

## Market ancillary service prices above \$5000/MW

4 October 2011  
South Australia



AUSTRALIAN ENERGY  
REGULATOR

### Introduction

The AER is required to publish a report where:

- prices for a market ancillary service over a period significantly exceed the relevant spot price for energy; and
- prices for a market ancillary service exceed \$5000/MW for a number of trading intervals within that period.<sup>1</sup>

The report must:

- describe the significant factors that contributed to the market ancillary service prices exceeding \$5000/MW;
- identify any linkages between spot prices in the energy market and market ancillary service prices contributing to the occurrence; and
- assess whether rebidding pursuant to clause 3.8.22 contributed to prices exceeding \$5000/MW.

### Summary

On 4 October 2011, a failure of processes led to a commissioning test of the new Mortlake generator proceeding during a planned transmission network outage in Victoria even though these combined activities had the potential to create adverse outcomes. This had unintended consequences in South Australia as it led to large requirements for local Frequency Control Ancillary Service (FCAS). The price for these services exceeded \$5000/MW and the cost, which is paid for by South Australian customers, totalled around \$3.9 million. This compares to less than \$3000 per day for the same services on a typical day. AEMO has reviewed its processes to prevent this happening again.

### Events on the day

On 4 October 2011, the lower ancillary service prices in South Australia exceeded \$5000/MW for a total of 56 five-minute dispatch intervals between 10.15 am and 1.35 pm. The power system in South Australia was also identified to be in an insecure state from 10.15 am to 11.10 am, as FCAS requirements were not met. The high FCAS prices and power system security breach was due to the commissioning testing of Mortlake Power Station<sup>2</sup> in Victoria coinciding with the planned outage of the Heywood to Portland (APD) No.2 500 kV transmission line.

AEMO published a [Power System Operating Incident Report](#)<sup>3</sup> into this event.

<sup>1</sup> This requirement is set out in clause 3.13.7 (e) of the National Electricity Rules.

<sup>2</sup> The Mortlake Power Station is a new power station that connects to the transmission network by bisecting the Heywood to Moorabool 500 kV #2 line, thereby creating two new transmission lines – the Heywood to Mortlake and Mortlake to Moorabool 500 kV lines. The other Heywood to Moorabool line (the #1 line) is unaffected.

<sup>3</sup> This report is available at [http://www.aemo.com.au/Electricity/Market-and-Power-Systems/NEM-Reports/Power-System-Operating-Incident-Reports/~/\\_media/Files/Other/reports/0232-0111%20pdf.ashx](http://www.aemo.com.au/Electricity/Market-and-Power-Systems/NEM-Reports/Power-System-Operating-Incident-Reports/~/_media/Files/Other/reports/0232-0111%20pdf.ashx)

**Frequency control ancillary services (FCAS)** are required to maintain the frequency of the power system within the frequency operating standards. There are two types of FCAS:

- Regulation services, which continuously manage small changes in demand or supply (changes that cause the frequency to move by only a small amount away from 50 Hz) to correct the frequency. There are regulation services to increase the frequency (raise regulation or RREG) and services to decrease the frequency (lower regulation or LREG).
- Contingency services, which manage large changes in demand or supply that occur relatively rarely and move the frequency by a large amount. There are contingency services to increase the frequency and contingency services to decrease the frequency.

Raise contingency FCAS are required to be available to correct the frequency excursions that have arisen from a credible contingency event<sup>4</sup> that leads to a decrease in frequency. As these contingency events usually involve step reductions in supply, the Electricity Rules stipulate that generators pay for these services.

Lower contingency FCAS are the services required to be available to correct the frequency excursions that arise from a credible contingency event that leads to an increase in frequency. As these contingency events usually involve step reductions in customer demand, the Electricity Rules stipulate that customers pay for these services.

There are three lower and three raise contingency services:

- fast services, which arrest a frequency deviation within the first six seconds of a contingent event (L6 and R6);
- slow services, which stabilise frequency deviations within sixty seconds of the event (L60/R60); and
- delayed services, which stabilise frequency deviations within five minutes of the event (L5/R5).

In the days leading up to the event, Origin Energy did not confirm in the market systems the commissioning test of Mortlake due to a number of uncertainties associated with the commissioning program. Thus the potential commitment (or start-up) of the plant was not reflected in the market systems. It was not until very close to the time of the test that Origin Energy was able to confirm that it wished to proceed. AEMO approved this decision and Origin Energy subsequently made rebids to reflect the planned start of the unit.

The combined effect of output from Mortlake generator and the planned outage of the APD to Heywood line saw flows forced into Victoria across the Heywood interconnector. This led to a requirement for local lower FCAS in South Australia that, at times, could not be met. The increased requirement for local lower FCAS in South Australia was not relieved until Mortlake shut down at around 2 pm.

AGL is the most significant provider of lower frequency control services in South Australia and offered, through day-ahead offers (and rebidding), the majority of the capacity for these services priced at the price cap.

The large requirement for FCAS combined with AGL's high offer prices meant the price for all lower frequency control services reached above \$5000/MW for 56 five-minute intervals in total and at the price cap for 41 of those intervals:

- Lower 60 second (L60) above \$5000/MW 41 times, 35 at the price cap
- Lower 6 second (L6) above \$5000/MW 9 times, 6 at the price cap
- Lower 5 minute (L5) above \$5000/MW 3 times
- Lower regulation (LREG) above \$5000/MW 3 times

---

<sup>4</sup> Any real power system is subject to shocks, for example the loss of a transmission line or a generator. Those shocks which have a material probability of occurring and/or are likely to have serious consequences are known as "credible contingencies".

Energy prices in South Australia were also affected, with the five-minute energy price reaching the price cap at 10.15 am leading to a spot price of \$2113/MWh at 10.30 am. This is described in detail in the [Electricity Weekly Report 2 – 8 October 2011](#).

#### **Network outage information prior to the event**

From 3 October<sup>5</sup>, there was a two day planned transmission outage of the APD to Heywood No.2 line in Victoria. According to AEMO's report this outage required the Heywood to Mortlake No.2 line and the Heywood M2 transformer to also be taken out of service, at times when the Mortlake generator was out of service.

On 3 October and the morning of 4 October, Mortlake was out of service, but the Network Outage Schedule (NOS) recorded only the outage of the APD-Heywood No.2 line and not the additional network equipment. In contrast, all three outages were reflected (through invoked network constraints) in the market systems.

Origin Energy informed the AER that its normal practice during the commissioning of Mortlake was to first check the NOS given there are several constraints that affect Mortlake, and that had the NOS correctly indicated the outage of the Heywood to Mortlake No.2 line, commissioning would likely have been postponed for the day.

#### **Mortlake generation**

Origin Energy contacted AEMO on 3 October to provide a commissioning schedule for the 4 October commissioning test. However, Origin Energy did not submit a generation availability offer prior to the morning of 4 October as they were not certain that the commissioning test would proceed. Origin Energy stated that the commissioning schedule had not been met on a number of occasions in the recent past, noting the limited control that Origin Energy has over the commissioning process.

Just prior to the commencement of the commissioning test, at 9.27 am on 4 October, Origin Energy informed AEMO of its intention to proceed with commissioning of Mortlake<sup>6</sup> unit one at 10 am, which AEMO approved. As part of its commissioning program, Mortlake Power Station required an initial fixed output level of 90 MW, increasing to 180 MW at the start of the 11 am trading interval before returning to 90 MW for the 2 pm trading interval and then shutting down by 2.30 pm.

At 10.03 am, first effective at 10.10 am, Origin Energy submitted its rebid to reflect the commissioning test. Mortlake unit one started to receive dispatch targets to increase its output at 10.10 am.

The late submission of Mortlake's generation offer meant that the offer was not in the pre-dispatch market forecasts.

AEMO notes in its report that at the time, a formal document explaining the specific requirements for commissioning and the issues that AEMO considers when granting permission to proceed with commissioning, did not exist. AEMO has since published a document, discussed further in the "follow up actions arising" section of this report below.

---

<sup>5</sup> Notification was advised through the market systems around four days prior to the outage.

<sup>6</sup> Mortlake Power Station is a new generator comprising two 280 MW generating units connected to the 500 kV network between Heywood and Moorabool in Victoria. Mortlake unit one first generated on 1 August 2011. After 2 August, the unit remained offline until 4 October.

## Network conditions

Prior to 10 am, (before Mortlake was online), electricity was flowing from Victoria to South Australia across both the Heywood and Murraylink interconnectors. The start of Mortlake at 10.10 am saw the network constraint used to manage the voltage imbalance at the APD 500 kV bus bind from 10.15 am.

As a result, the limits and flows on the Heywood interconnector changed, from 190 MW into South Australia at 10.10 am to forcing 123 MW into Victoria at 10.15 am.

The forced flow from South Australia in turn led to an increased requirement for local lower FCAS in South Australia, with the requirements for some services unable to be met. Local ancillary services are explained in the text box below.

### Local frequency control ancillary services

AEMO sets the requirement for FCAS to ensure that the frequency standard (as set by the Reliability Panel) is maintained in the event of step changes in supply that result from credible contingencies, including in this instance the loss of the Heywood to Moorabool No.1 line (which would have led to the loss of the interconnector). The Reliability Panel terms this as a “separation event”.<sup>7</sup>

The standard states that in the event of a “separation event” the frequency must be contained within 49 to 51 Hz or a wider band notified to AEMO by a relevant Jurisdictional Coordinator. In the case of South Australia AEMO states

*“the Jurisdictional Coordinator for South Australia has notified AEMO that the frequency band for separation of the South Australian power system is 47 to 52 Hz. ... The reliability panel has anticipated that under frequency relays will operate at frequency levels in the low end of this range.”*

When there is a potential separation event caused by the loss of an interconnector “local frequency control ancillary services” are usually required.

If the region was previously exporting and the interconnector fails, then local “lower” services are required to lower the frequency (typically generators offer to quickly reduce output to lower frequency). So in the event of a loss of the Heywood interconnector while exporting from South Australia, the resulting oversupply will lead to an increase in frequency in South Australia. In order to manage this, lower contingency FCAS must be sourced from suppliers in South Australia (typically generators). The requirement for this local lower FCAS is proportional to the flow across the interconnector from South Australia to Victoria.

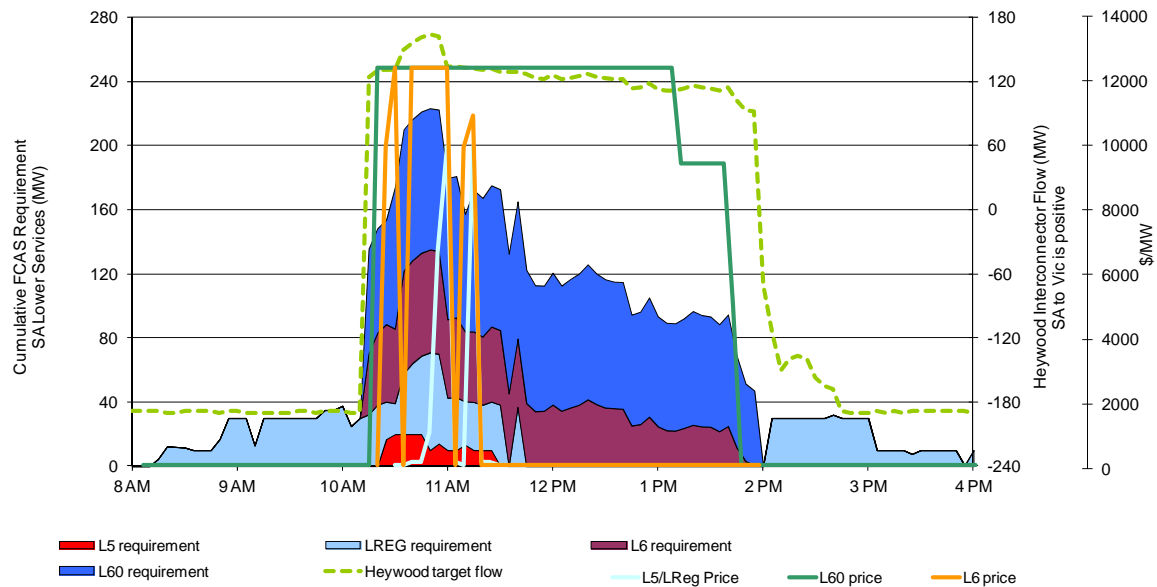
If the region was previously importing and the interconnector fails, then local “raise” services are required to increase the frequency. Typically generators offer to quickly increase output to raise frequency or, as occurs in South Australia, the low frequency will be remedied through involuntarily interrupting customer loads.

---

<sup>7</sup> A separation event is a credible contingency transmission event that forms an island.

Figure 1 shows the requirement and dispatch prices for local lower FCAS on 4 October and the flow across the Heywood interconnector. It highlights the relationship between exports from South Australia (shown on the right hand side vertical axis) and the local FCAS requirement. In the diagram, the shaded areas are all local FCAS requirements for South Australia. A positive flow indicates export of electricity from South Australia to Victoria.

**Figure 1: South Australia local lower FCAS requirements and Heywood interconnector flow**



Note that the frequency standard allows for LREG to be substituted for L5 and the prices of both services are closely aligned.

Mortlake unit one was first dispatched at 10.10 am and continued to increase its output to 150 MW by 10.55 am before voluntarily reducing its output to 80 MW by 11.15 am to help alleviate the constraint.

### FCAS Price Outcomes

The voluntary reduction of Mortlake generation mentioned above saw a reduction in forced exports across the Heywood interconnector. This in turn reduced the South Australian local FCAS requirements.

The price for L60 local services reached the price cap (\$12 500/MW) for 35 consecutive dispatch intervals from 10.15 am before falling to \$9500/MW for six consecutive dispatch intervals from 1.10 pm. Prices for the L6 service exceeded \$9500/MW for nine dispatch intervals between 10.20 am and 11.10 am, reaching the price cap for six dispatch intervals in that period. Prices for the L5 and LREG services increased to \$6750/MW at 10.50 am and around \$10 000/MW at 10.55 am and 11.10 am.

At around 12.45 pm AEMO required Mortlake to postpone the commissioning program to allow AEMO to perform further power system studies in response to the unexpected market outcomes caused by the constraint equation. Mortlake shut down from 1.45 pm and the price of local lower 60 second FCAS reduced to below \$5/MW.

## **Generator FCAS offers**

There are only three power stations registered to provide the L6, L60 and LREG lower contingency services in South Australia—Northern Power Station (owned by Alinta Energy), Torrens Island A and B (owned by AGL) and Pelican Point Power Station (owned by International Power). The Torrens Island B units are the only registered providers of L5.

### Initial offers

During the time of high prices, the following day-ahead offers were made:

#### Torrens Island Power Station - AGL

- 250 MW of L60 (110 MW priced at the cap) and
- 115 MW of L6 (30 MW priced at the cap) and
- 200 MW of L5 (120 MW priced at the cap) and
- 200 MW of LREG (60 MW priced at the cap).

#### Northern Power Station - Alinta

- 46 MW of L60 (24 MW priced less than \$5/MW and the remainder priced at around \$11 000/MW) and
- 28 MW of L6 (18 MW priced less than \$15/MW and the remainder priced at around \$11 000/MW) and
- 20 MW of LREG (16 MW priced less than \$1/MW or less and the remainder at around \$11 000/MW).

#### Pelican Point Power Station – International Power

- 15 MW of L60 (all priced at \$10/MW or less) and
- 15 MW of L6 (all priced at \$10/MW or less) and
- 30 MW of LREG (20 MW priced at \$15/MW or less and the remainder priced at less than \$100/MW).

### Rebids

At 10.42 am on 4 October, effective from 10.50 am, AGL rebid 10 MW of L5 FCAS at Torrens Island B from \$5/MW to the price cap. The rebid was effective for the 11 am to 12.30 pm trading intervals. The reason given for the rebid was “10:31A Unicast network constraint :: V\_HYMO2\_1”.

There were no other rebids that impacted on the high FCAS prices.

### Closing offers

AGL is the largest provider of FCAS in South Australia. The increased requirement for local lower FCAS saw the high priced FCAS offers (together with high priced energy offers) from AGL dispatched and setting the price for these services for 54 out of 56 dispatch intervals.

The generators involved in setting the price during the high-price period and how that price was determined by the market systems is detailed in Appendix A.

Both AGL and Alinta Energy offered capacity priced at or above \$5000/MW for lower FCAS. The closing bids are presented in Appendix B.

## Follow up actions arising<sup>8</sup>

Following this event a number of actions have been undertaken:

- AEMO has published a document, the [\*Commissioning Requirements for Generating Systems\*](#)<sup>9</sup> to address some of the concerns that arose on the day.
- AEMO has reinforced to its staff the need to verify potential power system security issues in pre-dispatch before issuing permission to proceed for commissioning testing of new generation units. These procedures require: commissioning plans to be submitted in advance; generator offers be in place that reflect the commissioning plan; and for at least one hour, separation between commissioning and any potentially conflicting network outages.
- Origin Energy has revised its procedures for commissioning of generating units, requiring submissions of offers reflecting the expected generation profile at least one day ahead regardless of whether the commissioning schedules are firm or not and to rebid whenever there are changes to that expectation.
- AEMO has reviewed its processes for advising and communicating changes to relevant participants in relation to network re-arrangements required for transmission outages.

**Australian Energy Regulator  
May 2012**

---

<sup>8</sup> Source: AEMO, *Power System Operating Incident Report: Insecure Power System Operation on 4 October 2011*, Feb 2012.

<sup>9</sup> This document was published by AEMO on 14 December 2011 and is available at [http://www.aemo.com.au/~media/Files/Other/connections/network\\_connections/documents/0174-0006%20pdf.pdf](http://www.aemo.com.au/~media/Files/Other/connections/network_connections/documents/0174-0006%20pdf.pdf)

## Appendix A – FCAS price setters for 4 October 2011

The following tables identify for the five-minute FCAS dispatch prices above \$5000/MW, each price and the generating units involved in setting the price for each of the lower Frequency Control Ancillary Services in South Australia. This information is published by AEMO<sup>10</sup>. Also shown is the offer prices involved in determining the dispatch price together with the quantity of that service and the contribution to the total price. AEMO reports an increase as a negative marginal change in FCAS price setter.

### South Australia – lower 60 second FCAS – 4 October 2011

Time	Dispatch Price	Participant	Unit	Service	Offer Price	Marginal change	Contribution
10:15	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
10:20	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
10:25	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
10:30	\$12 500.00*	International Power	LOYYB1	ENOF	\$17.89	-0.0048	-\$0.09
		International Power	PPCCGT	L5RE	\$11.69	0.18	\$2.10
		Snowy Hydro	MURRAY	R5MI	\$5.50	0.18	\$0.99
		Snowy Hydro	UPPTUMUT	ENOF	\$29.07	-0.1897	-\$5.51
		AGL (SA)	TORRB3	ENOF	-\$1000.00	0.18	-\$180.00
		AGL (SA)	TORRB3	L5RE	\$0.45	-0.18	-\$0.08
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5MI	\$0.95	-0.18	-\$0.17
			ENOF,CLEMGPF,1,TORRB3,1	tbslack2	\$0.00	10.26	\$0.00
			ENOF,NPS1,1,TORRB3,1	tbslack2	\$0.00	48.96	\$0.00
			ENOF,NPS2,1,TORRB3,1	tbslack2	\$0.00	45	\$0.00
			ENOF,OSB-AG,1,TORRB3,1	tbslack1	\$0.00	-21.24	\$0.00
			ENOF,PLAYB-AG,1,TORRB3,1	tbslack2	\$0.00	36	\$0.00
			ENOF,POR01,1,TORRB3,1	tbslack1	\$0.00	-1.8	\$0.00
			ENOF,PPCCGT,1,TORRB3,1	tbslack1	\$0.00	-30.6	\$0.00
			ENOF,SNUG1,1,TORRB3,1	tbslack1	\$0.00	-0.72	\$0.00
			ENOF,TORRA1,1,TORRB3,1	tbslack2	\$0.00	8.1	\$0.00
			ENOF,TORRA2,1,TORRB3,1	tbslack2	\$0.00	8.1	\$0.00
			ENOF,TORRA3,1,TORRB3,1	tbslack2	\$0.00	8.1	\$0.00
			ENOF,TORRA4,1,TORRB3,1	tbslack2	\$0.00	8.1	\$0.00
			ENOF,TORRB1,1,TORRB3,1	tbslack2	\$0.00	10.8	\$0.00
			ENOF,TORRB2,1,TORRB3,1	tbslack2	\$0.00	10.8	\$0.00
			ENOF,TORRB3,1,TORRB4,1	tbslack2	\$0.00	-36	\$0.00
10:35	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
10:40	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
10:45	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
10:50	\$12 500.00*	Alinta Energy	NPS1	ENOF	-\$1000.00	0.7391	-\$739.10
		Alinta Energy	NPS1	L60S	\$10 999.00	-1	-\$10 999.00
		Macquarie Gen.	BW03	R5MI	\$4.80	-0.7391	-\$3.55
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.3696	-\$4619.91
		AGL (SA)	TORRB3	L5RE	\$0.90	-0.3696	-\$0.33
		AGL (SA)	TORRB3	R5RE	\$0.90	0.3696	\$0.33
		AGL (SA)	TORRB4	ENOF	-\$1000.00	-0.3696	\$369.60
		AGL (SA)	TORRB4	L5RE	\$0.90	0.3696	\$0.33
		AGL (SA)	TORRB4	R5RE	\$0.90	0.3696	\$0.33
			ENOF,CLEMGPF,1,NPS1,1	tbslack2	\$0.00	42.1304	\$0.00
			ENOF,CLEMGPF,1,TORRB4,1	tbslack2	\$0.00	-21.0652	\$0.00
			ENOF,MINTARO,1,NPS1,1	tbslack2	\$0.00	22.1739	\$0.00
			ENOF,MINTARO,1,TORRB4,1	tbslack2	\$0.00	-11.087	\$0.00
			ENOF,NPS1,1,NPS2,1	tbslack1	\$0.00	184.7826	\$0.00
			ENOF,NPS1,1,OSB-AG,1	tbslack2	\$0.00	-87.2174	\$0.00
			ENOF,NPS1,1,PLAYB-AG,1	tbslack1	\$0.00	147.8261	\$0.00
			ENOF,NPS1,1,POR01,1	tbslack2	\$0.00	-14.7826	\$0.00
			ENOF,NPS1,1,PPCCGT,1	tbslack2	\$0.00	-125.6522	\$0.00
			ENOF,NPS1,1,SNUG1,1	tbslack2	\$0.00	-2.9565	\$0.00
			ENOF,NPS1,1,TORRA1,1	tbslack1	\$0.00	33.2609	\$0.00
			ENOF,NPS1,1,TORRA2,1	tbslack1	\$0.00	33.2609	\$0.00
			ENOF,NPS1,1,TORRA3,1	tbslack1	\$0.00	33.2609	\$0.00
			ENOF,NPS1,1,TORRA4,1	tbslack1	\$0.00	33.2609	\$0.00
			ENOF,NPS1,1,TORRB1,1	tbslack1	\$0.00	44.3478	\$0.00
			ENOF,NPS1,1,TORRB2,1	tbslack1	\$0.00	44.3478	\$0.00
			ENOF,NPS1,1,TORRB3,1	tbslack2	\$0.00	-44.3478	\$0.00
			ENOF,NPS1,1,TORRB4,1	tbslack2	\$0.00	-248.3478	\$0.00

<sup>10</sup>

Details on how the price is determined can be found at [www.aemo.com.au](http://www.aemo.com.au)



			ENOF,NPS2,1,TORRB4,1	tbslack2	\$0.00	-92.3913	\$0.00
			ENOF,OSB-AG,1,TORRB4,1	tbslack1	\$0.00	43.6087	\$0.00
			ENOF,PLAYB-AG,1,TORRB4,1	tbslack2	\$0.00	-73.913	\$0.00
			ENOF,POR01,1,TORRB4,1	tbslack1	\$0.00	7.3913	\$0.00
			ENOF,PPCCGT,1,TORRB4,1	tbslack1	\$0.00	62.8261	\$0.00
			ENOF,SNUG1,1,TORRB4,1	tbslack1	\$0.00	1.4783	\$0.00
			ENOF,TORRA1,1,TORRB4,1	tbslack2	\$0.00	-16.6304	\$0.00
			ENOF,TORRA2,1,TORRB4,1	tbslack2	\$0.00	-16.6304	\$0.00
			ENOF,TORRA3,1,TORRB4,1	tbslack2	\$0.00	-16.6304	\$0.00
			ENOF,TORRA4,1,TORRB4,1	tbslack2	\$0.00	-16.6304	\$0.00
			ENOF,TORRB1,1,TORRB4,1	tbslack2	\$0.00	-22.1739	\$0.00
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-3.6957	\$0.00
			ENOF,TORRB2,1,TORRB4,1	tbslack2	\$0.00	-22.1739	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-3.6957	\$0.00
			ENOF,TORRB3,1,TORRB4,1	tbslack1	\$0.00	22.1739	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-3.6957	\$0.00
10:55	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
11:00	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
11:05	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
11:10	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
11:15	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
11:20	\$12 500.00*	Delta Electricity	VP6	R5MI	\$2.00	0.2546	\$0.51
		Hydro Tasmania	GORDON	L60S	\$0.35	0.2546	\$0.09
		Hydro Tasmania	GORDON	L6SE	\$0.10	0.2546	\$0.03
		Hydro Tasmania	JBUTTERS	ENOF	\$22.18	0.2546	\$5.65
		Hydro Tasmania	JBUTTERS	R5MI	\$1.90	-0.2546	-\$0.48
		Hydro Tasmania	MACKNTSH	L5MI	\$0.40	0.2546	\$0.10
		Origin Energy	ER03	R5RE	\$2.00	0.58	\$1.16
		Snowy Hydro	UPPTUMUT	ENOF	\$29.07	0.6644	\$19.31
		Snowy Hydro	UPPTUMUT	R60S	\$1.00	0.2546	\$0.25
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.90	-0.58	-\$0.52
		TRUenergy	YWPS1	L5MI	\$0.05	-0.2546	-\$0.01
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
			T-V-MNSP1,TAS1	ENOF	\$0.00	-0.2546	\$0.00
11:25	\$12 500.00*	CS Energy	GSTONE1	ENOF	\$23.82	0.3564	\$8.49
		CS Energy	GSTONE2	ENOF	\$23.82	0.3564	\$8.49
		Hydro Tasmania	BASTYAN	ENOF	\$22.14	0.1496	\$3.31
		Hydro Tasmania	JBUTTERS	R60S	\$0.90	-0.1496	-\$0.13
		Hydro Tasmania	MEADOWBK	L60S	\$0.01	0.1496	\$0.00
		Origin Energy	ER04	R5RE	\$2.00	0.58	\$1.16
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.90	-0.58	-\$0.52
		TRUenergy	MP2	R60S	\$0.97	0.1496	\$0.15
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
			T-V-MNSP1,TAS1	ENOF	\$0.00	-0.1496	\$0.00
11:30	\$12 500.00*	Hydro Tasmania	BASTYAN	ENOF	\$22.14	0.1155	\$2.56
		Hydro Tasmania	MACKNTSH	R5MI	\$1.90	0.58	\$1.10
		Hydro Tasmania	MEADOWBK	L60S	\$0.01	0.1155	\$0.00
		Hydro Tasmania	TUNGATIN	R60S	\$0.90	-0.1155	-\$0.10
		Snowy Hydro	TUMUT3	ENOF	\$25.07	0.6501	\$16.30
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.90	-0.58	-\$0.52
		TRUenergy	MP2	R60S	\$0.97	0.1155	\$0.11
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
			T-V-MNSP1,TAS1	ENOF	\$0.00	-0.1155	\$0.00
11:35	\$12 500.00*	Hydro Tasmania	JBUTTERS	R5MI	\$1.90	0.58	\$1.10
		LYMMCo	LYA4	ENOF	\$21.40	0.1313	\$2.81
		Snowy Hydro	UPPTUMUT	ENOF	\$25.10	0.6553	\$16.45
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.90	-0.58	-\$0.52
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
11:40	\$12 500.00*	Hydro Tasmania	BASTYAN	R5MI	\$1.90	0.58	\$1.10
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90

		AGL (SA)	TORRB3	R5RE	\$0.90	-0.58	-\$0.52
		AGL (SA)	TORRB4	ENOF	\$38.77	0.58	\$22.49
			ENOF,TORRA1,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRA2,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRA3,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRA4,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
11:45	\$12 500.00*	Aurora Energy	TVCC201	ENOF	\$22.06	0.1651	\$3.64
		Delta Electricity	VP6	ENOF	\$29.50	0.669	\$19.74
		Hydro Tasmania	GORDON	R5MI	\$1.90	0.58	\$1.10
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.90	-0.58	-\$0.52
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
			ENOF,VP5,5,VP6,5	tbslack2	\$0.00	53.5183	\$0.00
			T-V-MNSP1,TAS1	ENOF	\$0.00	-0.1651	\$0.00
11:50	\$12 500.00*	Delta Electricity	VP6	ENOF	\$29.50	0.6781	\$20.00
		Hydro Tasmania	FISHER	R5MI	\$1.90	0.58	\$1.10
		LYMMCo	LYA3	ENOF	\$21.30	0.208	\$4.43
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.45	-0.58	-\$0.26
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
			ENOF,VP5,5,VP6,5	tbslack2	\$0.00	54.2439	\$0.00
11:55	\$12 500.00*	CS Energy	GSTONE4	L5RE	\$0.99	-0.58	-\$0.57
		Hydro Tasmania	GORDON	R5MI	\$1.90	0.58	\$1.10
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.45	-0.58	-\$0.26
		AGL (SA)	TORRB4	ENOF	\$38.77	0.58	\$22.49
		AGL (SA)	TORRB4	L5RE	\$0.45	0.58	\$0.26
			ENOF,TORRA1,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRA2,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRA3,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRA4,4,TORRB4,4	tbslack2	\$0.00	17.4	\$0.00
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
12:00	\$12 500.00*	Hydro Tasmania	BASTYAN	R5MI	\$1.90	0.58	\$1.10
		LYMMCo	LYA4	ENOF	\$21.40	0.1707	\$3.65
		Stanwell Corp.	STAN-2	ENOF	\$26.97	0.7259	\$19.58
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.58	-\$7249.87
		AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5RE	\$0.90	-0.58	-\$0.52
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5.8	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5.8	\$0.00
12:05	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:10	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:15	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:20	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:25	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:30	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:35	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:40	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:45	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:50	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
12:55	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
13:00	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
13:05	\$12 499.90	AGL (SA)	TORRB3	L60S	\$12 499.90	-1	-\$12 499.90
13:10	\$9500.00	AGL (SA)	TORRB3	L60S	\$9500.00	-1	-\$9500.00
13:15	\$9500.00	AGL (SA)	TORRB3	L60S	\$9500.00	-1	-\$9500.00
13:20	\$9500.00	AGL (SA)	TORRB3	L60S	\$9500.00	-1	-\$9500.00
13:25	\$9500.00	AGL (SA)	TORRB3	L60S	\$9500.00	-1	-\$9500.00
13:30	\$9500.00	AGL (SA)	TORRB3	L60S	\$9500.00	-1	-\$9500.00
13:35	\$9500.00	AGL (SA)	TORRB3	L60S	\$9500.00	-1	-\$9500.00

\*denotes period where the market price cap was applied

## South Australia – lower 6 second FCAS – 4 October 2011

Time	Dispatch Price	Participant	Unit	Service	Offer Price	Marginal change	Contribution
10:20	\$9999.90	AGL (SA)	TORRB4	L6SE	\$9999.90	-1	-\$9999.90
10:25	\$12 499.90	AGL (SA)	TORRB3	L6SE	\$12 499.90	-1	-\$12 499.90
10:35	\$12 500.00*	Aurora Energy	TVCC201	ENOF	\$22.06	-0.0541	-\$1.19
		Macquarie Generation	BW01	ENOF	\$30.37	-0.134	-\$4.07
		Macquarie Generation	BW02	ENOF	\$30.37	-0.134	-\$4.07
		Macquarie Generation	BW03	ENOF	\$30.37	-0.134	-\$4.07
		Macquarie Generation	BW04	ENOF	\$30.37	-0.134	-\$4.07
		International Power	PPCCGT	L5RE	\$99.69	0.5	\$49.85
		Snowy Hydro	UPPTUMUT	R5RE	\$5.50	0.5	\$2.75
		AGL (SA)	TORRB3	ENOF	-\$1000.00	0.5	-\$500.00
		AGL (SA)	TORRB3	L5RE	\$0.45	-0.5	-\$0.23
		AGL (SA)	TORRB3	L6SE	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5MI	\$0.95	-0.5	-\$0.48
			ENOF,CLEMGPWF,1,TORRB3,1	tbslack2	\$0.00	28.5	\$0.00
			ENOF,NPS1,1,TORRB3,1	tbslack2	\$0.00	136	\$0.00
			ENOF,NPS2,1,TORRB3,1	tbslack2	\$0.00	125	\$0.00
			ENOF,OSB-AG,1,TORRB3,1	tbslack1	\$0.00	-59	\$0.00
			ENOF,PLAYB-AG,1,TORRB3,1	tbslack2	\$0.00	100	\$0.00
			ENOF,POR01,1,TORRB3,1	tbslack1	\$0.00	-10	\$0.00
			ENOF,PPCCGT,1,TORRB3,1	tbslack1	\$0.00	-85	\$0.00
			ENOF,SNUG1,1,TORRB3,1	tbslack1	\$0.00	-2	\$0.00
			ENOF,TORRA1,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA2,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA3,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA4,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRB1,1,TORRB3,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB2,1,TORRB3,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB3,1,TORRB4,1	tbslack2	\$0.00	-100	\$0.00
			T-V-MNSP1,TAS1	ENOF	\$0.00	0.0541	\$0.00
10:40	\$12 500.00*	Delta Electricity	VP6	R5RE	\$5.00	0.5	\$2.50
		LYMMCo	LYA1	ENOF	\$24.10	-0.1143	-\$2.75
		International Power	PPCCGT	L5RE	\$99.69	0.5	\$49.85
		Origin Energy	ER03	ENOF	\$29.09	-0.549	-\$15.97
		AGL (SA)	TORRB3	ENOF	-\$1000.00	0.5	-\$500.00
		AGL (SA)	TORRB3	L5RE	\$0.45	-0.5	-\$0.23
		AGL (SA)	TORRB3	L6SE	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5MI	\$0.95	-0.5	-\$0.48
			ENOF,CLEMGPWF,1,TORRB3,1	tbslack2	\$0.00	28.5	\$0.00
			ENOF,ER02,7,ER03,7	tbslack2	\$0.00	-65.8845	\$0.00
			ENOF,ER03,7,ER04,7	tbslack1	\$0.00	-43.923	\$0.00
			ENOF,NPS1,1,TORRB3,1	tbslack2	\$0.00	136	\$0.00
			ENOF,NPS2,1,TORRB3,1	tbslack2	\$0.00	125	\$0.00
			ENOF,OSB-AG,1,TORRB3,1	tbslack1	\$0.00	-59	\$0.00
			ENOF,PLAYB-AG,1,TORRB3,1	tbslack2	\$0.00	100	\$0.00
			ENOF,POR01,1,TORRB3,1	tbslack1	\$0.00	-10	\$0.00
			ENOF,PPCCGT,1,TORRB3,1	tbslack1	\$0.00	-85	\$0.00
			ENOF,SNUG1,1,TORRB3,1	tbslack1	\$0.00	-2	\$0.00
			ENOF,TORRA1,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA2,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA3,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA4,1,TORRB3,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRB1,1,TORRB3,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB2,1,TORRB3,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB3,1,TORRB4,1	tbslack2	\$0.00	-100	\$0.00
10:45	\$12 500.00*	AGL (SA)	TORRB3	L6SE	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5MI	\$0.95	-0.5	-\$0.48
		AGL (SA)	TORRB3	R5RE	\$0.45	0.5	\$0.23
10:50	\$12499.93	AGL (SA)	TORRB3	L6SE	\$12 499.90	-1	-\$12 499.90
		AGL (SA)	TORRB3	R5MI	\$0.95	-0.5	-\$0.48
		AGL (SA)	TORRB3	R5RE	\$0.90	0.5	\$0.45
10:55	\$12 499.90	AGL (SA)	TORRB3	L6SE	\$12 499.90	-1	-\$12 499.90
11:05	\$9999.92	AGL (SA)	TORRB4	L6SE	\$9999.90	-1	-\$9999.90
		AGL (SA)	TORRB4	R5MI	\$0.95	-0.4667	-\$0.44
		AGL (SA)	TORRB4	R5RE	\$0.90	0.4667	\$0.42
11:10	\$10999.00	Alinta Energy	NPS1	L6SE	\$10999.00	-1	-\$10999.00

\*denotes period where the market price cap was applied

### South Australia – lower 5 minute FCAS – 4 October 2011

Time	Dispatch Price	Participant	Unit	Service	Offer Price	Marginal change	Contribution
10:50	\$6750.68	CS Energy	CALL_B_2	L5RE	\$0.50	1	\$0.50
		AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.5	-\$6249.89
		AGL (SA)	TORRB3	L5RE	\$0.90	-0.5	-\$0.45
		AGL (SA)	TORRB3	R5RE	\$0.90	0.5	\$0.45
		AGL (SA)	TORRB4	ENOF	-\$1000.00	0.5	-\$500.00
		AGL (SA)	TORRB4	L5RE	\$0.90	-0.5	-\$0.45
		AGL (SA)	TORRB4	R5RE	\$0.90	-0.5	-\$0.45
		TRUenergy	MP2	L5MI	\$0.40	-1	-\$0.40
			ENOF,CLEMGPF,1,TORRB4,1	tbslack2	\$0.00	28.5	\$0.00
			ENOF,MINTARO,1,TORRB4,1	tbslack2	\$0.00	15	\$0.00
			ENOF,NPS1,1,TORRB4,1	tbslack2	\$0.00	136	\$0.00
			ENOF,NPS2,1,TORRB4,1	tbslack2	\$0.00	125	\$0.00
			ENOF,OSB-AG,1,TORRB4,1	tbslack1	\$0.00	-59	\$0.00
			ENOF,PLAYB-AG,1,TORRB4,1	tbslack2	\$0.00	100	\$0.00
			ENOF,POR01,1,TORRB4,1	tbslack1	\$0.00	-10	\$0.00
			ENOF,PPCCGT,1,TORRB4,1	tbslack1	\$0.00	-85	\$0.00
			ENOF,SNUG1,1,TORRB4,1	tbslack1	\$0.00	-2	\$0.00
			ENOF,TORRA1,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA2,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA3,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA4,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRB1,1,TORRB4,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5	\$0.00
			ENOF,TORRB2,1,TORRB4,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5	\$0.00
			ENOF,TORRB3,1,TORRB4,1	tbslack1	\$0.00	-30	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5	\$0.00
10:55	\$9999.90	AGL (SA)	TORRB4	L5MI	\$9999.90	-1	-\$9999.90
11:10	\$9999.90	AGL (SA)	TORRB4	L5MI	\$9999.90	-1	-\$9999.90

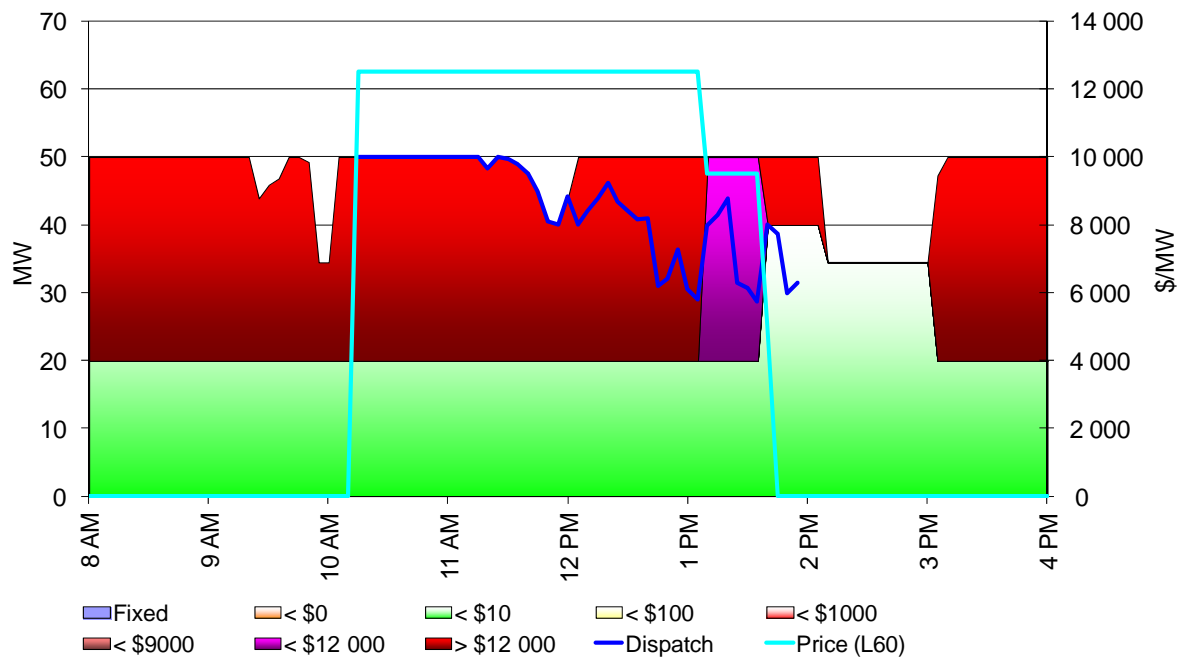
### South Australia – lower regulation FCAS – 4 October 2011

Time	Dispatch Price	Participant	Unit	Service	Offer Price	Marginal change	Contribution
10:50	\$6750.78	AGL (SA)	TORRB3	ENOF	\$12 499.77	-0.5	-\$6249.89
		AGL (SA)	TORRB3	L5RE	\$0.90	-0.5	-\$0.45
		AGL (SA)	TORRB3	R5RE	\$0.90	0.5	\$0.45
		AGL (SA)	TORRB4	ENOF	-\$1000.00	0.5	-\$500.00
		AGL (SA)	TORRB4	L5RE	\$0.90	-0.5	-\$0.45
		AGL (SA)	TORRB4	R5RE	\$0.90	-0.5	-\$0.45
			ENOF,CLEMGPF,1,TORRB4,1	tbslack2	\$0.00	28.5	\$0.00
			ENOF,MINTARO,1,TORRB4,1	tbslack2	\$0.00	15	\$0.00
			ENOF,NPS1,1,TORRB4,1	tbslack2	\$0.00	136	\$0.00
			ENOF,NPS2,1,TORRB4,1	tbslack2	\$0.00	125	\$0.00
			ENOF,OSB-AG,1,TORRB4,1	tbslack1	\$0.00	-59	\$0.00
			ENOF,PLAYB-AG,1,TORRB4,1	tbslack2	\$0.00	100	\$0.00
			ENOF,POR01,1,TORRB4,1	tbslack1	\$0.00	-10	\$0.00
			ENOF,PPCCGT,1,TORRB4,1	tbslack1	\$0.00	-85	\$0.00
			ENOF,SNUG1,1,TORRB4,1	tbslack1	\$0.00	-2	\$0.00
			ENOF,TORRA1,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA2,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA3,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRA4,1,TORRB4,1	tbslack2	\$0.00	22.5	\$0.00
			ENOF,TORRB1,1,TORRB4,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB1,10,TORRB3,10	tbslack2	\$0.00	-5	\$0.00
			ENOF,TORRB2,1,TORRB4,1	tbslack2	\$0.00	30	\$0.00
			ENOF,TORRB2,10,TORRB3,10	tbslack2	\$0.00	-5	\$0.00
			ENOF,TORRB3,1,TORRB4,1	tbslack1	\$0.00	-30	\$0.00
			ENOF,TORRB3,10,TORRB4,10	tbslack1	\$0.00	-5	\$0.00
10:55	\$10 000.00	CS Energy	CALL_B_2	L5RE	\$0.50	-1	-\$0.50
		AGL (SA)	TORRB4	L5MI	\$9999.90	-1	-\$9999.90
		TRUenergy	MP2	L5MI	\$0.40	1	\$0.40
11:10	\$10 001.50	Origin Energy	ER03	L5RE	\$2.00	-1	-\$2.00
		AGL (SA)	TORRB4	L5MI	\$9999.90	-1	-\$9999.90
		TRUenergy	MP2	L5MI	\$0.40	1	\$0.40

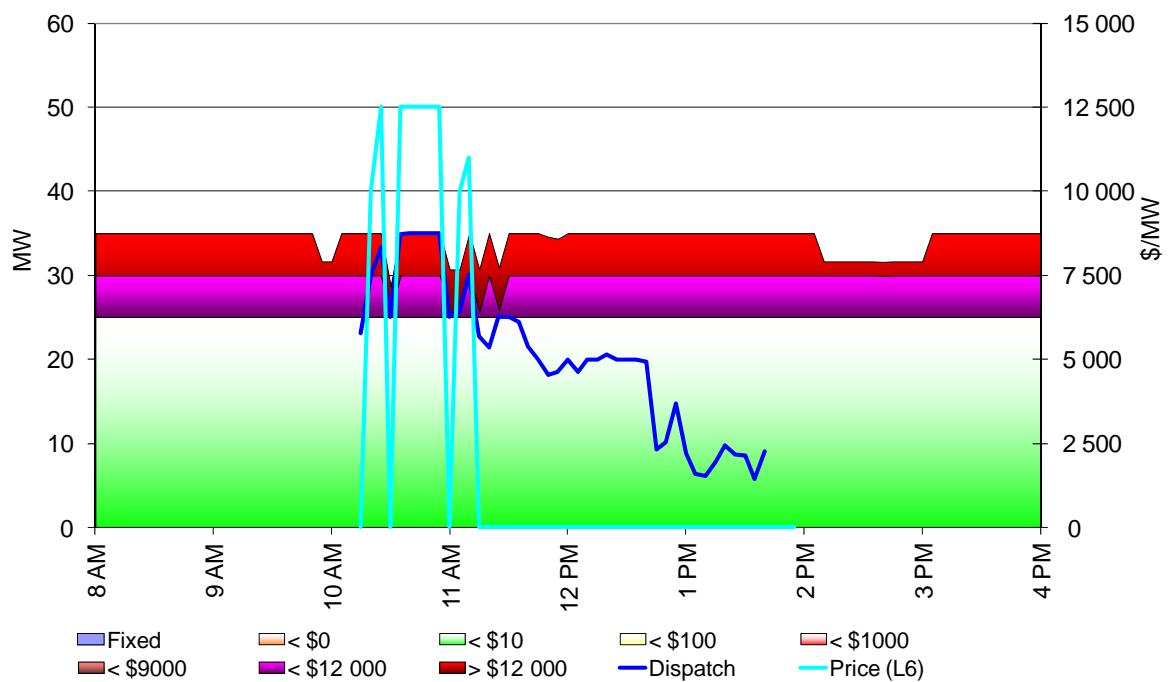
## Appendix B – Closing bids

Figures B1 – B7 highlight the 5-minute lower FCAS closing bids for AGL and Alinta Energy (the only participants in South Australia with capacity priced at or above \$5000/MW during the period the price exceeded \$5000/MW). It also shows the dispatch level of the respective services at each station and the dispatch price.

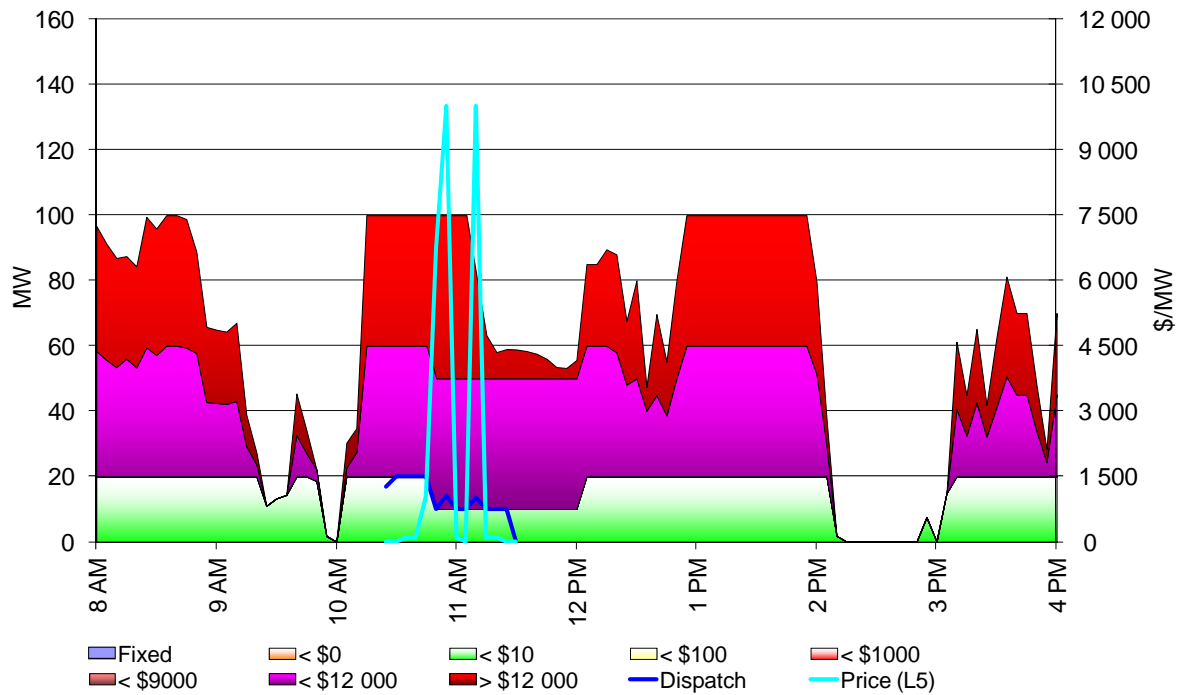
**Figure B1: Torrens Island B lower 60 second service closing bid prices, dispatch and dispatch price for 4 October**



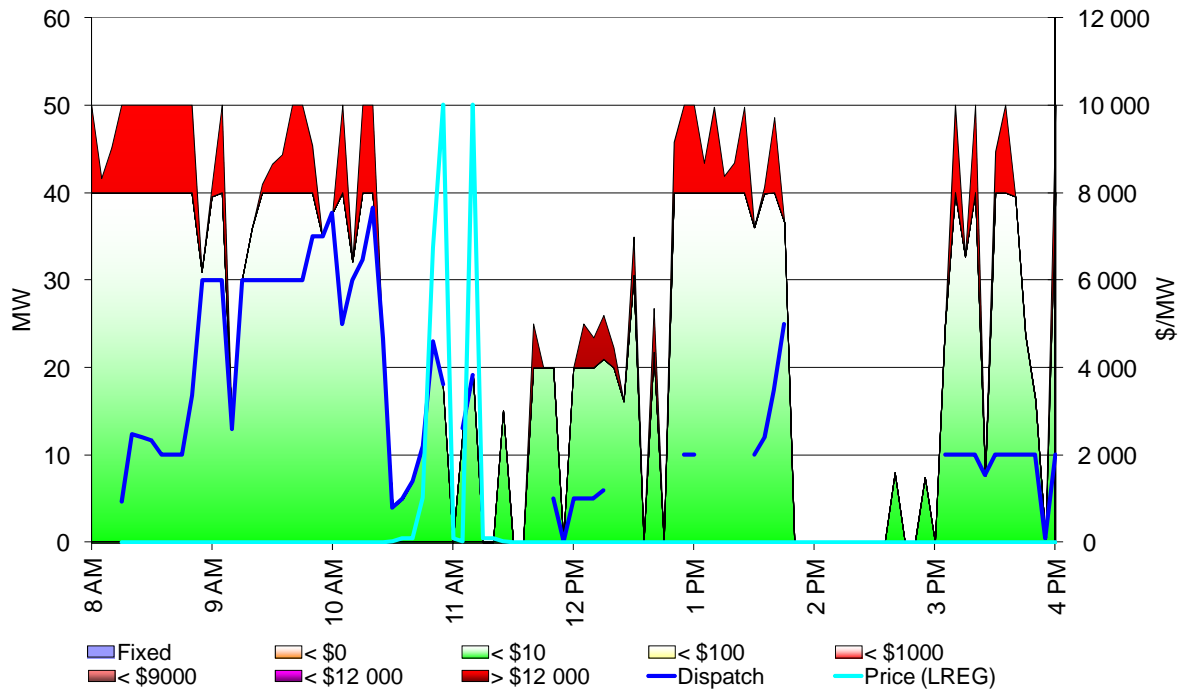
**Figure B2: Torrens Island B lower 6 second service closing bid prices, dispatch and dispatch price for 4 October**



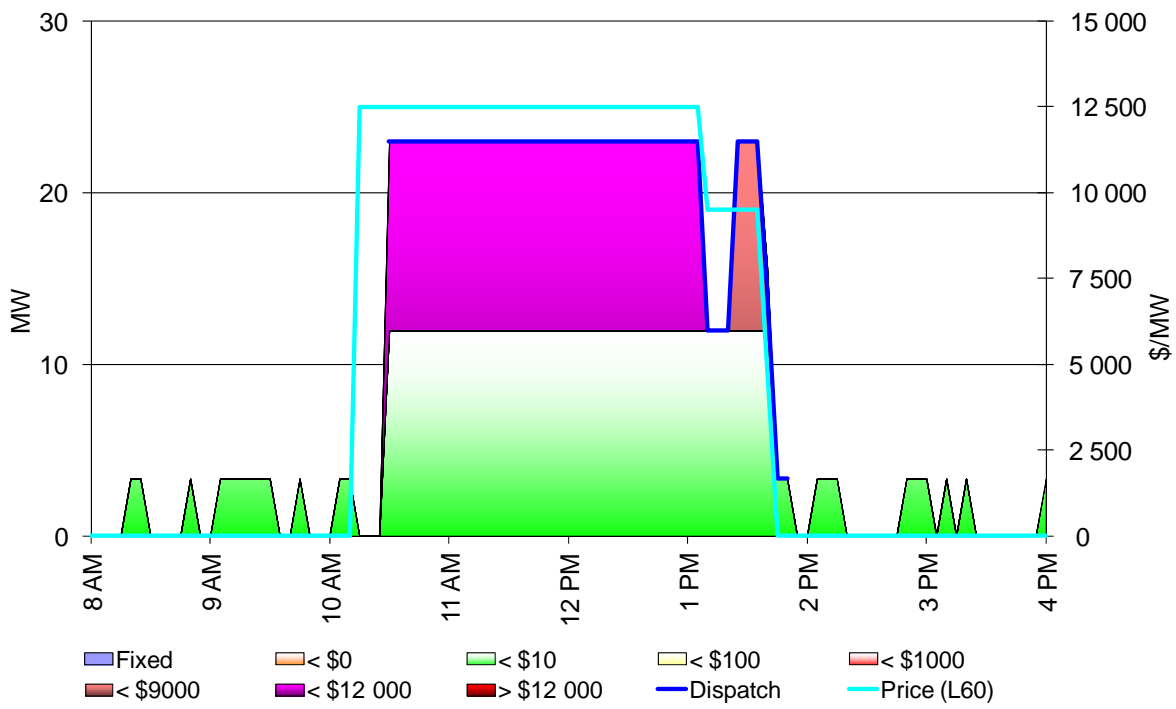
**Figure B3: Torrens Island B lower 5 minute service closing bid prices, dispatch and dispatch price for 4 October**



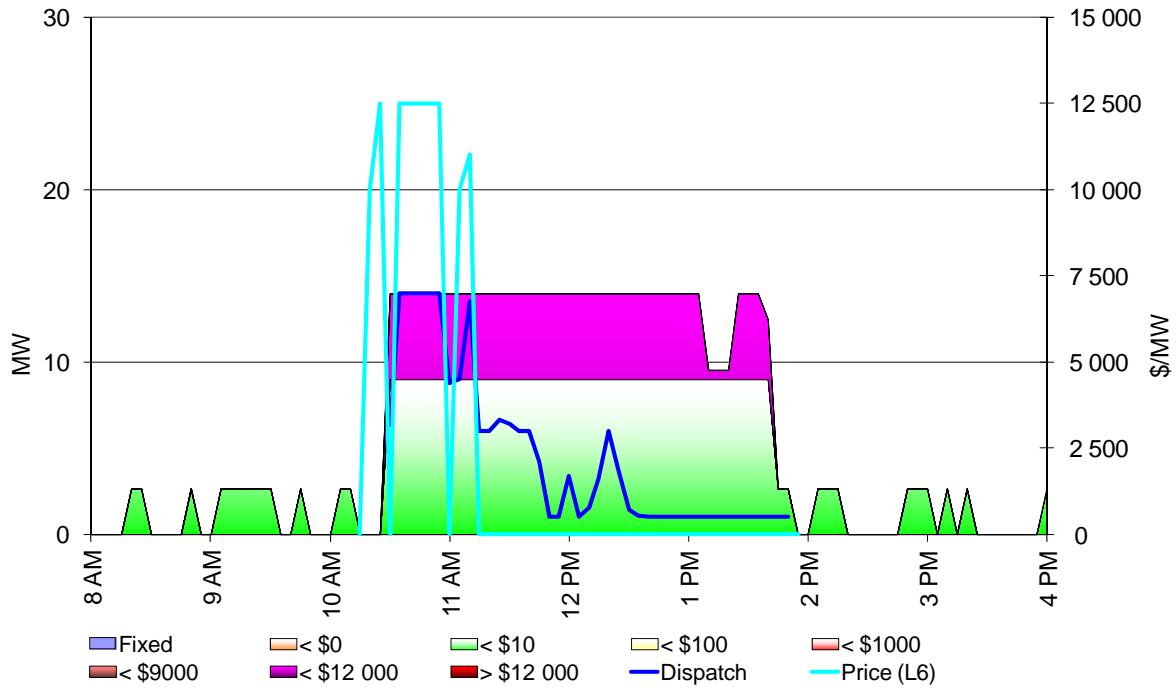
**Figure B4: Torrens Island B lower regulation service closing bid prices, dispatch and dispatch price for 4 October**



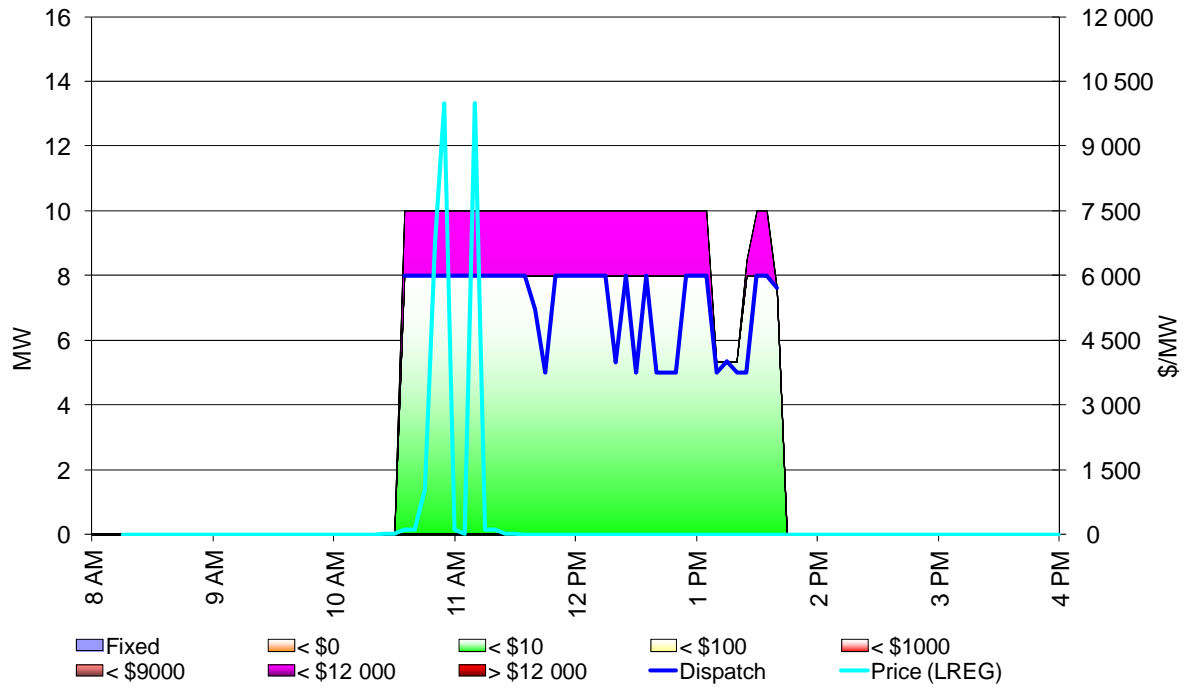
**Figure B5: Northern Power Station lower 60 second service closing bid prices, dispatch and dispatch price for 4 October**



**Figure B6: Northern Power Station lower 6 second service closing bid prices, dispatch and dispatch price for 4 October**



**Figure B7: Northern Power Station lower regulation service closing bid prices, dispatch and dispatch price for 4 October**





## Appendix C – FCAS constraints invoked as a result of the Victorian network outages

On 4 October there was a planned outage of one of the APD to Heywood 500kV lines in Victoria. The configuration of the transmission network and location of Mortlake Power Station meant that this outage also required the Heywood to Mortlake 500kV No.2 line and the Heywood M2 transformer out of service. The Heywood to Mortlake line forms part of the Heywood interconnector. This means that for the loss of the remaining Heywood to Moorabool line, the Heywood interconnector between South Australia and Victoria would be lost. This would cause a step change in supply into South Australia equivalent to the flow across that interconnector. In the event of the loss of the Heywood interconnector:

- If electricity was being exported from SA this would have resulted in an oversupply and an increase in frequency in SA.
- If electricity was being imported into SA this would have resulted in an undersupply and a decrease in frequency in SA.

The outage of the Heywood to Mortlake 500 kV line required the F-V-HYMO constraint set to be invoked. The constraint equations in this set are:

- F\_S++HYML\_L5, F\_S++HYML\_L6, F\_S++HYML\_L60
  - These constraints determine only the lower contingency (L5, L6 and L60) requirements to manage the impact of loss of the Heywood to Moorabool line on SA. The Heywood interconnector is co-optimised.
  - This group of constraints led to the very high local FCAS requirements and prices in South Australia.
- F\_QNV+HYMO\_L5, F\_QNV+HYMO\_L6, F\_QNV+HYMO\_L60, F\_QNV+HYMO\_R5, F\_QNV+HYMO\_R6, F\_QNV+HYMO\_R60,
  - These constraints determine lower (L5, L6 and L60) and raise (R5, R6 and R60) contingency requirements to manage the impact of loss of the interconnector on NSW, Qld and Vic. BassLink is **unable** to transfer FCAS. The BassLink and Heywood interconnectors are co-optimised.
  - This group of constraints at times set the requirement for **lower** contingency FCAS across the NEM. This is because the contingency (loss of the smelter load, that would also have been interrupted, and flows across the Heywood interconnector) was the largest in the NEM. Prices at all times, however, were less than \$5/MW.
- F\_ESTN++HYMO\_L5, F\_ESTN++HYMO\_L6, F\_ESTN++HYMO\_L60, F\_ESTN++HYMO\_R5, F\_ESTN++HYMO\_R6, F\_ESTN++HYMO\_R60,
  - These constraints determine lower and raise contingency requirements to manage the impact of loss of the interconnector on NSW, Qld, Vic and Tas. The Heywood interconnector is co-optimised.
  - These constraints did not impact on market outcomes.

- F\_QNV++HYMO\_L5, F\_QNV++HYMO\_L6, F\_QNV++HYMO\_L60, F\_QNV++HYMO\_R5, F\_QNV++HYMO\_R6, F\_QNV++HYMO\_R60,
  - These constraints determine lower and raise contingency requirements to manage the impact of loss of the interconnector on NSW, Qld and Vic. BassLink is able to transfer FCAS. The BassLink and Heywood interconnectors are co-optimised.
  - These constraints did not impact on market outcomes.
- F\_ESTN+MO\_TG\_R5, F\_ESTN+MO\_TG\_R6, F\_ESTN+MO\_TG\_R60,
  - These constraints determine raise contingency requirements to manage the impact of loss of the interconnector on NSW, Qld and Vic.
  - These constraints did not impact on market outcomes.
- F\_QNV++MO\_TG\_R5, F\_QNV++MO\_TG\_R6, F\_QNV++MO\_TG\_R60,
  - These constraints determine raise contingency requirements to manage the impact of loss of the interconnector on NSW, Qld and Vic. BassLink is able to transfer FCAS.
  - These constraints did not impact on market outcomes.
- F\_QNV+MO\_TG\_R5, F\_QNV+MO\_TG\_R6, F\_QNV+MO\_TG\_R60,
  - These constraints determine raise contingency requirements to manage the impact of loss of the interconnector on NSW, Qld and Vic. BassLink is unable to transfer FCAS.
  - These constraints did not impact on market outcomes.