NEM EVENT – DIRECTION TO SOUTH AUSTRALIA PARTICIPANTS – 1 DECEMBER 2016

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

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 30 November 2017, unless otherwise specified.

This report uses several terms that have defined meanings in the NER. They have the same meanings in this report.

All references to time in this report are based on Australian Eastern Standard Time (AEST).

Disclaimer

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CONTENTS

1. PURPOSE

As described in clause 4.8.9 of the National Electricity Rules (NER), AEMO is permitted to intervene in the market and issue a *direction* or a *clause 4.8.9 instruction* to Registered Participants, if satisfied it is necessary:

- To maintain or re-establish the power system to a secure, satisfactory or reliable operating state.
- For reasons of public safety or otherwise for the security of the power system.

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 on the circumstances of the direction, the processes followed, and its impact on dispatch outcomes. This report meets those NER obligations.

AEMO has previously published a reviewable operating incident report[1] which focused primarily on the power system security issues which caused the events of 1 December 2016.

2. SUMMARY

Between 0115 hours and 0500 hours on 1 December 2016, AEMO issued directions to three participants in South Australia to restore power system security under clause 4.8.9 of the National Electricity Rules (NER) or Section 116 of the National Electricity Law (NEL):

- From 0115 hours to 0500 hours, AEMO directed Torrens Island A1 generating unit to provide 10 megawatts (MW) of fast raise (R6) FCAS under clause 4.8.9 of the NER.
- From 0226 hours to 0500 hours, AEMO directed Pelican Point Power Station to reduce energy output to 165 MW (minimum load) under clause 4.8.9 of the NER.
- From 0149 hours to 0500 hours, AEMO directed Electranet to instruct BHP Olympic Dam to reduce load by 45 MW (until and including DI ending 0250 hours) and 60 MW (between and including DI ending 0255 hours and 0500 hours) under Section 116 of the NEL.

The power system was not secure during this period due to insufficient availability of fast raise and fast lower frequency control ancillary services (FCAS) to meet the requirements in South Australia following its separation from the rest of the mainland.

The directions were cancelled at 0500 hours when South Australia's interconnection to Victoria was restored and there was sufficient availability of FCAS services to meet requirements in South Australia.

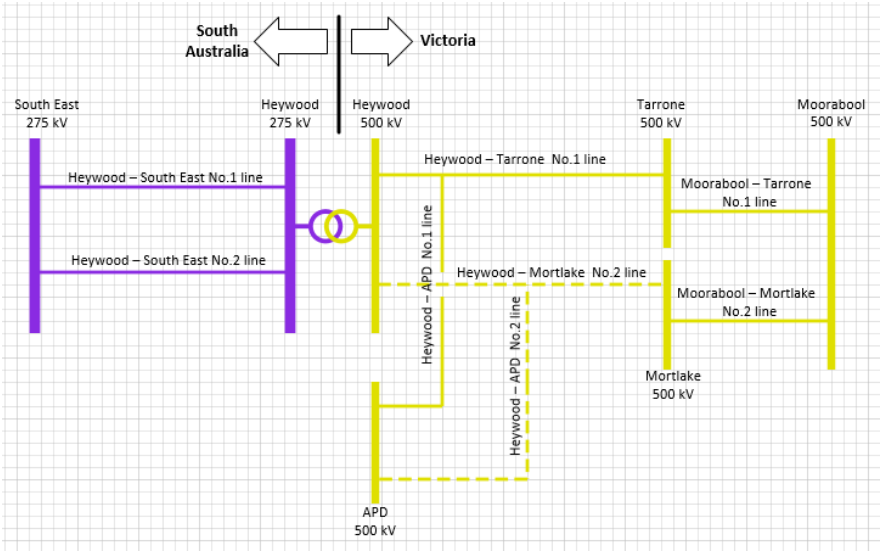
3. BACKGROUND

Prior to the event, due to a planned outage of the Heywood No.2 500 kilovolt (kV) busbar, South Australia was connected to Victoria by a single connection via the Heywood Interconnector. This outage commenced at 0602 hours on 30 November 2016, and was scheduled to be completed by 1600 hours on 1 December 2016.

See Figure 1 below for the network topology across the Heywood Interconnector prior to separation.

[1] For a detailed assessment of the system event, please see AEMO's Reviewable Operating Incident Report, *Final Report – South Australia Separation Event, 1 December 2016*, published 28 February 2017. Available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Final-report---SA-separation-event-1-December-2016.pdf.

Figure 1 Pre-separation Heywood Interconnector network topology

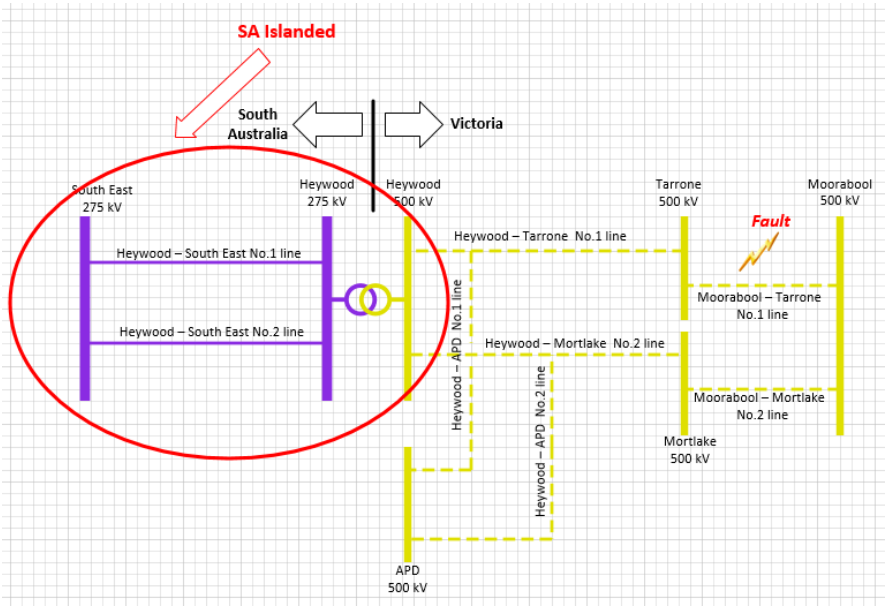


At 0016 hours, a fault occurred on the Moorabool – Tarrone No.1 500 kV transmission line, causing the line to trip at both ends. The trip of this line and subsequent tripping of the Heywood – Tarrone No.1 500 kV transmission line severed the interconnection between South Australia and Victoria via the Heywood Interconnector.

As a result, South Australia separated from the rest of the mainland National Electricity Market (NEM), with no synchronous connection to the NEM grid. The Murraylink interconnector (DC interconnection) continued to be in service and operated normally during the separation event.

See Figure 2 below for the network topology across Heywood interconnector following the separation event.

Figure 2 Post-separation Heywood Interconnector network topology



Soon after the separation, at 0025 hours, AEMO invoked F-ESTN_ISLE, F-SA_ESTN_ISLE_REG, F-SA_ISLE and SA_ESTN_ISLE constraint sets to manage network and FCAS requirements within the

South Australia island. Under islanded operation, all FCAS requirements for South Australia had to be supplied by local generation within South Australia.

From and including the dispatch interval (DI) ending at 0030 hours, a number of constraint equations within the F-SA_ISLE constraint set that manage fast raise and fast lower FCAS requirements within South Australia began to violate. These constraint equations violated due to insufficient availability of fast raise and fast lower services within South Australia to meet the requirements.

The violating constraint equations meant the power system in South Australia was not in a secure operating state. All available fast raise and fast lower FCAS from Pelican Point (17 MW), Torrens Island A1 (10 MW), Torrens Island B2 (20 MW), Torrens Island B3 (20 MW), and Torrens Island B4 (15 MW) units were enabled to meet the requirements.

Between 0055 hours and 0100 hrs, AGL rebid all of its available fast raise, fast lower, slow raise, slow lower, regulation raise, and regulation lower FCAS capacity at Torrens Island A1 unit as unavailable. As a result, the fast raise and fast lower FCAS requirement constraint equations violated to a larger degree.

At 0115 hours, AEMO issued a verbal direction under Clause 4.8.9 of the NER to Torrens Island A1 unit to provide 10 MW of fast raise FCAS. AEMO invoked the direction and intervention pricing constraint equations for Torrens Island A1 unit from (and including) the DI ending at 0135 hours.

At 0149 hours, to manage the violation of the fast lower FCAS requirement constraint equation, AEMO issued a verbal direction to Electranet under Section 116 of the NEL to instruct BHP Olympic Dam to reduce load by 45 MW. The direction and intervention pricing constraint equations relating to the load reduction at Olympic Dam were invoked from (and including) the DI ending at 0215 hours. The load reduction at BHP Olympic Dam ceased violation of the FCAS lower requirement constraint equations from (and including) the DI ending at 0215 hours.

Despite the direction to Torrens Island A1 to procure additional fast raise FCAS capacity, the fast raise FCAS requirement constraint equations continued to violate.

At 0226 hours, AEMO issued a verbal direction to Pelican Point Power Station under Clause 4.8.9 of the NER to reduce energy output to 165 MW. The direction was issued to reduce the fast raise FCAS requirement in the South Australia region, since Pelican Point was the generator with the largest actual energy output. AEMO invoked the intervention constraint equation for Pelican Point from (and including) the DI ending at 0235 hours.

To minimise the impact to affected participants and interconnectors due to the direction to Pelican Point, AEMO also issued a counter-action instruction to Mintaro Power Station to increase energy output by 50 MW, in accordance with Clause 3.8.1(b)(11) and 4.8.9 (h)(3) of the NER. The instruction was issued at 0300 hours and the constraint equation associated with the counter-action was invoked from (and including) the DI ending at 0305 hours.

From (and including) the DI ending at 0255 hours, AEMO amended the earlier direction (issued at 0149 hours) for load reduction at BHP Olympic Dam, as follows:

- Increased the load reduction amount from 45 MW to 60 MW
- Increased the Constraint Violation Penalty (CVP) factors for the direction and intervention pricing constraint equations from 55 and 50 respectively, to 1145 and 1140 respectively.

Despite the directions to Torrens Island A1 unit and Pelican Point Power Station to manage the fast raise FCAS requirements in South Australia, there was insufficient fast raise FCAS available to meet the reduced requirement. The fast raise FCAS requirement constraint equations continued to violate until South Australia was reconnected to Victoria at the DI ending at 0500 hours.

The Heywood Interconnector was restored by 0441 hours. All directions were cancelled and associated constraint equations revoked by 0455 hours (DI ending 0500 hours).

4. NER COMPLIANCE WITH THE INTERVENTION PROCESSES

4.1 Circumstances giving rise to the need for the directions

Following the separation of South Australia from Victoria, the fast raise and fast lower FCAS requirement constraint equations for South Australia began to violate.

4.1.1 Fast Raise FCAS

To resolve the shortage of fast raise FCAS, AEMO contacted participants to enquire about the availability of additional fast raise FCAS capacity. Only Torrens Island A1 unit confirmed availability of 10 MW for fast raise FCAS, but indicated their intention to move this capacity from the FCAS market to the energy market.

At 0115 hours, following a rebid by AGL to move all fast raise FCAS capacity from Torrens Island A1 unit to the energy market, AEMO issued a direction to Torrens Island A1 to provide 10 MW of fast raise FCAS (that is, to move the capacity that had been rebid into the energy market, back into the FCAS market). The constraint equations associated with this direction were invoked from (and including) the DI ending at 0135 hours.

Despite the direction to Torrens Island A1 unit to procure additional fast raise FCAS capacity, the fast raise FCAS requirement constraint equations continued to violate. To alleviate the violation of the constraint equations, AEMO issued a direction to Pelican Point Power Station to reduce energy output to its minimum load of 165 MW. The direction was issued to reduce the size of the largest generator (Pelican Point) which determined the fast raise FCAS requirement for South Australia. By reducing the output of the largest generator, the fast raise FCAS requirement for South Australia would be lower, thus reducing the violation of the fast raise FCAS requirement constraint equations.

The constraint equations associated with the direction to Pelican Point were invoked from (and including) the DI ending at 0235 hours.

4.1.2 Fast Lower FCAS

To resolve the shortage of fast lower FCAS, AEMO contacted participants to enquire about the availability of additional fast lower FCAS capacity. Torrens Island A1 unit indicated availability of 10 MW for fast lower FCAS under direction by AEMO. Since it is not possible for Torrens Island A1 unit to provide 10 MW of fast raise FCAS and 10 MW of fast lower FCAS at the same time, AEMO pursued alternative options to manage the fast lower FCAS requirement in South Australia.

At 0149 hours, AEMO issued a direction to Electranet to instruct Olympic Dam to reduce consumption by 45 MW. The direction was issued to reduce the size of the largest load (Olympic Dam) that determines the fast lower FCAS requirement for South Australia. By reducing the consumption of the largest load, the fast lower FCAS requirement for South Australia would be lower, thus reducing the violation of the fast lower FCAS requirement constraint equations.

The constraint equations associated with the Direction to Olympic Dam were invoked from (and including) the DI ending at 0215 hours.

These constraint equations were amended from (and including) the DI ending at 0255 hours, as follows:

- Increased the load reduction at Olympic Dam from 45 MW to 60 MW.
- Increased the constraint violation penalty (CVP) factors for the direction and intervention pricing constraint equations for Olympic Dam from 55 and 50 respectively, to 1145 and 1140 respectively.

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.

At 0031 hours, AEMO issued Market Notice MN 55958[2] to advise the South Australia region had separated from the rest of the NEM.

The separation event was an unplanned event resulting in an insecure power system in South Australia due to shortage of fast raise and fast lower FCAS services. To restore power system security, there was an immediate need for additional fast raise and fast lower FCAS capacity.

AEMO contacted all online thermal synchronous generating units capable of providing fast raise and fast lower FCAS in South Australia. Only Torrens Island A1 unit confirmed they had additional fast raise or fast lower FCAS capacity which would be available under direction.

AEMO determined that there was insufficient time for a market response to address the power system security issues and that no viable market alternatives were available.

4.3 Processes implemented by AEMO to issue the direction

AEMO's procedure for management of directions is outlined in Section 5 of System Operating Procedure SO_OP 3707 "Intervention, Direction and Clause 4.8.9 Instruction".[3] The procedure requirements are summarised below, together with a description of the process followed and compliance of each requirement by AEMO.

I. *Publish a Market Notice of the possibility AEMO might have to issue a direction or clause 4.8.9 instruction, so there is an opportunity for Registered Participants to respond to alleviate that need.*

   AEMO did not issue a market notice indicating the possibility that AEMO might have to issue a direction. Due to the immediate need for additional fast raise and fast lower FCAS capacity to restore power system security, AEMO determined that there was insufficient time for a market response to address the power system security issues.

II. *Determine and publish the latest time for intervention.*

   AEMO did not determine and publish the latest time for intervention. As outlined in Section 4.2, AEMO contacted all online thermal synchronous generating units capable of providing fast raise and fast lower FCAS in South Australia. Based on the responses, AEMO determined that there were no viable market alternatives. The latest time for intervention would have been published, had there been viable market alternatives and sufficient time to procure them. In this case there were no viable market alternatives or sufficient time to procure those services.

III. *Determine which Registered Participant should be the subject of a direction or clause 4.8.9 instruction.*

   AEMO contacted all online thermal synchronous generating units capable of providing fast raise and fast lower FCAS in South Australia. Only Torrens Island A1 unit indicated availability of 10 MW each for fast raise and fast lower FCAS under direction by AEMO.

   To reduce the fast raise FCAS requirement in South Australia, AEMO determined the generation output from Pelican Point should be reduced, since it was the generator with the largest output. To

[2] AEMO's Market Notices are issued in real time to subscribing market participants and stored at: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Market-notices-and-events.

[3] Available at: 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.

reduce the fast lower FCAS requirement in South Australia, AEMO determined the consumption at BHP Olympic Dam should be reduced since it was the load with the largest consumption in SA.

IV. *If a direction is to be issued, if reasonably practicable, the determination will aim to minimise the effect on interconnector flows and minimise the number of Affected Participants.*

To minimise the effect on interconnector flows and the number of affected participants, AEMO issued a counter-action instruction to Mintaro Power Station for the direction to Pelican Point. The instruction was such that the increase in generation by Mintaro due to counter-action (50 MW) was the same as the decrease in generation by Pelican Point due to the direction (50 MW).

To limit the number of affected participants, AEMO issues counter-action instructions to generators within the same region and generation portfolio as the Directed participant. In this case, Mintaro PS was within Engie's generation portfolio in South Australia.

V. *Issue a direction or clause 4.8.9 instruction verbally to the relevant Registered Participant, confirming whether it is a direction or clause 4.8.9 instruction.*

AEMO control room logs indicate the following verbal directions were issued:

(i) At 0115 hours, verbal direction issued to Torrens Island A1 unit to provide 10 MW of fast raise FCAS.

(ii) At 0149 hours, verbal direction issued to Electranet to instruct BHP Olympic Dam to reduce load by 45 MW.

(iii) At 0226 hours, verbal direction issued to Pelican Point power station to reduce output to 165 MW.

(iv) At 0243 hrs, verbal direction issued to Electranet to instruct BHP Olympic Dam to reduce load by 60 MW.

(v) At 0300 hours, counter-action instruction issued to Mintaro power station to increase output by 50 MW.

VI. *Issue a Participant Notice confirming the direction or clause 4.8.9 instruction.*

AEMO issued the following participant notices on 1 December 2016:

(i) PN 55972: Published at 0237 hours to Torrens Island Unit A1 relating to the verbal direction issued at 0115 hours.

(ii) PN 55981: Published at 0256 hours to Pelican Point relating to the verbal direction issued at 0226 hours.

(iii) PN 55986: Published at 0311 hours to BHP Olympic Dam relating to the verbal direction issued at 0149 hours.

(iv) PN 55987: Published at 0315 hours to BHP Olympic Dam relating to the verbal direction issued at 0243 hours. This direction was an amendment of the earlier direction to BHP Olympic Dam issued at 0226 hours.

(v) PN 56082: Published at 0046 hours on 2 December 2016 to Mintaro Power Station relating to counter-action instruction issued at 0300 hours on 1 December 2016.

VII. *Issue a Market Notice advising that AEMO has issued a direction or clause 4.8.9 instruction.*

At 0234 hours, AEMO issued market notice MN 55973 advising that directions had been issued to participants in the South Australia region under clause 4.8.9 of the NER.

VIII. *Revoke the direction or clause 4.8.9 instruction as soon as it is no longer required.*

At 0502 hours, AEMO issued MN 56015 cancelling all direction and counter-action instructions from 0500 hours. The Victoria – South Australia interconnection via the Heywood Interconnector was restored at 0441 hours. Following the restoration of the interconnector, there was sufficient

availability of fast raise FCAS services from other regions to meet the requirement in South Australia, so the directions were no longer required.

4.4 Basis for AEMO not following any or all processes under clause 4.8 prior to the issuance of the direction

AEMO considers that it followed all applicable processes under NER clause 4.8 prior to the issuance of the directions.

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

As noted in Section 4.2, AEMO contacted all online thermal synchronous generating units capable of providing fast raise and fast lower FCAS. Only Torrens Island A1 generating unit confirmed they had additional fast raise or fast lower FCAS capacity which would be available under direction.

AEMO is satisfied that all generators responded to inquiries made under 4.8.5A (d) in a timely manner.

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

No indication was received from any directed participant under NER clause 4.8.9(d) that it would be unable to comply with the direction.

5. DETERMINATION OF WHETHER TO APPLY INTERVENTION PRICING UNDER CLAUSE 3.9.3(B)

Under NER clause 3.9.3(b), AEMO must set the *dispatch price* and *ancillary service prices* for an *intervention price dispatch interval* at the value which AEMO, in its reasonable opinion, considers to have applied for that dispatch interval in the relevant region had the intervention event not occurred (intervention pricing). AEMO's relevant procedures for intervention pricing are:

- Section 10 of Power System Operating Procedure SO_OP 3705 "Dispatch".[4]
- Intervention Pricing Methodology.[5]

Under NER clause 3.9.3 (f)(2), AEMO should determine and publish the prices that apply during a period of intervention in accordance with the Intervention Pricing Methodology developed in accordance with clause 3.9.3(e). Section 10 of SO_OP 3705 "Dispatch" requires AEMO to do the following:

I. *In accordance with NER Clause 3.9.3(a), "In respect of a dispatch interval where an AEMO intervention event occurs AEMO must declare that dispatch interval to be an intervention price dispatch interval".*

   AEMO issued market notice MN 56022 at 0742 hours to:

   - Declare an AEMO intervention event commenced at the DI ending at 0135 hours.
   - Declare all DIs during the AEMO intervention event would be intervention price dispatch intervals.

[4] Available at: http://aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3705---Dispatch.pdf.
[5] Available at: https://www.aemo.com.au/-/media/Files/PDF/Intervention-Pricing-Methodology-October-2014.pdf.

- Declare intervention pricing would be implemented during these intervention price dispatch intervals from (and including) DI ending 0135 hours until the end of the AEMO Intervention event at 0500 hours.

II. *AEMO may initiate 'intervention' or 'What If' pricing if the RRN test[6] is passed. If the RRN test is passed and AEMO applies intervention pricing NEMDE will do an intervention price run after completion of the dispatch or outturn run.*

AEMO issued directions to three participants in South Australia between 0115 hours and 0500 hours. The first direction was issued to Torrens Island A1 generating unit to provide 10 MW of fast raise FCAS under clause 4.8.9 of the NER. The Regional Reference Node (RRN) test was met for this direction, that is, a direction at the RRN would have avoided the need for the direction (NER clause 3.9.3(d)). Intervention pricing was implemented from (and including) the DI ending at 0135 hours until the end of the direction at the DI ending at 0500 hours.

The remaining three directions involved reducing generation at Pelican Point or reducing consumption at Olympic Dam to manage shortage of fast raise and fast lower FCAS respectively. The RRN test was not met for either of these directions, that is, a direction at the RRN would not have avoided the need for the direction. However, since these directions overlapped with the first direction for which the RRN test was met, AEMO applied intervention pricing for all intervals between the DI ending 0135 hours and 0500 hours.

The central dispatch process has been automated to apply the Intervention Pricing Methodology into the intervention pricing run to determine the prices in accordance with 3.9.3(b).

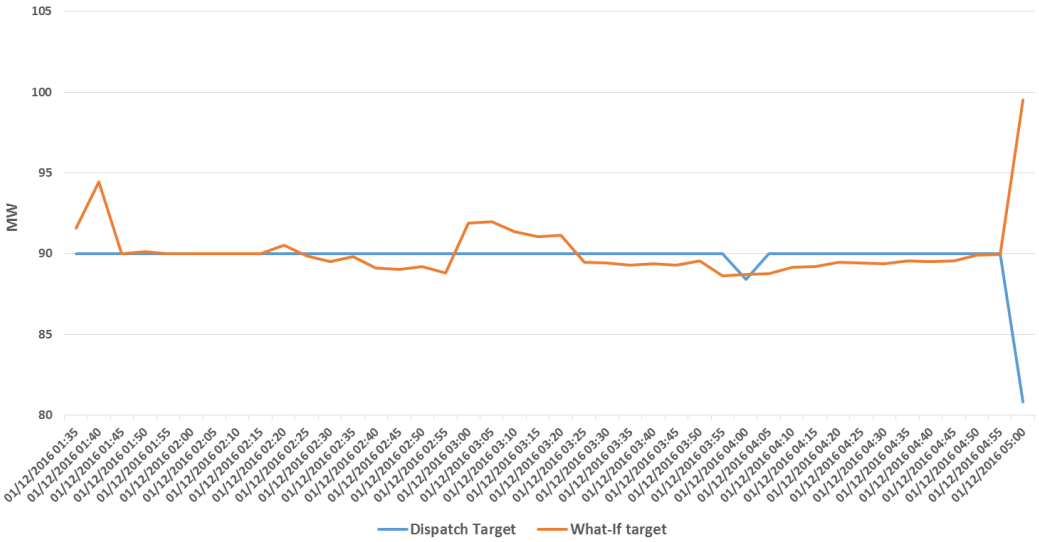
6. CHANGES TO DISPATCH OUTCOMES DUE TO THE DIRECTION

6.1 Generation outcomes

Figures 3 to 5 below compare the generation targets in the dispatch run versus the intervention pricing run for Torrens Island A1 (directed generating unit), Pelican Point (directed generating unit), and Mintaro (counter-acted generating unit).

[6] The RRN test is reflected in NER clause 3.9.3(d).

Figure 3 Torrens Island A1 output_dispatch run vs intervention pricing run



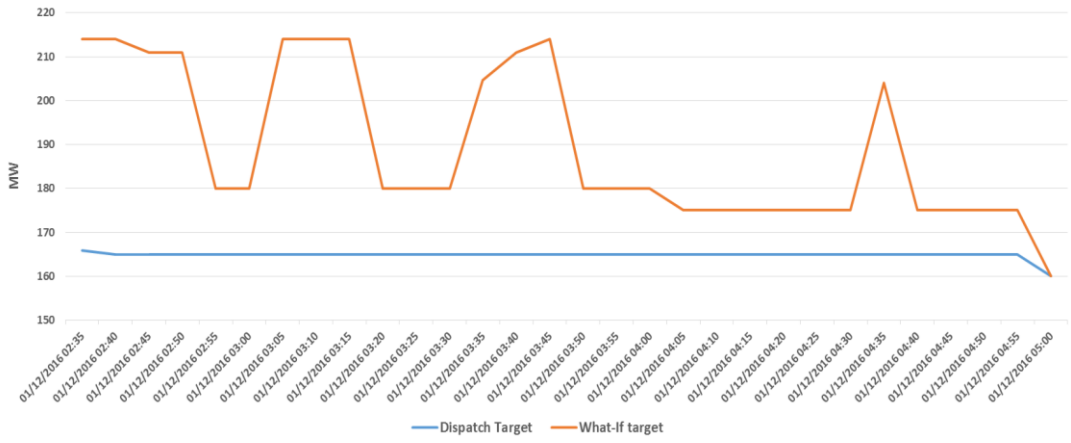
The intervention pricing run indicated the generation output from Torrens Island A1 generating unit would have been higher for 11 DIs (out of a total of 42 DIs when the unit was under direction) had the direction not occurred.

Torrens Island A1 had all its generation capacity of 120 MW bid at the market floor price during the period of direction. However, the what-if targets indicated that the unit would not have been dispatched above 99 MW during this period.

The lower than expected level of output was a result of the way in which the NEM Dispatch Engine (NEMDE) manages fast raise FCAS during islanded scenarios. In the absence of the direction, there was insufficient availability of fast raise FCAS. NEMDE managed the insufficient availability by reducing the requirement for fast raise FCAS by lowering the dispatch level of the largest units in operation at the time in South Australia. This reduced the maximum size of any credible contingency that had to be accommodated, thereby reducing the fast raise FCAS requirements.

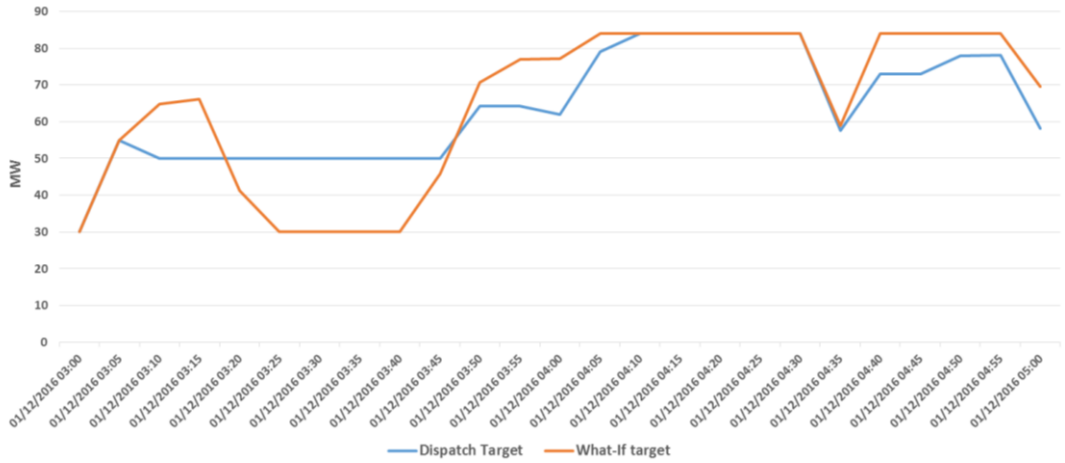
This optimisation resulted in the what-if targets for Torrens Island A1 unit being lower than the offered capacity, and only modestly higher than the actual level of generation.

Figure 4 Pelican Point output_dispatch run vs intervention pricing run



The intervention pricing run indicated the generation output from Pelican Point would have been higher for all DIs had the direction not occurred.

Figure 5 Mintaro output_dispatch run vs intervention pricing run



The intervention pricing run indicated the generation output from Mintaro would have been higher for 12 DIs (out of a total of 25 DIs when the unit was under counter-action instruction).

6.2 Price outcomes

6.2.1 Energy prices

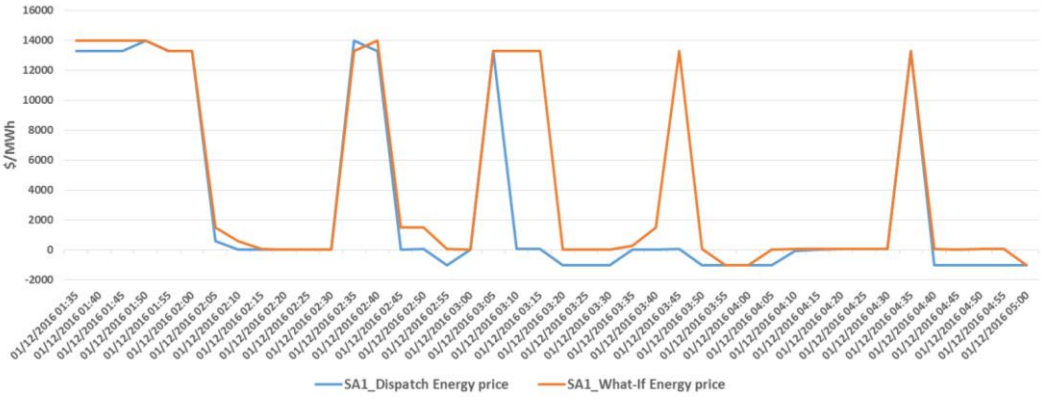
Figure 6 below compares the 5-minute energy prices in the dispatch run versus the intervention pricing run (what-if pricing) for South Australia.

The what-if energy prices in South Australia were higher than the dispatch run for 35 DIs (out of a total of 42 DIs).

The what-if energy prices in the other regions were similar to their respective dispatch run prices.

Settlement in the NEM energy market is based on the what-if energy prices produced in the intervention pricing run.

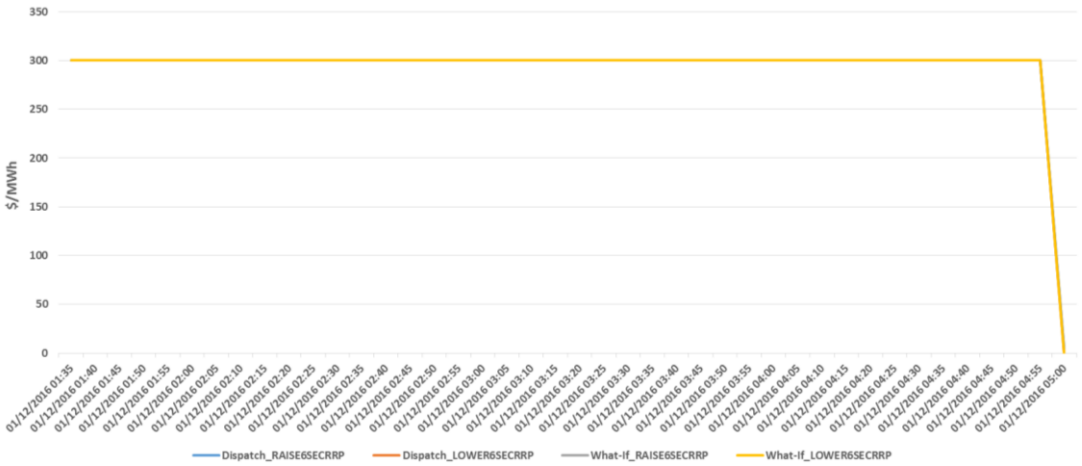
Figure 6 South Australia 5-minute energy prices_dispatch run vs intervention pricing run



6.2.2 R6 and L6 FCAS prices

Figure 7 below compares the 5-minute fast raise (R6) and fast lower (L6) FCAS prices in South Australia between the dispatch run and intervention pricing run during the period of direction.

Figure 7 South Australia 5-minute R6 and L6 FCAS prices_dispatch vs intervention pricing run



The 5-minute prices for R6 and L6 in the Dispatch and Intervention pricing run stayed flat at $300/MWh. The price curves in this graph overlay each other.

An administered price period had been declared in the South Australia region from (and including) the DI ending at 1135 hours on 25 November 2016 until (and including) the DI ending at 0400 hours on 3 December 2016. During this period, an administered price cap of $300/megawatt hour (MWh) applied to all market ancillary service prices for all dispatch intervals.

The 5-minute prices for fast raise and fast lower FCAS during the direction were capped to the Administered Price Cap of $300/MWh in the dispatch run and intervention pricing runs. Had the administered price period not existed, the 5-minute fast raise and fast lower FCAS prices would have been at or close to the Market Price Cap.

6.3 Interconnector flow outcomes

The flows across all interconnectors were similar between the dispatch run and intervention pricing run. The counter-action to Mintaro for the Direction to Pelican Point was effective in minimising the impact to the interconnector flows.

7. CONCLUSIONS AND FURTHER ACTIONS

AEMO has reviewed the following directions issued between 0115 hours and 0500 hours on 1 December 2016, and the circumstances surrounding these directions, as set out in this report:

- Direction to Torrens Island A1 between 0115 hours and 0500 hours to provide 10 MW of fast raise FCAS under clause 4.8.9 of the NER.
- Direction to Pelican Point Power Station between 0226 hours and 0500 hours to reduce energy output to 165 MW (minimum load) under clause 4.8.9 of the NER.
- Direction to Electranet between 0149 hours and 0500 hours to instruct BHP Olympic Dam to reduce load by 45 MW (until and including DI ending 0250 hours) and 60 MW (between and including DIs ending 0255 hours and 0500 hours) under Section 116 of the NEL.

AEMO assessed its compliance with the applicable procedures and processes for determining to issue the direction, notification, and the application of intervention pricing, and is satisfied all requirements were met, except the following:

- For the direction to Electranet to instruct BHP Olympic Dam to reduce load, between (and including) DIs ending 0215 hours and 0250 hours, AEMO incorrectly applied CVP factors of 55 and 50 for the

Intervention and intervention pricing constraints respectively. In accordance with the published Schedule of CVP Factors and Section 10 of AEMO's internal Power System Operating Guide SO_OG NEM 14 "Direction Constraints", AEMO should have applied CVP factors of 1145 and 1140 for the Intervention and intervention pricing constraints during that period. AEMO rectified the error from (and including) the DI ending at 0255 hours by increasing the CVPs to the correct values of 1145 and 1140.

AEMO has also identified and implemented the following improvements.

- AEMO will apply system security constraints to reduce the output from the largest generating units to manage raise FCAS requirements.

Section 5 of the Power System Operating Procedure SO_OP 3715 "Power System Security Guidelines" has been amended to reflect the above improvements.

ABBREVIATIONS

Abbreviation	Expanded name
AC	Alternating Current
DC	Direct Current
DI	Dispatch Interval
MN	Market Notice
NEM	National Electricity Market
NEMDE	NEM Dispatch Engine
NEL	National Electricity Law
NER	National Electricity Rules
PN	Participant Notice
RRN	Regional Reference Node
SA	South Australia
TI	Trading Interval
VIC	Victoria