Electricity Pricing Event Reports

DECEMBER 2015

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

Thursday 17 December 2015 – High Energy price SA, Negative Energy price TAS

Market Outcomes: South Australia spot prices reached $863.88/MWh, $2,310.06/MWh and $1,682.40/MWh for trading intervals (TIs) ending 1500 hrs, 1530 hrs and 1630 hrs respectively. Victoria spot price reached $1,626.30/MWh for TI ending 1630 hrs. Tasmania spot price reached - $410.38/MWh for the same TI.

Actual Lack of Reserve Level 1 (LOR1) condition had been declared for the South Australia region from 1600 hrs to 1825 hrs (Market Notices 50993 and 51010).

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

Detailed Analysis: 5-Minute dispatch price in South Australia was between $3,457.73/MWh and the Market Price Cap (MPC) of $13,800/MWh for three dispatch intervals (DIs) between DIs ending 1500 hrs and 1605 hrs. The 5-Minute dispatch price in Victoria reached $13,499.86/MWh for dispatch interval (DI) ending 1605 hrs. The 5-Minute dispatch price in South Australia, Victoria and Tasmania all reduced to between -$708.69/MWh and the Market Floor Price (MFP) of -$1,000/MWh for four dispatch intervals (DIs) between DIs ending 1615 hrs and 1630 hrs.

The high prices can be attributed to a tight supply curve during high demand period, low wind generation, non-scheduled generation changing their availability and rebidding of generation capacity. The negative prices can be attributed to rebidding of excess cheaper priced generation.

The South Australia demand peaked at 2,974 MW for TI ending 1730 hrs and the Victoria demand peaked at 8,572 MW for TI ending 1700 hrs. During the high priced TIs, wind generation in South Australia was between 120 MW and 137 MW.

Between DIs ending 1450 hrs and 1505 hrs, Alinta and AGL shifted or rebid a total of 150 MW of generation capacity from the bands priced at lower than $125.00/MWh to bands priced at higher than $13,329.00/MWh. For DI ending 1500 hrs, South Australia demand increased by 96 MW which was contributed by a decrease in non-scheduled generation. Cheaper priced generation was available but limited due to ramp rates or required more than one DI to synchronise or constrained off by the thermal constraint equation S>>NIL_SETB_KHTB1.

For DI ending 1500 hrs, the target flow on the Heywood interconnector was limited to 418 MW towards South Australia by the thermal constraint equation, S>>NIL_SETB_KHTB1. This constraint manages the post contingent loading on the Keith - Tailem Bend no. 1 132 kV line. For DI ending 1505 hrs, the target flow on the Heywood interconnector was limited to 460 MW towards South Australia by the same thermal constraint equation and the Victoria to South Australia Heywood upper transfer limit thermal constraint equation, V>S_460.

The target flow on the Murraylink interconnector was limited to up to 33 MW towards South Australia for the two DIs by the voltage stability constraint equation, V^SML_NSWRB_2 . This constraint avoids the voltage collapse in Victoria for loss of the Darlington Point to Buronga (X5) 220 kV line.

The 5-minute price in South Australia reduced to $260.69/MWh in the subsequent interval, DI ending 1510 hrs, when the demand was reduced by approximately 154 MW when 113 MW of non-

scheduled generation came online. Also, a total of 253 MW of generation capacity was rebid from price bands higher than $590.00/MWh to market floor price (MFP) of -$1,000/MWh.

Between DIs ending 1600 hrs and 1605 hrs in South Australia, Synergen, Alinta and AGL shifted or rebid a total of 166 MW of generation capacity from the bands priced at lower than $591/MWh to bands priced at higher than $10,759.30/MWh. For DI ending 1605 hrs, SA demand increased by 146 MW which was contributed by a decrease in non-scheduled generation. Cheaper priced generation was available but limited due to ramp rates or required more than one DI to synchronise or limited due to FCAS.

For the same DIs in Victoria, Origin and Snowy Hydro rebid a total of 780 MW of generation capacity from the bands priced at lower than $300.00/MWh to bands priced at or higher than $13,794.00/MWh. Cheaper priced generation was available but limited due to ramp rates or required more than one DI to synchronise or limited due to FCAS profile or constrained off by the voltage stability constraint equation N^^V_NIL_1.

For DI ending 1605 hrs, South Australia generation capacity was offered at less than $590/MWh or above $10,759/MWh and Victoria generation capacity was offered at less than $299/MWh or above $13,314/MWh resulting in a steep supply curve.

For DI ending 1605 hrs, the target flow on the VIC-NSW interconnector was limited to 213 MW towards Victoria by the voltage stability constraint equation, N^^V_NIL_1. This constraint prevents voltage collapse in Southern NSW for the loss of the largest VIC generating unit or Basslink. The target flow on the Basslink interconnector was limited to 515 MW towards Victoria by the voltage stability constraint equation, T^V_NIL_11. This constraint equation prevents voltage collapse at George Town 220 kV bus for the trip of Basslink harmonic filter.

Following high prices at DI ending 1605 hrs, between DIs ending 1615 hrs and 1625 hrs, Victoria moved 2,930 MW of capacity to the MFP, South Australia moved 42 MW of capacity to the MFP and Tasmania moved 1,745 MW of capacity to the MFP. These contributed to the negative dispatch prices below -$708/MWh in Victoria, South Australia and Tasmania. Prices returned to normal in Victoria, South Australia and Tasmania when generation capacity was shifted to higher priced bands.

The high 30-minute spot price for South Australia was not forecast in the pre-dispatch schedules, as it was a result of rebid of generation capacity within the affected trading interval.

Sunday 20 December 2015 – High Energy price TAS*

Market Outcomes: Tasmania spot price reached $1,993.58/MWh for trading interval (TI) ending 1430 hrs.

FCAS prices in Tasmania were elevated but did not exceed the reporting threshold ($3,000/MWh). Energy and FCAS prices for the other NEM regions were not affected by this event.

Detailed Analysis: 5-Minute dispatch price in Tasmania reached $11,707.37/MWh for dispatch interval (DI) ending 1425 hrs. The high price can be attributed to a tight supply and demand situation, and limited ramp rates during the unplanned outage of the Basslink interconnector.

- At 1403 hrs, the Basslink interconnector flow tripped from 250 MW when flowing towards Tasmania.

- The trip of the Basslink interconnector triggered the Frequency Control Special Protection Scheme (FCSPS) and reduced several Tasmania loads. The FCSPS is designed to disconnect pre-determined loads for the trip of Basslink when it is importing into Tasmania. This operation is required to ensure power system frequency in Tasmania does not fall below the minimum operating standard following the trip of Basslink.
- Target flow on the Basslink interconnector was constrained to 0 MW from DI ending 1425 hrs.
- Between DIs ending 1420 hrs and 1425 hrs, Tasmania demand increased by 132 MW.
- For DI ending 1425 hrs, Tasmania had a steep supply curve where generation capacity were offered either at below $84.80/MWh or above $11,707/MWh.
- For DI ending 1425 hrs, cheaper priced generation was available but limited due to ramp rates (Gordon, Liapootah-Catagunya-Wayatinah, Poatina units 1 and 2) and FCAS profile (Poatina units 3, 4, 5 and 6). Ramp rates for most units were limited to 1 MW per minute as the Automatic Generation Control (AGC) for these units were temporarily suspended for one DI due to a frequency event.

Tasmania energy price reduced to $84.72/MWh for DI ending 1430 hrs when:

- Generation capacity from Poatina units 3, 4, 5, and 6 was no longer limited by its FCAS profile.
- Ramp rates for Gordon, Liapootah-Catagunya-Wayatinah, Poatina units 1 and 2 increased when AGC was no longer suspended.
- Increased wind generation from Musselroe wind farm.

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

Friday 25 December 2015 – High Energy price SA, Negative Energy price VIC*

Market Outcomes: South Australia spot price reached $901.11/MWh for trading interval (TI) ending 1000 hrs.

Spot price in Victoria was -$69.68/MWh for the same interval but did not fall below the reporting threshold of -$100/MWh.

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 $5,236.23/MWh for dispatch interval (DI) ending 0935 hrs. The high price can be attributed to rebidding of generation capacity and limited interconnector support on a hot Christmas Day with temperatures exceeding 35 degrees.

- South Australia experienced warm temperatures on Christmas Day, with temperature in Adelaide reaching 35.5 degrees at 1000 hrs. South Australia demand peaked at 1916 MW at 1630 hrs for the 2015 Christmas Day, much higher than the Christmas Day demands over the last 10 years.
- For DI ending 0935 hrs, AGL rebid 300 MW of Torrens Island B PS generation capacity from bands priced at $350.99/MWh to bands priced at market price cap ($13,800/MWh). The

rebid was submitted with the reason "0925~A~050 CHG IN AEMO PD~56 PRICE INCREASE $102 5MPD VS PD 09:35".

- Target flow on the Heywood interconnector was limited to 268 MW towards South Australia by the V>>S_NIL_KHTB2_KHTB1 system normal constraint equation. The constraint equation prevents overload of the Keith – Tailem Bend no.1 275 kV transmission line for the loss of the parallel Keith – Tailem Bend no.2 transmission line.
- Target flow on the Murraylink interconnector was limited to 48 MW towards South Australia by the V>>SML_NIL_CONT_7B system normal constraint equation. The constraint equation prevents overload of the Buangor – Arrarat 66 kV transmission line for the loss of the Ballarat – Waubra – Horsham 66 kV transmission line.
- Cheaper priced generation was available but limited due to fast-start profiles (Hallett GT) or were constrained off by the V>>S_NIL_KHTB2_KHTB1 constraint equation (Lake Bonney 2 wind farm).

5-Minute dispatch price in Victoria was -$519.04/MWh for dispatch interval (DI) ending 0935 hrs.

- Target flow towards New South Wales across the VIC-NSW interconnector reduced from 809 MW for DI ending 0930 hrs to 332 MW for DI ending 0935 hrs. The flow towards NSW across the VIC-NSW interconnector was limited by the V>>SML_NIL_CONT_7B constraint equation.
- The excess cheaper generation capacity within Victoria resulted in the Dispatch price reducing to -$519.04/MWh.

South Australia energy price reduced to $22.65/MWh for DI ending 0940 hrs when:

- South Australia demand reduced by 139 MW. This includes 118 MW of non-scheduled generation coming online.
- 164 MW of generation capacity was rebid from bands priced at or above $64.97/MWh to market floor price (-$1000/MWh).

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

Wednesday 30 December 2015 – High Energy price SA*

Market Outcomes: South Australia spot price was between $517.32/MWh and $1,014.48/MWh for four trading intervals (TIs) between TIs ending 1530 hrs and 1730 hrs.

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 a maximum of $2,950.40/MWh for dispatch interval (DI) ending 1730 hrs. The high prices can be attributed to high demand, change in non-scheduled generation availability and limited interconnector support.

- Temperatures in Adelaide reached a maximum of 38.1°C and the demand reached 2385 MW for TI ending 1730 hrs.
- Wind generation was moderate, averaging at 228 MW during the high price intervals.
- South Australia prices spiked to above $1,000/MWh for DIs ending 1600 hrs, 1620 hrs, 1635 hrs, 1730 hrs and 1800 hrs when non-scheduled generation reduced their availability to 0 MW.
- During the high price intervals, target flow on the Heywood interconnector was limited up to 142 MW towards South Australia by V>>S_NIL_KHTB2_KHT and S>>NIL_SETB_KHTB1 system

normal constraint equations. The constraint equation V>>S_NIL_KHTB2_KHTB1 prevents overload of the Keith – Tailem Bend no.1 275 kV transmission line for the loss of the parallel Keith – Tailem Bend no.2 transmission line. The constraint equation S>>NIL_SETB_KHTB1 prevents overload of Keith – Tailem Bend no.1 132 kV transmisison line for the loss of the South East – Tailem Bend n275 kV transmission lines.

- During the high price intervals, target flow on the Murraylink interconnector was limited up to 96 MW towards Victoria by V>>SML_NIL_MLTS_N-2 and N^^V_NIL_1 system normal constraint equations. The constraint equation V>>SML_NIL_MLTS_N-2 prevents overload of Elaine – Ballarat 220 kV transmission line for the loss of the Ballarat – Moorabool – Terang 220 kV transmisison line. The constraint equation N^^V_NIL_1 avoids voltage collapse in southern areas of New South Wales for the loss of the largest Victorian generating unit.
- Cheaper priced generation was available during the high price intervals but limited due to fast-start profiles (Torrens Island A unit 4) or ramp rates (Mintaro), were constrained off by the V>>S_NIL_KHTB2_KHTB1 constraint equation (Ladbroke units 1 and 2, Lake Bonney 2 and 3 wind farms), or required more than one DI to synchronise (Mintaro).

South Australia dispatch price reduced to below $500/MWh for subsequent intervals following high prices when:

- Demand reduced, which non-scheduled generation coming online.
- Rebidding of generation capacity from higher to lower priced bands.

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

Thursday 31 December 2015 – High Energy price SA*

Market Outcomes: South Australia spot price reached $578.19/MWh for trading interval (TI) ending 1500 hrs.

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 $1,785.00/MWh for dispatch interval (DI) ending 1500 hrs. The high price can be attributed to high demand, low wind generation and limited interconnector support.

- The temperature in Adelaide reached a maximum of 40.6°C.
- The demand reached 2,353 MW for TI ending 1500 hrs.
- Wind generation was low at 185 MW during the high price interval.
- During the high price interval, target flow on the Heywood interconnector was limited to 329 MW towards South Australia by S>>NIL_SETB_KHTB1 system normal constraint equation. The constraint manages the post contingent loading on the Keith - Tailem Bend no. 1 132 kV line for the loss of the South East – Tailem Bend 275 kV transmisison lines.
- During the high price interval, target flow on the Murraylink interconnector was limited to 69 MW towards Victoria by V>>SML_NIL_MLTS_N-2 and N^^V_NIL_1 system normal constraint equations. The constraint equation V>>SML_NIL_MLTS_N-2 prevents overload of Elaine – Ballarat 220 kV transmission line for the loss of the Ballarat – Moorabool – Terang 220 kV transmisison line. The constraint equation N^^V_NIL_1 avoids voltage collapse in southern areas of New South Wales for the loss of the largest Victorian generating unit or Basslink.

- Cheaper priced generation was available during the high price interval but limited due to ramp rates (Torrens Island A unit 4), or required more than one DI to synchronise (Dry Creek unit 3).

South Australia dispatch price reduced to $360.81/MWh for the subsequent interval following the high price when:

- Demand reduced, which includes around 95 MW of non-scheduled generation coming online.
- A total of 75 MW of generation capacity was rebid or shifted from bands priced higher than $13,481/MWh to bands priced below $362/MWh.

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