

NEM EVENT - DIRECTIONS TO NORTHERN QUEENSLAND GENERATORS - 13 OCTOBER 2015

PREPARED BY: Markets Department

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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 21 July 2016, unless otherwise specified.

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Abbreviations and definitions

| Abbreviation | Term |
|--------------|-----------------------------|
| DI | dispatch interval |
| NEM | National Electricity Market |
| NER, Rules | National Electricity Rules |

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

1 Summary

On 13 October 2015, there was a planned outage of the Ross to Strathmore 8857 275kV transmission line. Between 0538 hrs and 0622 hrs, the Ross to Strathmore 879 275kV transmission line tripped and reclosed three times. At 0640 hrs, the 879 line tripped and remained out of service.

To manage power system security, AEMO invoked a constraint set to limit the flow across the Ross cutset¹ to 260MW. This required an increase of northern Queensland generation. Some northern Queensland generators responded by rebidding their generating units as unavailable, causing the network security constraint equation in the constraint set to violate.

At 0702 hrs, the 879 line returned to service. At this time Powerlink was still determining the root cause of the multiple trip of the 879 line, so AEMO reclassified the potential loss of 275kV transmission lines 879 and 8858 between Ross and Strathmore as a credible contingency event. The constraint set, limiting the flow across the Ross cutset, remained invoked during the reclassification. The network security constraint in the constraint set violated for 18 dispatch intervals (DIs) from 0645 hrs to 0815 hrs.

Between 0731 hrs and 0930 hrs, AEMO issued a number of directions to northern Queensland generators to synchronise and follow dispatch targets to restore and maintain the power system in a secure operating state.

AEMO cancelled the reclassification at 0920 hrs and all directions at 0930 hrs after Powerlink advised that the trip of the 879 line was due to a combination of insulator pollution, high humidity and low wind conditions. At the time of the cancellation, the contributing weather conditions had dissipated.

Based on the information available at the time, AEMO is satisfied with its determination to issue directions to maintain power system security. AEMO compensated those Directed Participants in accordance with clause 3.15.7(c) of the National Electricity Rules (NER). There were no Affected Participants² in this determination.

2 Purpose

Under clause 4.8.9 of the NER, AEMO is permitted to intervene in the market and issue directions and clause 4.8.9 instructions to a Registered Participant, in order 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.
- Other purposes, such as disconnection of a generating unit that is threatening power system security.

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

² 'Affected Participants' is a defined term in the Rules. In respect of a particular direction in an intervention price trading interval: An Affected Participant is

(1) a Scheduled Generator or Scheduled Network Service Provider:

(i) which was not the subject of the direction, that had its dispatched quantity affected by that direction; or

(ii) which was the subject of the direction, that had its dispatched quantity for other generating units or other services which were not the subject of that direction affected by that direction, however, the Scheduled Generator or Scheduled Network Service Provider is only an Affected Participant in respect of those generating units and services which were not the subject of that direction; or

(2) an eligible person entitled to receive an amount from AEMO pursuant to clause 3.18.1(b)(1) where there has been a change in flow of a directional interconnector, for which the eligible person holds units for the intervention price trading interval, as a result of the direction.

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 “use of directions” report as soon as reasonably practicable, to:

- Assess its compliance with the intervention processes.³
- Describe the impact of the intervention on dispatch outcomes.
- If required, identify improvements to the intervention processes.

This report meets those NER obligations.

3 NER intervention processes

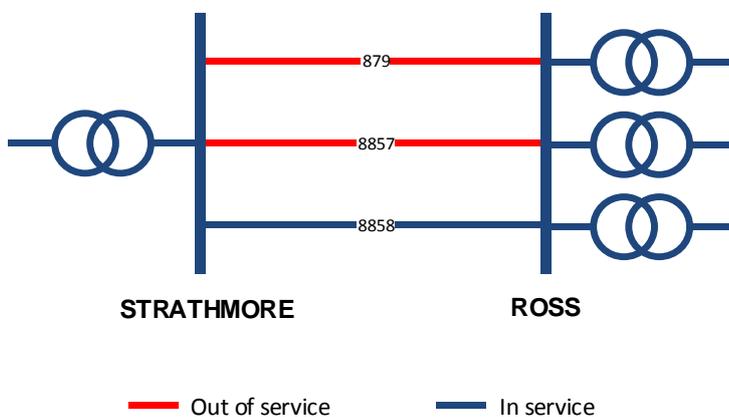
3.1 Circumstances giving rise to the need for the directions

Between Ross and Strathmore in northern Queensland, there are three parallel 275kV transmission lines: 879 line, 8857 line and 8858 line.

On 13 October 2015, there was a planned outage of the Ross to Strathmore 8857 line. Between 0538 hrs and 0622 hrs, the Ross to Strathmore 879 line tripped and reclosed three times. At 0640 hrs, 879 line tripped and remained out of service.

Figure 1 shows the 275 kV transmission line configuration between Ross to Strathmore during the 879 line trip.

Figure 1: Power system during the 879 line trip



To manage power system security, AEMO invoked the constraint set Q-X_SMRS_A at 0645 hrs. This constraint set applies a limit of 260MW on the flow across the Ross cutset. This required an increase of generation in northern Queensland to reduce the cutset flow to the 260MW limit.

At 0702 hrs, 879 line returned to service. At this time Powerlink was then determining the root cause of the multiple trips of the 879 line, so the simultaneous loss of 879 and 8858 lines was reclassified as a credible contingency. The 8857 line was not available for recall from the planned outage. As such, constraint set Q-X_SMRS_A remained invoked.

³ This includes the processes for:

- Calling for a market response to address the identified need prior to intervention under NER clauses 4.8.5A and 4.8.5B;
- Intervening in the market through issuing a direction under NER clause 4.8.9; and
- Applying intervention pricing under NER clause 3.9.3(b).

The constraint equation Q_RS_260 (of the constraint set Q-X_SMRS_A) constrained on northern Queensland generation. In response to the increased dispatch targets, some generators in northern Queensland rebid their generating units as unavailable⁴, causing the network security constraint equation to violate, leaving the power system in northern Queensland in a non-secure operating state. The constraint equation Q_RS_260 violated for 18 DIs from 0645 hrs to 0815 hrs.

To reduce the flow between Ross and Strathmore and restore power system security, AEMO issued energy directions to northern Queensland generators to synchronise and follow dispatch instructions.

At 0908 hrs Powerlink advised that the cause of the impact to line 879 was a combination of environmental pollution build up on the line insulators, high humidity and low wind conditions but these conditions were no longer prevailing. The reclassification was cancelled at 0920 hrs and the constraint set Q-X_SMRS_A revoked at 0920 hrs.

As this is a reviewable operating incident under the Rules, a power system operating incident report will be published to provide more details relating to this incident⁵.

3.2 AEMO's determination for direction

AEMO determined the need to direct generation in northern Queensland. This was to restore power system security following the continuous violation of the constraint equation Q_RS_260, indicating the power system in northern Queensland was in a non-secure operating state.

A market response from other generating units located elsewhere would not have avoided the need for the direction, because the only effective generation option in reducing flow on the Ross cutset is to increase generation north of the Ross cutset.

3.3 AEMO's determination of the latest time for issuing the direction

Under NER clauses 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 determined that there was insufficient time for a market response to address the power system security issues⁶ and that no viable market alternatives were available.

Accordingly, AEMO concurrently issued directions and notified the market of the power system security issues.

3.4 Process for issuing directions

AEMO followed the power system operating procedures below for managing these directions:

- SO_OP 3707 "Intervention, Direction and Clause 4.8.9 Instruction"⁷.
- Intervention Pricing Methodology⁸.

Procedure SO_OP 3707 requires AEMO to take specific actions when deciding to issue directions.

⁴ The reason provided by the generator was to avoid uneconomic start.

⁵ <http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/Power-System-Operating-Incident-Reports>

⁶ Under NER clause 4.2.6 (b), AEMO should take all reasonable actions to return the power system to a secure operating state as soon as it is practical to do so, and, in any event, within 30 minutes following a contingency event or significant change in power system conditions.

⁷ http://www.aemo.com.au/Electricity/Policies-and-Procedures/System-Operating-Procedures/Intervention-Direction-and-Clause-Instructions-SO_OP3707

⁸ <http://www.aemo.com.au/Electricity/Market-Operations/Dispatch/Intervention-Pricing-Methodology>

At 0702 hrs, AEMO reclassified⁹ the simultaneous trip of 879 line and 8858 line as a credible contingency event due to increased risk of a trip of one of the Ross to Strathmore lines. AEMO informed the market of the reclassification via Market Notice No. 50011 issued at 0737 hrs, followed by corrections via Market Notice No. 50012 issued at 0752 hrs.

To manage power system security for the reclassified contingency, AEMO applied a security constraint to limit flow across the Ross cutset by increasing northern Queensland generation. The constraint violated due to insufficient available generation.

With no other viable market option to restore power system security, AEMO identified the need for directions.

AEMO issued directions to the relevant participants at 0731 hrs, 0803 hrs, 0811 hrs and 0826 hrs. The direction issued at 0803 hrs was cancelled at 0830 hrs after the relevant participant informed AEMO that it was unable to follow the direction.

AEMO invoked direction constraints to dispatch each generating unit to adequate levels to maintain cutset flow below 260 MW.

At 0908 hrs, Powerlink advised that the cause of the multiple trips on Ross to Strathmore 275 kV line 879 was weather related and the conditions were no longer prevailing. AEMO cancelled the reclassification of loss of multiple lines as a credible contingency event. AEMO cancelled all directions at 0930 hrs and revoked the associated constraints.

AEMO issued the first Market Notice to inform the market of the reclassification at 0737 hrs. Corrections were made in respect to the notice and the final notice was issued via Market Notice No. 50021 at 0925 hrs. AEMO informed the market of the directions in Queensland via Market Notice No. 50022 issued at 0949 hrs. The market was notified of the cancellation of all directions via Market Notice No. 50023 at 1005 hrs.

AEMO failed to issue a market notice to declare that all DIs during the direction were intervention price dispatch intervals, as required by NER clause 3.9.3(a)¹⁰ and Section 10 of SO_OP 3705 "Dispatch"¹¹. AEMO also failed to issue a market notice to declare intervention pricing would not be implemented during these intervention price dispatch intervals¹².

AEMO reviewed its internal procedures for issuing market notices and added the requirement to issue a market notice to:

- Declare intervention price dispatch intervals.
- Declare intervention pricing would or would not be implemented during these intervention price dispatch intervals.

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

AEMO followed all processes set out in NER clause 4.8 except for the requirement to determine the latest time for AEMO intervention. The basis for this is described in section 3.3 above.

⁹ <http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/Power-System-Operating-Incident-Reports>

¹⁰ "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."

¹¹ http://www.aemo.com.au/Electricity/Policies-and-Procedures/System-Operating-Procedures/Dispatch-SO_OP3705

¹² 'intervention price dispatch interval' is a defined term in the Rules. AEMO must determine whether to apply intervention pricing to the intervention price dispatch interval in accordance with the intervention pricing methodology outlined in clause 3.9.3 of the Rules.

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

AEMO did not request information with respect to the latest time for intervention, because there was an immediate need for action to address the insecure operating state, and no viable technical alternatives were available.

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

One of the directions was cancelled at 0830 hrs after the participant advised AEMO at 0821 hrs that they were unable to follow the direction due to plant issues. The participant advised AEMO that a generator trip occurred when responding to the previous rebid, and required on-site operator intervention to restart.

4 Determination of whether to apply intervention pricing under clause 3.9.3(b)

Intervention pricing was not applied, as 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).

5 Changes to dispatch outcomes due to the direction

Figure 2 shows that up to 228 MW of additional generation in northern Queensland was dispatched as a result of the directions, a total of around 284 MWh over the period of directions. The reasons for differences between the total direction target and actual generation were:

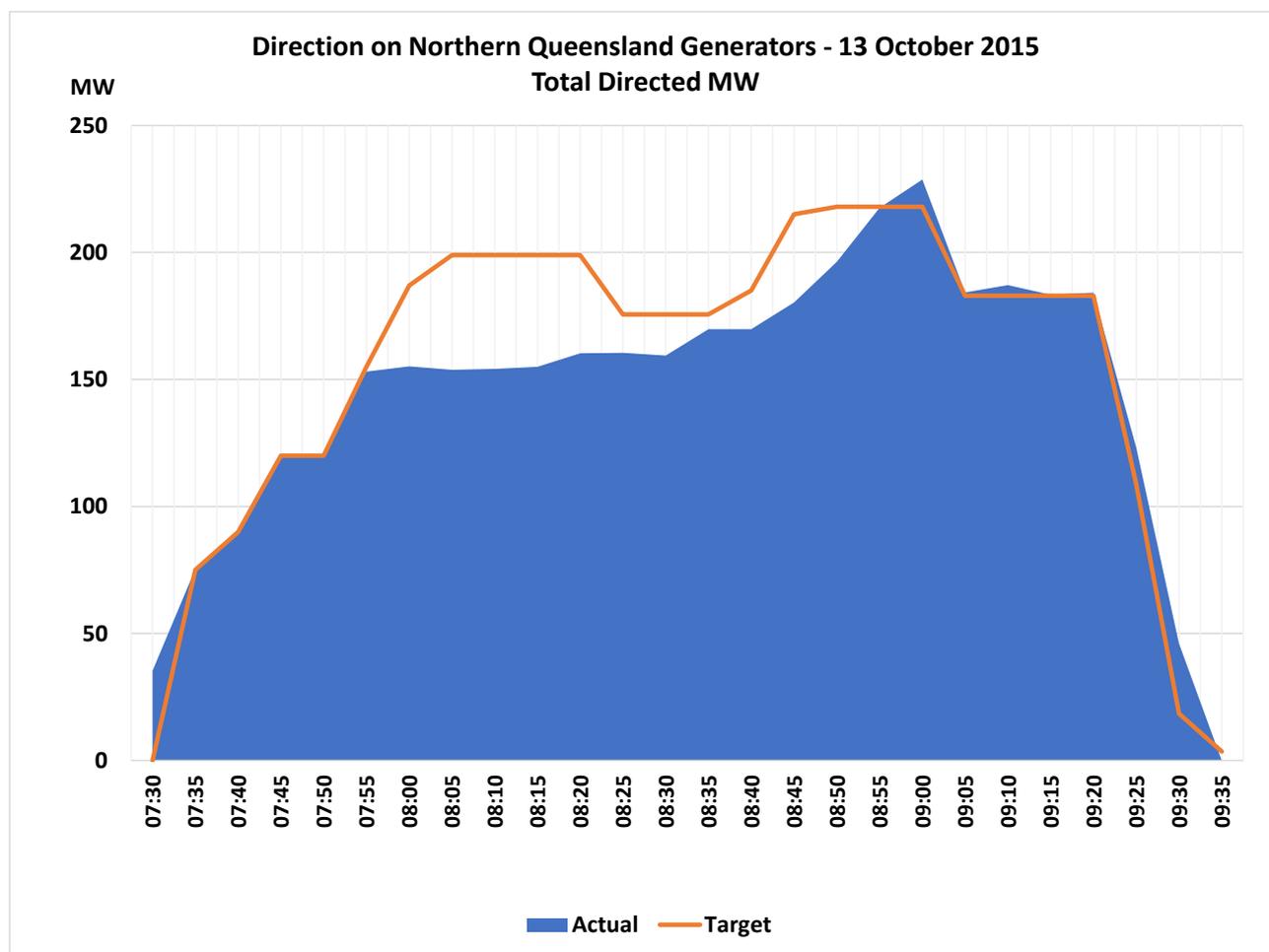
- Two directed generating units were unable to synchronise and follow target due to plant issues.
- Another directed generating unit had a delay in following targets for more than one DI. The participant has advised AEMO that the delay was due to an operational constraint.

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 flows.¹³

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

¹³ 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.

Figure 2: Impact of Direction



6 Conclusions and further actions

AEMO has reviewed all directions issued on 13 October 2015 and the circumstances surrounding those directions.

As required by NER clause 3.13.6 A, AEMO assessed its compliance with the processes for market notification and intervention.

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

While AEMO is satisfied that the intervention processes were mostly correctly followed, the event highlighted issues with the market notification process.

AEMO did not correctly follow the Power System Operating Procedure SO_OP 3705 in regard to the market notices. AEMO has since updated its internal procedures to align them with the procedure SO_OP 3705.