Electricity spot prices *above $5000/MWh*

31 January 2011
South Australia

AUSTRALIAN ENERGY REGULATOR

Introduction

The AER is required to publish a report whenever the electricity spot price exceeds $5000/MWh.[1] The report:

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

Summary

On Monday 31 January, the spot price in South Australia exceeded $5000/MWh for nine trading intervals. Eight of these spot prices were around $12 000/MWh, with the maximum reaching $12 200/MWh at 3 pm, a record spot price for South Australia.[2] The prices were all close to that forecast 12 hours ahead of dispatch. The prices were, however, significantly higher than forecast four hours ahead for four of the nine trading intervals.

A combination of high demand and large volumes of capacity priced in high price bands led to the high spot price outcomes:

- The third consecutive day of high temperatures, (reaching 43 degrees Celsius in Adelaide on this day), drove demand to a new record in South Australia of 3378 MW[3] at 4.30 pm.
- Alinta Energy priced around 70 per cent of capacity at Northern Power Station close to the price cap.

Although average wind generation before the time of high prices was around 540 MW, during the time of high prices the output of low-priced wind generation in South Australia dropped to an average of only 100 MW. Had wind generation been at higher levels, the high price outcomes may not have eventuated.

Rebidding did not contribute to the prices exceeding $5000/MWh.

This event contributed to the spot price exceeding $5000/MWh in Victoria. The AER has published a separate report covering this event.

[1] This requirement is set out in clause 3.13.7 (d) of the National Electricity Rules.
[2] The record spot price in the NEM is $12 400/MWh and occurred in Tasmania on 19 November 2010. The market price cap increased from $10 000/MWh to $12 500/MWh
[3] The previous record was 3318 MW and occurred on 28 January 2009.

Actual and forecast demand

Figure 1 compares the actual demand, spot price and available capacity in South Australia on 31 January with that forecast by AEMO four and 12 hours ahead of dispatch.

Figure 1: Actual and forecast demand, spot price and available capacity, 31 January 2011

2 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3327	3300	3262
Spot Price ($MW/h)	12 099	629	11 300
Available capacity (MW)	3358	3531	3499
2.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3326	3289	3291
Spot Price ($MW/h)	11 999	12 199	12 199
Available capacity (MW)	3359	3537	3489
3 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3316	3308	3304
Spot Price ($MW/h)	12 200	12 495	12 199
Available capacity (MW)	3339	3520	3475
3.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3327	3320	3316
Spot Price ($MW/h)	12 199	12 495	12 499
Available capacity (MW)	3339	3483	3462
4 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3348	3339	3332
Spot Price ($MW/h)	12 133	12 499	12 499
Available capacity (MW)	3309	3463	3450
4.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3378	3355	3361
Spot Price ($MW/h)	12 183	12 200	12 500
Available capacity (MW)	3291	3451	3404
5 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3335	3344	3346
Spot Price ($MW/h)	12 066	609	12 495
Available capacity (MW)	3282	3363	3400
5.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3302	3302	3308
Spot Price ($MW/h)	12 082	500	12 199
Available capacity (MW)	3274	3332	3397
6 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3263	3236	3241
Spot Price ($MW/h)	9021	155	12 199
Available capacity (MW)	3263	3319	3395

Around 35 MW of non-scheduled generation is not included in this demand figure. Actual non-scheduled generation was close to forecast.

While demand was generally close to forecast, available capacity was generally slightly below forecast. The maximum shortfall of actual capacity compared to that forecast four hours ahead was 181 MW at 3 pm (note that reductions in capability from semi-scheduled wind generation as a result of reduced wind speed translate to a reduction in regional available capacity).

Figure 1 shows that for the 2 pm, and 5 pm to 6 pm trading intervals the price forecast four hours ahead was lower than both the actual price and that forecast 12 hours ahead.

On the day, there was no capacity priced between $600/MWh and $10 000/MWh, and therefore any changes in forecast import capability, generation capacity or demand, had the potential to result in significant fluctuations in forecast spot prices.

Average wind generation before the time of high prices was around 540 MW, (peaking at 715 MW at 6.05 am) but during the time of high prices averaged only 100 MW (the minimum was 45 MW at 4.40 pm). Actual wind generation was, however, close to forecast.

Generator offers and rebids

For the period of high prices up to 4130 MW of available capacity was offered through initial offers (day ahead)[4]. Around 3190 MW (three quarters) of this capacity was priced below $600/MWh, and the remainder was priced above $10 000/MWh. Around 485 MW (or half) of the initial offers priced above $10 000/MWh was from Alinta Energy at its Northern and Playford Power Stations. In response to the initial high forecast prices rebids of capacity from high prices to low prices occurred to commit all South Australian peaking plant into service:

- At 10.43 pm on the previous day, International Power committed a number of gas turbines by rebidding a total of 95 MW of available capacity (at Snuggery, Port Lincoln, Mintaro and Dry Creek) from prices above $10 800/MWh to close to the price floor. The reason given across all stations was “Response to pre-dispatch prices”.
- At 10.16 am on the day, TRUenergy committed all of the Hallett gas turbines by rebidding 175 MW of available capacity from prices above $575/MWh to $1/MWh. The reason given was “Band adj due to shift in SA price sen”.
- At 11.44 am, International Power committed its remaining gas turbine at Snuggery by rebidding 54 MW of available capacity from prices above $11 800/MWh to zero. The reason given was “Vic demand tracking ahead of forecast 8872 v 8674”.

The only other significant rebid was by Alinta Energy at 11.38 am, which reduced the capacity of its Playford Power Station by 100 MW (all priced above $12 000/MWh). This unit was returned to service earlier in the morning. The reason given was “1138P PPS failed fuel oil service pumps@11.38.”

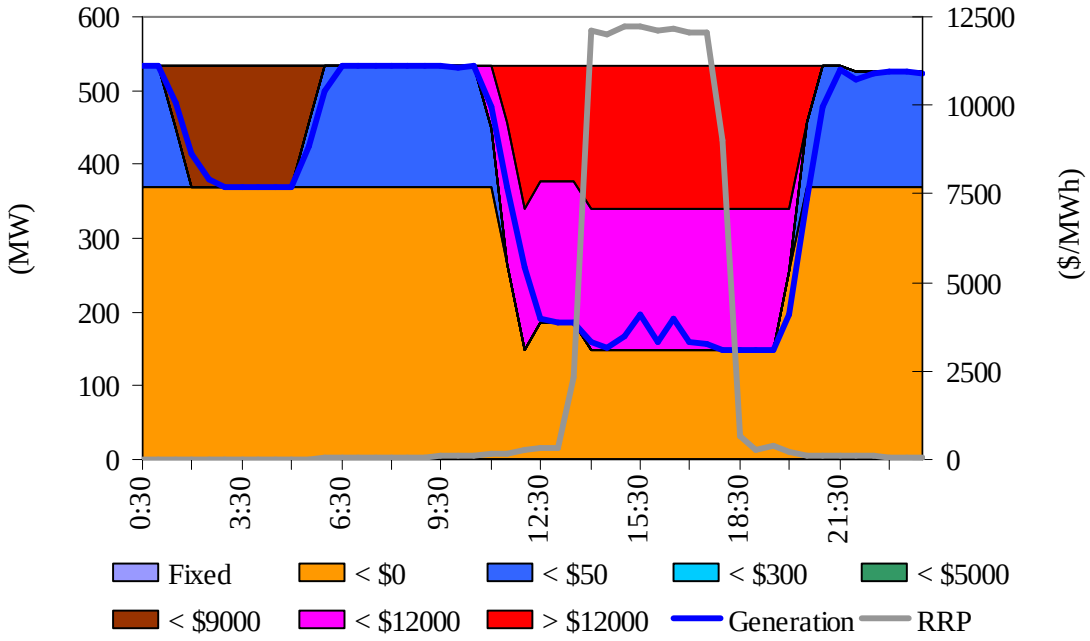
Following these rebids around 500 MW was priced at above $10 000/MWh, with all other capacity in South Australia priced at less than $600/MWh. The majority of this high-priced capacity was offered by Alinta Energy at its Northern Power Station (191 MW at $11 778/MWh and 193 MW at $12 064/MWh).

[4] Around 600 MW of this low priced capacity was offered from wind generation, which was forecast through the automatic wind energy forecasting system (AWEFS) to be generating at close to zero during this period. Actual wind generation was close to that forecast.

As shown in figure 2, for the majority of the day 370 MW (or 185 MW per unit) at Northern Power Station was offered at less than zero. During the high-priced period however, only 150 MW (or 75 MW per unit) was offered at less than zero, with the remainder priced at close to the price cap. Figure 2 shows that only a small amount of this high-priced capacity was dispatched. Had there been higher wind generation or lower demand on the day this high priced capacity would not have been dispatched and the South Australia price would have been considerably lower. [5]

The offers from Alinta Energy led to dispatch targets of as low as 75 MW for each of the Northern Power Station units (compared to availability of around 270 MW per unit). This is a very low minimum load for brown coal plant, and historically low for these particular units. Modifications were made to the control systems in October 2010 to improve the operating flexibility (minimum loading levels) of this plant in response to extended periods of very low prices in South Australia during periods of high wind generation levels. The Northern Power Station units have only been operated at these low levels on a handful of occasions since October 2010.

Figure 2: Northern Power Station closing bid prices, dispatch and spot price (RRP)



The generators involved in setting the price during the high-price period, and how that price was determined by the market systems is detailed in **Appendix A**.

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

[5] A similar bidding strategy occurred the previous day (when demand was less than 3000 MW) but the high priced Northern Power Station offers were not dispatched and the spot price peaked at only $358/MWh.

Network constraints

Two system normal transmission network constraints bound for the majority of the time between 1.30 pm and 7.30 pm. These constraints (V>>S_NIL_SETB_KHTB and V^^S_NIL_NPS_SE_ON) manage loading on the Keith to Tailem Bend line for the loss of a South East to Tailem Bend line, and voltage stability for the loss of a large generator in South Australia. These constraints had the effect of constraining-off[6] International Power's Snuggery Power Station, and Origin Energy's Ladbroke Grove units one and two, despite all offered capacity being priced at the price floor.

- In response to receiving dispatch targets from AEMO below its minimum loading level, International Power rebid the ramp down rate at its Snuggery Power Station to zero. However, after receiving a subsequent dispatch target above its minimum loading level International Power rebid to increase the ramp down rate at Snuggery back to its previous level. This is in accordance with the AER's Rebidding and Technical Parameters guideline.[7]
- The Ladbroke Grove units were at times targeted to increase output and at other times to decrease output by up to 10 MW. In response to a request for further information from the AER, Origin advised that it relies on an arrangement with ElectraNet (the transmission network service provider) to manually control the power station output on instruction from Origin, rather than automatic generation control (AGC), which is commonly used (particularly for larger generators). It appears that, under this manual control arrangement, the fluctuating targets were difficult to meet. However, following a longer period of reducing targets the generators did reduce output. [8]

Import capability

Combined import capability across the Heywood and Murraylink interconnectors into South Australia was generally lower than forecast. Import capability was up to 90 MW lower than forecast four hours ahead (407 MW compared to 497 MW for the 3.30 pm trading interval). The import capability for the 5.30 pm trading interval was, however, 55 MW higher than forecast both four and twelve hours ahead.

Australian Energy Regulator

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[6] Network constraints can cause generators to be dispatched at a price that is lower than its offer price (constrained-on) or generators to not be dispatched even though its offer price is lower than the regional price (constrained-off).

[7] Available at www.aer.gov.au.

[8] The National Electricity Rules anticipate that all scheduled generators are capable of following dispatch instructions on a 5-minute basis. In circumstances where generators cannot follow targets, they must advise AEMO immediately or modify their offer.

In December 2006 the AER published the Compliance Bulletin *Complying with dispatch instructions.* The requirement for participants to comply with dispatch instructions, as specified in chapter 4 of the Electricity Rules, is fundamental to the secure operation of the power system. On that basis, the AER monitors closely registered participant's general responsibilities to comply with dispatch instructions issued by AEMO.

Appendix A – Price setters for 31 January 2011

The following tables identify for the each trading interval exceeding $5000/MWh, the five minute dispatch interval price and the generating units involved in setting the energy price. This information is published by AEMO[9]. Also shown is the energy 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 average of the six dispatch interval prices.

2 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
13:35	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
13:40	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
13:45	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
13:50	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
13:55	$11 999.40	International Power	DRYCGT2	Energy	$11 999.40	1.00	$11 999.40
14:00	$11 999.40	International Power	DRYCGT2	Energy	$11 999.40	1.00	$11 999.40
Spot price	**$12 099/MWh**						

2.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
14:00	$11 999.40	International Power	DRYCGT2	Energy	$11 999.40	1.00	$11 999.40
14:05	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
14:10	$11 999.40	International Power	DRYCGT2	Energy	$11 999.40	1.00	$11 999.40
14:15	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
14:20	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
14:25	$11 999.40	International Power	DRYCGT2	Energy	$11 999.40	1.00	$11 999.40
Spot price	**$11 999/MWh**						

3 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
14:35	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
14:40	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
14:45	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
14:50	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
14:55	$14 052.06	LYMMCO	LYA3	Energy	$12 403.00	1.13	$14 052.60
15:00	$14 140.46	International Power	LOYYB2	Energy	$12 398.99	1.14	$14 141.05
Spot price	**$12 200/MWh**						

3.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
15:05	$12 495.00	Alinta Energy	NPS2	Energy	$12 495.00	1.00	$12 495.00
15:10	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
15:15	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
15:20	$13 973.94	International Power	LOYYB2	Energy	$12 398.99	1.13	$13 973.66
15:25	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
15:30	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
Spot price	**$12 199/MWh**						

[9] Details on how the price is determined can be found at www.aemo.com.au

4 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
15:35	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
15:40	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
15:45	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
15:50	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
15:55	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
16:00	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
Spot price	**$12 133/MWh**						

4.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
16:05	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
16:10	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
16:15	$15 197.48	International Power	LOYYB1	Energy	$12 398.89	1.23	$15 197.32
16:20	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
16:25	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
16:30	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
Spot price	**$12 183/MWh**						

5 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
16:35	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
16:40	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
16:45	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
16:50	$12 199.00	Alinta Energy	NPS1	Energy	$12 199.00	1.00	$12 199.00
16:55	$11 999.40	International Power	DRYCGT2	Energy	$11 999.40	1.00	$11 999.40
17:00	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
Spot price	**$12 066/MWh**						

5.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
17:05	$12 495.00	Alinta Energy	NPS2	Energy	$12 495.00	1.00	$12 495.00
17:10	$11 999.60	International Power	POR01	Energy	$11 999.60	1.00	$11 999.60
17:15	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
17:20	$11 999.20	International Power	DRYCGT1	Energy	$11 999.20	1.00	$11 999.20
17:25	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
17:30	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
Spot price	**$12 082/MWh**						

6 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
17:35	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
17:40	$11 999.20	International Power	DRYCGT1	Energy	$11 999.20	1.00	$11 999.20
17:45	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
17:50	$2433.96	Snowy Hydro	MURRAY	Energy	$294.69	3.02	$889.37
		AGL Hydro	DARTM1	Energy	$-1 000.00	0.20	$-202.30
		Origin Energy	LADBROK2	Energy	$-1 000.00	-2.23	$2225.80
		AGL Hydro	MCKAY1	Energy	$-1 000.00	0.42	$-416.40
		AGL Hydro	WKIEWA1	Energy	$-1 000.00	0.04	$-41.60
		AGL Hydro	WKIEWA2	Energy	$-1 000.00	0.02	$-20.80
17:55	$3692.74	Snowy Hydro	MURRAY	Energy	$294.69	4.14	$1219.04
		AGL Hydro	DARTM1	Energy	$-1 000.00	0.28	$-277.20
		Origin Energy	LADBROK1	Energy	$-1 000.00	1.37	$-1371.30
		Origin Energy	LADBROK2	Energy	$-1 000.00	1.37	$-1371.30
		AGL Hydro	MCKAY1	Energy	$-1 000.00	0.57	$-570.80
		International Power	SNUG1	Energy	$-1 000.00	-6.15	$6150.00
		AGL Hydro	WKIEWA1	Energy	$-1 000.00	0.06	$-57.10
		AGL Hydro	WKIEWA2	Energy	$-1 000.00	0.03	$-28.50
18:00	$11 999.30	International Power	DRYCGT3	Energy	$11 999.30	1.00	$11 999.30
Spot price	**$9021/MWh**						

Appendix B – Closing bids

Figures B1 and B2 highlight the half hour closing bids for participants in South Australia with significant capacity priced at or above $5000/MWh during the period in which the spot price exceeded $5000/MWh. It also shows the generation output of that participant and the spot price.

Figure B1: Alinta Energy closing bid prices, dispatch and spot price

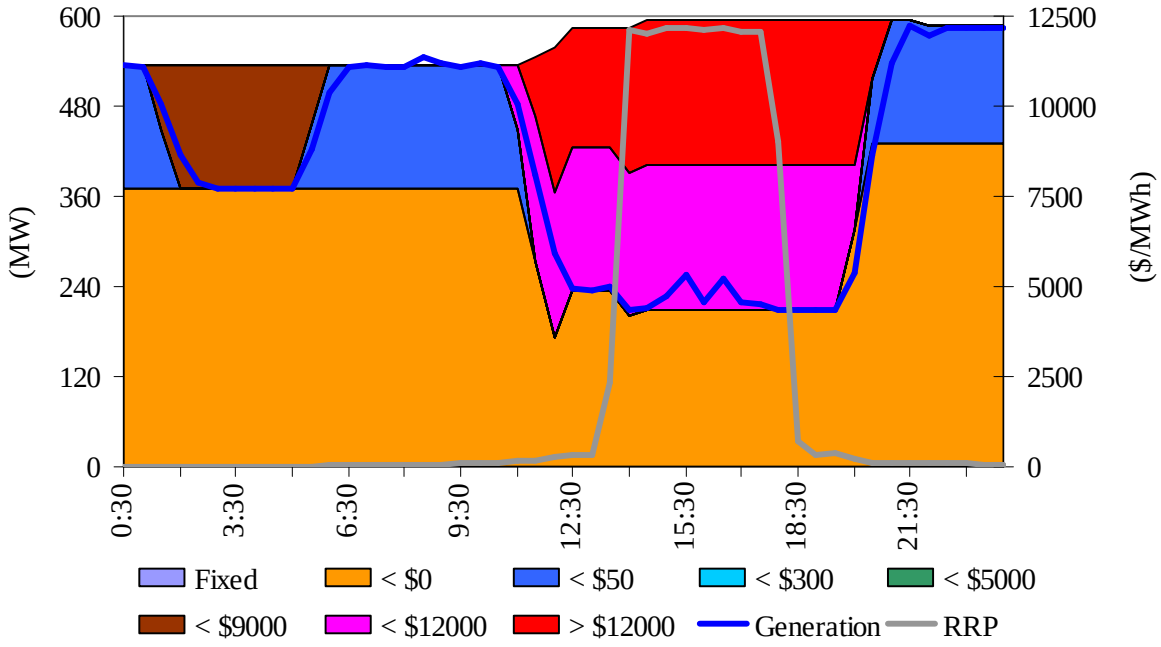
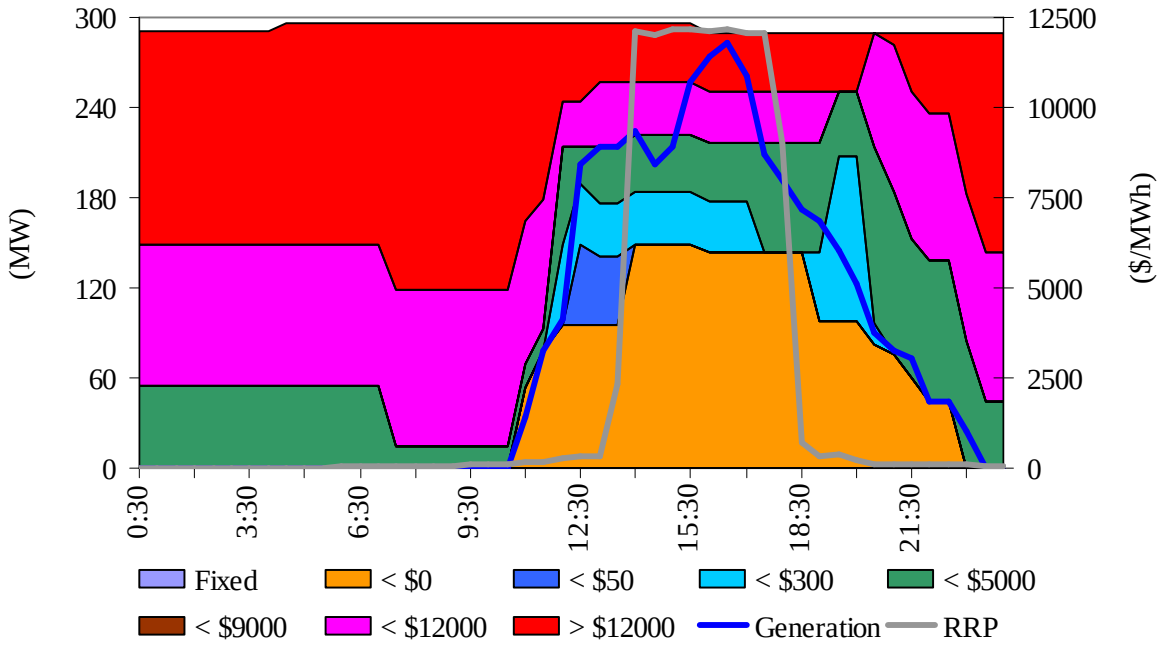


Figure B2: International Power (Synergen) closing bid prices, dispatch and spot



Appendix C – Spot prices exceeding three times the weekly average and $250/MWh from Electricity Weekly Analysis report 30 January to 5 February.

In addition to the spot price exceeding $5000/MWh on 31 January, there were numerous trading intervals in South Australia where the spot price exceeded three times the weekly average and $250/MWh, as seen in figure C1.

The Weekly Market Analysis Report for the week 30 January to 5 February referred readers to this *Spot Prices above $5000/MWh* report for an explanation of the spot prices shown in figure C1. The reasons for these spot prices are consistent with the explanation in the main body of this report.

Figure C1: Actual and forecast demand, spot price and available capacity, 31 January 2011

12 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3085	3198	3221
Spot Price ($MW/h)	266	300	300
Available capacity (MW)	3471	3651	3588
12.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3135	3232	3234
Spot Price ($MW/h)	314	590	590
Available capacity (MW)	3440	3618	3559
1 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3193	3254	3210
Spot Price ($MW/h)	324	590	590
Available capacity (MW)	3417	3578	3532
1.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3250	3276	3232
Spot Price ($MW/h)	2316	11 300	590
Available capacity (MW)	3395	3550	3515
6.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3224	3153	3156
Spot Price ($MW/h)	682	101	11 300
Available capacity (MW)	3271	3307	3394
7 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3208	3083	3086
Spot Price ($MW/h)	300	101	11 300
Available capacity (MW)	3293	3308	3393
7.30 PM	**Actual**	**4 hr forecast**	**12 hr forecast**
Demand (MW)	3172	3013	3018
Spot Price ($MW/h)	366	300	11 300
Available capacity (MW)	3259	3306	3415