

# Spot prices greater than \$5000/MWh



AUSTRALIAN ENERGY  
REGULATOR

South Australia - 31 December 2007

## 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

On Monday 31 December extreme temperatures in South Australia resulted in near-record demand.

A multiple unplanned outage of network equipment at Moorabool, which is close to Melbourne, reduced the ability to supply load to the north east of Victoria from Melbourne. To manage this reduction in capability, network constraints were invoked that increased flows into Victoria from the Snowy region and forced counter price flows from South Australia across the Murraylink interconnector.

The forced exports from South Australia further tightened the supply and demand balance in that region resulting in the spot price reaching \$5057/MWh at 1 pm.

## Actual and forecast demand

On 31 December demand in South Australia was very high, peaking at 2776 MW at 3 pm, 96 MW lower than South Australia's record demand. At 1 pm, when the half hour price exceeded \$5000/MWh, demand was 2722 MW, which was 267 MW greater than that forecast four hours ahead of dispatch.

Figure 1 compares the actual demand in South Australia with that forecast by NEMMCO four and twelve hours ahead of dispatch. A comparison of actual and forecast spot price is also included.

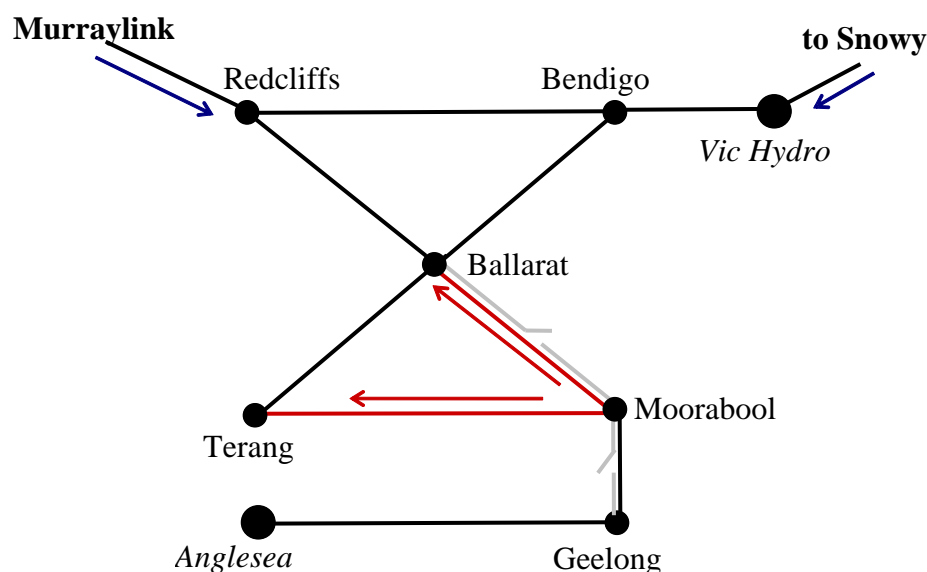
**Figure 1: Actual and forecast demand and spot price in South Australia**

<b>Monday 1:00 PM</b>	<b>Actual</b>	<b>4 hr forecast</b>	<b>12 hr forecast</b>
Demand (MW)	2722	2455	2432
Spot Price (\$MW/h)	5057.04	72.00	61.71

**Changes to network availability**

An unplanned outage of the Moorabool No 2 220kV busbar and the subsequent offloading of two 220 kV lines - Moorabool to Ballarat No 2 and the Moorabool to Geelong No 1 – at 12.38 pm required four additional constraints to be invoked to manage the new configuration of the network. Figure 2 shows the simplified 220 kV network in western Victoria. These constraints were invoked for the 12.50 pm to 1.05 pm dispatch intervals inclusive. One of these constraints bound - with significant impacts on dispatch and pricing across the market. This constraint managed the flows across Moorabool to Terang to supply the north west of Victoria (for the loss of Moorabool to Ballarat) by increasing flows into Victoria from both South Australia (across Murraylink) and Snowy. Hydro generation in north eastern Victoria was constrained on by the constraint, and Anglesea Power Station was constrained off. These counter-priced flows led to high prices in South Australia and low prices in Victoria. This outage also interacted with the system normal constraints managing flows through the Snowy region that caused high prices in the Snowy region and low prices in New South Wales and Queensland.

**Figure 2: The simplified 220 kV network in western Victoria**



The limit for flows across Murraylink into South Australia changed from a maximum of around 110 MW into South Australia at 12.45 pm to forced flows of more than 160 MW into Victoria at 12.50 pm. The new limit, however, was violated - there was insufficient online spare capacity in South Australia to meet the step change and a conflicting network constraint prevented flows of more than 85 MW into Victoria. Five-minute dispatch prices in South Australia reached \$10 000/MWh as all online capacity was dispatched at either its maximum capability or ramp up rate until 1.05 pm. A number of offline units received start instructions during this period.<sup>1</sup>

<sup>1</sup> The Murraylink Very Fast Runback scheme operated as designed at 12.38 pm in response to the loss of the Moorabool equipment. This saw the actual interconnector flow reduce from 108 MW to zero for a few minutes. This did not contribute to the price outcomes at the time.

At the same time the dispatch of flows from Snowy into Victoria increased from 1000 MW to around 1700 MW as the constraint attempted to force flows of more than 2400 MW south into Victoria. This forced flow, in combination with the flows from South Australia across Murraylink created a supply surplus in Victoria and caused two five-minute prices at the price floor or \$-1000/MWh.

The constraints invoked to manage the network outage also impacted on the dispatch of the Snowy to NSW interconnector. In order to manage flows through the Snowy region the step change in the Snowy to Victoria limit caused an equivalent change for flows between the Snowy region and New South Wales. Flows changed from 567 MW south at 12.45 pm to 47 MW north at 12.50 pm. This resulted in forced exports north and south out of the Snowy region, which led to a price of \$4823/MWh for the 1 pm trading interval for that region. Five-minute prices in New South Wales and Queensland fell to zero at 12.50 pm following the step change on the Snowy interconnector.

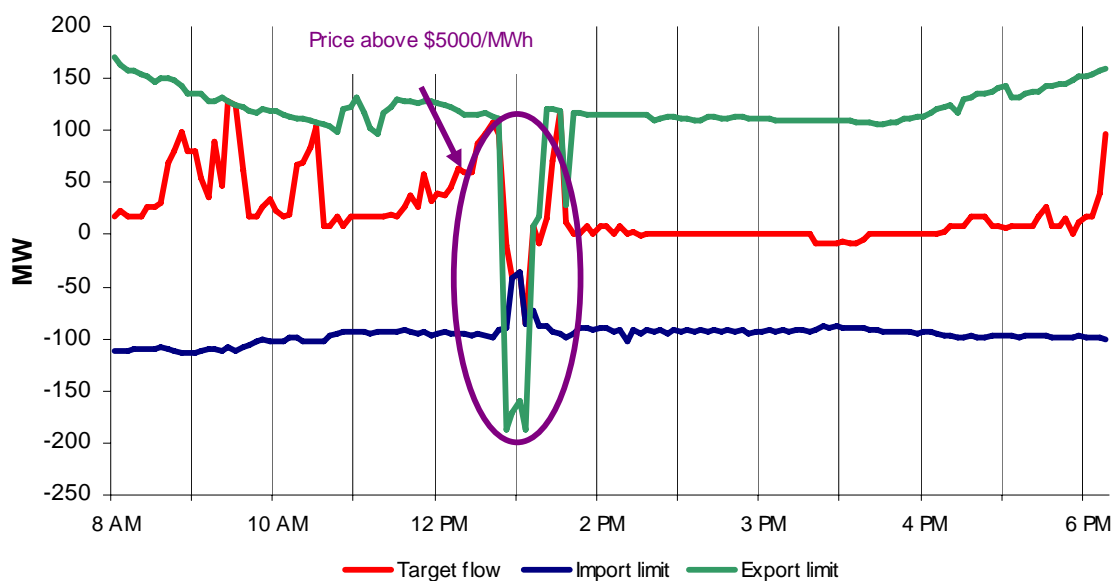
Figure 3 shows the dispatch price for all mainland regions. The constraints were invoked for the 12.50 pm to 1.05 pm dispatch intervals inclusive, which are shaded.

**Figure 3: Dispatch prices – all regions**

	SA (\$/MWh)	Vic (\$/MWh)	Snowy (\$/MWh)	NSW (\$/MWh)	Qld (\$/MWh)
12.45 pm	111	83	49	44	37
12.50 pm	10 000	-1000	9654	0	0
12.55 pm	10 000	-1000	9561	16	14
1.00 pm	10 000	1	9568	22	20
1.05 pm	10 000	9	9646	25	22
1.10 pm	9652	8988	9813	32	28
1.15 pm	86	83	76	46	39

Figure 4 shows the five-minute flow and limits on Murraylink for the day. The trading interval when the spot price exceeded \$5000/MWh is highlighted.

**Figure 4: five-minute dispatch flows and limits across Murraylink into South Australia**



## Generator offers and rebidding

There were no significant rebids.

Generators in South Australia had 287 MW or 10 per cent of offered capacity priced above \$5000/MWh for the 1 pm trading interval. All this capacity was offered by offline generators and Hallett which was starting up and had 10 MW priced above \$5000/MWh. Following the step change in the Murraylink interconnector, all online plant in South Australia was dispatched at either maximum capability or ramp up rate - Dry Creek unit 3 and Mintaro received start instructions with this capacity priced at around \$10 000/MWh.

Figure 5 shows the actual generating capacity presented in South Australia for the 1 pm trading interval. The figure compares this with the amount of available capacity forecast four and twelve 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 and shows an increase in capacity offered at less than the forecast price.

*Figure 5: Actual and forecast capacity and spot price in South Australia*

<b>Monday 1:00 PM</b>	<b>Actual</b>	<b>4 hr forecast</b>	<b>12 hr forecast</b>
Capacity (MW)			
available	2862	2843	2843
Priced at less than \$72	2397	2190	
Spot price (\$/MWh)	5057.04	72.00	

The generators involved in setting the spot price during the 1 pm trading interval, and how that price was determined by the market systems are detailed in **Appendix A**.

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

## Assessment

On Monday 31 December at 12.45 pm an unplanned network outage at Moorabool in Victoria caused a step change on flows across Murraylink, forcing flows out of South Australia. This step change led to high priced capacity being dispatched and dispatch interval prices of up to \$10 000/MWh in South Australia. This network outage had pricing impacts across the national market.

## Appendix A – Price setters for the 1 pm trading interval

The following table identifies the trading intervals 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<sup>2</sup>. 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.

### Monday 31 December – South Australia – 1 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
12:35	\$114.27	Southern Hydro	MCKAY2	Energy	\$85.00	1.34	\$114.27
12:40	\$116.71	Southern Hydro	MCKAY2	Energy	\$85.00	1.37	\$116.71
12:45	\$111.27	Southern Hydro	MCKAY1	Energy	\$82.77	1.34	\$111.28
12:50	\$10,000.00	Snowy Hydro	TUMUT3	Raise 5 min	\$0.00	-6.17	\$0.00
		Snowy Hydro	TUMUT3	Energy	\$149.87	6.48	\$971.62
		Hydro Tasmania	TREBALLN	Energy	\$240.60	12.56	\$3,021.78
		TRUenergy (SA)	TORRB2	Raise 6 sec	\$0.50	-4.22	-\$2.11
		CS Energy	SWAN_B_4	Raise 5 min	\$1.30	1.95	\$2.53
		CS Energy	SWAN_B_3	Lower 5 min	\$0.01	4.22	\$0.04
		Redbank	REDBANK1	Energy	\$0.00	-5.72	\$0.00
		Vic Power Trader	PTH03	Raise 60 sec	\$0.20	-4.22	-\$0.84
		Snowy Hydro	MURRAY	Energy	\$9,999.00	4.85	\$48,506.45
		Hydro Tasmania	JBUTTERS	Raise 5 min	\$20.00	4.22	\$84.49
		Hydro Tasmania	JBUTTERS	Raise 60 sec	\$0.93	4.22	\$3.93
		Bell Bay Power	BELLBAY1	Raise 6 sec	\$10,000.00	4.22	\$42,246.90
		Bell Bay Power	BELLBAY1	Energy	-\$1,000.00	-16.90	\$16,898.77
		Basslink	T-V-MNSP1	Energy	\$0.01	-4.22	-\$0.04
12:55	\$10,000.00	TRUenergy (Vic)	YWPS3	Lower 5 min	\$0.05	4.21	\$0.21
		Snowy Hydro	UPPTUMUT	Energy	\$301.27	6.46	\$1,947.46
		Hydro Tasmania	TREBALLN	Energy	\$240.60	-4.33	-\$1,042.60
		Snowy Hydro	MURRAY	Energy	\$9,999.00	4.78	\$47,774.02
		LYMMCO	LYA3	Raise 6 sec	\$0.50	-4.21	-\$2.10
		Hydro Tasmania	LEM_WIL	Raise 5 min	\$20.00	4.21	\$84.15
		Hydro Tasmania	JBUTTERS	Raise 60 sec	\$0.93	4.21	\$3.91
		CS Energy	CALL_B_1	Energy	\$14.40	-3.14	-\$45.24
		Macquarie					
		Generation	BW01	Raise 5 min	\$2.80	-4.21	-\$11.78
		Bell Bay Power	BELLBAY1	Raise 6 sec	\$10,000.00	4.21	\$42,077.10
		Vic Power Trader	APD02	Raise 60 sec	\$0.20	-4.21	-\$0.84
		Basslink	T-V-MNSP1	Energy	\$0.01	-4.21	-\$0.04
		CS Energy	CALL_B_2	Energy	\$14.40	-3.14	-\$45.24
13:00	\$10,000.00	Snowy Hydro	UPPTUMUT	Energy	\$301.27	6.48	\$1,952.15
		Snowy Hydro	MURRAY	Energy	\$9,999.00	4.79	\$47,939.41
		Ecogen	JLB03	Energy	\$4.67	6.07	\$28.33
		Eraring Energy	HUMEV	Energy	-\$900.00	-10.15	\$9,136.07
		Stanwell	GSTONE3	Energy	\$19.82	-6.25	-\$123.97
<b>Spot price</b>		<b>\$5057/MWh</b>					

Note :

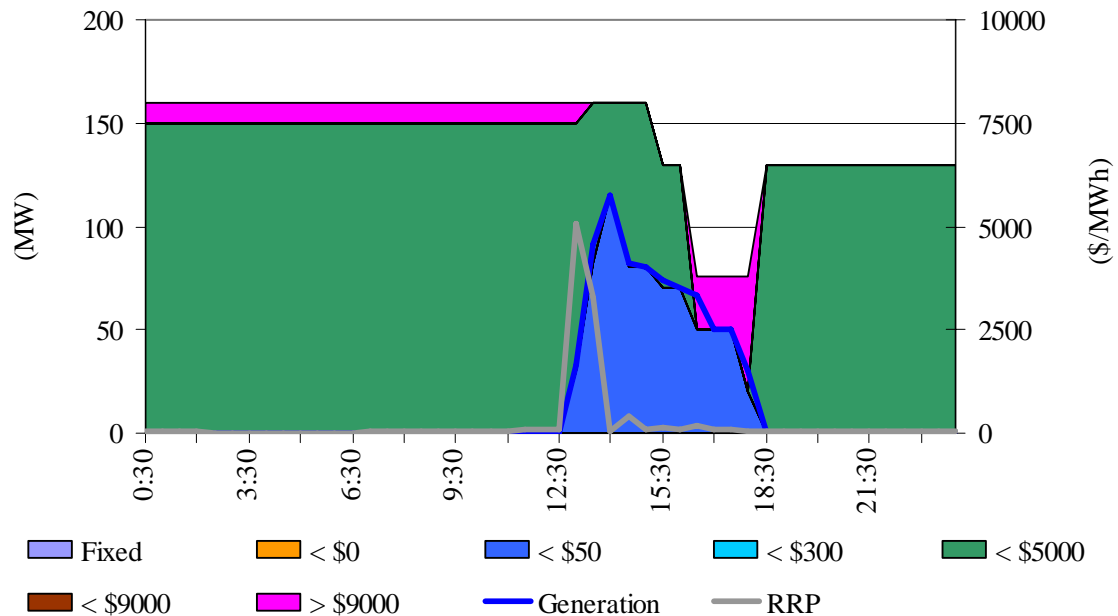
An unplanned outage of the Gordon to Chapel St line in Tasmania occurred at 12.31 pm. This led to an increased requirement for local frequency control ancillary services in Tasmania and also restricted Gordon from providing those services. At 12.51 pm there was an unplanned outage of Basslink, which lasted until 8 January. From 12.50 pm until 2 pm the price of raise 6 second service in Tasmania was \$10 000/MW. At around 1 pm flows from Tasmania into Victoria decrease from around 150 MW to zero as a result of the Basslink outage.

<sup>2</sup> 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>

## Appendix B – Closing bids

Figures B1 and B2 highlight the half hour closing bids for TRU Energy and International Power, the participants in South Australia with capacity priced at or above \$5000/MWh during the trading interval in which the spot price exceeded \$5000/MWh. It also shows the generation output and the spot price.

**Figure B1: TRU Energy's Hallet Power station closing bid prices, dispatch and spot price.**



**Figure B2: International Power Synergen closing bid prices, dispatch and spot price.**

