NEM SCHEDULING ERROR - INCORRECT 132 KV CONSTRAINT FORMULATION

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FINAL

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Contents

1 Summary

AEMO has determined that a scheduling error has occurred[1] because generation from a particular wind farm was not factored into a constraint equation to manage flow on a 132kV transmission line in South Australia.

The affected constraint equation, which applies during a circuit breaker (CB) outage at South East substation (SESS), manages flow on the Snuggery – Keith 132 kV line on the trip of one of the SESS 275/132 kV transformers.

The limit (right hand side) of the affected constraint equation did not include the impact of Canunda wind farm generation, which means the Snuggery – Keith 132 kV line would have operated at a higher-than-desirable loading. The incorrect constraint equation had been in operation since mid-2008.

The scheduling error occurred during dispatch intervals where the calculated post-contingent flow on the Snuggery – Keith 132 kV was above the limit in the constraint equation.

AEMO considers the market impact to be minor, with dispatch affected on 10 days from August 2008 to June 2012 and a maximum dispatch error of around 45 MW.

Under NER clause 3.16.2 (a), Market Participants affected by a scheduling error may apply to the dispute resolution panel established under NER clause 8.2.6A for a determination on compensation.

2 Description of the Error

2.1 Background

The constraint equation 'S>SE132CB_SETX_SGKH' manages flow into Keith on the Snuggery – Keith 132 kV line following a trip of one of the SESS 275/132 kV transformers, during a prior outage of a circuit breaker associated with the other SESS transformer. This is the affected constraint equation in error.

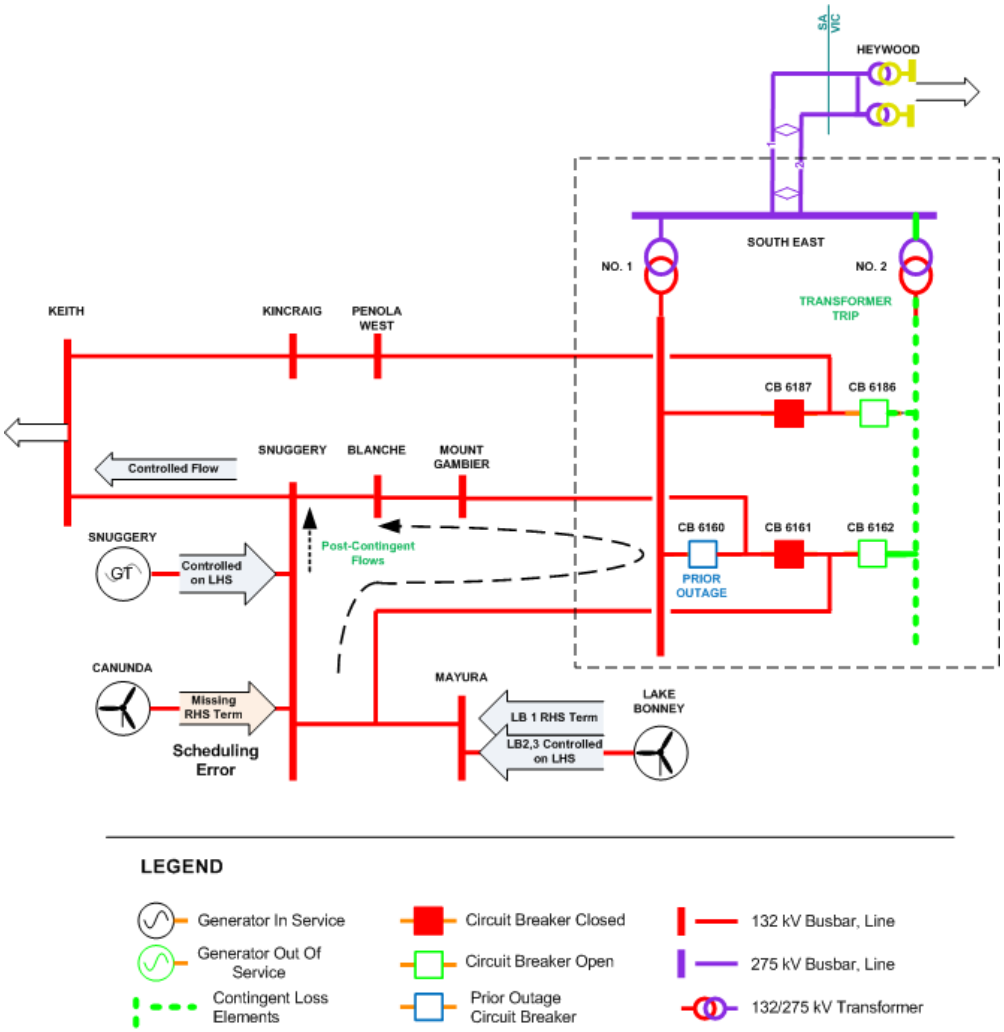
With CB 6160 out of service, the contingent loss of the SESS No.2 275/132 kV transformer results in all generation from Snuggery power station and Lake Bonney and Canunda wind farms (less load supplied to Snuggery, Blanche and Mount Gambier substations) being redirected through the Snuggery – Keith 132 kV line.

The same occurs for a prior outage of CB 6162 and the contingent loss of the SESS No.1 275/132 kV transformer.

Figure 1 shows the layout of SESS and surrounding transmission network. For clarity, only the relevant parts of the network have been included.

[1] In accordance with clause 3.8.24 (a)(3) of the NER

Figure 1 – Keith – Snuggery 132 kV line constraint and post-contingent flows



Several power stations are connected through the Snuggery 132 kV substation:

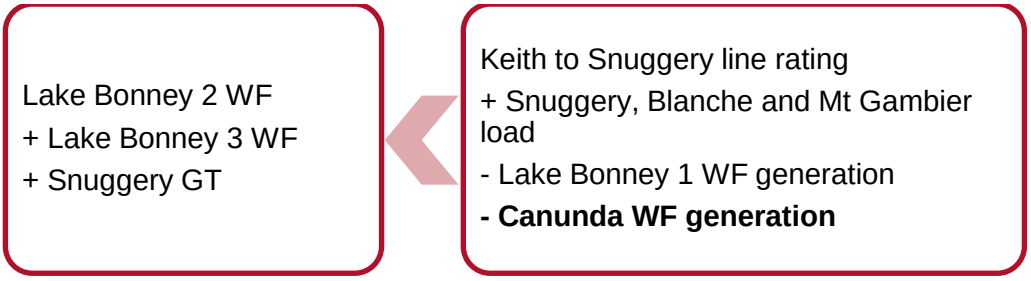
- Snuggery power station (69 MW, scheduled)
- Lake Bonney 1 wind farm (81 MW, non-scheduled)
- Lake Bonney 2 wind farm (159 MW, semi-scheduled)
- Lake Bonney 3 wind farm (39 MW, semi-scheduled)
- Canunda wind farm (46 MW, non-scheduled)

The affected constraint equation manages the post-contingent flow towards Keith on the Snuggery – Keith 132 kV line by constraining off generation from Snuggery, Lake Bonney 2 and Lake Bonney 3.

The post-contingent flow on the Snuggery – Keith 132 kV line is:

Flow = Lake Bonney 1, 2, 3 Gen + Snuggery Gen + Canunda Gen – Local Load

Hence the correct constraint equation formulation is:



2.2 Cause of the Error

On 1 August 2012, ElectraNet raised concerns about the interaction of two constraint equations associated with the outage of CB 6160 at SESS. AEMO immediately investigated and found an error with the formulation of one of the constraint equations, 'S>SE132CB_SETX_SGKH', which was rectified shortly afterwards.

AEMO had omitted Canunda wind farm generation from the right-hand-side of the constraint equation, for all versions used in central dispatch from August 2008 onwards. The pre-dispatch form of the constraint equation was correct.

2.3 Market Impacts

The impact of the error was that the calculated flow on the Snuggery – Keith 132 kV line was lower than the actual flow by the amount of Canunda generation at that time.

Canunda wind farm is a non-scheduled generating unit and is not subject to network constraints in the central dispatch process. This meant that, whenever the affected constraint equation was binding[2], the combined dispatch from the other generators contributing to the line flow – that is, Snuggery power station and Lake Bonney 2 and 3 wind farms – was higher than it would have been had the correct constraint equation been in place. In addition, the affected constraint equation did not bind in some dispatch intervals where it would have with the correct formulation.

Table 1 shows the dates that the affected constraint equation was binding and the number of dispatch intervals involved.

Table 1: Affected Period of Scheduling Error

Date	DIs Affected
21/08/2008	23
25/09/2008	97
26/09/2008	19
20/08/2010	65
23/08/2010	31
15/10/2011	15
28/04/2012	93
30/04/2012	30
1/05/2012	123
18/06/2012	58

2.4 Estimated Financial Impact

Whenever the affected constraint equation bound and Canunda wind farm was generating, the Snuggery power station and Lake Bonney 2 and 3 wind farms would have displaced higher-priced generation operating outside of the constraint equation.

[2] The concept of a binding constraint is explained in "Constraint Frequently Asked Questions", found at: http://www.aemo.com.au/Electricity/Market-Operations/Congestion-Information-Resource/Constraint-Frequently-Asked-Questions

This could have potentially lowered the spot price in South Australia, and possibly other regions depending on whether interconnector constraints were binding at the time.

According to AEMO's estimates, the adverse financial impact on any Market Participant due to this error is minor.

3 Assessment of the Error

3.1 Assessment against Criteria for a Scheduling Error

Under NER clause 3.8.24 (a)(2), a scheduling error occurs when AEMO determines that it has failed to follow the central dispatch process set out in rule 3.8.

In this case, AEMO has determined that its procedures for formulating and implementing constraint equations were not correctly followed and AEMO declares that a scheduling error has occurred.

3.2 Outcomes

Under NER clause 3.16.2 (a), Market Participants affected by a scheduling error may apply to the dispute resolution panel established under NER clause 8.2.6A for a determination on whether they are entitled to compensation.

4 Resulting Actions

AEMO rectified the error in constraint equation 'S>SE132CB_SETX_SGKH' shortly after it was identified on 1 August 2012.

AEMO has since initiated a review of all other constraint equations of a similar nature in South Australia.

AEMO conducts peer reviews of proposed changes to constraint equations before they are placed into service. In late 2011 this process was revised to be more rigorous.

If the revised peer review process had been in place when the affected constraint equation was first implemented in 2008, AEMO believes that the error would have been detected and rectified at that time. AEMO does not consider that any further changes are required to its processes for constraint equation formulation and peer review.

Appendix 1 – Constraint Formulation

Constraint: S>SE132CB_SETX_SGKH

Constraint type: LHS<=RHS

Constraint description: Out= South East 132 kV CB6160 or CB6162, avoid O/L Snuggery to Keith 132 kV line on trip of the South East 275/132 transformer providing 275 kV link to the LB2 WF

Impact: SA Generation

Reason: Prevent Snuggery - Keith line OL

Modifications: Changed Operating Margin from -5% to -5

Additional Notes: Snuggery, Blanche and Mt Gambier are connected radial on trip of the South East 275/132 transformer that is providing 275 kV link to the LB2 WF. LB2 and Snuggery generation are reduced to limit Snuggery Keith line flow.

LHS=
Lake Bonney 2 wind farm
+ Lake Bonney 3 wind farm
+ Snuggery GT (3 aggregated units)

RHS

Dispatch RHS=
SA: Keith to Snuggery 132 kV line 15 minute rating
- 5 {OperatingMargin}
+ Snuggery, Blanche and Mt Gambier transformer load MW
- Lake Bonney #1 generation (SCADA)

Predispatch RHS=
SA: Keith to Snuggery 132 kV line 15 minute rating
- 5 {OperatingMargin}
+ 0.042 x [South Australia region demand]
+ Lake Bonney Wind Farm - MW forecast is negative
+ Canunda Wind Farm - MW forecast is negative

Appendix 2 – Glossary

ABBREVIATION	TERM
CB	Circuit breaker
kV	kilovolt
MW	megawatt
NER	National Electricity Rules
SCADA	Supervisory Control and Data Acquisition
SESS	South East Substation

Appendix 3 – Legal Notices

Disclaimer

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