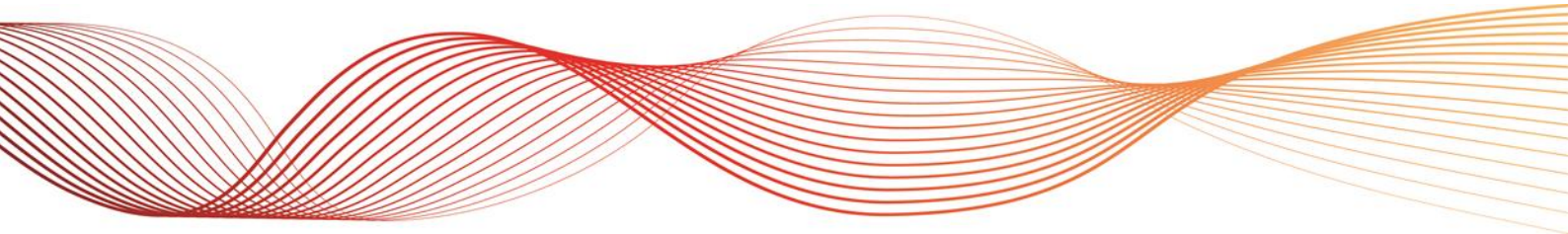




NEM EVENT – DIRECTION TO QUEENSLAND GENERATORS – 28 AND 29 MARCH 2017

Published: **January 2018**





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 29 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

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the National Electricity Law, the National Electricity Rules, or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.

© 2018 Australian Energy Market Operator Limited. The material in this publication may be used in accordance with the [copyright permissions on AEMO's website](#).



CONTENTS

1. PURPOSE	4
2. SUMMARY	4
3. BACKGROUND	4
4. NER COMPLIANCE WITH THE INTERVENTION PROCESSES	5
4.1 Circumstances giving rise to the need for the directions	5
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	6
4.3 Processes implemented by AEMO to issue the direction	6
4.4 Basis for AEMO not following any or all processes under clause 4.8 prior to direction	8
4.5 Effectiveness of responses to AEMO inquiries under clause 4.8.5A(d)	8
4.6 Notice from Registered Participants of inability to comply with the direction	8
5. DETERMINATION OF WHETHER TO APPLY INTERVENTION PRICING UNDER CLAUSE 3.9.3(B)	8
6. CHANGES TO DISPATCH OUTCOMES DUE TO THE DIRECTION	9
7. CONCLUSIONS AND FURTHER ACTIONS	9
ABBREVIATIONS	10



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.

2. SUMMARY

Between 1440 and 1600 hours on 28 March 2017, AEMO issued three directions to Origin Energy Electricity Limited in Queensland to maintain power system security under clause 4.8.9 of the National Electricity Rules (NER).

At 1425 hours, AEMO reclassified the loss of multiple transmission lines between Nebo and Ross as a credible contingency due to a tropical cyclone. During the period of the reclassification, flow on the Ross cutset¹ between central and north Queensland had to be maintained at or below 260 MW. This reduced the flow from central to north Queensland, which, in addition to insufficient market response within north Queensland meant supply-demand balance in north Queensland could not be maintained.

AEMO issued directions to Mt Stuart PS units 2 and 3 to ensure supply-demand balance in north Queensland was maintained. The following directions were issued:

- At 1440 hours on 28 March 2017, AEMO directed Origin Energy to synchronise Mt Stuart PS unit 3 as soon as possible and follow dispatch targets. Due to start-up issues, the direction to Mt Stuart PS Unit 3 was cancelled at 1500 hours.
- From 1500 hours on 28 March 2017, AEMO directed Mt Stuart PS unit 2 to synchronise as soon as possible and follow dispatch targets.
- Once the start-up issues were resolved, from 1600 hours on 28 March 2017, AEMO directed Mt Stuart PS unit 3 to synchronise as soon as possible and follow dispatch targets.

The directions were cancelled at 0400 hours on 29 March 2017, following the cancellation of the reclassification relating to the loss of multiple transmission lines between Nebo and Ross.

3. BACKGROUND

A severe tropical cyclone named Debbie (Category 4)² made landfall near Airlie Beach, Queensland, at approximately 1240 hours on 28 March 2017 and continued inland in a south west direction. AEMO determined that this severe weather posed increased risk to the loss of multiple transmission lines between Nebo and Ross.

¹ The set of 275 kV and 132 kV transmission lines connecting Ross and Strathmore.

² Refer to Bureau of Meteorology (BOM) website for the categories of cyclone intensity explanations.
<http://www.bom.gov.au/cyclone/about/intensity.shtml>.

As a result, as per AEMO's reclassification process³, AEMO reclassified the loss of the multiple transmission lines between Nebo and Ross as a credible contingency event at 1425 hours (MN 58264). The reclassification was based on information of wind speeds reaching up to 125 kilometres per hour (km/hr) forecast to be within 10 km of the transmission lines. There was a risk of debris faulting the transmission lines due to the high wind speeds, thus increasing the risk of losing multiple transmission lines between Nebo and Ross.

The reclassification of the lines involved limiting the flow on the Ross cutset between central and north Queensland to 260 MW. Generation in north Queensland is constrained on during such periods of reclassification to ensure demand in north Queensland continues to be supplied. However, there was insufficient generation availability in north Queensland to meet demand on 28 March 2017. To maintain supply-demand balance in north Queensland, AEMO issued directions to Mt Stuart PS Units 2 and 3 to synchronise and follow dispatch targets.

AEMO cancelled the reclassification and all directions at 0400 hours on 29 March 2017, when tropical cyclone Debbie was downgraded to a tropical low and AEMO no longer considered the loss of multiple lines between Nebo and Ross as a credible contingency.

4. NER COMPLIANCE WITH THE INTERVENTION PROCESSES

4.1 Circumstances giving rise to the need for the directions

At 1425 hours on 28 March 2017, AEMO reclassified the loss of multiple transmission lines between Nebo and Ross as a credible contingency due to tropical cyclone Debbie. During the reclassification period, the flow on the Ross cutset had to be maintained at or below 260 MW in order to maintain power system security. Constraint set Q-X_SMRS_A was invoked for the reclassification from dispatch interval (DI) ending 1430 hours.

The constraint set required increased generation from the generators in north Queensland (Barron Gorge, Kareeya Hydro, Mt Stuart GTs and Townsville GTs) to reduce the flow across the Ross cutset within the 260 MW limit.

In response to the increased dispatch targets, the north Queensland generators were either:

- Synchronising (Barron Gorge unit 2, Mt Stuart GTs),
- Ramp up rate limited (Barron Gorge unit 1),
- Fully dispatched to their availability (Kareeya and Townsville GT unit 1), or
- Unavailable (Townsville GT unit 2).

With insufficient generation availability the network security constraint equation Q_RS_260 (within the constraint set Q-X_SMRS_A) violated as soon as it was invoked from DI ending 1430 hours.

At DI ending 1440 hours, Mt Stuart GTs rebid their generating units as unavailable with the reason "CORRECT BID – AVAIL CORRECTED".

The equation continued to violate for 12 DIs, between DIs ending 1430 hours and 1545 hours.

To reduce the flow between Ross and Nebo and restore power system security, an immediate response was required from AEMO. Directions were issued to Mt Stuart PS units 2 and 3 to synchronise as soon as possible and follow dispatch targets. A market response from generating units outside of north Queensland would not have avoided the need for the direction, because the only effective option in

³ SO_OP 3715 – Power System Security Guidelines (Available from: <http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Power-system-operation>)

reducing flow across the Ross cutset was to increase generation from the generators north of the Ross cutset.

AEMO issued the following directions to Mt Stuart PS Units 2 and 3 to synchronise and follow dispatch targets in order to maintain the power system in a secure operating state:

- At 1440 hours on 28 March 2017, AEMO directed Origin Energy to synchronise Mt Stuart PS unit 3 as soon as possible and follow dispatch targets. Due to start-up issues, the direction to Mt Stuart PS Unit 3 was cancelled at 1500 hours.
- From 1500 hours on 28 March 2017, AEMO directed Mt Stuart PS unit 2 to synchronise as soon as possible and follow dispatch targets.
- Once the start-up issues were resolved, from 1600 hours on 28 March 2017, AEMO directed Mt Stuart PS unit 3 to synchronise as soon as possible and follow dispatch targets.

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 a market notice (MN 58261) at 1007 hours on 28 March 2017 to advise the market of the increased risk to the power system in north Queensland due to the abnormal conditions created by the severe weather condition. The market notice also indicated that, if required, AEMO will apply network constraints to generating units in north Queensland to manage power system security.

At 1423 hours on 28 March 2017, AEMO issued another market notice (MN 58264) to advise the market AEMO had reclassified the loss of multiple transmission lines between Nebo and Ross as a credible contingency and constraint set Q-X_SMRS_A was invoked. The corresponding constraint equation violated as soon as it was invoked and could only be alleviated by north Queensland generators. A market response from generating units outside of north Queensland would not have avoided the need for the direction. The only effective option in reducing the flow across the Ross cutset was to increase generation from the generators north of the Ross cutset. Since sufficient market response was not achieved and the invoked constraint equation continued to violate, AEMO had to intervene immediately in the market by issuing a Direction.

4.3 Processes implemented by AEMO to issue the direction

AEMO followed its relevant procedures for the management of the Direction on 28 and 29 March 2017, being System Operating Procedure SO_OP 3707 "Intervention, Direction and Clause 4.8.9 Instruction", section 5⁴.

The procedure requirements are summarised below, together with a description of the process AEMO followed in relation to each requirement.

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

⁴ 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 published two market notices on 28 March 2017, MN 58261 (1007 hours) and MN 58264 (1423 hours) informing the market of the impact of the severe weather condition on the power system and the requirements to apply network constraint equations to generating units in north Queensland. The market was also advised about the possibility of intervention in order to maintain a secure operating state.

II. Determine and publish the latest time for intervention.

As the start of the direction is highly dependent on the severity of the weather and power system conditions, AEMO determined that it is not possible to publish the latest time for intervention. An immediate response was required to restore the power system to secure operating state via intervention following the reclassification of the transmission lines.

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

In anticipation of the possibility of intervention due to the severe weather conditions, AEMO contacted all Scheduled Generators in north Queensland to determine their availability for direction.

AGL Hydro advised that Townsville GT (Yabulu) unit 1, which was generating near its registered capacity prior to the direction, was available for direction if it was determined that it was uneconomical to generate during the reclassification period. The unit continued to generate without any intervention.

Barron Gorge had limited water reserves therefore both units were not available for direction.

Origin Energy indicated that Mt Stuart PS was available for direction with no material difference in costs between the three units. The preferred start sequence of the units to be directed was unit 3, unit 2 and then unit 1.

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.

AEMO did not issue counter-action instructions to minimise the effect on interconnector flows and the number of Affected Participants. In the absence of the direction, load shedding in north and central Queensland would have occurred to approximately the quantity of generation subject to direction, given that the network supply to that area was at a high risk.

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 a verbal direction was issued to Origin Energy at 1440 hours, 1500 hours and 1600 hours on 28 March 2017 for Mt Stuart PS Units 2 and 3 to synchronise and follow dispatch targets.

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

AEMO issued participant notices PN 58265, PN 58269, and PN 58270 to Origin Energy at 1447 hours, 1509 hours, and 1603 hours respectively on 28 March 2017 advising of directions under clause 4.8.9 of the NER.

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

AEMO issued market notice MN 58266 at 1447 hours on 28 March 2017 advising the market that a direction under clause 4.8.9 of the NER had been issued to a participant.

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

AEMO revoked the Direction at 0400 hours on 29 March 2017 when the reclassification was cancelled following the downgrade of the tropical cyclone to a tropical low. Market notice MN 58279 was issued to advise the market of the cancellation.



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

AEMO considers that it followed all applicable processes under NER clause 4.8 for this Direction.

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

As noted in 4.1, AEMO contacted all Scheduled Generators in north Queensland on 28 March 2017 to determine their availability for direction. All contacted Generators other than Mt Stuart PS confirmed that all of their capacity had either been made available or remained unavailable. Townsville (Yabulu) unit 1 was generating near its registered capacity prior to the direction and indicated that they were available for direction if they determined that it was uneconomical to generate. Barron Gorge had limited water reserves, therefore both units were not available for direction.

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

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

Mt Stuart PS unit 3 was directed to synchronise as soon as possible from 1440 hours, however was unable to comply with the direction due to start-up issues. Origin Energy advised AEMO about the inability to comply with the direction, following which AEMO cancelled the direction.

There were no other indications received from Origin Energy under NER clause 4.8.9(d) that it would be unable to comply with the two subsequent directions.

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

Intervention pricing was not applied, because the need to restore power system security could not be met by directing plant located at the regional reference node in accordance with NER clauses 3.9.3(b) and (d). AEMO issued a market notice MN 58267 to inform that intervention pricing would not be implemented during the intervention price dispatch intervals.



6. CHANGES TO DISPATCH OUTCOMES DUE TO THE DIRECTION

Under NER 3.8.1 (b) (11), AEMO is required, as far as reasonably practicable, to minimise the market impact of its direction in terms of the number of Affected Participants and changes to interconnector flows⁵.

In this instance, there were no Affected Participants. This is because, in the absence of directions, load shedding in central and north Queensland would have occurred to approximately the quantity of generation subject to direction, given the network supplying that area was at high risk.

7. CONCLUSIONS AND FURTHER ACTIONS

AEMO has reviewed the Directions issued to Origin in relation to Mt Stuart PS units 2 and 3 on 28 and 29 March 2017 and the circumstances surrounding this Direction, as set out in this report.

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 these requirements were met.

⁵ Note that AEMO's power system operating procedure SO_OP 3707 "Intervention, Direction and Clause 4.8.9 Instructions" describes this objective, but does not link it to NER clause 3.8.1(b)(11). In practice, AEMO meets the objective by selecting generating units located in the same region as the directed generation (and, if possible, belonging to the same participant) and then constraining the dispatch of the selected generating units by an equal and opposite amount to that of the directed generating units.



ABBREVIATIONS

Abbreviation	Expanded name
DI	Dispatch Interval
MN	Market Notice
PN	Participant Notice