THE EFFECTIVENESS OF THE AUTOMATED PROCEDURES FOR IDENTIFYING DISPATCH INTERVALS SUBJECT TO REVIEW

2011 REVIEW

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

IMPORTANT NOTICE

Purpose

AEMO has prepared this report on AEMO's automated procedures for identifying dispatch intervals that may contain manifestly incorrect inputs, in accordance with rule 3.9.2B(l) of the National Electricity Rules, using information available as at the date of publication, unless otherwise specified.

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EXECUTIVE SUMMARY

The National Electricity Rules require AEMO to apply automated procedures to identify dispatch intervals that are subject to review. AEMO must then determine whether a dispatch interval subject to review contained a manifestly incorrect input to the dispatch algorithm. The Rules also require AEMO to review and report on the effectiveness of these procedures.

In absolute terms the current automated procedure is not effective at identifying dispatch intervals that may contain manifestly incorrect inputs. The automated procedure correctly identified one dispatch interval in 2011 that contained a manifestly incorrect input. However, the automated procedure also failed to detect at least one other instance in which a manifestly incorrect input was used in the dispatch algorithm. This means that the rate of true positives in 2011 was no higher than 50%.

Furthermore, the rate of false positives in 2011 was over 98%. In other words, over 98% of the dispatch intervals that were subject to review did not contain a manifestly incorrect input. One of those false positives led to prices being incorrectly rejected.

However, there are no obvious improvements to the current procedure. Tightening the thresholds might reduce the number of incorrect inputs used in central dispatch, but at the cost of triggering more false positives, with the attendant increase in market price uncertainty, resources needed to review suspect dispatch intervals, and the possibility of incorrectly declaring a manifestly incorrect input. Relaxing the price and flow thresholds would yield fewer false positives, but at the risk of allowing more incorrect inputs to enter the central dispatch process.

AEMO concludes that no justifiable material improvements can be made to the existing automated procedure.

CONTENTS

1 – INTRODUCTION

This report analyses the effectiveness of AEMO's automated procedure for identifying dispatch intervals subject to review during 2011. It has been published to meet the requirements of rule 3.9.2B(l) of the National Electricity Rules (Rules).

Section 2 provides a general description of the automated procedure for identifying dispatch intervals subject to review.

Section 3 provides a specific description of the changes to prices and interconnector flows that trigger a review.

Section 4 summarises the outcomes of AEMO's automated procedure during 2011.

Section 5 comments on the effectiveness of the automated procedure.

Appendix A reproduces section 3.9.2B of the Rules. AEMO's obligations to identify and act on any dispatch interval that may contain MII are defined in s.3.9.2B of the Rules.

Appendix B analyses all dispatch intervals that were subject to review during 2011. Section 3.9.2B(l) of the Rules requires AEMO to report on all dispatch intervals that were subject to review but were subsequently judged to not contain a manifestly incorrect input (MII) to the dispatch algorithm.

Appendix C contains a brief discussion of the entire MII price review process. The body of this report focuses only on the automated procedures for identifying dispatch intervals subject to review. It does not analyse the subsequent price review process.

2 – THE AUTOMATED PROCEDURE

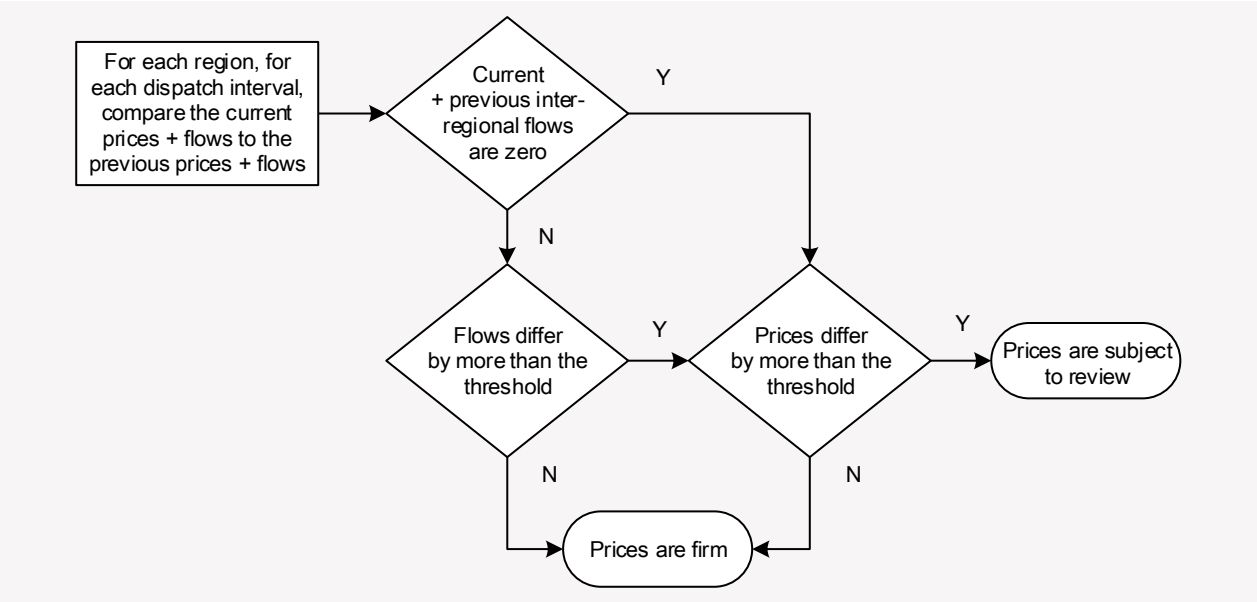
This section provides a general description of the automated procedure for detecting dispatch intervals subject to review.

For each dispatch interval, the price in each region and the interconnector flows into or out of that region are compared to the price and flows from the previous dispatch interval. If the changes in price and any interconnector flow breach pre-defined thresholds, then the price for the latest dispatch interval in that region is subject to review.

An exception is made if the interconnector flows are zero for the current and previous dispatch intervals – in other words, if the region is electrically "islanded" from the rest of the National Electricity Market (NEM). In this case, only the prices between consecutive dispatch intervals are compared. If the change in those prices breaches the pre-defined threshold, then the latest dispatch interval price in that region is subject to review.

The automated procedure is shown schematically in Figure 1.

Figure 1: The automated procedure for detecting dispatch intervals subject to review



3 – PRICE AND FLOW THRESHOLDS

This section provides a specific description of the changes to prices and interconnector flows that identify a dispatch interval as subject to review.

3.1 Price thresholds

Price thresholds are based on two parameters: an absolute number X and a relative number Y. The parameters are specific to each region.

- If the prices for the current and previous dispatch intervals both exceed X, then the price threshold is breached if the difference between the prices, expressed as a multiple of the smaller price, exceeds Y.
- If one of the prices for the current and previous dispatch intervals does not exceed X, then the price threshold is breached if the difference between the prices exceeds X*Y.[1]

This can be expressed mathematically as:

The price threshold is breached if

$$Min(|P_i|, |P_{i-1}|) > X \; and \; |P_i - P_{i-1}| / Min(|P_i|, |P_{i-1}|) > Y$$

or

$$Min(|P_i|, |P_{i-1}|) \leq X \; and \; |P_i - P_{i-1}| > X * Y$$

where

$$P_i = price \; in \; the \; current \; dispatch \; interval$$

$$P_{i-1} = price \; in \; the \; previous \; dispatch \; interval$$

The parameters for each region are:

Region	X ($/MWh)	Y
NSW	20	3
QLD	20	3
SA	20	3
TAS	20	4
VIC	20	3

3.2 Flow thresholds

Flow thresholds are based on a single parameter Z. The flow thresholds are specific to the directional flow on each interconnector.

[1] The prices used in these comparisons are the Regional Original Price (ROP) for each dispatch interval. The ROP includes the cost of any constraint violations, and can exceed the Market Price Cap (MPC), in which case it will be automatically revised before it is published as the Regional Reference Price (RRP) for the dispatch interval.

- The flow threshold is breached if the difference between the flows for the current and previous dispatch intervals exceeds Z.[2]

This can be expressed mathematically as:

The flow threshold is breached if

$$|F_i - F_{i-1}| > Z$$

where

$$F_i = flow\ in\ the\ current\ dispatch\ interval$$

$$F_{i-1} = flow\ in\ the\ previous\ dispatch\ interval$$

The parameters for each interconnector are:

Interconnector	Direction	Z (MW)
NSW1-QLD1 (QNI)	NSW ⇨ QLD	450
	QLD ⇨ NSW	240
N-Q-MNSP1 (Terranora)	NSW ⇨ QLD	80
	QLD ⇨ NSW	80
T-V-MNSP1 (Basslink)	TAS ⇨ VIC	190
	VIC ⇨ TAS	190
VIC1-NSW1	VIC ⇨ NSW	500
	NSW ⇨ VIC	500
V-SA (Heywood)	VIC ⇨ SA	130 before 1 July 2011 150 after 1 July 2011
	SA ⇨ VIC	130 before 1 July 2011 150 after 1 July 2011
V-S-MNSP1 (Murraylink)	VIC ⇨ SA	80 before 1 July 2011 100 after 1 July 2011
	SA ⇨ VIC	80 before 1 July 2011 100 after 1 July 2011

[2] The flows used in these comparisons are the interconnector targets for each dispatch interval.

4 – 2011 RESULTS

This section summarises the results from AEMO's automated procedure for identifying dispatch intervals subject to review during 2011.

The automated procedure worked as designed in all cases, and flagged 61 dispatch intervals as subject to review during 2011. Of these 61 dispatch intervals:

- Prices were accepted in 59 dispatch intervals.
- Prices were correctly rejected in one dispatch interval.[3]
- Prices were incorrectly rejected in one other dispatch interval.[4]

Analysis of the dispatch interval in which prices were incorrectly rejected revealed another dispatch interval which contained MII, but which was not detected by the automated procedure.[5] This means that the rate of true positives in 2011 was no higher than 50%.

On the other hand, the rate of false positives for the automated procedure was over 98%. In other words, over 98% of the dispatch intervals that were flagged as subject to review contained no MII.

[3] 1140 hrs on 17 February 2011. This is analysed as incident number 16 in Appendix B.
[4] 1105 hrs on 5 September 2011. This is analysed as incident number 46 in Appendix B.
[5] 1055 hrs on 5 September 2011. This is analysed as incident number 45 in Appendix B.

5 – CONCLUSIONS

This section comments on the effectiveness of the automated procedure for identifying dispatch intervals subject to review.

The current automated procedure cannot be considered effective in absolute terms. The automated procedure correctly identified one dispatch interval in 2011 that contained a manifestly incorrect input. However, the automated procedure also failed to detect at least one other instance in which a manifestly incorrect input was used in the dispatch algorithm. This means that the rate of true positives in 2011 was no higher than 50%.

The rate of false positives in 2011 was also over 98%. Furthermore, one of those false positives led to prices being incorrectly rejected.

However, it is plausible that there is no alternative automated procedure that would be more effective.

Relaxing the price and flow thresholds would yield fewer false positives, but at the probable cost of missing more MII. For example, the one dispatch interval that was correctly identified as containing MII was reviewed after a change in an interconnector flow exceeded a 240 MW threshold by just 9 MW.

Tightening the price and flow thresholds might capture more actual MII, but at the cost of triggering more false positives. For example, the one known dispatch interval that contained MII but was not to subject to review in 2011 did not trigger a review because the change in an interconnector flow failed to exceed an 80 MW threshold by only 3 MW. However, more false positives would cause greater market price uncertainty while the dispatch intervals were subject to review, require more resources to review the increased number of suspect dispatch intervals, and increase the possibility of incorrectly declaring a manifestly incorrect input.

Consequently AEMO considers that the benefits of any material improvements to the existing automated procedure are unlikely to justify the costs.

APPENDIX A – AEMO'S RULES OBLIGATIONS ON MANIFESTLY INCORRECT INPUTS

3.9.2B Pricing where AEMO determines a manifestly incorrect input

(a) For the purposes of this clause:

Input means any value that is used by the *dispatch algorithm* including measurements of *power system* status, five minute demand forecast values, *constraint* equations entered by *AEMO*, or software setup but not including *dispatch bids* and *dispatch offers* submitted by *Registered Participants*.

Last correct *dispatch interval* means the most recent *dispatch interval* preceding the affected *dispatch interval* that is not itself an affected *dispatch interval*.

(b) *AEMO* may apply the automated procedures developed in accordance with clause 3.9.2B(h), to identify a *dispatch interval* as subject to review ("a ***dispatch interval* subject to review**").

(c) *AEMO* may also determine that a *dispatch interval* is subject to review if *AEMO* considers that it is likely to be subject to a manifestly incorrect input, but only where the *dispatch interval* immediately preceding it was a *dispatch interval* subject to review.

(d) *AEMO* must determine whether a *dispatch interval* subject to review contained a manifestly incorrect input to the *dispatch algorithm* ("an **affected *dispatch interval***").

(e) Where *AEMO* determines an affected *dispatch interval*, *AEMO* must:

(1) replace all *dispatch prices* and *ancillary service prices* with the corresponding prices for the last correct *dispatch interval*; and

(2) recalculate, in accordance with clause 3.9.2(h), and adjust all *spot prices* relevant to each affected *dispatch interval*.

(f) *AEMO* may only carry out the action described in clause 3.9.2B(e) if no more than 30 minutes have elapsed since the publication of the *dispatch prices* for the *dispatch interval* subject to review.

(g) As soon as reasonably practicable after the action as described in clause 3.9.2B(e), *AEMO* must *publish* a report outlining:

(1) The reasons for the determination under clause 3.9.2B(d);

(2) Whether that determination was correct;

(3) What action will be taken to minimise the risk of a similar event in future.

(h) *AEMO* must, in consultation with *Registered Participants*, develop procedures for the automatic identification of *dispatch intervals* subject to review under clause 3.9.2B (b) ("the **automated procedures**").

(i) The purpose of the automated procedures is to detect instances where manifestly incorrect inputs may have resulted in material differences in pricing outcomes.

(j) **[Deleted]**

(k) At least once each calendar year, *AEMO* must review the effectiveness of the automated procedures referred to in clause 3.9.2B(h).

(l) *AEMO* must report on the findings of the review under clause 3.9.2B(k) and must include in that report details of all *dispatch intervals* subject to review that were not affected *dispatch intervals* and an analysis of why such intervals were identified as subject to review.

(m) **[Deleted]**

APPENDIX B – DISPATCH INTERVALS SUBJECT TO REVIEW DURING 2011

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
1	12/01/2011 04:15	TAS1	A	-1	-999	999	T-V-MNSP1	-192	44	237	TAS generators rebid 628 MW of capacity priced at -$0.80/MWh to -$990/MWh. Basslink flow was reversed, and negative prices were recorded in TAS, VIC, and SA.
		VIC1	A	0	-999	999					
2	17/01/2011 16:35	QLD1	A	-1,000	66	16x	NSW1-QLD1	190	-141	330	A multiple-outage constraint set was invoked to manage security in the South Pine-Blackwell-Rocklea area due to flood damage. A step change in QLD offers at 1635 hrs moved 2930 MW of capacity offered at negative prices to positive price bands.
3	17/01/2011 21:35	QLD1	A	-1,000	0	1,000	N-Q-MNSP1	-178	-98	80	Market Floor Price (MFP) based on QLD generator offers. Zero price caused by negative residue management (NRM) constraining off negatively-priced generation.
4	18/01/2011 16:10	QLD1	A	-1,000	14	1,014	N-Q-MNSP1	-202	-112	90	MFP based on QLD generator offers. Positive price caused by NRM constraining off negatively-priced generation.
5	24/01/2011 13:45	QLD1	A	-1,000	0	1,000	NSW1-QLD1	2	-279	280	MFP based on QLD generator offers. Change in prices and flows caused by RHS of NRM constraint increasing from 200 MW to 400 MW.
							N-Q-MNSP1	-202	-121	80	
6	26/01/2011 20:10	VIC1	A	101	19	82	V-SA	-59	78	137	Change in prices and flows caused by the unbinding of a constraint preventing pre-contingent overloading of the South Morang 500/330kV (F2) transformer.

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
7	31/01/2011 14:55	VIC1	A	300	12,403	40x	VIC1-NSW1	316	-258	574	Newport tripped from 511 MW at 1450 hrs.
8	31/01/2011 19:05	VIC1	A	18	102	84	T-V-MNSP1	100	293	193	Change in prices and flows caused by the unbinding of a constraint that prevents the overload of one Dederang–Mt Beauty 220kV line on a trip of the other.
9	02/02/2011 15:00	VIC1	A	412	56	6x	V-SA	-6	155	161	Murray rebid 400 MW of capacity priced at $12,499/MWh to $30/MWh.
		SA1	A	416	59	6x					
10	02/02/2011 16:35	QLD1	A	6,925	290	23x	NSW1-QLD1	-719	-470	249	NSW demand reduced 80 MW at 1635 hrs, and a step change in NSW offers at the same time moved 440 MW of capacity priced above $7,500/MWh to below $280/MWh.
11	03/02/2011 10:20	SA1	A	69	0	69	V-SA	-29	207	236	Heywood–Moorabool No.2 line and South Morang F1 transformer were out of service. VIC generators rebid 589 MW of capacity to the MFP.
							V-S-MNSP1	-126	-43	83	
12	03/02/2011 12:15	VIC1	A	98	16	82	T-V-MNSP1	224	434	210	VIC generators rebid 427 MW of capacity to the Market Floor Price. The unbinding of a constraint managing a Heywood Moorabool No.2 line and South Morang F1 transformer outage allowed greater Basslink flows to VIC.
							V-SA	-60	192	252	
13	04/02/2011 11:50	NSW1	A	296	8,664	28x	VIC1-NSW1	1,137	524	613	A constraint managing the post-contingent overload of the Upper Tumut–Canberra 330 kV line on a trip of the Lower Tumut–Canberra 330 kV line reduced flows on the VIC-NSW interconnector when NSW demand was increasing and NSW generator availability was reducing

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
14	05/02/2011 15:40	NSW1	A	270	90,954	336x	VIC1-NSW1	1,073	35	1,038	A change in the dynamic rating of the Marulan–Dapto 330 kV line created a constraint violation. 285 MW of NSW generation was constrained off, and imports from QLD and VIC were sharply reduced. The reduced flows on the VIC-NSW interconnectors caused prices to fall in VIC and SA.
		VIC1	A	10	-972	982	V-S-MNSP1	-154	213	367	
		SA1	A	16	-1,000	1016					
15	05/02/2011 15:45	QLD1	A	280	51	5x	NSW1-QLD1	-1,026	-746	280	A change in the dynamic rating of the Marulan–Dapto 330 kV line relaxed the constraint that violated in the previous dispatch interval (DI).
		NSW1	A	90,954	55	1,643x	VIC1-NSW1	35	996	960	
		VIC1	A	-972	34	30x	T-V-MNSP1	109	351	242	
		SA1	A	-1,000	35	29x	V-S-MNSP1	213	-162	375	
16	17/02/2011 11:40	QLD1	R	41	8,045	197x	NSW1-QLD1	-776	-528	249	Test data incorrectly marked as “good” entered the central dispatch process. This led to constraint violations on the Calvale–Wurdong and Calvale–Stanwell 275 kV lines. Prices were rejected.[f]
17	17/02/2011 11:45	QLD1	A	8,045	36	224x	NSW1-QLD1	-528	-777	249	Restoration of correct line rating data led to a reversal of the MII from the previous DI.
18	27/02/2011 18:35	QLD	A	178	32	5x	N-Q-MNSP1	26	-56	82	Change in prices and flows caused by a 50 MW reduction in the dynamic rating of the Calvale–Stanwell (855) line.

[f] A report on this price revision is available at http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/reports/price_revisions/0150-0119%20pdf.ashx.

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
19	01/03/2011 08:45	SA1	A	-160	23	8x	V-SA	-116	-250	133	A constraint managing post-contingent overload on the South East 275/132 kV transformers increased flows from SA to VIC due to a decrease in Lake Bonney generation.
20	05/03/2011 13:50	QLD1	A	975	22	43x	NSW1-QLD1	-145	-538	392	Change in prices and flows caused by a 45 MW reduction in the dynamic rating of the Calvale–Stanwell (855) line.
21	25/03/2011 05:20	QLD1	A	25	-1,000	42x	N-Q-MNSP1	-147	-67	81	A ramping constraint prior to the planned outage of an Armidale–Tamworth line reduced QLD exports, which in turn reduced the QLD price to the MFP.
22	10/05/2011 16:15	SA1	A	19	-999	1,018	V-SA	-107	59	167	The Dederang–Murray No.1 330 kV line was out of service. An increase in the FCAS L60 requirement for VIC, NSW, and QLD reversed flow on the Heywood interconnector to SA, and reduced SA prices to close to the MFP.
23	10/05/2011 16:25	SA1	A	-997	11	1,008	V-SA	51	-118	169	A decrease in the FCAS L60 requirement for VIC, NSW, and QLD allowed increased flow from SA to VIC, and reversed the earlier situation.
24	18/05/2011 02:35	TAS1	A	16	99	83	T-V-MNSP1	-91	-289	198	A step change in TAS offers moved 331 MW of capacity priced below $0/MWh to above $99/MWh.
25	30/05/2011 13:10	QLD1	A	24	-1,000	42x	NSW1-QLD1	-475	-213	262	The Dederang–Murray No.1 330 kV line was out of service when Loy Yang A Unit 3 tripped from 571 MW. Constraint violations led to extreme prices and counter-price flows between VIC and NSW.
		NSW1	A	26	-1,008	41x	VIC1-NSW1	238	924	686	
		VIC1	A	91,427	48	1,909x	VIC1-NSW1	238	924	686	
							T-V-MNSP1	-50	143	193	

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
		SA1	A	92,226	49	1,896x	V-S-MNSP1	-36	70	106	
26	30/05/2011 13:35	VIC1	A	-1,000	4	1,004	T-V-MNSP1	-125	109	234	Changes in prices and flows caused by extensive rebidding in response to the earlier Loy Yang trip, followed by a step change in offers at 1335 hrs.
							V-SA	-75	194	269	
		SA1	A	-978	4	982	V-SA	-75	194	269	
		TAS1	A	-1,000	4	1,004	T-V-MNSP1	-125	109	234	
27	31/05/2011 08:00	VIC1	A	301	50	5x	VIC1-NSW1	3	981	978	Murray rebid 1550 MW of capacity from positive price bands to the MFP.
28	31/05/2011 10:45	NSW1	A	-994	26	40x	N-Q-MNSP1	1	-79	80	The Dederang–Murray No.1 330 kV line was out of service. An outage constraint constrained on Tumut and drove down QLD and NSW prices in the previous DI.
		QLD1	A	-1,000	24	42x	N-Q-MNSP1	1	-79	80	
							NSW1-QLD1	-123	-501	378	
29	05/06/2011 13:40	SA1	A	21	-43	3x	V-SA	-318	-175	143	A constraint managing post-contingent overload on the South East 275/132 kV transformers reduced flows from SA to VIC due to an increase in Lake Bonney generation.
							V-S-MNSP1	-72	-189	117	
30	17/06/2011 04:20	SA1	A	-61	-419	6x	V-SA	-325	-182	143	A constraint managing post-contingent overload on the South East 275/132 kV transformers bound due to an increase in Lake Bonney generation.

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
31	17/06/2011 04:25	SA1	A	-419	-61	6x	V-SA	-182	-325	143	A constraint managing post-contingent overload on the South East 275/132 kV transformers unbound due to a decrease in Lake Bonney generation.
32	17/06/2011 04:40	SA1	A	-127	-997	7x	V-SA	-286	-460	174	Torrens Island rebid 340 MW of capacity to close to the MFP from 0425 hrs. A slight fall in SA demand led to abrupt changes in prices and flows.
							V-S-MNSP1	-134	40	174	
33	17/06/2011 05:05	SA1	A	-997	19	1,016	V-SA	-460	-320	140	A step change in the Torrens Island offer moved 340 MW of capacity from close to the MFP to positive price bands.
							V-S-MNSP1	40	-81	121	
34	11/07/2011 15:25	SA1	A	44	299	6x	V-S-MNSP1	117	0	117	Murraylink runback scheme operated unexpectedly (i.e. not caused by system conditions).
35	25/07/2011 10:40	TAS1	A	12,390	28	436x	T-V-MNSP1	-386	-116	270	A step change in TAS offers in the previous DI moved over 1,000 MW of capacity to close to the Market Price Cap (MPC). A rebid from Gordon then moved 370 MW of capacity to a negative price band.
36	25/07/2011 16:35	TAS1	A	499	24	20x	T-V-MNSP1	-478	-267	211	A step change in TAS offers moved 1,053 MW of capacity from higher-priced bands to < $300/MWh.
37	26/07/2011 10:05	TAS1	A	26	295	10x	T-V-MNSP1	-89	-281	191	A step change in TAS offers moved 826 MW of capacity from lower-priced bands to > $295/MWh.
38	27/07/2011 06:35	TAS1	A	35	295	7x	T-V-MNSP1	-187	-397	210	A step change in TAS offers moved 1,142 MW of capacity from bands priced at < $300/MWh to bands priced close to the MPC.

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
39	27/07/2011 11:05	TAS1	A	295	23	12x	T-V-MNSP1	-478	-273	205	A step change in TAS offers moved 538 MW of capacity from higher-priced bands to < $25/MWh.
40	27/07/2011 20:35	TAS1	A	41	299	6x	T-V-MNSP1	174	-33	207	A step change in TAS offers moved 837 MW of capacity from lower-priced bands to > $295/MWh.
41	27/07/2011 22:05	TAS1	A	295	41	6x	T-V-MNSP1	-478	-277	201	A step change in TAS offers moved 869 MW of capacity from higher-priced bands to < $41/MWh.
42	31/07/2011 08:20	SA1	A	-1,000	15	1,015	V-S-MNSP1	4	-106	110	Planned outages increased loading on the Richmond–Brunswick 220 kV line. TNSP advice to limit flows on this line led to abrupt changes in prices and flows.
43	04/08/2011 17:25	SA1	A	44	251	5x	V-S-MNSP1	107	0	107	Murraylink runback scheme operated unexpectedly (i.e. not caused by system conditions).
44	05/08/2011 23:35	SA1	A	46	251	4x	V-S-MNSP1	63	205	142	Hot water load pickup of around 200 MW in SA
45	05/09/2011 10:55	QLD1	Not triggered	29	82,163	2,878x	NSW1-QLD1	-215	-229	14	Incorrect input into 855/871 line constraints after a database failover from Powerlink. However, flow changes did not breach threshold values and a price review was NOT triggered.
							N-Q-MNSP1	-60	17	77	
46	05/09/2011 11:05	QLD1	R	92	6	86	N-Q-MNSP1	64	-19	83	QLD generators moved 561 MW of capacity to the MFP. Prices were incorrectly rejected. Powerlink provided faulty ratings for the 855/871 lines in the two previous DIs, but the ratings had been manually corrected in the current DI.[g]

[g] A report on this price revision is available at http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/reports/price_revisions/0150-0139%20pdf.ashx.

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
47	11/09/2011 23:35	SA1	A	40	251	5x	V-S-MNSP1	104	220	116	Hot water load pickup of around 200 MW in SA
48	21/09/2011 23:35	SA1	A	39	450	11x	V-S-MNSP1	99	204	105	Hot water load pickup of around 200 MW in SA
49	04/10/2011 10:15	SA1	A	35	15,912	454x	V-SA	190	-124	314	Heywood–Mortlake No.2 500kV line was out of service. Mortlake commissioning reversed flow on the Heywood interconnector and caused a local FCAS L60 constraint to violate.
							V-S-MNSP1	72	238	166	
50	05/10/2011 09:45	SA1	A	299	30	9x	V-S-MNSP1	220	81	139	SA generators rebid 361 MW of capacity to the MFP.
51	15/10/2011 13:40	SA1	A	19	-925	944	V-SA	-244	-92	152	Constraints managing post-contingent overload on the Robertstown and South East 275/132 kV transformers reduced exports to VIC when SA wind generation exceeded 1,000 MW.
52	09/11/2011 12:05	VIC1	A	28	-46,764	1,690x	VIC1-NSW1	798	-200	998	Heywood–Moorabool No.1 500kV line was out of service. Mortlake ramping down after commissioning tests caused multiple constraint equation violations.
							V-SA	-144	-550	406	
							T-V-MNSP1	106	-91	198	
		SA1	A	30	461,896	15,556x	V-S-MNSP1	0	156	156	
53	09/11/2011 12:10	VIC1	A	-46,764	27	1,716x	VIC1-NSW1	-200	810	1,010	Re-establishment of more normal system conditions following constraint violations in previous DI.
							T-V-MNSP1	-91	200	291	
54	09/11/2011 12:15	SA1	A	40	-87	3x	V-SA	-550	-351	199	SA generators rebid 600 MW of capacity to the MFP in the previous DI and 50 MW to the MFP in this DI.

Incident number	Dispatch interval	Region	Price status (A = accepted, R = rejected)	Previous dispatch interval ROP ($/MWh)	Current dispatch interval ROP ($/MWh)	Change in price	Interconnector	Previous dispatch interval flow (MW)	Current dispatch interval flow (MW)	Change in flow (MW)	Explanation
							V-S-MNSP1	159	-69	228	
55	09/11/2011 12:20	SA1	A	-90	-917	10x	V-SA	-351	-143	208	A fall in SA demand in this DI reduced prices further.
56	09/11/2011 12:35	VIC1	A	129	28	4x	VIC1-NSW1	-81	688	769	A step change in SA offers moved 634 MW of capacity from the MFP to positive price bands.
57	21/11/2011 08:15	QLD1	A	30	173	5x	N-Q-MNSP1	-65	15	80	An automated constraint increased transfer south on QNI and a flow reversal on Terranora.
58	21/11/2011 08:55	QLD1	A	92	-1,000	12x	NSW1-QLD1	-1,010	-533	477	NRM reduced southward transfer on QNI by around 500 MW.
59	21/11/2011 09:10	QLD1	A	-1,000	23	44x	N-Q-MNSP1	36	-46	82	RHS of NRM constraint increased by around 200 MW.
60	30/11/2011 04:20	SA1	A	9	-907	916	V-S-MNSP1	-142	-33	110	A constraint to avoid overload of a Dederang–South Morang 330 kV line on the trip of the parallel line reduced flow on Murraylink to VIC when SA had around 900 MW of wind generation.
61	30/11/2011 06:00	SA1	A	16	-1,000	1,016	V-S-MNSP1	-138	-31	108	A constraint managing overload of the Roberstown transformers reduced flow on Murraylink to VIC when SA had around 970 MW of wind generation.
62	30/11/2011 06:05	SA1	A	-1,000	15	1,015	V-S-MNSP1	-31	-162	131	Unbinding of a constraint preventing overload of the Robertstown transformers allowed increased transfer on Murraylink to VIC.

APPENDIX C – THE MII PRICE REVIEW PROCESS

The MII price review process was implemented in AEMO's market systems on 1 June 2006.

The process was introduced to manage the risks of setting electricity prices that were inconsistent with the actual operating state of the power system. The design also aimed to strike a balance between the uncertainty introduced by a price review process and the accuracy of spot market pricing.

An automated procedure to detect dispatch intervals that may contain MII was developed in consultation with participants. The automated procedure is based on changes to prices within – and interconnector flows to or from – a region. A dispatch interval identified by the automated procedure is flagged as "subject to review".

As soon as a dispatch interval is flagged as subject to review, a Market Notice is automatically generated that identifies the dispatch interval and prices that are under review. Subsequent dispatch intervals are also flagged as subject to review until the prices in the original dispatch interval have been either accepted or rejected.

AEMO has a short time to reject the prices from any dispatch interval that is subject to review. The prices will be rejected only if AEMO considers that the dispatch interval contained manifestly incorrect inputs. In other words, prices will be rejected only if one or more of the inputs used in the dispatch algorithm appears clearly wrong. If the prices have been neither rejected nor accepted after 30 minutes they are automatically accepted.

If the prices from a dispatch interval are rejected, they are replaced with the prices from the most recent dispatch interval that was not subject to review. In this case a Market Notice is automatically generated that identifies the dispatch interval, the original prices, and the revised prices.

If the prices from a dispatch interval that was subject to review are accepted, a Market Notice is automatically generated that identifies the dispatch interval and states that the original prices have been confirmed.

The entire MII price review process is detailed in Power System Operating Procedure 3705. This procedure covers market operation in relation to the power system, and is available at http://www.aemo.com.au/Electricity/Policies-and-Procedures/System-Operating-Procedures/~/media/Files/Other/SystemOperatingProcedures/SO_OP_3705_Dispatch_v79.ashx. The relevant parts of this procedure are s.20 and Appendix B.

GLOSSARY

Term	Definition
DI	dispatch interval
MII	Manifestly Incorrect Input
MFP	Market Floor Price
MPC	Market Price Cap
NEM	National Electricity Market
ROP	Regional Original Price
RRP	Regional Reference Price
Rules	National Electricity Rules
TNSP	Transmission Network Service Provider