

Electricity Pricing Event Report – Monday 23 May 2016

Market Outcomes: Spot prices in South Australia ranged between $-\$140.99/\text{MWh}$ and $-\$368.47/\text{MWh}$ for 6 trading intervals (TIs) between TIs ending 0130 hrs and 0500 hrs. Spot prices in Victoria ranged between $-\$188.59/\text{MWh}$ and $-\$517.12/\text{MWh}$ for the same TIs. The spot price in South Australia reached $\$2,149.77$ for trading interval (TI) ending 0900 hrs.

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

Detailed Analysis: The 5-Minute dispatch price in South Australia ranged between $-\$326.43/\text{MWh}$ and the Market Floor Price (MFP) of $-\$1,000/\text{MWh}$ for 23 dispatch intervals (DIs) between DIs ending 0115 hrs and 0500 hrs. The 5-minute dispatch in Victoria price ranged between $-\$474.24/\text{MWh}$ and $-\$896.49/\text{MWh}$ for the same DIs. These negative prices can be mainly attributed to the reduced rating on the South Morang F2 500/330kV transformer and subsequent implementation of constraint automation equations to prevent the overload on the transformer.

An unplanned outage of APD Potline 1 at 2354 hrs on 22 May 2016 caused the South Morang F2 500/330 kV transformer loading to increase to 1,116 MVA at 2358 hrs. At 0002 hrs on 23 May, AusNet advised AEMO that the South Morang F2 500/330 kV transformer loading had exceeded its short term rating of 1100 MVA. To prevent damage to the transformer, AusNet advised AEMO the transformer loading should not exceed 1,000 MVA for the next 24 hrs (Market Notice 53461). Thus, AEMO amended the short term ratings on the transformer to 1000 MVA. At 0010 hrs on 23 May 2016, APD Potline 1 returned to service.

At 0105 hrs, real time contingency analysis (RTCA) indicated that under pre-existing constraints, the South Morang F2 500/330 kV transformer would overload for the loss of the APD potlines with either of the Heywood – Tarrone No.1 500 kV line or the Heywood – Mortlake No.2 500 kV line.

As no pre-formulated constraint equations were available, constraint automation was used to build the constraint equations, CA_SPS_46545836_01 and CA_SPS_46545836_02. These constraint equations were invoked between 0110 hrs and 0930 hrs (Market Notice 53465 and 53502) to prevent overload of the F2 transformer as indicated by RTCA.

The constraint equations, CA_SPS_46545836_01 and CA_SPS_46545836_02, reduced flow towards New South Wales across the VIC-NSW interconnector and increased flow towards South Australia across the VIC-SA interconnector. The target flow towards New South Wales across the VIC-NSW interconnector reduced from 945 MW, for DI ending 0110 hrs, to 112 MW for DI ending 0440 hrs. The target flow towards South Australia across the Heywood interconnector increased from 201 MW, for DI ending 0110 hrs, to 550 MW towards South Australia for DI ending 0440 hrs.

As a result, the flow across the South Morang F2 500/330 kV transformer decreased steadily from 910 MVA at DI ending 0105 hrs to 354 MVA (minimum) at 0440 hrs.

For the negative priced TIs, demand was low in South Australia and Victoria, reaching a minimum of 1,167 MW and 3,861 MW, respectively.

With excess cheaper priced generation available in Victoria and South Australia, prices in these regions collapsed to at or below $-\$326.43/\text{MWh}$ for the affected DIs between 0115 hrs and 0500 hrs.

Victoria and South Australia returned to positive prices at DIs ending 0550 hrs and 0620 hrs, respectively, when the loading on the South Morang F2 500/330kV transformer increased and demand in both regions increased.

The 5-minute dispatch price in South Australia reached $\$12,195.07/\text{MWh}$ for DI ending 0855 hrs. This high price can be attributed to the withdrawal of generation capacity, a steep supply curve and

an increase in demand, during a period of limited interconnector support, which resulted from the implementation of constraint automation equations.

Between DIs ending 0850 hrs and 0855 hrs, demand in South Australia increased by 44 MW and wind generation decreased by 43 MW. For DI ending 0855 hrs, generation capacity in South Australia was offered in bands priced below \$65/MWh or above \$12,195/MWh, resulting in a steep supply curve.

Between DIs ending 0835 hrs and 0855 hrs, AGL withdrew 310 MW of generation capacity from Torrens Island B Units 3 and 4 with the reasons '0825~P~010 UNEXPECTED/PLANT LIMITS~106 AUX/PLANT FAILURE', '0830~P~030 INCREASE IN AVAIL CAP~UNIT REMAINING ON LOAD' and '0845~P~020 REDUCTION IN AVAIL CAP~204 UNIT TRIP'.

For DI ending 0855 hrs, target flow on the Heywood interconnector was limited to 370 MW towards South Australia by the constraint automation equation, CA_SPS_46545836_02, transient stability constraint equation, V::S_NIL_TBSE, and thermal constraint equation, V>>S_NIL_SETB_SGKH. The target flow on the Murraylink interconnector was limited to 220 MW towards South Australia by the upper limit transfer constraint equation, VSML_220.

Cheaper priced generation was available but limited due to ramp rates (Osborne PS), fast start profiles (Hallett PS, Ladbroke Grove PS Units 1 and 2) or constrained off by the constraint equations, V::S_NIL_TBSE and V>>S_NIL_SETB_SGKH (Lake Bonney Windfarm units 2 and 3).

The 5-minute price in South Australia decreased to \$41.77/MWh for DI ending 0900 hrs, when 177 MW of generation capacity was rebid from bands priced at or above \$13,676.91/MWh to bands priced at or below -\$991.08/MWh and demand decreased by 51 MW.

At 0930 hrs, AEMO applied continuous rating of 850 MVA to the South Morang F2 500/330 kV transformer and revoked the constraint equations CA_SPS_46545836_01 and CA_SPS_46545836_02. The short term rating remained at 1,000 MVA. At 0002 hrs on Tuesday 24 May 2016, the transformer ratings were returned to normal. (Market Notices 53503 and 53505)

The spot prices, between TIs ending 0130 hrs and 0500 hrs, forecast for South Australia and Victoria in the latest pre-dispatch schedules were negative, but much smaller in magnitude than the dispatch prices. This difference was a result of the different formulation of the constraint equations, CA_SPS_46545836_01 and CA_SPS_46545836_02, in pre-dispatch and dispatch. The high spot price for TI ending 0900 hrs for South Australia was not forecast in the latest pre-dispatch schedule, as it was the result of withdrawal of generation capacity within the affected TI and different formulation of the constraint equation, CA_SPS_46545836_02, in pre-dispatch and dispatch.

Version Control

VER	DATE	REVISION DESCRIPTION	AUTHOR	CHECKED	RESPONSIBLE MANAGER	APPROVED
v1	24/04/16	Original Document	Eloise Taylor	Basilisa Choi Ellise Harmer Jennie Liu Peter Biddle Tjaart Van Der Walt Abraham Yohannan	Laura Walsh	