0000 hrs on 10 October, and advised it would only be available under a direction by AEMO. As a result, AEMO issued a direction to this generating unit at 2054 hrs on 9 October 2016 to synchronise and run to minimum load by 0000 hrs until 0530 hrs on 10 October 2016.

#### Direction on 11 October 2016

During the morning of 11 October 2016, there were at least three synchronous generating units<sup>4</sup> available for dispatch until 0000 hrs on 12 October 2016 in SA. The Pre-dispatch runs in the morning forecast a power system security violation in SA where only two synchronous generating units<sup>4</sup> would be online from 0000 hrs on 12 October 2016. At 1305 hrs on 11 October 2016, AEMO issued Market Notice (MN 55334) advising the market about the forecast power system security violation from 0000 hrs on 12 October 2016, and seeking a market response from synchronous generating units<sup>4</sup>. AEMO also contacted all thermal synchronous generating units<sup>4</sup> to confirm generation availability from 0000 hrs on 12 October 2016, and to determine the latest time to intervene.

At 1520 hrs on 11 October 2016, one of the three SA thermal synchronous generating units<sup>4</sup> available for dispatch between 2100 hrs and 0000 hrs advised AEMO that it would bid “unavailable” from the energy market due to uneconomic dispatch. This generator bid unavailable in the energy market from 1527 hrs. Following this, the 1600 hrs Pre-dispatch run forecast a power system security violation in SA where only two synchronous generating units<sup>4</sup> would be online from 2100 hrs on 11 October 2016. At 1612 hrs on 11 October 2016, AEMO issued MN 55337 advising the market about the forecast power system security violation from 2100 hrs, and seeking a market response from synchronous generating units<sup>4</sup>. AEMO contacted all thermal synchronous generating units<sup>4</sup> to confirm generation availability from 2100 hrs on 11 October 2016, and to determine latest time to intervene.

Three generating units confirmed they were able to meet the requirement to synchronise generation and generate to their technical minimum load by 2100 hrs on 11 October 2016 under a direction by

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<sup>4</sup> The synchronous generating units discussed here are units with installed capacity not less than 100 MW.

AEMO. At 1616 hrs on 11 October 2016, AEMO issued a direction to one synchronous generating unit that met the requirement based on least cost.

## 4.2 AEMO's determination that a market response would not have avoided the direction and the determination of the latest time for issuing the direction

Under NER clause 4.8.5A(a) and (c), AEMO must notify the market of an anticipated power system security or reliability issue and the latest time for a market response to address that issue before AEMO would use directions to intervene in the market.

AEMO issued directions on two occasions during the suspension of the SA spot market:

1. On 9 October 2016, AEMO contacted all SA synchronous generating units with installed capacity not less than 100 MW to confirm their availability from 0000 hrs and to determine the latest time to intervene. Only one generating unit advised it could meet AEMO's requirement to synchronise generation by 0000 hrs. Therefore, a market response from other Generators would not have avoided the need for the direction. Accordingly, AEMO concurrently issued a direction to that generating unit at 2054 hrs and notified the market accordingly (see MN 55293).
2. On 11 October 2016, AEMO issued two Market Notices (MN 55334 and 55337) seeking generation in SA with an installed capacity not less than 100 MW. AEMO also contacted each generating unit known to have such capacity to confirm their availability from 2100 hrs and to determine the latest time to intervene. None of the synchronous generating units<sup>4</sup> committed to staying or coming online after 2100 hrs, but three synchronous generating units<sup>4</sup> confirmed they would be available under a direction. Due to the lack of market response, AEMO issued a direction to one of the Generators to maintain the SA power system in a secure operating state (see MN 55339) at 1616 hrs.

## 4.3 AEMO's process for issuing the directions

AEMO followed the relevant Power System Operating Procedures for managing the directions on 9 October 2016 and 11 October 2016, namely:

- Section 10 of SO\_OP 3705 "Dispatch"<sup>5</sup>
- SO\_OP 3707 "Intervention, Direction and Clause 4.8.9 Instruction"<sup>6</sup>

### Direction on 9 October 2016

At 2054 hrs, AEMO issued a direction verbally to a Generator to synchronise its generating unit and generate to their technical minimum load by 0000 hrs. The direction was required to maintain power system security in SA.

AEMO invoked a direction constraint equation to dispatch the directed generating unit to its minimum loading of 155 MW by 0000 hrs on 10 October 2016. At 2356 hrs, the direction constraint equation was amended to reflect changes to the plant's minimum loading of 160 MW as advised by the Generator. The constraint equation was effective in dispatch from Dispatch Interval (DI) ending 0000 hrs to 0530 hrs on 10 October 2016.

<sup>5</sup> [http://aemo.com.au/-/media/Files/Electricity/NEM/Security\\_and\\_Reliability/Power\\_System\\_Ops/Procedures/SO\\_OP\\_3705---Dispatch.pdf](http://aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3705---Dispatch.pdf)

<sup>6</sup> [http://aemo.com.au/-/media/Files/Electricity/NEM/Security\\_and\\_Reliability/Power\\_System\\_Ops/Procedures/SO\\_OP\\_3707---Intervention-Direction-and-Clause-4-8-9-Instructions.pdf](http://aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3707---Intervention-Direction-and-Clause-4-8-9-Instructions.pdf)

AEMO issued a Participant Notice<sup>7</sup> confirming the issue of the direction at 2159 hrs and stating that the direction was subject to the Generator's best endeavours to comply with it unless compliance would be a hazard to public safety or materially risk damaging equipment in accordance with NER clause 4.8.9(c). Following the Participant Notice, AEMO issued Market Notices (MN 55293 and 55294) at 2201 hrs and 2204 hrs respectively, advising the market that AEMO had issued a direction.

The direction was issued at 2054 hrs, and was expected to be revoked by 0530 hrs. MN 55294 also advised the market that an AEMO intervention event had occurred and all DIs during the AEMO intervention event would not be intervention price dispatch intervals.

At 0530 hrs, when the power system security violation no longer existed, AEMO cancelled the direction. MN 55308 was issued at 0532 hrs to inform the market about the cancellation.

### **Direction on 11 October 2016**

At 1305 hrs and 1612 hrs, AEMO published Market Notices (MN 55334 and 55337) to notify the market about a forecast AEMO intervention event due to a power system security violation. These Market Notices indicated the forecast timelines during which a power system security violation existed and sought a market response from synchronous generating units<sup>4</sup> in SA.

At 1616 hrs, AEMO issued a direction verbally to a Generator to synchronise its generating unit and generate to its technical minimum load. The direction was necessary to maintain the power system in a secure operating state. At 1622 hrs, AEMO invoked the direction constraint equation to dispatch the directed generating unit to its minimum loading of 60 MW by 2100 hrs on 11 October 2016.

AEMO issued a Participant Notice confirming the issue of the direction at 1704 hrs and stating that the direction was subject to the Generator's best endeavours to comply with it unless compliance would be a hazard to public safety or materially risk damaging equipment in accordance with NER clause 4.8.9(c). Following the Participant Notice, AEMO issued MN 55339 at 1705 hrs, advising the market that AEMO had issued a direction.

The direction was issued at 1616 hrs, and was expected to be revoked by 0700 hrs on 12 October 2016.

At 1748 hrs, AEMO was notified that the Ministerial direction for market suspension in the SA region had been revoked. AEMO issued MN 55343 advising the market about the revocation of the Ministerial direction and that AEMO was satisfied there was no other reason to continue the suspension. The spot market was to resume operation in accordance with the NER by 2230 hrs on 11 October 2016.

Following the Market Notice advising of the resumption of the spot market at 2230 hrs, there was significant market response, and pre-dispatch no longer indicated a power system security violation from 2100 hrs.

At 1906 hrs, AEMO cancelled the direction and issued MN 55345 advising the market of the cancellation.

## **4.4 Basis for AEMO not following any or all processes under clause 4.8 prior to direction**

### **Direction on 9 October 2016**

AEMO followed all processes set out in NER clause 4.8 apart from:

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<sup>7</sup> The objective of a Participant Notice is to confirm the direction or clause 4.8.9 with the Directed Participant and is not publically available. Refer to AEMO's power system operating procedure SO\_OP 3707 "Intervention, Direction and Clause 4.8.9 Instructions"

- The requirement to notify the market of the possibility that AEMO may issue a direction so that there is an opportunity for a market response (NER clause 4.8.5A(a)).
- The requirement to determine and publish the latest time for AEMO intervention.

When AEMO contacted synchronous generating units<sup>4</sup> in SA, only one confirmed it could meet the power system security requirement to synchronise by 0000 hrs. Therefore, the option of sending an additional Market Notice seeking market response after having contacted each Generator, would not have alleviated the power system security violation issue.

#### **Direction on 11 October 2016**

AEMO followed all processes set out in NER clause 4.8 for this direction.

#### **4.5 Effectiveness of responses to AEMO inquiries under clause 4.8.5A(d)**

AEMO had requested information from all synchronous generating units in SA with installed capacity greater than 100 MW to address the power system security violations.

As noted in section 4.1, in both cases, the Generators responded to all AEMO's inquiries and the directions were required because generating units were either unavailable or only available under a direction by AEMO.

#### **4.6 Notice from Registered Participants of inability to comply with the direction**

No information was received from a Directed Participant on 9 October or 11 October 2016, respectively, under NER clause 4.8.9(d) stating they would be unable to comply with the relevant direction.

### **5 Determination of whether to apply intervention pricing under clause 3.9.3(b)**

Under NER clause 3.9.3(b), intervention prices are the prices that:

- AEMO considers would have applied had the intervention not occurred;
- Subject to the direction satisfying the “regional reference node test” under NER clause 3.9.3(d); and
- Subject to returning to a secure operating state under NER clause 3.9.3(c).

Intervention pricing was not implemented on 9 October 2016 or 11 October 2016. The directions were issued during a period of market suspension when the SA spot price was determined by the Market Suspension Default Pricing Schedule in accordance with NER clause 3.14.5(l).

### **6 Changes to dispatch outcomes due to the direction**

Under NER clause 3.8.1(b)(11), AEMO is required, as far as is reasonably practicable, to minimise the market impact of its direction in terms of the number of Affected Participants and changes to interconnector flows. The directions were issued during a period of market suspension when the Heywood and Murraylink interconnector flows towards Victoria were dynamically restricted to minimise market distortion. Refer to the power system operating incident report “*Black System in*

*South Australia*<sup>8</sup> published on AEMO's website for further information about interconnectors during market suspension.

### **Direction on 9 October 2016**

For the direction on 9 October 2016, a synchronous generating unit<sup>4</sup> was directed to increase its output to maintain power system security in SA. The directed generating unit was increased by up to 160 MW, a total of 1,018 MWh over the direction period.

There were two Affected Participants. The total generation from these two Affected Participants was 46 MWh lower during their associated compensable period<sup>9</sup> due to the direction.

There was no counter-action<sup>10</sup> applied during this direction. Heywood Interconnector was constrained to 0 MW during the market suspension period to minimise market distortion to neighbouring regions. Within SA, AEMO did not use the option of counter-action by reducing generation from other thermal synchronous generating units<sup>4</sup> to below their stable minimum, since it was not practical to do so and would have contributed to the power system security violation.

### **Direction on 11 October 2016**

For the direction on 11 October 2016, there were no changes to dispatch outcomes as the direction was cancelled before the directed generating unit synchronised.

## **7 Conclusions and further actions**

AEMO has reviewed the directions issued on 9 and 11 October 2016 and the circumstances surrounding those directions.

As required by NER clause 3.13.6A, AEMO assessed its compliance with the processes for market notification and intervention, and is satisfied those requirements were largely met. The one exception, which was the absence of a Market Notice on 9 October 2016 prior to the issue of the direction, was inconsequential as AEMO had already explored all feasible options for a market response.

Based on the information available at the time, AEMO is satisfied with its determination to issue directions to maintain power system security.

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<sup>8</sup> Available at: <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Market-notice-and-events/Power-System-Operating-Incident-Reports>

<sup>9</sup> In accordance with NER Clause 3.12.2 (b), an Affected Participant would only be compensated for TIs when the impact exceeds \$5000. In this case, the impact to the Affected Participants exceeded \$5000 for only one TI.

<sup>10</sup> Under NER Clause 4.8.9(h)(3), AEMO may apply a counter-action constraint on a selected market participant to minimise the number of affected participants during an AEMO Intervention Event.