Spot prices greater than $5000/MWh

AUSTRALIAN ENERGY REGULATOR

Mainland: 23 July 2008

Introduction

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

- describe significant factors contributing to the spot price or market ancillary service 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;
- identifies any linkages between spot prices in the energy market and market ancillary service prices contributing to the occurrence;
- identify the marginal scheduled generating units involved in the spot price; and
- identify all units with energy 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 or the market ancillary services 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.

Frequency control ancillary services are required to maintain the power system frequency within the standard. These services are offered into the market systems by registered providers (usually generators) along with energy market offers from the same provider. The dispatch algorithm optimises the dispatch of energy and ancillary services subject to the provider's capability to simultaneously provide those services. These interactions can lead to significant impacts in any number of those markets, including leading to pricing and dispatch outcomes that were not forecast.

Summary

On 23 July at 11.40 am the Hazelwood to Loy Yang No 2 500kV line was taken out of service to investigate an alarm relating to equipment at Hazelwood terminal station in the Latrobe Valley in Victoria. At 5.24 pm the Hazelwood to Loy Yang No 3 500kV line tripped due to faulty protection equipment, leaving only one remaining line connecting Loy Yang and Tasmania to the rest of the market. The combined outages restricted flow into Victoria across BassLink to zero and constrained generation at Loy Yang A and B by around 1000 MW.

At 6 pm, NEMMCO invoked frequency control ancillary services (FCAS) constraints to manage the potential loss of the remaining Hazelwood to Loy Yang line. This saw the requirement for all raise contingency services for the mainland increase significantly – the 6-second requirement increased from 212 MW to 1076 MW, 60-second from 212 MW to 1538 MW and 5-minute from 406 MW to 1731 MW. The price for those services increased to the price cap.

The large increase in FCAS requirements led to some generators being reduced in the energy market in order to provide those services. This reduced the dispatch of low-priced generation for energy by more than 1000 MW. As a result of the reduced availability of low priced generation the five-minute dispatch price increased from $294/MWh to $10 000/MWh at 6 pm. The spot price for each of the mainland regions exceeded $5000/MWh for the 6.30 pm trading interval.

At 7.10 pm SP AusNet restored the Hazelwood to Loy Yang No 3 500kV line to service on the understanding that the protection fault had been rectified. This saw the requirements for FCAS reduce to normal levels. At 7.52 pm, however, the line tripped again and at 8.10 pm the requirement for and price of FCAS increased again. The energy price also increased to around $600/MWh by 9 pm for all mainland regions. The Hazelwood to Loy Yang No 3 500kV line was returned to service at 9.56 pm after SP AusNet took the faulty protection equipment out of service. This saw the requirements for FCAS reduce to normal levels.

As a result of these two unplanned network outages combined with the earlier outage the prices for contingency raise ancillary services exceeded $5000/MW for six trading intervals between 6.30 pm and 10 pm. The total price for those services for these two periods totalled $118 million, the highest ever for a single event.

This event coincided with the highest demand across the mainland for the winter at that time.

Actual and forecast demand

Demand on the mainland was around 300 MW lower than that forecast four hours ahead but at a winter high level. Figure 1 compares the actual demand in the mainland regions with that forecast 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

NSW	**Wednesday 6:30 PM**	**Actual**	**4 hr forecast**	**12 hr forecast**
	Demand (MW)	13 203	13 411	13 085
	Spot Price ($MW/h)	$8455	$147	$100
Qld	**Wednesday 6:30 PM**	**Actual**	**4 hr forecast**	**12 hr forecast**
	Demand (MW)	7512	7488	7018
	Spot Price($MW/h)	$8058	$139	$88
VIC	**Wednesday 6:30 PM**	**Actual**	**4 hr forecast**	**12 hr forecast**
	Demand (MW)	7835	7977	7832
	Spot Price($MW/h)	$8766	$133	$98
SA	**Wednesday 6:30 PM**	**Actual**	**4 hr forecast**	**12 hr forecast**
	Demand (MW)	2178	2164	2148
	Spot Price($MW/h)	$8033	$133	$101

As a result of the loss of the Hazelwood to Loy Yang No 3 line, NEMMCO issued a notice at 6.14 pm of an actual Lack of Reserve level 2 (LOR2) condition for the Victorian region between 6.14 pm and 7.10 pm. A further notice was issued at 8.02 pm following loss of the Hazelwood to Loy Yang No 3 line the second time. This condition applied from 7.52 pm until 9.56 pm. The LOR2 condition means that the trip of the third remaining Hazelwood to Loy Yang 500kV line would have caused interruption of customer load.

Changes to network availability

On 23 July, an outage of the Hazelwood Terminal Station to Loy Yang Power Station No 2 line commenced at 11.40 am. SP AusNet first entered the outage information in the market systems at 10.46 am. The constraint set "V-HWLY_2" was invoked to manage the outage, which limits generation at Loy Yang and Valley Power stations and restricts flow into Victoria from Tasmania. The outage was initially scheduled for completion at 3 pm that afternoon. The expected completion was delayed a number of times until later the following day. Following the loss of the No 3 line for the second time the repairs were accelerated and a temporary arrangement was implemented allowing the line to be returned to service at 3 am the following day.

At 5.24 pm, the Hazelwood to Loy Yang No. 3 line tripped due to faulty protection equipment, resulting in flows of more than 3000 MW across the remaining line. Two network constraint sets were invoked at 5.50 pm to manage the loss of the remaining line. The first constraint set "V-LY_2200", restricted the generation at Loy Yang A and B and Valley power stations plus northerly flows across BassLink, to be less than 2200 MW. The second constraint set restricted flow across BassLink into Victoria to zero. Market notices 22244 and 22246 were issued at around 6 pm to inform participants of the unplanned outage and the LOR2 condition for Victoria.

The outages of the two Hazelwood to Loy Yang lines meant that the next contingency (the loss of the remaining Hazelwood to Loy Yang line) would have seen Loy Yang A and B Power Stations and BassLink disconnected from the mainland. In order to manage this potential step change of around 2000 MW in generation supply, NEMMCO invoked the constraint set "F-I_TG_2000" to dispatch extra raise FCAS services. Additional constraints were invoked at 6.15 pm that precluded Loy Yang A and B Power Stations from providing FCAS, as these generators would not have assisted with frequency control following loss of the remaining Hazelwood to Loy Yang line connecting it to the mainland. It appears that a similar restriction should have been placed on generators in Tasmania but this did not occur. Generators in Tasmania were dispatched for more than 200 MW of each raise contingency service above that needed locally to meet the requirements of the mainland during the network outages. This meant that dispatch of FCAS on the mainland was deficient by this same amount. This is detailed in **Appendix A**. The AER has confirmed with NEMMCO that the use of FCAS constraints to manage power system security and dispatch will be included in NEMMCO's investigation into the event.

At 7.10 pm SP AusNet believed that the cause of the faulty line protection had been rectified. This allowed the Hazelwood to Loy Yang No. 3 line to be returned to service and all constraints associated with the outage to be revoked. At 7.41 pm, NEMMCO issued a market notice advising the return to service of the Hazelwood to Loy Yang No. 3 line and cancelling the LOR2 condition in Victoria.

A second trip of the Hazelwood to Loy Yang No. 3 line occurred at 7.52 pm. A market notice was issued at 8.02 pm to reflect the event. Initially the same network and FCAS constraint sets were invoked, which again dispatched the generators in Tasmania to provide FCAS for the mainland. Further constraints were invoked by NEMMCO at 8.50 pm and 9 pm to address this but these changes were unsuccessful. This is detailed in **Appendix A**. After further assessment by SP AusNet the Hazelwood to Loy Yang No. 3 line was returned to service at 9.56 pm and all constraints associated with the second line trip were revoked at 10.05 pm.

The AER will seek further information from VENCorp and SP AusNet with respect to the operation of protection systems.

Generator offers and rebidding

Prices were aligned across the mainland during the high priced period. There was no significant rebidding in the energy market. The closing bids for all participants on the mainland with capacity priced at or above $5000/MWh during the high priced period are presented in **Appendix B**. The generators involved in setting the spot price are detailed in **Appendix C**.

During the 6.30 pm trading interval, up to 1372 MW of capacity at Loy Yang A and B, Valley Power and across BassLink was prevented from supplying to the mainland. Around 1000 MW of additional low-priced capacity was unavailable to provide energy as a result of the interaction between the dispatch of ancillary services and energy[1]. In total, around 1200 MW of low price generation in Victoria was not dispatched, 450 MW in New South Wales, 230 MW in Queensland and 100 MW in South Australia. A further 109 MW was unavailable for dispatch in energy and FCAS as a result of being trapped[2] or stranded in the ancillary service markets; and 1000 MW was ramp rate limited. Further information about the frequency control ancillary services is detailed below.

During the second network outage the spot price increased to around $600/MWh by 9 pm for all mainland regions. There was no significant rebidding.

FCAS

Raise contingency ancillary services exceeded $5000/MWh in six trading intervals during the two network outages. On the mainland this was driven by the large requirements that were needed as a result of the unplanned network outages. The line outages meant that the next contingency - loss of the third remaining line - the supply of generation would fall by the output from Loy Yang A and B plus imports across BassLink into Victoria. Requirements for these frequency control ancillary services increased from 212 MW to 1076 MW for the 6-second raise service, from 212 MW to 1538 MW for 60-second and from 406 MW to 1731 MW for 5-minute.

The significant requirements for raise services resulted in a total cost for those services of $118 million over the period. These services are paid for by generators pro-rata to their output. Figure 2 details the main recipients of frequency control ancillary services income for the period, and figure 3 details the generators with the highest payments for those services[3].

Figure 2: Approximate earnings for raise frequency control ancillary service providers

Participant	Approximate earning ($mil)
Snowy Hydro	$26.2
Macquarie Generation	$21.6
VicPower Trading	$18.1
Stanwell Corporation	$9.2
Eraring Energy	$9.0
AGL SA	$8.2
Tarong Energy Corporation	$8.0
CS Energy	$7.3
Hydro Tasmania	$3.5
Others	$6.9

1 For example, from 5.55 pm, the dispatch of generation at Bayswater power station in NSW was reduced from 2700 MW to 2324 MW at 6.25 pm whilst being increased in the dispatch of FCAS.

2 If a generator is flagged as stranded then its initial MW is outside of its ancillary service enablement limits and the unit is unavailable for FCAS. If a generator is flagged as trapped then its energy target is at an ancillary service enablement limit, which restricts its movement in the energy market.

3 Publicly available market data is used to calculate the approximate earnings and payments for each participant.

Figure 3: Generator payments for raise frequency control ancillary services

Generator	Approximate payment ($mil)
Macquarie Generation	$16.8
Delta Electricity	$14.7
Eraring Energy	$10.3
Snowy Hydro	$9.4
LYMMCO	$7.5
Stanwell Corporation	$7.4
TRUenergy	$6.3
CS Energy	$5.1
Others	$40.5

On the mainland, rebidding did not contribute to the high prices for market ancillary services. The majority of rebidding shifted capacity into lower price bands. In Tasmania, however, rebidding was a significant factor that contributed to market ancillary service prices exceeding $5000/MWh. On a number of occasions, Hydro Tasmania rebid virtually all raise ancillary services capacity into the top price band. For instance at 7.07 pm more than 3400 MW of capacity across the three services was shifted into the top price band.[4] This resulted in an increase in ancillary raise service prices in Tasmania from generally less than $1 to $10 000/MW at times between 7 pm and 10 pm. The high prices resulted in payments to Hydro Tasmania generators of around $3.5 million during this period. The majority of this is, however, funded by Hydro Tasmania.

Figure 4 details the prices for each of the raise contingency services for each trading interval and under each service, the ancillary price for the mainland and Tasmania are detailed separately. Figure 5 details the average requirements for each service for each trading interval. The high requirements align with the two periods between 6 pm and 7.30 pm and 8.30 pm to 10 pm when the Hazelwood to Loy Yang No 3 line tripped.

Figure 4: Prices for raise ancillary services

Time	RAISE 6 SEC		RAISE 60 SEC		RAISE 5 MIN	
	Mainland	TAS	Mainland	TAS	Mainland	TAS
6:00 PM	$1,667	$0.50	$1,667	$0.12	$1,669	$0.30
6:30 PM	$10,000	$0.80	$10,000	$0.19	$10,000	$0.01
7:00 PM	$10,000	$2,349	$10,000	$0.19	$9,999	$0.15
7:30 PM	$6,666	$6,668	$6,667	$6,667	$6,666	$6,667
8:00 PM	$0.20	$0.74	$0.08	$0.20	$1.05	$1.38
8:30 PM	$8,333	$1,760	$8,305	$0	$8,289	$0.40
9:00 PM	$10,000	$8,374	$9,907	$8,333	$9,046	$8,333
9:30 PM	$0.43	$0.43	$0.22	$0.53	$1.84	$1,668
10:00 PM	$10,000	$10,000	$8,156	$8,333	$6,527	$4,863
10:30 PM	$645	$75	$495	$96	$426	$44

[4] This amount is the sum of capacity shifted into the top price band by Hydro Tasmania in the Raise 5 minutes, Raise 60 seconds and Raise 6 seconds ancillary services markets.

Figure 5: Requirements for raise ancillary services

Time	RAISE 6 SEC (MW)		RAISE 60 SEC (MW)		RAISE 5 MIN (MW)	
	Mainland	TAS	Mainland	TAS	Mainland	TAS
6:00 PM	312	20	381	57	551	101
6:30 PM	1078	39	1538	92	1732	81
7:00 PM	955	108	1397	175	1614	148
7:30 PM	667	87	959	153	1209	106
8:00 PM	136	6	120	22	359	32
8:30 PM	791	118	1175	159	1378	163
9:00 PM	1032	56	1467	121	1668	99
9:30 PM	167	0	164	3	388	4
10:00 PM	1059	66	1428	162	1515	231
10:30 PM	426	44	495	96	645	75

There were four dispatch intervals, 8.10 pm, 8.55 pm, 9 pm and 9.40 pm, where the mainland requirement for raise 60-sec service was not satisfied, but at all other times there were sufficient services available.

The FCAS requirement, established by NEMMCO, was intended to manage the step change in supply to the mainland regions for loss of the third remaining Hazelwood to Loy Yang line, by dispatching mainland generators in a way that would ensure the power system frequency remained within the standard if that contingency occurred. As detailed in **Appendix A** there was considerable FCAS sourced from generators outside of Victoria, particularly in New South Wales and Queensland. This meant that in the event of the contingency flows from New South Wales into Victoria would have increased significantly. The AER has confirmed with NEMMCO that this matter is included in the scope of NEMMCO's investigation.

Assessment

On 23 July, the spot price exceeding $5000/MWh at 6.30 pm was caused by the unplanned outages of the No. 2 and No. 3 Hazelwood to Loy Yang 500 kV lines in the Latrobe Valley in Victoria. This left one line in operation between Loy Yang and Tasmania, and the rest of the market. To manage this, 1000 MW of generation at Loy Yang was constrained, BassLink imports into the mainland were limited to zero and raise contingency ancillary services requirements increased significantly. This caused the price for those services to reach the price cap of $10 000/MW for six trading intervals.

In Tasmania raise ancillary service prices exceeded $5000/MWh following rebids of large amounts of capacity into high price bands by Hydro Tasmania. The AER is seeking further information from Hydro Tasmania regarding its bidding activity during the period.

The AER has confirmed with NEMMCO that its management of security and dispatch during this event is included in NEMMCO's investigation into the event.

The AER has requested that VENCorp and SP AusNet investigate and report on its management of protection and control services associated with the network outages.

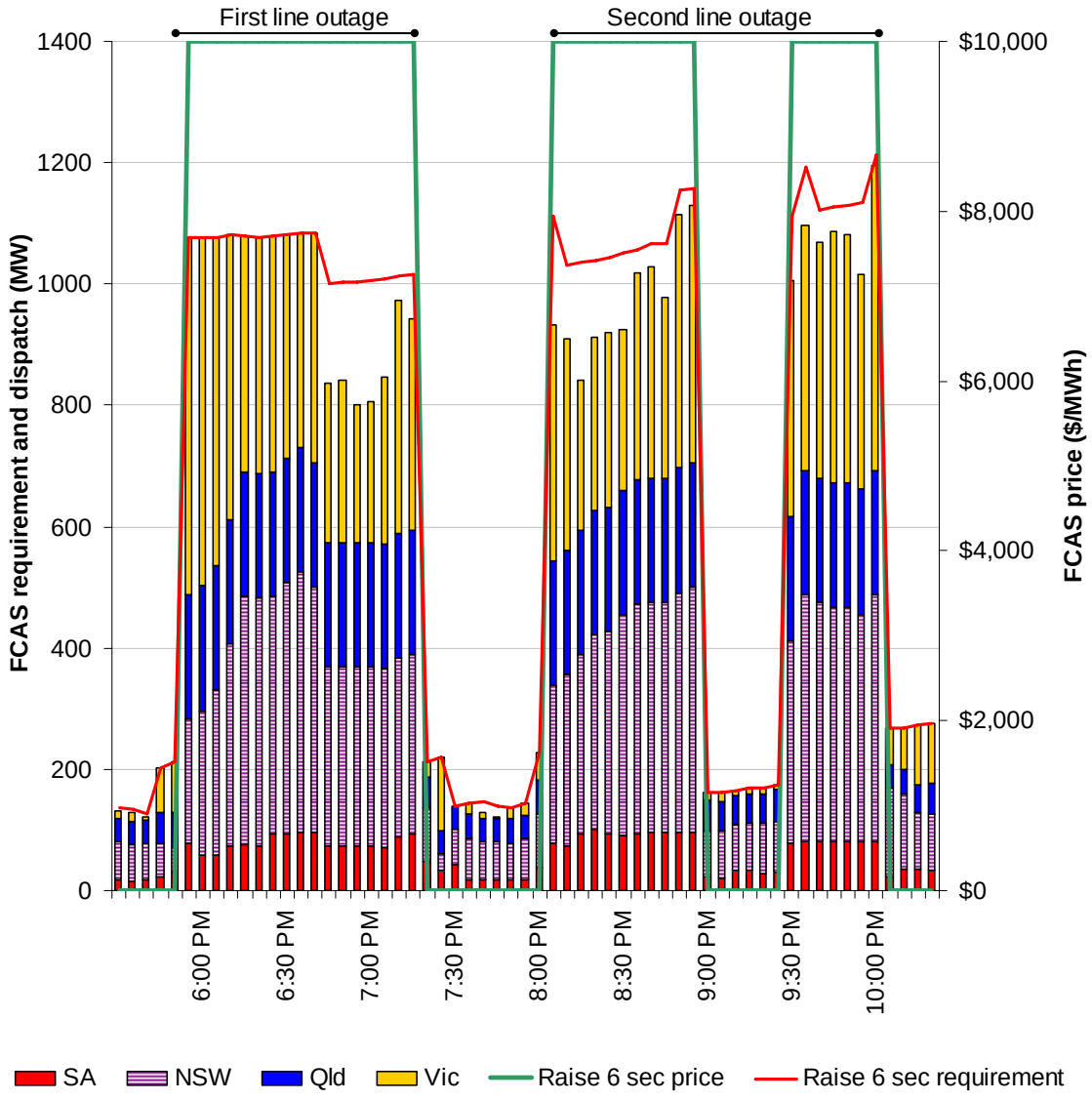
Australian Energy Regulator

September 2008

Appendix A – Dispatch of FCAS to manage outages of Hazelwood to Loy Yang lines

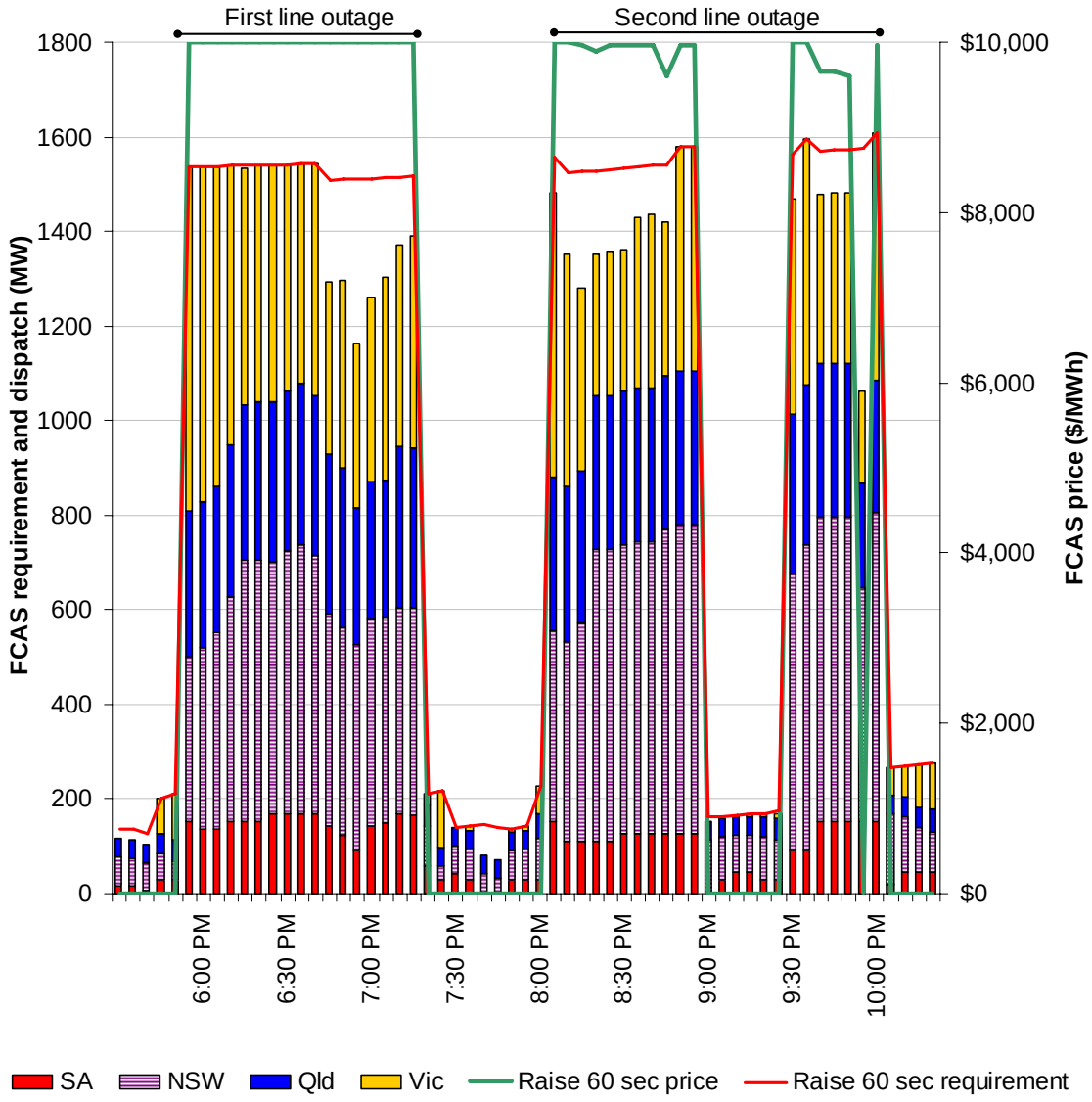
Figures A1 – A3 detail the requirements for and dispatch of 6-second, 60-second and 5-minute raise contingency FCAS. There were two periods where two of the three Hazelwood to Loy Yang lines were out of service, from 6.14 pm to 7.10 pm and from 7.52 pm to 9.56 pm. The figures highlight the increased requirements (the red line) that were sourced to manage the step change in supply to the mainland regions for loss of the remaining Hazelwood to Loy Yang line. The price for the service (the green line) increases to the price cap following the increase in the requirement. Between the two outages the requirement and price for the service returned to normal levels. The figures also show the mainland region that the FCAS was sourced from.

Figure A1: requirements for and dispatch of raise 6-second services



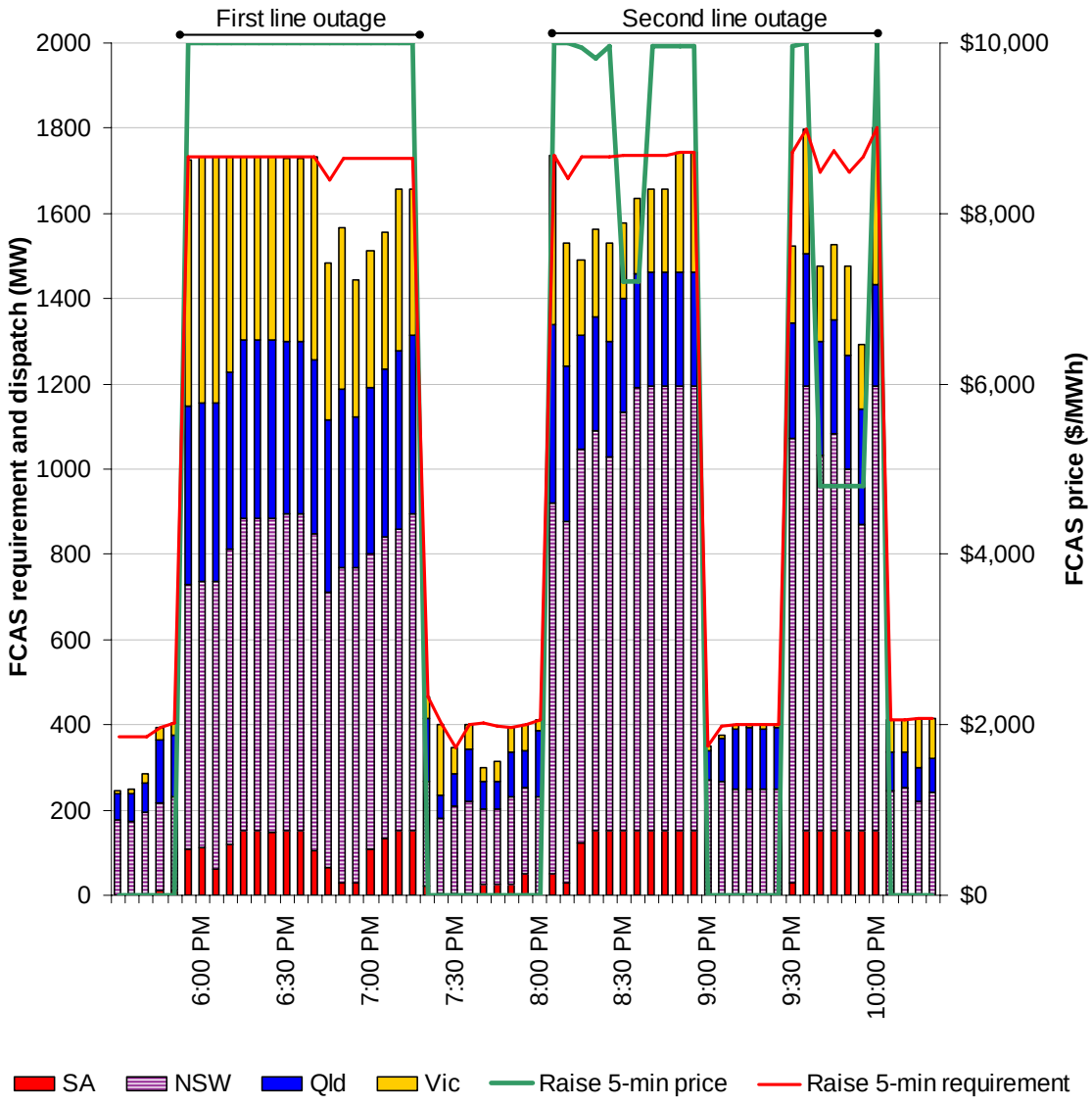
There were three periods, from 6.50 pm to 7.20 pm, 8.10 pm to 9 pm and 9.35 pm to 10.05 pm when the dispatch of mainland generators for 6-second raise contingency FCAS was insufficient to meet the requirement because Tasmanian generators had been dispatched instead. There was a further period from 9.05 pm to 9.30 pm when a constraint was invoked by NEMMCO that reduced the requirement significantly. The power system conditions, however, remained unchanged so this reduction appears to be inappropriate.

Figure A2: requirements for and dispatch of raise 60-second services



There were four periods, from 6.50 pm to 7.20 pm, 8.10 pm to 8.50 pm, 9.35 pm and 9.45 pm to 10.05 pm when the dispatch of mainland generators for 60-second raise contingency FCAS was insufficient to meet the requirement because Tasmanian generators had been dispatched instead. There was a further period from 9.05 pm to 9.30 pm when a constraint was invoked by NEMMCO that reduced the requirement significantly. The power system conditions, however, remained unchanged so this reduction appears to be inappropriate.

Figure A3: requirements for and dispatch of raise 5-minute services



There were four periods, from 6.50 pm to 7.20 pm, 8.15 pm to 8.50 pm, 9.35 pm and 9.45 pm to 10 pm when the dispatch of mainland generators for 5-minute raise contingency FCAS was insufficient to meet the requirement because Tasmanian generators had been dispatched instead. There was a further period from 9.05 pm to 9.30 pm when a constraint was invoked by NEMMCO that reduced the requirement significantly. The power system conditions, however, remained unchanged so this reduction appears to be inappropriate.

Appendix B – Closing bids for 23 July 2008

Figures B1 – B10 highlight the half hour closing bids for participants 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 of that participant and the spot price.

Figure B1: Origin Energy closing bid prices, dispatch and spot price on 23 July

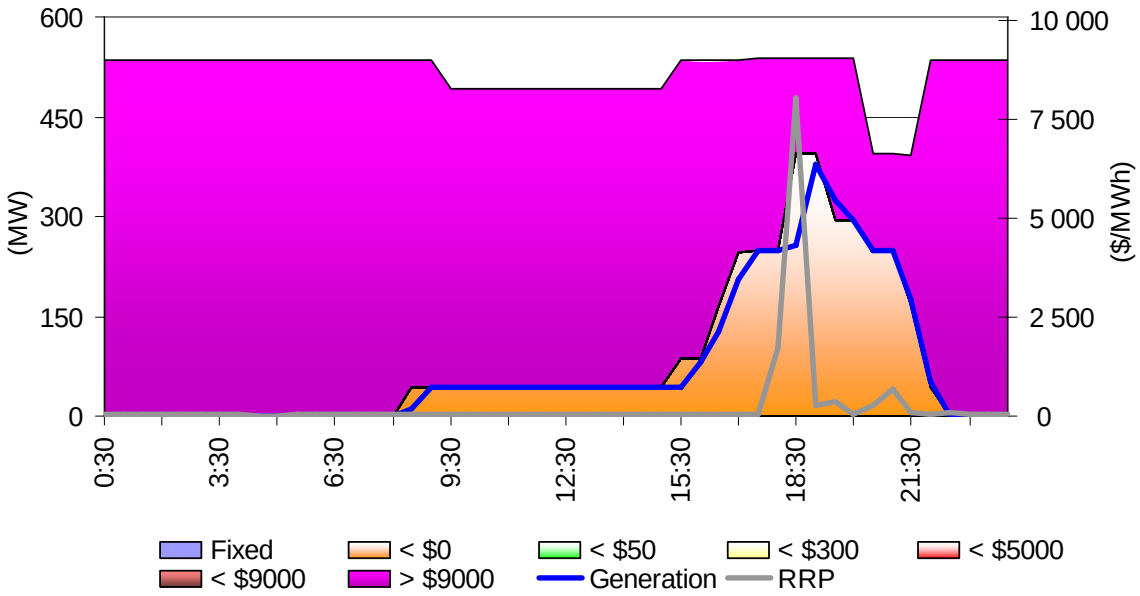


Figure B2: CS Energy closing bid prices, dispatch and spot price on 23 July

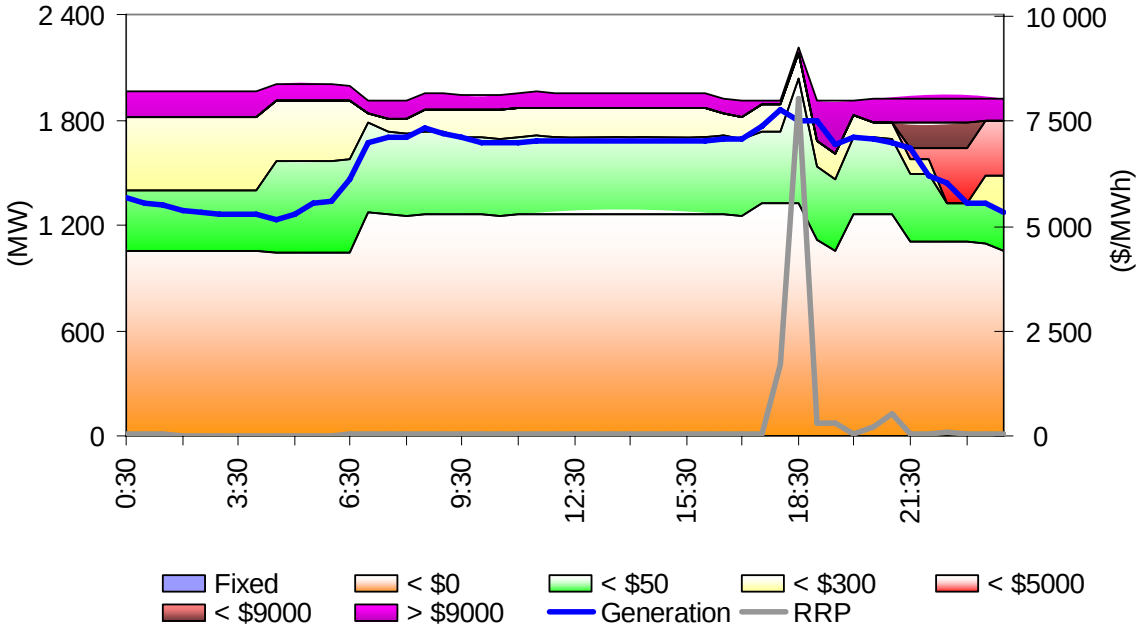


Figure B3: Delta Electricity closing bid prices, dispatch and spot price on 23 July

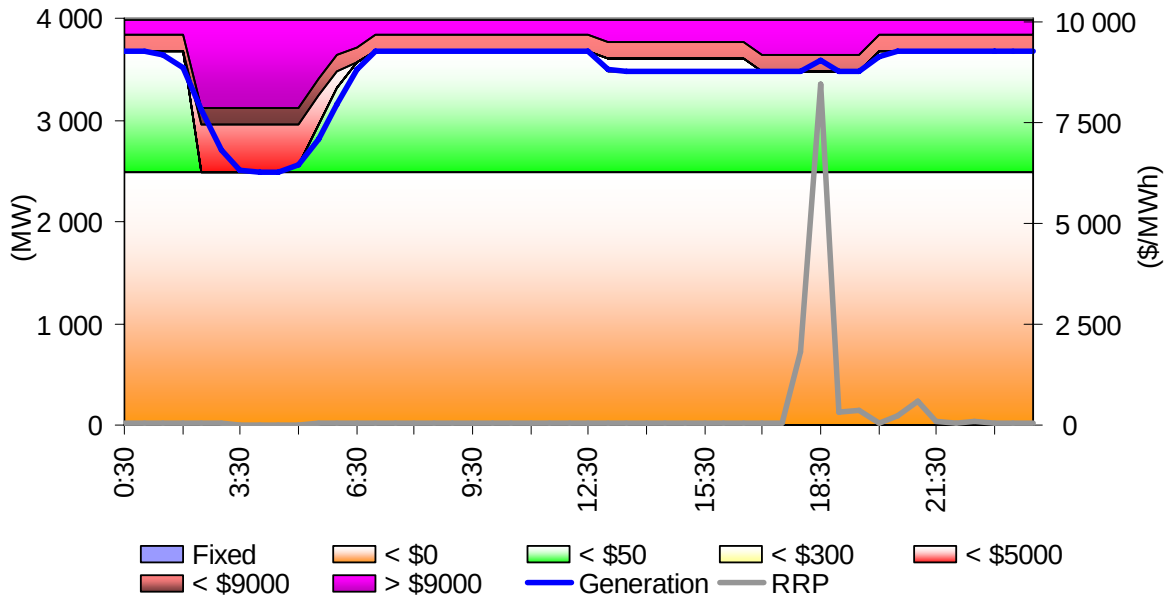


Figure B4: Ecogen closing bid prices, dispatch and spot price on 23 July

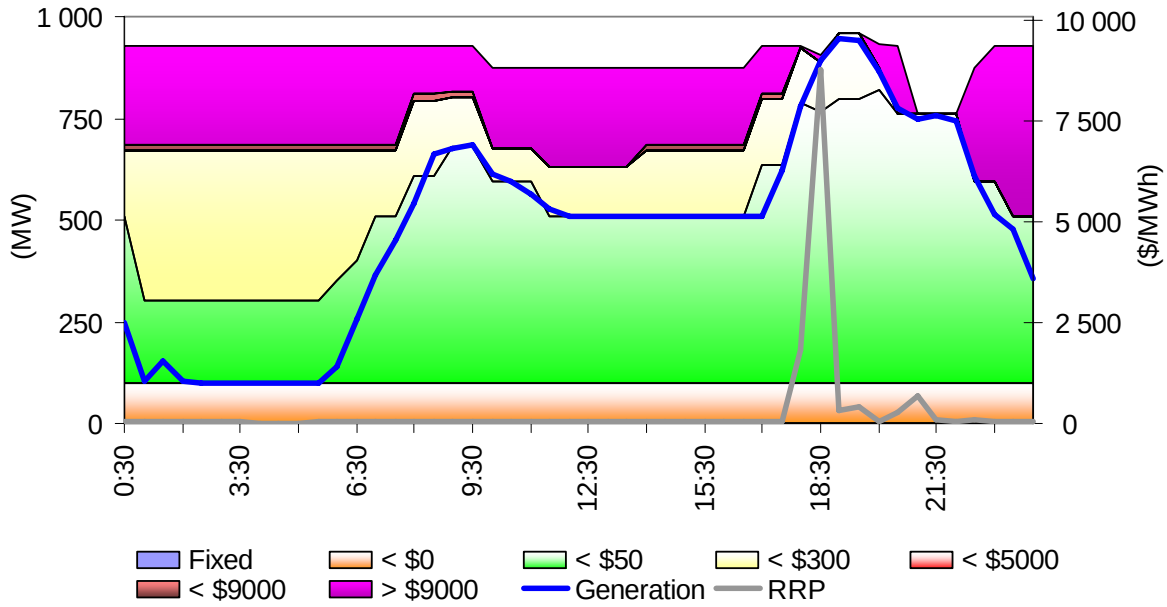


Figure B5: Energy Brix closing bid prices, dispatch and spot price on 23 July

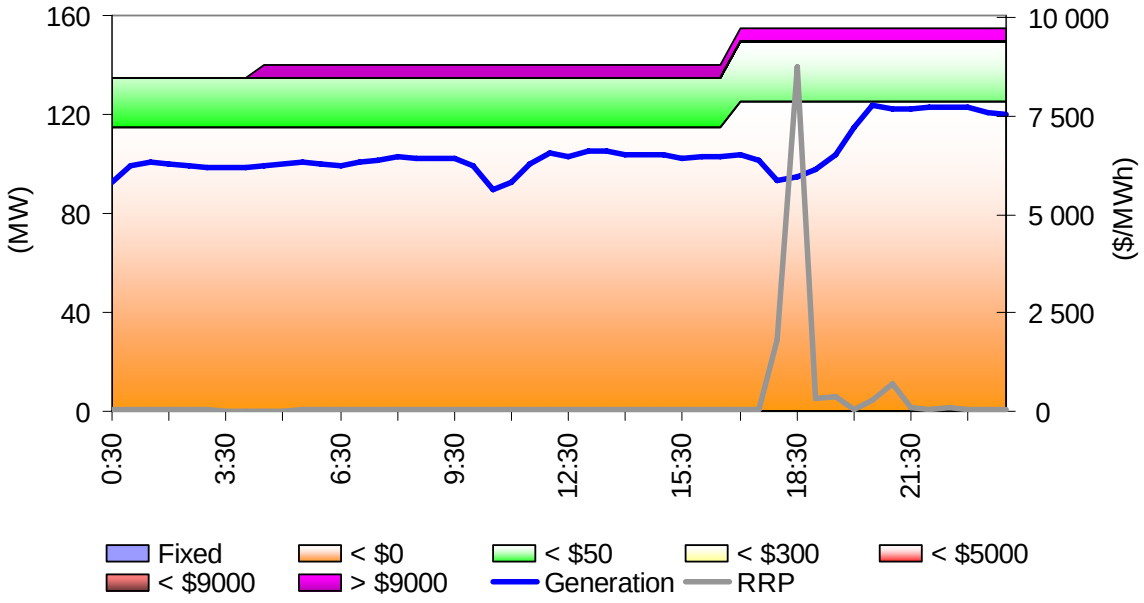


Figure B6: Millmerran Trader closing bid prices, dispatch and spot price on 23 July

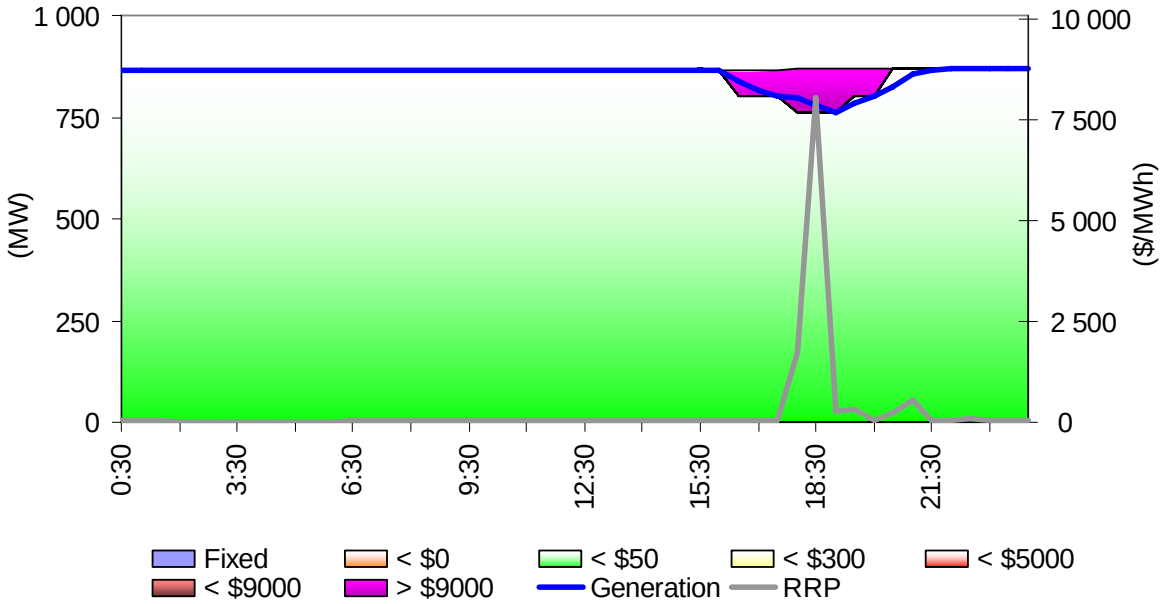


Figure B7: Eraring Energy closing bid prices, dispatch and spot price on 23 July

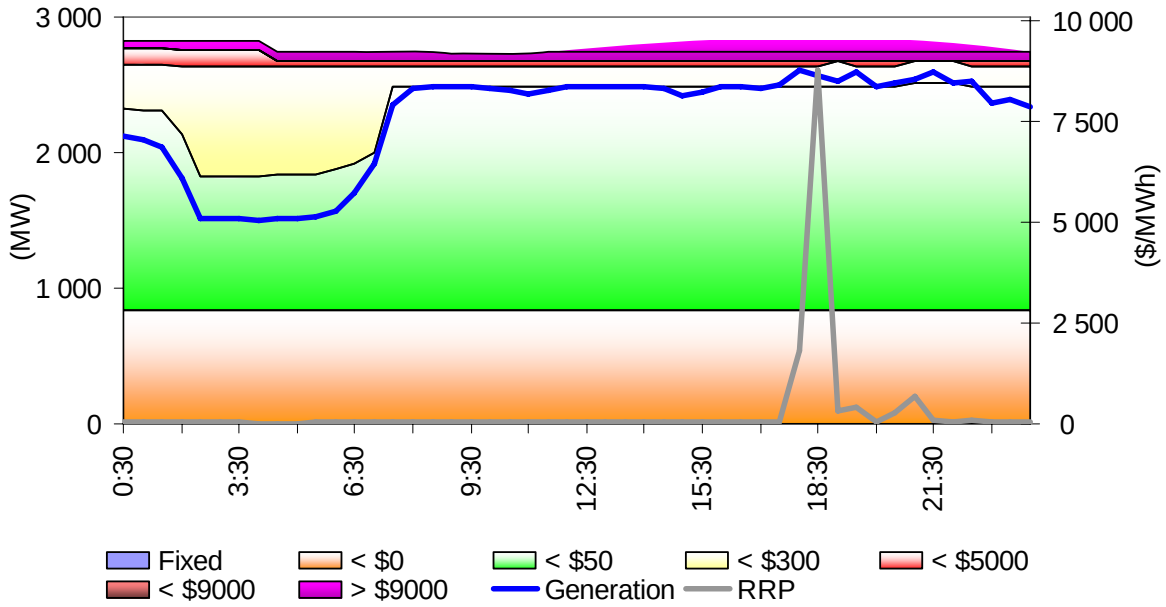


Figure B8: Snowy Hydro closing bid prices, dispatch and spot price on 23 July

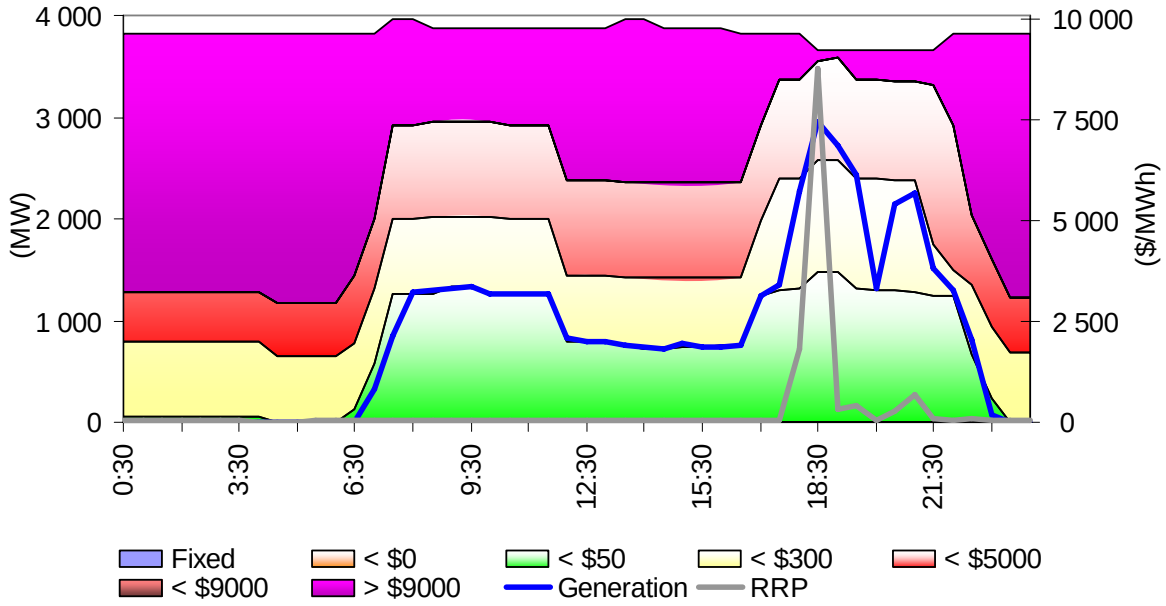


Figure B9: Stanwell closing bid prices, dispatch and spot price on 23 July

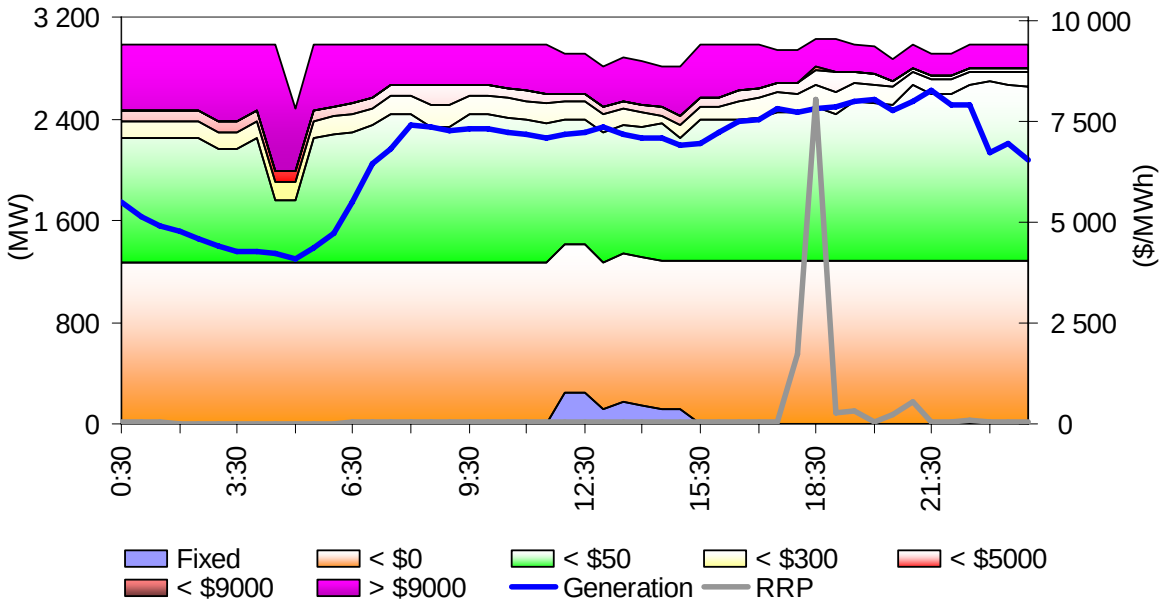
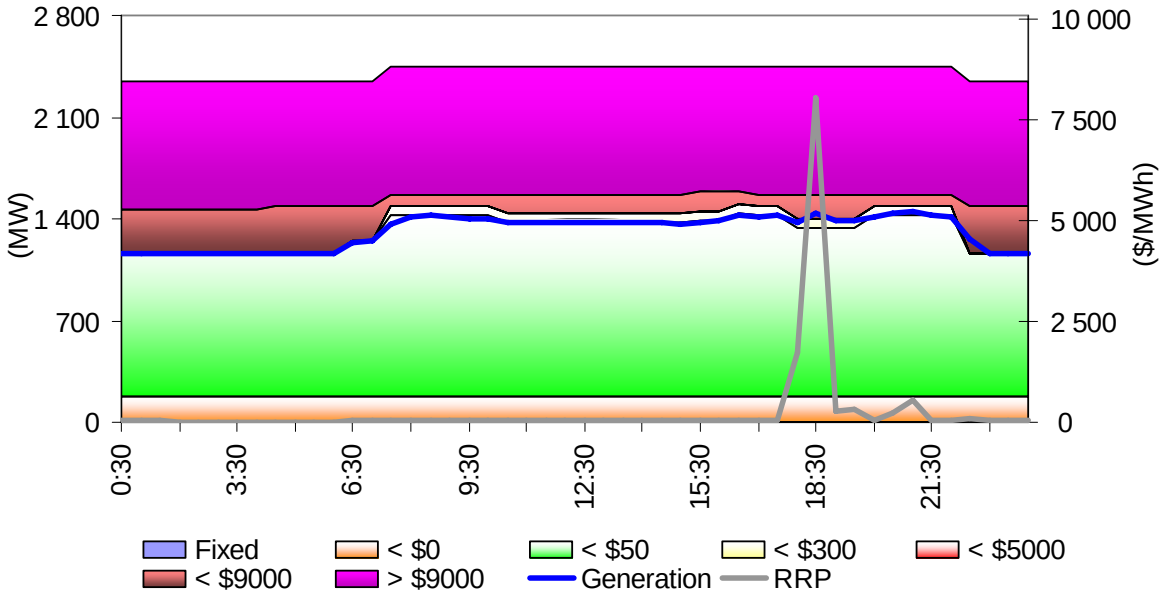


Figure B10: Tarong Energy closing bid prices, dispatch and spot price on 23 July



Appendix C – Price setters for 23 July 2008

The following tables identify the trading interval for each region 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[5]. 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.

Wednesday 23 July – New South Wales – 6.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
18:05	$9620	Snowy Hydro	LAVNORTH	Energy	$9999	1.0	$9620
18:10	$9985	Delta Electricity	MP1	Energy	$9985	0.5	$4993
		Delta Electricity	MP2	Energy	$9985	0.5	$4993
18:15	$10 000	CS Energy	SWAN_B_1	Energy	$54	3.2	$173
		CS Energy	SWAN_E	Energy	-$27	-2.1	$56
		CS Energy	SWAN_E	Raise 60 sec	$9998	1.2	$11910
		CS Energy	SWAN_B_1	Raise 60 sec	$24	-1.2	-$29
18:20	$10 000	CS Energy	SWAN_B_2	Energy	$54	53.0	$2881
		CS Energy	SWAN_B_3	Energy	$54	-51.9	-$2821
		CS Energy	SWAN_B_3	Raise 60 sec	$650	19.9	$12908
		CS Energy	SWAN_B_2	Raise 60 sec	$25	-19.9	-$496
18:25	$9985	Delta Electricity	MP1	Energy	$9985	0.5	$4993
		Delta Electricity	MP2	Energy	$9985	0.5	$4993
18:30	$2510	Stanwell	STAN-1	Energy	$244	1.1	$273
		International Power	LOYYB1	Energy	-$1000	0.3	-$282
		International Power	LOYYB2	Energy	-$1000	0.3	-$282
		LYMMCO	LYA1	Energy	-$1000	-1.1	$1118
		LYMMCO	LYA2	Energy	-$1000	0.3	-$280
		LYMMCO	LYA4	Energy	-$1000	0.3	-$274
		LYMMCO	LYA1	Raise reg	$2000	1.1	$2237
		Stanwell	STAN-1	Raise reg	$0	-1.1	-$1
Spot price	**$8455/MWh**						

[5] 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

Wednesday 23 July – South Australia – 6.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
18:05	$9153	Snowy Hydro	LAVNORTH	Energy	$9999	0.9	$9153
18:10	$8109	Delta Electricity	MP1	Energy	$9985	0.4	$4054
		Delta Electricity	MP2	Energy	$9985	0.4	$4054
18:15	$10 000	Snowy Hydro	TUMUT3	Energy	$294	-1.0	-$294
		CS Energy	SWAN_B_1	Energy	$54	3.2	$173
		AGL (SA)	TORRB3	Energy	$49	1.0	$49
		CS Energy	SWAN_E	Energy	-$27	-2.1	$56
		CS Energy	SWAN_E	Lower reg	$1	-1.0	-$1
		AGL (SA)	TORRB3	Lower reg	$1	1.0	$1
		AGL (SA)	TORRB3	Raise 5 min	$10 000	-1.0	-$10 000
		Snowy Hydro	TUMUT3	Raise 5 min	$9800	1.0	$9800
		CS Energy	SWAN_E	Raise 60 sec	$9998	1.2	$11910
		CS Energy	SWAN_B_1	Raise 60 sec	$24	-1.2	-$29
18:20	$10 000	CS Energy	SWAN_B_2	Energy	$54	50.7	$2757
		CS Energy	SWAN_B_3	Energy	$54	-49.6	-$2700
		CS Energy	SWAN_B_3	Raise 60 sec	$650	19.0	$12353
		CS Energy	SWAN_B_2	Raise 60 sec	$25	-19.0	-$475
18:25	$9471	Delta Electricity	MP1	Energy	$9985	0.5	$4736
		Delta Electricity	MP2	Energy	$9985	0.5	$4736
18:30	$2273	Stanwell	STAN-1	Energy	$244	1.1	$273
		Eraring Energy	ER01	Energy	$75	-1.0	-$75
		AGL (SA)	TORRB3	Energy	$49	0.5	$24
		AGL (SA)	TORRB4	Energy	$49	0.5	$24
		International Power	LOYYB1	Energy	-$1000	0.3	-$282
		International Power	LOYYB2	Energy	-$1000	0.3	-$282
		LYMMCO	LYA1	Energy	-$1000	-1.1	$1118
		LYMMCO	LYA2	Energy	-$1000	0.3	-$280
		LYMMCO	LYA4	Energy	-$1000	0.3	-$274
		AGL (SA)	TORRB3	Raise 5 min	$10000	-0.5	-$5000
		AGL (SA)	TORRB4	Raise 5 min	$10000	-0.5	-$5000
		Eraring Energy	ER01	Raise 5 min	$9790	1.0	$9790
		LYMMCO	LYA1	Raise reg	$2000	1.1	$2237
		Stanwell	STAN-1	Raise reg	$0.5	-1.1	-$1
Spot price		**$8033/MWh**					

Wednesday 23 July – Victoria – 6.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
18:05	$9999	Snowy Hydro	LAVNORTH	Energy	$9999	1	$9999
18:10	$10 000	Delta Electricity	MP1	Energy	$9985	0.5	$5267
		Delta Electricity	MP2	Energy	$9985	0.5	$5267
18:15	$10 000	CS Energy	SWAN_B_1	Energy	$54	3	$184
		CS Energy	SWAN_E	Energy	-$27	-2	$59
		CS Energy	SWAN_E	Raise 60 sec	$9998	1	$12660
		CS Energy	SWAN_B_1	Raise 60 sec	$24	-1	-$30
18:20	$10 000	CS Energy	SWAN_B_2	Energy	$54	55	$3012
		CS Energy	SWAN_B_3	Energy	$54	-54	-$2949
		CS Energy	SWAN_B_3	Raise 60 sec	$650	21	$13494
		CS Energy	SWAN_B_2	Raise 60 sec	$25	-21	-$519
18:25	$10 000	Delta Electricity	MP1	Energy	$9985	0.5	$5173
		Delta Electricity	MP2	Energy	$9985	0.5	$5173
18:30	$2598	Stanwell	STAN-1	Energy	$244	1	$283
		International Power	LOYYB1	Energy	-$1000	0.3	-$292
		International Power	LOYYB2	Energy	-$1000	0.3	-$292
		LYMMCO	LYA1	Energy	-$1000	-1	$1158
		LYMMCO	LYA2	Energy	-$1000	0.3	-$289
		LYMMCO	LYA4	Energy	-$1000	0.3	-$284
		LYMMCO	LYA1	Raise reg	$2000	1	$2316
		Stanwell	STAN-1	Raise reg	$0.5	-1	-$1
Spot price		**$8766/MWh**					

Wednesday 23 July – Queensland – 6.30 pm

Time	Dispatch price	Participant	Unit	Service	Offer price	Marginal change	Contribution
18:05	$9133	Snowy Hydro	LAVNORTH	Energy	$9999	0.91	$9133
18:10	$9250	Tarong	TARONG#2	Energy	$9250	0.50	$4625
		Tarong	TARONG#3	Energy	$9250	0.50	$4625
18:15	$10 000	CS Energy	SWAN_B_1	Energy	$54	2.88	$157
		CS Energy	SWAN_E	Energy	-$27	-1.88	$50
		CS Energy	SWAN_E	Raise 60 sec	$9998	1.08	$10 789
		CS Energy	SWAN_B_1	Raise 60 sec	$24	-1.08	-$26
18:20	$10 000	CS Energy	SWAN_B_2	Energy	$54	48.00	$2611
		CS Energy	SWAN_B_3	Energy	$54	-47.00	-$2557
		CS Energy	SWAN_B_3	Raise 60 sec	$650	18.00	$11700
		CS Energy	SWAN_B_2	Raise 60 sec	$25	-18.00	-$450
18:25	$9047	Delta Electricity	MP1	Energy	$9985	0.45	$4524
		Delta Electricity	MP2	Energy	$9985	0.45	$4524
18:30	$2244	Stanwell	STAN-1	Energy	$244	1.00	$244
		International Power	LOYYB1	Energy	-$1000	0.25	-$252
		International Power	LOYYB2	Energy	-$1000	0.25	-$252
		LYMMCO	LYA1	Energy	-$1000	-1.00	$1000
		LYMMCO	LYA2	Energy	-$1000	0.25	-$250
		LYMMCO	LYA4	Energy	-$1000	0.25	-$245
		LYMMCO	LYA1	Raise reg	$2000	1.00	$2000
		Stanwell	STAN-1	Raise reg	$0.5	-1.00	-$0.5
Spot price		**$8058/MWh**					