



SCHEDULING ERROR REPORT

INCORRECT BASSLINK STATUS AFFECTING TASMANIAN FCAS 20 AND 24 TO 26 OCTOBER 2011

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FINAL

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This report has been prepared by the Australian Energy Market Operator Limited (**AEMO**) for the sole purpose of declaring a scheduling error under clause 3.8.24 (a)(2) of the National Electricity Rules.

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Abbreviations and Symbols

ABBREVIATION	TERM
AEMO	Australian Energy Market Operator Ltd
CB	Circuit Breaker
DI	Dispatch Interval
FCAS	Frequency Control Ancillary Service
FCSPS	Frequency Control Special Protection Scheme
DSA	Dynamic Security Assessment
EMS	Energy Management System
MMS	Market Management System
NEM	National Electricity Market
NEMDE	NEM Dispatch Engine; the central dispatch software
R6	Raise 6 second or fast raise service
R60	Raise 60 second or slow raise service

R5	Raise 5 minute or delayed raise service
SCADA	Supervisory Control and Data Acquisition

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1 Summary

On 20 October 2011 the Tasmania to Victoria interconnector (Basslink) was taken out of service for planned maintenance work, separating Tasmania from the rest of the NEM.

The outage caused a failure of AEMO's Dynamic Security Assessment¹ (DSA) and required a temporary solution in AEMO's Energy Management System (EMS). The solution, applied from 1037 hrs on 20 October 2011, was only partially completed, and resulted in the Basslink status point incorrectly showing Basslink as being still in-service until corrected at 1123 hrs. The Basslink status point is used as an input to the Frequency Control Ancillary Services (FCAS) constraint equations that determine the contingency FCAS requirements in Tasmania for the loss of Basslink.

Basslink was returned to service at 1452 hrs on 24 October 2011 and the temporary solution removed, but shortly after there was an EMS database update that resulted in the Basslink status point reverting to a prior state and incorrectly showing Basslink as being out of service. This was corrected at 0318 hrs on 26 October 2011.

Consequently, incorrect FCAS was enabled in the Tasmania region for a number of periods between 1510 hrs on 24 October 2011 and 0320 hrs on 26 October 2011.

Under clause 3.8.24 (a)(2) of the National Electricity Rules, AEMO has determined that scheduling errors occurred during the dispatch intervals (DIs) that the incorrect Basslink status was used in the FCAS constraint equations.

2 Event Details

At 0445 hrs on 20 October 2011, Basslink was taken out of service for planned maintenance work. The disconnection of Basslink from the power system revealed an issue with the model for Basslink that caused the DSA process to fail to solve from around 0646 hrs.

So that the DSA would solve, AEMO applied a temporary solution in the EMS at 1037 hrs that involved hand-dressing the relevant Basslink circuit breakers (CBs) and isolators to "closed" status. However the solution was only partially completed, and at 1123 hrs AEMO also hand-dressed the Basslink status point to 'Off' (Basslink out of service), as it is derived from the Basslink CB status and was incorrectly showing as 'On' (Basslink in service) since 1037 hrs.

The Basslink status point is an input to a number of Tasmanian FCAS constraint equations used by the central dispatch process.

At 1452 hrs on 24 October 2011 Basslink was returned to service, and by 1456 hrs AEMO had removed all hand-dressing associated with the outage. This was done via the Norwest EMS session and was automatically replicated to the Mansfield EMS session. However, less than a minute earlier AEMO had swapped over the Mansfield EMS session from the primary to the standby database in preparation for a routine update, with the Basslink status point left in its hand-dressed 'Off' state on the primary (but now offline) database. At 1505 hrs, on completion of the database update, AEMO reverted the Mansfield EMS session to the primary database but hand-dressing of the Basslink status point was not removed². As a result, from DI ending 1520 hrs onwards the incorrect Basslink 'Off' status was used by the central dispatch process³ as input to the constraint equations that set Tasmania's contingency raise FCAS requirements for the loss of Basslink. Basslink received its first dispatch target (after it was returned to service) of 33 MW towards Tasmania for DI ending 1510 hrs.

¹ DSA uses this model to perform online power system stability analysis

² AEMO has an internal procedure for identifying differences between the online EMS databases, including differences in the hand-dress status.

³ The incorrect Basslink 'Off' status on the Mansfield EMS was used instead of the correct non hand-dressed Basslink 'On' status on the Norwest EMS session as a hand-dressed value always has priority over a good quality non hand-dressed value

At 0318 hrs on 26 October 2011, AEMO identified that the Basslink status on the Mansfield EMS session was incorrectly showing as 'Off'. The hand-dressing was removed and the Basslink status point returned to 'On'.

3 Scheduling Errors

Under clause 3.8.24 (a)(2) of the National Electricity Rules, 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, the central dispatch process used the incorrect Basslink status for a total period of approximately 37 hours, which resulted in the incorrect representation of contingency raise FCAS requirements in Tasmania.

As a result AEMO declares that a scheduling error occurred from DI ending 1045 hrs to 1125 hrs on 20 October 2011, and again from DI ending 1520 hrs on 24 October 2011 to DI ending 0320 hrs on 26 October 2011.

4 Impact of the Scheduling Errors

When Basslink is importing into Tasmania the Tasmanian frequency is mostly managed by the Frequency Control Special Protection Scheme (FCSPS) associated with Basslink. There is however a residual contingency raise FCAS requirement managed by the F_T++NIL_R% constraint equations.

When the contingency is the loss of Basslink the risk should be managed by the raise FCAS provided by generators in Tasmania. The constraint equations F_T+NIL_BL_R% manage this requirement. It is usually the F_T+NIL_BL_R6_1, F_T+NIL_BL_R60_1 and F_T+NIL_BL_R5 equations that bind, since the impact of the loss of Basslink is more severe than the residual Tasmanian contingency raise FCAS requirement following the loss of a generating unit.

One of the inputs to these constraint equations is the Basslink status point. If the Basslink status indication is 'Off', Basslink is out of service and not considered to be a contingency.

Figures 1A and 1B show the actual flow on Basslink for the duration of the scheduling errors.

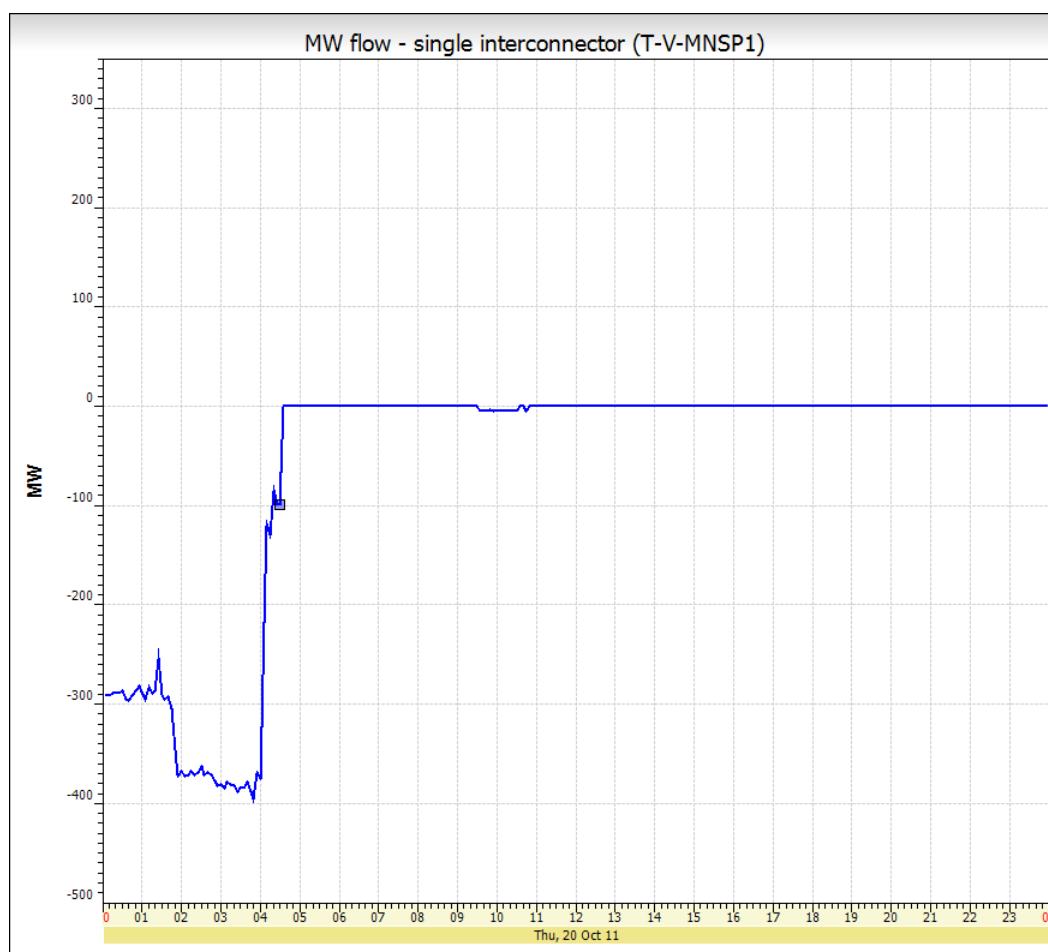


Figure 1A: Basslink flow for the first scheduling error on 20 October 2011

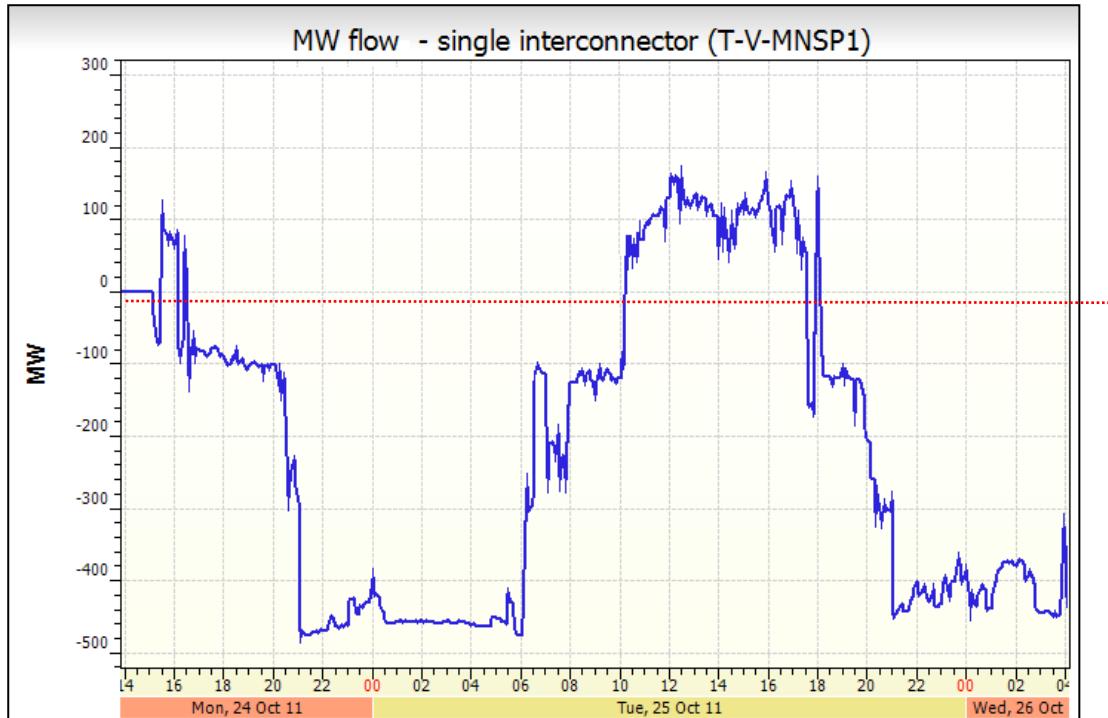


Figure 1B: Basslink flow for the second scheduling error from 24 to 26 October 2011

At any time Basslink flow is towards Tasmania (negative flow in the figures above) there is a potential contingency raise FCAS requirement in Tasmania to cover the loss of Basslink⁴.

For the scheduling error on 20 October 2011, although the Basslink status point was incorrectly showing 'On' this did not impact on the Tasmanian contingency raise FCAS requirement as Basslink was out of service.

However for the scheduling error from 24 to 26 October 2011 where the Basslink status point was incorrectly showing 'Off' (approximately 36 hours), the Basslink flow was towards Tasmania for 27.75 hours. During this time the raise FCAS enabled in Tasmania was incorrectly determined by central dispatch without considering the loss of Basslink as a risk. This was done by swamping⁵ the constraint equations F_T+NIL_BL_R6_1, F_T+NIL_BL_R60_1 and F_T+NIL_BL_R5 that set the Tasmanian contingency raise FCAS requirements for fast, slow and delayed services respectively, to cover the loss of Basslink.

AEMO performed a market study where the incorrect swamping was reversed. The shortfalls in the enabled FCAS when Basslink flow is towards Tasmania are indicated in Figure 2.

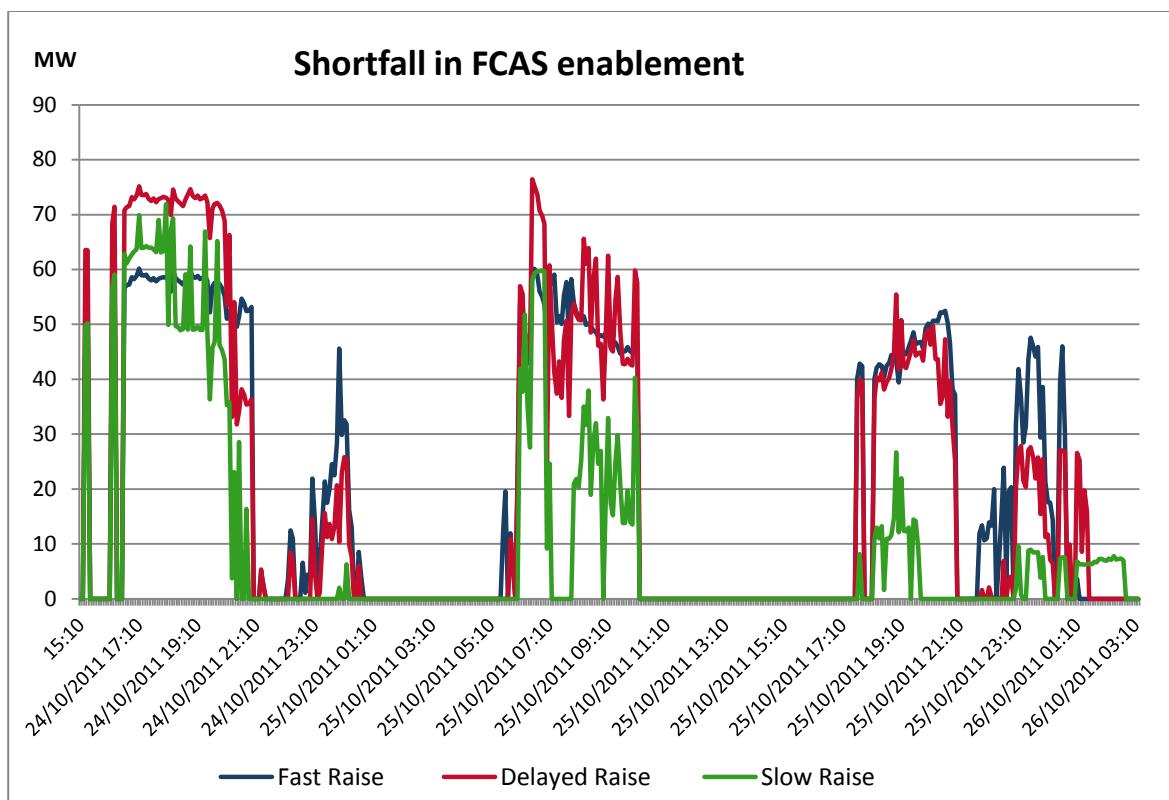


Figure 2 Shortfall in FCAS enablement for the duration of the second scheduling error

The enabled raise FCAS was below the Tasmanian contingency raise services requirement for approximately 21 hours, with the longest continuous period being 53 DIs or approximately 4.4 hours.

AEMO estimates the total market impact of the scheduling errors to be low, as underpayment to Tasmanian FCAS providers arising from the shortfall in enabled contingency raise FCAS is estimated to be around \$1,100.

⁴ No lower services are required in Tasmania when Basslink is exporting from Tasmania as this requirement is fully covered by the FCSPS.

⁵ Swamping is automatically adjusting the RHS by a large amount based on a condition (in this case, the Basslink status) in order to make the constraint equation ineffective

5 Further Actions

The current version of the model for Basslink, as supplied by Transend and used by the DSA, appears to cause DSA to fail when Basslink is disconnected from the power system. AEMO has requested an updated version of the model from Transend.

AEMO has established an EMS project to make the identification of failed and hand-dressed SCADA easier. This project is due for completion in 2012. AEMO has also updated its internal procedures for identifying and rectifying EMS database differences.

AEMO intends to publish a Power System Operating Incident Report describing the event in more detail, at http://www.aemo.com.au/reports/incident_reports.html.