Electricity Pricing Event Reports

JUNE 2016

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

Friday 03 June 2016 – High FCAS price Mainland

Market Outcomes: The Mainland (Queensland, New South Wales, Victoria and South Australia) had high Raise Regulation Frequency Control Ancillary Service (FCAS) prices, reaching $68.27/MWh and $149.47/MWh for trading intervals (TIs) ending 0000 hrs and 0600 hrs, respectively. The Mainland Fast Raise and Slow Raise prices reached $31.88/MWh and $24.89/MWh, respectively, for TI ending 0000 hrs.

FCAS and Energy prices in Tasmania were not affected by this event. Energy prices for the Mainland were elevated but did not reach the price threshold for reporting purposes.

Detailed Analysis: The 5-minute Raise Regulation FCAS prices in the Mainland ranged between $75.10/MWh and $203.70/MWh for 8 dispatch intervals (DIs) within the high priced TIs. The 5-minute Slow Raise FCAS prices ranged between $29.95/MWh and $34.00/MWh between DIs ending 2335 hrs and 2345 hrs. Fast Raise prices ranged between $34.20/MWh and $38.00/MWh for the same DIs. These high FCAS prices can be mainly attributed to increased FCAS requirements on the Mainland, due to an increasing time error. Other contributing factors include, rebidding and withdrawal of FCAS capacity, limited availability of cheaper priced FCAS capacity and steep supply curves in the Raise FCAS markets. In addition, FCAS support from Tasmania was unavailable due to the outage of the Basslink interconnector from 20 December 2015.

Since early April 2016, there has been limited availability of cheaper priced Raise FCAS capacity across the Mainland. Several generating units that typically provide cheaper priced Raise Regulation and Delayed Raise FCAS capacity were unavailable for extended periods. These include, Bayswater PS Unit 2, Vales Point PS Unit 6 and Torrens Island PS B Unit 2. In addition, Torrens Island PS A unit 1 was unavailable for the duration of the price event.

Between DIs ending 2325 hrs and 2340 hrs, Mainland demand increased by 323 MW, mainly due to hot water load management in South Australia. During this period, a number of units providing cheaper priced FCAS in the Mainland were dispatched close to their maximum capacity in the energy market, which effectively reduced their Raise FCAS availability. Between DIs ending 2335 hrs and 2345 hrs, 5-minute energy prices were between $161.96/MWh and $323.19/MWh across the Mainland regions. This energy price impacted the FCAS prices as the Raise FCAS availability was adjusted against the energy dispatch.

For DI ending 2305 hrs, AGL shifted up to 150 MW of Raise FCAS capacity from bands priced at or below $3.03/MWh to bands priced at $13,773.82/MWh with the reason '0835~F~00 INITIAL BID~'.

For DIs ending 2325 hrs and 2335 hrs, up to 30 MW of Raise FCAS capacity was withdrawn by CS energy from Gladstone PS units 3 and 5 with the reasons '2301P FCAS ENABLEMENT UPDATE-SL' and '1110P UNIT OFFLINE REVISED-SFP TX ISSUE-SL'.

Between DIs ending 2330 hrs and 2335 hrs, Raise Regulation FCAS availability in the Mainland decreased by 146 MW to 227 MW. During the same DIs, Fast Raise and Slow Raise FCAS availability decreased by 80 MW and 92 MW, respectively.

The Mainland FCAS prices for Fast Raise, Slow Raise and Raise Regulation Services reduced to $34.2/MWh, $25.43/MWh and $55.00/MWh, respectively, for DI ending 2350 hrs, when Mainland demand decreased by 228MW and Raise FCAS availability increased.

Between TIs ending 0500 hrs and 0600 hrs, Mainland total demand increased by 1,478 MW. Thus, additional generation capacity was dispatched in the energy market, which further reduced Raise FCAS availability for that period. For the high priced DIs, between DIs ending 0535 hrs and 0600hrs, 5-minute energy prices were between $197.37/MWh and $319.24/MWh across the Mainland regions. This energy price impacted the FCAS prices as the Raise FCAS availability was adjusted against the energy dispatch.

Between TI ending 0100 hrs and 0530 hrs, wind generation steadily reduced across South Australia from 274 MW to 48 MW. This contributed to an increase in the accumulated time error in the mainland.

The accumulated time error in the Mainland was below -1.5 sec for 77 minutes between 0517 hrs and 0700 hrs. To manage the time error, the amount of Raise Regulation services enabled in the Mainland increased from 130 MW for DI ending 0520 hrs to 205 MW for DI ending 0600 hrs.

The Mainland FCAS prices for Raise Regulation Services reduced to $49.20/MWh for DI ending 0605 hrs, when the Raise Regulation requirement reduced by 13 MW and 160 MW of Raise Regulation capacity was shifted from bands priced at or above $298.43/MWh to bands priced at or below $58.89/MWh.

The high 30-minute Mainland FCAS prices were forecast in the latest pre-dispatch schedules.

Wednesday 08 June 2016 – High FCAS price QLD

Market Outcomes: Queensland had high Frequency Control Ancillary Service (FCAS) prices for 5 trading intervals (TIs) between TIs ending 0930 hrs and 1200 hrs. The Queensland Delayed Lower and Lower Regulation FCAS prices were between $15.18/MWh and $115.47/MWh, between TIs ending 0930 hrs and 1030 hrs. The Queensland Slow Lower FCAS prices ranged between $23.65/MWh and $45.57/MWh for the high priced TIs, between TIs ending 1000 hrs and 1200 hrs. Queensland Fast Lower FCAS prices were $90.62/MWh and $57.08/MWh, for TIs ending 1130 hrs and 1200 hrs respectively.

Energy prices for Victoria, South Australia and New South Wales were elevated but did not reach the price threshold for reporting purposes. FCAS and energy prices in other NEM regions were not affected by this event.

Detailed Analysis: The 5-minute Delayed Lower and Lower Regulation FCAS prices in Queensland ranged between $52.39/MWh and $147.30/MWh for 7 dispatch intervals (DIs), between DIs ending 0930 hrs and 1000 hrs. The 5-minute Slow Lower and Fast Lower prices were $177.22/MWh and $28.99/MWh, respectively, for DI ending 1030 hrs. The 5-minute Slow Lower and Fast Lower prices ranged between $24.88/MWh and $201.63/MWh between DIs ending 1115 hrs and 1155 hrs. These high FCAS prices can be mainly attributed to increased FCAS requirements in Queensland, due to increased risk of electrical separation of Queensland from the NEM during a planned outage. Other contributing factors include, rebidding and withdrawal of FCAS capacity, limited availability of cheaper priced FCAS capacity and steep supply curves in the Lower FCAS markets.

Planned outage of the Muswellbrook – Tamworth no. 88 330 kV line was scheduled between 0633 hrs and 1803 hrs on 8 June 2016. This outage increased the risk of electrical separation between Queensland and New South Wales. The risk of separation created local contingency FCAS requirements for Queensland, which had to be sourced from within the region. In preparation for

the outage, AEMO invoked the constraint set F-N-MUTW_88 to manage the local FCAS requirements, effective from DI ending 0635 hrs.

For all high priced DIs, a number of units that typically provide Lower FCAS in Queensland were unavailable.

For all high priced DIs, between DIs ending 0930 hrs ad 1030 hrs, only 50 MW of local Queensland Contingency Lower FCAS was offered between $29/MWh and $1,200/MWh, resulting in steep supply curves. For a number of high priced DIs in this period, Lower Regulation was dispatched in Queensland to substitute for expensive Delayed Lower.

For DI ending 0930 hrs, Origin Energy shifted 164 MW of capacity in the New South Wales energy market from bands priced at the Market Floor Price (MFP) to bands priced at $281.55/MWh. For the same DI, the target flow towards New South Wales on the QNI interconnector increased by 45 MW. To prevent the FCAS constraint equations F_Q++MUTW_L6, F_Q++MUTW_L60 and F_Q++MUTW_L5 from violating, the enablement of local Contingency Lower services in Queensland increased by 107 MW.

Between DIs ending 0950 hrs and 0955 hrs, Queensland and New South Wales demand decreased by 61 MW and 37 MW respectively. Resultantly, the target flow towards New South Wales on the QNI interconnector decreased by 27 MW and the enablement of local Contingency Lower services in Queensland decreased by 41 MW.

For DI ending 1030 hrs, CS Energy shifted 90 MW of Fast Lower and Slow Lower capacity and 15MW of Delayed Lower capacity from bands priced at or below $2.78/MWh to bands priced between $5.16/MWh and $29.42/MWh.

For DI ending 1105 hrs, Origin Energy shifted 328 MW of capacity in the New South Wales energy market from bands priced at the Market Floor Price (MFP) to bands priced between $199.45/MWh and $281.55/MWh. Between DIs ending 1105 hrs and 1120 hrs, the target flow towards New South Wales on the QNI interconnector increased by 28 MW. To prevent the FCAS constraint equations F_Q++MUTW_L6, F_Q++MUTW_L60 and F_Q++MUTW_L5 from violating, the enablement of local Contingency Lower services in Queensland increased by 96 MW.

For DI ending 1115 hrs, CS Energy (Callide B unit 1) withdrew 10 MW from each of the Lower Regulation, Slow Lower and Fast Lower FCAS markets and 15 MW from the Delayed Lower FCAS market with the reason ‘1107P PLANT NOT FOLLOWING TARGET REBID TO MATCH LOAD-SL’.

For DIs ending 1125 hrs and 1155 hrs, CS Energy shifted 90 MW of Fast Lower, Slow Lower and Regulation Lower capacity and 15 MW of Delayed Lower capacity from bands priced at or below $18.60/MWh to bands priced between $29.38/MWh and $1,240.82/MWh.

For the DIs following the high priced DIs, the Queensland FCAS prices for Fast, Slow, Delayed and Regulation Lower services reduced to at or below $28.99/MWh, $28.99/MWh, $5.19/MWh and $24.71/MWh, respectively, when Queensland demand increased by up to 49MW.

The high 30-minute Mainland FCAS prices were forecast in the latest pre-dispatch schedules.

Monday 27 June 2016 – High Energy price SA*

Market Outcomes: South Australian spot price reached $1,252.20/MWh, $1,618.74/MWh and $1,241.39/MWh for trading intervals (TIs) ending between 0900 hrs and 1000 hrs.

Energy prices in other NEM regions were elevated, but did not reach the threshold for reporting purposes. FCAS prices in all regions were not affected by this event.

Detailed Analysis: 5-Minute dispatch price in South Australia ranged between $608.96/MWh and $1,756.38/MWh for all DIs between DIs ending 0835 hrs and 0950 hrs. These high prices can be attributed to a steep supply curve in South Australia, rebidding of generation capacity during a planned network outage.

- Planned outage of the Moorabool – Sydenham no. 1 500 kV line scheduled between 0630 hrs and 1649 hrs on 27 June 2016. Constraint sets V-MLSY_NOEMTT_R, V-SY_CB and V-SMSY were invoked for the duration of the outage.
- For the high priced TIs, South Australian demand was high, between 1,756 MW and 1,861 MW and, wind generation was low, between 167 MW and 192 MW.
- No generation capacity was offered between $0 and $119/MWh or between $591/MWh and $12,195MWh during the high priced DIs, resulting in a steep supply curve in South Australia.
- The thermal constraint equation, V>>V_MLSY_4BR started binding at DI ending 0755 hrs and bound for all high priced DIs. This constraint equation prevents the overload of the Keilor A2 or A4 500/220 kV transformer for the loss of the remaining Moorabool – Sydenham 500 kV line, during outage of the Moorabool – Sydenham no. 1 500 kV line.
- Target flow on the Heywood interconnector was limited by the constraint equation V>>V_MLSY_4BR.
    - Between DIs ending 0405 hrs and 0950 hrs, flow across the Keilor A2 and A4 500/220 kV transformers increased by 184 MVA and 182 MWA, respectively. This increased loading on the transformers contributed to the reduced flow towards South Australia on the Heywood interconnector.
    - For DIs ending between 0835 hrs and 0910 hrs, target flow towards South Australia on the Heywood interconnector reduced from 93 MW to 23 MW.
    - For DI ending 0915 hrs, the constraint equation, V>>V_MLSY_4BR, reversed the target flow on the Heywood interconnector towards Victoria.
    - For DIs ending between 0915 hrs and 0950 hrs, the same constraint equation increased the target flow on the Heywood interconnector from 18 MW to 51 MW towards Victoria.
- Target flow on the Murraylink interconnector was limited up to 206 MW towards South Australia by the constraint equations V>>V_MLSY_4BR and V^SML_NSWRB_2. The V^SML_NSWRB_2 constraint equation prevents the overload of the Buronga – Redcliffs (X5) 220 kV line during outage of the NSW Murraylink runback scheme.
- For DIs ending 0840 hrs, 0905 hrs, 0935 hrs, and 0940 hrs, AGL rebid or shifted up to 20 MW of generation capacity from bands priced at $590.06/MWh or below to bands priced at $12,195.07/MWh or above.
- Additional cheaper priced generation was available from Snuggery GT, but either required more than one DI to synchronise, or was limited by its fast start profile or ramp rates.

The 5-minute price in South Australia reduced to $409.99/MWh for DI ending 0955 hrs, when:

- South Australia demand decreased by 35MW.
- Flow across the Keilor A2 and A4 500/220 kV transformers decreased by 6 MVA and 5 MVA, respectively.
- Target flows on the Heywood Interconnector towards Victoria decreased by 34 MW.

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

Tuesday 28 June 2016 – High Energy price SA

Market Outcomes: South Australian spot price reached $1,862.16/MWh, $2,054.51/MWh and $3,102.23/MWh for trading intervals (TIs) ending 1000 hrs, 1830 hrs and 1900 hrs, respectively.

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

Detailed Analysis: 5-Minute dispatch price in South Australia reached $10,760.69/MWh for dispatch interval (DI) ending 0935 hrs and ranged between $7,281.39/MWh and $10,761.96/MWh for 3 DIs between DIs ending 1825 hrs and 1840 hrs. These high prices can be attributed to a steep supply curve in South Australia, rebidding of generation capacity and limited interconnector support.

South Australian demand peaked at 2108 MW for TI ending 1930 hrs. Between TIs ending 1800 hrs and 1900 hrs, demand increased by 224 MW. For all high priced DIs, semi-scheduled wind generation in South Australia was low, between 125 MW and 215 MW.

For all high priced DIs, South Australian generation capacity was offered at either below $362/MWh or above $10,586/MWh.

For all high priced DIs, the thermal constraint equation, V>>S_KNPW_SETB_SGKH was binding. This constraint equation prevents overload of the Snuggery – Keith 132kV line for loss of one South East – Tailem Bend 275kV line, during outage of the Kincraig – Penola West 132kV line. This constraint equation constrained off cheaper priced generation in South Australia from Ladbroke Grove PS units 1 and 2 and Lake Bonney WF units 2 and 3 and limited the target flow towards South Australia on the Heywood interconnector up to 346 MW.

For the high priced DIs, the target flow on the Murraylink interconnector was limited to 24 MW towards Victoria by the thermal constraint equation, V>SMLBAHO4. This constraint equation prevents the overload of the Buronga – Redcliffs (0X1) 220 kV line for loss of either the Bendigo – Kerang 220 kV line or the Ballarat – Horsham 220 kV line, during the outage of either the Bendigo – Kerang 220 kV line or the Ballarat – Horsham 220 kV line.

For DI ending 0935 hrs, AGL and Energy Australia shifted 146 MW of generation capacity from bands priced at $484.99 or below to bands priced at $10,759.99/MWh or above.

For DI ending 1815 hrs, Lumo rebid 111 MW of generation capacity from the Market Floor Price (MFP) of -$1,000/MWh to the Market Price Cap (MPC) of $13,800/MWh.

For DI ending 1835 hrs, AGL and Synergen shifted 47 MW of generation capacity from the MFP to bands priced at $10,759.99/MWh or above.

For DI ending 1840 hrs, Synergen rebid 53 MW of generation capacity from the MPC to the MFP. For DI ending 1840 hrs, prices dropped to $7,281.39/MWh.

Additional cheaper priced generation was available but required more than one DI to synchronise (Quarantine PS unit 5, Dry Creek GT unit 1), or was limited by fast start profiles (Lonsdale PS, Dry Creek GT unit 2, Quarantine PS units 1 and 2, Snuggery PS) for at least one of the high priced DIs.

For the DIs subsequent to the high priced DIs, the South Australian dispatch price reduced to $305.49/MWh or below, when up to 305 MW of generation capacity was rebid from bands priced at $12,195.07/MWh or above to the Market Floor Price (MFP) of -$1000/MWh.

The high spot prices were not forecast in the latest pre-dispatch schedules, as rebidding of generation capacity occurred within the affected TIs.