NEMMCO

National Electricity Market Management Company Limited
ABN 94 072 010 327

Impact of intra-regional constraints on pricing:

Additional results

August 2007

1. Introduction

Initial investigation of this congestion management study was conducted in response to AEMC's request to review the report produced by Dr. Darryl Biggar titled "How significant is the mis-pricing impact of the congestion in the NEM?". A paper titled "Impact on intra-regional constraints on pricing" was published[1].

The AEMC has since made an additional request to NEMMCO to provide more results for the last three years of study (mid 2003 to mid 2006) to assist with the congestion management review. Some of the studies were proposed in NEMMCO's original paper "Impact on intra-regional constraints on pricing", under the section "Possible extension of this analysis". NEMMCO only undertook to provide information and no attempt was made to investigate the reasons behind the trends.

In continuance with the original paper, the term mis-pricing is used to describe the incidence of a difference between regional reference and local (sometimes referred to as nodal) prices. Mis-pricing occurs when a dispatched quantity of a generator is directly subjected to a binding constraint. The local generator's price may be higher or lower than the reference price.

Scope

The study years are:

- Y03_04: Period 1 July 2003 to 31 June 2004;
- Y04_05: Period 1 July 2004 to 31 June 2005; and
- Y05_06: Period 1 July 2005 to 31 June 2006.

Data for TAS region only includes Y05_06.

The aim of this extended study is to find other mis-pricing trends, in particular:

- Frequency of mis-priced intervals with regional reference price (RRP) > $1000/MWh;
- Classification of mis-pricing trends into positive and negative mis-pricing;
- Classification of mis-pricing trends into system normal or network outage events;
- Impact of constraint formulation chance on mis-pricing; and
- Analysis of mis-pricing at selected locations.

The set of connection points used in this study are the same as per NEMMCO's original paper (March 2007 report). In the original paper, the connection points were selected based on the following criteria:

- VIC, NSW and QLD region connection points were mis-priced by more than 100hrs per annum; and
- SA, Snowy and TAS region connection points were mis-priced by more than 50hrs per annum.

1

http://www.aemc.gov.au/pdfs/reviews/Congestion%20Management%20Review/Directions%20Paper/Supplementary%20Documents/000NEMMCO%20Paper%20-%20Impact%20of%20Intra-regional%20Constraints%20on%20Pricing.pdf

Assumptions

In this analysis, NEMMCO used the methodology of the original study to identify mis-pricing. This methodology was subject to several assumptions as discussed below.

As discussed in the original paper by Dr. Biggar, mis-pricing occurs when a generator is directly influenced by a binding constraint. Therefore this study initially looked at the binding constraints with generator terms during the study period to identify mis-pricing. After that any constraints not relevant to congestion were removed from study dataset. NEMMCO assumed the following constraint types are not relevant to congestion:

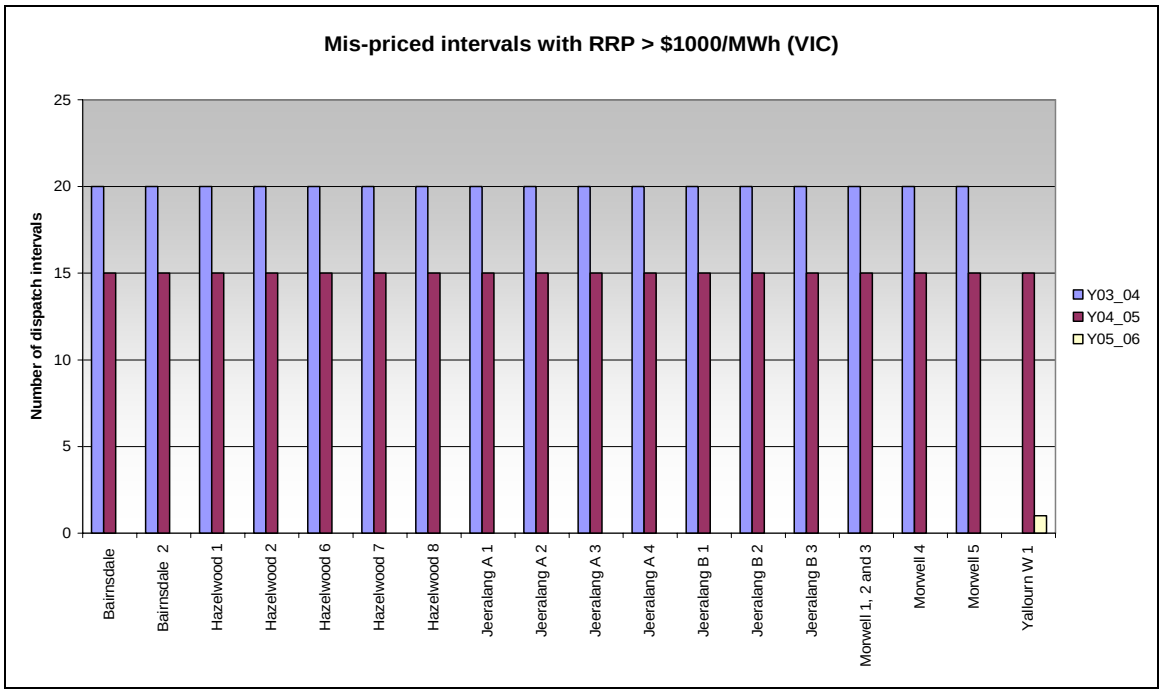
- FCAS constraints: These are constraints which are imposed to manage FCAS dispatch.
- Identified Network Support Agreement (NSA) constraints: These are the constraints applied to represent known NSAs between TNSPs and generators. Any mis-pricing due to these constraints is assumed to be managed by the agreement between the parties.
- Identified constraints to manage connection point equipment outages: These are the constraints applied to set the output of a generator to zero to manage any outage of the connection equipment. In some situations these constraints are used instead of generators making their units unavailable. It was assumed that these situations were managed by agreements between parties. Any mis-pricing in these situations had no financial impact since there was no output from the generators
- Identified non-conformance constraints: These are the constraints to manage generator non-conformance.
- Internal NEMDE constraints: There are many internal NEMDE constraints which manage FCAS limits, ramp-rates and other issues. These relate to scheduled unit characteristics and are considered to be not relevant to network congestion.

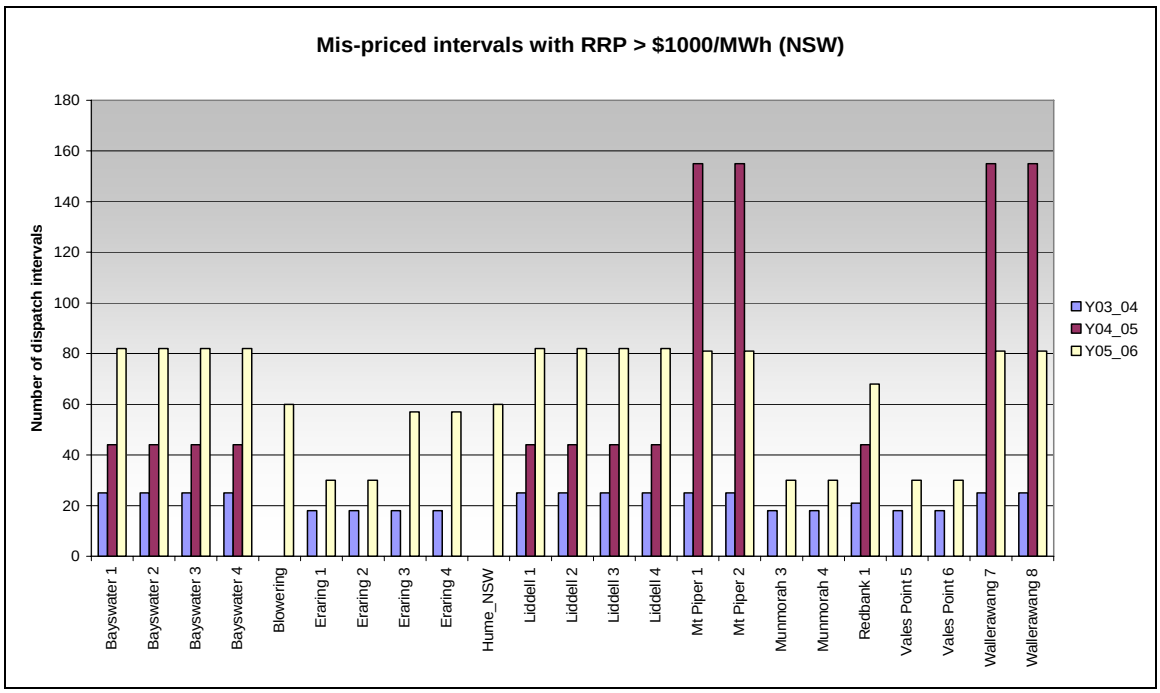
Note: The dataset used for the study includes some of the constraints discussed above where the identified purpose of the constraint was not established. The regional analysis section of this report shows results of detailed analysis of the top 5 binding constraints, which include some of the non-conformance constraints etc.

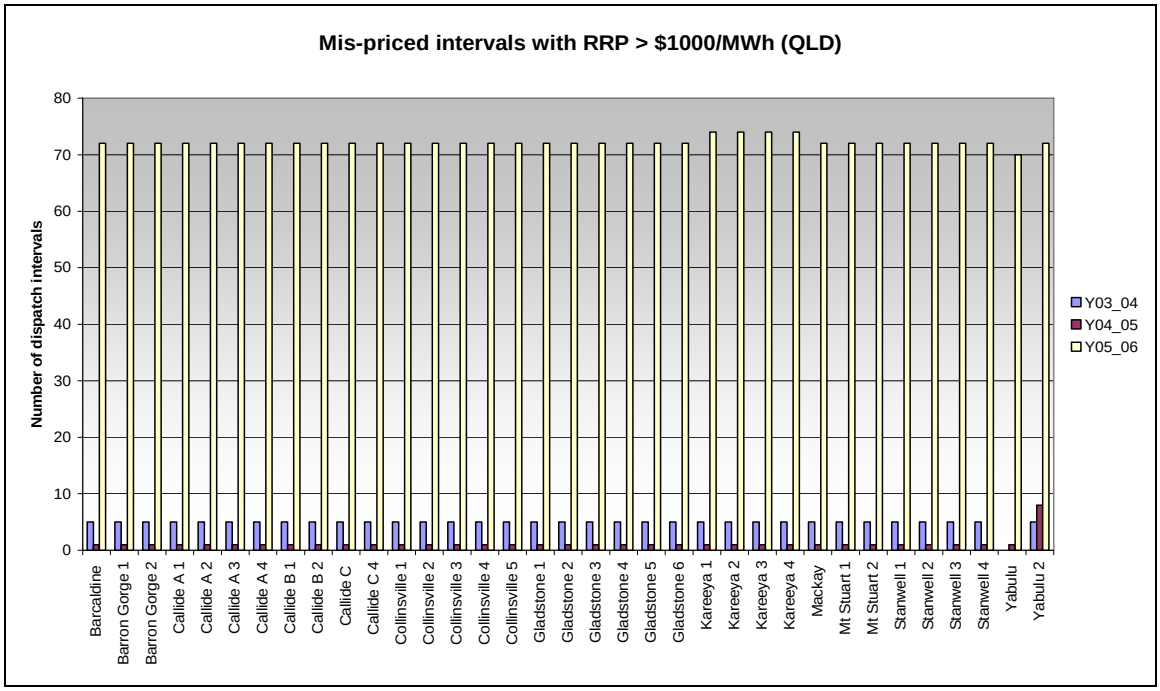
Additional assumptions for each extended study are included in the heading of each subsection.

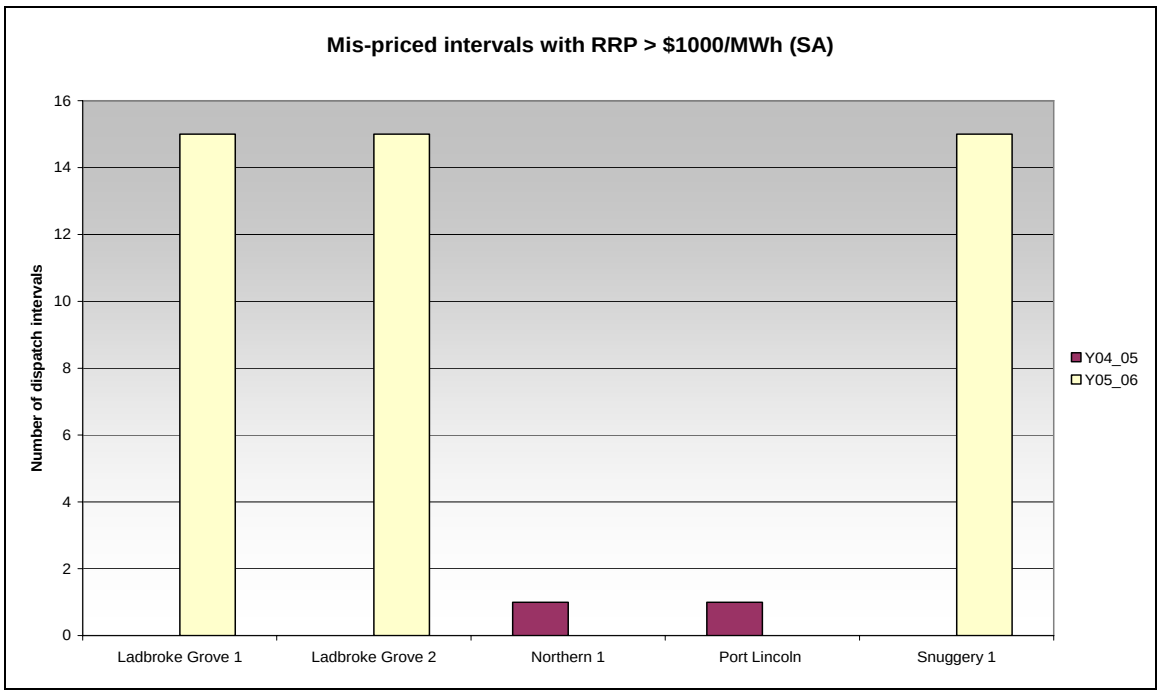
2. Mis-priced intervals with RRP > $1000/MWh

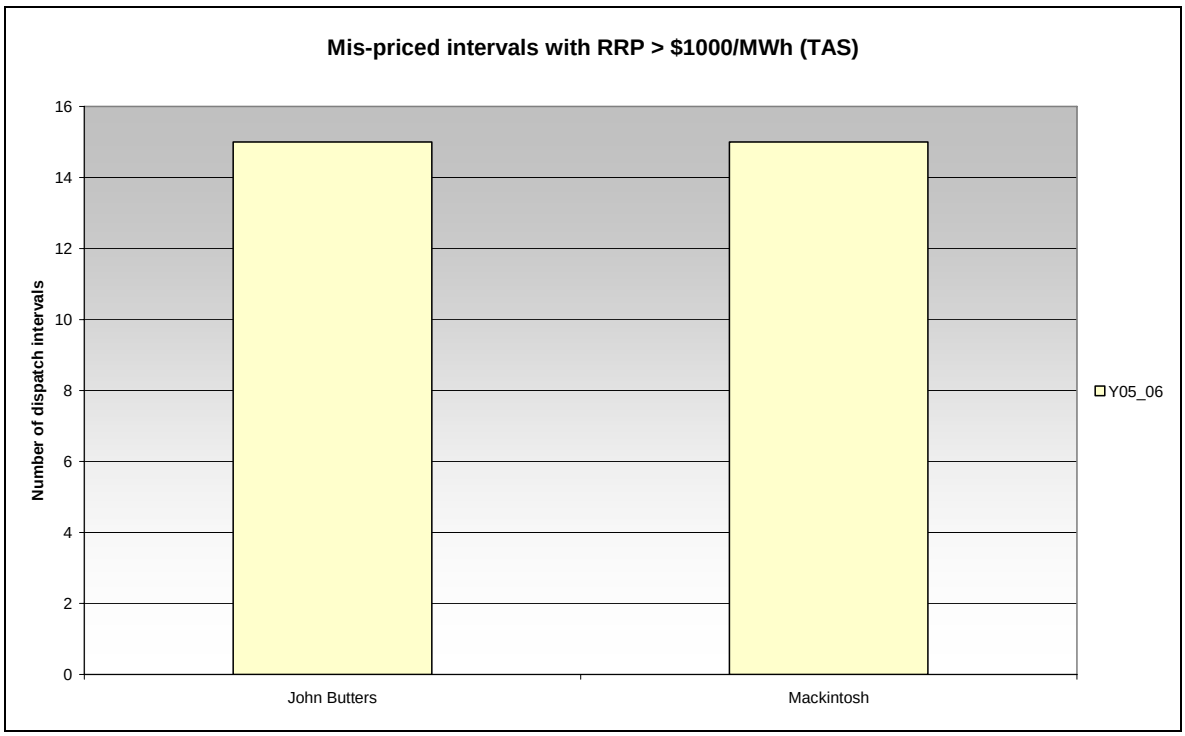
This section presents the number of dispatch intervals where mis-pricing occurred while regional reference price was more than $1000/MWh. Data is presented for each region per connection point. The selection of connection points are defined in the scope section of this document.






Mis-priced intervals with RRP > $1000/MWh (QLD)
Number of dispatch intervals
0
10
20
30
40
50
60
70
80
Barcaldine
Barron Gorge 1
Barron Gorge 2
Callide A 1
Callide A 2
Callide A 3
Callide A 4
Callide B 1
Callide B 2
Callide C
Callide C 4
Collinsville 1
Collinsville 2
Collinsville 3
Collinsville 4
Collinsville 5
Gladstone 1
Gladstone 2
Gladstone 3
Gladstone 4
Gladstone 5
Gladstone 6
Kareeya 1
Kareeya 2
Kareeya 3
Kareeya 4
Mackay
Mt Stuart 1
Mt Stuart 2
Starwell 1
Starwell 2
Starwell 3
Starwell 4
Yabulu
Yabulu 2
Y03_04
Y04_05
Y05_06


Mis-priced intervals with RRP > $1000/MWh (SA)
Number of dispatch intervals
0
2
4
6
8
10
12
14
16
Ladbroke Grove 1
Ladbroke Grove 2
Northern 1
Port Lincoln
Snuggery 1
Y04_05
Y05_06



QLD region showed an increase in number of DIs of mis-pricing when RRN is more than $1000/MWh in the year 2005 – 2006. Upper and Lower Tumut connection points were also subjected to the similar trend.

3. Analysis of the distribution of positive and negative mis-pricing

In this section, mis-pricing is categorised according to the impact on pricing.

Assumptions and definitions

Positive mis-pricing: When a generator is paid more than its local marginal offer price.

Generator Local Price < RRP

Typically occurs when a generator is constrained-off. (When a generator has a positive LHS coefficient in a <= type constraint OR negative LHS coefficient in a >= type constraint.)

Negative mis-pricing: When a generator is paid less than its marginal offer price.

Generator Local Price > RRP

Typically occurs when a generator is constrained-on. (When a generator has a negative LHS coefficient in a <= type constraint OR positive LHS coefficient in a >= type constraint.)

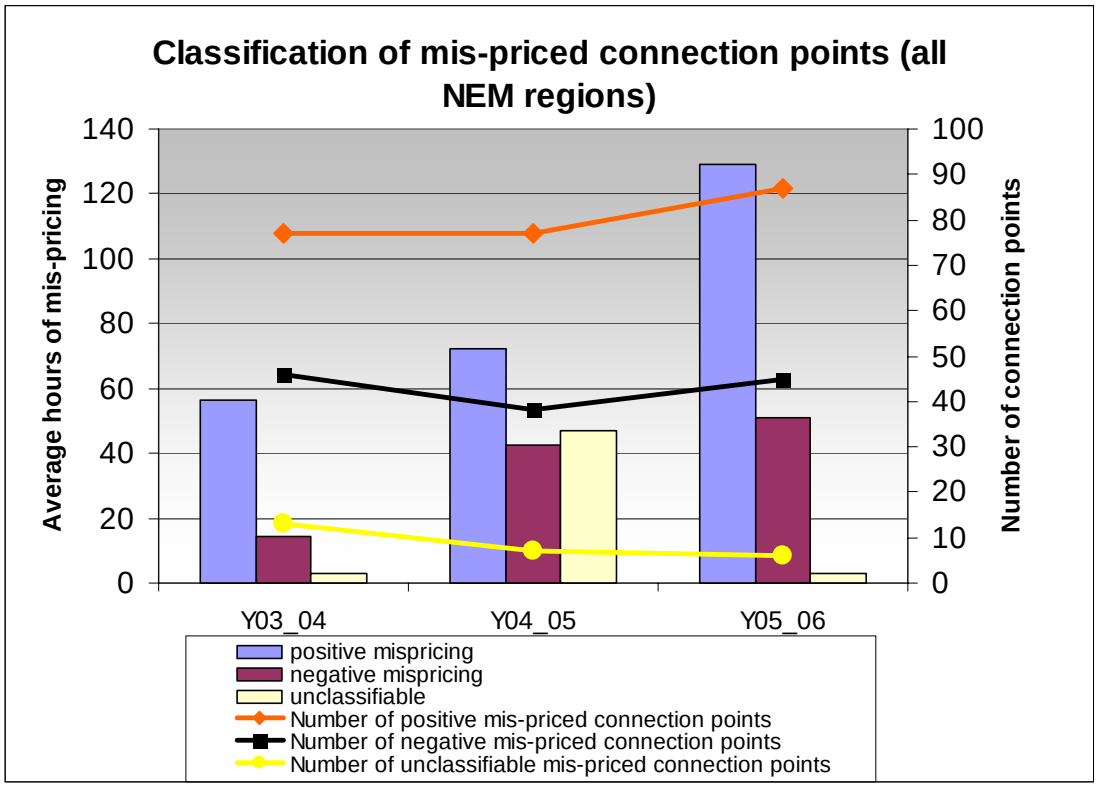
Unclassifiable: When a generator is constrained by an equality (LHS = RHS) constraint. This type of constraint is unclassifiable since the sign of marginal cost of the constraints are not stored in the NEM databases. Therefore there is no direct method to classify these mis-pricing incidents.

Appendix A1 lists the description for each for these unclassifiable constraints. Please refer to Appendix A2 for the method used for calculating the average.

Note: When a generator is constrained by more than one constraint equation in a dispatch interval, the combined effect is used for classifying the mis-pricing.

3.1 Hours of mis-pricing

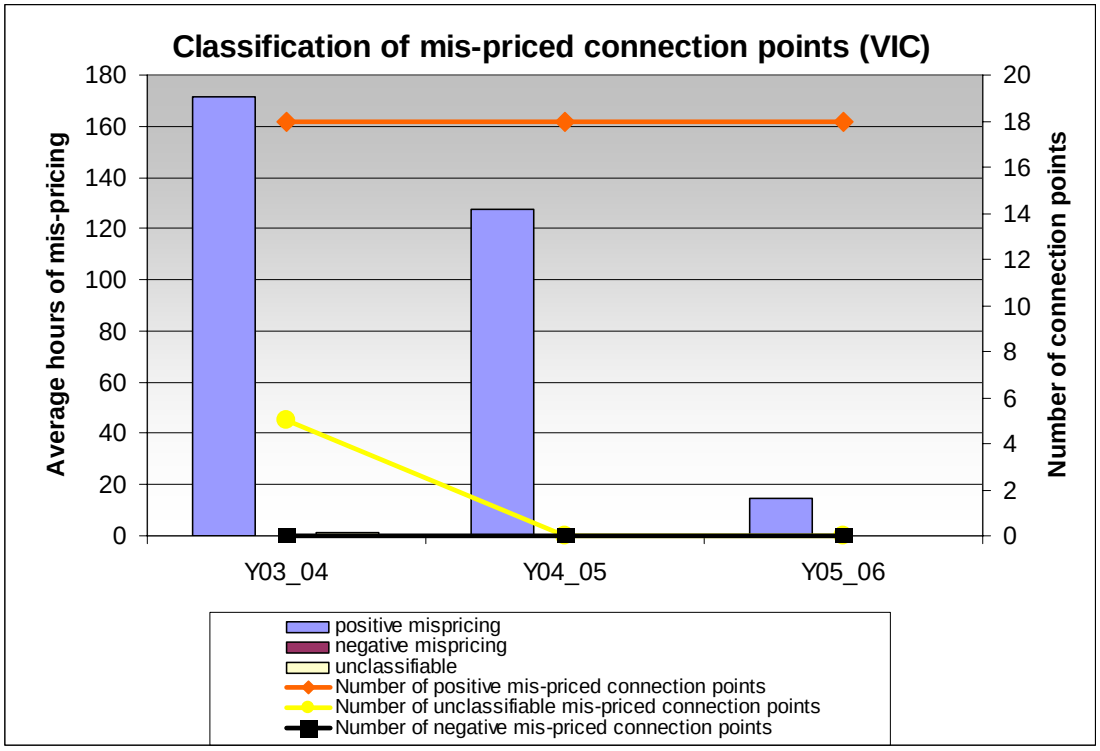
3.1.1. NEM Regions

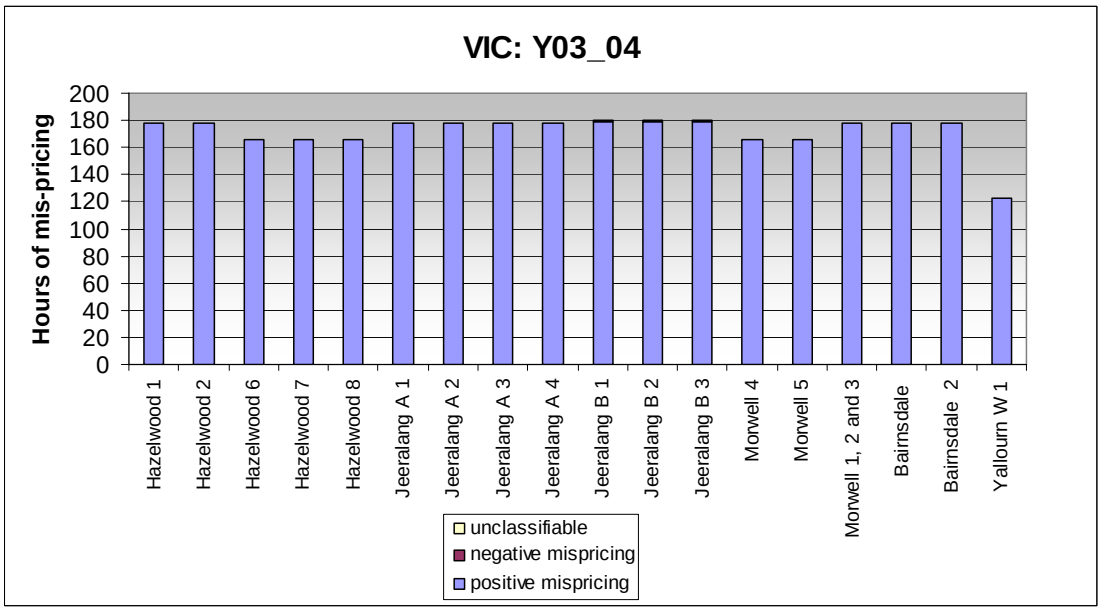


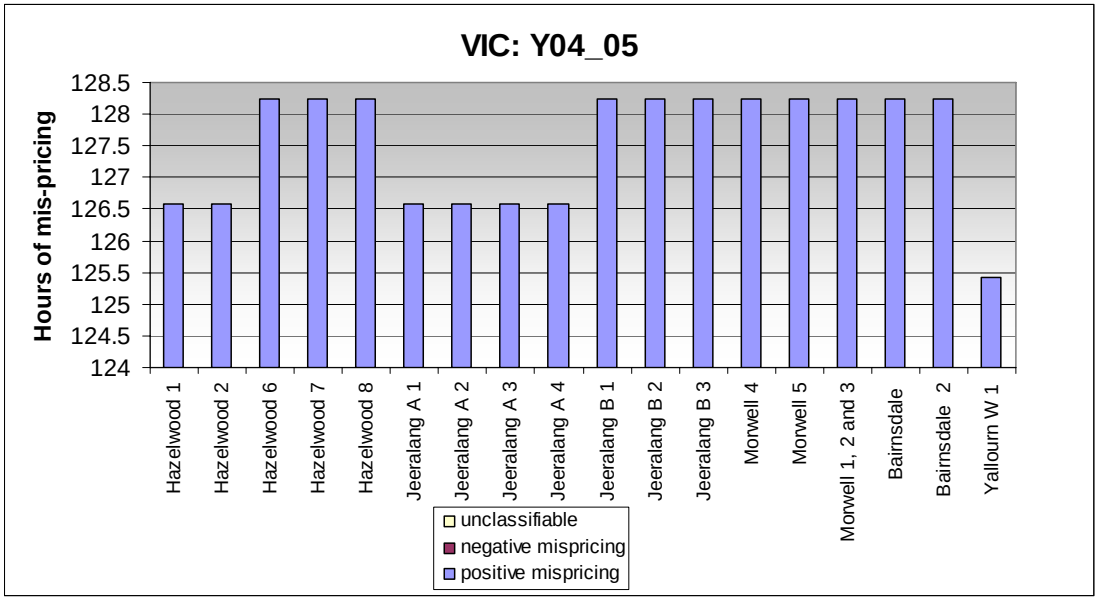
Note: The term “Average hours of mis-pricing” refers to hours of mis-pricing per mis-priced connection point. Please refer to Appendix A2 for the definition and the calculation method.

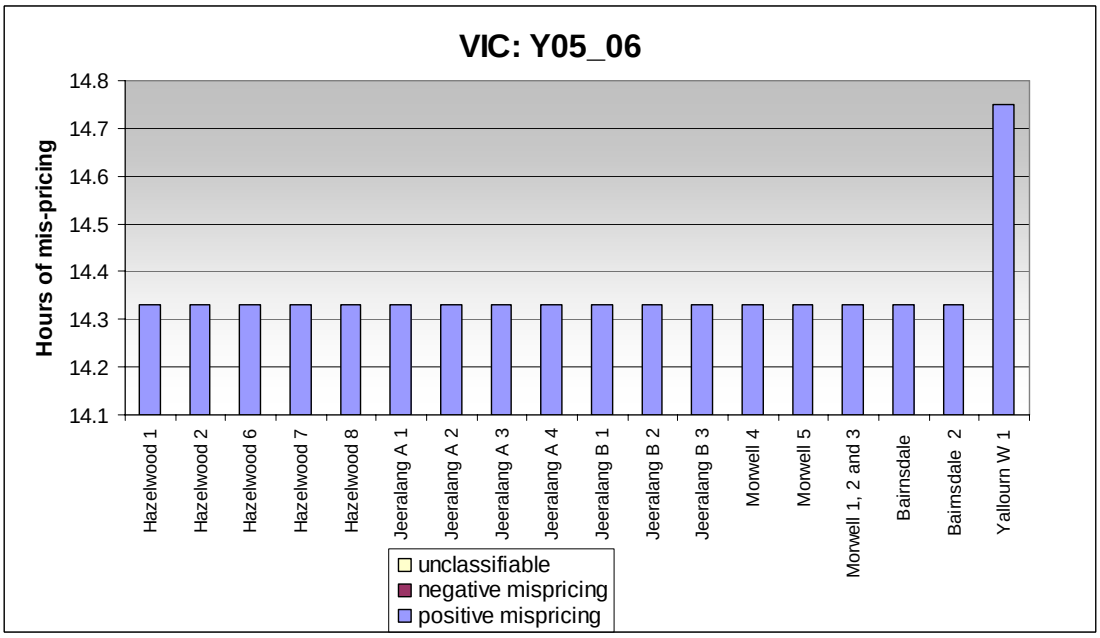
According to the total NEM results, positive mis-pricing has a higher average duration and is subjected to a larger number of connection points in all 3 years of study. Both positive and negative mis-pricing shows an increase in average number of hours during the study period.

3.1.2. VIC Region



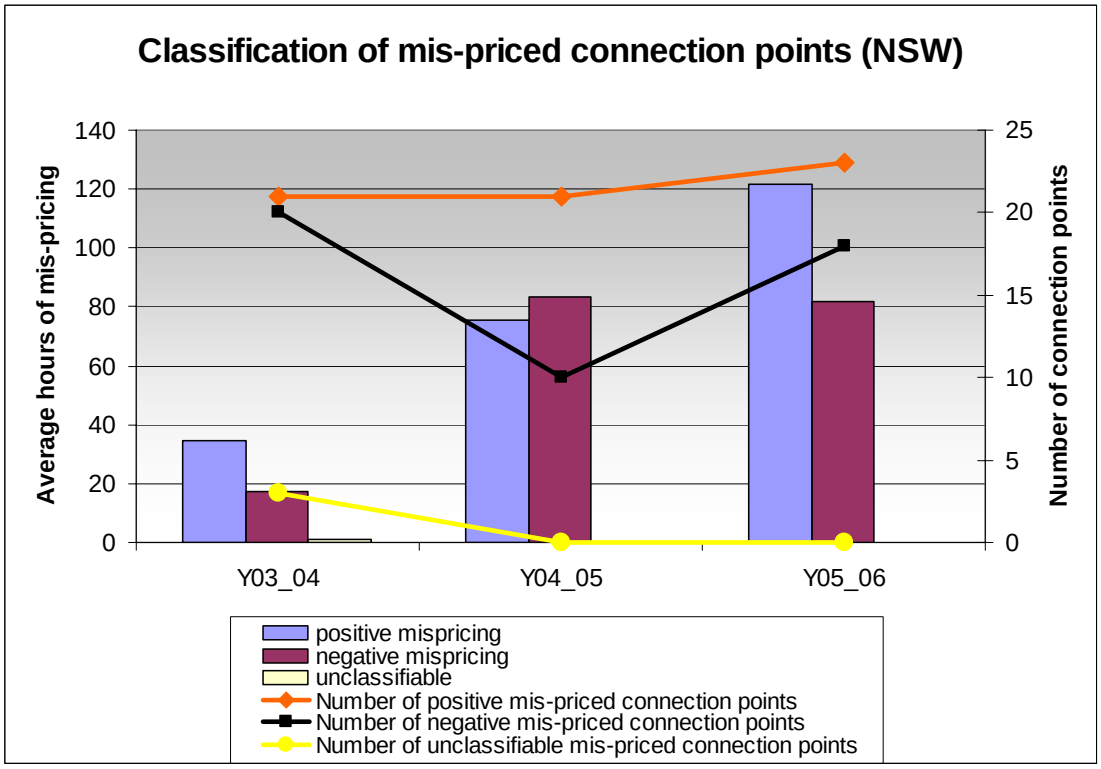


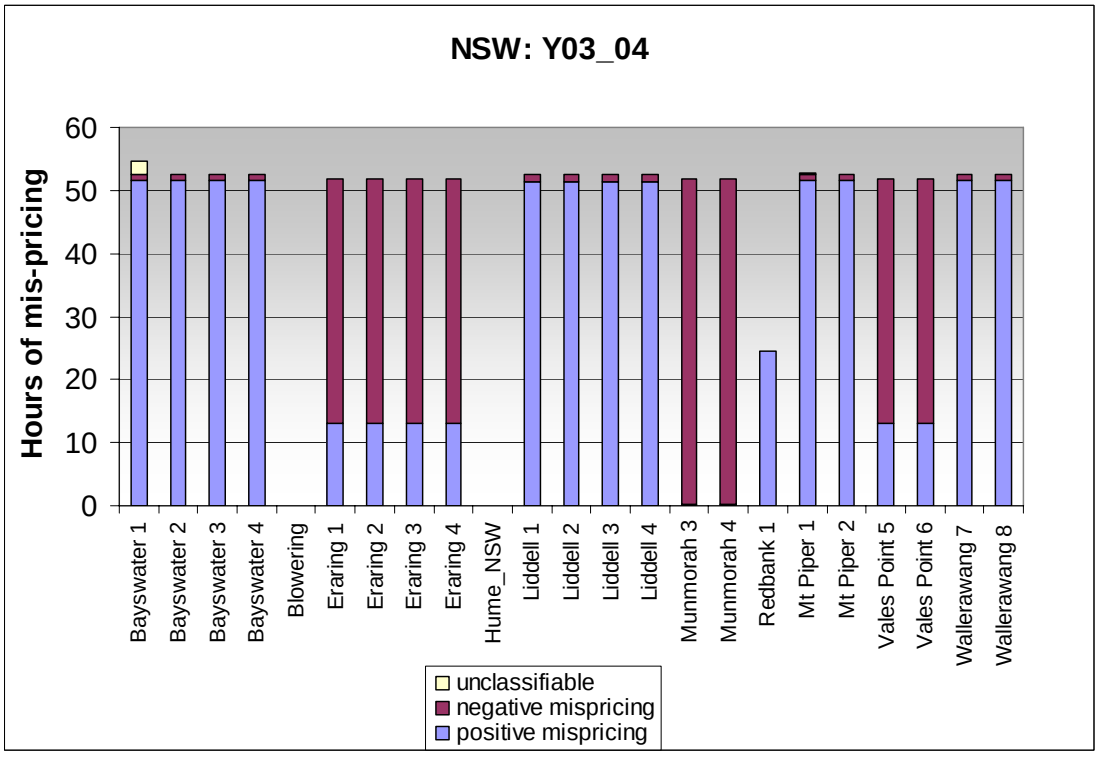


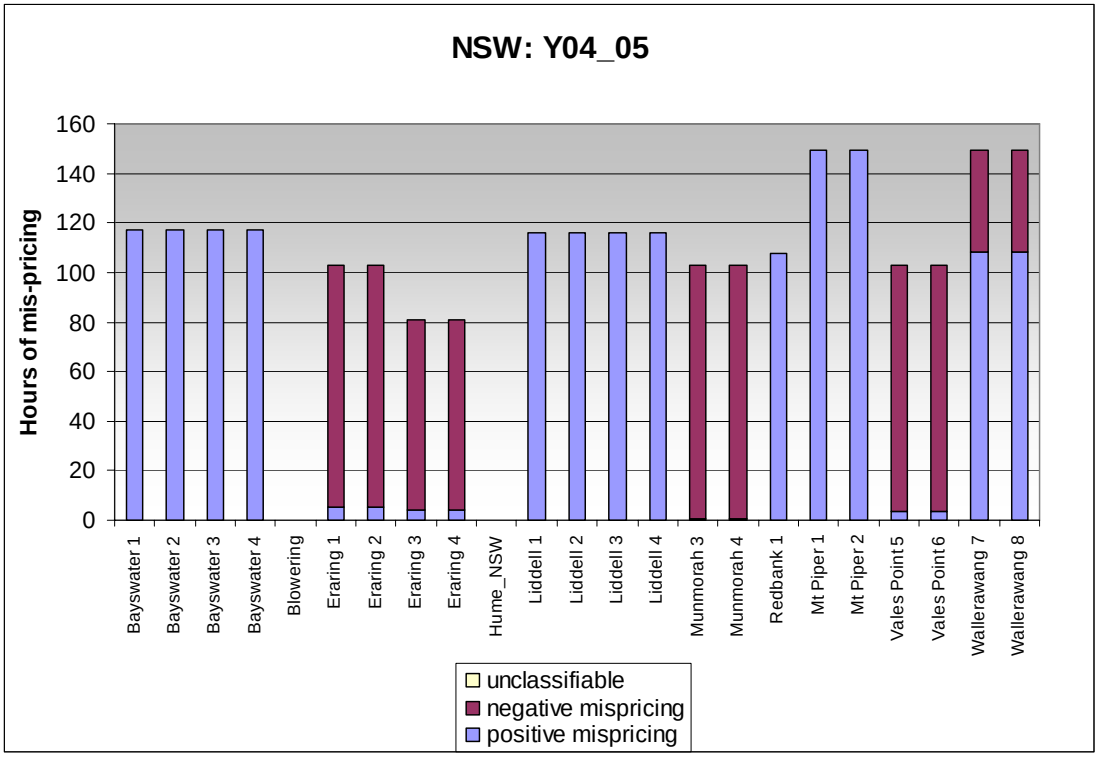


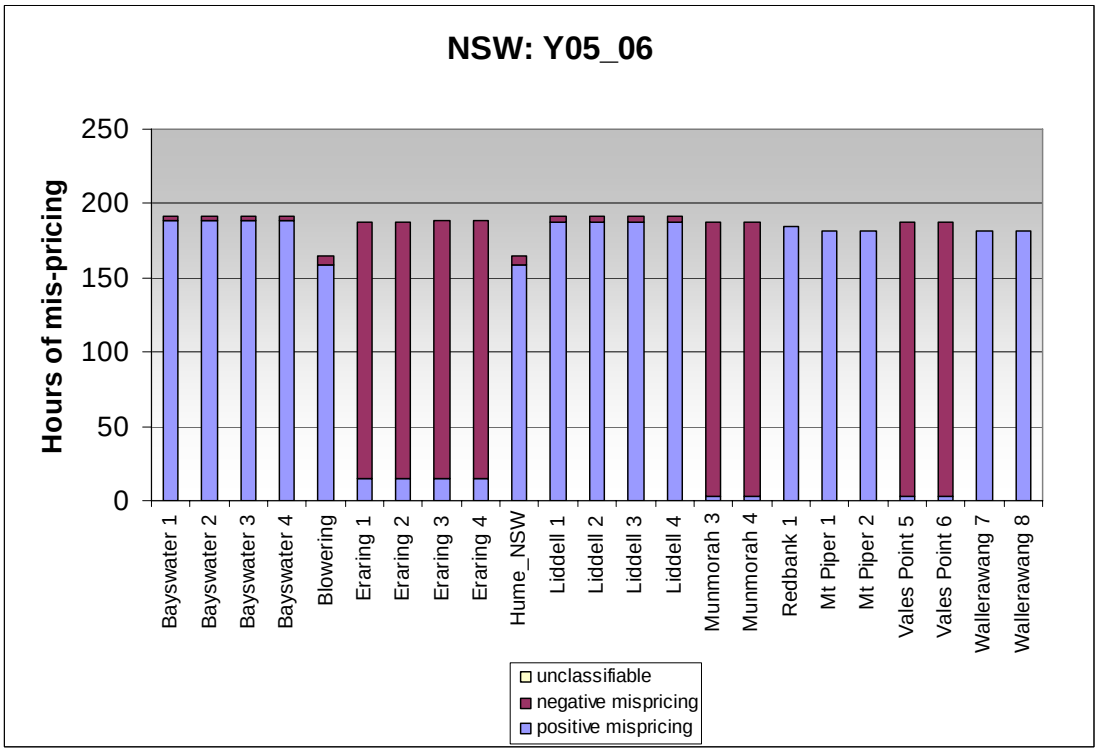
VIC region was mainly subjected to positive mis-pricing and showed a decreasing average number of hours.

3.1.3. NSW Region



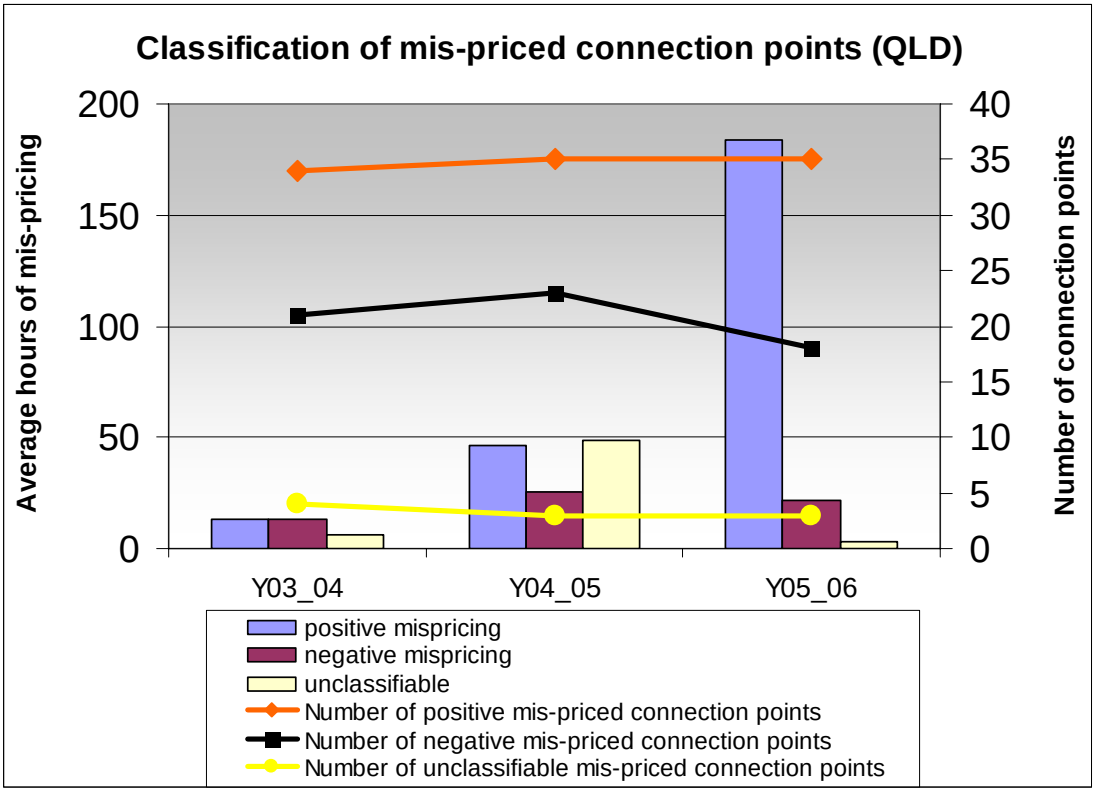


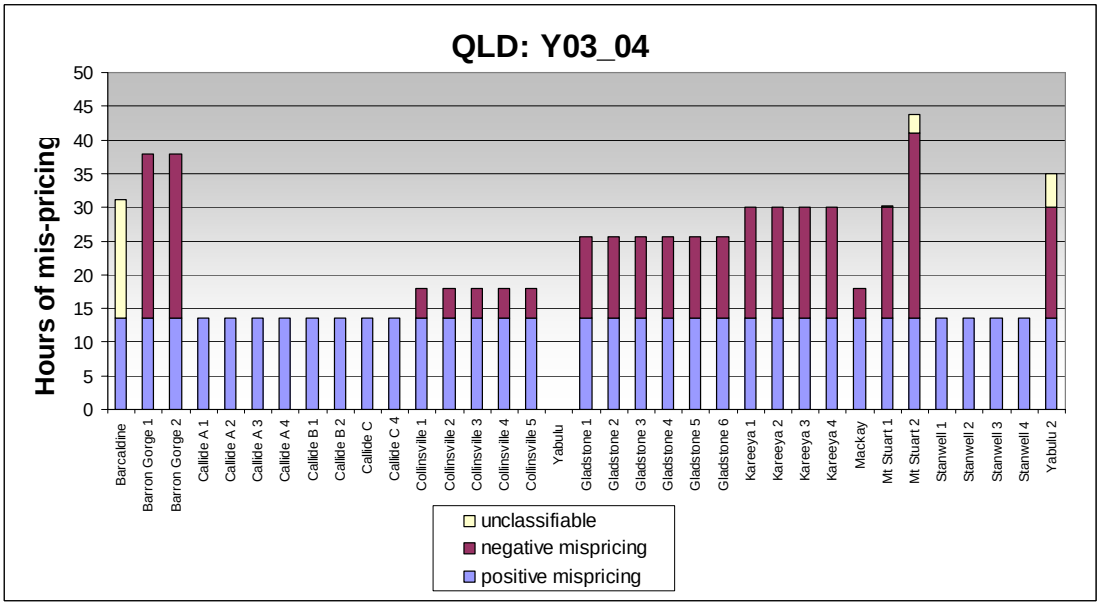


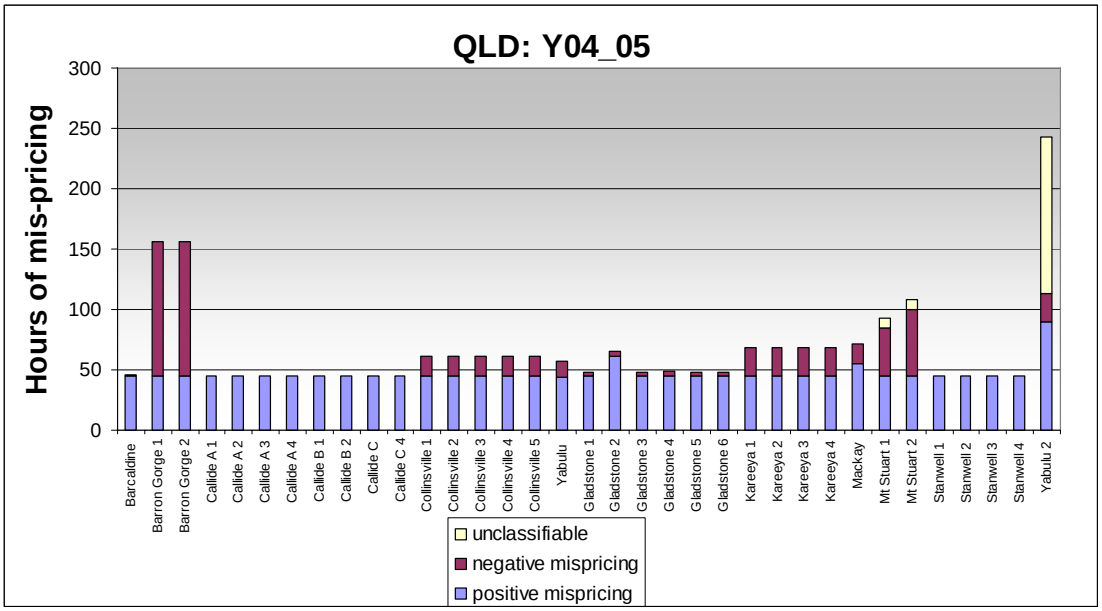


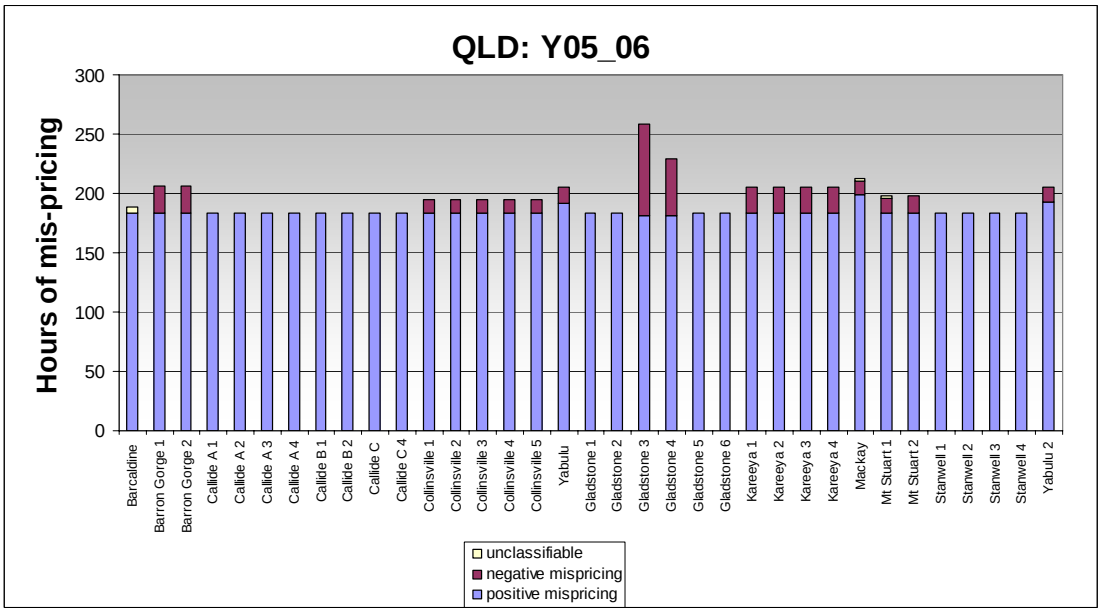
Eraring, Munmorah and Vales Point generators show negative mis-pricing in most of the intervals while other generators show positive mis-pricing. This may be due to constraints protecting Liddell-Newcastle and Liddelll-Tomago lines requiring these units to be constrained on while other NSW generators are being constrained off. A detailed discussion is given in section 6.1 (Bayswater No.1 generation unit).

3.1.4. QLD Region



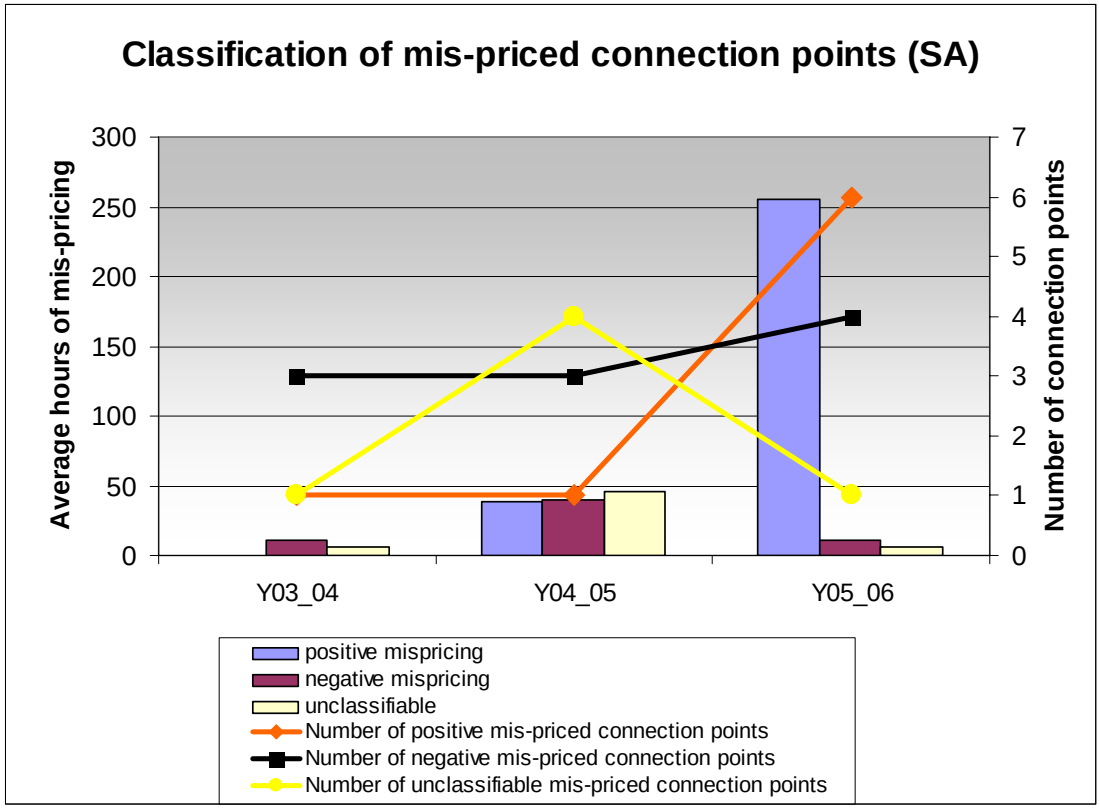


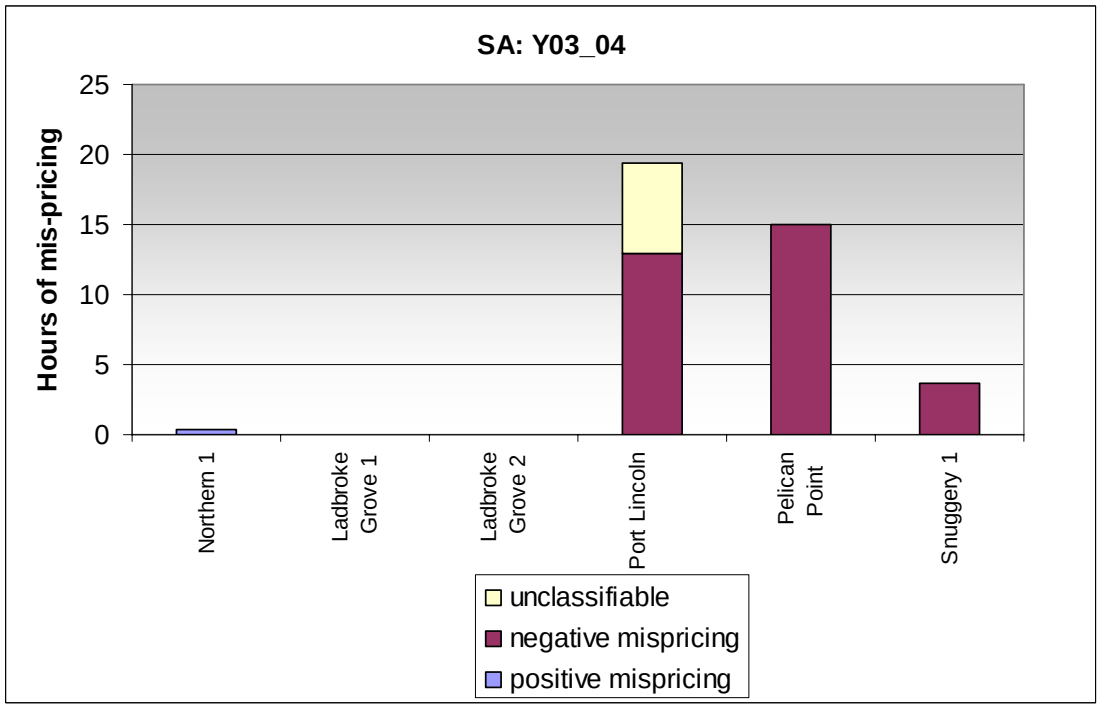


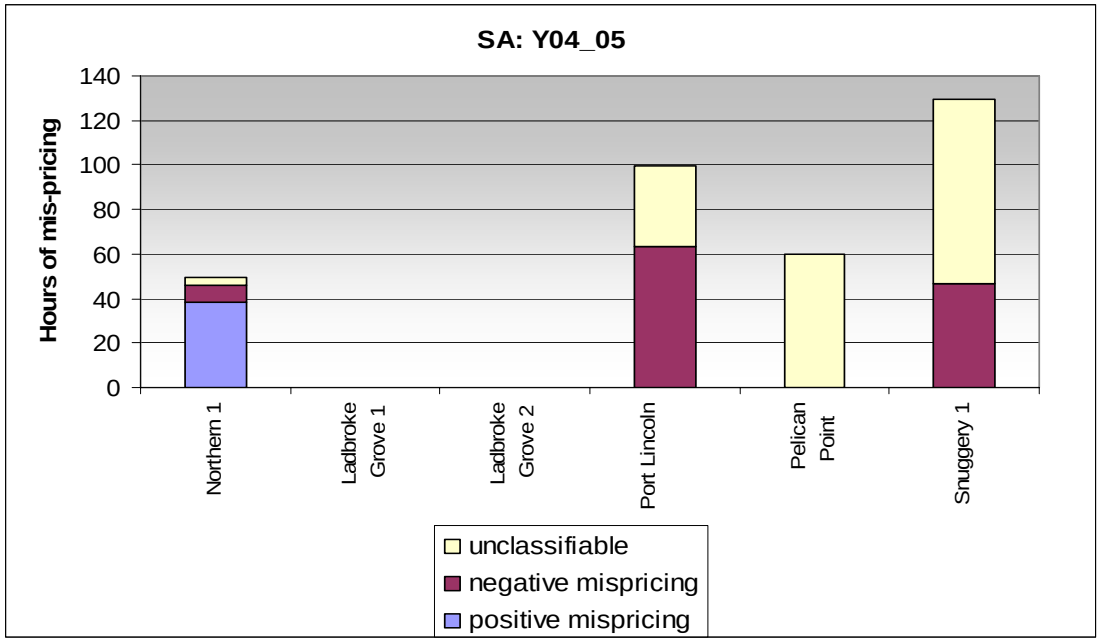


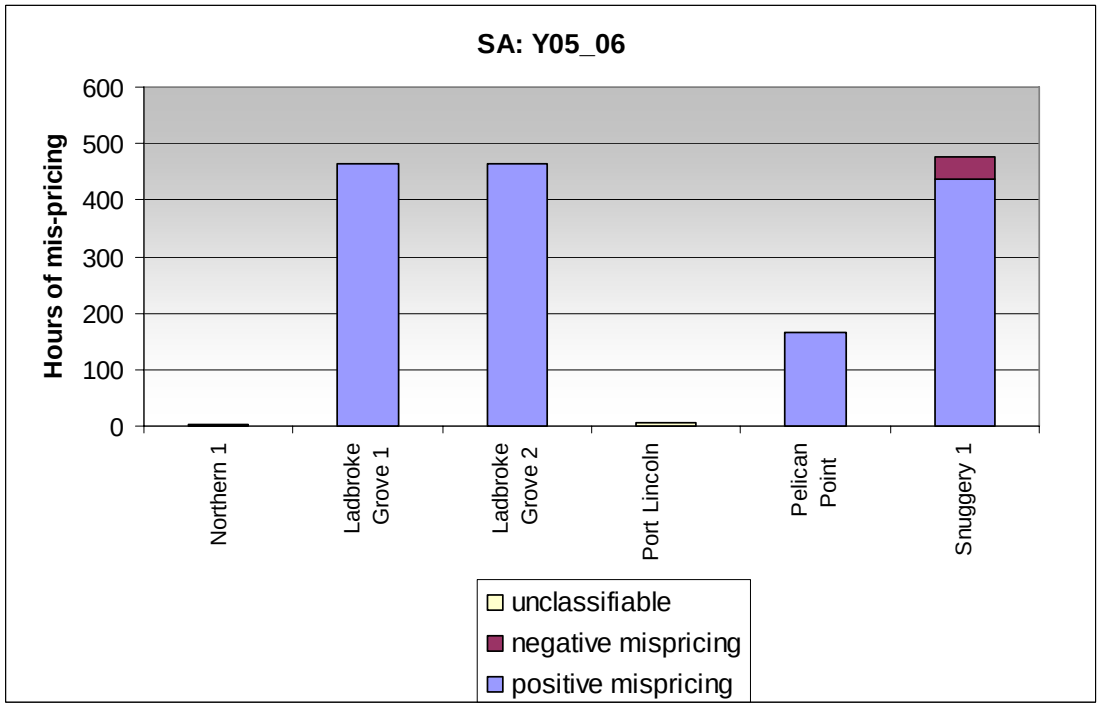
In the QLD region, there was a sharp increase in positive mis-pricing from years 2004 – 2005 to 2005 – 2006.

3.1.5. SA Region



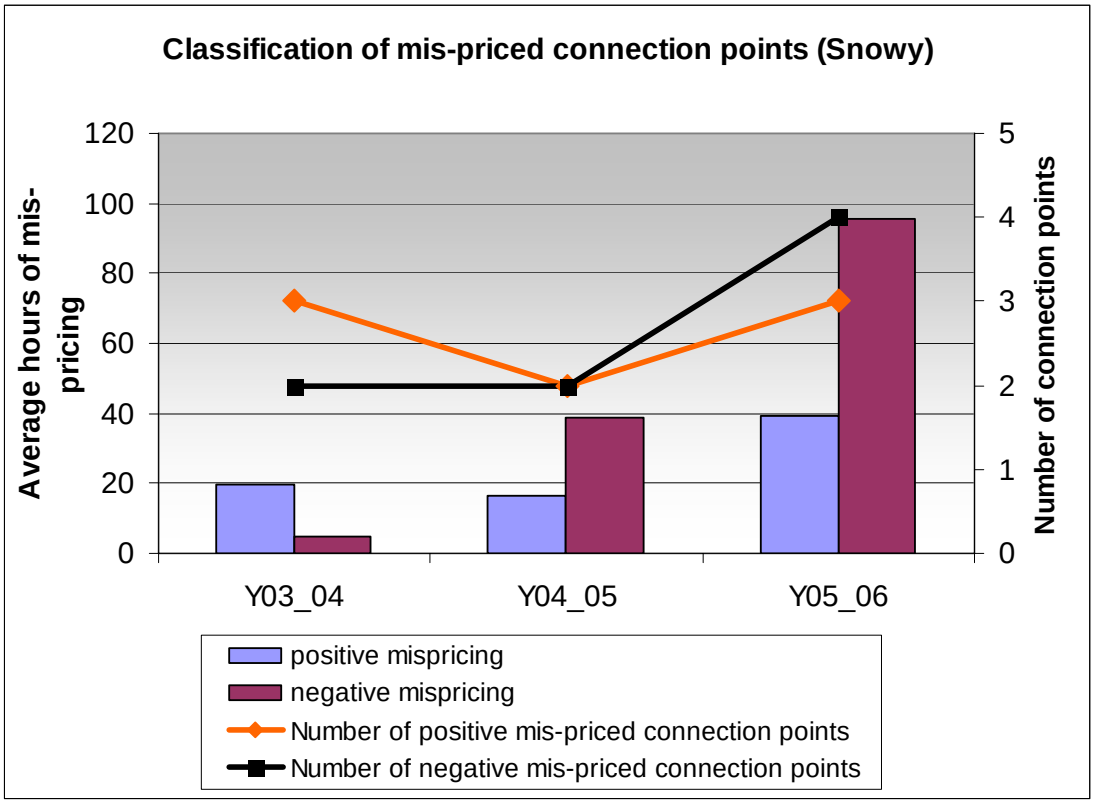


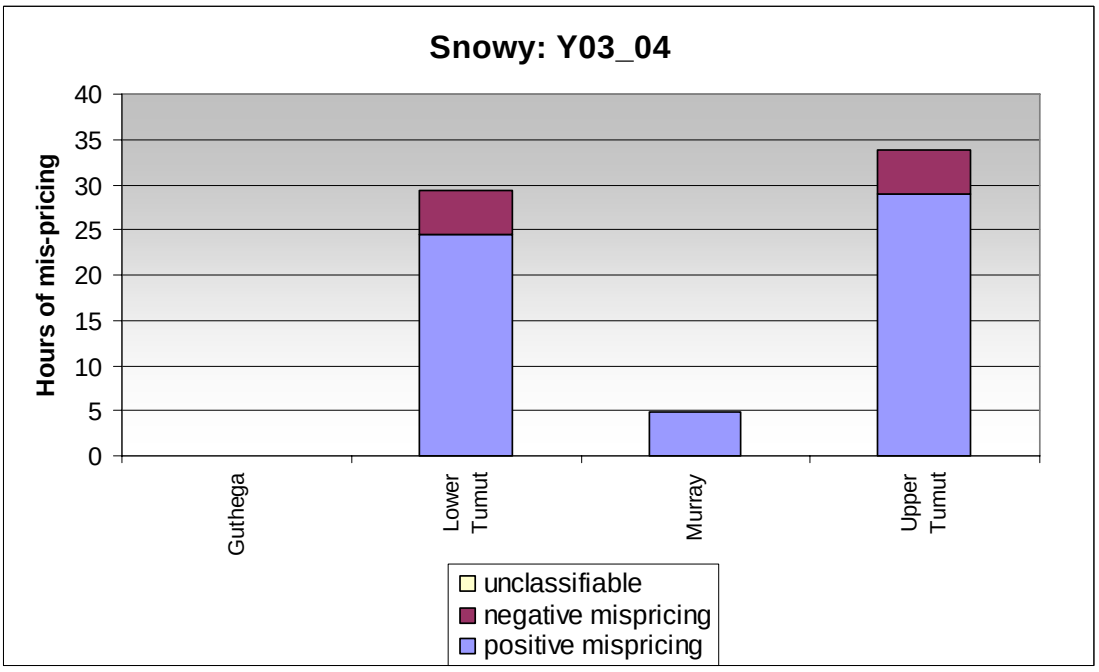


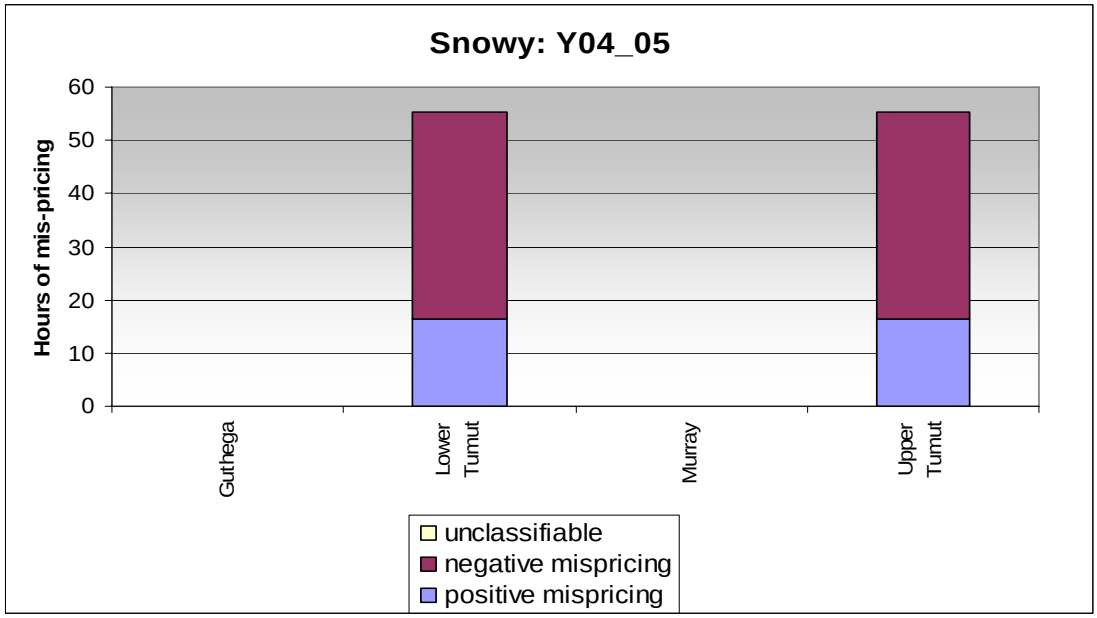


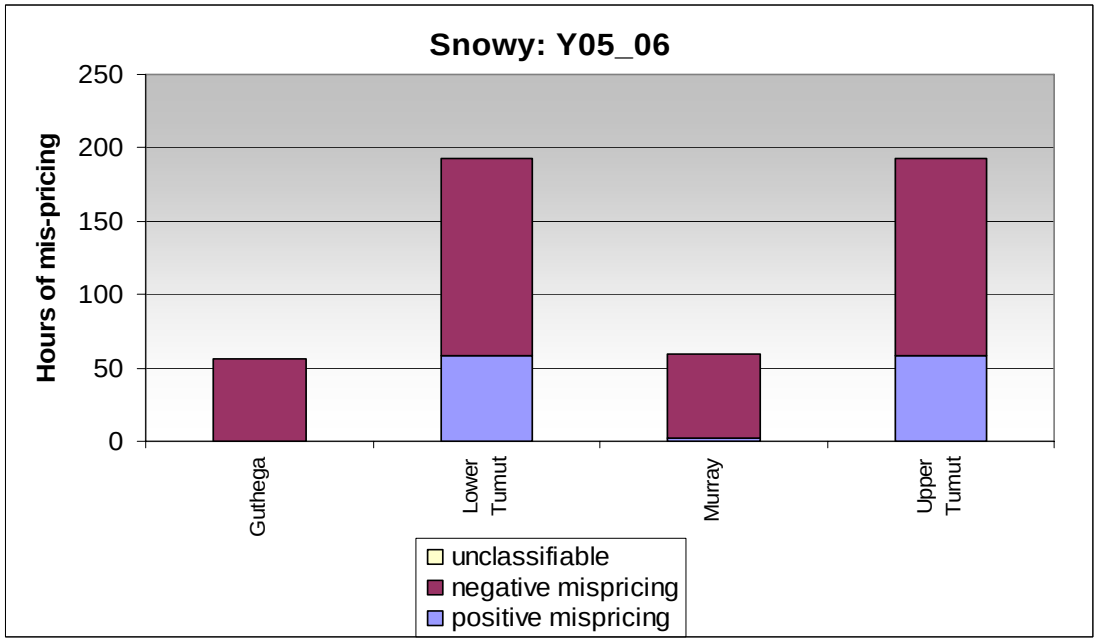
SA region showed an increase in positive mis-pricing during the study period. As discussed in section 6.3 (Ladbroke Grove generating units) the constraint formulation changes had an impact on mis-pricing of the Ladbroke Grove units.

3.1.6. Snowy Region



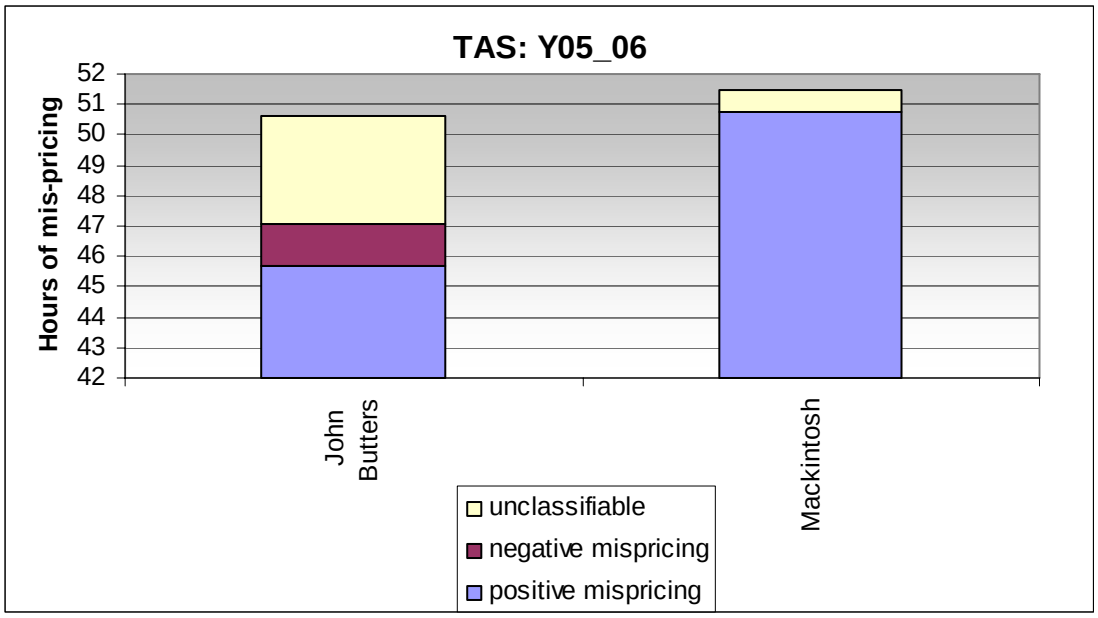






Upper and Lower Tumut connection points were subjected to more negative mis-pricing with time.

3.1.7. TAS Region



3.2 Average capped mis-pricing amount (in $/MWh)

The following figures show the average amount of mis-pricing for the various connection points for the 3 study years.

This analysis assumed the local prices of generators are also capped to be in between floor and VoLL prices (same as RRP). Therefore any mis-pricing which can lead to the generator price to be more than VoLL is capped to the VoLL. Similar limiting action is taken for the prices below the floor value.

The results show the average amount of mis-pricing per dispatch interval. This was achieved by summing the total amount of capped mis-pricing amounts together per each year and then dividing them by number of dispatch intervals when the generator is being mis-priced.

This type of historical analysis procedure has the weakness of not being subjected to an "Over Constrained Dispatch" to manage violated constraints. Accordingly, two sets of data per NEM region are included in this analysis. The first figure for each region includes mis-pricing due to violated constraints, where the figure is labelled "Average capped mis-pricing". The second figure for each region includes mis-pricing after removing the violated constraints, where the data is labelled "Average capped mis-pricing (without violation)". For the second set of data, constraints with marginal cost[2] >= 20*VoLL are assumed to be violated constraints. Since OCD process typically changes a violated constraint to a binding constraint, these two sets of data are indication of the upper and lower bound of average mis-pricing.

Please refer to Appendix A3 for the full set of data and their respective standard deviation[3] for average capped mis-pricing amount per dispatch intervals when a generator is being mis-priced.

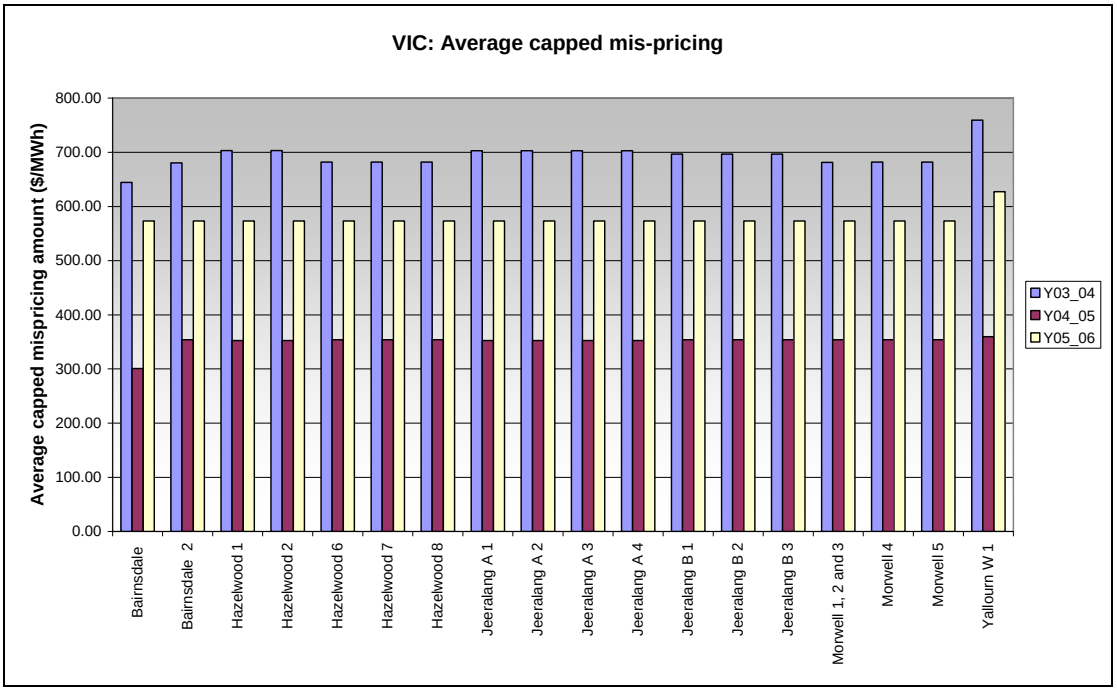
Note: When generators are subject to binding constraints, their offer prices have no impact on the setting of the RRP. Therefore, some generators shifted their generation capacity to extreme levels to maximise or minimise their volume. For example, when some generators are constrained off, they may shift most of their generation capacity to -$1000/MWh (market floor price) price bands to maximise the volume in the lowest price band while being paid the RRP. This type of behaviour distorts the results by exaggerating the mis-pricing amount.

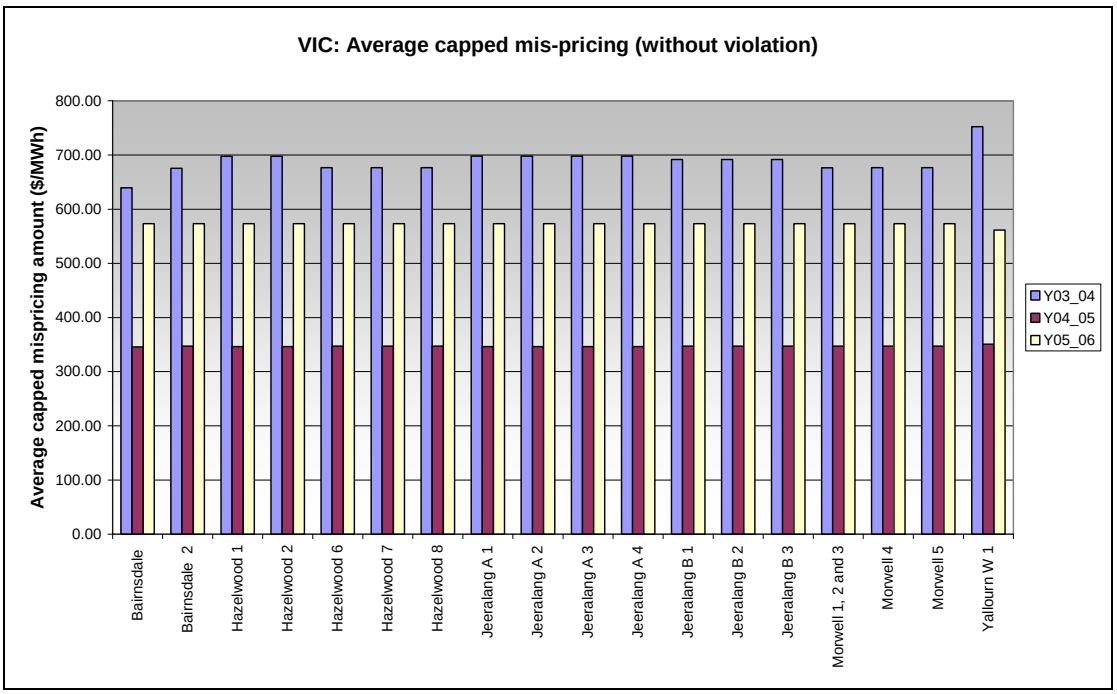
Data is also available for average capped mis pricing amount per total dispatch intervals during the study period. Please refer to Appendix A4 for the full set of data and an explanation of the calculation method.

[2] Marginal cost of a constraint is the change in the NEMDE objective function when the constraint RHS changed by 1 unit.

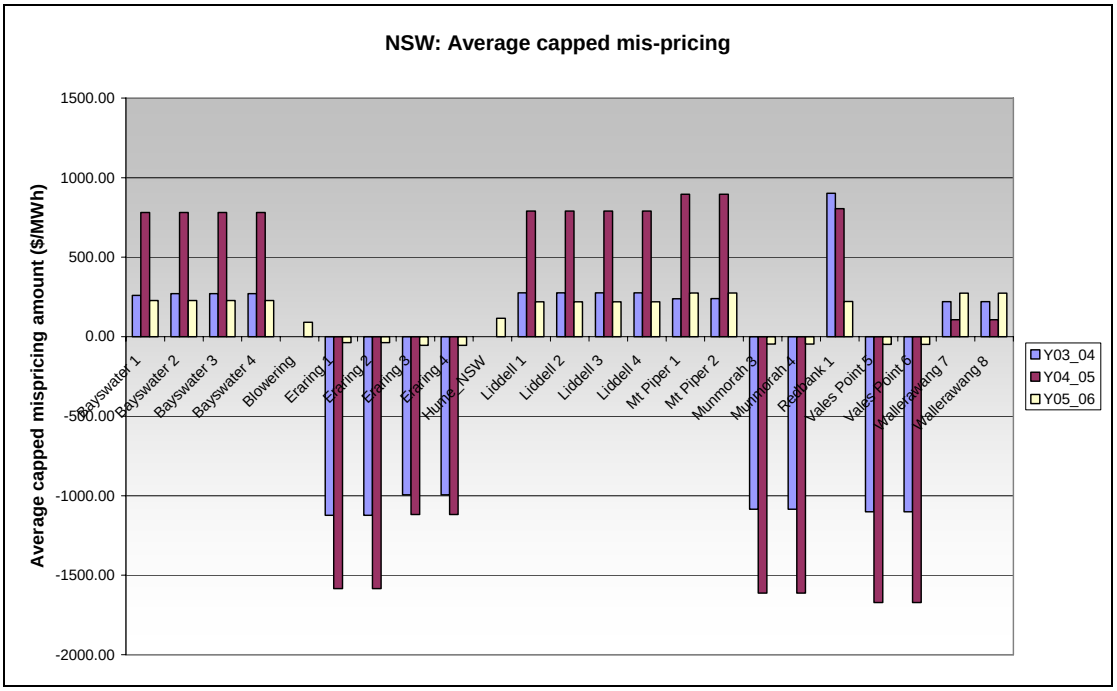
[3] Standard deviation for a population sample which gives a measure of the spread of amount of mis-pricing (MS Access function stdev() was used for this calculation, please refer to the manual for details).

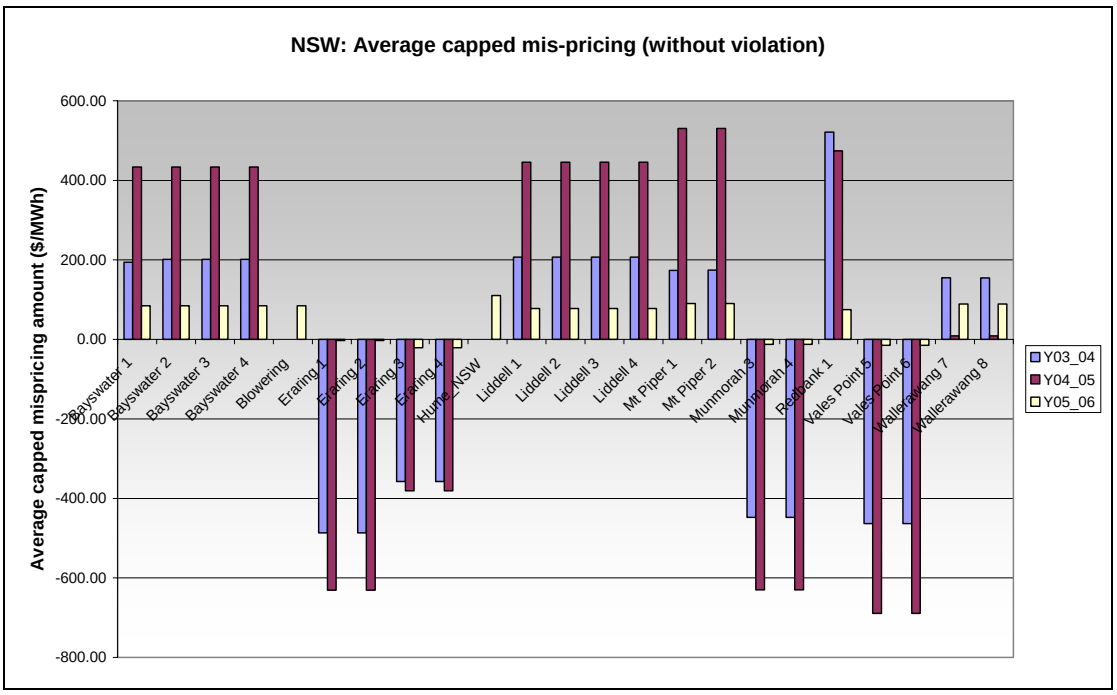
3.2.1. VIC region



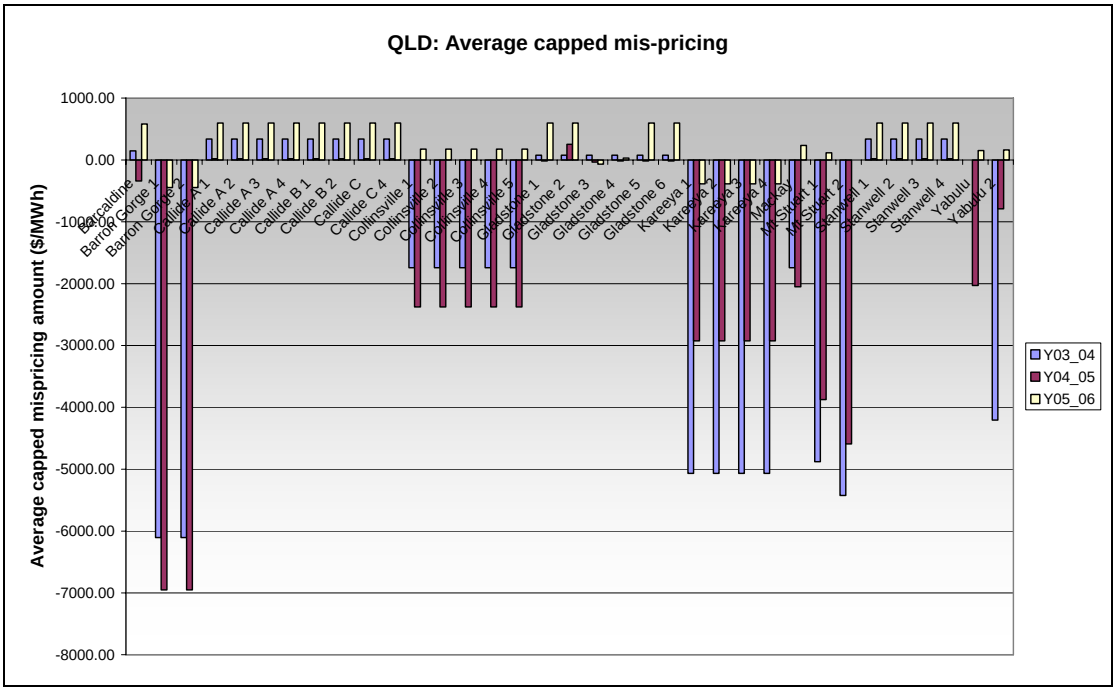


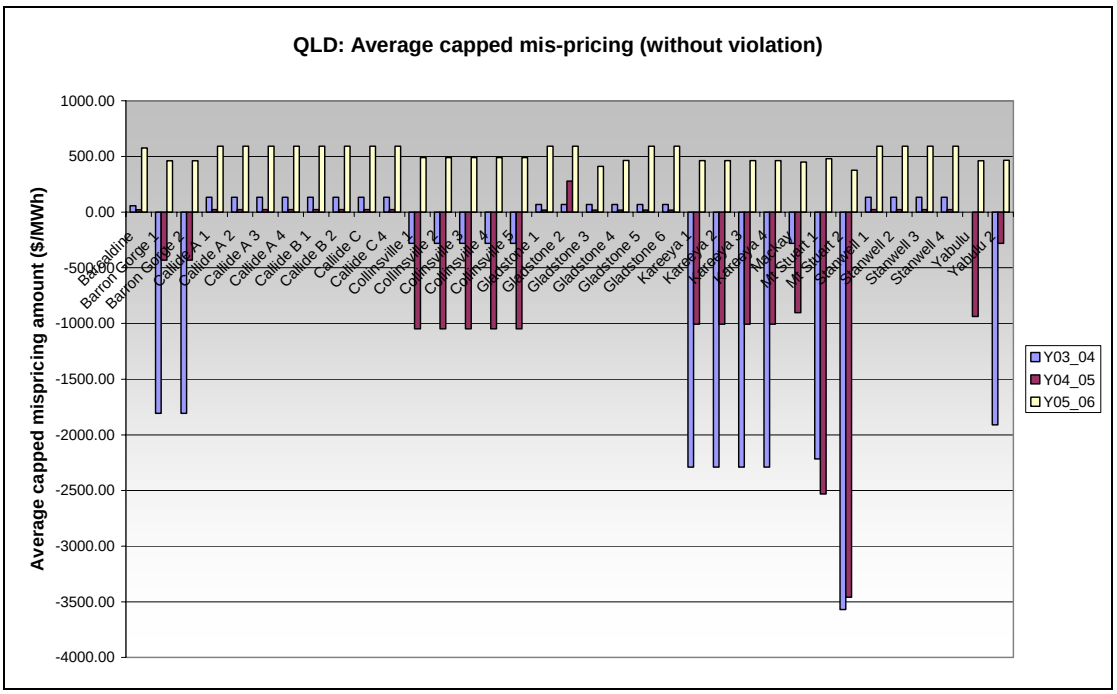
3.2.2. NSW region



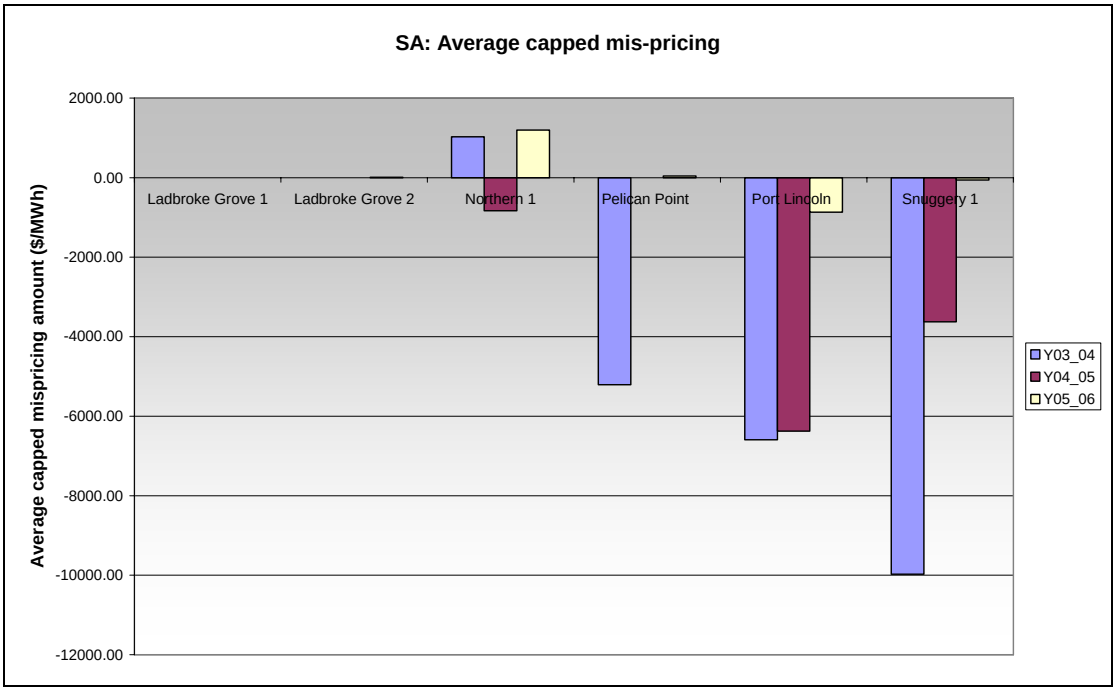


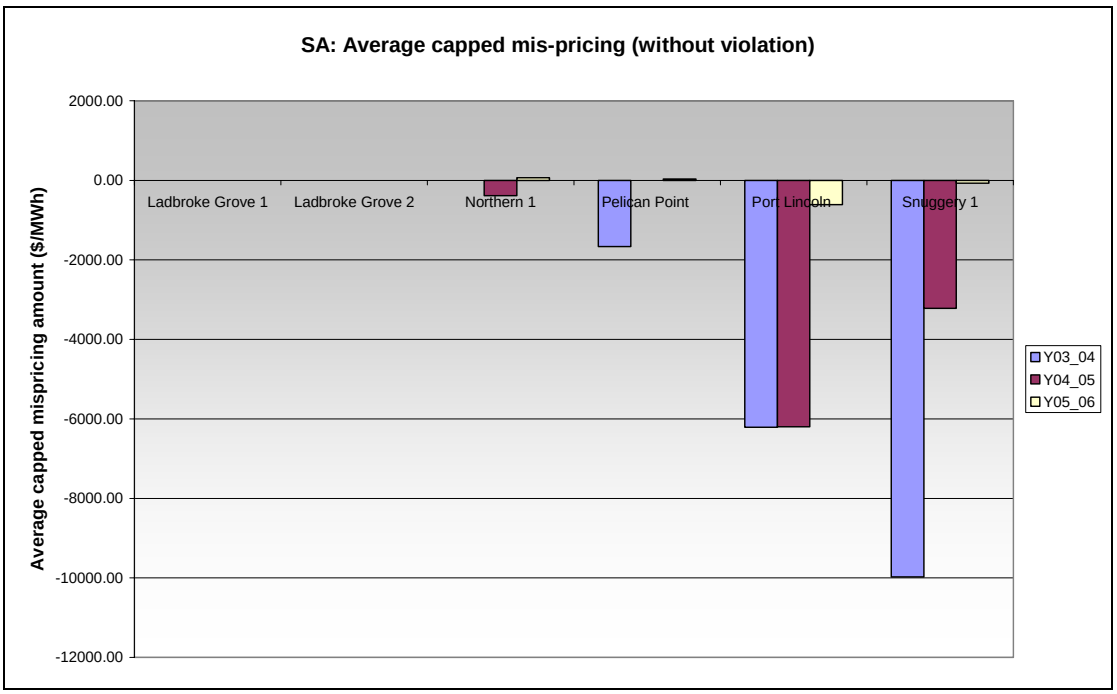
3.2.3. QLD region



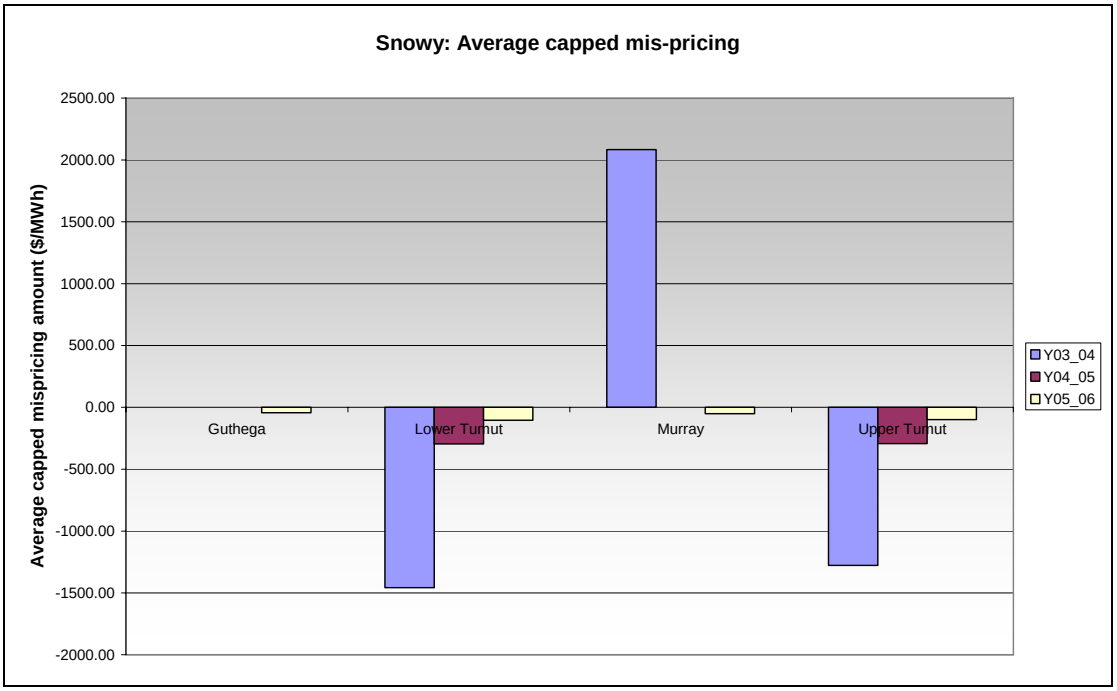


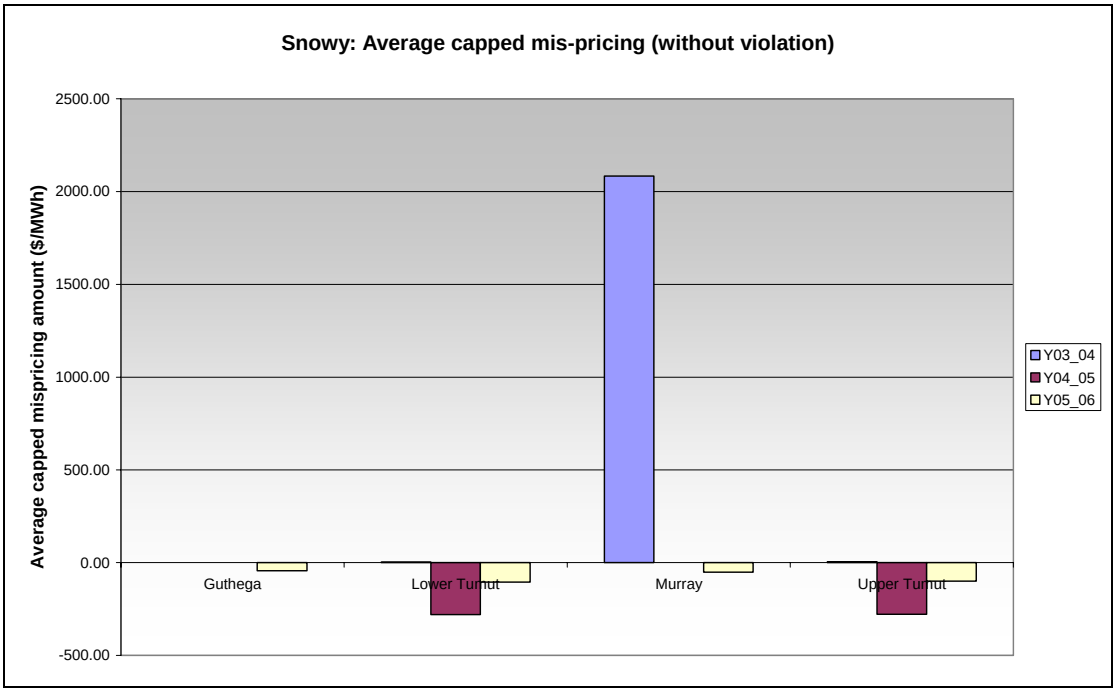
3.2.4. SA region



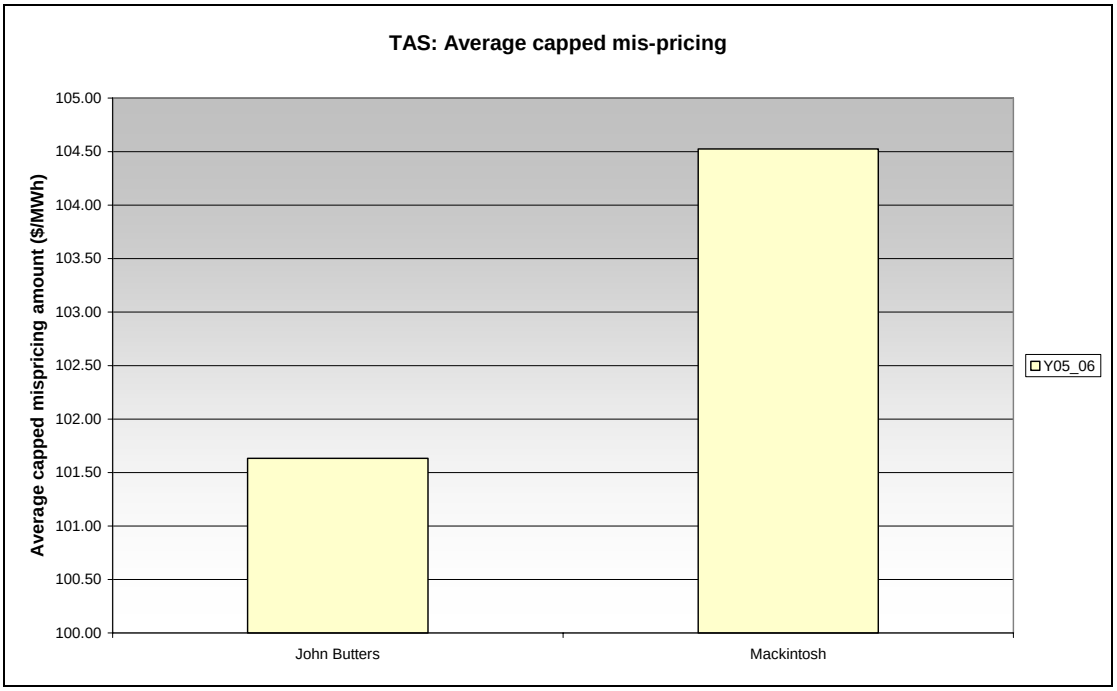


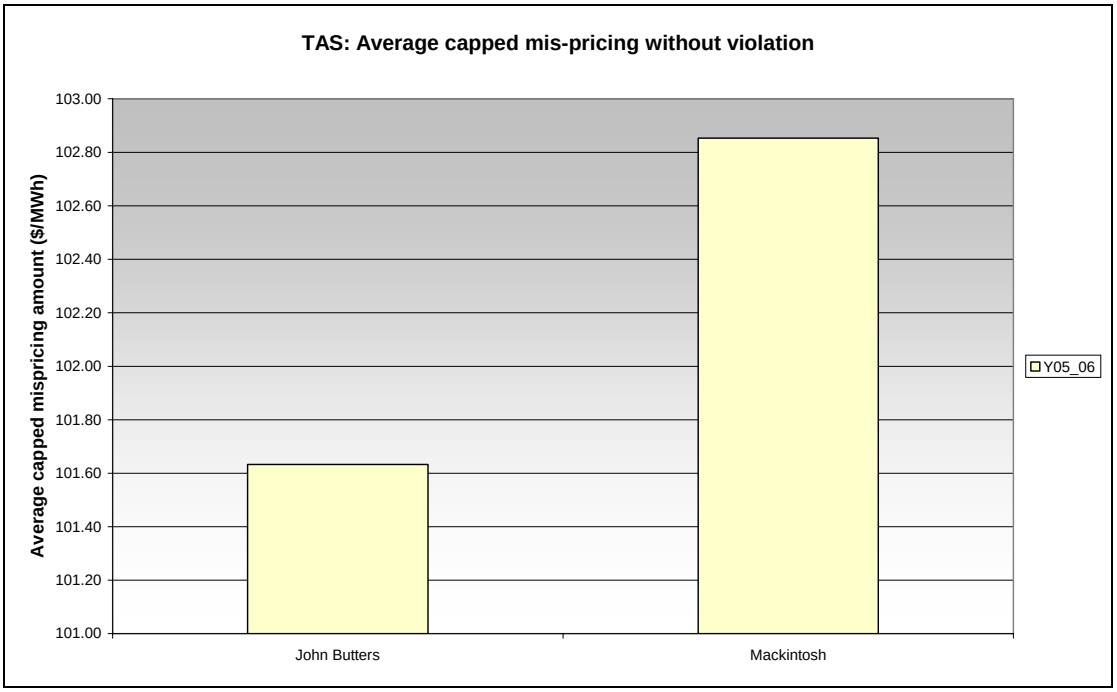
3.2.5. Snowy region





3.2.6. TAS region



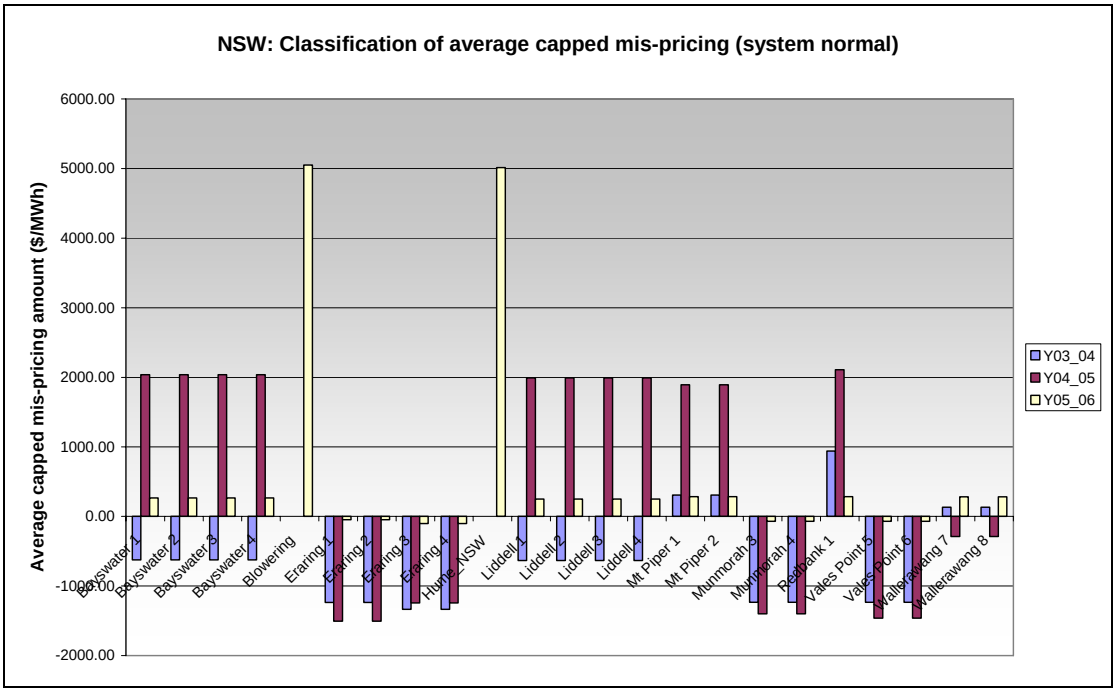


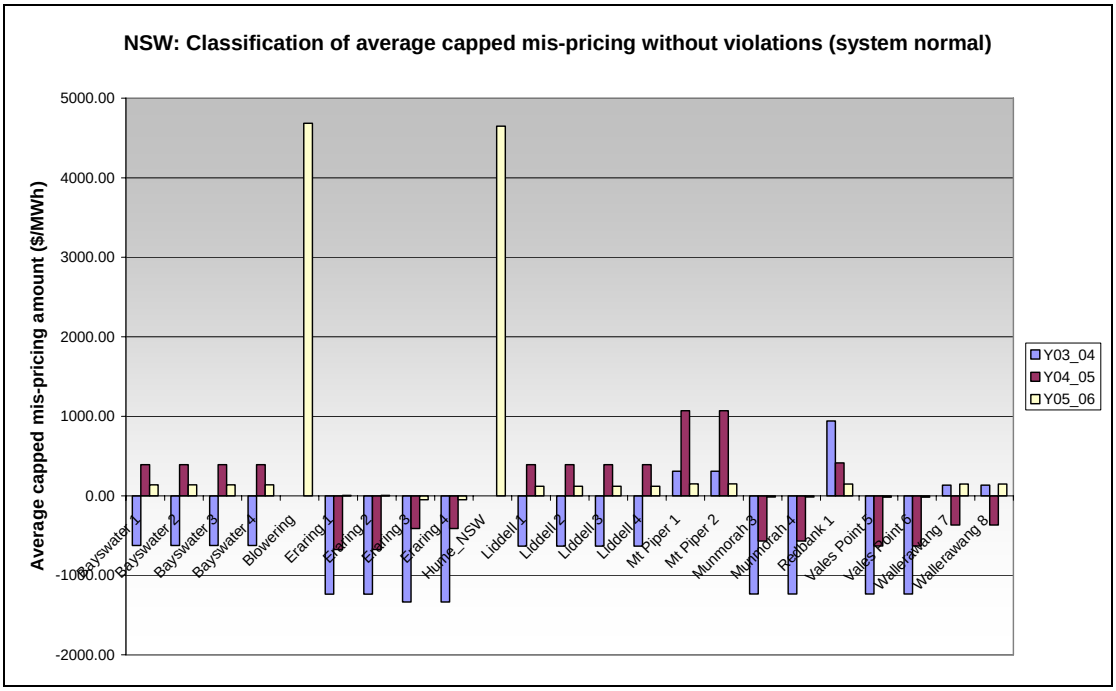
3.3 Classification of average capped mis-pricing amount (in $/MWh) into system normal and outage events

In addition to the results obtained in section 3.2, AEMC has requested to further classify the average capped mis-pricing amount into either system normal or network outage categories for NSW and QLD regions. Definition of each system event is explained in section 4. Similar to section 3.2, there are two sets of figures for each event classification: First figure shows mis-pricing due to violated constraints; and the second figure shows mis-pricing after removing the violated constraints.

Please refer to Appendix A5 for the full set of data and their respective standard deviation.

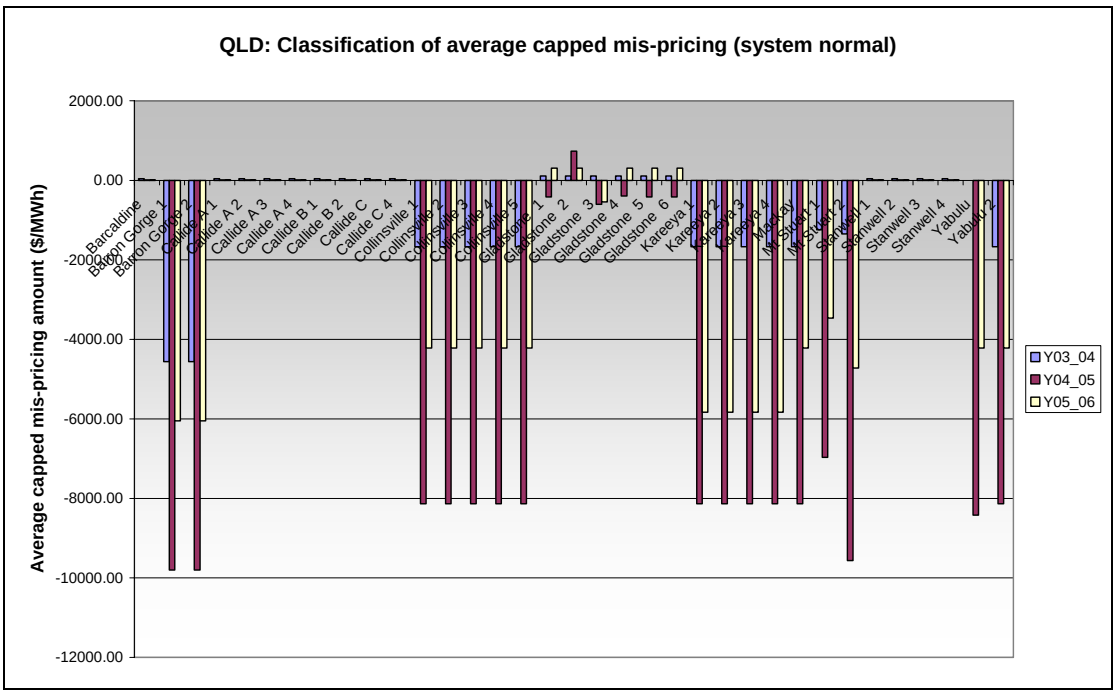
3.3.1. NSW region: System normal

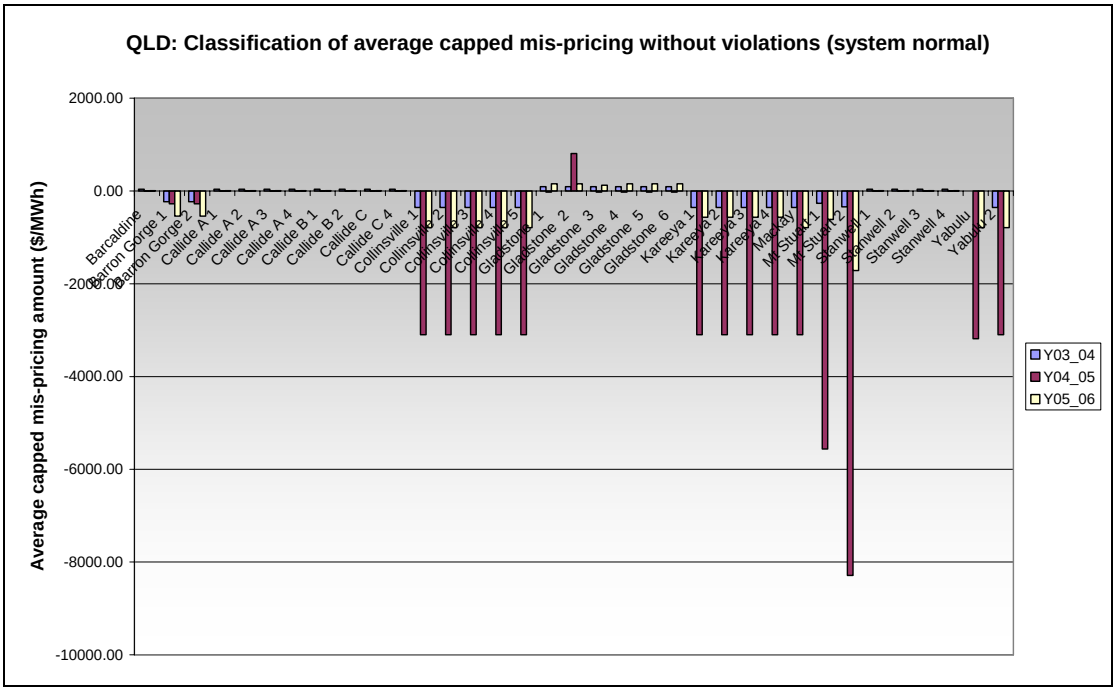




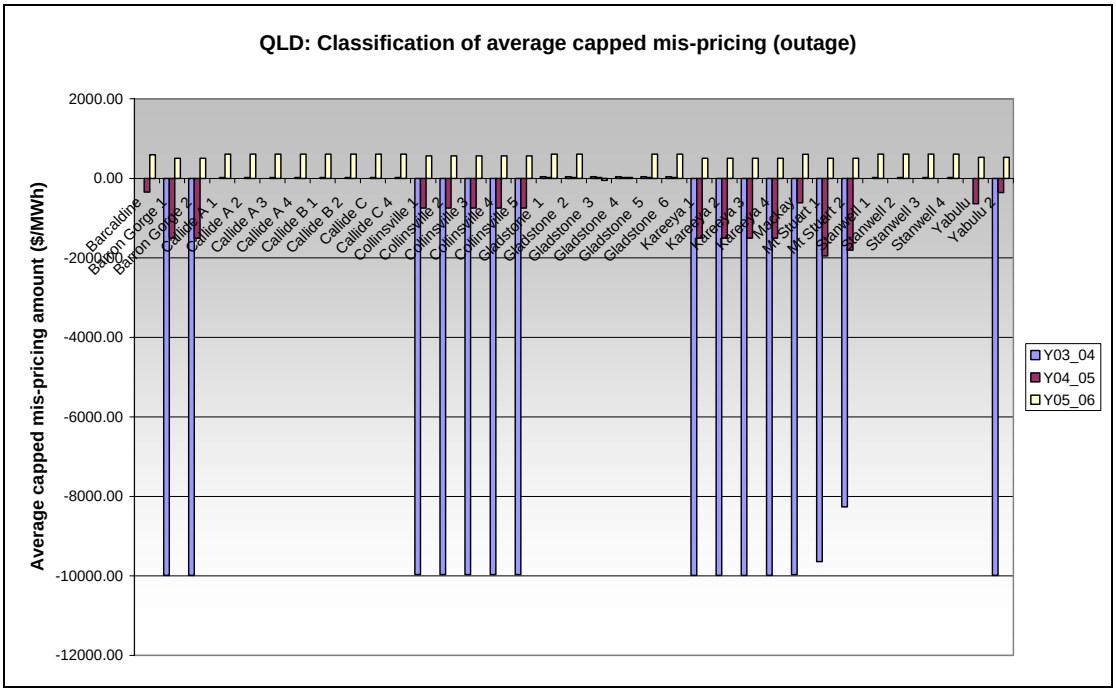
3.3.2. NSW region: Outage

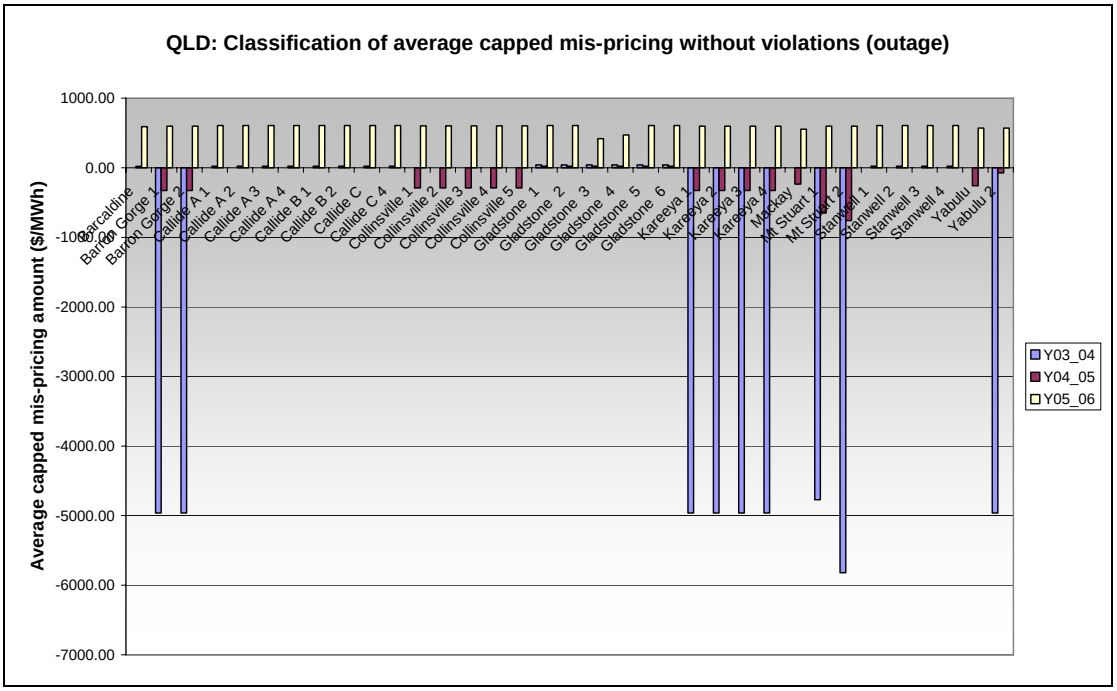
3.3.3. QLD region: System normal





3.3.4. QLD region: Outage





NSW and QLD connection points experienced more negative average capped mis-pricing during outage events as compared to system normal events.

4. Classification of mis-pricing between transmission outages and system normal events

In this section, mis-pricing is classified according to the power system conditions.

Assumptions and definitions

Normal: These are mis-pricing events when a generator is constrained by a constraint classified as “system normal constraint”. These constraints belong to a system normal constraint set. System normal constraints are always applied in NEMDE. They protect the system for contingencies assuming that all transmission elements are available in the base case.

Outage: These are mis-pricing events when a generator is constrained by a constraint classified as “network outage constraint”. These constraints belong to a one of the transmission element outage constraint sets. Outage constraints are constraints specifically applied to manage contingencies during a transmission element outage in the base case.

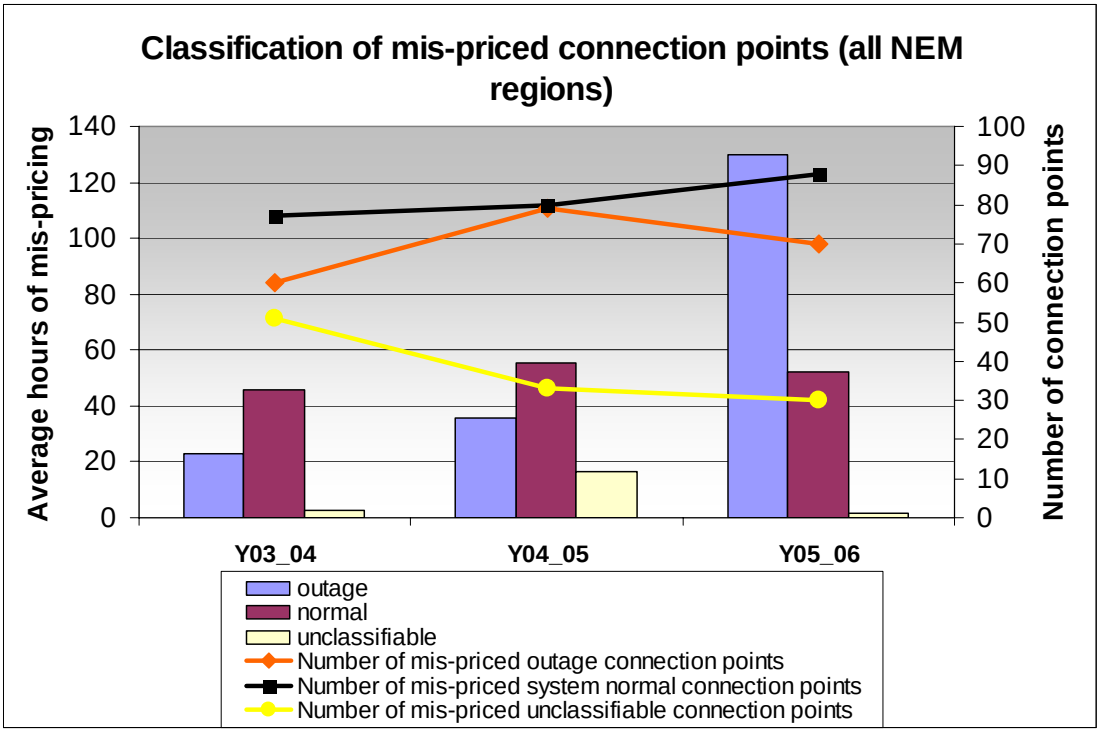
Unclassifiable: These are mis-pricing events where there is no direct method to identify the cause of the constraint. Some discretionary constraints come under this category. Some of the constraints controlling transfer across a corridor can also be in this category since the reason for changing the transfer limit can not be established by the information stored in NEM databases.

Appendix B1 lists the description for each of the unclassifiable constraints.

Note: Most unclassifiable constraints in QLD and SA reasons had been identified by going through the text fields in system logs.

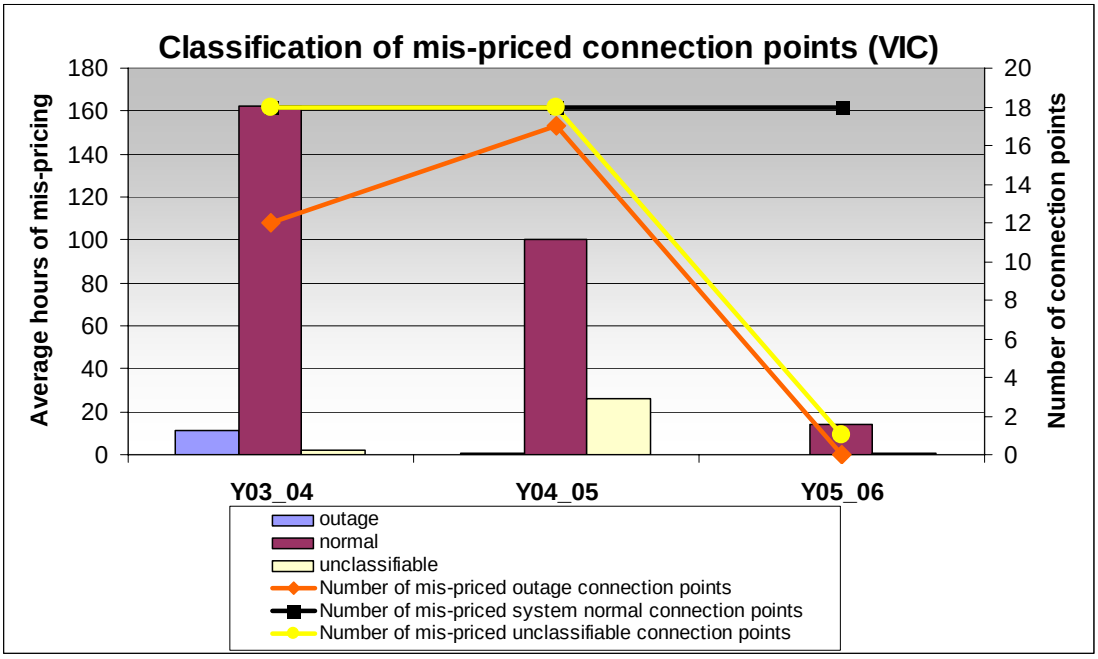
Please refer to the Appendix B2 for the method used for calculating averages, and Appendix B3 for the data used to calculate the average number of hours for all regions.

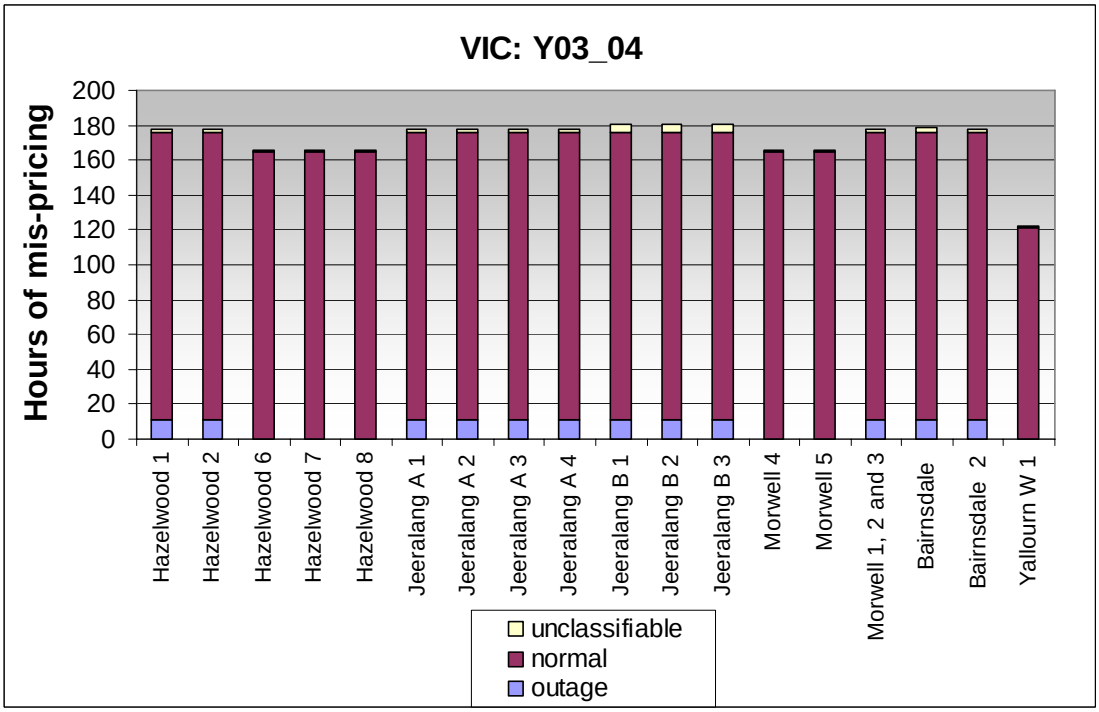
4.1 NEM regions

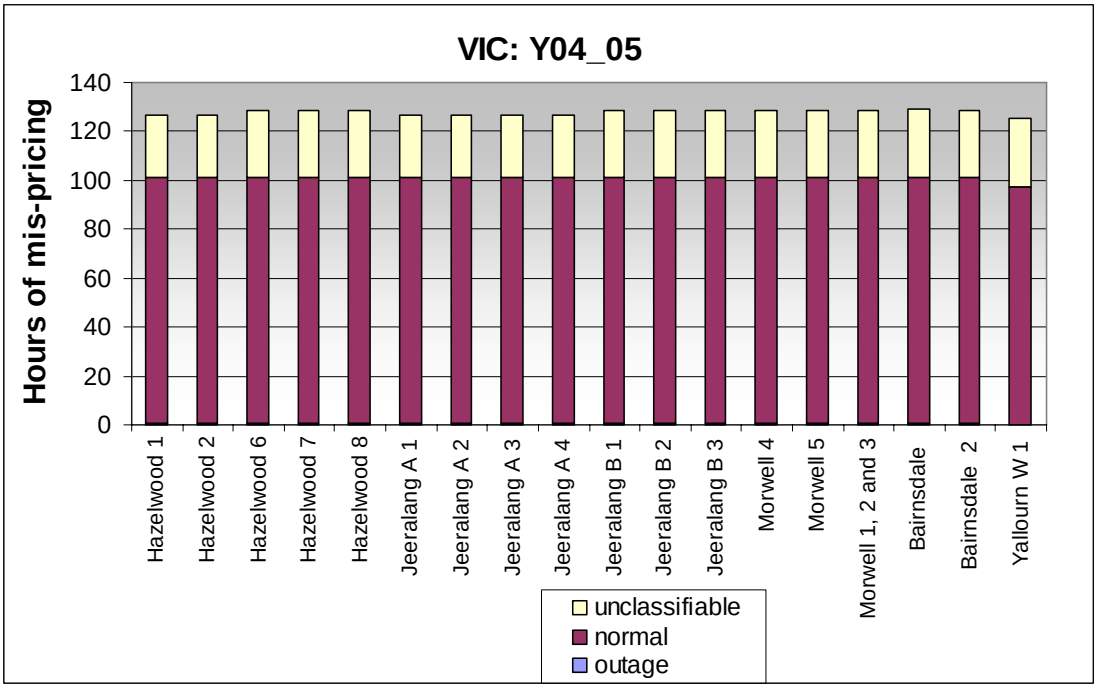


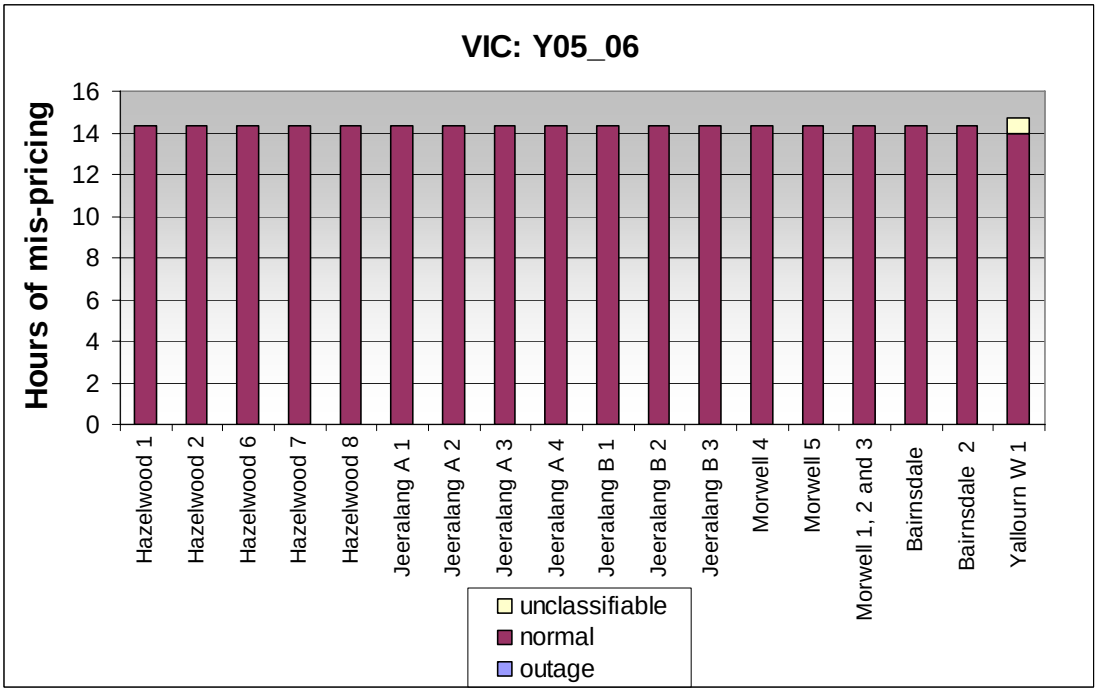
There is an increase in the number of incidences of mis-pricing due to outages over the study period.

4.2 VIC region





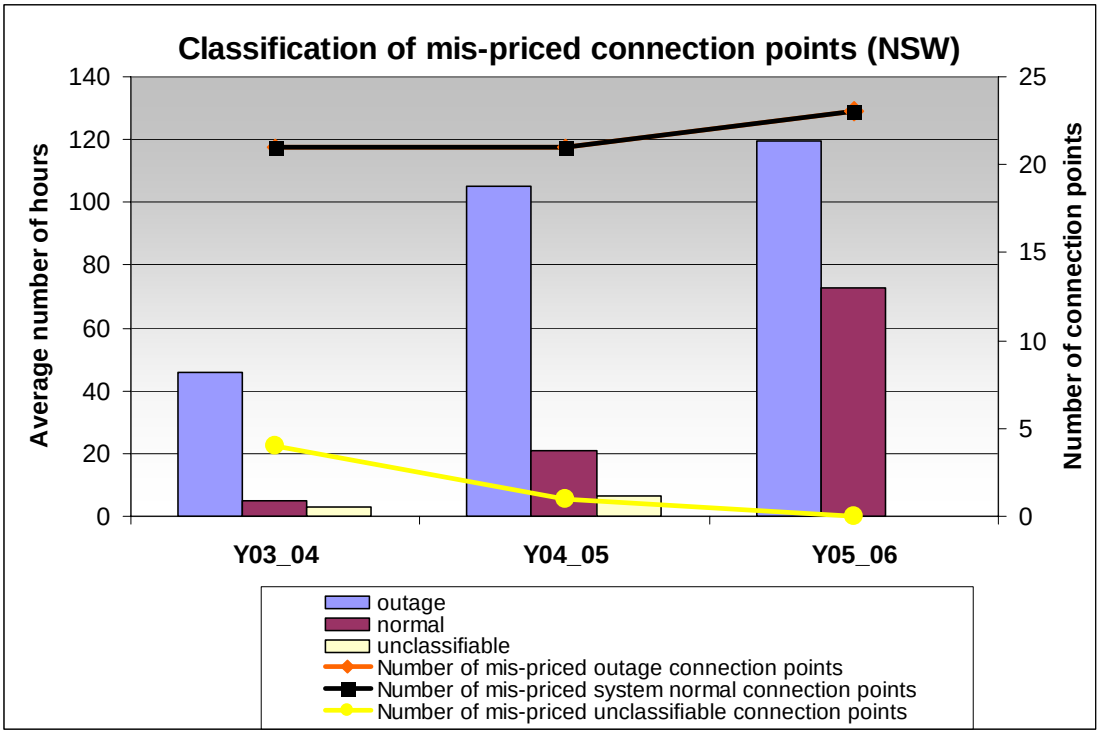


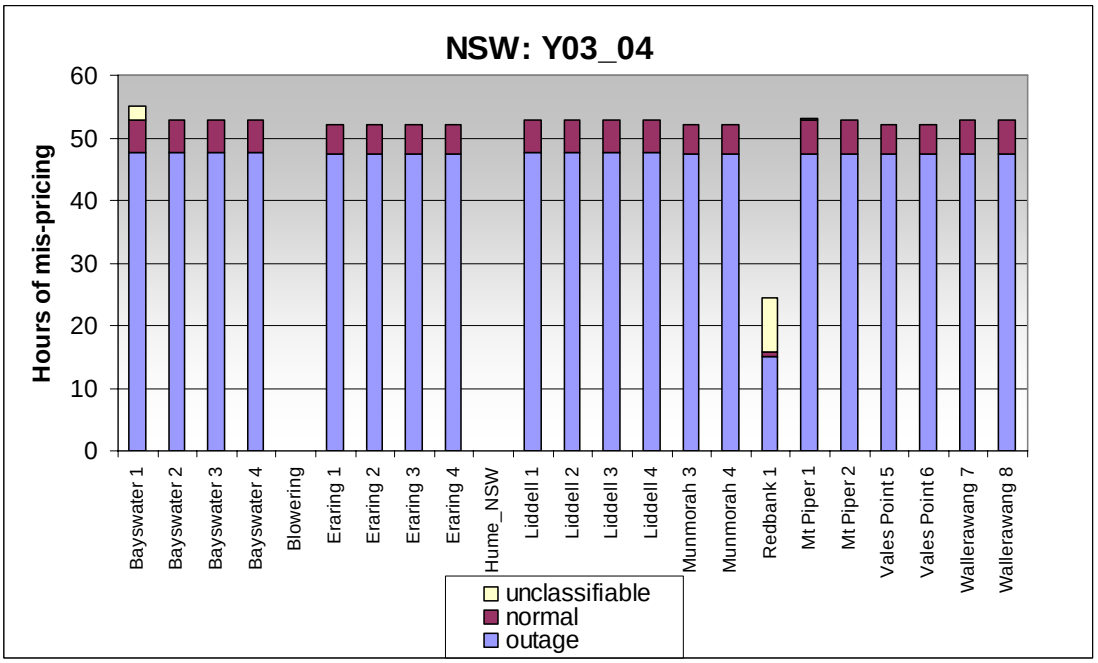


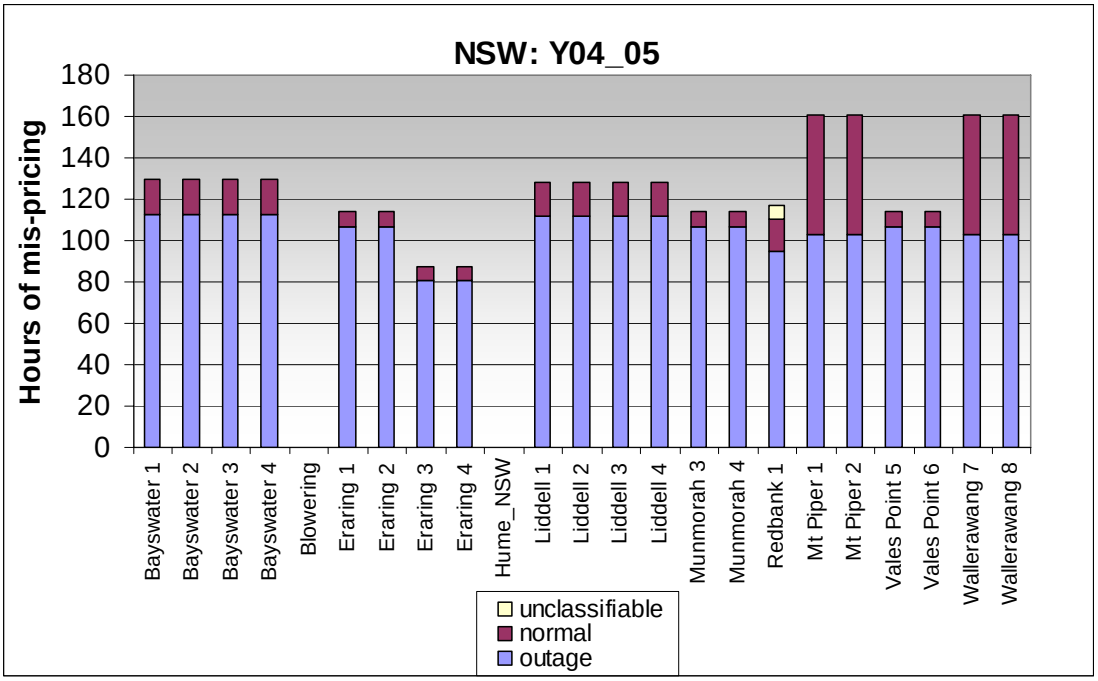
Victoria region shows a decrease in the number of incidences of mis-pricing under system normal condition. It has negligible amount of mis-pricing due to outage events.

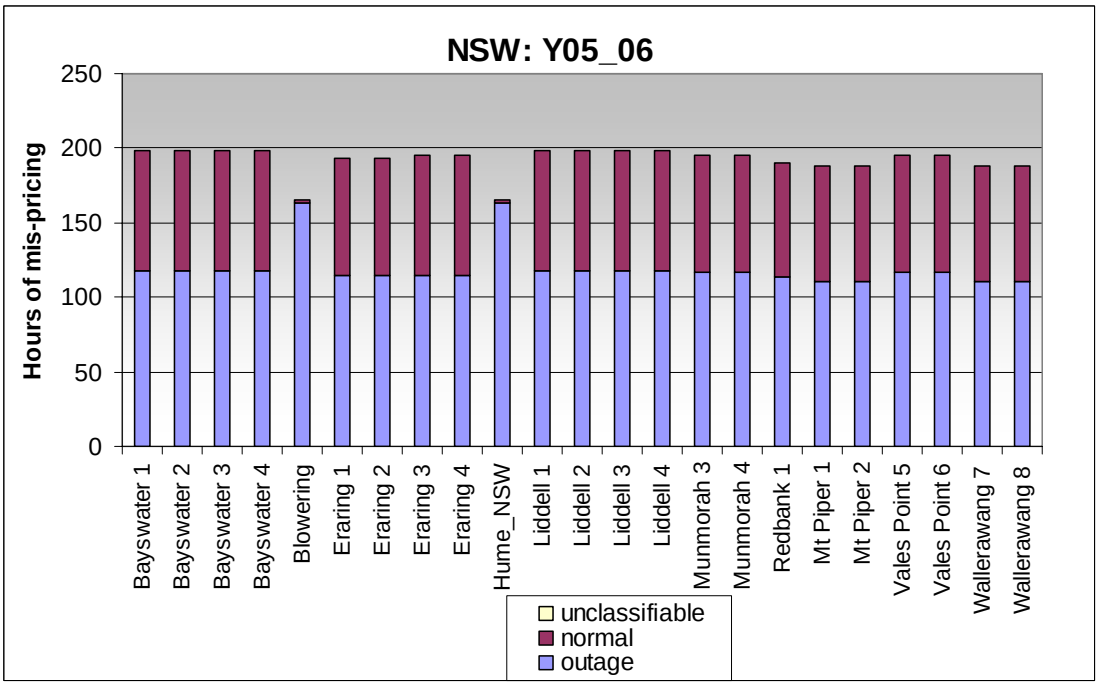
4.3 NSW region

Appendix B4 lists the annual hours binding for each outage constraint in NSW.



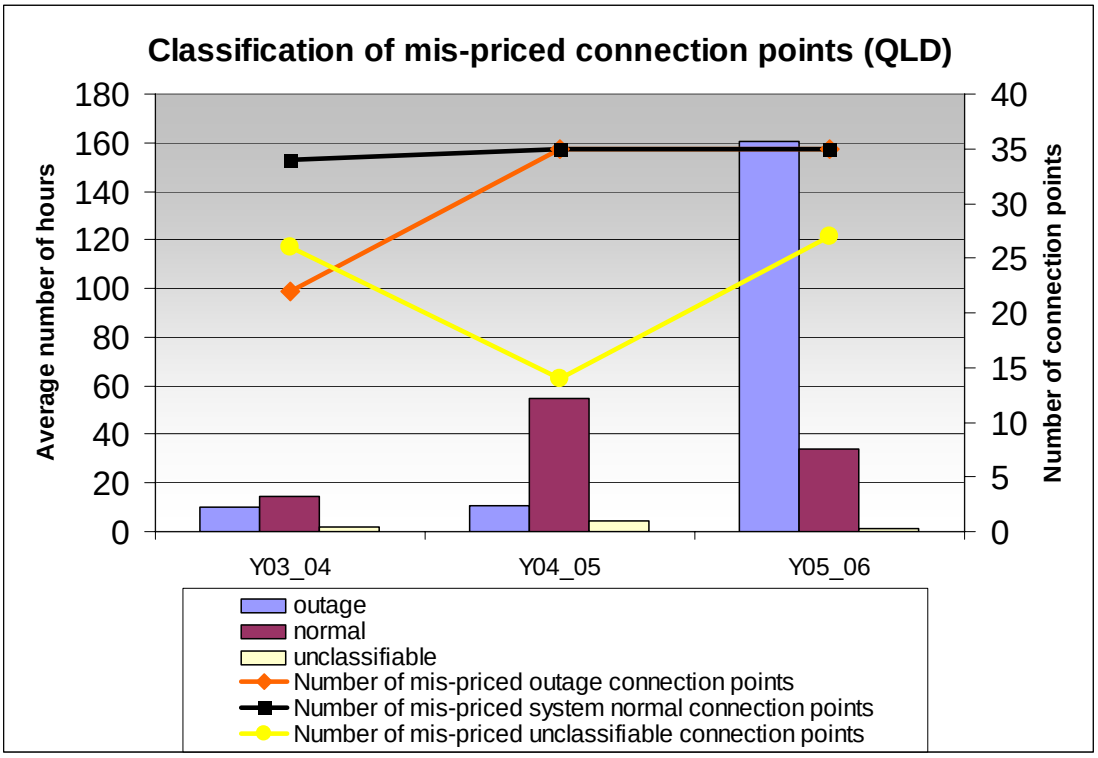




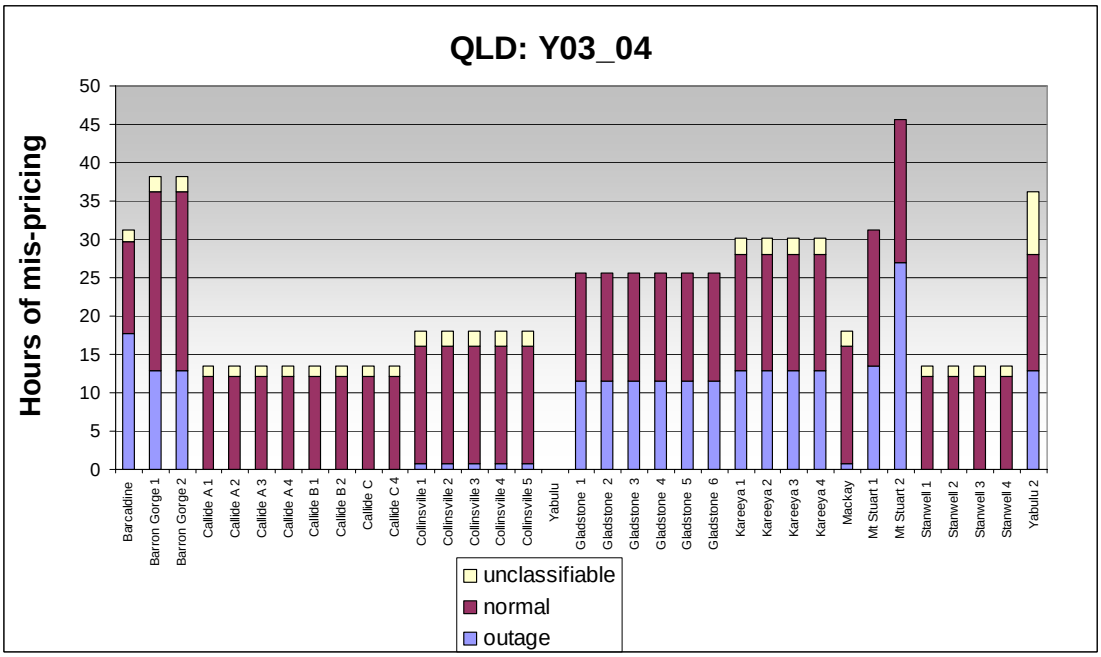


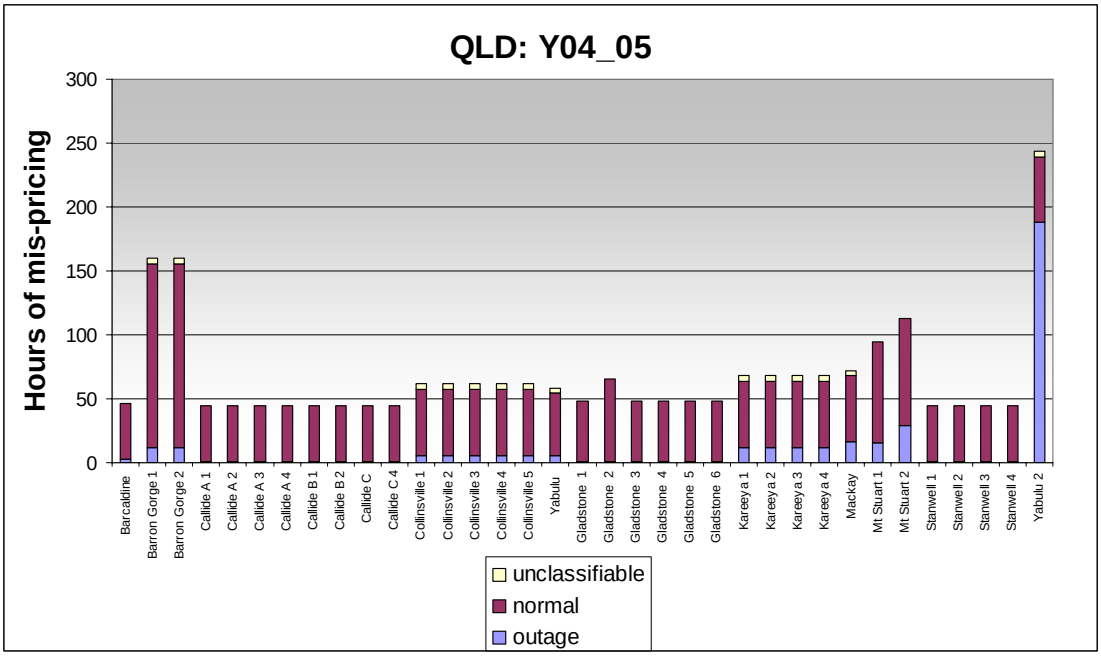
There is a steady increase in both types of mis-pricing (positive and negative) in NSW.

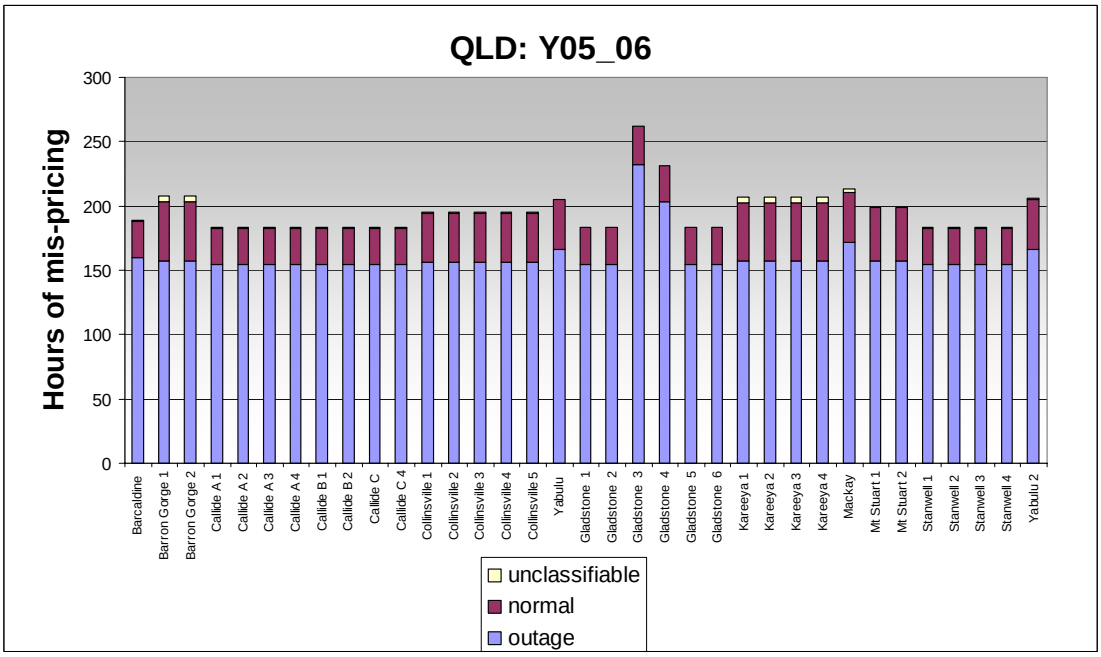
4.4 QLD region



Most of the binding Q:CN constraints were unclassifiable

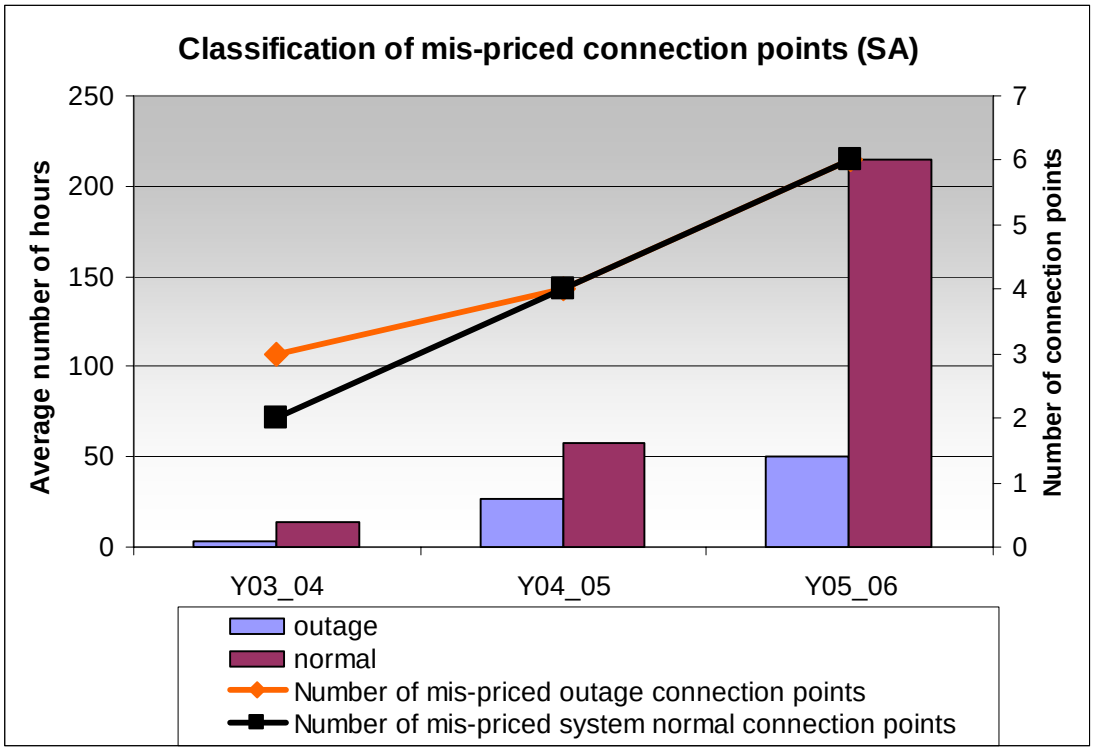




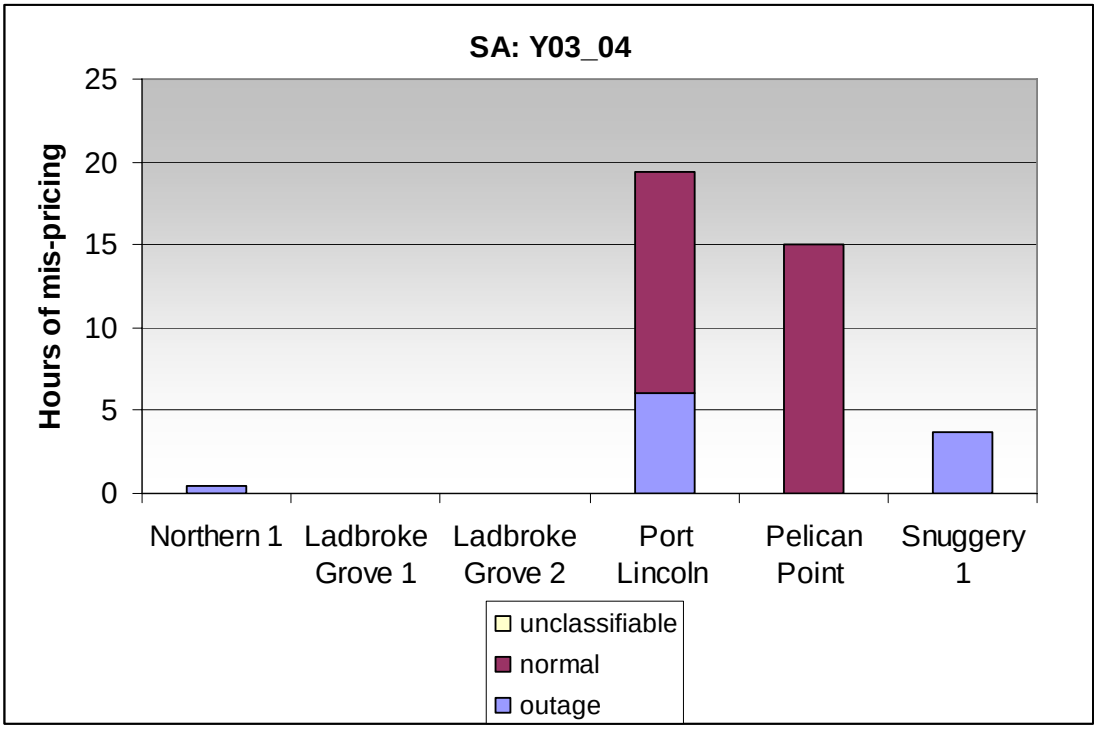


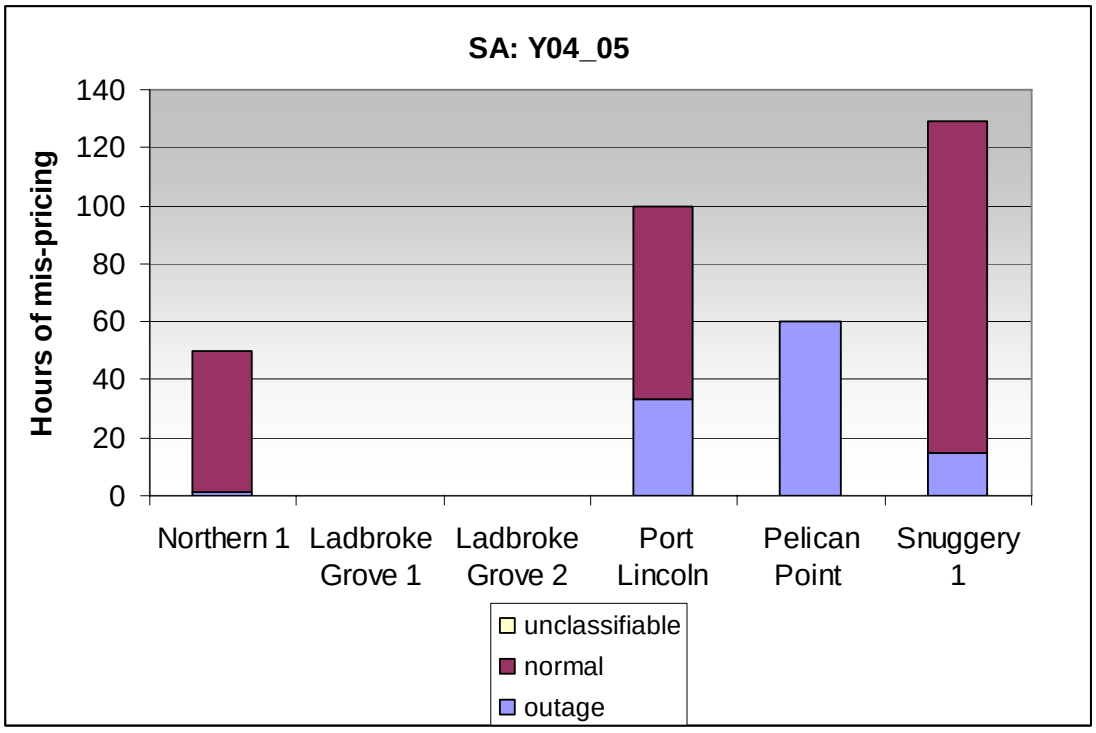
QLD also shows an increase in mis-pricing due to outage events with time.

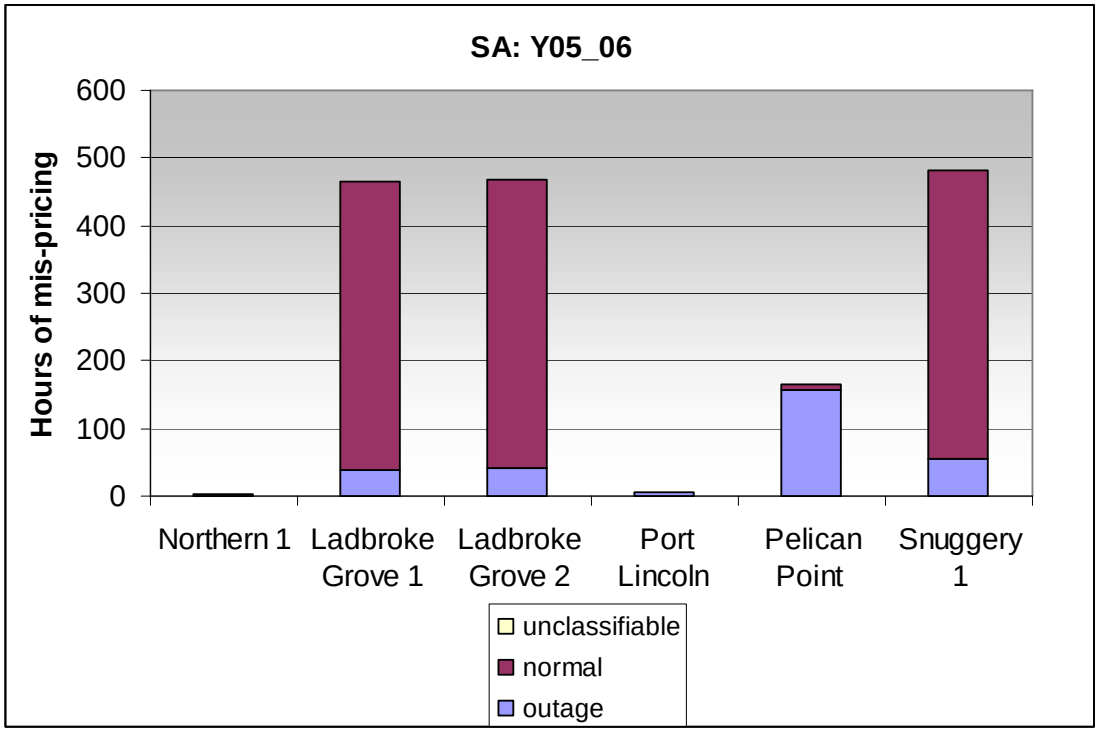
4.5 SA region



Constraint equation S^PPT340 that was binding during Y03_04 was classified as a system normal constraint.

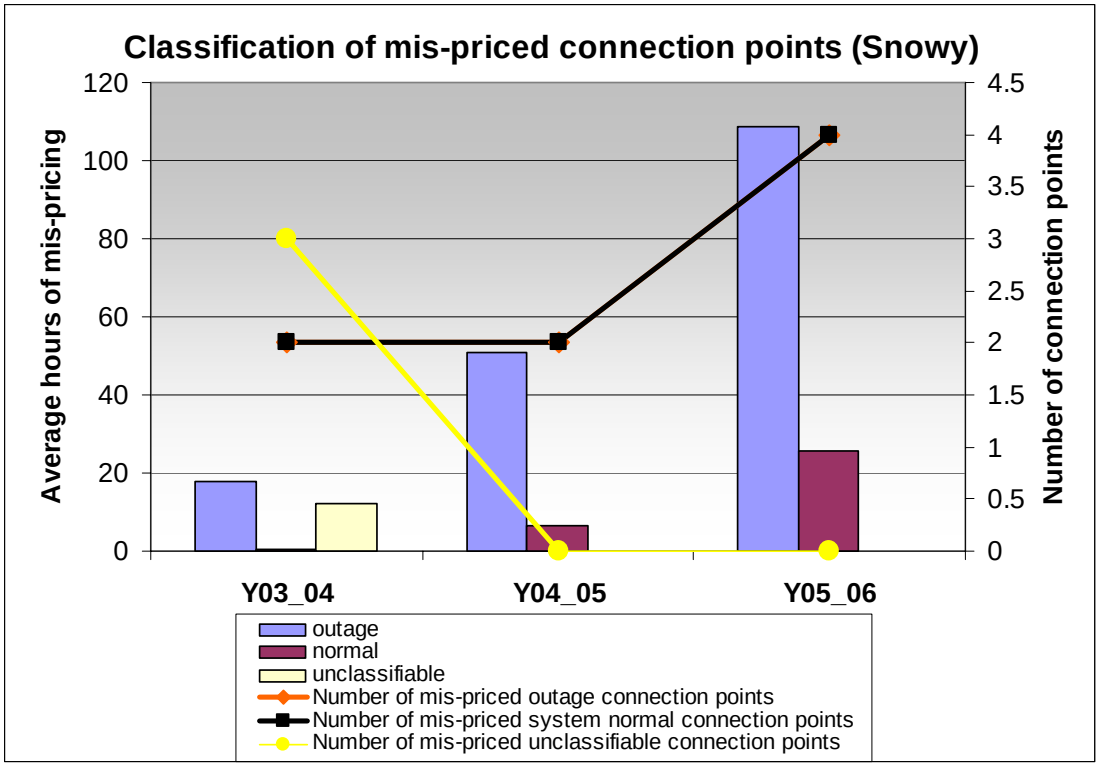


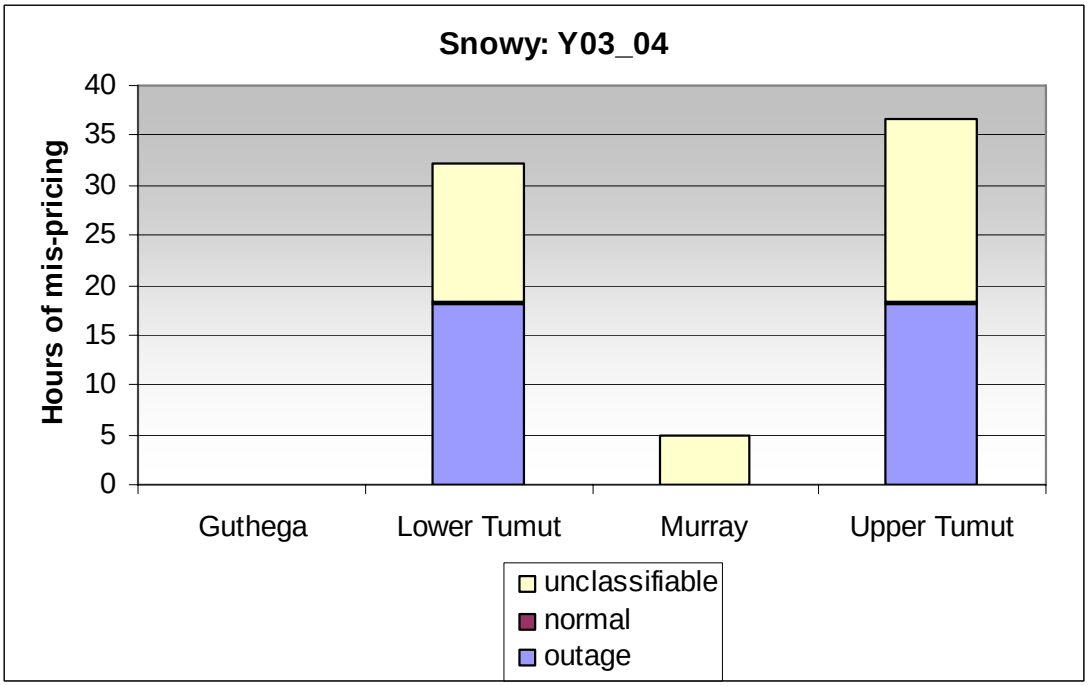


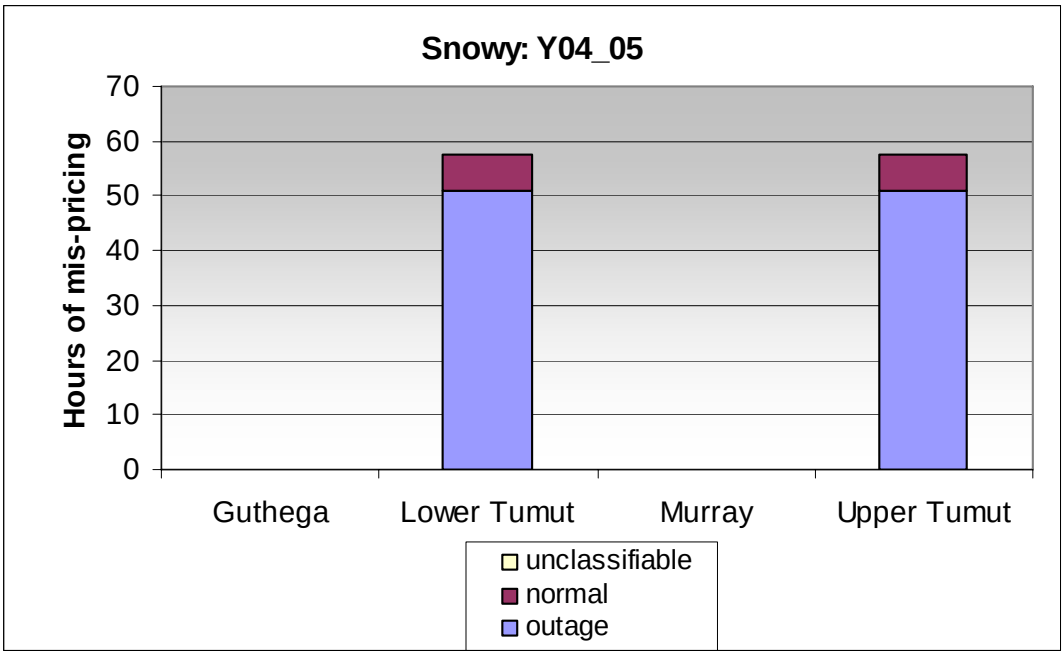


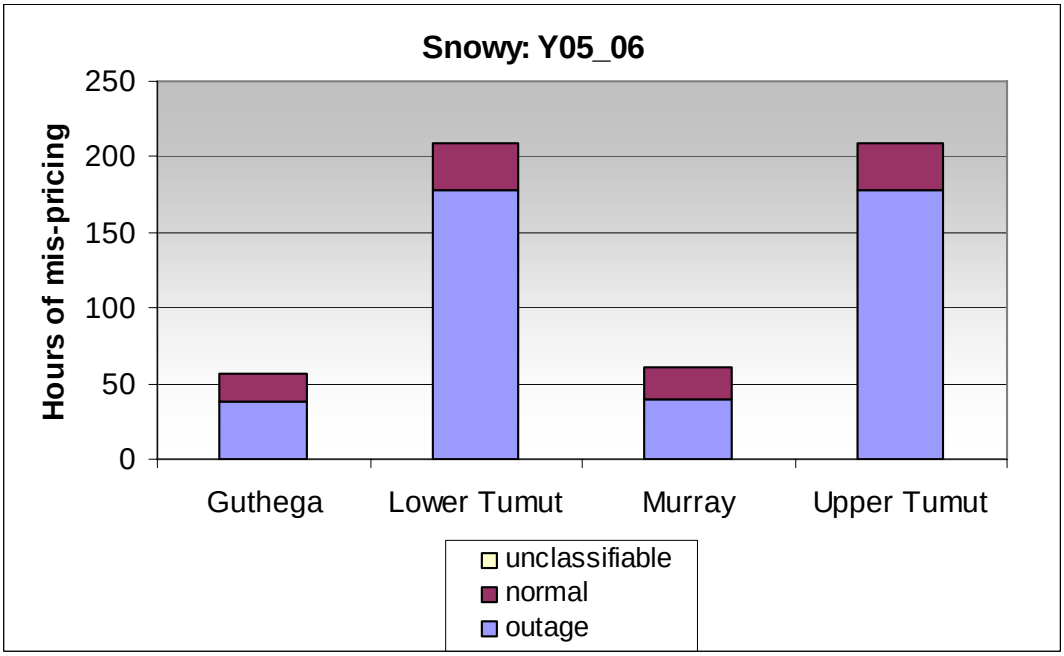
Both types of mis-pricing increased with time in SA. However, majority of the mis-pricing is under system normal conditions.

4.6 Snowy region

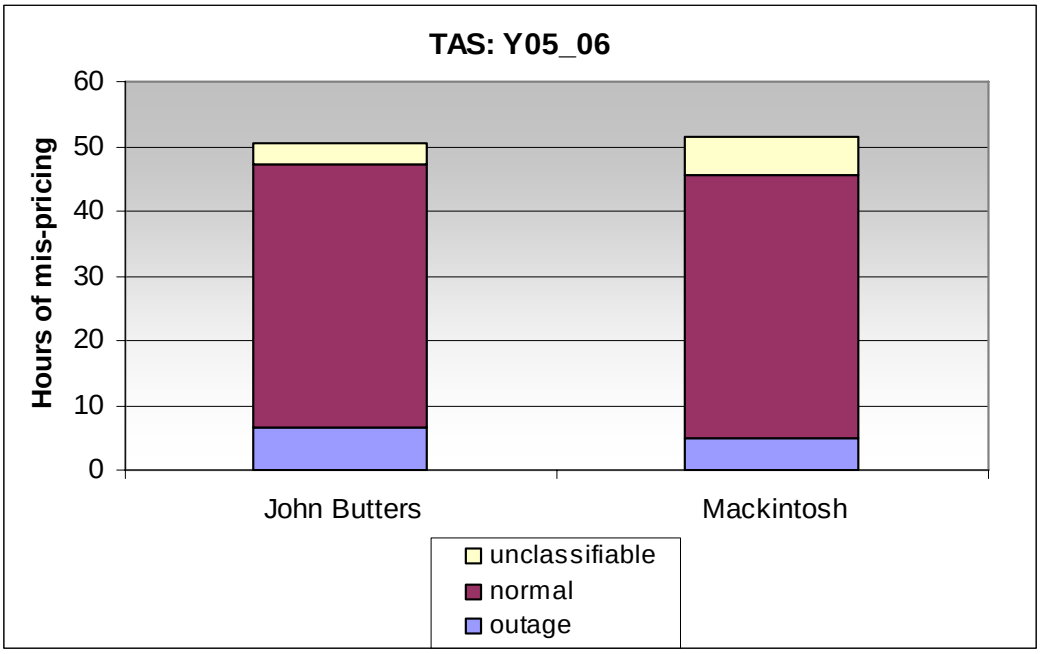





Snowy: Y04_05
Hours of mis-pricing
70
60
50
40
30
20
10
0
Guthega
Lower Tumut
Murray
Upper Tumut
unclassifiable
normal
outage


Snowy: Y05_06
Hours of mis-pricing
250
200
150
100
50
0
Guthega
Lower Tumut
Murray
Upper Tumut
unclassifiable
normal
outage

4.7 TAS region



5. Analysis of impact of constraint formulation change on mis-pricing

The following table shows the impact of formulation change on some selected constraints. There is no clear evidence to suggest correlation of formulation changes to the incidence of mis-pricing. In some situations number of binding intervals increased after moving to fully co-optimised constraint equations and in some other situations the amount decreased.

When interconnector only constraints (option 8)[4] were converted to fully co-optimised constraints (option 4), this lead to increased amount of mis-pricing. However, when intra-regional constraints (option 1)[5] were converted, the impact depends on the constraint binding statistics.

Region ID / New constraint	05/06 Binding Count	Classification	Old constraint(s)	04/05 Binding Count	Other binding count	Evaluation
NSW1						
N>>N-81_1T	1168	Outage	Q>N-81__1T N>N-81__1T	1056 713		Constraint replaced on 14/07/2005
N>>N-NIL_1N	632	System Normal	N>N-NIL_1N Q>N-NIL_1N	5 9		Constraint replaced on 6/7/2005
N>>N-NIL_1T	228	System Normal	N>N-NIL_1T Q>N-NIL_1T	65 83		Constraint replaced on 8/7/2005
N::N_LDNC_1	79	Outage	N:N_LDNC_1	107		Constraint replaced on 15/3/2006
N>>N-81_22	32	Outage	N>N-81__22	106		Constraint replaced on 14/7/2005
QLD1						
Q>>QTR_1800		Discretionary constraint	No old constraints			
SA1						
V::S_NIL	4687	System Normal	V>S_NIL	308	44 in 2nd half of 2005	Constraint replaced on 29/12/2005
V>>S_NIL	421	System Normal	V>S_NIL	308		Constraint replaced on 29/12/2005
V>>S_BNSG	403	Outage	V>S_BNSG	32	20 in 2nd half of 2005	Constraint replaced on 10/2/2006
V>>S_BNMT	52	Outage	V>S_BNMT	0	48 in year 2003/04	Constraint replaced on 10/2/2006

[4] Option 8 constraints contain only interconnector terms. The naming of these constraints will have two different regions eg. Q>N-81_1T (Queensland to New South Wales region)

[5] Option 1 constraints contain only intra-regional terms (connection points). The naming of these constraints will have a single region eg. N>N-81_1T (New South Wales region connection points)

S>>V_NIL	21	System Normal	S>V_NIL	0	36 in 2nd half of 2005	Constraint replaced on 16/1/2006
SNOWY1						
H>>H-64_B	1026	Outage	H>H-64__05			Constraint replaced on 11/11/2003
H>>H-64_J	311	Outage	None			
H>>H-64_C	239	Outage	None			
H^^V_NIL_1	233	System Normal	H^V_NIL1	88	248 up until 19/4/2006	Constraint replaced on 19/4/2006
H>>H-64_DX	216	Outage - special case for negative residues				
VIC1						
V>>V_DDTX_A	227	Outage	V>SML_DDTX		14 in Year 2003/04	Old constraint archived on 15/9/2003, new constraint available on 16/9/2004
H>>V_NIL_1A	27	System Normal	H>V_NIL_1A	0		Constraint replaced on 19/4/2006
H>>V_NIL_4A	20	System Normal	H>V_NIL_4A	0		Constraint replaced on 19/4/2006
V>>V_DDTX_C	4	Outage	V>SML_DDTX		14 in Year 2003/04	Old constraint archived on 15/9/2003, new constraint available on 16/9/2004

6. Locational Mis-Pricing

In order to better understand locational mis-pricing, the impact of binding constraints on specific generating units in various regions of the NEM has been analysed. Tasmanian generating units have not been considered because Tasmania did not join the NEM until May 2005.

6.1 Bayswater No. 1 generating unit

The total number of dispatch intervals for which constraint equations with the Bayswater No. 1 generating unit on the left hand side bound during the period 2001/02 to 2005/06 is tabled below:

Table 1

Year	2001/02	2002/03	2003/04	2004/05	2005/06
Binding dispatch intervals	1425	822	660	1555	2379

A major reason for the variations in binding dispatch intervals is the incidence of transmission element outages. Network outages tend to increase the likelihood of constraint equations binding due to the reduction in transmission capacity. Significant network outages can result in sharp increases in the incidence of constraint binding in one year compared to the next. Variations in the number of transmission outages from one year to the next can also result in large variations in binding dispatch intervals.

The percentage of the dispatch intervals in Table 1 due to transmission element outages has been tabled below:

Table 2

Year	2001/02	2002/03	2003/04	2004/05	2005/06
% of Binding dispatch intervals due to outages	60%	70%	90%	87%	59%

Network outages are managed by the Transmission Network Service Providers (TNSPs) and are mostly outside NEMMCO's control, other than providing permission to proceed. NEMMCO would normally only reject a network outage for system security reasons.

A more detailed analysis of the reason for constraint equations including the Bayswater No. 1 unit binding on a year by year basis is provided below:

2001/02

The binding dispatch intervals in the 2001/02 period were dominated by constraint equations managing the flow on the Vales Pt - Munmorah (23) line during system normal and outage conditions. The Bayswater units have positive left hand side coefficients in these equations and are therefore likely to have their output constrained off when the equations bind.

There was some binding on this line during outages in 02/03 and 03/04 as well, but no binding from then on. Other than transmission outages one of the main influences on the binding of this constraint is the output from Munmorah power station which varied as follows (average output over year):

Table 3

01/02	02/03	03/04	04/05	05/06
8 MW	58 MW	33 MW	106 MW	174 MW

The higher the output from Munmorah the less power would flow across the 23 line and the less likely it would be to bind. This is reflected in the negative left hand side coefficients for these units in the binding constraint equations. The 23 line sustained emergency rating also increased in late 2004 from 1370 MVA to 1429 MVA which would have contributed to a reduction in binding instances.

2002/03

The most prevalent binding constraint equation on the Bayswater No. 1 unit during this period was managing flow on the Eraring – Newcastle (93) line for the trip of one Eraring – Kemps 500 kV line, with the other Eraring – Kemps 500 kV line already out of service. The Bayswater units have negative left hand side coefficients in this equation and are therefore likely to have their output constrained on when the equation is binding.

The next most prevalent binding constraint was to manage loading on the Bayswater – Liddell 33 line on trip of the Bayswater – Liddell 34 line, or vice versa. This equation is most likely to bind for high Bayswater generation combined with low Liddell output. This equation was converted from an Option 1 formulation (generating units only on the LHS) to a fully co-optimised formulation (generating units plus interconnectors on the LHS) in July 2006. The Option 1 formulation bound for 2 dispatch intervals in 2003/04 and for a further 10 dispatch intervals in 2005/06.

Neither equation has bound since 2002/03 reflecting the variable impact of network outages on mis-pricing.

The remaining equations that made up the top 5 were all network outage constraint equations. Outside of 2002/03 their binding results were:

- The N>N-6__04 equation did not bind in any of the other years considered;
- The N>N-82__04 equation bound for 20 dispatch intervals in 2001/02 only; and
- The N>N-22__03 equation bound for 50 dispatch intervals in 2001/02 and for 120 dispatch intervals in 2003/04 only. As mentioned previously increasing output from Munmorah power station and uprating of the 23 line in 2004 helped ensure there were no binding instances after 2003/04.

2003/04 – 2005/06

Between 2003/04 and 2005/06 most of the constraint equations binding on Bayswater power station were managing flow on the Liddell – Tomago 82 line, and to a lesser extent the Liddell – Newcastle 81 line. The majority of these binding dispatch intervals occurred during network outages. The main drivers in

this case were increasing flow on the Queensland – NSW Interconnector (QNI) towards NSW and increasing output from Liddell power station. The average annual values for these quantities are tabled below:

Table 4

Year	QNI flow	Liddell output
2001/02	-177 MW	900 MW
2002/03	-266 MW	877 MW
2003/04	-438 MW	1055 MW
2004/05	-510 MW	1160 MW
2005/06	-619 MW	1192 MW

It is difficult to assess whether the increasing trend in binding dispatch intervals observed between 2003/04 and 2005/06 will continue as this is dependent on:

- Output from NSW generators;
- Flow on QNI which is dependent on generation and demand in Queensland and NSW. The commissioning of Kogan Creek in April 2007 will tend to increase flows towards NSW, while the impact of the drought on Queensland generators will tend to reduce flows in that direction
- Changes to the ratings of transmission lines. The 82 line rating was increased by 170 MVA in December 2006. Any increase in rating will tend to reduce the incidence of binding.

6.2 Hazelwood No. 3 generating unit

The total number of dispatch intervals for which constraint equations with the Hazelwood No. 3 generating unit on the left hand side bound during the period 2001/02 to 2005/06 is tabled below:

Table 5

Year	2001/02	2002/03	2003/04	2004/05	2005/06
Binding dispatch intervals	0	0	12	215	1103

There were no binding constraints on the Hazelwood No. 3 unit in 2001/02 or 2002/03.

In 2003/04 there were 12 binding dispatch intervals due to the V>D4500_LV and V>D4750_LV constraint equations. These equations were invoked during a bushfire that caused the Hazelwood – South Morang No. 2 500 kV line to trip and remain open for almost 6 hours. The equations ensured flow on the remaining Hazelwood – South Morang 500 kV line would remain within rating for trip of a Hazelwood – South Morang 500 kV lines while the bushfire was burning in the vicinity of the No. 1 line.

In 2004/05 a number of discretionary constraint equations of the form V_LV5_XXXX bound for 215 dispatch intervals, where XXXX represents the maximum permissible output from generation connected to the 500 kV network

between the Latrobe Valley and Melbourne metropolitan area and varied between 4900 and 5150 MW. The equations were invoked during periods when NEMMCO's on-line transient stability analysis tool (DSA) was detecting a security issue. This issue was resolved by retuning the constraint equations that managed Victorian export flows. The situation was further improved by the commissioning of the fourth 500 kV line between the Latrobe Valley and Melbourne metropolitan area in August 2005.

In 2005/06 the V>V_NIL_4 constraint equation was the only one to bind on the Hazelwood No. 3 generating unit. This equation limits output from the Hazelwood No. 3, 4 and 5 generating units to ensure pre-contingent flow on the Hazelwood terminal station No. 1 500/220 kV transformer does not exceed its continuous rating. The constraint equation bound for 1103 dispatch intervals in 2005/06 and for 1208 dispatch intervals during the period 1 July 2006 to 31 May 2007.

VENCorp is planning a reconfiguration of the Hazelwood power station buses in late 2008. Following completion of this work the Hazelwood No. 3, 4 and 5 generating units will have two paths to flow through and their output should no longer need to be constrained by the rating of the Hazelwood terminal station No. 1 500/220 kV transformer.

6.3 Ladbroke Grove generating units

These units are located in southeast SA, close to the Victoria – SA interconnector and the Lake Bonney and Canunda wind farms. The total number of dispatch intervals for which constraint equations with one or both of the Ladbroke Grove generating units on the left hand side bound during the period 2001/02 to 2005/06 is tabled below:

Table 6

Year	2001/02	2002/03	2003/04	2004/05	2005/06
Binding dispatch intervals	91	22	0	0	5584

In 2001/02 and 2002/03 the #Ladbrok1 constraint equation was invoked and bound while managing non-conformance issues associated with the Ladbroke Grove units.

No constraint equations bound on the Ladbroke Grove units during 2003/04 and 2004/05.

In 2005/06 a number of the constraint equations with only the Vic – SA interconnector term on the left hand side were converted to fully co-optimised formulations which have both interconnector and generating unit terms on the left hand side.

The V>S_NIL constraint equation was updated to a fully co-optimised formulation (V>>S_NIL) in December 2005. The V>S_NIL equation bound for 308 dispatch intervals in 2004/05 and 45 dispatch intervals in 2005/06 prior to reformulation. Because this equation only had the Vic – SA term on the left hand side these binding intervals did not result in mis-pricing at Ladbroke Grove.

Between December 2005 and late January 2006 the V>>S_NIL equation bound for 421 dispatch intervals. The limit equation provided by the TNSP incorporated a number of managed line/contingency events and also assumed summer ratings.

Due to the large increase in binding dispatch intervals following implementation, NEMMCO replaced the V>>S_NIL equation with a number of separate fully co-optimised equations for each managed line/contingency pair. This reduced the instances of binding with the separate equations binding for 900 dispatch intervals during the remainder of the financial year. Some 476 (53%) of these binding intervals were due to network outages.

The V::S_NIL fully co-optimised stability constraint equation was invoked for the first time in December 2005. This equation bound for 4687 dispatch intervals in 2005/06, but has only bound for 835 dispatch intervals so far in 2006/07. A contributing factor to this decrease in binding intervals is the reduction in average Victoria to SA transfer from 267 MW in 2005/06 to 126 MW so far in 2006/07.

6.4 Gladstone

The total number of dispatch intervals along with the percentage due to outages for constraint equations with the Gladstone generating units on the left hand side bound during the period 2001/02 to 2005/06 is tabled below:

Table 7

Year	2001/02	2002/03	2003/04	2004/05	2005/06
Binding dispatch intervals	1790	315	308	581	3140
% of Binding dispatch intervals due to outages	8.9%	66.3%	46.1%	0.0%	55.9%

Overall there is no pattern of increasing or decreasing binding due to outages. Looking at the percentage of time binding on the cutset flows:

Table 8

Year	2001/02	2002/03	2003/04	2004/05	2005/06
% Central - South cutset	82.6%	89.8%	36.7%	91.7%	69.8%
% Tarong cutset	16.8%	0.0%	11.4%	0.0%	0.0%

In the case of Gladstone the Central-South cutset dominates except in 03/04. Here, the dominant constraint was for minimum generation at Gladstone for the outage of a Gladstone - Bouldercombe 275kV line. This constraint was replaced in 2006 by a thermal constraint to manage flows on Calvale - Wurdong or the remaining Gladstone - Bouldercombe line (it did not bind for the 2 weeks the line was out in 2006). The Central - South constraints made up 67% of the remaining binding constraints. There have been no major changes to the Central - South limits during this time.

The Tarong constraint contributed to 16.8% of the binding intervals in 2001/2 as this was mainly due to the system normal constraint. This has not bound since and this can be attributed to the many augmentations (from capacitor banks, line - rearrangements and new lines) in south east Qld. The 11.4% in 2003/4 was to manage negative residues on QNI in February 2004.

There is not really an increasing trend in binding constraints. This is partly due to limits being increased regularly (especially the Tarong constraint) due to augmentations and that some outages can have a big effect on the number of binding intervals.

6.5 Townsville PS

The total number of dispatch intervals along with the percentage due to outages for constraint equations with the Gladstone generating units on the left hand side bound during the period 2001/02 to 2005/06 is tabled below:

Table 9

Year	2001/02	2002/03	2003/04	2004/05	2005/06
Binding dispatch intervals	11321	1006	434	2919	2467
% of Binding dispatch intervals due to outages	4.5%	35.2%	37.3%	77.8%	38.5%

Overall there is no pattern of increasing or decreasing binding due to outages. Looking at the percentage of time binding on the cutset flows:

Table 10

Year	2001/02	2002/03	2003/04	2004/05	2005/06
% Central - South cutset	13.1%	28.1%	26.0%	18.3%	88.8%
% Central – North cutset	61.0%	18.7%	12.4%	6.7%	5.8%
% Ross cutset	8.6%	14.5%	33.4%	2.6%	0.5%
% Tarong	2.6%	0.0%	8.1%	0.0%	0.0%

Townsville PS was most affected by the Central – North constraints. The change on Central-North can be mainly attributed to a series of augmentations (from new substations at Strathmore and Woree and new SVCs at Ross and Woree). Over that time the Central - North limit has increased from static 780 MW to a dynamic limit which can vary between 925 and 985 MW. Also the average generation in North Qld has increased since 2001/2 most of which is due to the changes to the Townsville GT and the addition of the steam turbine in 2004/5.

Table 11

Year	2001/02	2002/03	2003/04	2004/05	2005/06
Central Generation	3641.13	3321.15	3238.57	3298.17	3336.34
North Generation	163.44	98.32	133.69	211.19	310.06

Increase in Central-South binding in 2005/6 was due to an outage of 814 in early November 2005. The increase in the Ross limit binding in 2002/3/4 was due to the Nebo SVC outage between February and October 2003 and an outage of Strathmore - Ross line. The Tarong limit was binding for the same reasons as for Gladstone.

Similar conclusions can be drawn about the binding constraints as for Gladstone.

Appendix A1:

Description of unclassifiable constraints from positive and negative mis-pricing list

EFFECTIVE DATE	VERSION NO	CONSTRAINT NAME[6]	DESCRIPTION
26/06/2003	1	#APS_E	VAPS.ENERGY * 1 = 0 (Wt = 360)
26/06/2003	2	#APS_E	VAPS.ENERGY * 1 = 0 (Wt = 360)
25/08/2003	1	#APS_E	VAPS.ENERGY * 1 = 95 (Wt = 360)
25/08/2003	2	#APS_E	VAPS.ENERGY * 1 = 95 (Wt = 360)
24/11/2006	1	#APS_E	VAPS.ENERGY * 1 = 0 (Wt = 360)
25/01/2006	1	#BASTYAN_E	TFA11.ENERGY * 1 = 0 (Wt = 360)
2/07/2003	1	#BDL01_E	VMWT2.ENERGY * 1 = 0 (Wt = 360)
12/04/2004	1	#BDL01_E	VMWT2.ENERGY * 1 = 20 (Wt = 20)
7/02/2007	1	#BDL01_E	VMWT2.ENERGY * 1 = 25 (Wt = 20)
21/02/2004	1	#BDL02_E	VMWT3.ENERGY * 1 = 0 (Wt = 360)
9/07/2003	1	#BW01_E	NBAY1.ENERGY * 1 = 575 (Wt = 360)
9/07/2003	2	#BW01_E	NBAY1.ENERGY * 1 = 575 (Wt = 360)
9/07/2003	4	#BW01_E	NBAY1.ENERGY * 1 = 480 (Wt = 360)
9/07/2003	3	#BW01_E	NBAY1.ENERGY * 1 = 480 (Wt = 360)
26/09/2005	1	#DEVILS_G_E	TDG11.ENERGY * 1 = 0 (Wt = 20)
26/09/2005	2	#DEVILS_G_E	TDG11.ENERGY * 1 = 0 (Wt = 20)
25/01/2006	1	#JBUTTERS_E	TJB11.ENERGY * 1 = 0 (Wt = 360)
12/04/2004	1	#JLB01_E	VJLGB1.ENERGY * 1 = 0 (Wt = 20)
12/04/2004	1	#JLB02_E	VJLGB2.ENERGY * 1 = 0 (Wt = 20)
12/04/2004	1	#JLB03_E	VJLGB3.ENERGY * 1 = 0 (Wt = 20)
13/04/2003	1	#LYA1_E	VLYP1.ENERGY * 1 = 395 (Wt = 360)
13/04/2003	2	#LYA1_E	VLYP1.ENERGY * 1 = 445 (Wt = 360)
4/05/2003	1	#LYA1_E	VLYP1.ENERGY * 1 = 510 (Wt = 360)
4/05/2003	2	#LYA1_E	VLYP1.ENERGY * 1 = 510 (Wt = 360)
12/05/2003	1	#LYA1_E	VLYP1.ENERGY * 1 = 460 (Wt = 360)
12/05/2003	2	#LYA1_E	VLYP1.ENERGY * 1 = 440 (Wt = 360)
20/09/2003	1	#LYA1_E	VLYP1.ENERGY * 1 = 510 (Wt = 360)
14/06/2003	1	#LYA2_E	VLYP2.ENERGY * 1 = 460 (Wt = 360)
20/09/2003	1	#LYA2_E	VLYP2.ENERGY * 1 = 0 (Wt = 360)
8/06/2003	2	#LYA3_E	VLYP3.ENERGY * 1 = 530 (Wt = 360)
28/06/2003	1	#LYA3_E	VLYP3.ENERGY * 1 = 375 (Wt = 360)
19/09/2003	1	#LYA3_E	VLYP3.ENERGY * 1 = 485 (Wt = 360)
20/09/2003	1	#LYA3_E	VLYP3.ENERGY * 1 = 535 (Wt = 360)
12/05/2003	1	#LYA4_E	VLYP4.ENERGY * 1 = 450 (Wt = 360)
19/05/2003	1	#LYA4_E	VLYP4.ENERGY * 1 = 470 (Wt = 360)
20/09/2003	1	#LYA4_E	VLYP4.ENERGY * 1 = 515 (Wt = 360)
18/01/2006	1	#MACKNTSH_E	TMA11.ENERGY * 1 = 40 (Wt = 20)
1/09/2003	1	#MP1_E	NMTP1.ENERGY * 1 = 4 (Wt = 360)
4/10/2004	1	#MPP_1_E	QBCK1.ENERGY * 1 = 0 (Wt = 20)
8/04/2003	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 120 (Wt = 360)

[6] Constraint naming guideline: (http://www.nemmco.com.au/dispatchandpricing/200-0141.pdf)

8/04/2003	2	#MSTUART1_E	QMSP1.ENERGY * 1 = 140 (Wt = 360)
16/04/2003	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 360)
16/04/2003	2	#MSTUART1_E	QMSP1.ENERGY * 1 = 0 (Wt = 360)
24/11/2003	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 144 (Wt = 360)
5/12/2003	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 144 (Wt = 360)
10/11/2004	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
10/11/2004	4	#MSTUART1_E	QMSP1.ENERGY * 1 = 65 (Wt = 20)
10/11/2004	6	#MSTUART1_E	QMSP1.ENERGY * 1 = 65 (Wt = 20)
10/11/2004	7	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
10/11/2004	5	#MSTUART1_E	QMSP1.ENERGY * 1 = 85 (Wt = 20)
10/11/2004	3	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
10/11/2004	2	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
19/01/2005	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 140 (Wt = 360)
19/01/2005	3	#MSTUART1_E	QMSP1.ENERGY * 1 = 60 (Wt = 20)
19/01/2005	2	#MSTUART1_E	QMSP1.ENERGY * 1 = 110 (Wt = 20)
14/08/2005	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
18/12/2005	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 360)
18/12/2005	3	#MSTUART1_E	QMSP1.ENERGY * 1 = 144 (Wt = 360)
18/12/2005	2	#MSTUART1_E	QMSP1.ENERGY * 1 = 100 (Wt = 360)
20/08/2006	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
20/08/2006	2	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
6/03/2007	1	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
6/03/2007	3	#MSTUART1_E	QMSP1.ENERGY * 1 = 45 (Wt = 20)
6/03/2007	2	#MSTUART1_E	QMSP1.ENERGY * 1 = 65 (Wt = 20)
4/04/2003	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 360)
4/04/2003	2	#MSTUART2_E	QMSP2.ENERGY * 1 = 0 (Wt = 360)
6/04/2003	3	#MSTUART2_E	QMSP2.ENERGY * 1 = 90 (Wt = 360)
6/04/2003	4	#MSTUART2_E	QMSP2.ENERGY * 1 = 60 (Wt = 360)
6/04/2003	5	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 360)
12/04/2003	9	#MSTUART2_E	QMSP2.ENERGY * 1 = 80 (Wt = 20)
12/04/2003	10	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
13/04/2003	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 0 (Wt = 20)
13/04/2003	4	#MSTUART2_E	QMSP2.ENERGY * 1 = 70 (Wt = 360)
13/04/2003	2	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 360)
13/04/2003	3	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 360)
14/04/2003	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 360)
14/04/2003	3	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
14/04/2003	5	#MSTUART2_E	QMSP2.ENERGY * 1 = 0 (Wt = 20)
14/04/2003	4	#MSTUART2_E	QMSP2.ENERGY * 1 = 0 (Wt = 20)
14/04/2003	2	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
27/04/2003	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
5/12/2003	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 144 (Wt = 360)
8/01/2004	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 360)
8/01/2004	2	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
9/01/2004	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
8/03/2004	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 50 (Wt = 20)
9/03/2004	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 50 (Wt = 20)
10/11/2004	2	#MSTUART2_E	QMSP2.ENERGY * 1 = 120 (Wt = 20)
10/11/2004	4	#MSTUART2_E	QMSP2.ENERGY * 1 = 140 (Wt = 20)
10/11/2004	6	#MSTUART2_E	QMSP2.ENERGY * 1 = 120 (Wt = 20)
10/11/2004	8	#MSTUART2_E	QMSP2.ENERGY * 1 = 95 (Wt = 20)
10/11/2004	10	#MSTUART2_E	QMSP2.ENERGY * 1 = 70 (Wt = 20)

10/11/2004	12	#MSTUART2_E	QMSP2.ENERGY * 1 = 50 (Wt = 20)
10/11/2004	18	#MSTUART2_E	QMSP2.ENERGY * 1 = 65 (Wt = 20)
10/11/2004	17	#MSTUART2_E	QMSP2.ENERGY * 1 = 85 (Wt = 20)
10/11/2004	16	#MSTUART2_E	QMSP2.ENERGY * 1 = 65 (Wt = 20)
10/11/2004	15	#MSTUART2_E	QMSP2.ENERGY * 1 = 85 (Wt = 20)
10/11/2004	14	#MSTUART2_E	QMSP2.ENERGY * 1 = 65 (Wt = 20)
10/11/2004	13	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
10/11/2004	11	#MSTUART2_E	QMSP2.ENERGY * 1 = 60 (Wt = 20)
10/11/2004	9	#MSTUART2_E	QMSP2.ENERGY * 1 = 95 (Wt = 20)
10/11/2004	7	#MSTUART2_E	QMSP2.ENERGY * 1 = 100 (Wt = 20)
10/11/2004	5	#MSTUART2_E	QMSP2.ENERGY * 1 = 144 (Wt = 20)
10/11/2004	3	#MSTUART2_E	QMSP2.ENERGY * 1 = 130 (Wt = 20)
17/09/2006	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 45 (Wt = 20)
11/03/2007	1	#MSTUART2_E	QMSP2.ENERGY * 1 = 70 (Wt = 20)
8/06/2003	1	#NPS1_E	SNPA1.ENERGY * 1 = 253 (Wt = 360)
10/05/2005	1	#NPS1_E	SNPA1.ENERGY * 1 = 180 (Wt = 20)
11/05/2005	1	#NPS1_E	SNPA1.ENERGY * 1 = 180 (Wt = 20)
27/05/2005	1	#NPS1_E	SNPA1.ENERGY * 1 = 180 (Wt = 20)
27/05/2005	3	#NPS1_E	SNPA1.ENERGY * 1 = 180 (Wt = 20)
27/05/2005	2	#NPS1_E	SNPA1.ENERGY * 1 = 180 (Wt = 20)
28/05/2005	1	#NPS1_E	SNPA1.ENERGY * 1 = 170 (Wt = 20)
28/05/2005	4	#NPS1_E	SNPA1.ENERGY * 1 = 170 (Wt = 20)
28/05/2005	5	#NPS1_E	SNPA1.ENERGY * 1 = 180 (Wt = 20)
28/05/2005	3	#NPS1_E	SNPA1.ENERGY * 1 = 160 (Wt = 20)
28/05/2005	2	#NPS1_E	SNPA1.ENERGY * 1 = 167 (Wt = 20)
1/04/2005	1	#NPS2_E	SNPA2.ENERGY * 1 = 255 (Wt = 360)
10/05/2005	1	#NPS2_E	SNPA2.ENERGY * 1 = 180 (Wt = 20)
11/05/2005	1	#NPS2_E	SNPA2.ENERGY * 1 = 180 (Wt = 20)
27/05/2005	1	#NPS2_E	SNPA2.ENERGY * 1 = 180 (Wt = 20)
27/05/2005	2	#NPS2_E	SNPA2.ENERGY * 1 = 180 (Wt = 20)
7/01/2004	1	#POR01_E	SPLN1.ENERGY * 1 = 5 (Wt = 20)
7/01/2004	2	#POR01_E	SPLN1.ENERGY * 1 = 10 (Wt = 20)
7/01/2004	3	#POR01_E	SPLN1.ENERGY * 1 = 15 (Wt = 20)
8/01/2004	1	#POR01_E	SPLN1.ENERGY * 1 = 10 (Wt = 20)
8/01/2004	2	#POR01_E	SPLN1.ENERGY * 1 = 5 (Wt = 20)
3/03/2004	1	#POR01_E	SPLN1.ENERGY * 1 = 5 (Wt = 20)
31/12/2004	1	#POR01_E	SPLN1.ENERGY * 1 = 5 (Wt = 20)
13/12/2004	1	#PPCCGT_E	SPPT.ENERGY * 1 = 0 (Wt = 360)
17/08/2003	1	#QPS1_E	SQPS1.ENERGY * 1 = 24 (Wt = 360)
17/08/2003	2	#QPS1_E	SQPS1.ENERGY * 1 = 24 (Wt = 360)
17/08/2003	1	#QPS2_E	SQPS2.ENERGY * 1 = 24 (Wt = 360)
17/08/2003	2	#QPS2_E	SQPS2.ENERGY * 1 = 24 (Wt = 360)
17/08/2003	1	#QPS3_E	SQPS3.ENERGY * 1 = 24 (Wt = 360)
17/08/2003	2	#QPS3_E	SQPS3.ENERGY * 1 = 24 (Wt = 360)
17/08/2003	1	#QPS4_E	SQPS4.ENERGY * 1 = 24 (Wt = 360)
17/08/2003	2	#QPS4_E	SQPS4.ENERGY * 1 = 24 (Wt = 360)
25/01/2006	1	#REECE2_E	TRCB1.ENERGY * 1 = 0 (Wt = 360)
17/08/2003	1	#ROMA_7_E	QRMA7.ENERGY * 1 = 34 (Wt = 360)
17/08/2003	1	#ROMA_8_E	QRMA8.ENERGY * 1 = 34 (Wt = 360)
12/10/2004	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
3/11/2004	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
28/02/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)

1/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
1/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
2/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
2/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
3/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
7/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
7/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
9/03/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 20)
10/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
10/03/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
10/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 15 (Wt = 360)
10/03/2005	4	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
19/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 20)
19/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
24/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
24/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
24/03/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
29/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 20)
29/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
29/03/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
29/03/2005	5	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
29/03/2005	6	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
29/03/2005	4	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 20)
30/03/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
30/03/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
1/04/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 20)
1/04/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
5/04/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
5/04/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
5/04/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
6/04/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
11/04/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
13/04/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
13/04/2005	4	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
13/04/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 15 (Wt = 360)
13/04/2005	5	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
15/04/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
15/04/2005	4	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
15/04/2005	6	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
15/04/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
15/04/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
16/04/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
19/04/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
19/04/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
19/04/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
20/04/2005	1	#SNUG1_E	SSGA1.ENERGY * 1 = 15 (Wt = 360)
20/04/2005	2	#SNUG1_E	SSGA1.ENERGY * 1 = 10 (Wt = 360)
20/04/2005	3	#SNUG1_E	SSGA1.ENERGY * 1 = 5 (Wt = 360)
13/02/2004	1	#TORRA2_W_E	STSA2.ENERGY * 1 = 0 (Wt = 50)
10/09/2003	1	#WW8_E	NWW28.ENERGY * 1 = 0 (Wt = 360)
16/04/2003	1	#YABULU_E	QTYP.ENERGY * 1 = 155 (Wt = 360)
16/04/2003	5	#YABULU_E	QTYP.ENERGY * 1 = 0 (Wt = 360)

16/04/2003	2	#YABULU_E	QTYP.ENERGY * 1 = 80 (Wt = 360)
16/04/2003	4	#YABULU_E	QTYP.ENERGY * 1 = 20 (Wt = 360)
16/04/2003	3	#YABULU_E	QTYP.ENERGY * 1 = 40 (Wt = 360)
26/04/2003	1	#YABULU_E	QTYP.ENERGY * 1 = 49 (Wt = 20)
17/09/2003	1	#YABULU_E	QTYP.ENERGY * 1 = 45 (Wt = 360)
24/11/2003	1	#YABULU_E	QTYP.ENERGY * 1 = 159 (Wt = 360)
5/12/2003	1	#YABULU_E	QTYP.ENERGY * 1 = 159 (Wt = 360)
9/01/2004	1	#YABULU_E	QTYP.ENERGY * 1 = 80 (Wt = 20)
9/01/2004	3	#YABULU_E	QTYP.ENERGY * 1 = 110 (Wt = 20)
9/01/2004	4	#YABULU_E	QTYP.ENERGY * 1 = 120 (Wt = 20)
9/01/2004	2	#YABULU_E	QTYP.ENERGY * 1 = 95 (Wt = 20)
8/03/2004	1	#YABULU_E	QTYP.ENERGY * 1 = 50 (Wt = 20)
20/05/2007	1	#YABULU_E	QTYP.ENERGY * 1 = 45 (Wt = 360)
7/04/2004	1	@DRYCK3=0	Eff = 07/04/2004 ; RHS = 0 ; Op = "=" ; Wt = 360
9/08/2004	1	@LYGS	Eff = 09/08/2004 ; RHS = 0 ; Op = "=" ; Wt = 20
27/08/2004	1	@LYGS	To Be Archived - DO NOT INVOKE
14/07/2004	1	@PLAY4=0	Eff = 14/07/2004 ; RHS = 0 ; Op = "=" ; Wt = 20
11/01/2006	1	@Q-MGT=0	Eff = 11/01/2006 ; RHS = 0 ; Op = "=" ; Wt = 20
7/01/2004	1	@SPLN=5	Eff = 07/01/2004 ; RHS = 5 ; Op = "=" ; Wt = 20
7/06/2005	1	@SPLN=5	To be archived, Eff = 07/01/2004 ; RHS = 5 ; Op = = ; Wt = 20
3/08/1999	1	Q<QBCG_01	QLD,Outage of 132kV fdrs 7153or7154(Lilyvale-Clermont-Barcaldine
29/10/1999	1	Q<QBCG_01	QLD,Outage of 132kV fdr 7153(Lilyvale-Clermont)
17/10/2000	1	Q<QBCG_01	QLD,Outage of 132kV fdr7153(Lilyvale-Clermont) .BCGT islanded.
21/01/2002	1	Q<QBCG_01	QLD,Outage of 132kV fdr7153(Lilyvale-Clermont) .BCGT islanded.
11/09/2003	1	Q<QBCG_01	QLD,Outage of 132kV fdr7153(Lilyvale-Clermont) .BCGT islanded.
18/01/2005	1	Q<QBCG_01	Out = Clermont to Lilyvale (7153) line, Barcaldine PS islanded
29/10/1999	1	Q<QBCG_02	QLD,Outage of 132kV fdr 7154 (Clermont-Barcaldine)
17/10/2000	1	Q<QBCG_02	QLD,Outage of 132kV fdr 7154(Clermont-Barcaldine).BCGT islanded
21/01/2002	1	Q<QBCG_02	QLD,Outage of 132kV fdr 7154(Clermont-Barcaldine).BCGT islanded
11/09/2003	1	Q<QBCG_02	QLD,Outage of 132kV fdr 7154(Clermont-Barcaldine).BCGT islanded
18/01/2005	1	Q<QBCG_02	Out = Barcaldine to Clermont (7154) line, Barcaldine PS islanded
3/06/2004	1	Q>TV_TYP	Out = 7241 Townsville - Townsville Ps 132KV line.
3/07/2001	1	S_PLN_ISL1	SA,Outage of 132kV fdr(Whyalla-Yadnarie) .SPLN1 islanded.
21/01/2002	1	S_PLN_ISL1	SA,Outage of 132kV fdr(Whyalla-Yadnarie) .SPLN1 islanded.
18/01/2005	1	S_PLN_ISL1	Out = Whyalla to Yadnarie line, Port Lincoln PS islanded
3/07/2001	1	S_PLN_ISL2	SA,Outage of 132kV fdr(Yadnarie-PortLincoln) .SPLN1 islanded.
21/01/2002	1	S_PLN_ISL2	SA,Outage of 132kV fdr(Yadnarie-PortLincoln) .SPLN1 islanded.
18/01/2005	1	S_PLN_ISL2	Out = Yadnarie to Port Lincoln line, Port Lincoln PS islanded
7/01/2005	1	S_PPT_ST	Pelican Pt to steam turbine 275kV circuit out of service

Appendix A2:

Calculation of average number of hours of positive, negative and unclassifiable mis-pricing

In this study, the hours of positive/negative mis-pricing or unclassifiable for each connection point per financial year is classified based on whether generators were constrained on/off or were constrained by equality constraints. The concept of positive/negative mis-pricing and unclassifiable is defined in section 3.

Average number of hours =

$$\frac{\sum Hours\ of\ \ mis-pricing\ *}{Number\ of\ \ connection\ \ pts}$$

* Positive or negative mis-pricing or unclassifiable

Hours of mis-pricing/ connection point/ financial year =

Σ Hours of mis-pricing of each system condition/ financial year

An example for the Victoria region as follows.

Connection points	Hours of mis-pricing Y03_04		
	positive mis-pricing	negative mis-pricing	unclassifiable
Hazelwood 1	177.5	0	0
Hazelwood 2	177.5	0	0
Hazelwood 6	165.92	0	0
Hazelwood 7	165.92	0	0
Hazelwood 8	165.92	0	0
Jeeralang A 1	177.42	0	0
Jeeralang A 2	177.42	0	0
Jeeralang A 3	177.42	0	0
Jeeralang A 4	177.42	0	0
Jeeralang B 1	178.83	0	1.33
Jeeralang B 2	178.83	0	1.33
Jeeralang B 3	178.83	0	1.33
Morwell 4	165.92	0	0
Morwell 5	165.92	0	0
Morwell 1, 2 and 3	177.42	0	0
Bairnsdale	177.42	0	0.5
Bairnsdale 2	177.42	0	0.17
Yallourn W 1	122.67	0	0
Sum of hours of mispricing	**3085.7**	**0**	**4.66**
Average number of hours	**171.43**	**0**	**0.932**
Number of connection points	**18**	**0**	**5**

Note: The average 171.43 is calculated by dividing 3085.7 by 18.

The same connection point can appear under more than one category; hence number of connection points should not be summed across categories.

Appendix A3:

Data for average capped mis-pricing amount per dispatch intervals when a generator is being mis-priced (in $/MWh)

Following tables contain average amount of mis-pricing per dispatch intervals when a generator is being mis-priced ($/MWh) and standard deviation for different connection points for 3 study years. The graphs in section 3.2 show the average amount of mis-pricing.

For NEM region, there are two sets of data. The first table for each region includes mis-pricing due to violated constraints, where the data is labelled “Average capped mispricing”. The second table for each region includes mis-pricing after removing the violated constraints, where the data is labelled “Average capped mispricing (without violation)”. The standard deviation of each set of data is also included in each respective table.

VIC region

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation
Bairnsdale	644.58	769.78	300.71	984.64	573.04	494.00
Bairnsdale_2	680.70	471.48	354.15	649.69	573.04	494.00
Hazelwood 1	703.27	479.78	352.61	651.39	573.04	494.00
Hazelwood 2	703.27	479.78	352.61	651.39	573.04	494.00
Hazelwood 6	681.92	485.81	354.15	649.69	573.04	494.00
Hazelwood 7	681.92	485.81	354.15	649.69	573.04	494.00
Hazelwood 8	681.92	485.81	354.15	649.69	573.04	494.00
Jeeralang A 1	703.12	479.84	352.61	651.39	573.04	494.00
Jeeralang A 2	703.12	479.84	352.61	651.39	573.04	494.00
Jeeralang A 3	703.12	479.84	352.61	651.39	573.04	494.00
Jeeralang A 4	703.12	479.84	352.61	651.39	573.04	494.00
Jeeralang B 1	696.54	482.24	354.15	649.69	573.04	494.00
Jeeralang B 2	696.54	482.24	354.15	649.69	573.04	494.00
Jeeralang B 3	696.54	482.24	354.15	649.69	573.04	494.00
Morwell 1, 2 and 3	681.34	471.24	354.15	649.69	573.04	494.00
Morwell 4	681.92	485.81	354.15	649.69	573.04	494.00
Morwell 5	681.92	485.81	354.15	649.69	573.04	494.00
Yallourn W 1	759.37	461.39	359.67	655.21	627.44	517.00

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)
Bairnsdale	639.56	770.45	345.55	646.69	573.04	494.00
Bairnsdale_2	675.66	472.97	347.35	647.89	573.04	494.00
Hazelwood 1	697.74	481.67	346.43	649.76	573.04	494.00

Hazelwood 2	697.74	481.67	346.43	649.76	573.04	494.00
Hazelwood 6	676.52	487.37	347.35	647.89	573.04	494.00
Hazelwood 7	676.52	487.37	347.35	647.89	573.04	494.00
Hazelwood 8	676.52	487.37	347.35	647.89	573.04	494.00
Jeeralang A 1	698.07	481.54	346.43	649.76	573.04	494.00
Jeeralang A 2	698.07	481.54	346.43	649.76	573.04	494.00
Jeeralang A 3	698.07	481.54	346.43	649.76	573.04	494.00
Jeeralang A 4	698.07	481.54	346.43	649.76	573.04	494.00
Jeeralang B 1	691.57	483.84	347.35	647.89	573.04	494.00
Jeeralang B 2	691.57	483.84	347.35	647.89	573.04	494.00
Jeeralang B 3	691.57	483.84	347.35	647.89	573.04	494.00
Morwell 1, 2 and 3	676.29	472.74	347.35	647.89	573.04	494.00
Morwell 4	676.52	487.37	347.35	647.89	573.04	494.00
Morwell 5	676.52	487.37	347.35	647.89	573.04	494.00
Yallourn W 1	752.07	464.80	350.71	652.97	561.33	497.25

NSW region

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation
Bayswater 1	259.85	1164.95	780.87	1201.37	227.51	1454.50
Bayswater 2	270.08	1186.53	780.87	1201.37	227.51	1454.50
Bayswater 3	270.08	1186.53	780.87	1201.37	227.51	1454.50
Bayswater 4	270.08	1186.53	780.87	1201.37	227.51	1454.50
Blowering					90.03	802.84
Eraring 1	-1124.05	2962.06	-1583.71	3298.80	-37.17	920.63
Eraring 2	-1124.05	2962.06	-1583.71	3298.80	-37.17	920.63
Eraring 3	-994.72	2774.54	-1117.31	2788.67	-54.81	904.10
Eraring 4	-994.72	2774.54	-1117.31	2788.67	-54.81	904.10
Hume_NSW					115.81	855.36
Liddell 1	275.98	1204.40	789.53	1169.04	219.29	1461.56
Liddell 2	275.98	1204.40	789.53	1169.04	219.29	1461.56
Liddell 3	275.98	1204.40	789.53	1169.04	219.29	1461.56
Liddell 4	275.98	1204.40	789.53	1169.04	219.29	1461.56
Mt Piper 1	238.55	897.27	895.53	2010.93	275.24	1454.26
Mt Piper 2	240.06	899.91	895.53	2010.93	275.24	1454.26
Munmorah 3	-1085.14	2865.65	-1612.26	3237.01	-46.80	879.08
Munmorah 4	-1085.14	2865.65	-1612.26	3237.01	-46.80	879.08
Redbank 1	901.85	1269.22	805.16	1212.84	221.79	1288.05
Vales Point 5	-1100.98	2927.86	-1671.49	3294.00	-49.15	892.14
Vales Point 6	-1100.98	2927.86	-1671.49	3294.00	-49.15	892.14
Wallerawang 7	220.68	855.68	106.10	2037.87	273.63	1449.45
Wallerawang 8	220.33	855.05	106.10	2037.87	273.63	1449.45

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)
Bayswater 1	193.67	1147.90	433.79	492.73	84.57	717.32
Bayswater 2	201.29	1169.66	433.79	492.73	84.57	717.32
Bayswater 3	201.29	1169.66	433.79	492.73	84.57	717.32
Bayswater 4	201.29	1169.66	433.79	492.73	84.57	717.32
Blowering					84.48	764.53
Eraring 1	-486.66	1855.63	-630.73	1866.92	-2.78	445.63
Eraring 2	-486.66	1855.63	-630.73	1866.92	-2.78	445.63
Eraring 3	-357.33	1484.08	-381.08	1236.63	-20.85	421.83
Eraring 4	-357.33	1484.08	-381.08	1236.63	-20.85	421.83
Hume_NSW					110.26	819.68
Liddell 1	207.20	1188.12	445.50	498.89	77.70	749.42
Liddell 2	207.20	1188.12	445.50	498.89	77.70	749.42
Liddell 3	207.20	1188.12	445.50	498.89	77.70	749.42
Liddell 4	207.20	1188.12	445.50	498.89	77.70	749.42
Mt Piper 1	173.20	873.69	530.53	1443.41	90.38	763.86
Mt Piper 2	174.29	876.35	530.53	1443.41	90.38	763.86
Munmorah 3	-447.75	1682.80	-630.01	1702.44	-12.79	363.25
Munmorah 4	-447.75	1682.80	-630.01	1702.44	-12.79	363.25
Redbank 1	521.26	1327.54	474.04	502.48	74.84	667.03
Vales Point 5	-463.59	1792.34	-689.24	1840.37	-15.15	394.02
Vales Point 6	-463.59	1792.34	-689.24	1840.37	-15.15	394.02
Wallerawang 7	154.91	829.33	8.70	998.76	88.76	754.27
Wallerawang 8	154.67	828.70	8.70	998.76	88.76	754.27

QLD region

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing	Standard deviation	Average capped mispricing	Standard deviation	Average capped mispricing	Standard deviation
Barcaldine	146.09	1150.38	-339.10	1878.74	581.06	1506.77
Barron Gorge 1	-6104.48	5093.75	-6951.91	4582.60	-443.64	3440.33
Barron Gorge 2	-6104.48	5093.75	-6951.91	4582.60	-443.64	3440.33
Callide A 1	337.26	1732.37	22.47	202.05	597.99	1525.26
Callide A 2	337.26	1732.37	22.47	202.05	597.99	1525.26
Callide A 3	337.26	1732.37	22.47	202.05	597.99	1525.26
Callide A 4	337.26	1732.37	22.47	202.05	597.99	1525.26
Callide B 1	337.26	1732.37	22.47	202.05	597.99	1525.26
Callide B 2	337.26	1732.37	22.47	202.05	597.99	1525.26
Callide C	337.26	1732.37	22.47	202.05	597.99	1525.26
Callide C 4	337.26	1732.37	22.47	202.05	597.99	1525.26
Collinsville 1	-1743.73	4380.08	-2376.23	4268.25	175.44	2513.17

Collinsville 2	-1743.73	4380.08	-2376.23	4268.25	175.44	2513.17
Collinsville 3	-1743.73	4380.08	-2376.23	4268.25	175.44	2513.17
Collinsville 4	-1743.73	4380.08	-2376.23	4268.25	175.44	2513.17
Collinsville 5	-1743.73	4380.08	-2376.23	4268.25	175.44	2513.17
Gladstone 1	78.27	1613.03	-16.08	618.40	597.99	1525.26
Gladstone 2	78.27	1613.03	253.17	699.40	597.99	1525.26
Gladstone 3	78.27	1613.03	-33.23	743.48	-65.79	2581.92
Gladstone 4	78.27	1613.03	-16.01	616.80	30.03	2549.36
Gladstone 5	78.27	1613.03	-16.08	618.40	597.99	1525.26
Gladstone 6	78.27	1613.03	-16.08	618.40	597.99	1525.26
Kareeya 1	-5067.73	5274.26	-2924.91	4550.39	-384.95	3365.45
Kareeya 2	-5067.73	5274.26	-2924.91	4550.39	-384.95	3365.45
Kareeya 3	-5067.73	5274.26	-2924.91	4550.39	-384.95	3365.45
Kareeya 4	-5067.73	5274.26	-2924.91	4550.39	-384.95	3365.45
Mackay	-1743.73	4380.08	-2049.47	4052.04	236.20	2416.26
Mt Stuart 1	-4878.42	5264.70	-3873.69	4868.97	113.52	2606.95
Mt Stuart 2	-5422.99	5159.06	-4590.66	4975.88	0.59	2820.21
Stanwell 1	337.26	1732.37	22.47	202.05	597.99	1525.26
Stanwell 2	337.26	1732.37	22.47	202.05	597.99	1525.26
Stanwell 3	337.26	1732.37	22.47	202.05	597.99	1525.26
Stanwell 4	337.26	1732.37	22.47	202.05	597.99	1525.26
Yabulu			-2031.37	4041.25	152.45	2548.40
Yabulu 2	-4203.99	5168.97	-791.51	2706.70	160.98	2563.26

	datayear					
	Y03_04		Y04_05		Y05_06	
Connection point ID	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)
Barcaldine	57.85	606.82	21.66	198.40	576.21	1490.84
Barron Gorge 1	-1806.95	3941.38	-430.41	2033.99	460.43	1644.57
Barron Gorge 2	-1806.95	3941.38	-430.41	2033.99	460.43	1644.57
Callide A 1	133.56	918.12	22.47	202.05	592.99	1509.11
Callide A 2	133.56	918.12	22.47	202.05	592.99	1509.11
Callide A 3	133.56	918.12	22.47	202.05	592.99	1509.11
Callide A 4	133.56	918.12	22.47	202.05	592.99	1509.11
Callide B 1	133.56	918.12	22.47	202.05	592.99	1509.11
Callide B 2	133.56	918.12	22.47	202.05	592.99	1509.11
Callide C	133.56	918.12	22.47	202.05	592.99	1509.11
Callide C 4	133.56	918.12	22.47	202.05	592.99	1509.11
Collinsville 1	-280.18	2067.55	-1048.93	3084.28	490.32	1692.82
Collinsville 2	-280.18	2067.55	-1048.93	3084.28	490.32	1692.82
Collinsville 3	-280.18	2067.55	-1048.93	3084.28	490.32	1692.82
Collinsville 4	-280.18	2067.55	-1048.93	3084.28	490.32	1692.82
Collinsville 5	-280.18	2067.55	-1048.93	3084.28	490.32	1692.82
Gladstone 1	68.38	668.43	18.36	194.64	592.99	1509.11
Gladstone 2	68.38	668.43	278.64	469.98	592.99	1509.11
Gladstone 3	68.38	668.43	18.33	194.47	410.54	1294.00
Gladstone 4	68.38	668.43	18.25	194.14	464.25	1366.63
Gladstone 5	68.38	668.43	18.36	194.64	592.99	1509.11
Gladstone 6	68.38	668.43	18.36	194.64	592.99	1509.11

Kareeya 1	-2291.13	4312.32	-1005.52	3015.42	462.12	1647.31
Kareeya 2	-2291.13	4312.32	-1005.52	3015.42	462.12	1647.31
Kareeya 3	-2291.13	4312.32	-1005.52	3015.42	462.12	1647.31
Kareeya 4	-2291.13	4312.32	-1005.52	3015.42	462.12	1647.31
Mackay	-280.18	2067.55	-902.54	2890.49	449.43	1626.33
Mt Stuart 1	-2217.62	4261.61	-2532.13	4349.29	480.87	1677.78
Mt Stuart 2	-3570.69	4849.43	-3459.49	4752.07	377.10	1989.21
Stanwell 1	133.56	918.12	22.47	202.05	592.99	1509.11
Stanwell 2	133.56	918.12	22.47	202.05	592.99	1509.11
Stanwell 3	133.56	918.12	22.47	202.05	592.99	1509.11
Stanwell 4	133.56	918.12	22.47	202.05	592.99	1509.11
Yabulu			-937.07	2941.05	461.70	1642.76
Yabulu 2	-1911.04	4028.90	-279.00	1661.89	465.28	1652.54

SA region

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation
Ladbroke Grove 1					-1.01	226.15
Ladbroke Grove 2					5.87	240.57
Northern 1	1026.76	1.49	-830.90	3222.52	1198.22	517.68
Pelican Point	-5205.46	4985.07	0.00	0.00	37.47	140.95
Port Lincoln	-6592.95	4687.52	-6372.20	4782.59	-867.54	2880.76
Snuggery 1	-9974.57	1.71	-3624.43	4796.22	-59.49	949.14

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)
Ladbroke Grove 1					-1.30	225.14
Ladbroke Grove 2					-1.32	224.51
Northern 1	0.00	0.00	-383.30	1920.37	67.41	240.30
Pelican Point	-1666.44	3725.87	0.00	0.00	33.31	125.99
Port Lincoln	-6208.90	4803.71	-6197.15	4830.27	-611.92	2469.93
Snuggery 1	-9974.57	1.71	-3219.52	4662.38	-69.04	825.63

Snowy region

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation
Guthega					-44.27	157.66
Lower Tumut	-1458.25	3323.62	-295.11	1221.60	-104.38	1059.92
Murray	2083.44	2926.05			-51.41	169.19
Upper Tumut	-1277.43	3150.10	-292.58	1226.50	-99.14	1044.77

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)
Guthega					-44.27	157.66
Lower Tumut	3.27	42.27	-280.64	1164.45	-104.38	1059.92
Murray	2083.44	2926.05			-51.41	169.19
Upper Tumut	4.72	53.18	-278.11	1169.56	-99.14	1044.77

TAS region

	Data year			
	Y04_05		Y05_06	
Connection Point ID	Average capped mispricing	Standard Deviation	Average capped mispricing	Standard Deviation
John Butters	801.50	2697.72	101.63	735.74
Mackintosh	801.50	2697.72	104.53	729.86

	Data year			
	Y04_05		Y05_06	
Connection Point ID	Average capped mispricing (without violation)	Standard deviation (without violation)	Average capped mispricing (without violation)	Standard deviation (without violation)
John Butters	801.50	2697.72	101.63	735.74
Mackintosh	801.50	2697.72	102.85	728.91

Appendix A4:

Data for average capped mis-pricing amount per total dispatch interval during the study period (in $/MWh)

Following tables contain average amount of mis-pricing per total dispatch interval during the study period ($/MWh). This was achieved by summing the total amount of capped mis-pricing amounts together per each year and then dividing them by number of DIs per year (8760*12).

Similar to the data in Appendix A3, this type of historical analysis has the weakness of not being subjected to an “Over Constrained Dispatch”. The data given under the columns “all data” includes mis-pricing due to violated constraints. The columns “without violations” show data after removing the violated constraints. (Constraints with marginal cost >= 20*VoLL are assumed to be violated constraints.) Since OCD process typically changes violated constraint to a binding constraint, these two columns are indications of upper and lower bound of average mis-pricing.

NSW region

Connection point id	Y03_04		Y04_05		Y05_06	
	all data	without violation	all data	without violation	all data	without violation
Bayswater 1	1.63	1.22	11.55	6.42	5.15	1.91
Bayswater 2	1.63	1.22	11.55	6.42	5.15	1.91
Bayswater 3	1.63	1.22	11.55	6.42	5.15	1.91
Bayswater 4	1.63	1.22	11.55	6.42	5.15	1.91
Blowering					1.70	1.59
Eraring 1	-6.68	-2.89	-20.58	-8.20	-0.82	-0.06
Eraring 2	-6.68	-2.89	-20.58	-8.20	-0.82	-0.06
Eraring 3	-5.91	-2.12	-11.17	-3.81	-1.22	-0.47
Eraring 4	-5.91	-2.12	-11.17	-3.81	-1.22	-0.47
Hume_NSW					2.19	2.08
Liddell 1	1.67	1.25	11.58	6.53	4.96	1.76
Liddell 2	1.67	1.25	11.58	6.53	4.96	1.76
Liddell 3	1.67	1.25	11.58	6.53	4.96	1.76
Liddell 4	1.67	1.25	11.58	6.53	4.96	1.76
Munmorah 3	-6.45	-2.66	-20.98	-8.20	-1.04	-0.29
Munmorah 4	-6.45	-2.66	-20.98	-8.20	-1.04	-0.29
Redbank 1	2.51	1.45	10.78	6.34	4.81	1.62
Mt Piper 1	1.45	1.05	16.46	9.75	5.91	1.94
Mt Piper 2	1.45	1.05	16.46	9.75	5.91	1.94
Vales Point 5	-6.55	-2.76	-21.75	-8.97	-1.10	-0.34
Vales Point 6	-6.55	-2.76	-21.75	-8.97	-1.10	-0.34
Wallerawang 7	1.33	0.93	1.95	0.16	5.87	1.90
Wallerawang 8	1.33	0.93	1.95	0.16	5.87	1.90

QLD region

Connection point id	Y03_04		Y04_05		Y05_06	
	all data	without violation	all data	without violation	all data	without violation
Barcaldine	0.52	0.21	-1.78	0.11	12.50	12.39
Barron Gorge 1	-26.65	-7.89	-126.84	-7.85	-10.52	10.92
Barron Gorge 2	-26.65	-7.89	-126.84	-7.85	-10.52	10.92
Callide A 1	0.52	0.21	0.11	0.11	12.50	12.39
Callide A 2	0.52	0.21	0.11	0.11	12.50	12.39
Callide A 3	0.52	0.21	0.11	0.11	12.50	12.39
Callide A 4	0.52	0.21	0.11	0.11	12.50	12.39
Callide B 1	0.52	0.21	0.11	0.11	12.50	12.39
Callide B 2	0.52	0.21	0.11	0.11	12.50	12.39
Callide C	0.52	0.21	0.11	0.11	12.50	12.39
Callide C 4	0.52	0.21	0.11	0.11	12.50	12.39
Collinsville 1	-3.58	-0.58	-16.82	-7.42	3.91	10.92
Collinsville 2	-3.58	-0.58	-16.82	-7.42	3.91	10.92
Collinsville 3	-3.58	-0.58	-16.82	-7.42	3.91	10.92
Collinsville 4	-3.58	-0.58	-16.82	-7.42	3.91	10.92
Collinsville 5	-3.58	-0.58	-16.82	-7.42	3.91	10.92
Yabulu			-13.39	-6.18	3.57	10.82
Gladstone 1	0.23	0.20	-0.09	0.10	12.50	12.39
Gladstone 2	0.23	0.20	1.89	2.08	12.50	12.39
Gladstone 3	0.23	0.20	-0.18	0.10	-1.97	12.26
Gladstone 4	0.23	0.20	-0.09	0.10	0.79	12.27
Gladstone 5	0.23	0.20	-0.09	0.10	12.50	12.39
Gladstone 6	0.23	0.20	-0.09	0.10	12.50	12.39
Kareeya 1	-17.45	-7.89	-22.84	-7.85	-9.10	10.92
Kareeya 2	-17.45	-7.89	-22.84	-7.85	-9.10	10.92
Kareeya 3	-17.45	-7.89	-22.84	-7.85	-9.10	10.92
Kareeya 4	-17.45	-7.89	-22.84	-7.85	-9.10	10.92
Mackay	-3.58	-0.58	-16.79	-7.39	5.74	10.92
Mt Stuart 1	-17.36	-7.89	-41.64	-27.22	2.58	10.92
Mt Stuart 2	-28.27	-18.61	-58.91	-44.40	0.01	8.54
Stanwell 1	0.52	0.21	0.11	0.11	12.50	12.39
Stanwell 2	0.52	0.21	0.11	0.11	12.50	12.39
Stanwell 3	0.52	0.21	0.11	0.11	12.50	12.39
Stanwell 4	0.52	0.21	0.11	0.11	12.50	12.39
Yabulu 2	-17.36	-7.89	-21.98	-7.75	3.78	10.92

VIC region

Connection point id	Y03_04		Y04_05		Y05_06	
	all data	without violation	all data	without violation	all data	without violation
Hazelwood 1	14.25	14.14	5.10	5.01	0.94	0.94
Hazelwood 2	14.25	14.14	5.10	5.01	0.94	0.94
Hazelwood 6	12.92	12.81	5.18	5.09	0.94	0.94
Hazelwood 7	12.92	12.81	5.18	5.09	0.94	0.94
Hazelwood 8	12.92	12.81	5.18	5.09	0.94	0.94
Jeeralang A 1	14.24	14.14	5.10	5.01	0.94	0.94
Jeeralang A 2	14.24	14.14	5.10	5.01	0.94	0.94
Jeeralang A 3	14.24	14.14	5.10	5.01	0.94	0.94
Jeeralang A 4	14.24	14.14	5.10	5.01	0.94	0.94
Jeeralang B 1	14.33	14.22	5.18	5.09	0.94	0.94
Jeeralang B 2	14.33	14.22	5.18	5.09	0.94	0.94
Jeeralang B 3	14.33	14.22	5.18	5.09	0.94	0.94
Morwell 4	12.92	12.81	5.18	5.09	0.94	0.94
Morwell 5	12.92	12.81	5.18	5.09	0.94	0.94
Morwell 1, 2 and 3	13.80	13.70	5.18	5.09	0.94	0.94
Bairnsdale	13.13	13.03	4.43	5.09	0.94	0.94
Bairnsdale 2	13.80	13.70	5.18	5.09	0.94	0.94
Yallourn W 1	10.63	10.53	5.15	5.02	1.06	0.95

SA region

Connection point id	Y03_04		Y04_05		Y05_06	
	all data	without violation	all data	without violation	all data	without violation
Northern 1	0.05	0.00	-4.71	-2.17	0.39	0.02
Ladbroke Grove 1					-0.05	-0.07
Ladbroke Grove 2					0.31	-0.07
Port Lincoln	-14.61	-13.76	-72.38	-70.39	-0.64	-0.45
Pelican Point	-8.91	-2.85	0.00	0.00	0.71	0.63
Snuggery 1	-4.18	-4.18	-53.48	-47.50	-3.28	-3.81

Snowy region

Connection point id	Y03_04		Y04_05		Y05_06	
	all data	without violation	all data	without violation	all data	without violation
Guthega					-0.29	-0.29
Lower Tumut	-5.35	0.01	-1.94	-1.84	-2.49	-2.49
Murray	1.15	1.15			-0.36	-0.36
Upper Tumut	-5.35	0.02	-1.92	-1.83	-2.37	-2.37

TAS region

Connection point id	Y04_05		Y05_06	
	all data	without violation	all data	without violation
John Butters	0.66	0.66	0.59	0.59
Mackintosh	0.66	0.66	0.61	0.60

Appendix A5:

Data for classification of average capped mis-pricing amount (in $/MWh) into system normal and outage events

The two sets of table for each system condition are as follows:

- First set of table for each region and each system condition lists the mis-pricing amount due to violated constraints; and
- Second set of table for each region and each system condition lists the mis-pricing amount excluding violated constraints.

NSW region: Outage

	Data Year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average Capped Mispricing	Standard Deviation	Average Capped Mispricing	Standard Deviation	Average Capped Mispricing	Standard Deviation
Bayswater 1	368.71	965.41	594.46	477.48	199.95	1464.63
Bayswater 2	368.71	965.41	594.46	477.48	199.95	1464.63
Bayswater 3	368.71	965.41	594.46	477.48	199.95	1464.63
Bayswater 4	368.71	965.41	594.46	477.48	199.95	1464.63
Blowering					13.84	110.12
Eraring 1	-1113.21	2969.17	-1588.79	3323.80	-30.65	1089.73
Eraring 2	-1113.21	2969.17	-1588.79	3323.80	-30.65	1089.73
Eraring 3	-961.90	2735.41	-1106.54	2791.10	-21.87	1019.46
Eraring 4	-961.90	2735.41	-1106.54	2791.10	-21.87	1019.46
Hume_NSW					40.59	336.53
Liddell 1	375.99	990.73	609.27	481.39	198.28	1448.02
Liddell 2	375.99	990.73	609.27	481.39	198.28	1448.02
Liddell 3	375.99	990.73	609.27	481.39	198.28	1448.02
Liddell 4	375.99	990.73	609.27	481.39	198.28	1448.02
Mt Piper 1	232.46	574.98	332.01	388.15	268.45	1433.25
Mt Piper 2	232.46	574.98	332.01	388.15	268.45	1433.25
Munmorah 3	-1070.75	2863.30	-1626.25	3261.82	-31.80	1052.23
Munmorah 4	-1070.75	2863.30	-1626.25	3261.82	-31.80	1052.23
Redbank 1	834.49	1590.13	571.29	482.45	179.34	1140.18
Vales Point 5	-1088.07	2931.60	-1685.33	3319.94	-34.75	1069.24
Vales Point 6	-1088.07	2931.60	-1685.33	3319.94	-34.75	1069.24
Wallerawang 7	230.25	567.53	329.12	387.20	267.77	1432.04
Wallerawang 8	230.25	567.53	329.12	387.20	267.77	1432.04

	Data Year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)
Bayswater 1	292.35	949.94	440.27	476.77	47.90	403.07
Bayswater 2	292.35	949.94	440.27	476.77	47.90	403.07
Bayswater 3	292.35	949.94	440.27	476.77	47.90	403.07
Bayswater 4	292.35	949.94	440.27	476.77	47.90	403.07

Blowering					13.84	110.12
Eraring 1	-414.32	1706.48	-627.80	1894.82	-9.33	517.72
Eraring 2	-414.32	1706.48	-627.80	1894.82	-9.33	517.72
Eraring 3	-263.01	1169.06	-378.51	1265.54	-0.55	345.59
Eraring 4	-263.01	1169.06	-378.51	1265.54	-0.55	345.59
Hume_NSW					40.59	336.53
Liddell 1	299.63	976.23	453.58	485.21	48.49	403.01
Liddell 2	299.63	976.23	453.58	485.21	48.49	403.01
Liddell 3	299.63	976.23	453.58	485.21	48.49	403.01
Liddell 4	299.63	976.23	453.58	485.21	48.49	403.01
Mt Piper 1	159.42	531.49	225.04	313.20	48.19	450.93
Mt Piper 2	159.42	531.49	225.04	313.20	48.19	450.93
Munmorah 3	-371.85	1495.03	-634.08	1732.44	-10.89	453.22
Munmorah 4	-371.85	1495.03	-634.08	1732.44	-10.89	453.22
Redbank 1	796.98	1595.50	444.50	480.59	26.18	118.50
Vales Point 5	-389.17	1629.46	-693.16	1871.15	-13.84	491.56
Vales Point 6	-389.17	1629.46	-693.16	1871.15	-13.84	491.56
Wallerawang 7	157.21	523.10	222.15	311.03	47.52	446.75
Wallerawang 8	157.21	523.10	222.15	311.03	47.52	446.75

NSW region: System normal

	Data Year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average Capped Mispricing	Standard Deviation	Average Capped Mispricing	Standard Deviation	Average Capped Mispricing	Standard Deviation
Bayswater 1	-625.43	2215.47	2036.55	2802.19	267.61	1439.45
Bayswater 2	-625.43	2215.47	2036.55	2802.19	267.61	1439.45
Bayswater 3	-625.43	2215.47	2036.55	2802.19	267.61	1439.45
Bayswater 4	-625.43	2215.47	2036.55	2802.19	267.61	1439.45
Blowering					5052.12	4170.77
Eraring 1	-1236.40	2911.63	-1506.19	2907.11	-46.77	590.35
Eraring 2	-1236.40	2911.63	-1506.19	2907.11	-46.77	590.35
Eraring 3	-1334.84	3159.61	-1241.34	2774.12	-101.71	705.98
Eraring 4	-1334.84	3159.61	-1241.34	2774.12	-101.71	705.98
Hume_NSW					5014.97	4146.26
Liddell 1	-632.01	2205.34	1992.18	2702.94	249.87	1481.24
Liddell 2	-632.01	2205.34	1992.18	2702.94	249.87	1481.24
Liddell 3	-632.01	2205.34	1992.18	2702.94	249.87	1481.24
Liddell 4	-632.01	2205.34	1992.18	2702.94	249.87	1481.24
Mt Piper 1	308.79	2283.77	1891.78	3062.76	284.87	1484.26
Mt Piper 2	308.79	2283.77	1891.78	3062.76	284.87	1484.26
Munmorah 3	-1234.25	2912.16	-1398.41	2839.49	-69.27	521.08
Munmorah 4	-1234.25	2912.16	-1398.41	2839.49	-69.27	521.08
Redbank 1	941.53	1277.64	2107.35	2736.32	285.43	1480.78
Vales Point 5	-1234.84	2912.15	-1459.91	2877.73	-70.73	524.70
Vales Point 6	-1234.84	2912.15	-1459.91	2877.73	-70.73	524.70
Wallerawang 7	134.09	2121.14	-288.16	3316.10	281.92	1474.50
Wallerawang 8	134.09	2121.14	-288.16	3316.10	281.92	1474.50

	Data Year					
	Y03_04		Y04_05		Y05_06	
Connection Point ID	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)
Bayswater 1	-625.43	2215.47	390.17	588.60	137.94	1011.32
Bayswater 2	-625.43	2215.47	390.17	588.60	137.94	1011.32
Bayswater 3	-625.43	2215.47	390.17	588.60	137.94	1011.32
Bayswater 4	-625.43	2215.47	390.17	588.60	137.94	1011.32
Blowering					4685.45	4112.97
Eraring 1	-1236.40	2911.63	-675.53	1380.47	6.85	310.73
Eraring 2	-1236.40	2911.63	-675.53	1380.47	6.85	310.73
Eraring 3	-1334.84	3159.61	-410.68	839.54	-49.75	509.95
Eraring 4	-1334.84	3159.61	-410.68	839.54	-49.75	509.95
Hume_NSW					4648.31	4084.66
Liddell 1	-632.01	2205.34	391.58	580.46	120.20	1067.82
Liddell 2	-632.01	2205.34	391.58	580.46	120.20	1067.82
Liddell 3	-632.01	2205.34	391.58	580.46	120.20	1067.82
Liddell 4	-632.01	2205.34	391.58	580.46	120.20	1067.82
Mt Piper 1	308.79	2283.77	1070.60	2267.42	150.20	1056.99
Mt Piper 2	308.79	2283.77	1070.60	2267.42	150.20	1056.99
Munmorah 3	-1234.25	2912.16	-567.75	1155.80	-15.64	148.25
Munmorah 4	-1234.25	2912.16	-567.75	1155.80	-15.64	148.25
Redbank 1	941.53	1277.64	414.07	589.28	147.81	1040.61
Vales Point 5	-1234.84	2912.15	-629.25	1287.59	-17.11	161.01
Vales Point 6	-1234.84	2912.15	-629.25	1287.59	-17.11	161.01
Wallerawang 7	134.09	2121.14	-368.66	1539.21	147.25	1042.87
Wallerawang 8	134.09	2121.14	-368.66	1539.21	147.25	1042.87

QLD region: Outage events

	Data Year					
	Y03_04		Y04_05		Y05_06	
Connection point ID	Average capped mispricing	Standard deviation	Average capped mispricing	Standard deviation	Average capped mispricing	Standard deviation
Barcaldine	0.00	0.00	-341.61	1885.36	589.83	1498.08
Barron Gorge 1	-9984.20	5.74	-1503.44	3586.61	502.44	1831.95
Barron Gorge 2	-9984.20	5.74	-1503.44	3586.61	502.44	1831.95
Callide A 1			22.60	202.81	607.59	1516.92
Callide A 2			22.60	202.81	607.59	1516.92
Callide A 3			22.60	202.81	607.59	1516.92
Callide A 4			22.60	202.81	607.59	1516.92
Callide B 1			22.60	202.81	607.59	1516.92
Callide B 2			22.60	202.81	607.59	1516.92
Callide C			22.60	202.81	607.59	1516.92
Callide C 4			22.60	202.81	607.59	1516.92
Collinsville 1	-9966.68	6.75	-750.97	2676.98	566.13	1644.50
Collinsville 2	-9966.68	6.75	-750.97	2676.98	566.13	1644.50
Collinsville 3	-9966.68	6.75	-750.97	2676.98	566.13	1644.50

Collinsville 4	-9966.68	6.75	-750.97	2676.98	566.13	1644.50
Collinsville 5	-9966.68	6.75	-750.97	2676.98	566.13	1644.50
Gladstone 1	40.66	524.78	22.60	202.81	607.59	1516.92
Gladstone 2	40.66	524.78	22.60	202.81	607.59	1516.92
Gladstone 3	40.66	524.78	22.60	202.81	-52.02	2561.22
Gladstone 4	40.66	524.78	22.60	202.81	22.67	2566.89
Gladstone 5	40.66	524.78	22.60	202.81	607.59	1516.92
Gladstone 6	40.66	524.78	22.60	202.81	607.59	1516.92
Kareeya 1	-9984.20	5.74	-1503.44	3586.61	502.44	1831.95
Kareeya 2	-9984.20	5.74	-1503.44	3586.61	502.44	1831.95
Kareeya 3	-9984.20	5.74	-1503.44	3586.61	502.44	1831.95
Kareeya 4	-9984.20	5.74	-1503.44	3586.61	502.44	1831.95
Mackay	-9966.68	6.75	-614.87	2446.57	602.86	1581.17
Mt Stuart 1	-9638.40	1990.30	-1953.32	3974.34	502.44	1831.95
Mt Stuart 2	-8262.69	3810.05	-1806.31	3852.51	502.44	1831.95
Stanwell 1			22.60	202.81	607.59	1516.92
Stanwell 2			22.60	202.81	607.59	1516.92
Stanwell 3			22.60	202.81	607.59	1516.92
Stanwell 4			22.60	202.81	607.59	1516.92
Yabulu			-638.99	2491.47	528.66	1789.33
Yabulu 2	-9984.20	5.74	-354.72	1865.39	528.66	1789.33

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection point ID	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)
Barcaldine	0.00	0.00	21.78	199.12	589.83	1498.08
Barron Gorge 1	-4960.45	5008.74	-324.96	1803.47	599.78	1508.97
Barron Gorge 2	-4960.45	5008.74	-324.96	1803.47	599.78	1508.97
Callide A 1			22.60	202.81	607.59	1516.92
Callide A 2			22.60	202.81	607.59	1516.92
Callide A 3			22.60	202.81	607.59	1516.92
Callide A 4			22.60	202.81	607.59	1516.92
Callide B 1			22.60	202.81	607.59	1516.92
Callide B 2			22.60	202.81	607.59	1516.92
Callide C			22.60	202.81	607.59	1516.92
Callide C 4			22.60	202.81	607.59	1516.92
Collinsville 1	0.00	0.00	-289.04	1741.31	603.42	1512.82
Collinsville 2	0.00	0.00	-289.04	1741.31	603.42	1512.82
Collinsville 3	0.00	0.00	-289.04	1741.31	603.42	1512.82
Collinsville 4	0.00	0.00	-289.04	1741.31	603.42	1512.82
Collinsville 5	0.00	0.00	-289.04	1741.31	603.42	1512.82
Gladstone 1	40.66	524.78	22.60	202.81	607.59	1516.92
Gladstone 2	40.66	524.78	22.60	202.81	607.59	1516.92
Gladstone 3	40.66	524.78	22.60	202.81	418.76	1299.33
Gladstone 4	40.66	524.78	22.60	202.81	472.34	1370.43
Gladstone 5	40.66	524.78	22.60	202.81	607.59	1516.92
Gladstone 6	40.66	524.78	22.60	202.81	607.59	1516.92
Kareeya 1	-4960.45	5008.74	-324.96	1803.47	599.78	1508.97
Kareeya 2	-4960.45	5008.74	-324.96	1803.47	599.78	1508.97

Kareeya 3	-4960.45	5008.74	-324.96	1803.47	599.78	1508.97
Kareeya 4	-4960.45	5008.74	-324.96	1803.47	599.78	1508.97
Mackay	0.00	0.00	-234.50	1584.29	554.45	1459.45
Mt Stuart 1	-4770.32	5063.75	-651.31	2487.67	599.78	1508.97
Mt Stuart 2	-5821.11	4955.89	-757.18	2657.03	599.78	1508.97
Stanwell 1			22.60	202.81	607.59	1516.92
Stanwell 2			22.60	202.81	607.59	1516.92
Stanwell 3			22.60	202.81	607.59	1516.92
Stanwell 4			22.60	202.81	607.59	1516.92
Yabulu			-257.94	1655.74	569.87	1476.63
Yabulu 2	-4960.45	5008.74	-73.52	891.67	569.87	1476.63

QLD region: System normal events

	Data Year					
	Y03_04		Y04_05		Y05_06	
Connection point ID	Average capped mispricing	Standard deviation	Average capped mispricing	Standard deviation	Average capped mispricing	Standard deviation
Barcaldine	37.46	59.16	4.68	4.41	6.25	9.45
Barron Gorge 1	-4558.24	4996.28	-9802.93	1258.98	-6050.24	4866.69
Barron Gorge 2	-4558.24	4996.28	-9802.93	1258.98	-6050.24	4866.69
Callide A 1	37.46	59.16	4.68	4.41	6.25	9.45
Callide A 2	37.46	59.16	4.68	4.41	6.25	9.45
Callide A 3	37.46	59.16	4.68	4.41	6.25	9.45
Callide A 4	37.46	59.16	4.68	4.41	6.25	9.45
Callide B 1	37.46	59.16	4.68	4.41	6.25	9.45
Callide B 2	37.46	59.16	4.68	4.41	6.25	9.45
Callide C	37.46	59.16	4.68	4.41	6.25	9.45
Callide C 4	37.46	59.16	4.68	4.41	6.25	9.45
Collinsville 1	-1672.04	3774.69	-8133.76	3859.94	-4217.77	4917.98
Collinsville 2	-1672.04	3774.69	-8133.76	3859.94	-4217.77	4917.98
Collinsville 3	-1672.04	3774.69	-8133.76	3859.94	-4217.77	4917.98
Collinsville 4	-1672.04	3774.69	-8133.76	3859.94	-4217.77	4917.98
Collinsville 5	-1672.04	3774.69	-8133.76	3859.94	-4217.77	4917.98
Gladstone 1	109.21	2127.50	-417.27	1952.95	310.63	1744.56
Gladstone 2	109.21	2127.50	731.48	1040.20	310.63	1744.56
Gladstone 3	109.21	2127.50	-601.24	2345.03	-543.50	3199.74
Gladstone 4	109.21	2127.50	-394.28	1899.29	310.63	1744.56
Gladstone 5	109.21	2127.50	-417.27	1952.95	310.63	1744.56
Gladstone 6	109.21	2127.50	-417.27	1952.95	310.63	1744.56
Kareeya 1	-1672.04	3774.69	-8133.76	3859.94	-5832.65	4908.61
Kareeya 2	-1672.04	3774.69	-8133.76	3859.94	-5832.65	4908.61
Kareeya 3	-1672.04	3774.69	-8133.76	3859.94	-5832.65	4908.61
Kareeya 4	-1672.04	3774.69	-8133.76	3859.94	-5832.65	4908.61
Mackay	-1672.04	3774.69	-8133.76	3859.94	-4217.77	4917.98
Mt Stuart 1	-1241.08	3909.76	-6964.92	4580.41	-3464.95	4933.59
Mt Stuart 2	-1346.46	3975.87	-9566.81	1963.14	-4717.70	5161.86
Stanwell 1	37.46	59.16	4.68	4.41	6.25	9.45
Stanwell 2	37.46	59.16	4.68	4.41	6.25	9.45
Stanwell 3	37.46	59.16	4.68	4.41	6.25	9.45
Stanwell 4	37.46	59.16	4.68	4.41	6.25	9.45

Yabulu			-8420.01	3614.94	-4217.77	4917.98
Yabulu 2	-1672.04	3774.69	-8133.76	3859.94	-4217.77	4917.98

	Data year					
	Y03_04		Y04_05		Y05_06	
Connection point ID	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)	Average capped mispricing (without violation)	Standard Deviation (without violation)
Barcaldine	37.46	59.16	4.68	4.41	6.25	9.45
Barron Gorge 1	-232.25	1566.81	-275.49	1629.50	-538.95	2225.47
Barron Gorge 2	-232.25	1566.81	-275.49	1629.50	-538.95	2225.47
Callide A 1	37.46	59.16	4.68	4.41	6.25	9.45
Callide A 2	37.46	59.16	4.68	4.41	6.25	9.45
Callide A 3	37.46	59.16	4.68	4.41	6.25	9.45
Callide A 4	37.46	59.16	4.68	4.41	6.25	9.45
Callide B 1	37.46	59.16	4.68	4.41	6.25	9.45
Callide B 2	37.46	59.16	4.68	4.41	6.25	9.45
Callide C	37.46	59.16	4.68	4.41	6.25	9.45
Callide C 4	37.46	59.16	4.68	4.41	6.25	9.45
Collinsville 1	-356.04	1930.33	-3099.88	4614.88	-790.46	2660.09
Collinsville 2	-356.04	1930.33	-3099.88	4614.88	-790.46	2660.09
Collinsville 3	-356.04	1930.33	-3099.88	4614.88	-790.46	2660.09
Collinsville 4	-356.04	1930.33	-3099.88	4614.88	-790.46	2660.09
Collinsville 5	-356.04	1930.33	-3099.88	4614.88	-790.46	2660.09
Gladstone 1	91.18	767.52	-25.66	46.53	155.93	1180.33
Gladstone 2	91.18	767.52	809.80	419.08	155.93	1180.33
Gladstone 3	91.18	767.52	-25.17	46.21	125.33	1060.61
Gladstone 4	91.18	767.52	-24.43	45.49	155.93	1180.33
Gladstone 5	91.18	767.52	-25.66	46.53	155.93	1180.33
Gladstone 6	91.18	767.52	-25.66	46.53	155.93	1180.33
Kareeya 1	-356.04	1930.33	-3099.88	4614.88	-568.78	2282.73
Kareeya 2	-356.04	1930.33	-3099.88	4614.88	-568.78	2282.73
Kareeya 3	-356.04	1930.33	-3099.88	4614.88	-568.78	2282.73
Kareeya 4	-356.04	1930.33	-3099.88	4614.88	-568.78	2282.73
Mackay	-356.04	1930.33	-3099.88	4614.88	-790.46	2660.09
Mt Stuart 1	-266.97	1927.08	-5559.68	4956.95	-613.14	2542.24
Mt Stuart 2	-340.08	2082.12	-8289.05	3734.28	-1716.46	3867.89
Stanwell 1	37.46	59.16	4.68	4.41	6.25	9.45
Stanwell 2	37.46	59.16	4.68	4.41	6.25	9.45
Stanwell 3	37.46	59.16	4.68	4.41	6.25	9.45
Stanwell 4	37.46	59.16	4.68	4.41	6.25	9.45
Yabulu			-3187.06	4657.46	-790.46	2660.09
Yabulu 2	-356.04	1930.33	-3099.88	4614.88	-790.46	2660.09

Appendix B1:

Description of unclassifiable constraints from outage and system normal events list

Effective date	Constraint name	Description
27/08/2004	@LYGS	To Be Archived - DO NOT INVOKE
9/08/2004	@LYGS	Eff = 09/08/2004 ; RHS = 0 ; Op = "=" ; Wt = 20
24/11/2006	#APS_E	VAPS.ENERGY * 1 = 0 (Wt = 360)
25/08/2003	#APS_E	VAPS.ENERGY * 1 = 95 (Wt = 360)
1/09/2003	#MP1_E	NMTP1.ENERGY * 1 = 4 (Wt = 360)
10/09/2003	#WW8_E	NWW28.ENERGY * 1 = 0 (Wt = 360)
1/07/2004	@BDL01	Eff = 01/07/2004 ; RHS = 20 ; Op = ">=" ; Wt = 20
7/06/2005	@BDL01	To be archived, Eff = 01/07/2004 ; RHS = 20 ; Op = >= ; Wt = 20
25/11/2003	Q_0010	Qld, discretionary (H32Chal+Fdrs7134/5 at T49KarPS)<=140MW
31/07/2001	Q_0415	Qld Central-South <=1700MW discretionary
13/12/2004	Q_0415	DO NOT INVOKE -to be archived , Qld Central-South <=1700MW discretionary
9/07/2003	#BW01_E	NBAY1.ENERGY * 1 = 480 (Wt = 360)
9/07/2003	#BW01_E	NBAY1.ENERGY * 1 = 575 (Wt = 360)
13/04/2003	#LYA1_E	VLYP1.ENERGY * 1 = 395 (Wt = 360)
12/05/2003	#LYA1_E	VLYP1.ENERGY * 1 = 440 (Wt = 360)
13/04/2003	#LYA1_E	VLYP1.ENERGY * 1 = 445 (Wt = 360)
12/05/2003	#LYA1_E	VLYP1.ENERGY * 1 = 460 (Wt = 360)
20/09/2003	#LYA1_E	VLYP1.ENERGY * 1 = 510 (Wt = 360)
20/09/2003	#LYA2_E	VLYP2.ENERGY * 1 = 0 (Wt = 360)
14/06/2003	#LYA2_E	VLYP2.ENERGY * 1 = 460 (Wt = 360)
28/06/2003	#LYA3_E	VLYP3.ENERGY * 1 = 375 (Wt = 360)
19/09/2003	#LYA3_E	VLYP3.ENERGY * 1 = 485 (Wt = 360)
8/06/2003	#LYA3_E	VLYP3.ENERGY * 1 = 530 (Wt = 360)
20/09/2003	#LYA3_E	VLYP3.ENERGY * 1 = 535 (Wt = 360)
27/06/2003	#LYA3_E	VLYP3.ENERGY * 1 <= 293 (Wt = 360)
8/06/2003	#LYA3_E	VLYP3.ENERGY * 1 <= 530 (Wt = 360)
12/05/2003	#LYA4_E	VLYP4.ENERGY * 1 = 450 (Wt = 360)
19/05/2003	#LYA4_E	VLYP4.ENERGY * 1 = 470 (Wt = 360)
20/09/2003	#LYA4_E	VLYP4.ENERGY * 1 = 515 (Wt = 360)
27/08/2004	@LYGS_A	To Be Archived - DO NOT INVOKE
10/08/2004	@LYGS_A	Eff = 10/08/2004 ; RHS = 0 ; Op = "<=" ; Wt = 20
16/03/2005	@NPS470	Eff = 16/03/2005 ; RHS = 470 ; Op = "<=" ; Wt = 360
16/03/2005	@NPS500	Eff = 16/03/2005 ; RHS = 500 ; Op = "<=" ; Wt = 360
8/12/2005	Q:CN780	Qld Central to North upper transfer limit of 780 MW (discretionary)
21/08/2003	Q:CN890	QLD, C-N Stab.trf Lmt 890(including Dysart infeed)
2/12/2004	Q:CN890	QLD, C-N Discretionary Stab.trf Lmt 890(including Dysart infeed)
8/12/2005	Q:CN890	Qld Central to North upper transfer limit of 890 MW (discretionary)
8/11/2002	Q:CN900	QLD, C-N Stab.trf Lmt 900(including Dysart infeed)

2/12/2004	Q:CN900	QLD, C-N Discretionary Stab.trf Lmt 900(including Dysart infeed)
8/12/2005	Q:CN900	Qld Central to North upper transfer limit of 900 MW (discretionary)
20/02/2003	Q:CN930	QLD, C-N Stab.trf Lmt 930(including Dysart infeed)
2/12/2004	Q:CN930	QLD, C-N Discretionary Stab.trf Lmt 930(including Dysart infeed)
8/12/2005	Q:CN930	Qld Central to North upper transfer limit of 930 MW (discretionary)
8/11/2002	Q:CN940	QLD, C-N Stab.trf Lmt 940(including Dysart infeed)
2/12/2004	Q:CN940	QLD, C-N Discretionary Stab.trf Lmt 940(including Dysart infeed)
8/12/2005	Q:CN940	Qld Central to North upper transfer limit of 940 MW (discretionary)
2/07/2003	#BDL01_E	VMWT2.ENERGY * 1 = 0 (Wt = 360)
12/04/2004	#BDL01_E	VMWT2.ENERGY * 1 = 20 (Wt = 20)
7/02/2007	#BDL01_E	VMWT2.ENERGY * 1 = 25 (Wt = 20)
12/04/2004	#BDL01_E	VMWT2.ENERGY * 1 >= 20 (Wt = 20)
21/02/2004	#BDL02_E	VMWT3.ENERGY * 1 = 0 (Wt = 360)
12/04/2004	#JLB01_E	VJLGB1.ENERGY * 1 = 0 (Wt = 20)
12/04/2004	#JLB02_E	VJLGB2.ENERGY * 1 = 0 (Wt = 20)
12/04/2004	#JLB03_E	VJLGB3.ENERGY * 1 = 0 (Wt = 20)
4/10/2004	#MPP_1_E	QBCK1.ENERGY * 1 = 0 (Wt = 20)
7/09/2004	#SHGEN_E	NSHL.ENERGY * 1 <= 0 (Wt = 20)
28/09/2004	#SHGEN_E	NSHL.ENERGY * 1 <= 80 (Wt = 20)
31/10/2005	#SHGEN_E	NSHL.ENERGY * 1 >= 240 (Wt = 20)
5/12/2004	#YWPS1_E	VYP21.ENERGY * 1 <= 340 (Wt = 20)
5/12/2004	#YWPS2_E	VYP22.ENERGY * 1 <= 320 (Wt = 20)
5/12/2004	#YWPS3_E	VYP23.ENERGY * 1 <= 320 (Wt = 20)
5/12/2004	#YWPS4_E	VYP24.ENERGY * 1 <= 320 (Wt = 20)
14/07/2004	@PLAY4=0	Eff = 14/07/2004 ; RHS = 0 ; Op = "=" ; Wt = 20
11/01/2006	@Q-MGT=0	Eff = 11/01/2006 ; RHS = 0 ; Op = "=" ; Wt = 20
10/07/2002	CHI_QKAH	CHIMERA, Kareeya PS
17/12/2005	#GORDON_E	TGO11.ENERGY * 1 >= 50 (Wt = 20)
10/08/2005	#GORDON_E	TGO11.ENERGY * 1 <= 200 (Wt = 20)
18/04/2007	#GORDON_E	TGO11.ENERGY * 1 <= 250 (Wt = 20)
28/10/2006	#GORDON_E	TGO11.ENERGY * 1 = 134 (Wt = 360)
10/09/2005	#GORDON_E	TGO11.ENERGY * 1 >= 100 (Wt = 20)
28/10/2006	#GORDON_E	TGO11.ENERGY * 1 >= 134 (Wt = 20)
28/10/2006	#GORDON_E	TGO11.ENERGY * 1 >= 140 (Wt = 20)
10/09/2005	#GORDON_E	TGO11.ENERGY * 1 >= 150 (Wt = 20)
28/10/2006	#GORDON_E	TGO11.ENERGY * 1 >= 153 (Wt = 20)
28/10/2006	#GORDON_E	TGO11.ENERGY * 1 >= 172 (Wt = 20)
28/10/2006	#GORDON_E	TGO11.ENERGY * 1 >= 202 (Wt = 20)
28/10/2006	#GORDON_E	TGO11.ENERGY * 1 >= 265 (Wt = 20)
10/05/2006	#GORDON_E	TGO11.ENERGY * 1 >= 267 (Wt = 20)
12/04/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 350 (Wt = 20)
20/04/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 400 (Wt = 20)
24/04/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 700 (Wt = 20)
24/04/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 750 (Wt = 20)
24/04/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 850 (Wt = 20)
27/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1000 (Wt = 20)
31/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1050 (Wt = 20)
29/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1100 (Wt = 20)
15/06/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1150 (Wt = 20)

27/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1200 (Wt = 20)
9/06/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1250 (Wt = 20)
25/06/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1300 (Wt = 20)
17/06/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1350 (Wt = 20)
25/06/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1400 (Wt = 20)
12/04/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 350 (Wt = 360)
18/04/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 400 (Wt = 360)
28/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1100 (Wt = 360)
28/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1200 (Wt = 360)
2/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1250 (Wt = 360)
2/07/2003	#MURRAY_E	NMUR8.ENERGY * 1 <= 1300 (Wt = 360)
21/10/2005	#OSB-AG_E	SNBN1.ENERGY * 1 >= 159 (Wt = 20)
25/01/2006	#REECE2_E	TRCB1.ENERGY * 1 = 0 (Wt = 360)
17/08/2003	#ROMA_7_E	QRMA7.ENERGY * 1 = 34 (Wt = 360)
17/08/2003	#ROMA_8_E	QRMA8.ENERGY * 1 = 34 (Wt = 360)
12/07/2007	#SHPUMP_E	NSHP1.ENERGY * -1 = 0 (Wt = 20)
31/10/2005	#SHPUMP_E	NSHP1.ENERGY * -1 <= 0 (Wt = 20)
31/10/2005	#SHPUMP_E	NSHP1.ENERGY * -1 <= 0 (Wt = 360)
10/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 300 (Wt = 20)
10/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 350 (Wt = 20)
10/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 400 (Wt = 20)
10/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 450 (Wt = 20)
10/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 500 (Wt = 20)
10/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 600 (Wt = 20)
3/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 150 (Wt = 360)
2/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 200 (Wt = 360)
2/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 250 (Wt = 360)
2/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 300 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 310 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 360 (Wt = 360)
2/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 370 (Wt = 360)
2/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 400 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 410 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 460 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 550 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 560 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 600 (Wt = 360)
1/10/2003	#TUMUT3_E	NLTS8.ENERGY * 1 <= 700 (Wt = 360)
16/04/2003	#YABULU_E	QTYP.ENERGY * 1 = 0 (Wt = 360)
26/04/2003	#YABULU_E	QTYP.ENERGY * 1 = 49 (Wt = 20)
8/03/2004	#YABULU_E	QTYP.ENERGY * 1 = 50 (Wt = 20)
9/01/2004	#YABULU_E	QTYP.ENERGY * 1 = 80 (Wt = 20)
9/01/2004	#YABULU_E	QTYP.ENERGY * 1 = 95 (Wt = 20)
9/01/2004	#YABULU_E	QTYP.ENERGY * 1 = 110 (Wt = 20)
9/01/2004	#YABULU_E	QTYP.ENERGY * 1 = 120 (Wt = 20)
16/04/2003	#YABULU_E	QTYP.ENERGY * 1 = 20 (Wt = 360)
16/04/2003	#YABULU_E	QTYP.ENERGY * 1 = 40 (Wt = 360)
20/05/2007	#YABULU_E	QTYP.ENERGY * 1 = 45 (Wt = 360)
16/04/2003	#YABULU_E	QTYP.ENERGY * 1 = 80 (Wt = 360)
29/09/2006	#YABULU_E	QTYP.ENERGY * 1 <= 125 (Wt = 20)
29/09/2006	#YABULU_E	QTYP.ENERGY * 1 <= 140 (Wt = 20)
29/09/2006	#YABULU_E	QTYP.ENERGY * 1 <= 145 (Wt = 20)

16/04/2003	#YABULU_E	QTYP.ENERGY * 1 = 155 (Wt = 360)
5/12/2003	#YABULU_E	QTYP.ENERGY * 1 = 159 (Wt = 360)
20/07/2004	@DRYCK3=0	Eff = 07/04/2004 ; RHS = 0 ; Op = <= ; Wt = 360
7/04/2004	@DRYCK3=0	Eff = 07/04/2004 ; RHS = 0 ; Op = "=" ; Wt = 360
7/06/2005	@DRYCK3=0	To be archived, Eff = 07/04/2004 ; RHS = 0 ; Op = <= ; Wt = 360
8/07/2004	@LV080704	Eff = 08/07/2004 ; RHS = 2841 ; Op = "<=" ; Wt = 20
7/06/2005	@LV080704	To be archived, Eff = 08/07/2004 ; RHS = 2841 ; Op = <= ; Wt = 20
18/03/2005	@NPS<=515	Eff = 18/03/2005 ; RHS = 515 ; Op = "<=" ; Wt = 360
15/12/2003	Q_CVL_090	Discretionary Collinsville Gen >= 90MW
9/07/2004	Q_FNQ_110	Qld, FNQ limit of 110MW
24/05/2004	V>JLG_185	Discretionary upper limit on Jeeralang B1, B2, B3 of 185 MW
31/01/2006	V>LY_2200	Discretionary Latrobe Loy Yang A, B and Loy Yang Gas Generation Limit <= 2200 MW
31/01/2006	V>LY_2250	Discretionary Latrobe Loy Yang A, B and Loy Yang Gas Generation Limit <= 2250 MW
31/01/2006	V>LY_2300	Discretionary Latrobe Loy Yang A, B and Loy Yang Gas Generation Limit <= 2300 MW
31/01/2006	V>LY_2350	Discretionary Latrobe Loy Yang A, B and Loy Yang Gas Generation Limit <= 2350 MW
31/01/2006	V>LY_2400	Discretionary Latrobe Loy Yang A, B and Loy Yang Gas Generation Limit <= 2400 MW
31/01/2006	V>LY_2500	Discretionary Latrobe Loy Yang A, B and Loy Yang Gas Generation Limit <= 2500 MW
13/11/2003	V>YW_1300	Discretionary Yallourn W generation limit 1300MW
13/11/2003	V>YW_1350	Discretionary Yallourn W generation limit 1350MW
13/11/2003	V>YW_1400	Discretionary Yallourn W generation limit 1400MW
25/01/2006	#BASTYAN_E	TFA11.ENERGY * 1 = 0 (Wt = 360)
4/10/2002	CHI_Q_TRNG	CHIMERA, Qld - Tarong Limit, 0.8*(margin) Qld Gen on LHS
24/01/2003	H_ULT_0500	Discretionary Upper Tumut + Lower Tumut Gen <= 500MW
24/01/2003	H_ULT_0550	Discretionary Upper Tumut + Lower Tumut Gen <= 550MW
14/03/2002	V>D4500-LV	Discretionary Latrobe Valley limit of 4500MW
14/03/2002	V>D4750-LV	Discretionary Latrobe Valley limit of 4750MW
12/11/2002	V>LV2_1750	1750MW upper limit for HWPS 6,7,8 + YPS+JLGSB+MWPS+BDPS gen
12/11/2002	V>LV2_1900	1900MW upper limit for HWPS 6,7,8 + YPS+JLGSB+MWPS+BDPS gen
31/01/2006	V_LV5_4650	4650MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_4700	4700MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_4750	4750MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_4800	4800MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_4900	4900MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_4950	4950MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_5000	5000MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_5050	5050MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_5100	5100MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_5150	5150MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_5200	5200MW upper limit on Latrobe Valley generation excluding Yallourn units 2,3,4
31/01/2006	V_LV5_5250	5250MW upper limit on Latrobe Valley generation excluding

		Yallourn units 2,3,4
26/09/2005	#DEVILS_G_E	TDG11.ENERGY * 1 = 0 (Wt = 20)
19/09/2005	#DEVILS_G_E	TDG11.ENERGY * 1 <= 0 (Wt = 20)
25/01/2006	#JBUTTERS_E	TJB11.ENERGY * 1 = 0 (Wt = 360)
18/01/2006	#MACKNTSH_E	TMA11.ENERGY * 1 <= 0 (Wt = 20)
18/01/2006	#MACKNTSH_E	TMA11.ENERGY * 1 = 40 (Wt = 20)
31/07/2004	#REDBANK1_E	NMRK1.ENERGY * 1 <= 0 (Wt = 20)
25/06/2006	#TUNGATIN_E	TTU11.ENERGY * 1 >= 20 (Wt = 20)
25/06/2006	#TUNGATIN_E	TTU11.ENERGY * 1 >= 50 (Wt = 20)
25/06/2006	#TUNGATIN_E	TTU11.ENERGY * 1 >= 70 (Wt = 20)
10/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 350 (Wt = 20)
10/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 400 (Wt = 20)
10/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 450 (Wt = 20)
6/11/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 500 (Wt = 20)
6/11/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 550 (Wt = 20)
6/11/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 600 (Wt = 20)
30/04/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 = 590 (Wt = 360)
2/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 200 (Wt = 360)
2/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 250 (Wt = 360)
2/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 300 (Wt = 360)
3/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 350 (Wt = 360)
3/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 400 (Wt = 360)
2/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 430 (Wt = 360)
3/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 450 (Wt = 360)
1/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 500 (Wt = 360)
2/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 520 (Wt = 360)
2/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 550 (Wt = 360)
1/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 600 (Wt = 360)
1/10/2003	#UPPTUMUT_E	NUTS8.ENERGY * 1 <= 700 (Wt = 360)
12/05/2004	@HW12678ETC	Eff = 12/05/2004 ; RHS = 1450 ; Op = "<=" ; Wt = 20
7/06/2005	@HW12678ETC	To be archived, Eff = 12/05/2004 ; RHS = 1450 ; Op = <= ; Wt = 20
2/02/2004	@HWPS_1_2_4	Limit HWPS 1, 2 and 4 to 470 MW
7/06/2005	@HWPS_1_2_4	To be archived, Limit HWPS 1, 2 and 4 to 470 MW
15/11/2003	@_SHYDR=298	Eff = 15/11/2003 ; RHS = 298 ; Op = "<=" ; Wt = 20

Appendix B2:

Calculation of average number of hours of mis-pricing for system normal and outage events

In this study, the hours of mis-pricing for each connection point per financial year is classified based on their system conditions. System conditions are classified as either outage, normal (system normal) or unclassifiable, as defined in the section 4.

Average number of hours =

$$\frac{\sum Hours\ of\ \ mis-pricing\ \ for\ each\ system\ condition}{Number\ of\ \ connection\ \ pts\ \ for\ each\ system\ condition}$$

Hours of mis-pricing/ connection point/ financial year =

Σ Hours of mis-pricing of each system condition/ financial year

An example for the Victoria region as follows.

Connection points	Hours of mis-pricing in Y03_04		
	outage	normal	unclassifiable
Hazelwood 1	11.5	164.5	1.5
Hazelwood 2	11.5	164.5	1.5
Hazelwood 6	0	164.5	1.42
Hazelwood 7	0	164.5	1.42
Hazelwood 8	0	164.5	1.42
Jeeralang A 1	11.5	164.5	1.42
Jeeralang A 2	11.5	164.5	1.42
Jeeralang A 3	11.5	164.5	1.42
Jeeralang A 4	11.5	164.5	1.42
Jeeralang B 1	11.5	164.5	4.17
Jeeralang B 2	11.5	164.5	4.17
Jeeralang B 3	11.5	164.5	4.17
Morwell 4	0	164.5	1.42
Morwell 5	0	164.5	1.42
Morwell 1, 2 and 3	11.5	164.5	1.42
Bairnsdale	11.5	164.5	2.5
Bairnsdale 2	11.5	164.5	1.58
Yallourn W 1	0	121.67	1
Sum of hours of mis-pricing	**138**	**2918.17**	**34.79**
Average number of hours	**11.5**	**162.12**	**1.93**
Number of connection points	**12**	**18**	**18**

Note: The average 11.5 is calculated by dividing 138 by 12.

The same connection point can appear under more than one category; hence number of connection points should not be summed across categories.

Appendix B3:

Average number of hours of mis-pricing for system normal and outage events for all NEM regions

VIC region

Connection points	Hours of mis-pricing in Y03_04			Hours of mis-pricing in Y04_05			Hours of mis-pricing in Y05_06		
	outage	normal	unclassifiable	outage	normal	unclassifiable	outage	normal	unclassifiable
Hazelwood 1	11.5	164.5	1.5	0.92	100.5	25.17	0	14.33	0
Hazelwood 2	11.5	164.5	1.5	0.92	100.5	25.17	0	14.33	0
Hazelwood 6	0	164.5	1.42	0.92	100.5	26.83	0	14.33	0
Hazelwood 7	0	164.5	1.42	0.92	100.5	26.83	0	14.33	0
Hazelwood 8	0	164.5	1.42	0.92	100.5	26.83	0	14.33	0
Jeeralang A 1	11.5	164.5	1.42	0.92	100.5	25.17	0	14.33	0
Jeeralang A 2	11.5	164.5	1.42	0.92	100.5	25.17	0	14.33	0
Jeeralang A 3	11.5	164.5	1.42	0.92	100.5	25.17	0	14.33	0
Jeeralang A 4	11.5	164.5	1.42	0.92	100.5	25.17	0	14.33	0
Jeeralang B 1	11.5	164.5	4.17	0.92	100.5	26.83	0	14.33	0
Jeeralang B 2	11.5	164.5	4.17	0.92	100.5	26.83	0	14.33	0
Jeeralang B 3	11.5	164.5	4.17	0.92	100.5	26.83	0	14.33	0
Morwell 4	0	164.5	1.42	0.92	100.5	26.83	0	14.33	0
Morwell 5	0	164.5	1.42	0.92	100.5	26.83	0	14.33	0
Morwell 1, 2 and 3	11.5	164.5	1.42	0.92	100.5	26.83	0	14.33	0
Bairnsdale	11.5	164.5	2.5	0.92	100.5	27.5	0	14.33	0
Bairnsdale 2	11.5	164.5	1.58	0.92	100.5	26.83	0	14.33	0
Yallourn W 1	0	121.67	1	0	97.33	28.08	0	14	0.75
Sum of hours of mis-pricing	138.00	2918.17	34.79	15.64	1805.83	474.90	0	257.61	0.75
Average number of hours	11.50	162.12	1.93	0.92	100.32	26.38	0	14.31	0.75
Number of connection points	12	18	18	17	18	18	0	18	1

NSW region

Connection points	Hours of mis-pricing in Y03_04			Hours of mis-pricing in Y04_05			Hours of mis-pricing in Y05_06		
	outage	normal	unclassifiable	outage	normal	unclassifiable	outage	normal	unclassifiable
Bayswater 1	47.67	5.25	2.08	112.83	16.75	0	117.5	80.75	0
Bayswater 2	47.67	5.25	0	112.83	16.75	0	117.5	80.75	0
Bayswater 3	47.67	5.25	0	112.83	16.75	0	117.5	80.75	0
Bayswater 4	47.67	5.25	0	112.83	16.75	0	117.5	80.75	0
Blowering	0	0	0	0	0	0	162.83	2.5	0
Eraring 1	47.5	4.58	0	106.83	7	0	115	78.25	0
Eraring 2	47.5	4.58	0	106.83	7	0	115	78.25	0
Eraring 3	47.5	4.58	0	80.58	7	0	115	80.75	0
Eraring 4	47.5	4.58	0	80.58	7	0	115	80.75	0
Hume_NSW	0	0	0	0	0	0	162.83	2.5	0
Liddell 1	47.67	5.25	0	111.75	16.75	0	117.5	80.75	0
Liddell 2	47.67	5.25	0	111.75	16.75	0	117.5	80.75	0
Liddell 3	47.67	5.25	0	111.75	16.75	0	117.5	80.75	0
Liddell 4	47.67	5.25	0	111.75	16.75	0	117.5	80.75	0
Munmorah 3	47.5	4.58	0	107	7	0	117.25	78.25	0
Munmorah 4	47.5	4.58	0	107	7	0	117.25	78.25	0
Redbank 1	15.08	0.75	8.58	94.75	15.83	6.67	114.08	76.08	0
Mt Piper 1	47.5	5.25	0.33	102.83	58.17	0	110.25	77.75	0
Mt Piper 2	47.5	5.25	0	102.83	58.17	0	110.25	77.75	0
Vales Point 5	47.5	4.58	0	107	7	0	117.25	78.25	0
Vales Point 6	47.5	4.58	0	107	7	0	117.25	78.25	0
Wallerawang 7	47.5	5.25	0	102.83	58.17	0	110.25	77.75	0
Wallerawang 8	47.5	5.25	0.08	102.83	58.17	0	110.25	77.75	0
Sum of hours of mis-pricing	966.44	100.39	11.07	2207.21	438.51	6.67	2749.74	1669.08	0
Average number of hours	46.02	4.78	2.77	105.11	20.88	6.67	119.55	72.57	0
Number of connection points	21	21	4	21	21	1	23	23	0

QLD region

Connection points	Hours of mis-pricing in Y03_04			Hours of mis-pricing in Y04_05			Hours of mis-pricing in Y05_06		
	outage	normal	unclassifiable	outage	normal	unclassifiable	outage	normal	unclassifiable
Barcaldine	17.67	12.08	1.42	3	43.08	0	160.16	27.75	0.51
Barron Gorge 1	12.92	23.25	2.08	12.25	143.08	4.5	157.08	46.16	4.51
Barron Gorge 2	12.92	23.25	2.08	12.25	143.08	4.5	157.08	46.16	4.51
Callide A 1	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Callide A 2	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Callide A 3	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Callide A 4	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Callide B 1	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Callide B 2	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Callide C	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Callide C 4	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Collinsville 1	0.83	15.17	2	5.83	51.67	4.5	156	38.58	0.51
Collinsville 2	0.83	15.17	2	5.83	51.67	4.5	156	38.58	0.51
Collinsville 3	0.83	15.17	2	5.83	51.67	4.5	156	38.58	0.51
Collinsville 4	0.83	15.17	2	5.83	51.67	4.5	156	38.58	0.51
Collinsville 5	0.83	15.17	2	5.83	51.67	4.5	156	38.58	0.51
Yabulu	0	0	0	5.25	49.58	2.92	166.5	38.58	0.17
Gladstone 1	11.58	14.08	0	1.33	47	0	154.83	28.26	0
Gladstone 2	11.58	14.08	0	1.33	64	0	154.83	28.26	0
Gladstone 3	11.58	14.08	0	1.33	47.08	0	231.99	29.68	0
Gladstone 4	11.58	14.08	0	1.33	47.25	0	203.24	28.26	0
Gladstone 5	11.58	14.08	0	1.33	47	0	154.83	28.26	0
Gladstone 6	11.58	14.08	0	1.33	47	0	154.83	28.26	0
Kareeya 1	12.92	15.17	2.08	12.25	51.67	4.5	157.08	44.91	5.01
Kareeya 2	12.92	15.17	2.08	12.25	51.67	4.5	157.08	44.91	5.01
Kareeya 3	12.92	15.17	2.08	12.25	51.67	4.5	157.08	44.91	5.01
Kareeya 4	12.92	15.17	2.08	12.25	51.67	4.5	157.08	44.91	5.01
Mackay	0.83	15.17	2	16.25	51.67	3.84	171.75	38.58	2.51
Mt Stuart 1	13.5	17.67	0	15.33	78.84	0	157.08	41.84	0
Mt Stuart 2	26.92	18.75	0	29.33	83.09	0	157.08	41.42	0
Stanwell 1	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Stanwell 2	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Stanwell 3	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Stanwell 4	0	12.08	1.42	1.33	43.08	0	154.83	27.75	0.51
Yabulu 2	12.92	15.17	8.08	187.75	51.75	3.76	166.5	38.58	0.51
Sum of hours of mis-pricing	222.99	491.31	51.02	383.50	1925.49	60.02	5614.06	1195.59	41.43
Average number of hours	10.14	14.45	1.96	10.96	55.01	4.29	160.40	34.16	1.53
Number of connection points	22	34	26	35	35	14	35	35	27

SA region

Connection points	Hours of mis-pricing in Y03_04			Hours of mis-pricing in Y04_05			Hours of mis-pricing in Y05_06		
	outage	normal	unclassifiable	outage	normal	unclassifiable	outage	normal	unclassifiable
Northern 1	0.42	0	0	1.42	48.25	0	2.66	0.17	0
Ladbroke Grove 1	0	0	0	0	0	0	38.58	427.42	0
Ladbroke Grove 2	0	0	0	0	0	0	41.17	427.42	0
Port Lincoln	6	13.42	0	33.17	66.33	0	5.92	0.58	0
Pelican Point	0	15	0	59.84	0.16	0	156.84	8	0
Snuggery 1	3.67	0	0	14.42	114.83	0	55.58	427.42	0
Sum of hours of mis-pricing	10.09	28.42	0.00	108.85	229.57	0.00	300.75	1291.01	0
Average number of hours	3.36	14.21	0.00	27.21	57.39	0.00	50.13	215.17	0
Number of connection points	3	2	0	4	4	0	6	6	0

Snowy region

Connection points	Hours of mis-pricing in Y03_04			Hours of mis-pricing in Y04_05			Hours of mis-pricing in Y05_06		
	outage	normal	unclassifiable	outage	normal	unclassifiable	outage	normal	unclassifiable
Guthega	0	0	0	0	0	0	37.75	19.42	0
Lower Tumut	18	0.25	13.92	51	6.5	0	178.67	30.58	0
Murray	0	0	4.83	0	0	0	38.92	21.67	0
Upper Tumut	18	0.25	18.42	51	6.5	0	178.67	30.58	0
Sum of hours of mis-pricing	36.00	0.50	37.17	102.00	13.00	0.00	434.01	102.25	0
Average number of hours	18.00	0.25	12.39	51.00	6.50	0.00	108.50	25.56	0
Number of connection points	2	2	3	2	2	0	4	4	0

TAS region

Connection points	Hours of mis-pricing in Y04_05			Hours of mis-pricing in Y05_06		
	outage	normal	unclassifiable	outage	normal	unclassifiable
John Butters	6.5	0.67	0	6.5	40.58	3.5
Mackintosh	6.5	0.67	0	5.08	40.58	5.83
Sum of hours of mis-pricing	13	1.34	0	11.58	81.16	9.33
Average number of hours	6.5	0.67	0	5.79	40.58	4.665
Number of connection points	2	2	0	2	2	2

Appendix B4:

Annual hours binding of each outage constraint in NSW

Binding NSW constraint	Data year			Grand Total (hrs)
	Y03_04	Y04_05	Y05_06	
N::N_LDNC_1			6.58	6.58
N:N_LDNC_1	0.17	8.92	1.00	10.08
N>>N-81_19			0.08	0.08
N>>N-81_1T			97.33	97.33
N>>N-81_22			2.67	2.67
N>N+81__07			1.25	1.25
N>N+LDNC_07			7.25	7.25
N>N-22__01	0.83			0.83
N>N-22__03	10.00			10.00
N>N-22__04	1.67			1.67
N>N-29__07		1.92		1.92
N>N-31__03		0.33		0.33
N>N-32__01	0.08			0.08
N>N-38__19		4.42		4.42
N>N-38__20		1.25		1.25
N>N-38_19A		0.33		0.33
N>N-38_20A		9.83		9.83
N>N-5___03	0.08			0.08
N>N-76__02			0.25	0.25
N>N-76__17			1.75	1.75
N>N-76+777			0.33	0.33
N>N-76+77A			2.33	2.33
N>N-76+77E			0.58	0.58
N>N-77__17			0.58	0.58
N>N-81__02		0.17	2.25	2.42
N>N-81__07		4.17	1.17	5.33
N>N-81__19	31.83	16.08		47.92
N>N-81__1T		59.42		59.42
N>N-81__22	1.00	8.83		9.83
N>N-81__27	0.50	0.25	0.25	1.00
N>N-82__14	0.33			0.33
N>N-82__15	1.17		1.83	3.00
N>N-LOTG_1		1.08		1.08
Grand Total	**47.67**	**117.00**	**190.25**	**354.92**