Spot prices greater than $5000/MWh

AUSTRALIAN ENERGY REGULATOR

New South Wales 20 July 2006

Introduction

The AER is required to publish a report covering the circumstances in which the spot price exceeded $5000/MWh, pursuant to clause 3.13.7 (d) of the Rules. That report should:

- describe significant factors contributing to the spot price exceeding $5000/MWh, including withdrawal of generation capacity and network availability;
- assess whether rebidding pursuant to clause 3.8.22 contributed to the spot price exceeding $5000/MWh;
- identify the marginal scheduled generating units; and
- identify all units with offers for the trading interval equal to or greater than $5000/MWh and compare these dispatch offers to relevant dispatch offers in previous trading intervals.

This report examines the factors that can contribute to the spot price exceeding $5000/MWh including; changes in demand (compared to that forecast by NEMMCO); generator offers and rebidding (including changes to generation capacity); and changes to network availability.

Summary

At 6.30 pm on July 20 demand in New South Wales reached its highest level since January and the second highest daily peak for twelve months. National demand exceeded 31 000 MW and was within 300 MW of the highest ever. At 4.47 pm, Macquarie Generation repriced around 900 MW of its capacity upwards, resulting in around one third of its capacity being priced above $5000/MWh for this period. The high demand combined with Macquarie Generation's rebidding resulted in a price of $5120/MWh in New South Wales during the 6.30 pm trading interval.

Actual and forecast demand

NEMMCO is responsible for forecasting demand, as part of the dispatch process. Changes between forecast and actual demand can have significant impacts on market outcomes. An increase in demand tends to push generation dispatch further up the supply curve leading to an increase in price.

On 20 July demand in New South Wales reached 13 078 MW at 6.30 pm. Demand was 600 MW higher than forecast 12 hours ahead and 150 MW higher than forecast 4 hours ahead. Figure 1 compares the actual demand in New South Wales with that forecast by NEMMCO 4 and 12 hours ahead of dispatch. A comparison of actual and forecast spot price is also included.

Figure 1: Actual and forecast demand and spot price in New South Wales

Thursday 6:30 PM	Actual	4 hr forecast	12 hr forecast
Demand (MW)	13 078	12 927	12 466
Spot price ($MW/h)	5120.14	659.26	239.89

Generator offers and rebidding.

New South Wales has 12 400 MW[1] of installed generating capacity during winter. The 2006 winter peak demand forecast for New South Wales was 13 930 MW[2]. On 20 July, 11 045 MW of this capacity was presented to the market. Figure 2 details the generation capacity that was not presented on that day.

Figure 2: Capacity in New South Wales not presented to market

Participant	Capacity (MW)	Comment
Macquarie Generation		
Hunter Valley GT	51	Two 25 MW open cycle turbines fuelled by diesel, generally operated only in extreme market circumstances.
Liddell unit 3	500	Shutdown on 7 July. This outage was to replace the both the HP and IP turbines. The generator returned to service on 21 September.
Liddell unit 1	500	Shutdown on 26 May. The reason given was "boiler pressure – water leak." The generator returned to service on 21 July following a number of attempts during 19-20 July.
Delta Electricity		
Munmorah unit 4	300	Shutdown on 9 May, returning to service on 16 August. The reason given was "taken out of service"
Capacity not presented	**1351**	(11 per cent of installed capacity)

Changes in generation

Macquarie Generation made a number of rebids throughout the day which reduced the available capacity of Liddell unit one as a result of delays in the generator's return to service following a shutdown on 26 May. All of this capacity, totalling up to 320 MW, was priced at less than zero. The unit was initially forecast to return to service around midday, but did not return until around 6 am the following morning.

At 4.47 pm Macquarie Generation rebid 800 MW of capacity at Bayswater from prices below $85/MWh to above $8100/MWh. The rebid was effective from 5 pm to 7.30 pm. At the same time, 90 MW of capacity at Liddell was rebid from prices below $200/MWh to above $4600/MWh, with 60 MW of this priced above $6500/MWh. The rebid was effective from 5 pm to 8.30 pm. The reason given for these rebids was "Sensitivities have changed".

Clause 3.13.4(f) of the Rules require NEMMCO to publish, as part of the forecasting process, the expected sensitivity of the forecast spot prices to changes in the forecast

[1] Based on the 2005 Statement of Opportunities winter forecast of aggregate generation capability for 2006.

[2] The 10% probability of exceedance winter forecast as stated in the 2005 Statement of Opportunities.

load or generating unit availability. NEMMCO prepare 43 spot price sensitivity scenarios[3], for each forecast, based on a series of predetermined changes in demand.

In relation to the reason "Sensitivities have changed" for the 4.47 pm rebid, the AER requested additional information from Macquarie Generation.

Macquarie Generation identified a number of material changes in market conditions since its original bid the previous day and by 4.45 pm on 20 July. These were:

- actual temperature was lower than forecast;
- the actual demand in New South Wales was trending higher than the previous day;
- the demand forecast prepared by NEMMCO had increased; and
- there were indications that gas generation in Victoria and/or South Australia had been committed earlier than anticipated.

NEMMCO produce a forecast of market conditions for each 30-minute trading interval of the trading day, including forecast price. The report focuses on two forecasting horizons, namely 4 and 12 hours ahead of dispatch and endeavours to compare and explain actual outcomes with reference to these timeframes. These forecasts are based on information compiled by NEMMCO and submitted by participants. The first forecast, or predispatch run, for a trading day is prepared at around 1 pm the previous day and is updated every half hour, taking into account: changes in demand; network capability; and participant bids and rebids. This information helps participants to make informed commercial decisions.

Macquarie Generation stated that following the publication of the predispatch forecast at around 4.30 pm, the forecast prices in the +500 MW and +1000 MW sensitivity runs were higher compared to those published at around 10.30 am. **Appendix B** shows the price for the 6.30 pm trading interval, together with each predispatch forecast price for the same trading interval. The forecast prices based on an increase in demand of 500 MW and 1000 MW in New South Wales, (the +500 MW and +1000 MW sensitivity scenarios respectively) are also included. The impact of the 4.47 pm rebid, and changes to the demand forecasts are highlighted.

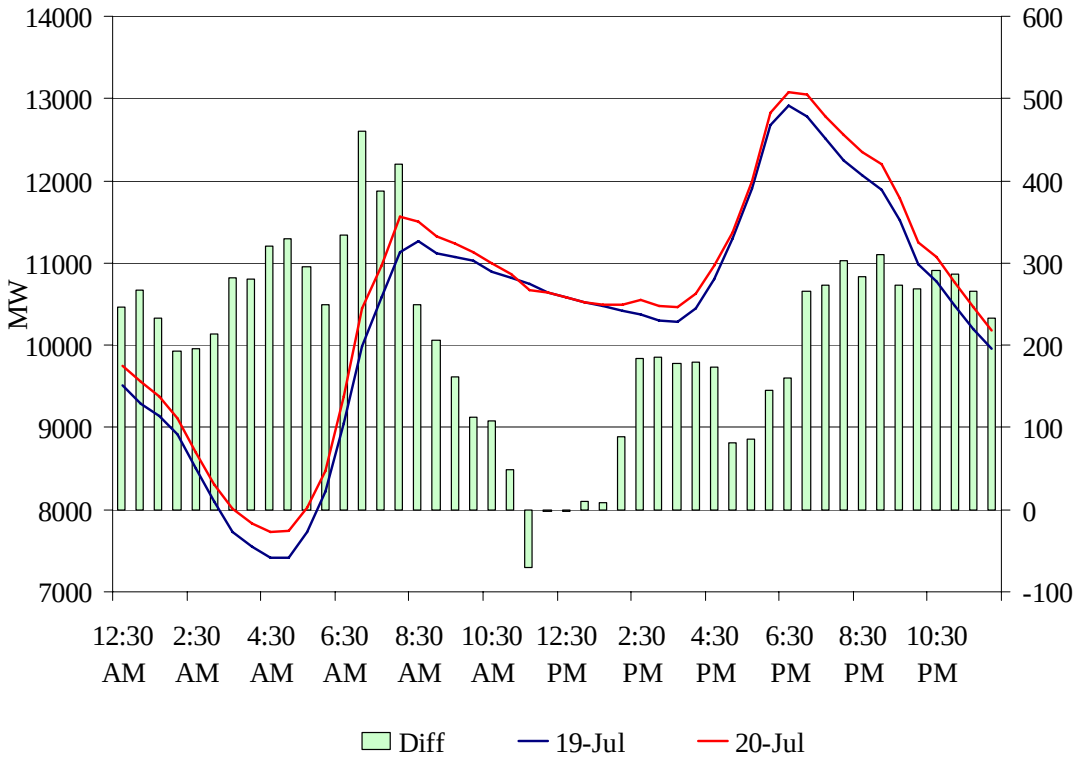
In relation to the changes identified by Macquarie Generation:

- the temperature in Sydney on Thursday 20 July reached 14.2 degrees, up only slightly on the previous day's maximum of 13.3 degrees. The forecast temperature for both days, prepared at 6 pm the night before, was 15 degrees. This represented a difference of 0.8 degrees for 20 July.

- the actual 5-minute demand in New South Wales at 4.30 pm on 20 July was 11 104 MW. This was around 120 MW higher than for the same time the previous day. Figure 3 shows the actual demand in New South Wales for both 19 and 20 July. The difference between the two demand traces is also shown.

[3] Pre-dispatch spot price sensitivities definitions can be found on the NEMMCO website: http://www.nemmco.com.au/dispatchandpricing/mo_mi771v005.pdf

Figure 3: New South Wales actual demand trace for 19 and 20 July



- forecast demand for the trading interval ending 6.30 pm, published around 4.30 pm (just prior to the Macquarie Generation rebid), was 12 920 MW. This compares to a forecast of 12 330 MW published the previous day. The forecast peak demand on 20 July for New South Wales had been consistent since around 11 am that morning. **Appendix C** shows the actual demand , together with each predispatch forecast demand for the same trading interval. The forecast prices based on an increase in demand of 500 MW and 1000 MW in New South Wales, (the +500 MW and +1000 MW sensitivity scenarios) are also included. Significant changes in the demand forecast are highlighted.

- Macquarie Generation stated that there were indications that gas generation in Victoria and/or South Australia was committed earlier than anticipated. This was based on an increase in dispatched generation in the published market information. Just prior to 4 pm, 95 MW of fast start capacity was rebid from prices above $9000/MWh to less than $40/MWh, committing units at Quarantine in South Australia and Bairnsdale in Victoria. In addition, 68 MW of fast start capacity was rebid, committing units at Roma in Queensland.

Figure 4 shows, for the trading intervals where the spot price was greater than $5000/MWh, the available generating capacity in New South Wales. The figure compares this with the amount of capacity forecast 4 and 12 hours ahead of dispatch. The change in the amount of capacity offered at prices less than the forecast price calculated four hours ahead of dispatch is also included. The actual supply curves and those forecast four hours ahead in each region are shown in **Appendix D**.

Figure 4: Actual and forecast capacity and spot price

Thursday 6.30 pm	Actual	4 hr forecast	12 hr forecast
Capacity (MW)			
total	11 045	11 165	11 345
priced at less than $659.26	8775	9785	
Spot price ($/MWh)	5120.14	659.26	

Of the 11 045 MW of capacity presented at the end of the trading interval (or closing bids) in New South Wales presented to the market during the trading interval ending 6.30 pm, there was 4900 MW priced at less than zero; 3710 MW priced between zero and $30/MWh, 340 MW priced between $30/MWh and $5000/MWh; 440 MW priced between $5000/MWh and $9000/MWh. The remaining 1650 MW was priced at more than $9000/MWh.

The closing bids for all participants in New South Wales with capacity priced at or above $5000/MWh during this period are presented in **Appendix E**.

Following the Macquarie Generation rebid, participants in Queensland rebid around 220 MW of capacity into prices above $5000/MWh. Millmerran rebid 82 MW of capacity across its two units, Stanwell Corporation rebid 65 MW of capacity across its Stanwell one, two and three units and Callide Power rebid 60 MW of capacity across its units. The rebid reasons included "Maintain station output" and "Financial optimisation, changed PD".

In Victoria around 600 MW of capacity was shifted into prices below $5000/MWh in the four hours leading up to dispatch. Most of this occurred following the rebid by Macquarie Generation when Ecogen Energy rebid 564 MW of capacity at Jeeralang B and Newport. The reason given was "change in market conditions".

The generators involved in setting the spot price during the 6.30 pm trading interval, and how that price was determined by the market systems are detailed in **Appendix A**.

Changes to network availability

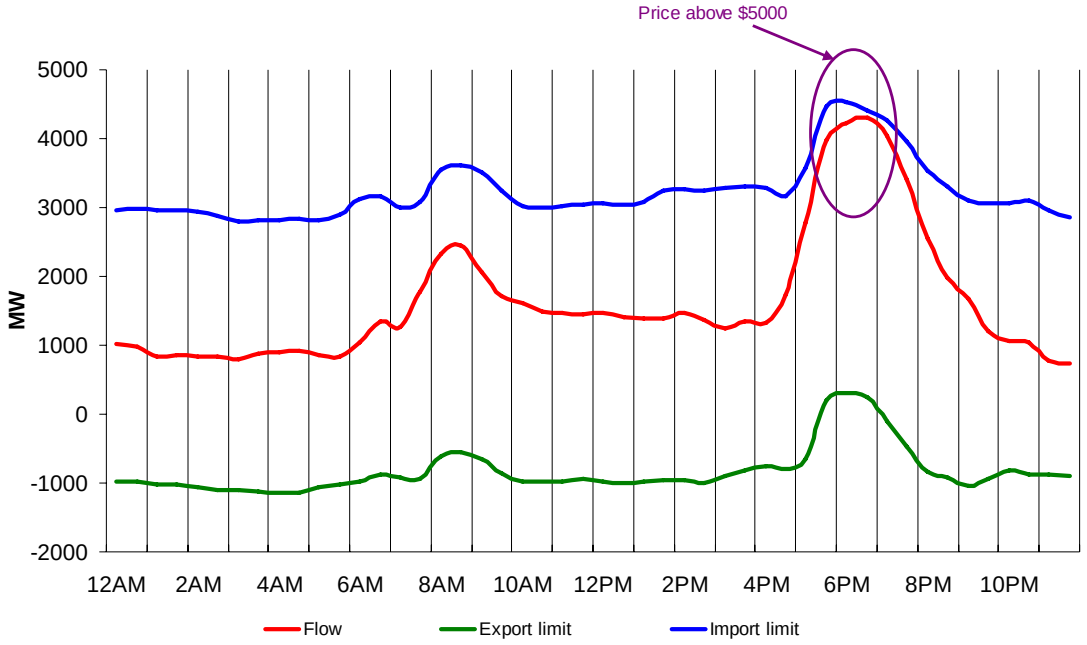
Flows into New South Wales were around 1600 MW and 1100 MW higher than forecast 12 hours and four hours ahead respectively. Flows across both the Queensland and Snowy interconnectors were approaching their maximum capabilities.

Figure 5 compares the average combined flows and interconnector limits into New South Wales, for the 6.30 pm trading interval, with those forecast four and 12 hours ahead of dispatch. Figure 6 shows the five minute combined actual flow and limits into New South Wales. The period where the spot price was greater than $5000/MWh is highlighted.

Figure 5: Combined actual and forecast flow and limits into New South Wales

Thursday 6:30 PM	Actual	4 hr forecast	12 hr forecast
Import limit	4526	3955	4079
Combined flow into NSW	4224	3142	2661

Figure 6: Combined flow and limits into New South Wales



Assessment

The significant factors that contributed to the spot price in New South Wales exceeding $5000/MWh at 6.30 pm on 20 July 2006 included near record demand and generator rebidding by Macquarie Generation. This rebidding included a reduction in the available capacity of Liddell unit one, as a result of delays in its return to service, and the rebidding of capacity into prices above $5000/MWh at 4.47 pm across Bayswater and Liddell power stations.

Australian Energy Regulator
December 2006

The following table identifies the trading interval in which the spot price exceeded $5000/MWh. Each five minute dispatch interval price and the generating units involved in setting the energy price, as published in the market systems are shown. This information is published by NEMMCO[4]. Also shown is the energy or ancillary service offer price involved in determining the dispatch price together with the quantity of that service and the contribution to the total energy price. The 30-minute spot price is the time weighted average of the six dispatch interval prices.

Thursday 20 July – New South Wales 6.30 pm

Time	Dispatch price ($/MWh)	Participant	Unit	Service	Offer price	Marginal change	Contribution ($/MWh)
18:05	$4512.80	CS Energy	SWAN_E	Energy	$4002.80	1.13	$4512.80
18:10	$5689.23	Macquarie Generation	LD02	Energy	$6992.00	0.81	$5684.55
		Eraring Energy	ER02	Energy	$25.00	0.09	$2.34
		Eraring Energy	ER01	Energy	$25.00	0.09	$2.34
18:15	$5813.98	International Power	LOYYB1	Energy	$4744.37	1.23	$5812.89
		Hydro Tasmania	GORDON	Raise 5 min	$0.80	1.23	$0.98
		International Power	LOYYB1	Raise 5 min	$0.51	-1.23	-$0.62
		LYMMCO	LYA1	Raise 6 sec	$0.50	1.23	$0.61
		Delta Electricity	VP5	Raise 60 sec	$0.10	1.23	$0.12
		International Power	LOYYB1	Raise 60 sec	$0.00	-1.23	$0.00
		International Power	LOYYB1	Raise 6 sec	$0.00	-1.23	$0.00
18:20	$5689.23	Macquarie Generation	LD02	Energy	$6992.00	0.81	$5684.55
		Eraring Energy	ER02	Energy	$25.00	0.09	$2.34
		Eraring Energy	ER01	Energy	$25.00	0.09	$2.34
18:25	$4509.34	CS Energy	SWAN_E	Energy	$4002.80	1.13	$4509.34
18:30	$4506.27	CS Energy	SWAN_B_3	Energy	$3997.61	1.13	$4506.27
Spot price	**$5120.14/MWh**						

[4] NEMMCO first published details on how the price is determined, for every dispatch interval, in June 2004. Documentation of this process can be found at http://www.nemmco.com.au/dispatchandpricing/140-0036.htm

Approx. predispatch run time	*QLD*	*NSW*	*Snowy*	*VIC*	*SA*	*TAS*	*NSW Sensitivities*	
Actual 6:30 pm	***$4,499***	***$5,120***	***$4,156***	***$4,102***	***$3,208***	***$3,672***	***+500***	***+1000***
6:00 PM	$679	$764	$625	$613	$557	$545	$7,350	$7,705
5:30 PM	$3,642	$4,065	$3,302	$3,287	$1,000	$2,958	$7,351	$7,706
5:00 PM	$299	**$4,063**	$3,301	$3,270	$2,587	$2,957	**$7,447**	$8,361
4:30 PM	$84	$608	$531	$545	$469	$494	$1,000	$9,024
4:00 PM	$84	$608	$531	$545	$295	$498	$1,001	$9,027
3:30 PM	$84	$609	$532	$548	$298	$498	**$4,246**	$9,029
3:00 PM	$84	$715	$625	[illegible]	[illegible]	$590	$7,350	$9,650
2:30 PM	$84	$659	$581			$548	$7,350	$9,650
2:00 PM	$84	$659	$581			$548	$7,350	$9,650
1:30 PM	$84	$710	$625			$590		
1:00 PM	$84	$648	$575			$552		
12:30 PM	$84	$705	$625	$661	$538	$608		
12:00 PM	$84	$705	$625	$671	$629	$618	$8,574	$9,903
11:30 AM	$84	$705	$625	$671	$629	$618	$8,666	$9,903
11:00 AM	$84	**$1,000**	$893	$969	$908	$897	**$8,888**	$9,906
10:30 AM	$84	**$282**	$264	$290	$292	$268	**$707**	$8,667
10:00 AM	$84	$282	$264	$290	$292	$268	$707	$8,888
9:30 AM	$81	$276	$258	$284	$289	$261	$707	$8,888
9:00 AM	$81	$282	$263	$290	$292	$268	$707	$8,888
8:30 AM	$81	$282	$263	[illegible]	[illegible]	$268	$707	$8,888
8:00 AM	$81	$258	[illegible]		89	$242	$608	$7,350
7:30 AM	$81	$258	[illegible]		89	$242	$609	$7,350
7:00 AM	$84	$240	[illegible]		80	$231	$295	$727
6:30 AM	$84	$240	[illegible]		80	$231	$295	$727
6:00 AM	$84	$240	$226	$250	$280	$231	$295	$727
5:30 AM	$84	$240	$226	$250	$280	$231	$295	$727
5:00 AM	$203	$238	$226	$250	$280	$231	$297	$727
4:30 AM	$196	$238	$226	$250	$280	$231	$300	$727
4:00 AM	$203	$238	$226	$248	$277	$229	$293	$727
3:30 AM	$183	$238	$226	$248	$277	$229	$293	$727
3:00 AM	$183	$238	$226	$248	$277	$229	$293	$727
2:30 AM	$183	$238	$226	$248	$277	$229	$293	$727
2:00 AM	$183	$238	$226	$248	$277	$229	$293	$727
1:30 AM	$183	$238	$226	$248	$277	$229	$293	$727
1:00 AM	$183	$238	$226	$248	$277	$229	$293	$727
12:30 AM	$183	$238	$226	$248	$277	$229	$295	$727
12:00 AM	$183	$238	$226	$248	$277	$229	$293	$727
11:30 PM	$155	$238	$226	$248	$277	$229	$293	$727
11:00 PM	$155	$238	$226	$248	$277	$229	$292	$726
10:30 PM	$155	$238	$226	$247	$276	$226	$290	$726
10:00 PM	$84	$238	$226	$250	$289	$229	$606	$7,350
9:30 PM	$84	$238	$226	$250	$289	$229	$607	$7,350
9:00 PM	$84	$238	$226	$250	$289	$229	$606	$7,350
8:30 PM	$84	$238	$226	$250	$289	$228	$606	$7,350
8:00 PM	$155	$238	$226	$249	$289	$226	$296	$6,994
7:30 PM	$84	$240	$226	$249	$289	$226	$291	$4,994
7:00 PM	$84	$240	$226	$249	$289	$225	$290	$4,994
6:30 PM	$84	$238	$226	$248	$289	$225	$288	$4,991
6:00 PM	$84	$240	$226	$248	$289	$225	$289	$4,991
5:30 PM	$84	$238	$226	$248	$289	$225	$288	$4,991
5:00 PM	$84	$240	$226	$248	$289	$225	$288	$6,992
4:30 PM	$81	$258	$239	$264	$294	$239	$1,000	$8,962
4:00 PM	$81	$259	$240	$265	$294	$241	$1,000	$9,125
3:30 PM	$81	$259	$240	$265	$294	$241	$1,000	$9,125
3:00 PM	$81	$259	$240	$265	$294	$241	$1,000	$9,125
2:30 PM	$81	$259	$240	$265	$295	$241	$6,991	$9,600
2:00 PM	$81	$259	$240	$265	$295	$241	$4,992	$9,600
1:30 PM	$81	$259	$240	$265	$295	$241	$4,994	$9,600
1:00 PM	$81	$259	$240	$265	$295	$241	$4,992	$9,600
12:30 PM	$81	$259	$240	$265	$295	$241	$4,992	$9,600

Macquarie Generation rebid at 4.47 pm

Fast start plant committed – just prior to 4pm

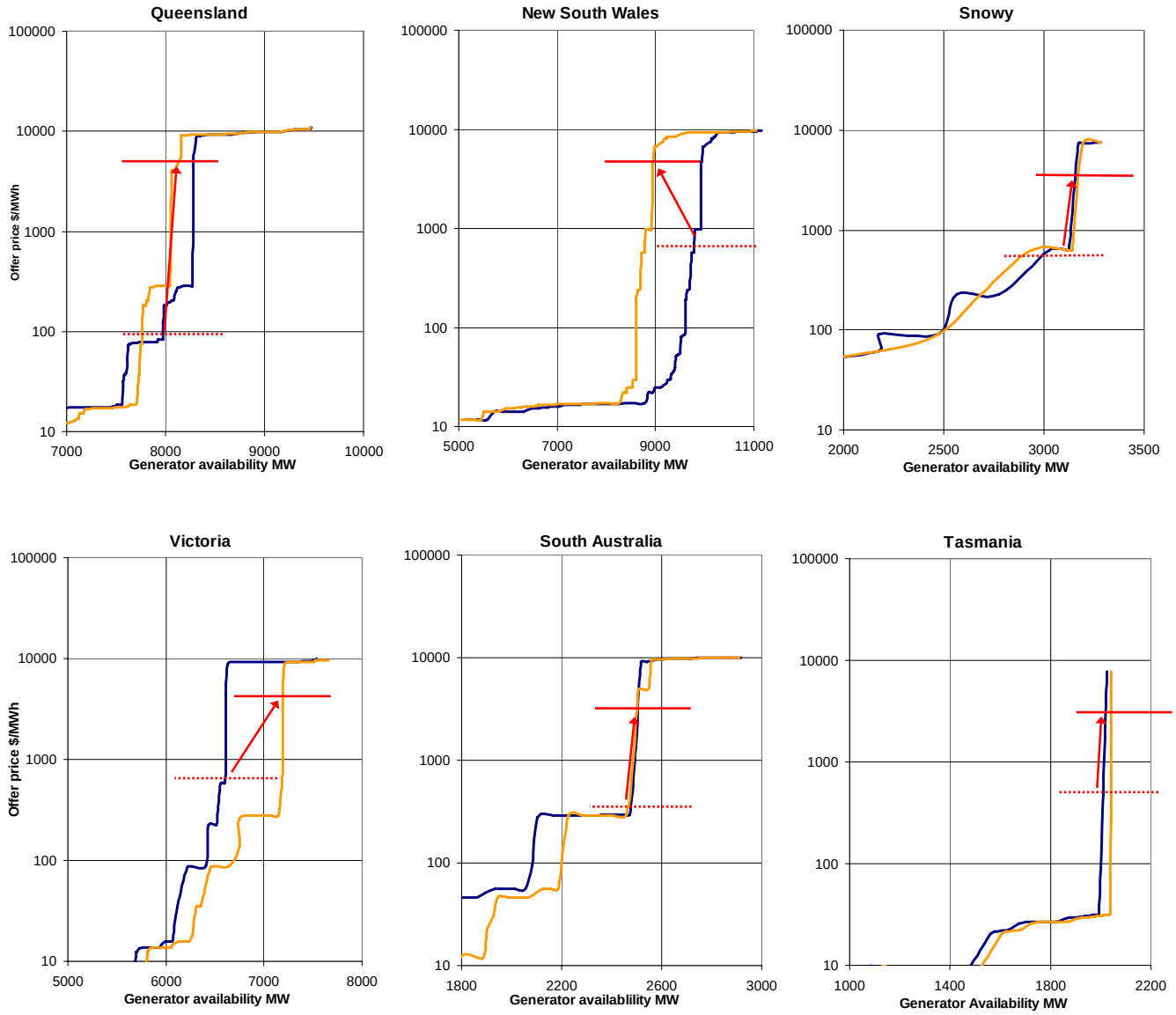
NSW demand forecast increased by 470 MW

Approx. predispatch run tim	*QLD*	*NSW*	*VIC*	*SA*	*TAS*	*NSW Sensitivities*	
Actual 6:30 pm	***7027***	***13078***	***7518***	***2061***	***1563***	***+500***	***+1000***
6:00 PM	7097	12895	7468	2038	1522	$7,350	$7,705
5:30 PM	7182	12922	7479	2023	1562	$7,351	$7,706
5:00 PM	7184	12927	7471	2021	1564	**$7,447**	$8,361
4:30 PM	7182	12920	7483	2032	1564	$1,000	$9,024
4:00 PM	7182	12920	7493	2035	1564	$1,001	$9,027
3:30 PM	7182	12920	**7493**	2036	1551	**$4,246**	$9,029
3:00 PM	7182	12924	7702	2030	1550	$7,350	$9,650
2:30 PM	7182	12927	7703	2035	1551	$7,350	$9,650
2:00 PM	7182	12927	7703	2035	1551	$7,350	$9,650
1:30 PM	7182	12927	7697			$7,350	$9,650
1:00 PM	7182	12923	7697			$6,994	$9,650
12:30 PM	7182	12926	7696			$7,350	$9,650
12:00 PM	7181	12925	7695			$8,574	$9,903
11:30 AM	7181	12927	7695			$8,666	$9,903
11:00 AM	7181	**12922**	7702	2024	1600	**$8,888**	$9,906
10:30 AM	7180	12457	7674	2023	1600	$707	$8,667
10:00 AM	7180	12457	7673	2026	1600	$707	$8,888
9:30 AM	7179	12456	7672	2026	1603	$707	$8,888
9:00 AM	7179	12456			00	$707	$8,888
8:30 AM	7179	12456			00	$707	$8,888
8:00 AM	7163	12460			00	$608	$7,350
7:30 AM	7163	12460			00	$609	$7,350
7:00 AM	7168	12468			600	$295	$727
6:30 AM	7167	12467	7701	2037	1601	$295	$727
6:00 AM	7167	12466	7701	2037	1601	$295	$727
5:30 AM	7167	12465	7700	2037	1602	$295	$727
5:00 AM	7169	12468	7700	2037	1602	$297	$727
4:30 AM	7168	12468	7700	2037	1602	$300	$727
4:00 AM	7169	12468	7701	2021	1601	$293	$727
3:30 AM	7168	12469	7701	2021	1601	$293	$727
3:00 AM	7168	12469	7701	2021	1601	$293	$727
2:30 AM	7168	12469	7702	2021	1600	$293	$727
2:00 AM	7168	12469	7702	2021	1600	$293	$727
1:30 AM	7168	12469	7703	2021	1599	$293	$727
1:00 AM	7168	12469	7703	2021	1599	$293	$727
12:30 AM	7168	12469	7703	2021	1599	$295	$727
12:00 AM	7168	12469	7703	2021	1599	$293	$727
11:30 PM	7168	12471	7703	2021	1599	$293	$727
11:00 PM	7168	12471	7703	2021	1589	$292	$726
10:30 PM	7168	12471	7704	2021	1589	$290	$726
10:00 PM	7164	12463	7682	2015	1590	$606	$7,350
9:30 PM	7164	12463	7682	2015	1590	$607	$7,350
9:00 PM	7166	12466	7683	2015	1590	$606	$7,350
8:30 PM	7167	12470	7686	2015	1588	$606	$7,350
8:00 PM	7168	12471	7687	2015	1588	$296	$6,994
7:30 PM	7165	12462	7685	2016	1590	$291	$4,994
7:00 PM	7166	12463	7687	2016	1590	$290	$4,994
6:30 PM	7167	12466	7688	2016	1591	$288	$4,991
6:00 PM	7166	12465	7688	2016	1591	$289	$4,991
5:30 PM	7167	12466	7688	2016	1591	$288	$4,991
5:00 PM	7165	12462	7678	2013	1591	$288	$6,992
4:30 PM	7162	12459	7679	2009	1590	$1,000	$8,962
4:00 PM	7162	12458	7671	2006	1590	$1,000	$9,125
3:30 PM	7162	12458	7672	2006	1590	$1,000	$9,125
3:00 PM	7162	12458	7672	2006	1590	$1,000	$9,125
2:30 PM	7163	12459	7671	2006	1590	$6,991	$9,600
2:00 PM	7163	12460	7670	2005	1590	$4,992	$9,600
1:30 PM	7163	12460	7671	2006	1590	$4,994	$9,600
1:00 PM	7163	12459	7672	2006	1590	$4,992	$9,600
12:30 PM	7163	12460	7671	2006	1590	$4,992	$9,600

VIC demand forecast decreased by 210 MW

NSW demand forecast increased by 470 MW

The figures in Appendix D show the supply curve and spot price in each region for the 6.30 pm trading interval compared with the forecast produced 4 hours ahead. The supply curve is the sum of all generation offered within a region at various offer prices. It highlights for a given level of demand, the movement in the amount of capacity offered at a given price in predispatch compared to dispatch. A shift in the supply curve left tends to increase spot price for the same level of generation dispatch, while a shift right tends to decrease spot price.



Supply curve: forecast 4hr ahead Actual

Spot price: forecast 4hr ahead Actual

Appendix E highlights the half hour closing bids for all participants in New South Wales with capacity priced at or above $5000/MWh for each trading interval of the day. It also shows the generation output of that participant and the spot price exceeding $5000/MWh. Figure E1 highlights the impact on dispatch of Macquarie Generation's rebid at 4.47 pm for the evening peak.

Figure E1: Macquarie Generation closing bid prices, dispatch and region price.

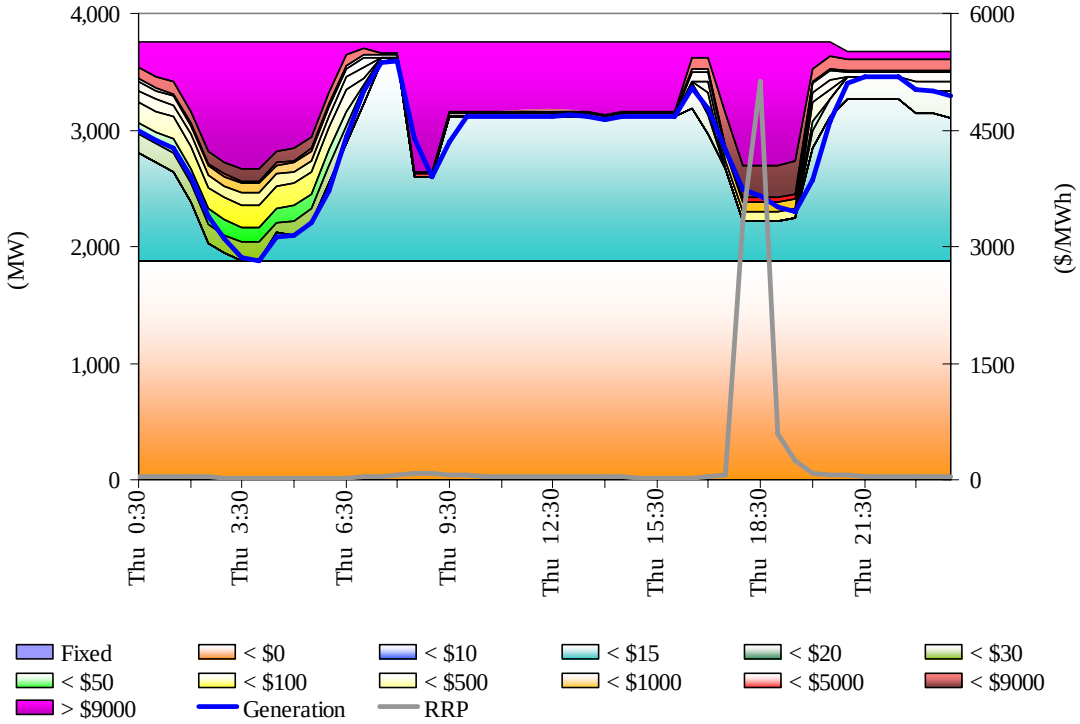


Figure E2: Delta Electricity closing bid prices, dispatch and spot price.

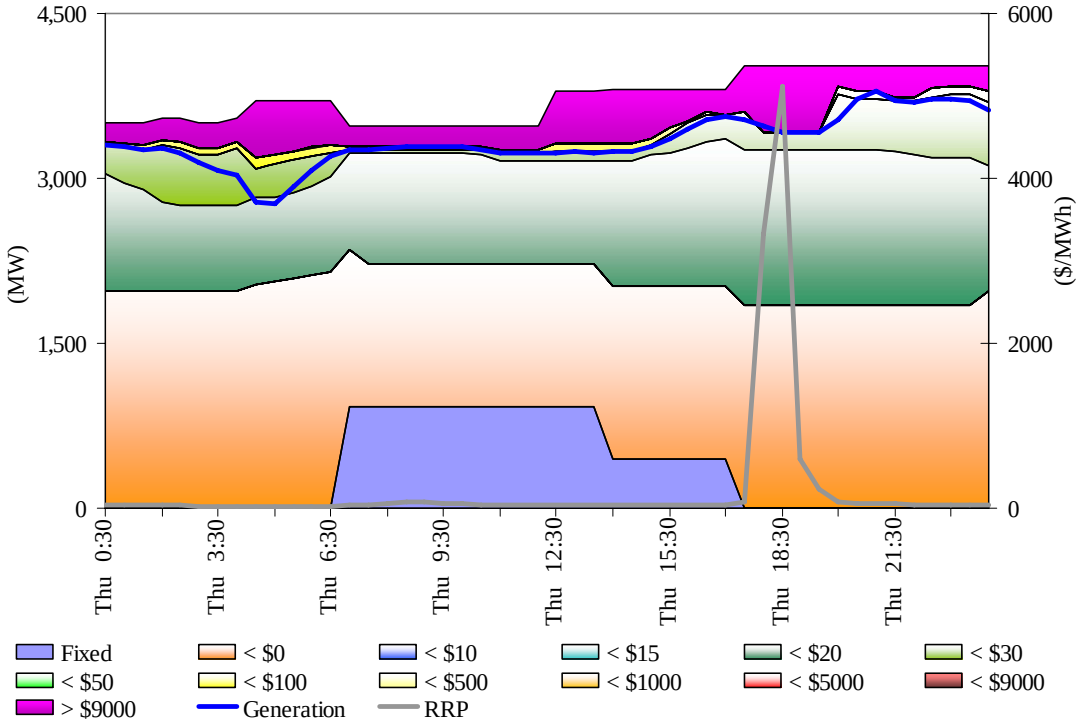


Figure E3: Eraring Energy closing bid prices, dispatch and spot price.