Report into Market ancillary service prices above $5000/MW

South Australia, 16 September 2016

29 November 2016

AUSTRALIAN ENERGY REGULATOR

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1 Introduction

The AER is required to monitor significant variations between forecast and actual prices and 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 for a number of trading intervals within that period.

In accordance with the clause 3.13.7(e) of the National Electricity Rules, the report must:

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

On 16 September 2016, the price of two Frequency Control Ancillary Services (FCAS) in South Australia exceeded $5000/MW for an extended period, in excess of energy spot prices. This report presents our analysis of the events in accordance with this obligation.

2 Summary

On 16 September the local price for both lower and raise regulation frequency control regulation services (FCAS) [1] in South Australia exceeded $5000/MW for over 50 dispatch intervals. Raise and lower regulation services are designed to maintain the frequency of the power system constant (at 50 Hertz) when small changes of demand and supply occur. The combined cost of regulation services on 16 September was in excess of $3.6 million – these costs are borne by generators and consumers in South Australia. On the mainland, FCAS costs are typically around $200 000 per day. [2]

The dominant factors that led to these high prices were:

- The planned network outage in Victoria on 16 September. This outage introduced a credible risk of islanding South Australia from the NEM. When this occurs AEMO requires South Australia to locally source 35 MW of raise and lower regulation service to mitigate this risk. See Appendix B for a description of the local regulation requirement.
- The offers by generators in South Australia for local regulation services:
    - There are four power stations in South Australia that can provide more than 386 MW of local regulation services. Early forecasts indicated there was a minimum of 41 MW of each service offered to the market priced below $600/MW, sufficient to cover the 35 MW requirements. The remaining capacity (up to 270 MW) was priced above $10 000/MW.
    - Rebidding of 1 MW of capacity by Origin Energy in both regulation services into high price bands, leaving only 34 MW (below the 35 MW local requirement) of both services at low prices.

While the majority of early forecasts indicated that prices would be between $600/MW and $750/MW, actual prices for lower and raise regulation services were $9450/MW and $11 250/MW for 53 dispatch intervals respectively, exceeding the AER's $5000/MW reporting threshold.

The 35 MW local regulation requirement imposed by AEMO has cost South Australian generators and consumers around $47 million since the constraint was invoked in October 2015.

1 Appendix A contains a more detailed explanation of frequency control ancillary services (FCAS).

2 Average costs of the 2015/2016 FY.

3 Analysis

On September 16, in response to a planned network outage in Victoria AEMO invoked local regulation FCAS requirements in South Australia. Prices for these services exceeded $9000/MW for all dispatch intervals from 11.05 am to 3.30 pm. Prices exceed $9000 on five other occasions between 7.40 am and 8.40 am on the same day, these high prices have been discussed in the 11-17 September 2016 Electricity report.[3] This section sets out the factors which contributed to the price outcomes between 11.05 am to 3.30 pm.

3.1 Planned network outage

South Australia is electrically connected to Victoria by the Heywood and Murraylink interconnectors. The Heywood Interconnector is an alternating current high voltage transmission link with a nominal capacity of 460 MW, while Murraylink is a 220 MW direct current interconnector. Heywood provides synchronous connection between South Australia and the rest of the NEM.

The Heywood interconnector is currently being augmented to increase its nominal capacity to 650 MW. From time to time network outages are planned to allow work to be undertaken. When there is a network outage that risks islanding South Australia, AEMO invokes constraints requiring 35 MW of local regulation services. This ensures there are adequate sources of regulation services immediately available in a separation event to manage the frequency within the islanded region post contingency.

On 16 September there was a planned network outage on the Moorabool to Mortlake 500kV line as part of the Heywood interconnector upgrade project. The market notice announcing the outage is replicated in Appendix E. As this outage put South Australia on a single contingency, which could result in the State being islanded, AEMO invoked the 35 MW regulation constraints for the duration of the outage.

3.2 Regulation service availability

Four power stations in South Australia were registered to provide raise and lower regulation services on the day, (shown in Table 1) each individually capable of providing the local regulation requirement.

Table 1: Registered maximum capacity by station and regulation service

Power Station	Max Capacity	
	Lower regulation	Raise regulation
Osbourne (Origin Energy)	36	36
Quarantine (Origin Energy)	50	50
Pelican Point (Engie)	100	100
Torrens Island (AGL)	200	260
Total	**386**	**446**

[3] AER, Electricity report 11-17 September, 2016.

3.3 Effective available capacity and price

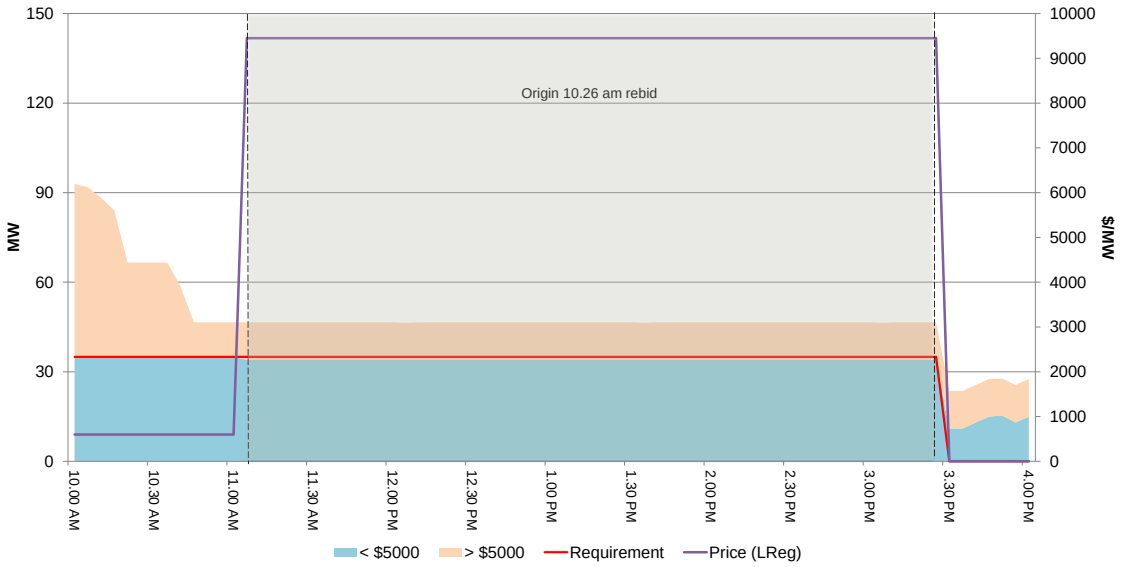
For every dispatch interval the National Electricity Market Dispatch Engine (NEMDE) co-optimises FCAS and energy offers to arrive at the least cost security constrained solution. Effective available FCAS capacity is the offered FCAS capacity adjusted for the energy output of the generator.

Prices for lower and raise regulation services were around $9450/MW and $11 250/MW respectively for around four and a half hours, exceeding the $5000/MW reporting threshold for 53 dispatch intervals.

Figure 1 and Figure 2 show actual price (purple line)[4] and effective available capacity over the high price period. The (constant) 35 MW requirement is shown as a red line.

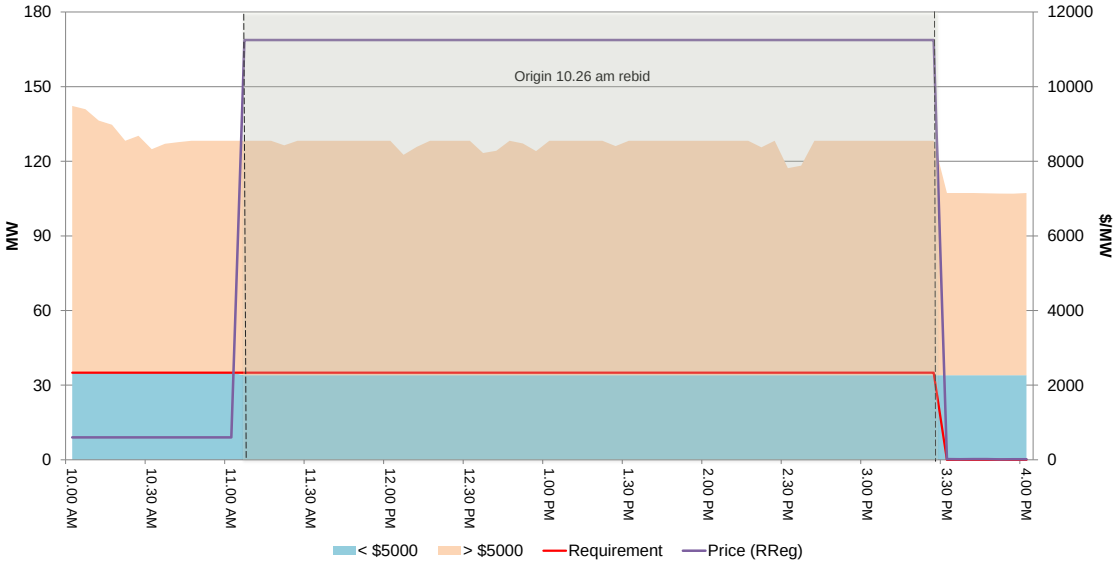
The blue shaded areas indicate effective available capacity below $5000/MW and effective available capacity above $5000/MW is indicated by the light orange shaded areas.

Figure 1 Lower regulation effective offers, requirement and price



4 Individual prices are contained in the Price Setter at Appendix F

Figure 2 Raise regulation effective offers, requirement and price



Prices for raise and lower regulation services were forecast to be below $600/MW four and twelve hours ahead of dispatch for the majority of the high price period. Four hours ahead of dispatch, effective available capacity was forecast to be around 47 MW for lower regulation services and around 128 MW for raise regulation services (sufficient to cover the 35 MW requirement) for the high price period.

The circumstances relating to the imposition of the South Australian regulation requirement are described more fully in Appendix B.

3.3.1 Rebidding

Forecasts four and 12 hours ahead showed that the 35 MW of local requirements could be met by low price capacity. Rebidding of lower and raise regulation services by Origin Energy at its Osbourne Power Station from low prices to high prices was the dominant factor affecting the high price outcomes. All significant rebids are listed in Appendix C.

Out of 446 MW and 386 MW of capacity registered for raise and lower regulation services respectively, around 182 MW and 152 MW was offered to the market. 35 MW was offered in price bands less than $5000/MW and 147 MW and 117 MW respectively offered in bands greater than $5000/MW.

A dominant cause of the high price was a rebid from Origin which shifted capacity from low to high prices.

At 10.26 am, effective from 11.05 am until 5.30 pm Origin Energy rebid:

- 1 MW of capacity at Osbourne in raise services from $0/MW to $11 250/MW
- 1 MW of capacity at Osbourne in lower services from $0/MW to $9450/MW

This left only 34 MW of capacity for both raise and lower regulation services priced less than $5000/MW; 1 MW below the 35 MW requirement. High cost services had to be used to meet the requirement and consequently, the price for raise services reached

$11 250/MW and lower services reached $9450/MW and remained there until 3.30 pm, when the 35 MW regulation requirement was no longer in effect. See Figure 1 and Figure 2 to observe the effect of the 10.26 am Origin rebid.

Australian Energy Regulator

November 2016

Appendix A Explanation of FCAS

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

- Regulation services, which continuously adjust to small changes in demand or supply (changes that cause the frequency to move by only a small amount away from 50 Hz). 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 three contingency services to increase the frequency and three 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 that leads to a decrease in frequency. As these contingency events usually involve step reductions in supply side, 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.

Participants providing regulation services will receive adjusted dispatch targets every 5 minutes via their automatic generation control (AGC) signals from AEMO. Participants are paid through the FCAS markets in accordance with their offered volumes. Their energy production, that may be higher or lower depending on the AGC signals they receive, are settled in accordance with energy market prices.

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).

Participants offering to provide contingency services are enabled in accordance with the “trapezium” supplied in their offers. While participants will not necessarily be supplying these services until a contingency occurs they are paid in accordance with their enablement.

Frequency Control Ancillary Service Settlement

AEMO settles the FCAS markets on a weekly basis, as follows[5].

- Contingency FCAS: Generators pay for Raise Services and customers pay for Lower Services.
- Regulation FCAS: Cost recovery on a "causer pays" basis using the Causer Pays Procedure[6] developed by AEMO in accordance with the appropriate NER procedures.

The 'Causer Pays' Procedure allocates regulation FCAS costs to those market generators, customers and small generation aggregators with facilities that have the metering capable of determining their contribution to frequency deviations at any time.

Every four weeks based on historical data AEMO calculates a single causer pays contribution factor that represents each market participants aggregate contribution to the need for Regulation FCAS on a portfolio basis across the NEM. This contribution factor is not dependent on the amount of energy purchased/consumed by the participant – consequently a generator with a non-zero factor in a particular period will still pay a share of FCAS costs irrespective of how much of its generation is running. Any market generator, with a non-zero contribution factor with generating units in SA, will incur regulation FCAS costs.

Since not all of the costs will be recovered from generators, the residual costs are recovered from market customers (including retailers) in the relevant region, based on the amount of energy each market customer is purchasing.

5 For a full description go to http://www.aemo.com.au/Electricity/Data/Ancillary-Services/Ancillary-Services-Payments-and-Recovery

6 For a full description go to http://www.aemo.com.au/Electricity/Market-Operations/Ancillary-Services/Process-Documentation/Ancillary-Services-Causer-Pays-Contribution-Factors

Appendix B 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 or demand that results from credible contingencies. Where a credible contingency results in the loss of an interconnector it is termed a “separation event”.

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 JSSC. In the case of South Australia the JSSC notified AEMO that the frequency band for separation of the South Australian power system is 47 to 52 Hz and 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 exporting at the time the interconnector fails, then as a consequence of the immediate over supply situation local contingency “lower” services are required in the islanded region to lower the frequency (typically generators offer to quickly reduce output to lower frequency). In other words, the loss of the Heywood interconnector when power is flowing from South Australia, results in an oversupply of generation, increasing the frequency in South Australia. Contingency lower services are sourced from registered suppliers in South Australia (typically generators) in proportion to the flow across the interconnector from South Australia to Victoria to quickly reduce that over frequency.

A similar situation exists for contingency “raise” services for all other regions except South Australia where, in accordance with the advice from the JSSC, the raise requirement is covered by under frequency load shedding. In other words, the loss of the Heywood interconnector when power is flowing into South Australia, results in an undersupply of generation decreasing the frequency in South Australia. Under frequency load shedding reduces demand in blocks to arrest the falling frequency until supply matches demand and the frequency is restored.

In either event, in the past, in the period immediately following the separation event AEMO would invoke local regulation services and establish a local regulation reference source to manage frequency until the region can be reconnected to the rest of the NEM. It is this aspect that has been recently changed by AEMO. AEMO will now impose a requirement for local lower and raise regulation services in South Australia prior to the failure of the interconnector so that frequency after an island is formed, and after the contingency services have operated, can be smoothly maintained.

Appendix C Significant Rebids

The rebidding tables highlight the relevant rebids submitted by generators that impacted on market outcomes during the time of high prices. It details the time the rebid was submitted and used by the dispatch process, the capacity involved, the change in the price of the capacity was being offered and the rebid reason.

Table C 1: Significant rebids for 16 September – lower regulation

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MW)	Price to ($/MW)	Rebid reason
10.26 am	11.05 am	Origin	Osbourne	1	0	9450	1025A DEC SA DEM 5PD 1186MW < 30PD 1251MW @ 1030 SL

Table C 2: Significant rebids for 16 September – raise regulation

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from ($/MW)	Price to ($/MW)	Rebid reason
10.26 am	11.05 am	Origin	Osbourne	1	0	11 250	1055A DEC IN SA DEM - 5PD 1497MW < 30PD 1550MW @ 1130 SL

Appendix D Closing bids

Figures D1a to D8b highlight for each dispatch interval the lower and raise regulation services closing bids for Origin, AGL and Engie (the participants in South Australia with ancillary service capability). It also shows the dispatch level of the respective services at each station and the dispatch price.

FCAS services are co-optimised with energy offers. For example a generator that is operating at its maximum capacity cannot provide raise services so their effective available capacity for raise services would be zero. Figures denoted with an “a” refer to the quantities offered while those with a “b” refer to the *effective* quantities available to the market after accounting for the interaction between energy and FCAS (“effective available capacity”).

Figure D1a: Osbourne (Origin) lower regulation service closing bid prices, dispatch and dispatch price - maximum offers

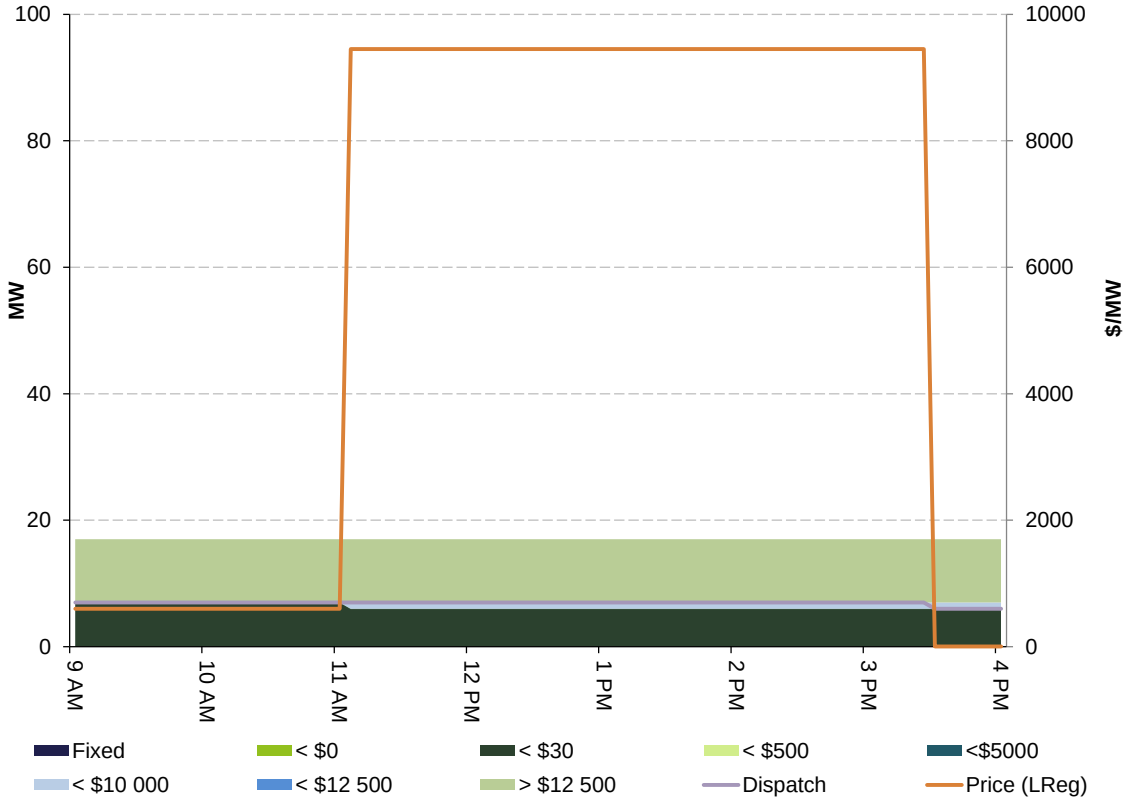


Figure D1b: Osbourne (Origin) lower regulation service closing bid prices, dispatch and dispatch price – effective offers

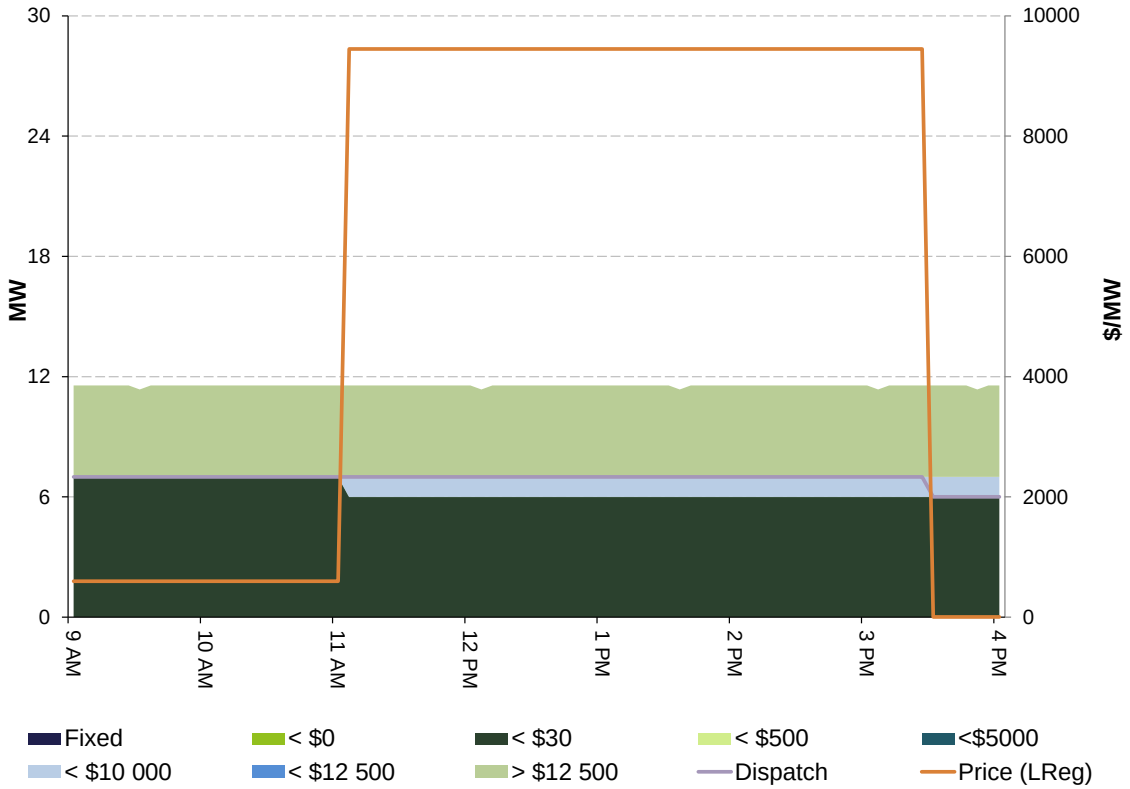


Figure D2a: Torrens Island (AGL) lower regulation service closing bid prices, dispatch and dispatch price – maximum offers

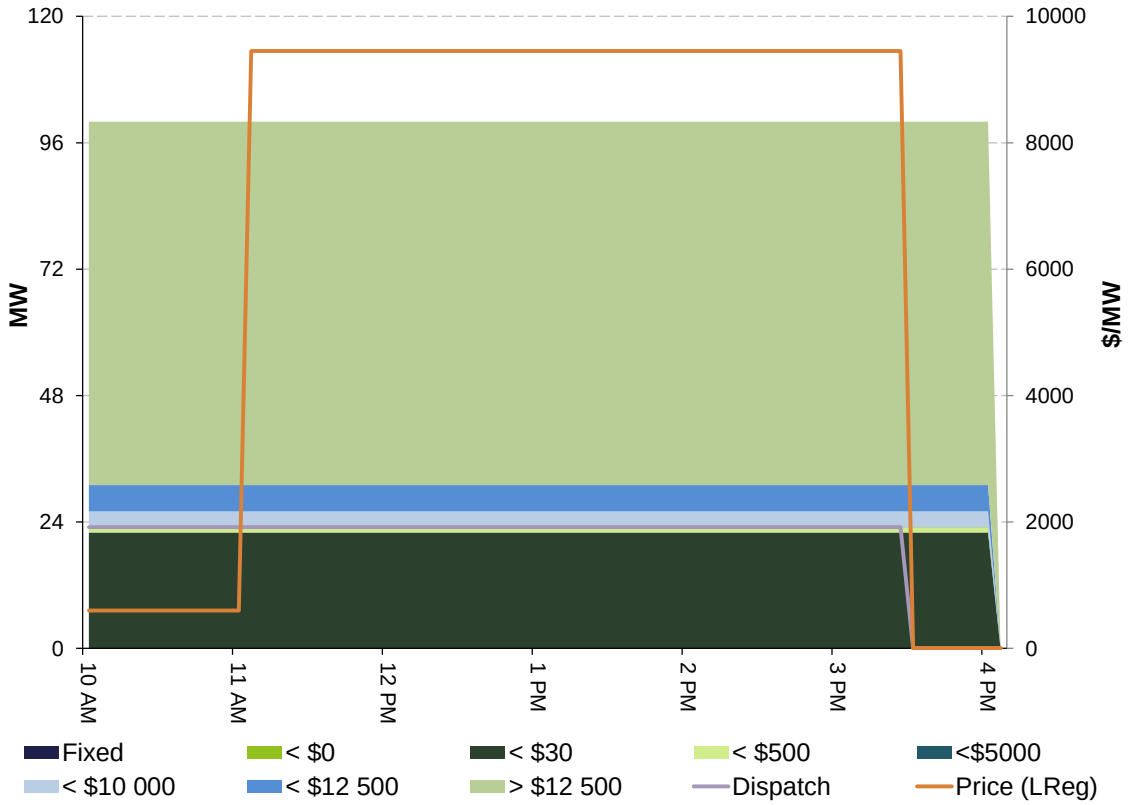


Figure D2b: Torrens Island (AGL) lower regulation service closing bid prices, dispatch and dispatch price – effective offers

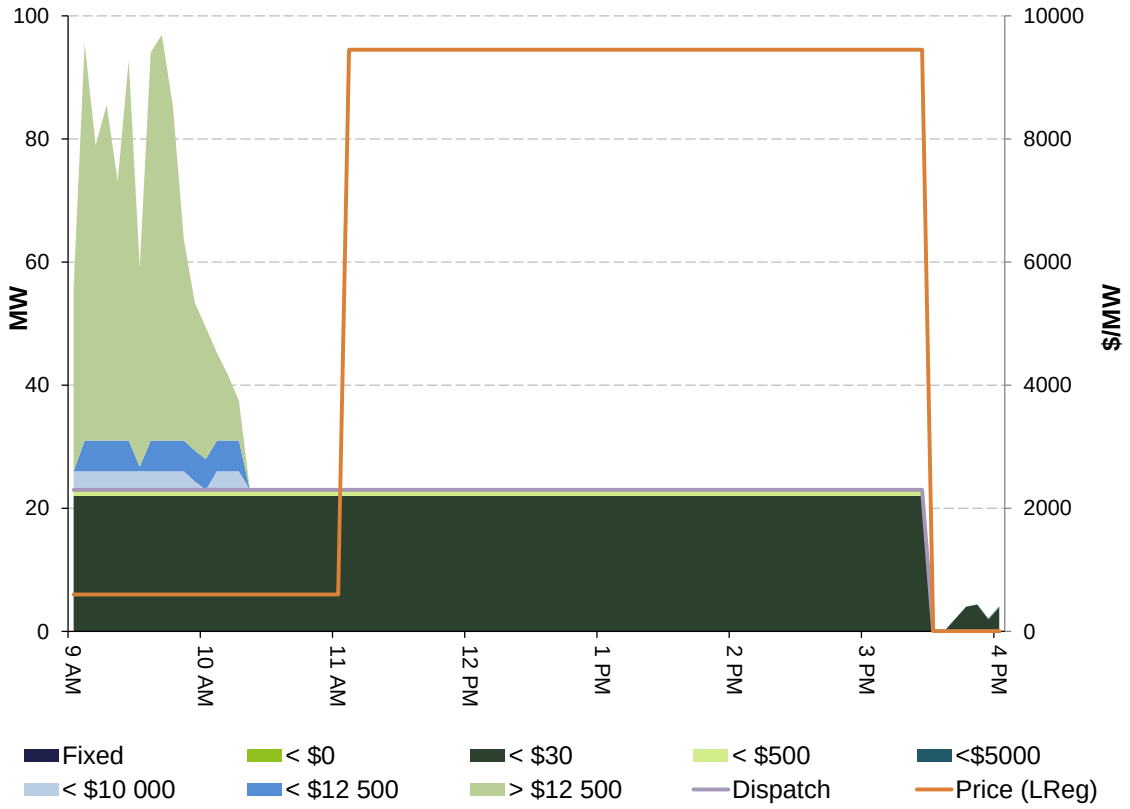


Figure D3a: Pelican Point (Engie) lower regulation service closing bid prices, dispatch and dispatch price – maximum offers

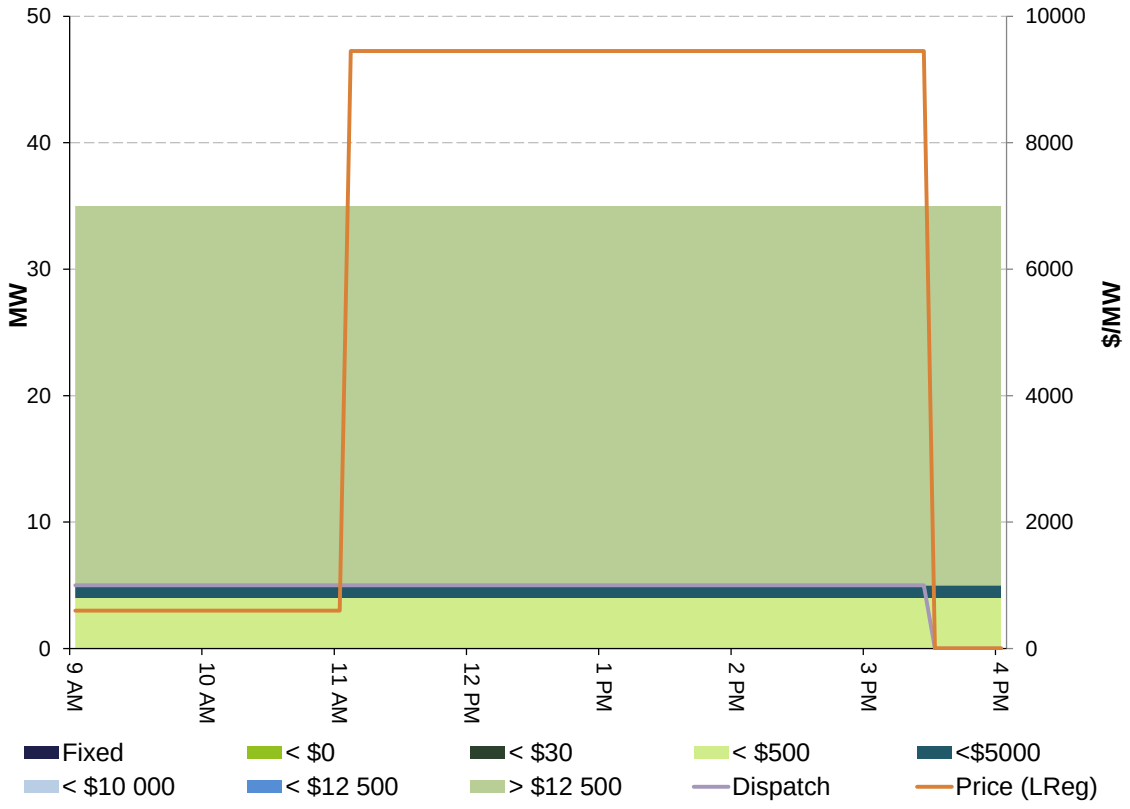


Figure D3b: Pelican Point (Engie) lower regulation service closing bid prices, dispatch and dispatch price – effective offers

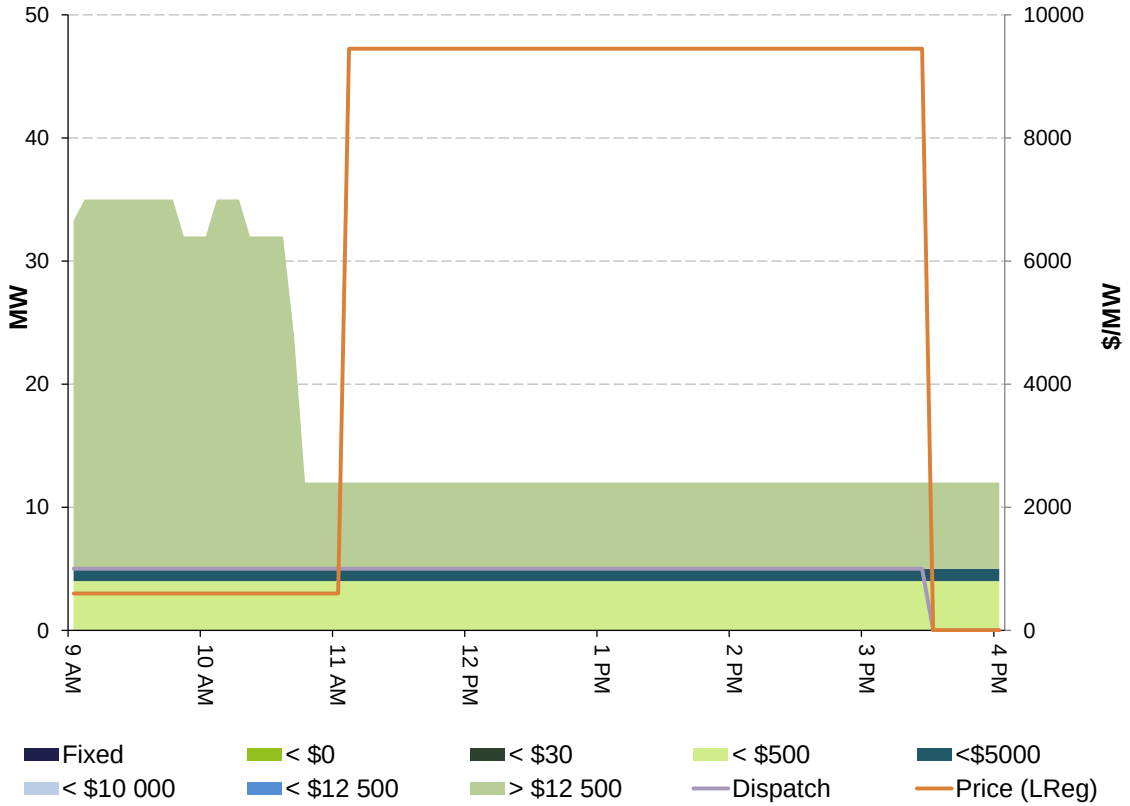


Figure D4a: Osbourne (Origin) raise regulation service closing bid prices, dispatch and dispatch price - maximum offers

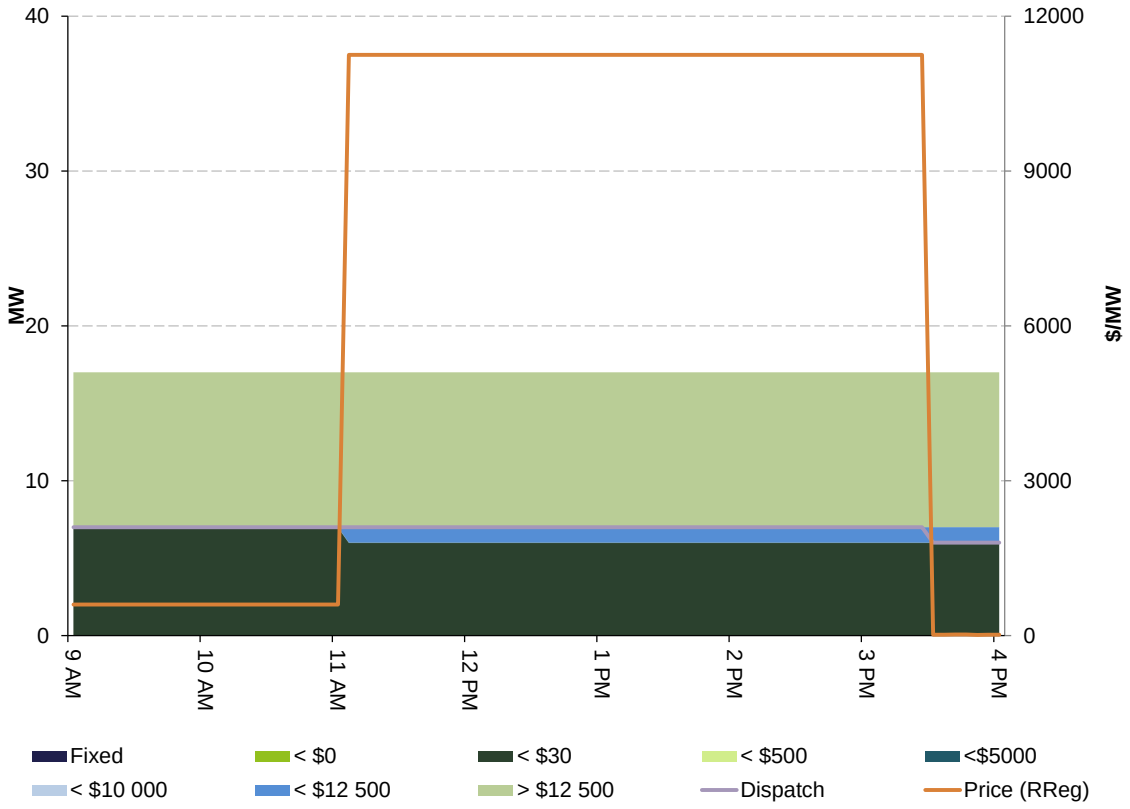


Figure D4b: Osborne (Origin) raise regulation service closing bid prices, dispatch and dispatch price - effective offers

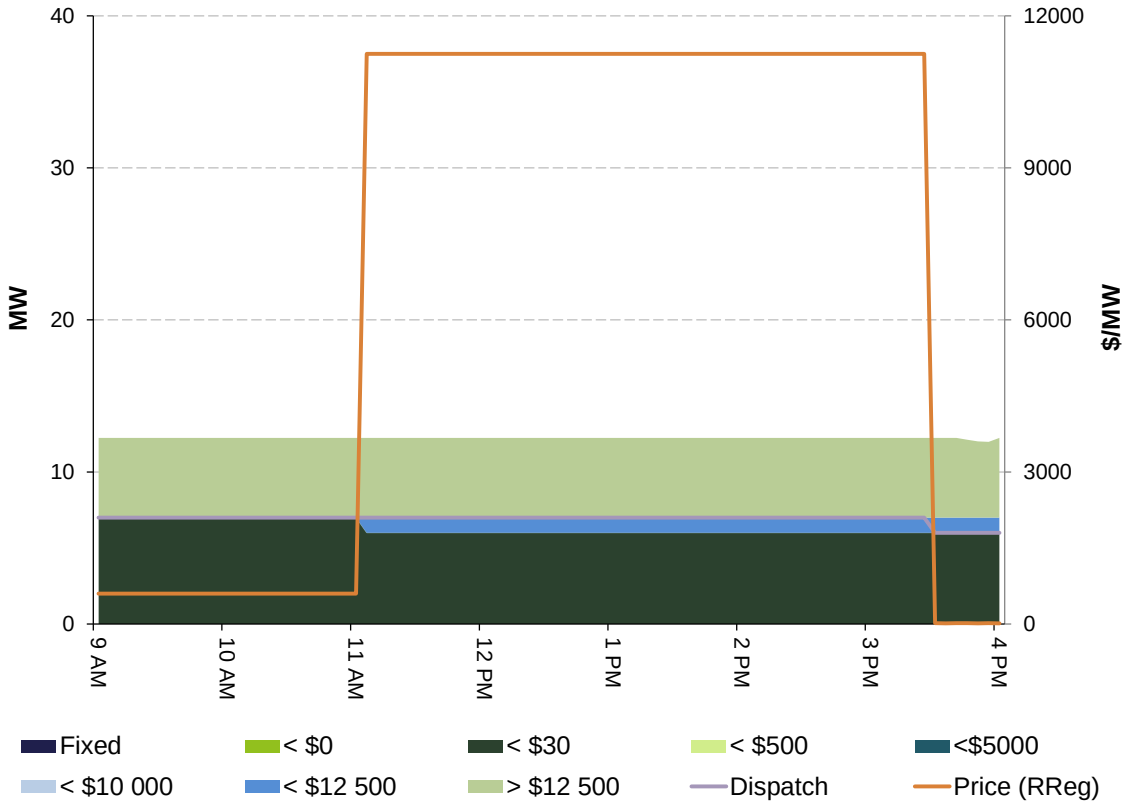


Figure D5a: Torrens Island (AGL) raise regulation service closing bid prices, dispatch and dispatch price – maximum offers

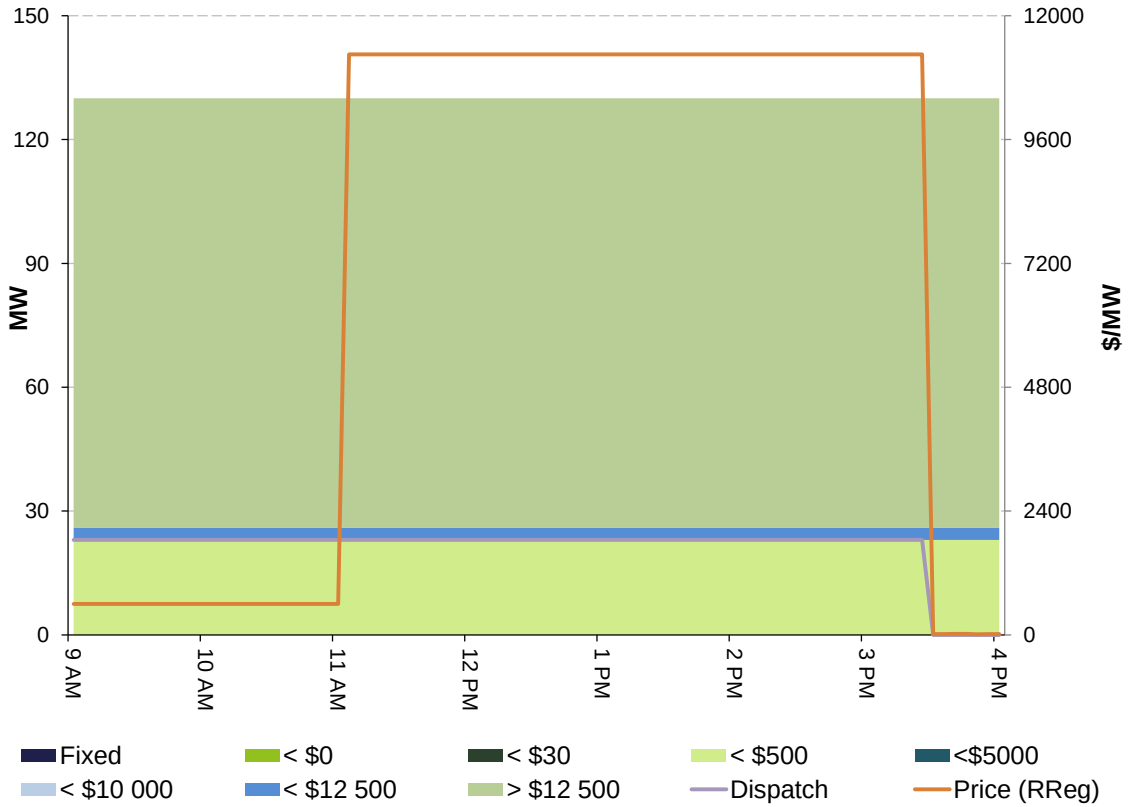


Figure D5b: Torrens Island (AGL) raise regulation service closing bid prices, dispatch and dispatch price – effective offers

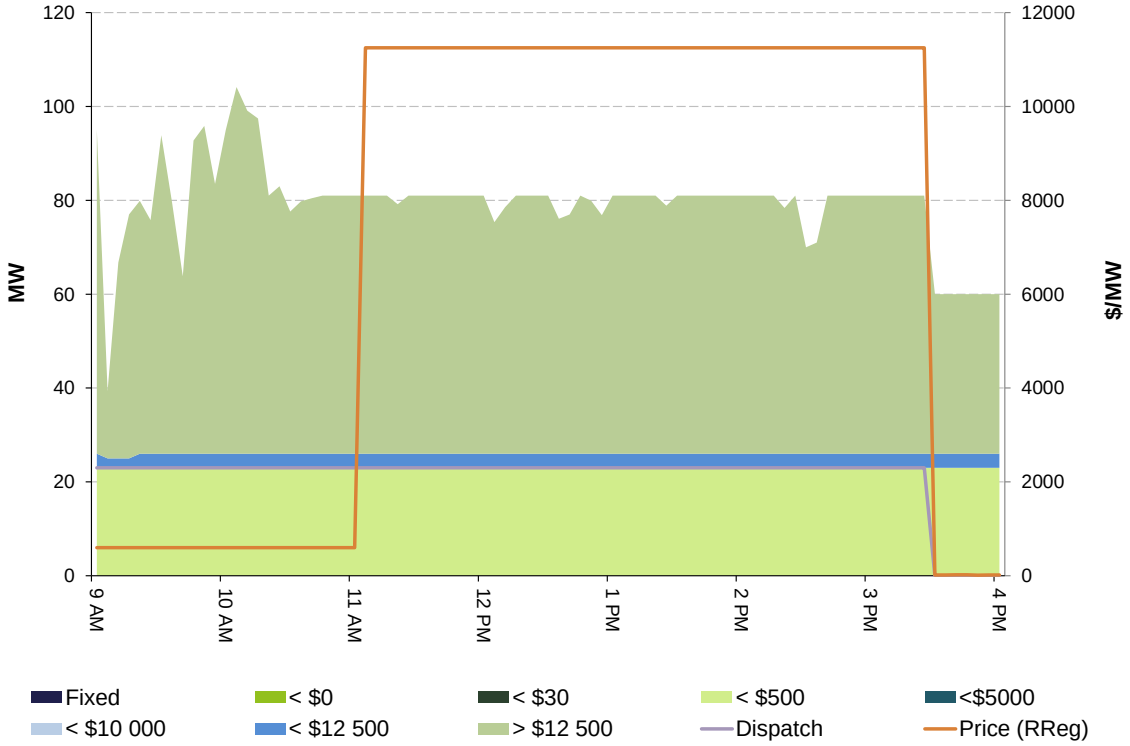


Figure D6a: Pelican Point (Engie) raise regulation service closing bid prices, dispatch and dispatch price – maximum offers

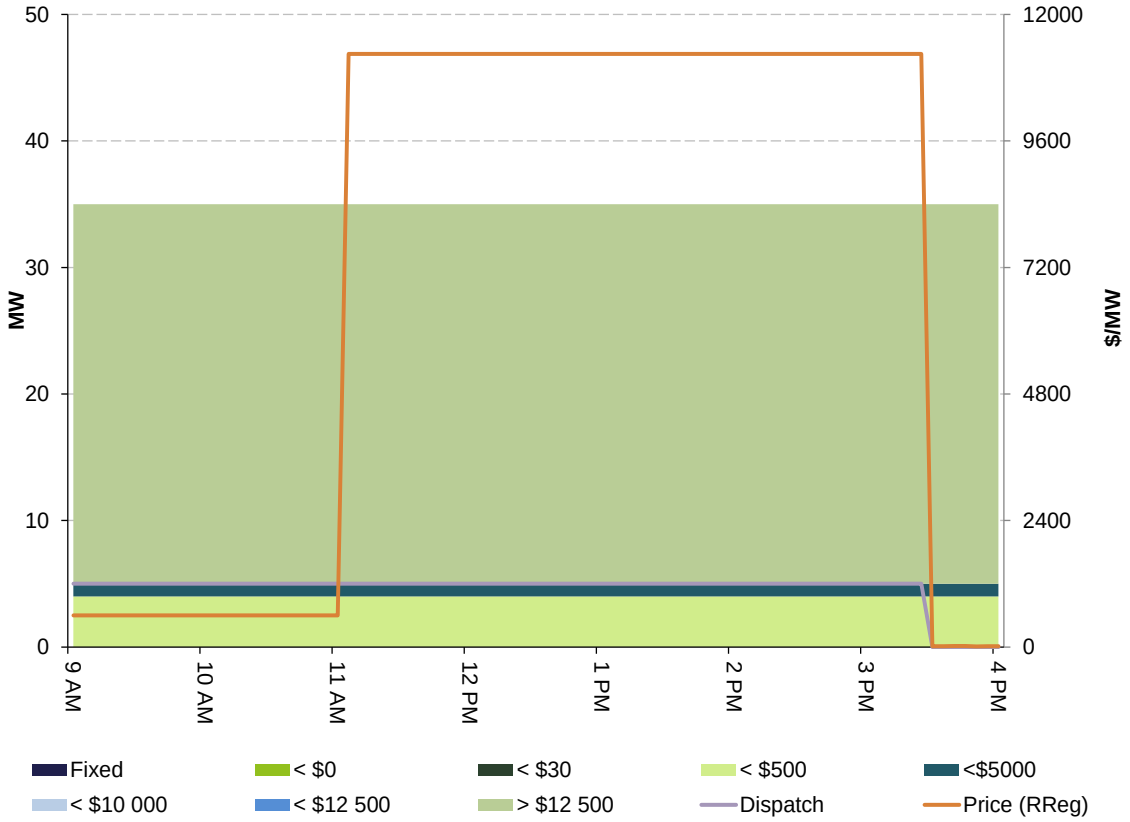
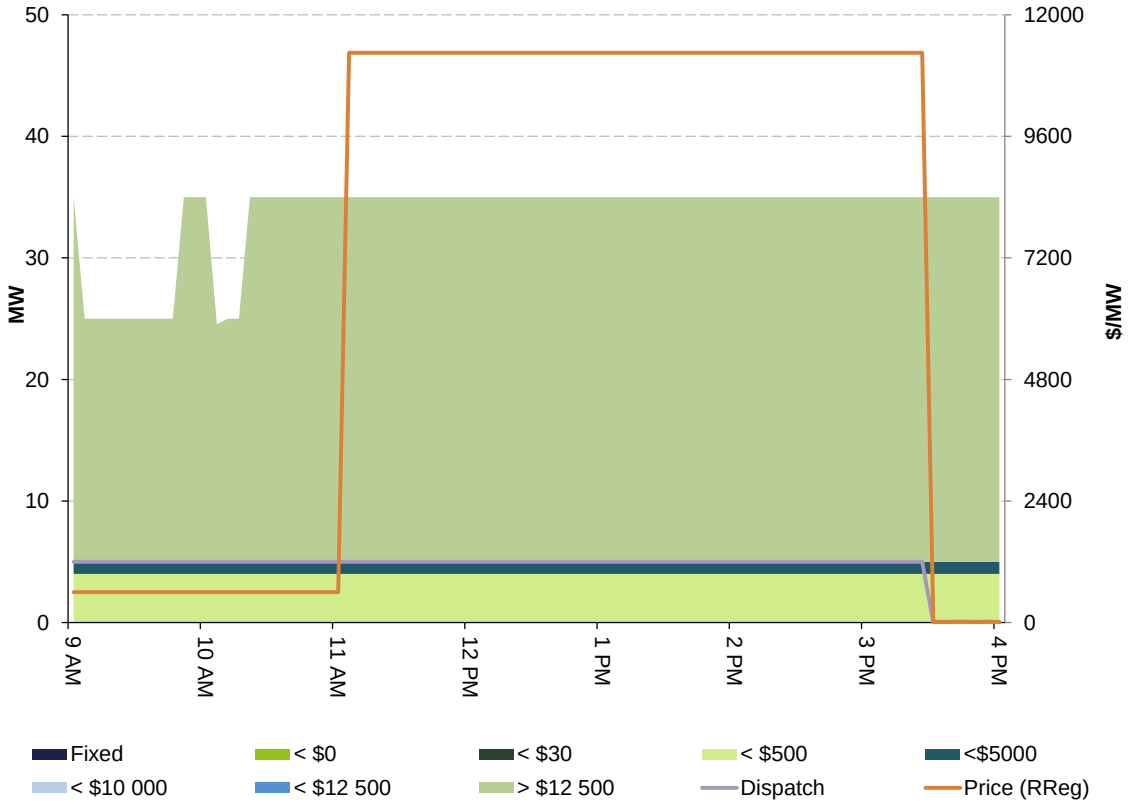


Figure D6b: Pelican Point (Engie) raise regulation service closing bid prices, dispatch and dispatch price – effective offers



Appendix E Relevant Market Notices

AEMO issued the following market notice to advise of the outage.

Market notice 54736 was issued on 15 August 2016.

Market Notice	Type	Date of issue	Last Changed
54736	General Notice	15/08/2016 07:45:09	15/08/2016 07:45:09

Reason

AEMO ELECTRICITY MARKET NOTICE.

This market notice is FOR INFORMATION ONLY.

The Moorabool to Mortlake PS 500kV line in Victoria Region is planned out of service from 0700 hrs on 15 September 2016 to 1700 hrs on 15 September 2016.

During this outage, a credible contingency can separate South Australia region from the rest of the NEM.

Under these circumstances, 35 MW of Raise and Lower regulation FCAS will be sourced from South Australia for the duration of this outage. In addition, consistent with AEMO existing procedures, adequate contingency FCAS lower requirements will also be sourced from South Australia at times when power transfer is from South Australia to Victoria.

The following constraint sets have been invoked for this outage:

F-V-MLMO (includes F-S_LREG_0035 and F-S_RREG_0035)
S-BOTH_BLKRG_C_OS
V-MLMO

Refer AEMO Network Outage Schedule (NOS) for further details.

AEMO will continue monitoring this proposed outage and will update the Market accordingly.

Edmund Hon
AEMO Operations

Market notice 54864 was issued on 8 September 2016.

Market Notice	Type	Date of issue	Last Changed
54864	General Notice	8/09/2016 12:41:18	08/09/2016 12:41:18

Reason

AEMO ELECTRICITY MARKET NOTICE.

**Re-scheduled outage from Ausnet. **
Originally planned for 15/09/2016 0700 hrs to 15/09/2016 1700 hrs and now been rescheduled as below.

This market notice is FOR INFORMATION ONLY.

The Moorabool to Mortlake PS 500kV line in Victoria Region is planned out of service from 0700 hrs on 16 September 2016 to 1700 hrs on 16 September 2016.

During this outage, a credible contingency can separate South Australia region from the rest of the NEM.

Under these circumstances, 35 MW of Raise and Lower regulation FCAS will be sourced from South Australia for the duration of this outage. In addition, consistent with AEMO existing procedures, adequate contingency FCAS lower requirements will also be sourced from South Australia at times when power transfer is from South Australia to Victoria.

The following constraint sets have been invoked for this outage:

F-V-MLMO (includes F-S_LREG_0035 and F-S_RREG_0035)
S-X_BC_CP
V-MLMO

Refer AEMO Network Outage Schedule (NOS) for further details.

AEMO will continue monitoring this proposed outage and will update the Market accordingly.

Edmund Hon
AEMO Operations

Appendix F Price setter

The following tables identify for each five-minute dispatch interval where regulation dispatch prices were above $5000/MW, the price and the generating units involved in setting the price for each of the lower and raise regulation services in South Australia. This information is published by AEMO.[7] Also shown are 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. Generator offers which contributed zero to the price have been removed for clarity.

Lower regulation 16 September

DI	Dispatch Price ($/MW)	Participant	Unit	Service	Offer price ($/MW)	Marginal change	Contribution
11:05	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:10	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:15	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:20	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:25	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:30	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:35	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:40	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:45	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:50	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
11:55	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:00	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:05	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:10	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:15	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:20	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:25	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:30	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:35	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:40	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:45	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:50	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
12:55	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:00	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:05	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00

[7] Details on how the price is determined can be found at www.aemo.com.au

DI	Dispatch Price ($/MW)	Participant	Unit	Service	Offer price ($/MW)	Marginal change	Contribution
13:10	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:15	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:20	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:25	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:30	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:35	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:40	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:45	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:50	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
13:55	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:00	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:05	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:10	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:15	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:20	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:25	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:30	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:35	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:40	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:45	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:50	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
14:55	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
15:00	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
15:05	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
15:10	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
15:15	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
15:20	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00
15:25	9450	Origin	OSB-AG	Lower reg	9450	-1	-$9450.00

Raise regulation 16 September

DI	Dispatch Price ($/MW)	Participant	Unit	Service	Offer price ($/MW)	Marginal change	Contribution
11:05	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:10	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:15	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:20	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:25	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:30	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250

DI	Dispatch Price ($/MW)	Participant	Unit	Service	Offer price ($/MW)	Marginal change	Contribution
11:35	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:40	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:45	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:50	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
11:55	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:00	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:05	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:10	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:15	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:20	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:25	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:30	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:35	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:40	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:45	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:50	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
12:55	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:00	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:05	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:10	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:15	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:20	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:25	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:30	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:35	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:40	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:45	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:50	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
13:55	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
14:00	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
14:05	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
14:10	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
14:15	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
14:20	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
14:25	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
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14:35	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
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DI	Dispatch Price ($/MW)	Participant	Unit	Service	Offer price ($/MW)	Marginal change	Contribution
14:50	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
14:55	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
15:00	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
15:05	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
15:10	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
15:15	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
15:20	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250
15:25	11 250	Origin	OSB-AG	Raise Reg	11 250	-1	-$11 250