



Electricity spot prices above \$5000/MWh

**New South Wales,
18 November 2016**

21 December 2016

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Inquiries about this publication should be addressed to:

Australian Energy Regulator
GPO Box 520
MELBOURNE VIC 3001

Tel: (03) 9290 1444
Fax: (03) 9290 1457

Email: AERInquiry@aer.gov.au
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Contents

1	Introduction.....	4
2	Summary	5
3	Analysis.....	6
	3.1. Constraint, rebidding and network availability	6
	3.1.1 Constraint.....	6
	3.1.2 Rebidding.....	9
	3.1.3 Network availability	11
	Appendix A: Significant rebids.....	13
	Appendix B: Price setter	15
	Appendix C: Closing bids	16
	Appendix D: Management of constraints	19
	Appendix E: N>>N-NIL_01N constraint description.....	22

1 Introduction

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

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

¹ This requirement is set out in clause 3.13.7 (d) of the National Electricity Rules.

2 Summary

On 18 November 2016, the spot price in New South Wales reached \$11 701/MWh for the 3.30 pm trading interval. Spot prices in the region had been around \$50/MWh for much of the morning and then increased to around \$190/MWh at 10 am, to around \$300/MWh at 2.30 pm. The spot price reached \$2942/MWh, \$11 701/MWh, \$3259/MWh and \$588/MWh for the 3 pm, 3.30 pm, 4 pm and 4.30 pm trading intervals, respectively.

While spot prices for the 3 pm to 4 pm trading intervals were forecast to be around \$300/MWh four and twelve hours ahead of dispatch, the spot price for the 4.30 pm trading interval, was forecast to be around \$13 800/MWh.

Factors that contributed to high prices on the day included:

System Normal Constraint

- A network constraint that includes the Vic – NSW interconnector and a number of large generators in southern New South Wales, bound. The way the constraint operates means that an increase in generation in southern New South Wales results in a reduction of imports from Victoria. Hence, generators on the constraint act as effective gate keepers by limiting imports into New South Wales from Victoria.

Rebidding

- Over a series of rebids Origin and Snowy Hydro progressively shifted a total of around 3000 MW of capacity for generators in southern New South Wales to the price floor, thereby increasing their output. By 2.20 pm generation in southern New South Wales had increased to a level that caused the constraint to bind.
- The supply curve in New South Wales was very steep with no capacity priced between \$288/MWh and \$13 600/MWh. The rebidding of capacity exacerbated the distribution of prices and reduced the amount of mid-priced capacity.
- Origin and Snowy Hydro also rebid their ramp down rates to the minimum allowable under the Rules which prolonged the period for which the constraint was binding.

Network availability

- The Terranora and Directlink interconnectors, which link New South Wales and Queensland, were flowing into New South Wales at their forecast limits. Consequently, additional low priced capacity from Queensland was inaccessible.
- Due to the rebidding and the binding constraint, flows across the Vic – NSW interconnector went from 780 MW into New South Wales at 2.25 pm to 90 MW counter price into Victoria at 3 pm.

With flows counter price from New South Wales into Victoria, high priced capacity was dispatched to meet demand in New South Wales and the price exceeded \$13 600/MWh for seven dispatch intervals from 2.40 pm to 3.30 pm, inclusive.

3 Analysis

Table 1 shows the actual and forecast spot price, demand and generator availability for the high priced trading interval. Shown in bold, the spot price in New South Wales exceeded \$5000/MWh for the 3.30 pm trading interval. Three other trading intervals around that event are included in this report as they form part of the same event.

Table 1: Actual and forecast spot price, demand and available capacity

Trading interval	Price (\$/MWh)			Demand (MW)			Availability (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
3 pm	2942	300	300	10 075	9956	9707	11 029	10 939	10 962
3.30 pm	11 701	300	300	10 246	10 095	9558	11 999	10 976	10 996
4 pm	3259	300	300	10 276	10 233	10 016	10 938	10 942	10 966
4.30 pm	588	13 800	300	10 236	10 350	10 041	10 904	10 932	10 939

3.1 Constraint, rebidding and network availability

3.1.1 Constraint

In optimising economic generation dispatch and interconnector flows, the National Electricity Market Dispatch Engine (NEMDE) takes into account the maximum network capability that applies at the time. Actual transmission network constraints are represented in NEMDE as constraint equations that mathematically describe the capability and performance of the network and include terms with coefficients that represent generator and interconnector contributions. Common to other mathematical equations, constraints contain a Left Hand Side (LHS) and a Right Hand Side (RHS) and are typically expressed as $LHS \leq RHS$ or $LHS \geq RHS$.

The RHS contains all of the factors or inputs that cannot be varied by NEMDE. These inputs may include single values, constants or multiple terms such as demand, the rating of the relevant transmission line (i.e. how much energy the line can carry without damaging the line or causing unsafe conditions) or generator status. The LHS contains all of the inputs that can be varied by NEMDE to deliver an outcome that satisfies the requirement of the RHS. These inputs may include factors such as output from generators and flow on interconnectors.

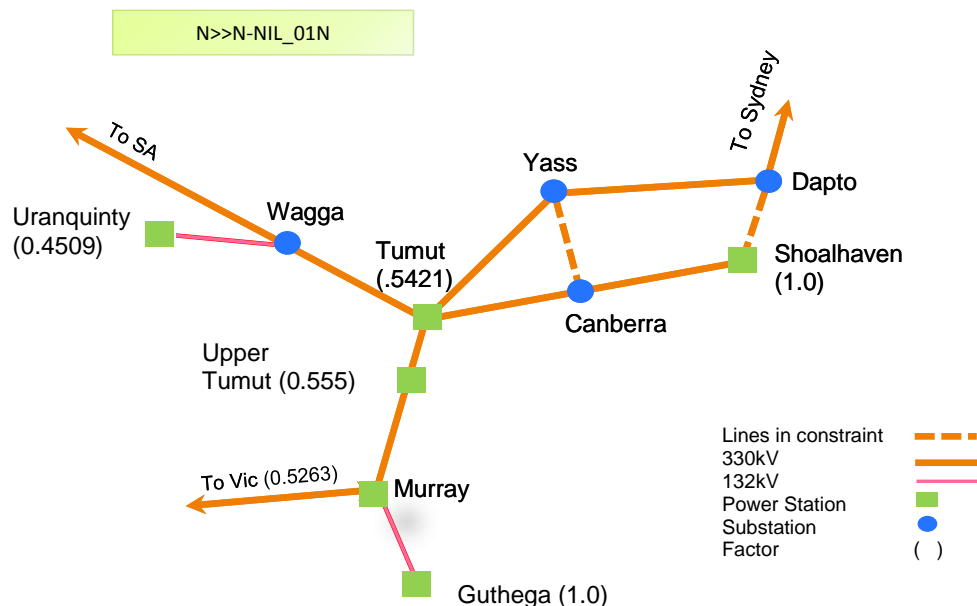
The magnitude of a coefficient on a term in either the LHS or RHS gives an indication of the significance of the generating unit or interconnector in the network limitation (the larger the coefficient the more significant the unit or interconnector). A positive coefficient means that a generator or interconnector is ‘constrained-off’ if the constraint is binding, where a negative coefficient means a generator or interconnector is ‘constrained-on’.

Headroom in the constraint equation is the difference between the LHS and RHS prior to equality being reached while satisfying the required relationship. See Appendix D for a detailed description of constraint management.

At 2.20 pm the system normal constraint, $N \gg N-NIL_01N$, bound.^{2,3} System normal constraints reflect the normal network performance envelope. This constraint is designed to avoid an overload on the 330kV line from Canberra to Yass on the loss of the Shoalhaven to Dapto line and limits generation west of the 330 kV line along with imports from Victoria into New South Wales.

Figure 1 shows the affected network area, the green squares represent significant generators and their coefficients, blue dots show significant substations, transmission lines are shown in colours according to their voltage and the dashed lines highlight the elements protected by the constraint.

Figure 1: Network diagram and constraint in effect



According to the formulation of the constraint, as output from the generators increases, imports into New South Wales on the Vic - NSW interconnector are reduced. That is, the design of the constraint is such that generation at Tumut (1800 MW) and Upper Tumut (616 MW) and Uranquinty (640 MW) in New South Wales can effectively govern the import limit on the Vic - NSW interconnector.

To prevent the $N \gg N-NIL_01N$ constraint from binding, the sum of generation and imports from the generators shown in Figure 1, around the time of the high prices, was to be less than around 2000 MW.

Figure 2 shows the output of the southern New South Wales generators identified above and imports into New South Wales from Victoria.

² System normal constraints describe the configuration of the power system where all transmission elements are in service, or the network is operating in its normal network configuration.
³ A full description of this constraint is provided in Appendix E

Figure 2: Generation output and imports on the Vic – NSW interconnector

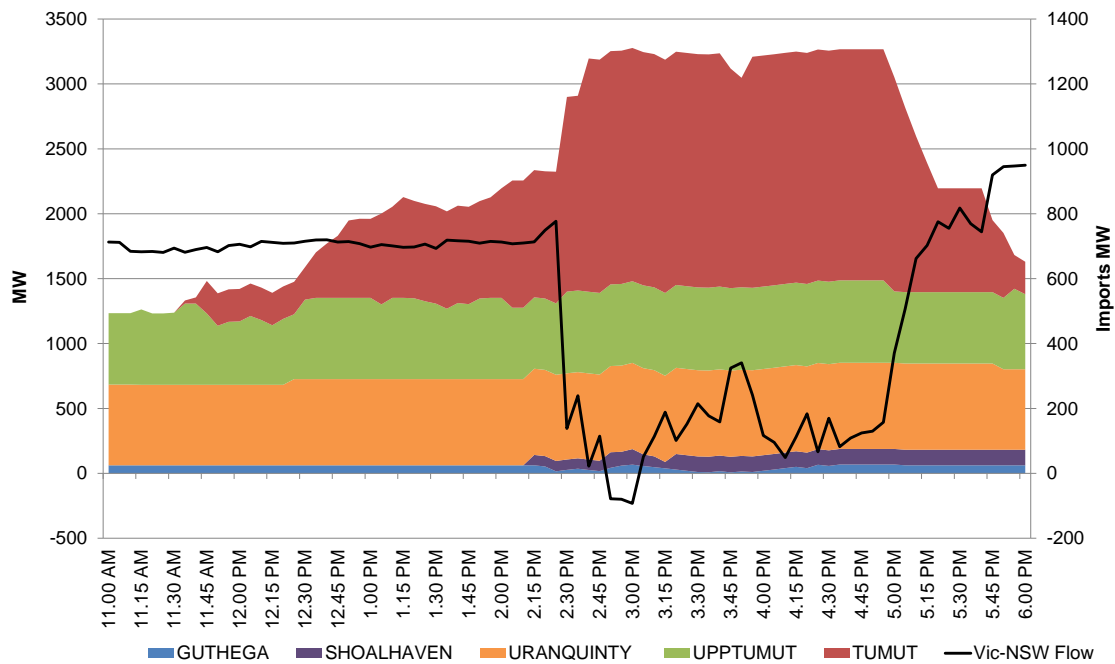
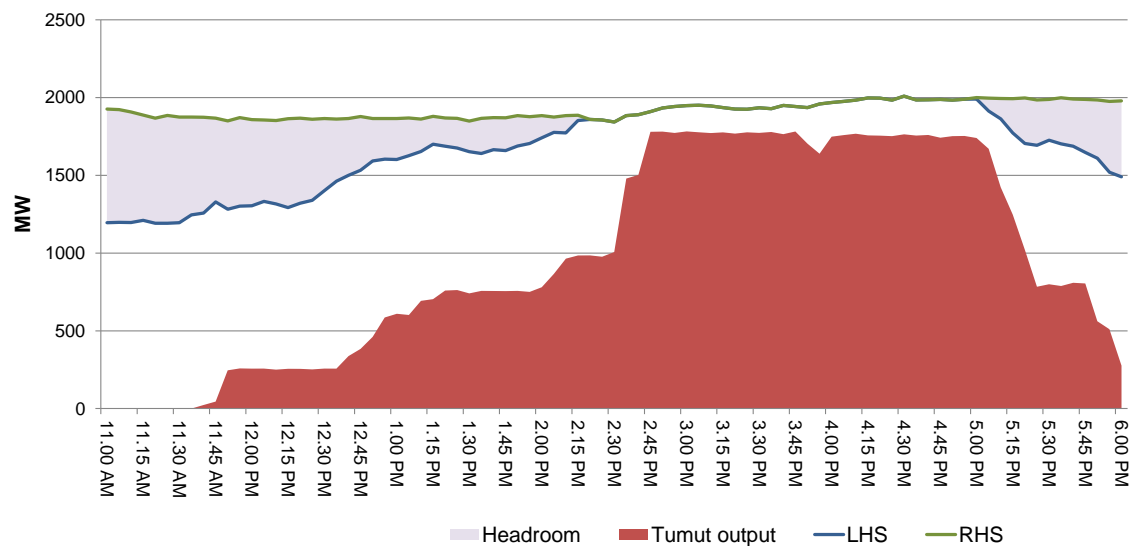


Figure 2 highlights the relationship between the increase of generation and the decrease in imports. There was a significant reduction in imports at around 2.30 pm following the Snowy Hydro rebid which resulted in an increase in Tumut’s output. This relationship is a direct consequence of the generators and interconnector being controllable variables on the LHS of the constraint.

Figure 3 shows the RHS (green), the LHS (blue), the headroom (shaded) and the output of Tumut (red block).⁴

Figure 3: N>>N-NIL_01N constraint LHS and RHS, headroom and Tumut output.



⁴ We are using Tumut in Figure 3 to represent the impact of the increase in generation as its total change in output was the greatest of all the generators in the constraint. Tumut’s output increased from 0 MW at 11.35 am to 980 MW at 2.20 pm as a result of rebidding capacity to the price floor.

As the generators on the LHS of the constraint increased output, the gap between the LHS and RHS (the headroom) decreased until they touched at 2.20 pm, which means the constraint bound at that point.

Comparing Figure 2 and Figure 3 shows that as the output from Tumut increased and the headroom was zero, the constraint was binding and the flow on the interconnector dropped. To avoid violating the constraint and given that the other interconnectors with Queensland were operating at their limits into New South Wales, NEMDE was forced to dispatch other generation in New South Wales out of merit order.

3.1.2 Rebidding

There was rebidding of capacity which affected dispatch and contributed to the high price outcomes and rebidding of ramp rates to the minimum values in accordance with clause 3.8.3A of the National Energy Rules which prolonged the event.

Within four hours of the high prices:

- AGL rebid around 470 MW of capacity at Bayswater to the price cap
- Origin rebid 466 MW of capacity at Uranquinty to the price floor
- Snowy Hydro rebid around 2500 MW of capacity at Tumut, Upper Tumut and Guthega to the price floor

Figure 4 shows closing bids for participants in New South Wales, total regional generation dispatched (orange) and the 5 minute dispatch price (grey).

Figure 4: Closing bids of New South Wales generators, output and spot price

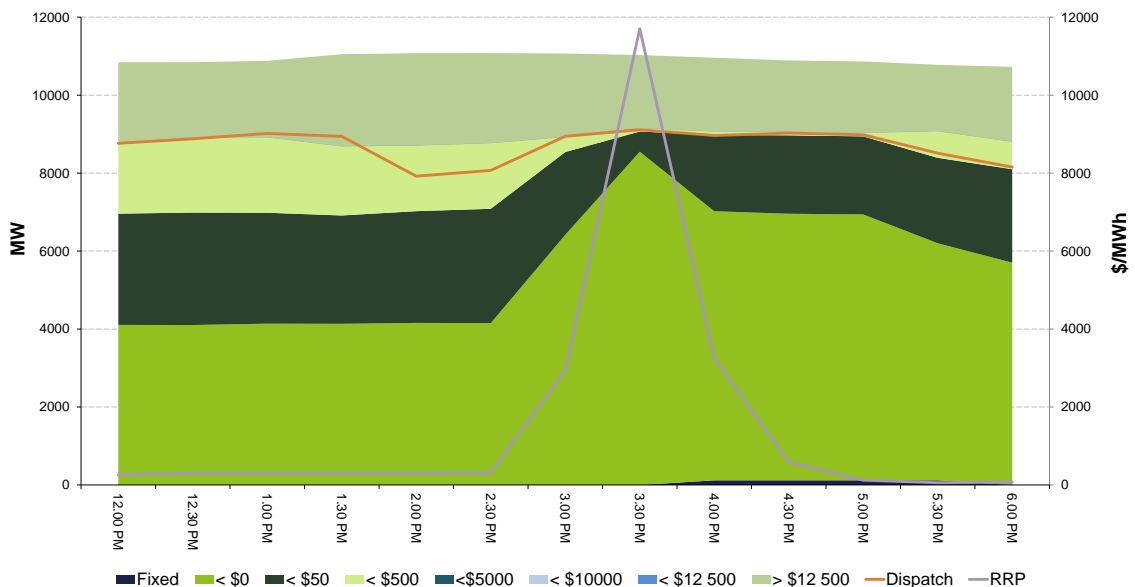


Figure 4 shows that there was almost no capacity priced between \$50/MWh and \$12 500/MWh. (light and dark green section almost disappear by 3.30 pm). This was caused by a number of rebids, made between 11 am and 2.40 pm by Snowy Hydro and Origin, which progressively shifted almost 3000 MW of capacity from high prices to

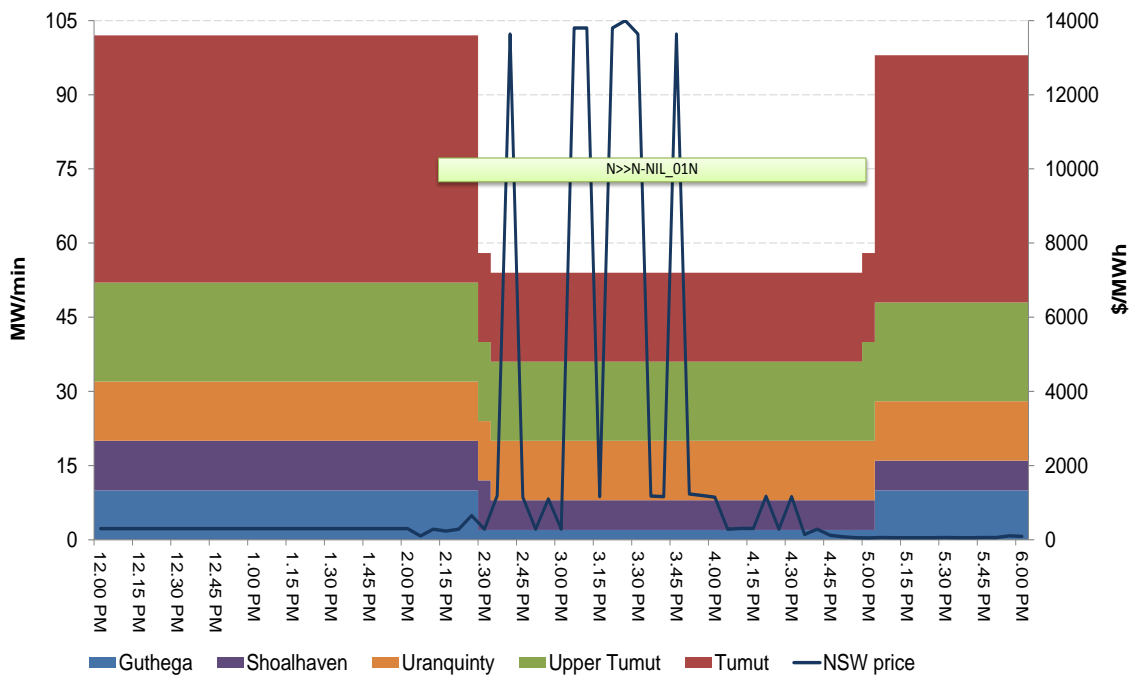
the price floor and a rebid by AGL which shifted 470 MW of capacity at Bayswater to the price cap.

The rebidding of Snowy Hydro capacity to the price floor increased the output of these units causing the system normal constraint to bind resulting in a step change in interconnector flows. Once the constraint bound, the wind farms involved in the constraint were issued a semi-scheduled dispatch cap and their output limited to low levels despite their bids being below the dispatch price.⁵

Origin and Snowy Hydro also rebid their ramp down rates of their generators to the minimum allowable by the Rules. This reduction effectively slowed down the rate at which the output of these units could be reduced, delaying the time to relieve the constraint and allowing imports from Victoria to increase and prices reduce.

Figure 5 shows the cumulative ramp down rate in MW/min for Tumut, Upper Tumut, Guthega and Uranquinty.

Figure 5: Cumulative ramp down rates for Tumut, Upper Tumut, Guthega and Uranquinty.



The horizontal green bar labelled N>>N-NIL_01N in Figure 5 shows the time when the system normal network constraint was binding. This highlights that after the constraint bound, the rebids which reduced the generator ramp rates came into effect.

The rebids considered to have been material to the event are listed in Appendix A.

Appendix B details the generators involved in setting the price during the high-price periods, and how that price was determined by the market systems.

The closing bids for all participants in New South Wales with capacity priced at or above \$5000/MWh for the high-price periods are set out in Appendix C.

⁵ Semi-Scheduled generators can be issued a semi-dispatch cap by AEMO at times when an increase in output above that limit would violate secure network limits

3.1.3 Network availability

This section examines the change in network capability and its contribution to price outcomes. The net import limit into New South Wales was up to 634 MW lower than that forecast four hours ahead. There were network constraints which limited flows into New South Wales on each of the three interconnectors connecting the region to Victoria and Queensland. Flows on the QNI and Terranora interconnectors were as forecast; however there was a significant difference between actual and forecast imports on the Vic-NSW interconnector.

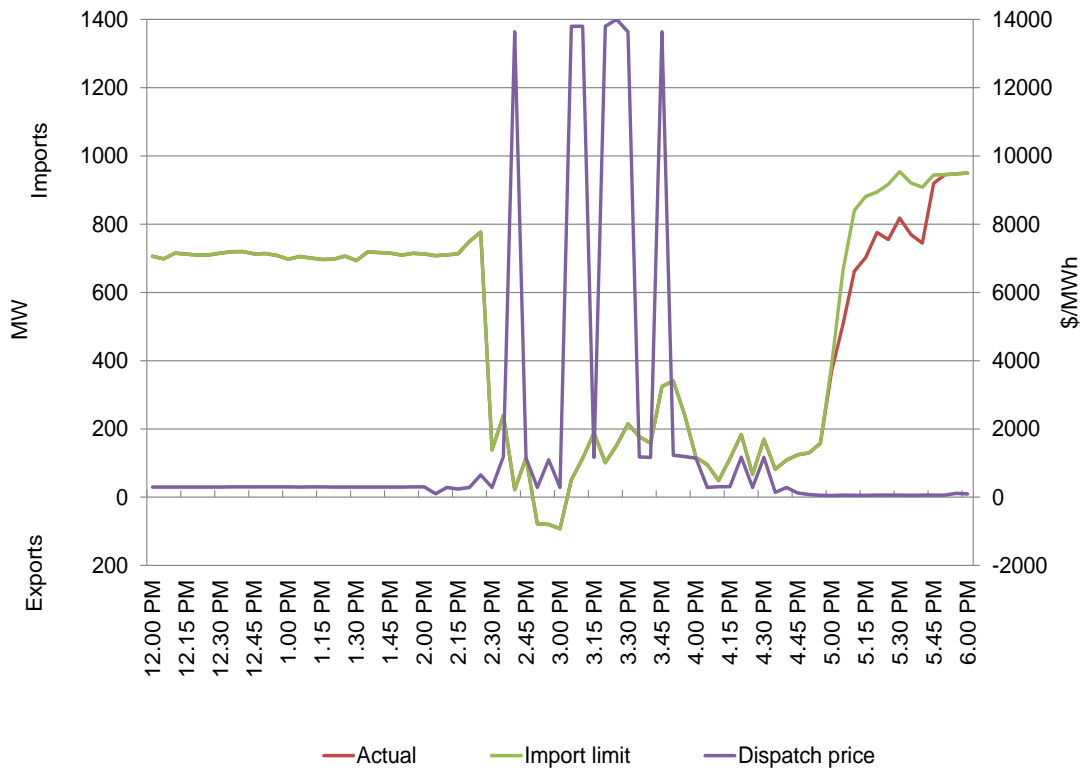
Table 2 shows the actual and forecast imports and import limit into NSW on the Vic-NSW interconnector.

Table 2: Actual and forecast network capability of Vic-NSW interconnector

Trading interval	Imports (MW)			Import limit (MW)		
	Actual	4 hr forecast	12 hr forecast	Actual	4 hr forecast	12 hr forecast
3 pm	21	771	767	21	771	767
3.30 pm	137	776	771	137	776	771
4 pm	226	780	775	226	780	775
4.30 pm	113	661	1120	113	661	1120

Figure 6 shows the import limit, actual flows and dispatch price in New South Wales. Actual imports and the import limit were 750 MW lower than forecast four and twelve hours ahead. Actual imports into New South Wales were at the import limit for the four trading intervals discussed here.

Figure 6: Imports into New South Wales across the Vic-NSW interconnector and dispatch price



The high prices occurred following a step change in the Vic-NSW interconnector. Vic-NSW went from importing around 780 MW at 2.25 pm to forcing 90 MW of flow into Victoria at 3 pm. Imports across QNI and the Terranora interconnector were less than 330 MW for the duration of the high prices.

Australian Energy Regulator

December 2016

Appendix A: Significant rebids

The rebidding tables highlight the relevant rebids submitted by generators that impacted on market outcomes during the time of high prices. It details the time the rebid was submitted and used by the dispatch process, the capacity involved, the change in the price of the capacity was being offered and the rebid reason.

Table 3: Significant energy rebids for 3.30 pm

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
10.56 am	12.05 pm	AGL	Bayswater	370	<70	14 000	1030-A~050 CHG IN AEMO PD~51 PD DEMAND INCREASE NSW +155-296MW 1300-1700
11.04 am	11.15 am	Origin	Uranquinty	302	61	-1000	1055A CONSTRAINT MANAGEMENT - V>>N-NIL_HA 3MW/MIN ROC DN REQ SL
12.14 am	12.25 pm	Origin	Uranquinty	44	61	-1000	1214P CHANGE IN AVAIL - PAG ENABLED SL
12.16 pm	12.25 pm	AGL	Bayswater	100	30	14 000	1200-A~050 CHG IN AEMO PD~51 PD DEMAND INCREASE NSW +69 TO 112MW 1300-1730.
12.25 pm	2.35 pm	Snowy Hydro	Tumut, Upper Tumut	1879	>28	-1000	12:01:00 A NSW 30MIN PD PRICE \$11,277.87 HIGHER THAN 30MIN PD 16:30@11:31 (\$13,800.00)
12.25 pm	2.35 pm	Snowy Hydro	Guthega	67	>0	-1000	12:01:00 A NSW 30MIN PD PRICE \$11,277.87 HIGHER THAN 30MIN PD 16:30@11:31 (\$13,800.00)
2 pm	2.10 pm	Origin	Shoalhaven	120	14 000	-1000	1400A CONSTRAINT MANAGEMENT - N^Q_NIL_B1 SL
2.23 pm	2.30 pm	Snowy Hydro	Tumut, Upper Tumut	249	300	-1000	14:20:04 A NSW 5MIN ACTUAL PRICE \$366.73 HIGHER THAN 5MIN PD 14:25@14:16 (\$654.73)

Submit time	Time effective	Participant	Station	Capacity rebid (MW)	Price from (\$/MWh)	Price to (\$/MWh)	Rebid reason
2.30 pm	2.35 pm	Snowy Hydro	Tumut	100	450	-1000	14:26:00 A NSW 5MIN PD PRICE \$852.31 HIGHER THAN 30MIN PD 14:50@14:02 (\$1,159.63)
2.32 pm	2.40 pm	Snowy Hydro	Tumut	197	≥300	-1000	14:31:00 A NSW 5MIN PD PRICE \$12,840.33 HIGHER THAN 5MIN PD 14:50@14:26 (\$13,999.96)

Table 4: Significant ramp down rate rebids for 3.30 pm

Submit time	Time effective	Participant	Station	Capacity rebid (MW/min)	Ramp down rate from (MW/min)	Ramp down rate to (MW/min)	Rebid reason
11.04 am	11.15 am	Origin	Uranquinty	8	11	3	1055A CONSTRAINT MANAGEMENT - V>>N-NIL_HA 3MW/MIN ROC DN REQ SL
12.25 pm	2.35 pm	Snowy Hydro	Tumut	32	50	18	12:01:00 A NSW 30MIN PD PRICE \$11,277.87 HIGHER THAN 30MIN PD 16:30@11:31 (\$13,800.00)
12.25 pm	2.35 pm	Snowy Hydro	Upper Tumut	4	20	16	12:01:00 A NSW 30MIN PD PRICE \$11,277.87 HIGHER THAN 30MIN PD 16:30@11:31 (\$13,800.00)
12.25 pm	2.35 pm	Snowy Hydro	Guthega	8	10	2	12:01:00 A NSW 30MIN PD PRICE \$11,277.87 HIGHER THAN 30MIN PD 16:30@11:31 (\$13,800.00)
2.28 pm	2.35 pm	Origin	Shoalhaven	4	10	6	1428P PLANT CONDITIONS - ROC ADJUSTED SL

Appendix B: Price setter

The following table identifies for the trading interval in which the spot price exceeded \$5000/MWh, each five minute dispatch interval price and the generating units involved in setting the energy price. This information is published by AEMO.⁶ The 30-minute spot price is the average of the six dispatch interval prices.

Table 5: Price setter for the 3.30 pm trading interval

DI	Dispatch Price	Participant	Unit	Service	Offer price	Marginal change	Contribution
15:05	\$13 800.00	Delta Electricity	VP5	Energy	\$13 800.00	0.50	\$6900.00
		Delta Electricity	VP6	Energy	\$13 800.00	0.50	\$6900.00
15:10	\$13 800.00	Delta Electricity	VP6	Energy	\$13 800.00	1.00	\$13 800.00
15:15	\$1166.01	Engie	LOYYB1	Energy	\$10.50	1.09	\$11.45
		Engie	LOYYB1	Lower 60 sec	\$0.02	1.09	\$0.02
		Engie	LOYYB2	Energy	\$10.50	1.09	\$11.45
		Engie	LOYYB2	Lower 60 sec	\$0.02	-1.09	-\$0.02
		Woodlawn	WOODLWN1	Energy	-\$1000.00	-1.14	\$1140.00
15:20	\$13 800.00	Delta Electricity	VP5	Energy	\$13 800.00	0.50	\$6900.00
		Delta Electricity	VP6	Energy	\$13 800.00	0.50	\$6900.00
15:25	\$13 999.96	AGL Energy	BW01	Energy	\$13 999.96	0.15	\$2099.99
		AGL Energy	BW02	Energy	\$13 999.96	0.15	\$2099.99
		AGL Energy	BW03	Energy	\$13 999.96	0.17	\$2379.99
		AGL Energy	BW04	Energy	\$13 999.96	0.15	\$2099.99
		AGL Energy	LD02	Energy	\$13 999.96	0.13	\$1819.99
		AGL Energy	LD03	Energy	\$13 999.96	0.13	\$1819.99
		AGL Energy	LD04	Energy	\$13 999.96	0.13	\$1819.99
15:30	\$13 637.81	EnergyAustralia	MP2	Energy	\$13 637.81	1.00	\$13 637.81
Spot Price		\$11 701/MWh					

⁶ Details on how the price is determined can be found at www.aemo.com.au

Appendix C: Closing bids

Figures C1 to C5 highlight the half hour closing bids for participants in New South Wales with significant capacity priced at or above \$5000/MWh during the periods in which the spot price exceeded \$5000/MWh. They also show generation output and the spot price.

Figure C1 - AGL (Bayswater, Liddell, Hunter Valley) closing bid prices, dispatch and spot price

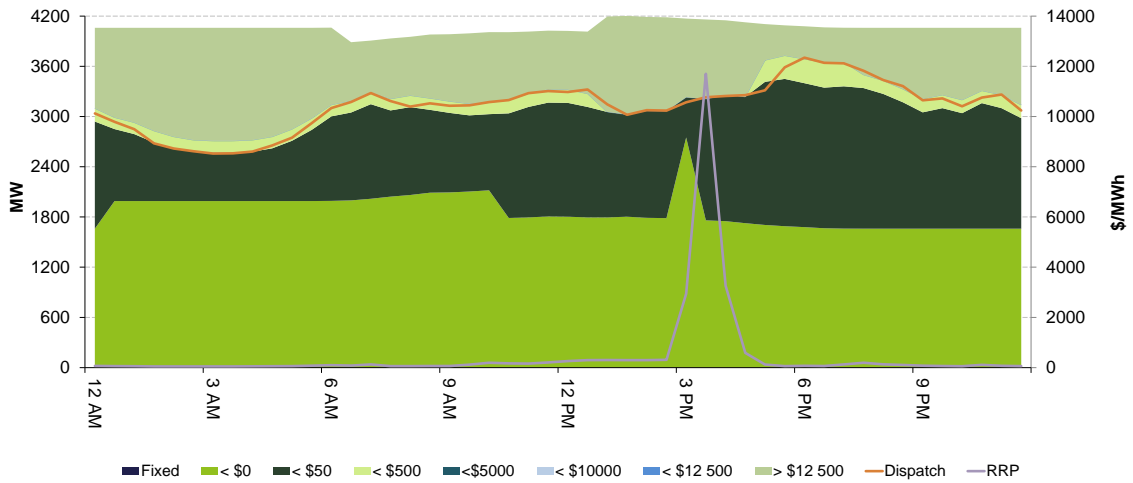


Figure C2 - Delta (Vales Point) closing bid prices, dispatch and spot price

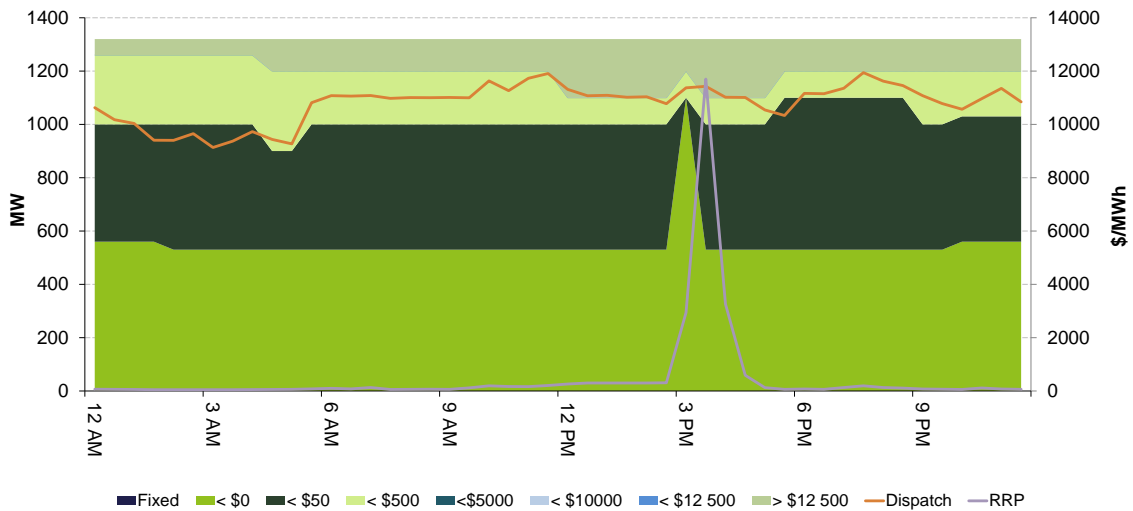


Figure C3 – Energy Australia (Mt Piper, Tallawarra) closing bid prices, dispatch and spot price

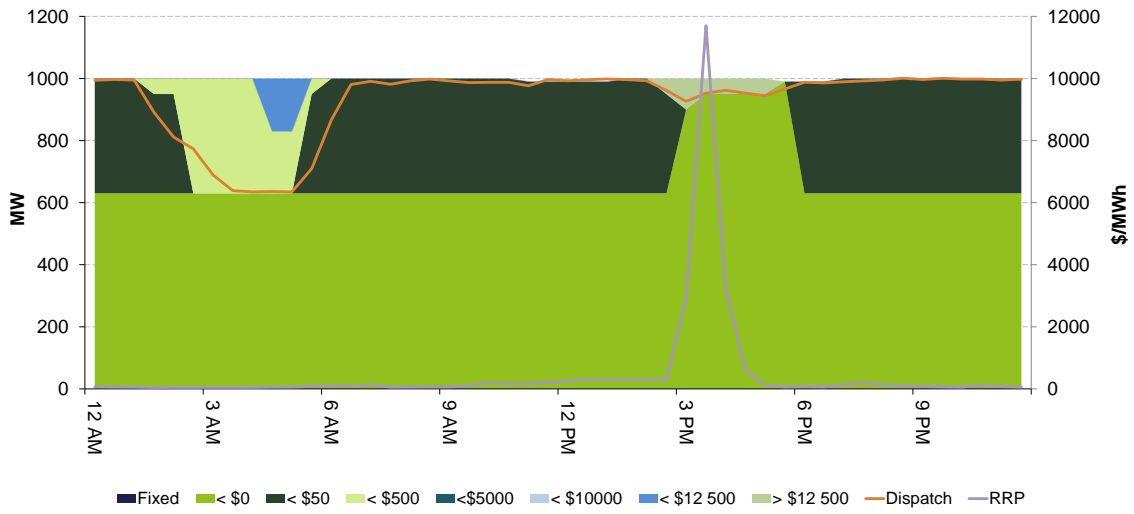


Figure C4 - Origin (Eraring, Shoalhaven, Uranquinty) closing bid prices, dispatch and spot price

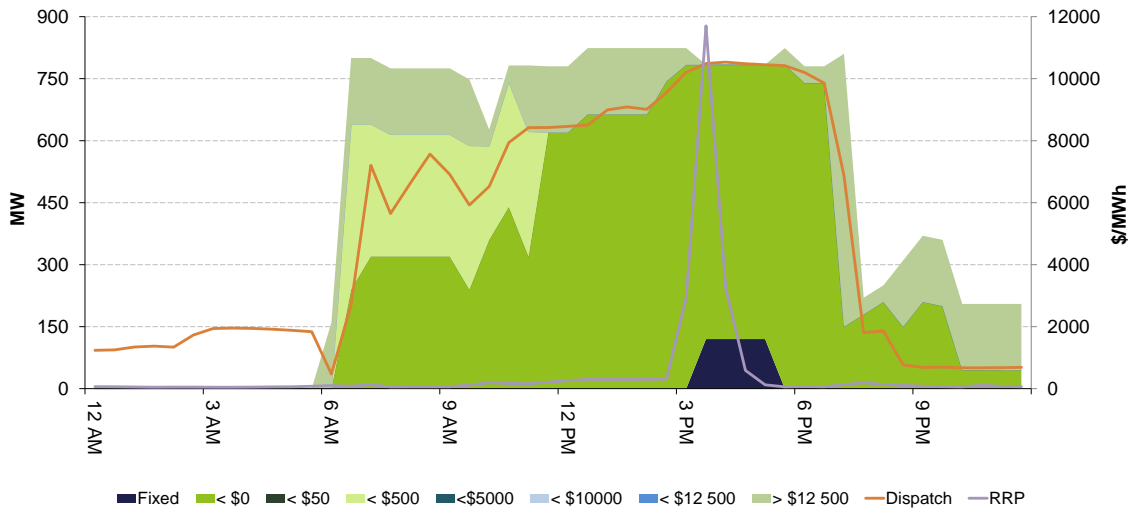
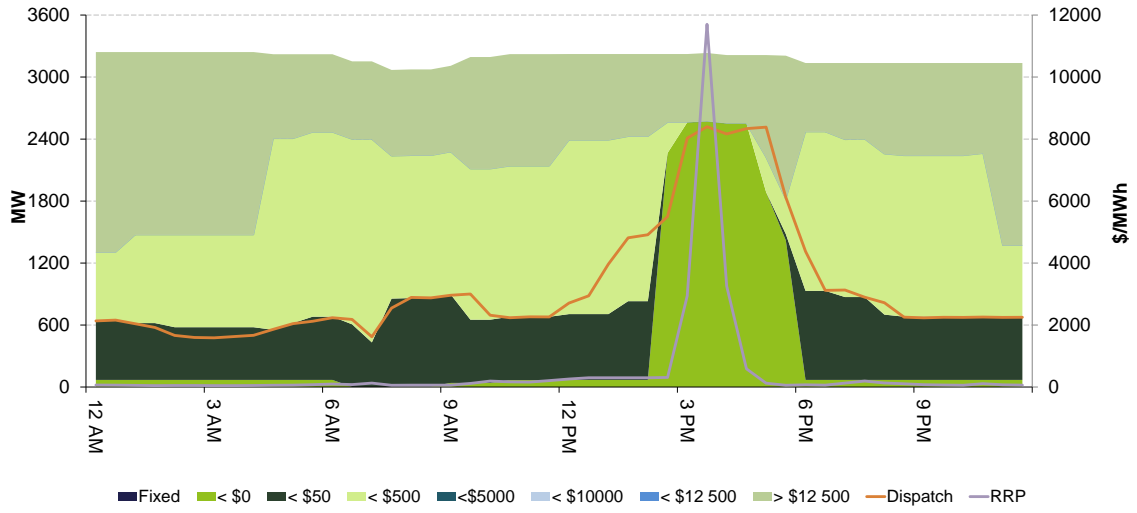


Figure C5 – Snowy Hydro (Colongra, Tumut, Upper Tumut, Guthega, Blowering) closing bid prices, dispatch and spot price



Appendix D: Management of constraints

Transmission networks transport electricity from generators to large customers and load centres served by distribution networks. Transmission networks also connect different regions, allowing for the interregional flow of electricity in the NEM. Every generator and transmission line or other piece of equipment has design or operational limits which if exceeded may cause damage or complete failure of that equipment.

One of AEMO's responsibilities, as the market and system operator, is to manage the network to ensure that transmission elements are not overloaded and system security is maintained.

"Congestion" is what happens when there is a bottleneck somewhere on this network. That is, congestion occurs when no more electricity that can flow over a particular line or other transmission system element without causing damage or exceeding design or operational limitations. These limitations usually reflect the ratings of transmission equipment (generally referred to as 'lines' in this report). The ratings of transmission lines are not always constant and are affected by ambient weather conditions.

Constraint equations

To manage network flows AEMO utilises constraint equations, which are mathematical representations of the performance of the network, in the NEM dispatch engine (NEMDE), which runs every five minutes.

A constraint equation is used to manage flows on specific transmission lines (and other equipment) for each five minute dispatch interval as determined by NEMDE based on their dispatch offers (or bids) of generators (and scheduled loads). Where transmission elements become congested, (they can carry no more power) they are referred to as "being constrained".

Each constraint equation consists of a Left Hand Side (LHS) and a Right Hand Side (RHS). The RHS signifies the outer point of an outcome, beyond which a network element could become overloaded in the event of the 'credible contingency' the constraint is designed to manage.⁷ A 'credible contingency' includes, for example, the loss of another line or a generator. The RHS contains all of the inputs that cannot be varied by NEMDE. These inputs include demand and the rating of the relevant transmission line (i.e. how much power – (MVA), or current (Amps)) the line can carry without damaging the line or causing unsafe conditions). The LHS contains all of the inputs that can be varied by NEMDE to deliver an outcome that satisfies the requirement of the RHS. These inputs include output from generators and flow on interconnectors.

How NEMDE deals with constraints

Constraint equations are used in NEMDE together with generator offers to determine the optimal economic dispatch of generators to meet customer demand without exceeding the capabilities of the transmission network. All else being equal, if the flow over a particular element of the transmission system is within the requirements of the RHS, then the relevant constraint equation does not affect NEMDE dispatching

⁷ If the constraint equation is not satisfied it is termed as 'violated'.

generators in accordance with ‘merit order’ or ‘economic dispatch’ (by ‘merit order’ or ‘economic dispatch’ the AER means least-price offers of generation capacity are dispatched first). When the LHS of a particular constraint equation is equal to the RHS, the constraint is considered to be at its limit and is ‘binding’ or constrained. In this situation, NEMDE may need to adjust dispatch outcomes from other sources to satisfy the constraint in preference to economic dispatch.

NEMDE is designed to avoid or minimise violating a constraint equation. Violations occur on the rare occasion when the LHS is greater than the RHS; that is, the flow over the line could be greater than its rating if the relevant credible contingency occurs in the next five minutes.⁸ A binding constraint equation affects dispatch until the constraint no longer binds.⁹

To control the flow over a bound line to avoid violating the constraint, NEMDE attempts to change the LHS inputs. For example, NEMDE may try to increase (out of merit order) the output of generators or interconnectors closer to a relevant load/demand centre (‘constrain on’ a generator or interconnector). By increasing generation closer to the load/demand, it can in effect reduce the congestion on the transmission system. Alternatively, NEMDE can reduce (out of merit order) the output of generators or interconnectors that are a source of the flow over the transmission line (‘constrain off’ a generator or interconnector). NEMDE may also adopt a combination of these actions, depending on the specific constraint equation that is binding.

While the priority is system security and avoiding violations of constraints, NEMDE still attempts to find the least cost way of dispatching generation out of the options available. Therefore if, for example, there are several generators that could be ‘constrained on’, it will choose the lowest cost combination taking into account the prices offered and the coefficients (see discussion of coefficients below). The ability of the system to change generator outputs and interconnector flows to manage network congestion is termed ‘fully co-optimised dispatch’.

When NEMDE changes flows over an interconnector (by ‘constraining on’ or ‘constraining off’ an interconnector), NEMDE changes the output of generators in adjoining region(s). This does not involve constraining particular generators, rather NEMDE reduces or increases the level of supply that is sourced from interstate generators.

Coefficients in constraint equations

As was noted earlier, the LHS of constraint equations contain all of the inputs that can be varied by NEMDE to avoid violating the constraint, such as output from generators and flow on interconnectors. Each generator or interconnector on the LHS has a coefficient, which reflects the impact it has on the constrained transmission line. In other words, the effect of a one megawatt (MW) change in the output of a particular generator (or flow on a particular interconnector) on flows over the constrained line is

⁸ Constraint equations can be expressed as $LHS \leq RHS$ or $LHS \geq RHS$. For the purposes of this report, the descriptions of constraint equations are limited to $LHS \leq RHS$. These are the most common types of constraint equations used to manage network limits.

⁹ Constraint may stop binding due to for example an increase in line rating (which can be influenced by ambient weather conditions) or changes in generator offers.

reflected in the coefficient assigned in the LHS. For example, if a one MW reduction in output of a generator decreases flow on the constrained line by one MW, the coefficient is +1. A positive coefficient means that a generator may be 'constrained-off' when the constraint binds, while a negative coefficient means a generator is 'constrained-on'. The further away a generator or interconnector is located from the constrained line, the greater the change in output required to achieve a one MW change in flow over the constrained line. This is reflected by a smaller coefficient.

Appendix E: N>>N-NIL_01N constraint description

The following is a list of the elements and their respective factors in the constraint formulation for the N>>N-NIL_01N constraint effective from 15/11/2016.

Factor	Element
0.5263	VIC1-NSW1 Interconnector
0.28	Blowering Generator MW
1	Boco Rock Wind Farm Generator MW
0.511	Broken Hill Generator MW
0.1052	Gunning Wind Farm Generator MW
1	Guthega Generator MW
0.5007	Hume NSW Generator MW
1	Shoalhaven Generator MW
-1	Shoalhaven Pump MW
-0.5421	Snowy Pump MW
0.5421	Tumut 3 Generator MW
0.555	Upper Tumut Generator MW
0.4509	Uranquity Generator MW
1	Woodlawn Wind Farm Generator MW