



Electricity Pricing Event Reports

SEPTEMBER 2016

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** A summary was prepared as the maximum daily spot price was between \$500/MWh and \$2,000/MWh*



Monday 5 September 2016 – High Energy price SA

Market Outcomes: South Australia spot price reached \$2,361.27/MWh for trading interval (TI) ending 0000 hrs.

FCAS prices in all regions and Energy prices for the other NEM regions were not affected by this event.

Detailed Analysis: The 5-Minute dispatch price reached \$14,000/MWh in South Australia for dispatch interval (DI) ending 2335 hrs. This high price can be mainly attributed to a spike in South Australian demand due to hot water load management, low wind and limited interconnector support.

Between DIs ending 2330 hrs and 2335 hrs, South Australian demand increased by 212 MW to reach 1,646 MW. This increase in demand was as a result of a spike in hot water load.

The target flow towards South Australia on the Heywood interconnector increased from 480 MW for DI ending 2330 hrs to 600 MW for DI ending 2335 hrs and was limited by the upper transfer limit constraint equation V:S_600_HY_TEST and oscillatory stability constraint equation V:S_PA_SVC_600. The V:S_PA_SVC_600 constraint equation prevents oscillatory instability by limiting Heywood interconnector to an upper transfer limit of 600 MW from VIC to SA, during the outage of one Para SVC.

The target flow towards South Australia on the Murraylink interconnector increased from 0 MW for DI ending 2330 hrs to 80 MW for DI ending 2335 hrs and was limited by the constraint equation VSML_ROC_80. This constraint equation limits the rate of change of flow towards South Australia across the Murraylink interconnector to 80 MW per 5 minutes.

Wind generation in South Australia was low at approximately 126 MW for DI ending 2335 hrs.

Cheaper priced generation was available but limited due to fast start inflexibility profiles (Hallet PS).

The 5-minute price reduced to \$48.02/MWh for DI ending 2340 hrs, when AGL, Origin Energy and Lumo Generation rebid 253 MW of generation capacity from bands priced at \$589.95/MWh or above to bands priced at -\$0.01/MWh or below.

The high 30-minute spot price for South Australia was not forecast in the pre-dispatch schedules, as they occurred as a result of a spike in 5-minute demand in South Australia during the affected TI.

Tuesday 06 to Saturday 10 September 2016 – High FCAS, Negative and High Energy price SA

Market Outcomes: South Australia Raise Regulation Frequency Control Ancillary Service (FCAS) prices ranged between \$98/MWh and \$452.66/MWh for all trading intervals (TIs) between TI ending 0730 hrs on 6 September 2016 and 1800 hrs on 10 September 2016. South Australian Lower Regulation FCAS prices ranged between \$77.50/MWh and \$300/MWh for 196 TIs over the same period (total of 214 TIs).



South Australia had a high energy price of \$1,783.47/MWh for TI ending 2100 hrs on 8 September 2016 and a negative energy price of -\$144.15/MWh for TI ending 1500 hrs on 9 September 2016.

FCAS and Energy prices in the other regions were not affected by this event.

Actual Lack of Reserve Level 2 (LOR2) conditions had been declared for the South Australia region between:

- 0710 hrs on 6 September 2016 and 2300 hrs on 7 September 2016 (Market Notices 54853 and 54860).
- 0220 hrs on 8 September 2016 and 0535 hrs on 9 September 2016 (Market Notices 54861 and 54880).
- 0710 hrs and 0945 hrs on 9 September 2016 (Market Notices 54882 and 54883).
- 1800 hrs on 9 September 2016 and 1805 hrs on 10 September 2016 (Market Notices 54886 and 54889).

During these LOR2 periods, there were sufficient capacity reserves in the South Australia region to meet electricity demand. However in the event of a credible contingency, whereby South Australia separated from the rest of the NEM, power interruptions would have been likely as it may not have been possible to bring the required additional capacity into service in time to avoid automatic under-frequency load shedding.

At 1635 hrs on 1 September 2016, the rolling sum of Raise Regulation FCAS price for the South Australia region for the previous 2,016 dispatch intervals (DIs) exceeded six times the cumulative price threshold (CPT) of \$210,100. As a result, an administered price cap (APC) of \$300/MWh was applied to all ancillary service prices in South Australia for DIs ending between 1640 hrs on 01 September 2016 and 0400 hrs on 09 September 2016 (Market Notices 54827 and 54877).

Detailed Analysis: The 5-minute Raise Regulation FCAS price ranged between \$98/MWh and \$1,100.95/MWh for all DIs between DIs ending 0705 hrs on 6 September 2016 and 1800 hrs on 10 September 2016 (total of 1,284 DIs). The 5-minute Lower Regulation FCAS price ranged between \$128.69/MWh and \$565.35/MWh for 1,153 DIs over the same period. These high FCAS prices are mainly attributed to the application of local Regulation FCAS requirements within South Australia during a planned outage of the Heywood No. 2 500 kV Bus. Other contributing factors include shifting and withdrawal of generation capacity and limitations associated with available Regulation FCAS during some DIs.

The 5-minute Energy dispatch price reached the Market Price Cap (MPC) of \$14,000/MWh for DI ending 2035 hrs on 8 September 2016. This high energy price was mainly attributed to a sudden reduction in wind generation and limited interconnector support, during a planned network outage.

The 5-minute Energy dispatch price was -\$592.10/MWh for DI ending 1500 hrs on 9 September 2016. This negative energy price was mainly attributed to high wind generation, a decrease in demand and limited interconnector flows, during a planned network outage.

The Heywood No. 2 500 kV Bus was on a planned outage between 0713 hrs on 6 September 2016 and 1733 hrs on 10 September. The outage constraint sets F-I_HYSE, S-BOTH_BLKRG_C_OS, V-HYTX_M12 and V-HY_500BUS were invoked for the duration of this outage. The Heywood – Mortlake 500kV line was also on a planned outage between 0740 hrs and 1643 hrs on 6 September 2016 and between 0734 hrs and 1655 hrs on 7 September 2016. The outage constraint sets F-V-HYMO, S-X_BC_CP and V-HYMO were invoked for the duration of this outage on each day. These outages increased the risk of synchronous separation between South Australia and Victoria. The constraint equations F_S+LREG_0035 and F_S+RREG_0035 contained within the F-V-HYMO and F-I_HYSE constraint sets



required 35 MW of Lower and Raise Regulation FCAS capacity to be sourced from within South Australia.

Regulation FCAS in South Australia during the outage period was provided by Torrens Island B PS, Quarantine PS unit 5 (QPS5), Pelican Point PS and Osborne PS.

06 September 2016

Following the commencement of the Heywood No. 2 500 kV Bus outage, between DIs ending 0715 hrs on 6 September and 0000 hrs on 7 September, the 5-minute Regulation FCAS prices ranged between \$20/MWh and \$287/MWh. The 5-minute Regulation FCAS prices reached up to \$287/MWh for DIs ending 1345 hrs, 1350 hrs, 1355 hrs, 1805 hrs and 1925 hrs, when the output from at least one unit providing Regulation services exceeded its Regulation FCAS trapezium maximum enablement limit. Consequently, these units became stranded or trapped (unavailable) for Regulation FCAS and additional generation had to be enabled from more expensive price bands.

For 6 September, South Australia 30-minute energy prices ranged between \$22.60/MWh and \$146.61/MWh.

07 September 2016

Between DIs ending 0035 hrs and 0700 hrs, the 5-minute Regulation FCAS prices were elevated between \$285/MWh and \$300/MWh, when Pelican Point withdrew 35 MW of generation capacity from both the Regulation markets and AGL shifted 4 MW of Regulation capacity from \$286.60/MWh to \$13,780.70/MWh.¹

The elevated prices reduced to \$98/MWh or below between DIs ending 0705 hrs and 0800 hrs, when additional Regulation capacity was made available from Torrens Island B PS. From DI ending 0805 hrs on 7 September until 0000 hrs on 8 September 2016, the Regulation prices returned to elevated levels ranging between \$284/MWh and \$300/MWh when AGL withdrew all generation capacity from Torrens Island B unit 4.

For 7 September, South Australia 30-minute energy prices were typical, mostly ranging between \$5.96/MWh and \$46.51/MWh. However, for 6 TIs, prices dropped to between -\$6.16/MWh and -\$73.10/MWh, as there was no generation offered between -\$45/MWh and \$0/MWh, so small fluctuations in wind or demand led to negative prices for some DIs.

08 September 2016

5-minute Regulation FCAS prices continued to remain elevated between \$284/MWh and \$300/MWh between DIs ending 0005 hrs and 1535 hrs. The Regulation FCAS prices reduced to \$98/MWh or below between DIs ending 1540 hrs and 1600 hrs, when additional Regulation capacity became available from Torrens Island B PS. The Regulation FCAS prices returned to \$129/MWh or above between DIs ending 1605 hrs on 8 September and 0000 hrs on 9 September, when AGL shifted 12 MW of Raise and Lower Regulation capacity from bands priced at \$299.57/MWh or below to \$13,980.43/MWh.

The 5-minute energy price in South Australia reached \$14,000/MWh for DI ending 2035 hrs. Between DIs ending 2030 hrs and 2035 hrs, wind generation decreased by 75 MW in South Australia, reaching 697 MW at DI ending 2035 hrs. Consequently, additional generation had to be sourced from Osborne

¹ 4 MW of Torrens Island PS units 3 and 4 Lower and Raise Regulation FCAS capacity was shifted from lower to higher priced bands at 0005 hrs and 0035 hrs, respectively.



PS and Torrens Island B PS at more expensive price bands. The increased dispatch in the Energy market reduced Osborne PS availability in the Raise Regulation FCAS market to zero. For DI ending 2035 hrs, the F_S+RREG_0035 constraint equation violated as only 26.84 MW of Raise Regulation capacity was available in South Australia, below the 35 MW required by the constraint equation. For DI ending 2035 hrs, the Raise Regulation FCAS price was capped to the APC of \$300/MWh.

For DI ending 2035 hrs, the target flow towards South Australia on the Heywood and Murraylink interconnectors was limited to 189 MW and 220 MW, respectively.^{2,3} Cheaper priced generation was available but required more than one DI to synchronise (Ladbroke Grove GT units 1 and 2).

09 September 2016

The APC was removed at 0400 hrs on 09 September 2016 when the cumulative sum of Lower and Raise Regulation FCAS prices reduced to below six times the CPT.

For DI ending 0405 hrs, the Regulation FCAS prices reduced from \$285/MWh or above to \$128.69/MWh, when additional lower priced capacity became available from Torrens Island B PS and Pelican Point PS. Regulation FCAS prices ranged between \$128.69/MWh and \$191.73/MWh for all DIs throughout the day, except DIs ending 1105 hrs, 1500 hrs, 2305 hrs and 2310 hrs.

For DI ending 1105 hrs, the Regulation FCAS prices increased up to \$324.80/MWh, when Torrens Island B unit 3 was unavailable to provide Regulation FCAS (AGC status off). For DI ending 1500 hrs, the 5-minute Lower Regulation FCAS prices increased up to \$565.35/ MWh, when Pelican Point's availability in the Lower Regulation FCAS market decreased.

The 5-minute Regulation FCAS prices increased up to \$1,100.95/MWh for DIs ending 2305 hrs and 2310 hrs, when Torrens Island B PS availability in Regulation FCAS markets reduced due to increased dispatch in the energy market.

The 5-minute energy price was negative for 36 DIs between DIs ending 1230 hrs and 1605 hrs. The prices reduced up to -\$592.10/MWh for DI ending 1500 hrs. During this period, wind generation was high, reaching up to 1,049 MW, and demand reducing, reaching a minimum of 1,069 MW.

For DI ending 1500 hrs, the target flow towards Victoria on the Murraylink interconnector was limited to 56 MW by the FCAS constraint equation F_S++HYSE_L60.⁴ The target flow towards Victoria on the Heywood interconnector was limited to 175 MW by the thermal constraint equation S>V_NIL_NIL_RBNW.⁵ With excess lower priced generation available in South Australia during the low demand period, the South Australia price decreased to -\$592.10/MWh for DI ending 1500 hrs.

10 September 2016

The 5-minute Regulation FCAS prices was \$128.69/MWh for most DIs between DIs ending 0005 hrs and 1805 hrs. Between DIs ending 0205 hrs and 0400 hrs, Lower Regulation prices ranged between

² Heywood was limited by the V_S_ROCOF constraint equation, which prevents the cascading loss of generation in South Australia following a separation event, during a period when South Australia is at risk of separation from Victoria.

³ Murraylink was limited by the upper transfer limit constraint equation VSML_220.

⁴ This constraint equation manages the Slow Lower FCAS requirement in South Australia, during the outage of the Heywood No. 2 500 kV Bus.

⁵ The system normal constraint equation, S>V_NIL_NIL_RBNW, prevents the overload of Robertstown – North West Bend No.1 or 2 132kV lines.



\$292.33/MWh and \$295.42/MWh, as the availability of Lower Regulation services from Torrens Island PS units 1, 3 and 4 was limited for those DIs.

For DI ending 1810 hrs, the 5-minute Raise and Lower Regulation prices reduced to \$16.12/MWh and \$3/MWh, respectively, when the outage constraint set F-I-HYSE was revoked following completion of the Heywood No. 2 500 kV Bus outage and there was no longer a local Regulation FCAS requirement for SA.

The high Regulation FCAS prices were generally forecast in pre-dispatch schedules. The high energy price on 8 September was not forecast in pre-dispatch schedules, as it was the result of a decrease in wind generation within the affected TI. The negative energy price on 9 September 2016 was not forecast in pre-dispatch as forecast demand was higher in the latest pre-dispatch schedule, compared to dispatch.

Tuesday 13 September 2016 – High FCAS price SA

Market Outcomes: South Australia Raise and Lower Regulation Frequency Control Ancillary Service (FCAS) price reached \$2,399.99/MWh and \$2,316.23/MWh, respectively, for trading interval (TI) ending 0730 hrs. Regulation FCAS prices ranged between \$151.51/MWh and \$307.05/MWh for all TIs between TIs ending 0800 hrs and 1730 hrs.

FCAS prices in the other regions and energy prices in all regions were not affected by this event.

Actual Lack of Reserve Level 2 (LOR2) condition had been declared for the South Australia region between 0830 hrs and 1715 hrs on 13 September 2016 (Market Notices 54897 and 54906). During this LOR2 period, there were sufficient capacity reserves in the South Australia region to meet electricity demand. However, in the event of a credible contingency, whereby South Australia separated from Victoria, power interruptions would have been likely, due to automatic under-frequency load shedding. This would have been triggered as a result of ramp rate limitations, associated with dispatching additional generation in a short timeframe.

Detailed Analysis: The 5-minute Regulation FCAS prices in South Australia ranged between \$299.99/MWh and \$498.70/MWh for all dispatch intervals (DIs) between DI ending 0705 hrs and 1715 hrs excluding DI ending 0710 hrs. For DI ending 0710 hrs, Raise and Lower Regulation FCAS prices reached \$12,899.99/MWh and \$12,000.00/MWh, respectively. These high prices were mainly attributed to increased Regulation FCAS requirements within South Australia during a planned outage of Moorabool – Mortlake 500kV line and limitations associated with available Regulation FCAS from Pelican Point.

The Moorabool – Mortlake 500kV line was on a planned outage between 0704 hrs and 1659 hrs on 13 September 2016. This outage increased the risk of electrical separation between South Australia and Victoria. The outage constraint sets F-V-MLMO, S-BOTH_BLKRG_C_OS and V-MLMO were invoked for between 0700 hrs and 1715 hrs on 13 September 2016. The constraint equations F-S+LREG_0035 and F-S+RREG_0035 contained within the F-V-MLMO constraint set required 35 MW of Lower and Raise Regulation FCAS capacity to be sourced from within South Australia.

Regulation FCAS in South Australia during the outage period was provided by Torrens Island B PS, Torrens Island A PS, Pelican Point PS and Osborne PS.



Following the invocation of the local Regulation FCAS requirement, at DI ending 0705 hrs, the FCAS price reached \$299.99/MWh and \$498.70/MWh for Raise and Lower Regulation services, respectively.

For DI ending 0710 hrs, Pelican Point PS output of 167.91 MW was below the unit's Regulation FCAS trapezium minimum enablement limit of 168 MW. As a result, for DI ending 0710 hrs, Pelican Point PS was stranded (unavailable) for Regulation FCAS and additional Regulation FCAS capacity had to be sourced from Torrens Island B units 1, 3 and 4 at more expensive price bands. For DI ending 0715 hrs, Pelican Point PS became available (not limited) for Regulation FCAS and the prices reduced to \$299.99/MWh and \$498.70/MWh for Raise and Lower Regulation, respectively.

Between DIs ending 0720 hrs and 1715 hrs, Regulation FCAS prices ranged between \$299.99/MWh and \$337.19/MWh. For DI ending 1720 hrs, the 5-minute Raise and Lower Regulation FCAS prices reduced to \$14.95/MWh and \$3.02/MWh, respectively, when the outage constraint set F-V-MLMO was revoked following completion of the outage.

The high Regulation FCAS prices were forecast in the latest pre-dispatch schedules, except for the high prices at TI ending 0730 hrs, which were not predictable as they were the result of stranding (unavailability) of generators within the affected TI.

Friday 16 September 2016 – High FCAS price SA

Market Outcomes: South Australia Raise and Lower Regulation Frequency Control Ancillary Service (FCAS) prices ranged between \$599/MWh and \$4,232.77/MWh for all trading intervals (TIs) between TIs ending 0730 hrs and 1100 hrs. Regulation FCAS prices ranged between \$7,875.50/MWh and \$11,250/MWh for all TIs between TIs ending 1130 hrs and 1530 hrs.

FCAS prices in the other regions and energy prices in all regions were not affected by this event.

Actual Lack of Reserve Level 2 (LOR2) condition had been declared for the South Australia region between 0700 hrs and 1525 hrs on 16 September 2016 (Market Notices 54919 and 54922). During this LOR2 period, there were sufficient capacity reserves in the South Australia region to meet electricity demand, however due to the Moorabool - Mortlake 550 kV line outage a credible contingency could result in South Australia being separated from Victoria, which could in-turn trigger automatic under-frequency load shedding, and result in power interruptions.

Detailed Analysis: Between DIs ending 0705 hrs and 1100 hrs, the 5-minute Raise and Lower Regulation FCAS prices ranged between \$599/MWh and \$11,502/MWh. For all DIs between DI ending 1105 hrs and 1525 hrs, the Raise and Lower Regulation FCAS price reached \$11,250/MWh and \$9,450/MWh, respectively. These high prices were mainly attributed to increased Regulation FCAS requirements within South Australia during a planned outage of Moorabool – Mortlake 500kV line, limitations associated with available Regulation FCAS and shifting of Regulation FCAS capacity to higher priced bands, resulting in limited availability of lower priced Regulation FCAS in South Australia.

The Moorabool – Mortlake 500kV line was on a planned outage between 0702 hrs and 1509 hrs on 16 September 2016. This outage meant that a credible contingency could result in electrical separation between South Australia and Victoria. The outage constraint sets F-V-MLMO, S-X_BC_CP



and V-MLMO were invoked between 0705 hrs and 1525 hrs on 16 September 2016. The constraint equations F_S+LREG_0035 and F_S+RREG_0035 contained within the F-V-MLMO constraint set required 35 MW of Lower and Raise Regulation FCAS capacity to be sourced from within South Australia.

Regulation FCAS in South Australia during the outage period was provided by Torrens Island B PS, Torrens Island A PS, Pelican Point PS and Osborne PS.

Between DIs ending 0705 hrs and 1100 hrs, the Regulation FCAS prices remained at \$599/MWh for most DIs. For DIs ending 0740 hrs, 0810 hrs, 0825 hrs, 0835 hrs and 0840 hrs, the prices reached up to \$11,501.53/MWh for Raise Regulation and \$9,501.94/MWh for Lower Regulation FCAS. For these DIs, the output from Torrens Island A PS unit 3 exceeded the unit's Regulation FCAS trapezium maximum enablement limit of 109.53 MW. As a result, Torrens Island A PS unit 3 was stranded (unavailable) for Regulation FCAS and more expensive Regulation FCAS capacity had to be sourced from Torrens Island B PS unit 3.

For DI ending 1105 hrs, Origin Energy (Osborne PS) shifted 1 MW of Raise and Lower Regulation FCAS capacity from \$0/MWh to \$11,256.75/MWh and \$9,455.67/MWh, respectively. This resulted in sustained high prices until DI ending 1525 hrs.

For DI ending 1530 hrs, the 5-minute Raise and Lower Regulation FCAS prices reduced to \$17.28/MWh and \$3/MWh, respectively, when the outage constraint set F-V-MLMO was revoked following completion of the outage and the 35 MW Regulation FCAS requirement was removed.

The high Regulation FCAS prices were forecast in the latest pre-dispatch schedules except for TIs ending 0800 hrs and 0900 hrs, due to stranding (unavailability) of units within the affected TIs.

Tuesday 27 September 2016 – High FCAS price Mainland

Market Outcomes: The Mainland had high Fast Raise and Raise Regulation Frequency Control Ancillary Service (FCAS) prices reaching \$65.99/MWh and \$96.92/MWh, respectively, for trading interval (TI) ending 1900 hrs.

Energy prices across all NEM regions and the FCAS price in Tasmania were not affected by this event.

Detailed Analysis: The 5-Minute Raise Regulation FCAS prices in the NEM reached \$238.83/MWh and \$157.98/MWh for dispatch intervals (DIs) ending 1840 hrs and 1845 hrs, respectively. The 5-minute Fast Raise FCAS prices reached \$194.54/MWh and \$109.32/MWh for the same DIs. These high prices were mainly attributed to limited availability of lower priced FCAS, due to planned generator outages and increasing demand, stranding or trapping of some units and Basslink being unable to transfer FCAS.

Between DIs ending 1820 hrs and 1845 hrs, Basslink was in the no-go zone and unable to transfer FCAS. During these DIs, the Global Raise Regulation FCAS requirement of 130 MW, had to be sourced solely from the mainland regions.



During this period, a number of units that typically provide lower priced Raise FCAS services were on planned outages in NSW (Eraring Unit 4, Mount Piper Unit 1 and Vales Point Unit 5), QLD (Gladstone Units 5 and 6 and Tarong Unit 1) and VIC (Hazelwood Units 2 and 6, and Yallourn Unit 2).

Between DI ending 1835 hrs and 1840 hrs demand in the Mainland increase by 224 MW. For this DI, Bayswater Unit 1, Liddell Unit 2 and Mount Piper Unit 2 became trapped or stranded for Raise Regulation FCAS, thus being unavailable to provide Raise Regulation capacity. For the same DI, Fast Raise FCAS services from Eraring Unit 2, Mount Piper Unit 2, Stanwell Units 1 and 4 became trapped or stranded, thus being unavailable for Fast Raise FCAS services. For DI ending 1845 hrs demand in the Mainland reached its daily peak at 24,401 MW and these units continued to remain trapped or stranded for both Raise Regulation and Fast Raise FCAS services for this DI.

At DI ending 1850 hrs, Raise Regulation and Fast Raise FCAS prices decreased to \$10.43/MWh and \$4.60/MWh, respectively, when Basslink became available to provide FCAS from Tasmania.

The high Raise Regulation and Fast Raise FCAS prices were not forecast in the latest pre-dispatch schedules as they were the result of trapping and stranding (unavailability) of generators as well as Basslink being in the no-go zone within the affected TI.

Thursday 29 September 2016 – High FCAS price QLD, NSW, VIC

Market Outcomes: Queensland, New South Wales and Victoria had high Frequency Control Ancillary Service (FCAS) prices for trading interval (TI) ending 2330 hrs. For this TI, Lower Regulation, Raise Regulation, Fast Raise and Slow Raise FCAS prices reached \$63.80/MWh, \$33.88/MWh, \$25.81/MWh, and \$45.18/MWh, respectively.

FCAS prices in Tasmania and energy prices for all regions were not affected by this event.

Detailed Analysis: The 5-minute Lower Regulation FCAS prices in the three regions ranged between \$20.80/MWh and \$99.99/MWh between dispatch intervals (DIs) ending 2305 hrs and 2330 hrs. The 5-minute Raise Regulation, Fast Raise and Slow Raise FCAS prices ranged between \$20.08/MWh and \$51.00/MWh over the same period. These high FCAS prices can be mainly attributed to increased Lower Regulation FCAS requirements, stranding of some units that typically provide lower priced FCAS services during a period when Basslink was unable to transfer FCAS.

The South Australia Energy and FCAS markets were suspended between 1625 hrs on 28 September 2016 until 2230 hrs on 11 October 2016, following a black system in the South Australia region between 1618 hrs on 28 September 2016 and 1825 hrs on 29 September 2016. During the period of market suspension, FCAS services were only procured from NSW, QLD, VIC and TAS. No FCAS was procured from SA generators during this period.

During the high priced TI, flow on the Basslink interconnector was in the no-go-zone and Basslink was unable to transfer FCAS from Tasmania to the mainland.

The accumulated time error in the NEM was above +1.5 seconds for 56 minutes between 2310 hrs on 29 September 2016 and 0006 hrs on 30 September 2016. The maximum time error reached was +3.47 seconds at 2328 hrs. To manage the time error, the requirement for Lower Regulation services in the Mainland increased from 120 MW for DI ending 2315 hrs to 222 MW (maximum) for DI ending 2335 hrs.



5-minute Raise Regulation, Fast Raise and Slow Raise FCAS prices had been elevated since DI ending 2205 hrs. Between DI ending 2205 hrs and 2225 hrs the FCAS enablement maximum from multiple generating units for these Raise FCAS services were rebid from between 175 MW and 240 MW down to between 150 MW to 175 MW. For most DIs within the high priced TI, at least one of the Gladstone PS units 1, 3 and 4 were unavailable (stranded) for FCAS services as their output fell below their FCAS trapezium minimum enablement limit (120 MW). As a result, FCAS capacity had to be sourced from other generators at more expensive price bands.

For DI ending 2340 hrs, 5-minute Lower Regulation, Raise Regulation, Fast Raise and Slow Raise FCAS prices reduced to \$47/MWh, \$10/MWh, \$6.8/MWh and \$2.39/MWh, respectively, when flow on the Basslink interconnector was outside the no-go zone and thus able to transfer FCAS to the mainland. The Lower Regulation FCAS requirement also reduced, as the time error had recovered to below 3 seconds.

The high FCAS prices were forecast in the latest pre-dispatch schedules.