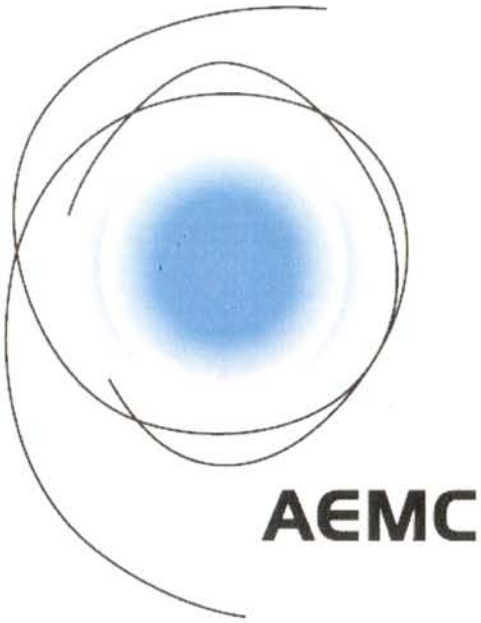

Australian Energy Market Commission

Draft Rule Determination

National Electricity Amendment (Management of negative settlement residues in the Snowy Region) Rule 2006

Rule Proponents:

Loy Yang Marketing Management Company Pty. Ltd. (LYMMCO), Southern Hydro Pty. Ltd., International Power (Hazelwood, Synergen, Pelican Point, Loy Yang B), TRUenergy Pty. Ltd., NRG Flinders Pty. Ltd., and Hydro Tasmania, and NEMMCO

Date: **6 June 2006**

Signed: .....

John Tamblyn
Chairman
For and on behalf of:
Australian Energy Market Commission

Commissioners: Tamblyn
Carver
Woodward

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Summary

This Rule proposal, lodged by the Southern Generators and the National Electricity Market Management Company (NEMMCO), seeks to introduce a new process for managing negative settlement residues in the Snowy Region. The proposal is short-term in nature, lasting only as long as the current CSP/CSC trial in the Snowy Region.

The Snowy Region is unique in the National Electricity Market (NEM) in that it contains a network loop, which intersects region boundaries. As a result of these characteristics and the design of the NEM, there are occasions when power will flow from a higher-priced region to a lower-priced region, resulting in negative settlements residues. To address these unfunded negative settlements residues, NEMMCO intervenes in the market by "clamping" flows on the Victoria to Snowy interconnector. However, this clamping can undermine competitive pressures, reduce the effectiveness of inter-regional trading instruments, and distort pricing outcomes.

The Southern Generators' Rule proposal seeks to address these issues by making a change to the settlement process. Under the proposal, negative residues on the Victoria to Snowy interconnector will be offset by accrued positive residues on the Snowy to NSW interconnector.

On the basis of the analysis outlined in this draft determination and after considering submissions, the Commission has decided to approve the change requested in the Rule proposal. This draft Rule determination sets out the Commission's reasoning in assessing the Southern Generators' proposal in accordance with the requirements of the National Electricity Law (NEL).

The Commission is satisfied that the proposal will promote improvements in competition and efficiency in the NEM compared to maintaining the status quo. That is, the proposal will be in the long-term interests of consumers of electricity services. The short-term gains in the market are consistent with the Commission's long-term view of the appropriate direction for progressive reform of the market.

The Commission's analytical assessment of the Southern Generators' proposal has suggested that the proposal should deliver a number of advantages over the status quo. The removal of clamping, an imposed market distortion, would provide:

- a greater level of competition in the wholesale electricity market compared to the status quo. The incentives that this additional competition provides will tend to discipline the ability of participants to raise prices above costs under certain market conditions. More cost reflective wholesale prices should promote economic efficiencies that will ultimately benefit end use customers;
- more efficient dispatch resulting from access to a wider range of generators to meet NSW demand. The Commission's modelling results suggested that the proposal is likely to result in some generation fuel cost savings in the short-term as result of being able to choose to operate a cheaper combination of plant to meet demand;
- enhanced inter-regional trade, through firmer inter-regional settlement residues, reduced inter-regional price differences, and greater availability of and competition

for contracts. This should increase competition, and promote greater pricing efficiency.

- a simpler, more transparent, and predictable approach to managing negative settlement residues in the Snowy Region. While the proposal may result in the need for some trading adjustments by participants in the market, its greater clarity, predictability, and transparency should enhance the confidence of investors in the NEM and improve dynamic efficiency.
- an improved environment for efficient investment through a number of the elements of the proposal. Improved firmness of inter-regional trade, and likely spot price changes, should enable better use of existing generation capacity, provide more efficient signals for new investment, and reduce the barriers to entry in the NEM.

The Commission supported its analytical assessment of the proposal with quantitative modelling. The results of the modelling supported the Commission's analytical conclusions, and suggested that there would be benefits in implementing the Southern Generators' proposal, as compared to the status quo.

However, the proposal by the Southern Generators is not the only potential solution to these issues. In consultation on this proposal, Snowy Hydro suggested that "re-orientation" of the network constraint to Dederang when negative residues accumulate would also be a legitimate short-term solution. The Commission has carried out preliminary modelling of the re-orientation option as a counterfactual against which to compare its assessment of the Southern Generators' proposal.

The Commission's analysis suggested both alternatives demonstrated the potential for superior competition and market efficiency outcomes compared to the current arrangements. However, the limited analysis undertaken did not identify clear differences between the two Rule proposals in terms of their market impacts.

Snowy Hydro subsequently submitted the Re-orientation proposal to the Commission as a formal Rule proposal which will now be subject to public consultation and full analysis in the formal Rule change process. The Commission proposes to issue a draft Rule determination in relation to the Snowy Hydro proposal at approximately the same time as issuing a final Rule determination in respect of the Southern Generators' proposal.

Concurrent with the publication of this draft determination, the Commission is also publishing a Congestion Management Program - "Statement of Approach". The Statement of Approach will provide interested parties with a view of the Commission's anticipated timetable and directions for its work program on congestion management. The Statement of Approach takes account of the interactions between the short-term projects, including this proposal, and the other inter-related congestion matters currently before the Commission.

Interested stakeholders are invited to make comment on the issues outlined in this draft determination. Submissions should be received by 5 pm on 20 July 2006. Submissions can be sent electronically to submissions@aemc.gov.au or by mail to:

Australian Energy Market Commission
PO Box H166
AUSTRALIA SQUARE NSW 1215
Fax (02) 8296 7899

1. The Southern Generators'/NEMMCO's Rule Proposal

On 9 November 2005, the Commission received a National Electricity Rule change proposal from a group of six generators (the Southern Generators) and the National Electricity Market Management Company (NEMMCO). The Southern Generators are Loy Yang Marketing Management Company Pty. Ltd. (LYMMCO), Southern Hydro Pty. Ltd., International Power (Hazelwood, Synergen, Pelican Point, Loy Yang B), TRUenergy Pty. Ltd., NRG Flinders Pty. Ltd., and Hydro Tasmania. Their proposal (the Southern Generators' proposal) seeks to introduce arrangements to fund negative settlement residues that accumulate on the Snowy region interconnectors, as a consequence of the network loop flows and constraints in the Snowy region.

At present, NEMMCO intervenes in the market to manage counter-price flows on interconnectors to avoid the accumulation of negative settlement residues.[1] For example, when there are counter-price flows at times of northward flows on the interconnector between the Victorian and Snowy regions (VIC-Snowy interconnector), NEMMCO intervenes to restrict flows in order to limit negative settlement residues. The Southern Generators argue that this intervention by NEMMCO distorts efficient outcomes in the market, and propose this Rule change to address those inefficiencies (as it reduces the flows that would otherwise pass from the Victoria into the Snowy region, and then into NSW).

In their proposal, the Southern Generators note:

> *This proposal addresses an issue that arises from the fact that with efficient dispatch, when the Snowy constraint binds, the flow on the Victoria to Snowy interconnector is contrary to the price difference because the constraint is within a network loop…*
>
> *This "counter price" flow is not of itself a problem and is an economically efficient outcome. However because the [National Electricity] Rules do not provide an adequate means of fund[ing] the resulting "negative residue", NEMMCO intervenes in the market to prevent the negative residue, by distorting efficient dispatch.*[2]

Snowy Hydro, in its Management of negative settlement residues – Re-orientation Rule change proposal concurs that there is a problem with the status quo as the current intervention:

> *Reduces dispatch options during high demand periods with northerly flows by placing a constraint on Victorian exports.*[3]

In addition, Snowy Hydro states that the status quo also affects inter-regional trade as:

> *Victorian participants have a reduced ability to manage inter-regional price risks, as there is little or no settlement residues between Victoria and Snowy when NEMMCO clamps.*[4]

The Southern Generators note that:

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1 Chapter 8A Part 8 of the National Electricity Rules empowers NEMMCO to intervene in this manner.
2 Southern Generators and NEMMCO, Management of Negative Settlement Residues in the Snowy Region Rule change proposal, 27 October, 2005, p. 4.
3 Snowy Hydro Limited, Management of Negative Settlement Residues by Re-orientation Rule change proposal, 24 May 2006, p. 14.
4 Snowy Hydro, Re-orientation Rule change proposal, p.14.

> *The problem is not the negative settlement residue on the interconnector in itself, but the anti-competitive measures that NEMMCO is forced to adopt because of the deficiencies of the settlement process in relation to negative settlement residues.*[5]

In its Re-orientation Rule change proposal, Snowy Hydro agrees with the Southern Generators' argument, stating that:

> *the status quo raises concerns about the predictability of the speed with which NEMMCO will respond to negative residues between Victoria and Snowy.*[6]

The Southern Generators further state that:

> *It should also be noted that the anti-competitive restriction of flow in spot market dispatch has flow-on consequences in the related derivative markets, where the risk of artificial restrictions on interconnector flow affects both generator's ability to dispatch generation to manage the risk of inter-regional contracts, and also reduces the value of [Settlement Residue Auction] units that are relevant to managing inter-regional price risk.*[7]

The proposal seeks to fund negative residues on the VIC-Snowy interconnector from positive residues on the interconnector between the Snowy and New South Wales (NSW) regions (Snowy-NSW interconnector). Therefore, should negative residues start accruing for northward flows on the VIC-Snowy interconnector, rather than reducing the flow on the interconnector, NEMMCO would offset the accumulating negative residues from positive inter-regional settlement residues (IRSRs) accruing on the Snowy-NSW interconnector.

The proposal is also designed to fund the negative residues from positive residues that can result from southward flows (flows from the Snowy to Victorian regions on the Snowy to Victorian interconnector (Snowy-VIC interconnector)). This would replace NEMMCO's current procedure for managing negative residues for southward flows, which is re-orientation.

The Southern Generators argue their proposal:

> *will result in economically efficient pricing signals by eliminating the significant problems created by the action taken by NEMMCO… and improve the efficiency of dispatch for Murray and Victorian generation, and will also increase the reliability of supply to NSW for northward flows and Victoria for southward flows and hence meets the market objective*[8].

More specifically, the Southern Generators' contend that their proposal is superior to the status quo for both northern and southern flows because it:

> *retains accurate locational marginal pricing for generation at the Snowy regional reference node as per the intent of clause 3.9.2 [of the Rules];*
>
> *does not provide incentives for generators receiving the Snowy region price to bid at prices below marginal cost to maximise volume;*

5 Southern Generators, Rule change proposal, p. 9.
6 Snowy Hydro, Re-orientation Rule change proposal, p. 4.
7 Southern Generators, Rule change proposal, p. 9.
8 Southern Generators, Rule change proposal, p. 5.

avoids causing market disturbance by NEMMCO intervention, upon prediction of negative residues;

ensures efficient use of the Dederang-Wagga-Tumut-Murray-Dederang transmission loop, maximising the transmission capacity for inter-regional transfers; and

increases interregional trade because the total amount of settlement residues available to support settlement residue instruments will remain greater than either of the NEMMCO intervention mechanisms, despite the depletion of some Snowy to NSW residue.[9]

The Southern Generators' proposal includes an analysis aimed at demonstrating that it is possible to fully fund the accruing negative residues using the proposed mechanism, called the "Negative Settlement Payment".[10]

The Southern Generators recognise that this is a "specific response to an acute problem in the National Market implementation." They expect over time a more general measure may replace this specific one.[11]

Snowy Hydro, in their Re-orientation Rule change proposal, agree that:

until such time that a boundary change, if any, is implemented there is a continuing need to manage the negative settlement residues between Victoria and Snowy.[12]

Implementation of the Southern Generators' proposal would be through an amendment to the NEMMCO derogation in Chapter 8A Part 8 of the Rules – Network Constraint Formulation. The proposal would expire with that derogation. The proponents stated that the issues addressed by the derogation were separate to those addressed as part of the CSP/CSC trial and therefore, "may continue to exist at the sunset". They recognised that some "inconsequential amendments" would be necessary if the proposal were to remain after the derogation's expiry. For this reason, the proponents thought it best to "align the duration of this derogation with the current derogation".[13]

2. Background to the proposal

This Rule change proposal is concerned with the arrangements for the management of negative settlement residues in the vicinity of the Snowy region. This Section discusses the network topology in the vicinity of the Snowy region that results in negative settlement residues and explains NEMMCO's intervention procedures and obligations for managing negative residues under the Rules. This Section also presents an example of the problem the Southern Generators' proposal is trying to address.

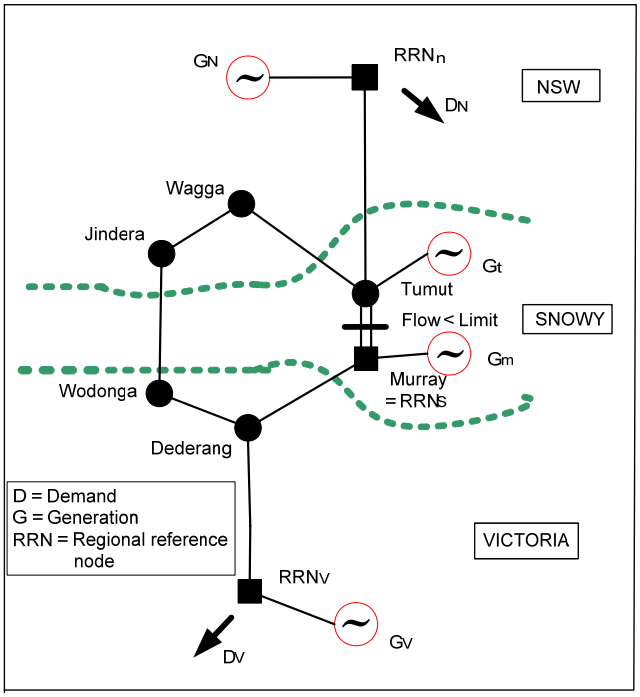
Network characteristics that cause negative residues

The transmission network design in the vicinity of the Snowy region contains a physical network loop, depicted in Figure 1. This loop, together with the location of the regional boundaries, location of the Snowy regional reference node, and the location of a constraint

9 Southern Generators, Rule change proposal, p. 5.
10 Southern Generators, Rule change proposal, p. 12.
11 Southern Generators, Rule change proposal, p. 5.
12 Snowy Hydro, Re-orientation Rule change proposal, p. 2.
13 Southern Generators, Rule change proposal, p. 6.

in the loop, can result in flows between the Snowy and adjacent regions moving from a higher priced region to a lower priced region, even with generator offers being efficiently dispatched. These counter-price flows result in negative residues.

Figure 1: Snowy region network topology - "the Snowy Constraint"



The transmission line between Murray generation and Tumut generation has a limited capacity. The transmission constraint binds when flows reach their limit (the "Snowy constraint" or "Murray-Tumut constraint"). For northward flows, when that intra-regional constraint binds, the lowest value of generation on the loop is at the Murray node, with locational prices *rising* relative to the price at the Murray node, in a clockwise fashion around the loop so that the highest price is at the Tumut node. This is because the physics of power flows means an increment, say 1MW, increase of output of Murray generation increases the congestion on the constrained line by more than power injected anywhere else on the loop. Since the Murray node is also the location of the Snowy regional reference node, this can result in the Snowy price being lower than the Victorian region price, leading to negative settlement residues on the VIC-Snowy interconnector. This pricing relationship is known as the "spring washer effect".[14]

Negative residues can also result at times of southward flows when the intra-regional constraint binds. At these times, the highest value of generation (or nodal price) on the loop is at the Murray node, with locational prices *falling* relative to the price at Murray, in a clockwise fashion around the loop, so that the lowest is at Tumut (which may also be similar to the NSW price); the Dederang nodal price will be lower than the Murray nodal price. If the Victorian price is also less than the Murray nodal price, and therefore the Snowy regional reference price, counter-price flows arise on the Snowy-VIC interconnector.

14 B. J. Ring, *Dispatch Based Pricing in Decentralised Power Systems*, PhD Thesis, University of Canterbury, Christchurch, 1995.

Under these conditions, counter-price flows can also result on the Snowy-NSW interconnector. The Tumut generators could face incentives to bid low or negative prices in order to be dispatched and receive the (relatively high) Murray nodal price. This can lead to flows from Tumut into NSW, even though the NSW price is less than the Snowy price. However, implementation of the partial Constraint Support Pricing/Constraint Support Contract (CSP/CSC) trial for the Tumut node (the "Snowy trial") directly addresses this incentive by settling all but 550MW of Tumut generation at the NSW price when the Snowy region price is higher.[15]

While negative residues arise from the normal operation of the network in the vicinity of the Snowy region, the Rules do not provide NEMMCO with a way to financially manage the difference in market settlement. NEMMCO, therefore, intervenes in the market to avoid the accumulation of negative settlement residues.

How NEMMCO intervenes

NEMMCO's Operating Procedure – Dispatch (SO_OP3705) defines NEMMCO's procedure and trigger criteria for managing negative settlement residues. From December 2004, if the accumulation of negative residues over a period of counter price flows is forecast to reach $6,000 then NEMMCO would apply constraints to prevent the further accumulation, provided power system security could be maintained. These constraints would remain in place until they could be revoked without creating counter price flows. This trigger applies to all inter-regional constraints.

Specific procedures also apply to the Murray-Tumut constraint. The procedures differ depending on whether flow is northwards or southwards. For forecast negative residue accumulation between Victoria and Snowy for northward flows, NEMMCO invokes either an interconnector ramping constraint or a fixed level discretionary constraint. These intervention constraints restrict the flow on the interconnector and will be referred to as "clamping". Negative residue accumulation between Snowy and Victoria for southward flows can result in NEMMCO replacing the normal constraint orientated to Murray (as the Snowy regional reference node) with a special constraint oriented to the Dederang node. This is known as "re-orientation" and results in the Snowy regional price being set as if Dederang was the reference node rather than the Murray node. All these constraints apply in both dispatch and pre-dispatch.[16] This procedure was finalised after consultation with market participants.

The Snowy trial, implemented in November 2005, addresses counter-price flows on the interconnector between the Snowy and NSW regions, eliminating the need for NEMMCO to intervene to manage the accumulation of negative residues. NEMMCO amended its Operating Procedure in November 2005 to implement the Snowy trial.

Incentives created by NEMMCO's intervention

The Southern Generators argue that NEMMCO's current intervention approach to manage counter-price flows creates incentives for generators receiving the Snowy region price to bid at prices below marginal cost to maximise volume. Box A shows an historical example of how these incentives can arise in dispatch intervals when NEMMCO intervenes to limit the

15 The Snowy trial is discussed further in the "History" Section below.
16 NEMMCO, *Operating Procedure: Dispatch,* SO_OP3705, v29, 3 December 2004, p.27.

accumulation of negative settlement residues. Appendix 1 presents a more comprehensive analysis of historical data.

Box A: Market outcomes with interconnector "clamping"

The incidence of NEMMCO intervention on the VIC-Snowy interconnector is greatest during the summer months (see Appendix 1). At these times, certain market conditions, including the combination of high NSW demand, northward flows on the VIC-Snowy interconnector, and the potential for NEMMCO intervention to restrict flows on that particular interconnector, can create incentives for generators to bid in a way to induce intervention.

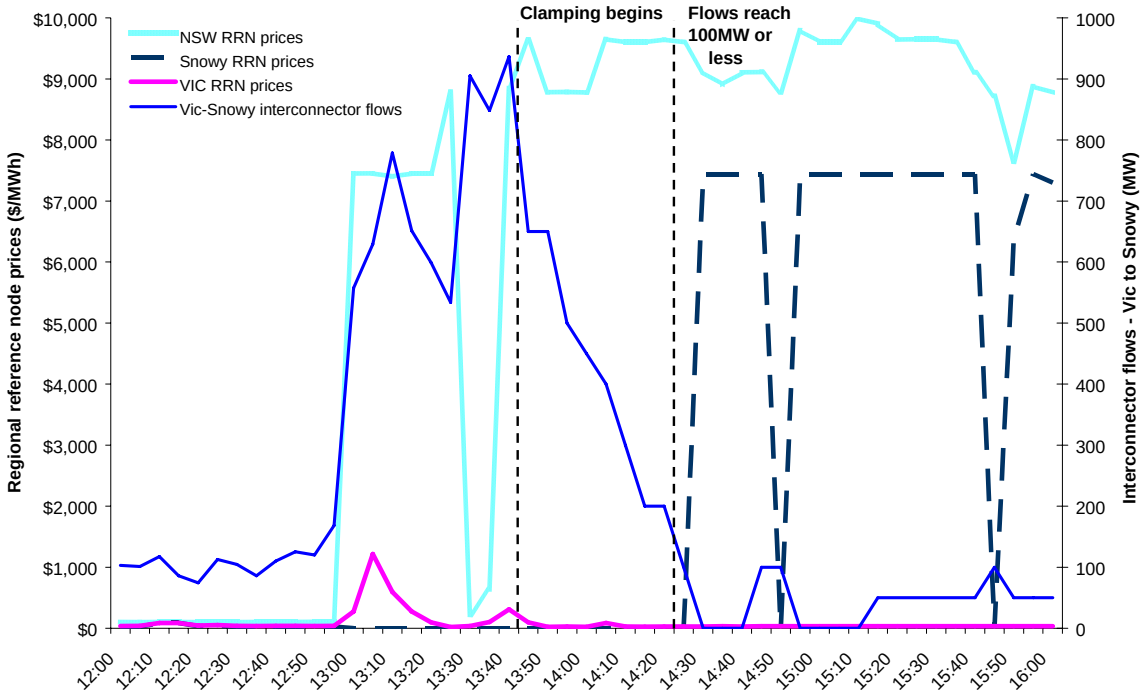
The outcomes of 2 February 2006 illustrate such behaviour (see Figure 2). High demand in NSW coupled with insufficient capacity reserves resulted in high NSW prices.[17] During the period of highest NSW prices, the Snowy region price was around $0/MWh, reflecting generator bids in that region. This, in turn, resulted in counter-price flows on the VIC-Snowy interconnector. As a result, at around 13:45, NEMMCO began reducing flows on the VIC-Snowy directional interconnector to prevent further negative residue accumulation. At 14:25, flows on that interconnector reached less than 100MW.

By 14:30, the Snowy region price increased significantly, from $0/MWh to over $7,000/MWh. Snowy prices remained volatile over the next few trading intervals, fluctuating between $0/MWh and over $7,000/MWh, depending on the level of interconnector flows. Whenever NEMMCO relaxed its restriction on interconnector flow so flows approached 100MW, the Snowy price would drop near $0/MWh until the emergence of counter-price flows resulted in NEMMCO intervention to reduce the interconnector flow again.

Murray generation's bid stack for 2 February 2006 is presented in Figure 3. Between around 11:30 and 20:00, at least half of Murray's generation was bid in the zero price band. As NEMMCO reduced imports from Victoria by restricting flow on the VIC-Snowy interconnector, to meet the high NSW demand, the National Electricity Market dispatch engine (NEMDE) dispatched Murray generation from the higher price bands. This resulted in the Snowy region price increasing quickly and significantly to approach the NSW price.

17 Bruce Bertram, "Low Reserves Top Prices", *Power Industry News*, Edition 447, 8 February 2006.

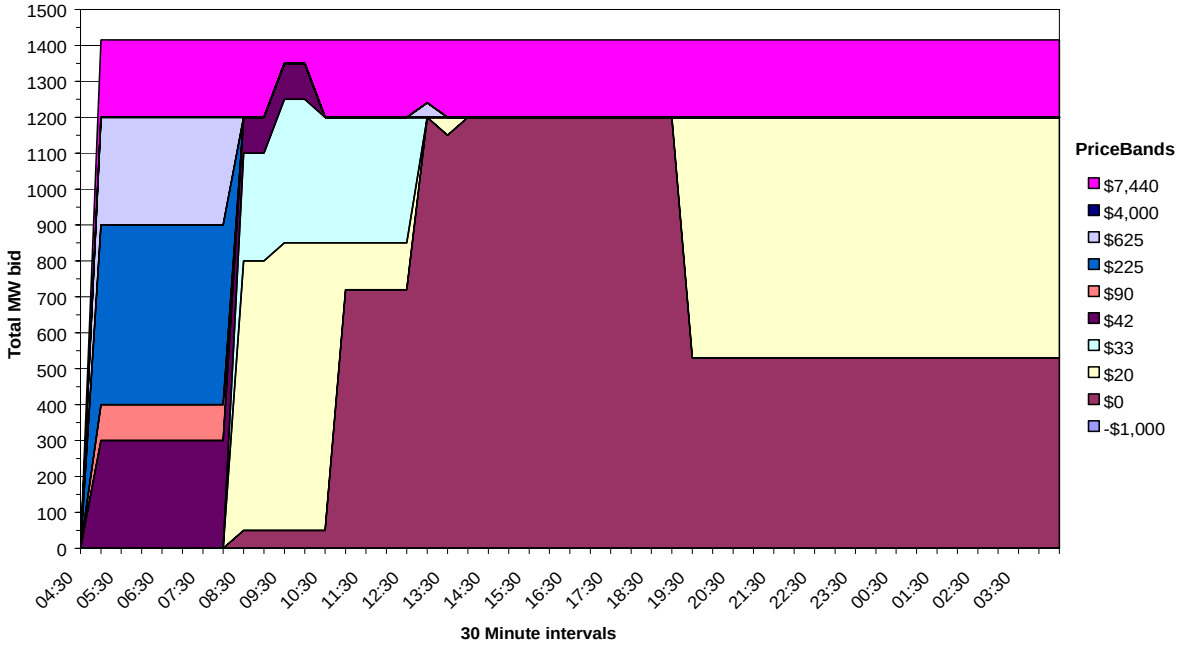
Figure 2: Pricing and flow outcomes for 2 February 2006



Source: NEMMCO dispatch interval price data available: http://www.nemmco.com.au/data/market_data.htm.

Figure 3: Murray generator bid stack from 2 February 2006

(04:30 2 Feb 2006 to 04:00 3 Feb 2006)



Source: NEMMCO bid data: http://www.nemweb.com.au/REPORTS/ARCHIVE/Yesterdays_Bids_Reports/

History

NEMMCO's current approach to managing settlement residues has developed over a number of years. In late 2003, NEMMCO applied to the National Electricity Code Administrator (NECA) for a participant derogation that would enable the use of alternative network constraint formulation to help manage counter-price flows on interconnectors to prevent the accumulation of negative residues. On 3 June 2004, Chapter 8 (now Chapter 8A) Part 8 – Network Constraint Formulation, of the Rules commenced. The derogation was set to expire on the 31 December 2004. On 16 December 2004, the expiry date was extended until 31 December 2005.

Clause (d) of the derogation requires NEMMCO to:

> *develop and publish a procedure for determining when a significant counter price flow is deemed to be significant for the purposes of [the intervention].*

On 16 June 2005, the ACCC authorised an amendment to the Network Constraint Formulation derogation. This amendment implemented Snowy Hydro's proposal of a partial Constraint Support Pricing/Constraint Support Contract (CSP/CSC) trial for the Tumut node (the "Snowy trial"). In authorising the amendment, the ACCC noted:

> *The proposal [was] aimed at improving the pricing signals through providing a pseudo regional boundary between the Tumut and Murray nodes at times where congestion occurs on the Murray-Tumut transmission lines, while allocating a portion of the settlement residue on the NSW to Murray link to Snowy Hydro.*[18]

The Snowy trial commenced on 1 October 2005. Under the trial, when the constraint between Murray and Tumut binds in the northward direction, Tumut generation receives a payment similar to the NSW price for all of its output. This provides the Tumut generators with a greater incentive to generate during times of high NSW demand than when the generators only received the lower Snowy price. The CSP is funded out of the IRSR on the Snowy-NSW interconnector.

The trial also includes the allocation of CSCs to Snowy Hydro in respect to southward flows only. The Tumut generators receive the Snowy price on the first 550MW of their output, rather than the lower NSW price. This reduces the incentives for Tumut generation to maximise output at times of southward flows from NSW to Snowy, which could result in counter-price flows into NSW.

The Chapter 8A Part 8 derogation will cease to apply on:

- 31 July 2007;
- the implementation of the first regional boundary review by the AEMC; or
- as otherwise determined by the AEMC.

The Snowy trial is intended to remove the bidding incentives that can result in counter-price flows between the Snowy and NSW regions for both northward and southward flows. This

18 ACCC, "Dispatching the market: CSP/CSC trial at the Tumut nodes", Amendments to the National Electricity Code, Applications for Authorisation, Determination, 15 June 2005, p. 34.

effectively removed the requirement for NEMMCO to actively manage the accumulation of negative residues on the Snowy to NSW interconnector. However, the Snowy trial has no impact on NEMMCO's intervention on the interconnector between Victoria and Snowy for northward or southward flows.

3. The Commission's power to make the Rule

The Southern Generators' Rule change proposal seeks to alter the current congestion pricing trial within the Snowy region, thereby reducing the likelihood of NEMMCO intervening in the dispatch and pricing process for the interconnector between the Victorian and Snowy regions.

The Commission is satisfied that the draft Rule falls within the subject matter for which the Commission can make Rules set out in s.34 of the National Electricity Law (NEL). Specifically, the draft Rule relates to the following items under Schedule 1 of the NEL:

> *(7) The settling of prices for electricity and services purchased through the wholesale exchange operated and administered by NEMMCO, including maximum and minimum prices;*
>
> *(8) The methodology and formulae to be applied in setting prices referred to in item 7;*
>
> *(9) The division of the national electricity market into regions for the purposes of the operation of the wholesale exchange operated and administered by NEMMCO…; and*
>
> *(10) The operation of generating systems, transmission systems, distribution systems or other facilities.*

Under s.88 of the NEL, the Commission is only able to make Rules if:

> *it is satisfied that the Rule will or is likely to contribute to the achievement of the national electricity market objective.*

The National Electricity Market (NEM) objective, as set out in s.7 of the NEL, is to:

> *promote efficient investment in, and efficient use of, electricity services for the long term interests of consumers of electricity with respect to price, quality, reliability and security of supply of electricity and the reliability, safety and security of the national electricity system.*

Section 7 presents the Commission's reasoning as to how the Southern Generators' proposal satisfies the NEM objective and the statutory Rule making test.

The Commission has determined in accordance with s.99 of the NEL to make the draft Rule attached to this determination (Appendix 3). The draft Rule contains some amendments to the proposed Rule put forward by the proponent. A summary of the differences between the proposed Rule and the draft Rule is included in Section 6.10 of this draft Rule determination.

This determination sets out the Commission's reasons for making the Draft Rule. The Commission has taken into account:

1. the Commission's powers under the NEL to make the Rule;

2. the Southern Generators' and NEMMCO's Rule change proposal and proposed Rule;

3. submissions received; and

4. the Commission's analysis as to the ways in which the Draft Rule will or is likely to contribute to the achievement of the NEM objective so that it satisfies the statutory Rule making test.

4. Consultation on the Southern Generators' proposal

The Southern Generators originally submitted their proposal to NECA on 10 May 2005. The commencement of the *National Electricity (South Australia) (New National Electricity Law) Amendment Act 2005* on 1 July 2005 introduced a requirement, under s.91(6) of the NEL, for NEMMCO to be a proponent of any participant derogation that related to its functions. As a result of these provisions, NEMMCO agreed to formally join the request. The Southern Generators then submitted this revised proposal to the Commission on 27 October 2005.

On 8 December 2005, the Commission commenced consultation under s.95 of the NEL on the Southern Generators' Rule change proposal. Consultation closed on 11 February 2006. The Commission received eight submissions from: the Australian Energy Regulator (AER) (with attached papers from Dr Darryl Biggar); Delta Electricity; Eraring Energy; Macquarie Generation; Origin Energy; Snowy Hydro Limited; the Southern Generators; and Westpac Institutional Bank. These submissions are all available on the Commission's website.

The Southern Generators gave a presentation to the Commission in support of their proposal at the Commission's office in Sydney on 3 February 2006. This presentation is available on the Commission's website.

The Commission used market modelling of the NEM to help inform its assessment of the Southern Generators' Rule change proposal. The Commission formed the Congestion Management Technical Reference Group to advise on the modelling assumptions and scenarios. On 9 May 2006, the Commission published an Information Disclosure Statement, which set out the analytical framework, modelling methodology and assumptions used for the information of interested parties. The Statement is available on the Commission's website.[19]

In evaluating the Southern Generators' proposal, the Commission considered a number of issues that were raised in submissions. The Commission analytically assessed these issues and then informed its conclusions with the modelling results. The quantitative modelling results did not drive the Commission's decision, only informed it. The Commission's assessment of these issues is included in Section 6, below.

As discussed in Section 3, in order to make a Rule, the Commission must determine whether a proposed Rule meets the NEM objective. In Section 7, the Commission assesses its findings presented in Section 6 against the NEM objective.

19 Appendix 1 provides further detail on the modelling and the role of the Congestion Management Technical Reference Group.

The Commission invites submissions on the matters raised in the draft Rule determination by 20 July 2006. Under s.101 of the NEL, any interested person or body seeking a hearing on this draft Rule determination must send their request in writing to the Commission no later than 15 June 2006.

After the Commission has received and considered any submissions on this draft Rule determination, it will proceed to making a final Rule determination.

5. The relationship of the proposal to other congestion related matters before the Commission

In addition to the Southern Generators' proposal, the Commission is currently considering a number of congested related matters including the MCE-directed Congestion Management Review and five Rule change proposals. The Commission considers it essential that this work be co-ordinated to deliver a comprehensive "Congestion Management Regime" for the market going forward. The Commission's "Congestion Management Program – Statement of Approach" describes the co-ordinated approach the Commission will adopt in managing these inter-related matters and is included in Appendix 2. It is also available on the Commission's website.

The Southern Generators have presented their Rule change proposal as an interim solution focusing on one specific interconnector between the Victorian and Snowy regions. Their proposal contained an expiry date of 31 July 2007, consistent with the expiry of the Snowy CSP/CSC trial. The Southern Generators stated that given the short-term nature of their proposal, it neither impedes nor encourages the other related Rule changes, and is independent of the Congestion Management Review.

Submissions on this issue differed. The AER agreed with the Southern Generators that it is possible to consider this Rule change proposal separately from other Rule changes and congestion management issues. However, Snowy Hydro, Delta Electricity, Eraring Energy, and Macquarie Generation all took the contrary view. They considered that the broader issues of managing negative settlements residue in the NEM and congestion in the Snowy region should be comprehensively addressed, rather than implementing yet another "band-aid" solution.

The Commission recognises the integrated nature of the congestion management issues it has under consideration and that they include short, medium, and longer-term aspects of a more general "Congestion Management Regime".

The Snowy trial is currently due to expire on 31 July 2007. If the Commission decides to make the Rule proposed by the Southern Generators, the Commission would expect that the new arrangements could be implemented by NEMMCO by the coming summer (2006-07). If implemented, any amendments to the derogation would expire with the expiry of the trial. That is, the proposal from the Southern Generators is short-term in nature.

In considering this short term proposal the Commission is mindful of two important factors. Firstly, the decision that the Commission makes in respect of the Southern Generators' proposal does not necessarily indicate mechanisms that it might find to be appropriate in the context of its broader Congestion Management Review. Secondly, the Commission is only likely to adopt Rule proposals, particularly proposals that operate in the short term, if the

direction the proposals would take the market is consistent with the Commission's longer term view of the efficient evolution of the market. In this regard, short term proposals which are adopted may be viewed as incremental steps in the longer development of the NEM. The Southern generator proposal will be considered in this light.

6. Commission's consideration of matters raised in analysis and consultation

As noted in Section 3, the Commission may only adopt the Rule proposed by the Southern Generators if it is satisfied that the Rule will or is likely to satisfy the NEM objective. The NEM objective will be satisfied if the proposal improves economic efficiency for the long-term benefit of electricity consumers.

The Commission has therefore considered the effects of this Rule proposal on the various dimensions of efficiency (cost, pricing, and longer term effects) in the context of the spot market and the effects on electricity contracts. In having regard to implications for the long-term interests of consumers, the Commission has also considered the direct changes to overall economic welfare from implementing the proposal. All other things being equal, a proposal that results in greater economic welfare – because it reduces costs most and/or results in prices being closer to costs – would be preferred to other options.

The NEM objective also requires the Commission to consider the likely effect of a Rule change proposal on the quality, security, and reliability of the national electricity system. While these aspects of the power system are more technical in nature, a degradation of these will have severe economic consequences that must be avoided.

In considering the merits of any proposal the Commission is also guided by standard principles of good regulatory practice and design that are relevant to the NEM objective. These include the desirability of limiting regulatory intervention in competitive markets to circumstances of market failures, although the Commission recognises that this is only a necessary and not sufficient condition for regulatory intervention. In applying principles of good regulatory practice, account should also be taken of the extent to which market participants and consumers are likely to be affected, either positively or negatively, by a proposal.

Following consultation on the Southern Generators' proposal (as described in Section 4), the Commission proceeded to evaluate the merits of the proposal. The evaluation involved a combination of conceptual analysis and empirical modelling. This Section describes the basis of the Commission's evaluation of the proposal.

The Commission's conceptual analysis involved a number of steps, starting with a clear identification of the problem the proposal aimed to address. The next step involved a assessment of how the proposal would operate and, from this, a general description of the likely economic and power system effects of the proposal. Given the complexity of the market and the difficulties in conceiving and describing the range of possible outcomes, the Commission considered that empirical modelling of the proposal would better inform its decision.

The Commission modelled two counterfactual cases to provide points of comparison for the Southern Generators' proposal: the base case (status quo, including the Snowy trial) and re-

orientation of the Snowy constraints to Dederang. The re-orientation option was referred to by Snowy Hydro in its submission on the proposal. Snowy Hydro supported the re-orientation alternative as a viable, possibly better, option for addressing NEMMCO's intervention on the VIC-Snowy interconnector. Consideration of these counterfactual cases provided the Commission with a means of testing the robustness of its results and the relative advantages and disadvantages of the Southern Generators' proposal assessed against alternative approaches to address the same issue. [20]

With the requirements of the NEM objective in mind, the Commission's draft decision on the Southern Generators' proposal has been informed by its assessment of the following key issues identified by its analytical work and stakeholder submissions:

- Economic efficiency of dispatch (Section 6.1);
- Pricing outcomes (Section 6.2);
- Inter-regional trading (Section 6.3);
- Power system security and reliability (Section 6.4)
- Good regulatory practice (Section 6.5);
- Revenue adequacy (Section 6.6);
- Long term implications (Section 6.7);
- An alternative option – re-orientation counterfactual (Section 6.8);
- Implementation (Section 6.9); and
- Summary of differences between the proposal Rule and draft Rule (Section 6.10).

The remainder of this Section examines these issues in turn, setting out the basis of the Commission's reasoning and conclusions on each.

6.1 Economic efficiency of dispatch

The Commission's assessment of the implications of the proposal for productive efficiency in the NEM will focus principally on any resulting improvements in the economic efficiency of dispatch. Specifically, the assessment will focus on the direction and extent of likely changes to the variable costs of power production. It is worthwhile noting that given the one year duration of the proposal, where the plant mix is reasonably certain and fixed, the Commission did not consider it necessary to examine the dynamic investment effects of the proposal.

Economically efficient dispatch is achieved when demand is met by the least cost combination of generation taking into account any network limitations and other power

20 Snowy Hydro submitted a formal Rule change application on 24 May 2006 proposing re-orientation to Dederang as an alternative to the Southern Generators' proposal. The Commission's analysis of the re-orientation counterfactual for purposes of this draft Rule determination is described in Section 6.8.

system security constraints. In this context, cost refers to the costs that can be avoided in the period covered by the proposal – this is most commonly referred to as short run marginal cost (SRMC). The avoidable cost of thermal plant is reasonably well-known and largely comprises fuel costs and a small amount of other variable operating costs (e.g. lubricants, chemicals, water, and ash treatment, etc).

By contrast, hydro plants tend to have few avoidable costs as they do not purchase the water used to generate electricity. This does not suggest that water has no value. It does. The value of the water is derived from the value of the power it produces or the value from other alternative water uses – or opportunities. The cost of water is therefore associated with the value of (the next best) foregone production opportunities. In a power system, a hydro plant with limited water supply will tend to use its water allocation when it can make most money. In the NEM these times are generally associated with peak demand periods. In the NEM when a hydro plant runs, it generally displaces the output of a thermal plant. If the avoidable cost of this thermal plant, would have been used to set the market price, the "cost" of the production opportunity (or opportunity cost) of the hydro plant would be the costs of the displaced thermal plant.

The NEM dispatch algorithm will minimise the economic cost of dispatch based on participants' bids and offers and network and power system constraints. If bids and offers reflect opportunity costs, and constraints are properly taken into account, the NEM dispatch engine (NEMDE) will produce economically efficient dispatch. However, dispatch may not be efficient if either of the following occurs:

- intervention in the dispatch process, such as clamping, occurs; or
- bids and offers do not reflect opportunity costs.

Dispatch efficiency may be improved if a change in the Rules results in a removal of the intervention or a change in incentives so that generators are more likely to bid closer to their opportunity costs. However, if *both* types of distortions are present, there is no guarantee that removing only one (e.g. intervention) will lead to more efficient dispatch if the other (e.g. strategic bidding) remains in place.

Southern Generators' perspective

In their proposal, the Southern Generators contended that NEMMCO's intervention resulted in a:

> *distortion of efficient dispatch and thus degrade[d] the performance of the market in relation to the objectives.*[21]

They stated that their proposal is designed so that "NEMMCO can schedule efficient dispatch without these undesirable interventions."[22]

Submissions

Origin Energy noted that NEMMCO's current intervention "interferes with what was previously an efficient dispatch".[23]

21 Southern Generators, Rule change proposal, p. 4.
22 Southern Generators, Rule change proposal, p. 4.
23 Origin Energy, s.95 submission, p. 1.

The Southern Generators and the AER submitted that the proposal would promote dispatch efficiency because it allows demand to be met at a lower underlying cost than under the current arrangements in which NEMMCO intervention can occur.[24]

Snowy Hydro disagreed, stating the proposal would:

> *introduce transparent and blatant generation dispatch inefficiencies as marginally more expensive gas plant in Victoria/SA [would be] operated ahead of marginally cheaper Murray generation…this [would be] an inefficient outcome as the lowest marginal cost plant in the market [would be] displaced by the highest.*[25]

Commission's considerations and reasoning

The Commission's assessment of the impact of the proposal on dispatch efficiency is described below separately for northward and southward flows, as the operation and effects of the alternative approaches are different depending on the flow direction.

For northward flows

Northward flows into NSW through the Snowy Region occur when demand and prices in the NSW region are high relative to demand and prices in the southern regions of Victoria, South Australia and Tasmania. During these periods supplying demand in NSW with power from the southern regions is likely to meet overall demand with a lower combination of offer prices than relying on relatively higher cost generation in NSW.

Implementation of the Southern Generators' proposal would lead to the elimination of the NEMMCO intervention that constrains the VIC-Snowy interconnector when counter-price flows occur at times of high NSW demand. As discussed in Section 2, counter-price flows can arise when the Murray-Tumut constraint binds. This is because the value of incremental generation at the Murray node (also the Snowy regional reference node) is lower than the incremental generation at any other point around the Snowy network loop. This low value is consistent with the physical situation that a marginal increase in Murray generation places a greater pressure on the Murray-Tumut constraint compared to the same marginal increase in VIC-Snowy interconnector exports. When the constraint binds, a marginal increase in Murray generation requires a reduction of flows on the VIC-Snowy interconnector by *more than* the marginal increase in Murray generation. This is because of differences in the relative impedances of power injected at different locations around the loop and their proximity to the point of congestion. The relevant constraint equation coefficients reflect this relationship.

An implication of the relatively low value of incremental Murray generation is that the price at the Snowy regional reference node is less than at the Victorian regional reference node. The lower price at the Murray node should provide the Murray generator with less incentive to produce than the Victorian, South Australian, and Tasmanian generators (southern region generators). The price incentives for Murray generation are therefore consistent with the market's interest in achieving least cost, security constrained, economic dispatch.

24 Southern Generators, s.95 submission, p. 4; AER, s.95 submission, p. 3.
25 Snowy Hydro, s.95 submission, p. 3.

However, when the Snowy regional reference price is less than the Victorian price, NEMMCO currently intervenes to prevent the accrual of negative settlement residue, as this exposes NEMMCO to financial risk. NEMMCO intervenes by constraining (i.e. clamping) northern flows on the VIC-Snowy interconnector. As interconnector exports are constrained-off, Murray generation gains greater access to the intra-regional constraint and effectively becomes the only generator south of the NSW region with access to the constraint. If Murray is the only source of power through the constraint then marginally less generation in total from south of the constraint can be exported into NSW. This can result in the increased dispatch of more expensive NSW, Queensland, or Tumut generation to meet the NSW demand.

If the proposal were implemented, NEMMCO would no longer clamp northward flows when negative settlement residues occur because the negative residues would be financed instead from positive settlement residues on the NSW-Snowy interconnector. This eliminates NEMMCO's financial risk.

Therefore, assuming that bids and offers reflect opportunity costs, elimination of NEMMCO's clamping can be expected to increase the economic efficiency of dispatch due to increased use of lower-priced southern generation.

However, as noted above, if bids and offers do not reflect opportunity costs, eliminating a dispatch intervention such as NEMMCO's clamping may not necessarily lead to more efficient dispatch. In its Re-orientation proposal, Snowy Hydro stated that the:

> *Impact of [its and the Southern Generators'] proposals depends on Tumut's bidding behaviour. If Tumut is dispatched to use the available headroom [in transmission capacity across a cutset of lines] into NSW then it will not be possible to increase flows into NSW. However, if Tumut withholds capacity during high demand periods, then additional flows across the cutset would increase flows into NSW.*[26]

Thus, whether the removal of NEMMCO's intervention results in more efficient dispatch when another distortion remains, such as incentives for non-cost reflective bidding, is a matter that can only be tested empirically. The Commission has used quantitative modelling to further inform its consideration on this matter.

For southward flows

Southward flows through the Snowy region occur when prices in Victoria, South Australia, and Tasmania (the southern regions) are high relative to prices in NSW. As noted above in relation to northward flows, during these periods, contributions to supply in the southern regions from lower cost NSW generation are likely to meet overall demand with a lower combination of offer prices than resorting to relatively higher-priced generation from the southern regions.

When the Murray-Tumut constraint binds, an increment in Murray generation relieves the Murray-Tumut constraint more than an increment in Victorian, South Australian, or Tasmanian generation (southern region generation). This is reflected in the constraint equation coefficients.

26 Snowy Hydro, Re-orientation Rule change proposal; p. 6.

Because of the Snowy network loop, when the Murray-Tumut constraint binds, the price at the Murray node is the highest price on the network loop. This pricing reflects the impact Murray generation has on relieving the Murray-Tumut constraint. Other things being equal, generation at Murray may therefore have a greater incentive to increase output compared to generators elsewhere on the loop.

However, if the Snowy regional price (also the Murray nodal price), is higher than the Victorian price at times of southward flows, counter-price flows will occur. At these times, NEMMCO intervenes by effectively reorientating the price Murray generation is settled at from its nodal price to the nodal price at Dederang. In this situation, Dederang's nodal price is lower than both the Victorian regional reference price and the Snowy price, such that Murray generation is being priced marginally below Victorian generation even though Murray generation provides greater relief to the constraint than Victorian generation.

By settling Murray's generation at a price lower than its value to the market, Murray generation faces a weaker incentive to generate than may be optimal. This may reduce the efficiency of dispatch if Murray generation responds by generating less than it would if it received its local nodal price.

Under the Southern Generators' proposal, NEMMCO would no longer reorientate the constraint to Dederang during counter-price flows. Instead, the negative residue issue would be funded through a transfer of settlement residues from the NSW-Snowy interconnector to the Snowy-VIC interconnector. Murray generation would face its local nodal price and may generate more as a result.

Again, this analysis suggests that some benefits in dispatch efficiency may result if the Southern Generators' proposal is implemented, but the nature and extent of any such benefits needs to be tested quantitatively, particularly in respect to the operational and bidding strategies that participants may adopt.

Modelling results

The model used to test the Southern Generators' proposal and the re-orientation counterfactual replicates the NEM dispatch engine's operation of dispatching the least-priced combination of generation to meet a given demand. When compared to the base case, the changes in output in the Southern Generators' case reflected a change in dispatched generation, and the underlying costs of that generation was used to determine whether productive efficiency had improved. Details of the modelling approach and assumptions can be found in Appendix 1.

An important aspect of the modelling approach is that it specifically examines the changes to generator bidding behaviour, and thus pricing and generator dispatch, resulting from the proposed Rule change. It does this using game theoretic techniques. This approach allows the Commission to test the overall effects of the different proposals over a very wide range of bidding conditions and to test the sustainability of any pattern of bidding.

The modelling undertaken for the Commission indicated that the Southern Generators' proposal may lead to a relatively small reduction in overall production costs when compared to the assumed base case (as defined in Appendix 1) (see Figure A8[27]).

27 Note: the Figures labelled Figure A"X" can be found in Appendix 1.

The proposal resulted in lower production costs in all but one scenario (when Snowy Hydro had relatively more contract cover in Victoria compared to NSW). The proposal also had the effect of causing production costs to be lower in summer and higher in winter. This result was consistent in all scenarios.

The lower summer peak production costs relative to the base case appear to be driven by a slightly higher Snowy Hydro summer output across most of the contracting scenarios. This would result in a greater displacement of thermal plant compared to the base case at these times. The slightly higher production costs during peak winter periods would indicate thermal plant in the southern and northern regions displacing Snowy Hydro given the energy constrained modelling restrictions[28] (see Figures A10 and A11).

Overall, the Southern Generators' proposal led to an expected annual production cost saving of around $1 million. These modest production cost savings are what would be expected given the relative costs of generators in the south and north and the relatively small number of hours in which clamping occurs (see Figure A1). Importantly, these savings do not involve any capital outlay or any appreciable operating costs, such as would be required for an equivalent increase in the capacity of the interconnector. Achieving these efficiency savings simply involves changing which constraint equations NEMDE uses when negative settlement residues on the VIC-Snowy interconnector accrue.

Commission's findings

In assessing this and other Rule change proposals against the NEM objective, the Commission's emphasis will be on promoting changes in the design and operation of the NEM where these are likely to result in cost and pricing efficiencies. In general, large efficiency gains will arise from large changes in the market and such changes will only be necessary if there are obvious and significant problems with the market design. However, market improvements will generally involve making continuous, mainly small, incremental changes to the design and performance of the NEM.

The direction of the change in dispatch efficiency that is likely to result from the proposal is consistent with the NEM objective. The Commission is persuaded, on the basis of submissions and its own assessment of the facts and modelling results, that implementing the Southern Generators' proposal is likely to result in generation cost savings.

6.2 Pricing outcomes

The effect of the proposal on price outcomes in the NEM is a further consideration in the Commission's assessment against the NEM objective.

A Rule change can contribute to the efficiency of the NEM if it is likely to promote prices which more closely reflect the efficient costs of supply; for example by increasing competition, which reduces generators' ability to be able to sustainably bid well above the short-run marginal cost of supply.

Prices that are too high relative to the underlying economic costs would result in a loss to consumers as they might have valued the additional services that access to more electricity

28 See page 70 in Appendix 1 for a description of the energy constrained modelling restrictions.

would have provided them. Similarly, if prices are too low, relative to underlying costs, consumers would use electricity wastefully. That is, the resources that went in to providing artificially cheap power could have provided other services that would be more highly valued in the community. The Commission recognises the important role prices play in allocating resources to their highest valued use (allocative efficiency) and considers that, generally, rule changes that move prices closer to economically efficient costs should be encouraged.

The Commission's assessment of the outcomes from the proposal will also examine the likely direction and extent of price impacts. The Commission will rely on a combination of the results of conceptual and empirical analysis to indicate whether the proposal will lead to more cost-reflective pricing and the materiality of these in the short and long-terms.

Southern Generators' perspective

The Southern Generators argued their proposal would result in:

> *economically efficient pricing signals by eliminating the significant problems created by the action taken by NEMMCO to avoid negative settlement residues in the Snowy region.*[29]

Submissions

In its submission, Origin Energy noted that NEMMCO's intervention can:

> *create significant volatility in prices at [the] Murray [node] due to the imprecise nature of [NEMMCO's] flow capping process.*[30]

Snowy Hydro argued that the Southern Generators' proposal would "increase costs to Victorian and SA customers". It maintained that the Southern Generators' proposal would:

> *artificially keep [the] Tumut [nodal] price high (by not addressing the real problem) and [would] force Murray generation to be cut in preference to more expensive generation located in Victoria/SA. The end effect [would be] that the proposal [would] significantly increase [the] cost to Victorian/SA customers without any additional benefit.*[31]

Commission's considerations and reasoning

The objective function of the central dispatch process is to meet demand in each region using the lowest-priced combination of generation from across the NEM subject to a range of operational and security constraints.[32] Under the status quo, when NEMMCO intervenes and restricts exports on the VIC-Snowy interconnector, generation in Victoria, South Australia or Tasmania cannot be dispatched to help meet NSW or Queensland demand.

The Southern Generators' proposal removes that intervention, providing a more free flowing interconnector. This allows generator bids in Victoria, South Australia, and Tasmania to be used to meet NSW and Queensland demand should those bids be included in the least-priced combination of generation required. The Southern Generators' proposal is likely to increase competition in the NEM by increasing the choice of generators that could be used to meet demand. It is expected that this increase in competition would result in generators bidding closer to their costs, resulting in lower spot prices.

29 Southern Generators, Rule change proposal, p. 4.
30 Origin Energy, s.95 submission, p. 1.
31 Snowy Hydro, s.95 submission, p. 8.
32 Clause 3.8.1(b) of the National Electricity Rules states the objective function of the central dispatch process.

As part of the modelling of the dispatch efficiency gains, the modelling also determined sustainable patterns of bidding and, thus, prices. A very wide range of bidding conditions and scenarios were modelled. The scenarios considered different patterns of hedging (which can affect, in the short term, bidding behaviour and prices), IRSR holdings, and bidding choices (see Appendix 1).

The results of this modelling indicate that, relative to the status quo, implementation of the Southern Generators' proposal could result in a reduction in the time-weighted average annual wholesale spot prices in the NSW and Snowy regions of between $2 to $4/MWh, a very slight increase in Victorian region prices of up to $0.30/MWh, falls in Queensland region prices of up to $0.30/MWh, and prices in the South Australian and Tasmanian region largely unchanged (see Figure A16).

The source of these price reductions is intuitively obvious. When NEMMCO clamps the interconnector, this limits the choice of generators that NEMMCO can use to meet demand. The smaller group of generators that are likely to be required to meet demand in that situation will have a greater chance of being dispatched at higher prices and therefore have an incentive to bid higher prices.

Unclamping the interconnector does the opposite. NEMMCO can now access a wider range of generators to meet demand. In these circumstances all generators have less chance of being dispatched at higher prices and, therefore, will have an incentive to bid prices closer to their costs. This will generally result in lower prices. In this regard, unclamping the interconnector can be thought to have a similar pro-competitive effect as expanding the capacity of the interconnector.

An important modelling result arising from the Southern Generators' proposal is the reduction in the difference between prices in the NSW, Snowy, and Victoria regions, relative to the status quo. This reduction in the differentials between regional prices is likely to reduce the risks of inter-regional trading (discussed further in Section 6.4).

It is important to recognise the economic consequences of spot price changes. Price changes are only beneficial if they are passed on to consumers and producers. It is the change in consumption and production behaviour in response to the new prices that are the source of efficiency gains. As indicated above, these gains arise from resources being allocated to their highest valued use as producers and consumers respond to price signals that more closely reflect the resource costs of supply.

Lower spot prices will have both short and long term effects on generators, retailers and customers.

In the short term, lower spot prices may result in lower revenues for generators who have output that is unhedged. Even if generators are fully hedged, some contract types they have (e.g. cap and collar contracts) may not protect them against lower spot prices, depending on level at which prices change. This may result in an immediate response from generators. Under these circumstances generators will probably be more inclined to sell more contracts that protect them against lower spot prices, and/or they could offer peak cap style contracts more cheaply than before.

To the extent that this contracting behaviour by generators emerges, this is likely to yield relatively immediate benefits to retailers. Their choice of contracts will probably be increased and the price at which they are offered will be lower than before. To the extent that retailers have locked-in customers at pre-proposal prices, lower electricity purchasing costs will be translated into higher returns for retailers. However, given the increasing competitiveness of the retail sector, these extra returns should be competed away progressively, over time, as retailers compete to retain or gain retail market share. In the medium term, retail customers should benefit from more competitive price offerings that reflect the trends in wholesale market spot and contract prices.

The nature of the response by customers to lower electricity prices will vary from the short to long term. In the short term lower electricity prices may not change their consumption behaviour much. This is because customers tend to respond to higher or lower electricity prices over long time periods by altering the equipment they have that uses electricity. This is not to suggest that customers cannot exploit the benefits of lower prices in the short term. They can. For example, they can use the savings in lower electricity costs to purchase other goods or services that they couldn't afford before the change in prices. Customers could also change how much they use at different times of the day and the way they use their existing stock of electricity using equipment. However, these short term changes tend to be moderate compared to the longer term changes in consumption patterns.

Commission's findings

The Commission considers that implementation of the Southern Generators' proposal is likely to strengthen competition in NSW at times of high demand, imposing some downward pressure on NSW spot prices. This is likely to result in more cost-reflective spot prices in NSW and greater convergence of spot prices between southern and northern regions. These changes in spot market prices may eventually be passed on to customers in the form of more competitive, cost reflective price structures.

6.3 Inter-regional trading

This Section examines the Commission's analysis of the likely impacts of the Southern Generators' proposal on inter-regional trading.

Hedging spot price risk through financial contracts is an important feature of the market in terms of pricing efficiency and competition:

- Pricing efficiency - In a market where all buyers and sellers, respectively, pay and earn the same spot price for electricity, hedging contracts (and customer supply contracts) provide a means for producers to charge different prices to customers with varying price sensitivities. This enhances efficiency as more customer demand will be met using a range of prices than a single price.

- Retail competition - Retailers will not enter the NEM without access to hedging contracts as the risks of spending more buying electricity for customers than they can sell it for is too great. Similarly, generators will be less inclined to commit the funds to invest in new plant, particularly new entrant generators, unless they have some degree of revenue certainty. Contracts protect retailers against the prospect of making losses and can simultaneously provide generators with greater revenue certainty.

It therefore follows that if retailers have access to a wider range of parties to contract with and types of contracts into which they can enter, this will enhance competition and pricing efficiency. One way to increase the range of contracting parties and products being offered to retailers is by encouraging generators to offer contracts to retailers that supply customers in different regions in which the generator operates. Typically generators will only be prepared to make these inter-regional contracting offers if they are able to effectively 'price in' or hedge against the risk of inter-regional price differentials.

While there are a variety of ways of achieving this protection, a key method is to use some form of hedge against the likelihood and extent of inter-regional price differences. The SRA is a key method that participants use to hedge this risk. The extent to which the proposal enhances the opportunities for inter-regional trading, will be an important factor for the Commission in deciding whether the proposal advances the NEM objective and should be adopted.

Southern Generators' perspective

In their proposal, the Southern Generators' stated that both clamping and re-orientation

> *have a detrimental impact on inter-regional competition and reduce the value of the settlement residue stream that would otherwise be available to hedge transfers between the Victorian and Snowy Regions.*[33]

They commented that:

> *the anti-competitive restriction of flow in spot market dispatch has flow-on consequences in the related derivative markets, where the risk of artificial restrictions on interconnector flow affects the generators ability to dispatch generation to manage the risk of inter-regional contracts, and also reduces the value of SRA units that are relevant to managing inter-regional price risk.*[34]

They noted that their proposal:

> *increases inter regional trade because the total amount of settlement residues available to support settlement residue instruments will remain greater than either of the NEMMCO intervention mechanisms [clamping or reorientation], despite the depletion of some Snowy to NSW residue.*[35]

The Southern Generators also stated that their proposal provides a better means of managing inter-regional trading risks than either clamping or constraint re-orientation. They contend that their proposal would be:

> *satisfactory for 'through' buyers…[and] may be an issue for [traders located in] the intermediate [Snowy] region, but under the Snowy [Hydro] proposal [i.e. the Tumut CSP/CSC trial], most Snowy generation is effectively in NSW for northward flow limit conditions.*[36]

Submissions

Several submissions addressed this issue:

33 Southern Generators, Rule change proposal, p. 4.
34 Southern Generators, Rule change proposal, p. 9.
35 Southern Generators, Rule change proposal, p. 5.
36 Southern Generators, Rule change proposal, p.11.

- The Southern Generators stated that the status quo discouraged them from offering financial hedge contracts referenced to the northern regional reference nodes at (Sydney and Brisbane), reflected in the divergence between forward contract prices in NSW and Victoria.[37]

- The AER considered that clamping devalued the effectiveness of settlement residues as an inter-regional hedging instrument.[38]

- Westpac noted that recent uncertainty in flows in the Snowy region had resulted in a decrease in the liquidity of inter-regional hedges.[39]

- Origin said "substantial competition and trading benefits are associated with having greater liquidity around regional reference nodes" and strongly supported measures that minimised inter-regional trading risk.[40]

- Delta Electricity said the Southern Generators' proposal failed to address the problems associated with inter-regional trade.[41]

- Eraring considered the proposal to be unacceptable as it would enhance the performance of one interconnector at the expense of another, and did not solve the underlying problem but rather created additional burdens on inter-regional trade.[42]

Commission's considerations and reasoning

As indicated above, the NEM objective would be advanced by the proposal, to the extent that it can be shown to promote inter-regional trade in the NEM and opportunities for more cost-effective risk management.

Clamping of the VIC-Snowy interconnector has three key effects that degrade the value of and likely extent of inter-regional trading:

- It can limit the amount of generation competition in NSW, which can raise NSW spot prices, thus causing an increase in the extent of price separation and, hence, inter-regional trading risk.

- Participants find it hard to protect their financial interests given the difficulty in predicting when NEMMCO will clamp the interconnector. This increases the complexity of determining the value of inter-regional hedging.

- When NEMMCO does clamp the interconnector, this undermines the value of any VIC-Snowy IRSR units held by participants, thus discouraging inter-regional trading.

Taken together, these additional trading risks and complexities are likely to discourage southern generators from offering contracts to NSW retailers. This will undermine pricing efficiency and competition for the reasons described above.

37 Southern Generators, s.95 submission, p. 6.
38 AER, s. 95 submission, p. 2.
39 Westpac, s.95 submission, p. 1.
40 Origin Energy, s. 95 submission, p. 2.
41 Delta Electricity, s. 95 submission, p. 2.
42 Eraring Energy, s. 95 submission, p. 1.

The Southern Generators' proposal is likely to improve inter-regional trading by first reducing inter-regional price differentials and, secondly, by removing the risk of the value of a holding of IRSR units being undermined by NEMMCO clamping. In addition if NEMMCO clamping is no longer a feature of the market this removes one of the complexities participants have to consider when deciding whether and to what extent they should trade inter-regionally.

More specifically, the proposal is also likely to increase the combined value of the IRSR units on both the VIC-Snowy and Snowy-NSW interconnectors. Under the present arrangements, when clamping is implemented, the Snowy regional reference price can rise towards the NSW regional reference price. This means that the Snowy-NSW IRSRs provide an inadequate means of hedging Victoria-NSW price differences, while at the same time the VIC-Snowy IRSRs have diminished value as a risk management tool due to clamping. By avoiding the need to clamp, the proposal ensures (subject to transmission outages) that Victorian generators holding an equal number of VIC-Snowy and Snowy-NSW IRSR units are hedged against equivalent exposures in NSW. This can operate in one of two ways:

- First, assuming the Murray-Tumut lines remain constrained and counter-price flows persist, the positive IRSRs on the Snowy-NSW interconnector will exceed the negative residues on the VIC-Snowy interconnector to the extent that the sum of the per-unit IRSRs will equal the NSW-Victoria price difference; and

- Second, by reducing the incentive for Snowy Hydro to bid Murray generation at low prices to induce clamping, the proposal could lead to the Murray-Tumut constraint not binding in the first instance. This would lead to positive residues on both the VIC-Snowy and Snowy-NSW interconnectors and avoid the need to transfer value from the Snowy-NSW IRSRs to the VIC-Snowy IRSRs.

For southward flows, the proposal would replace NEMMCO's current practice of reorientating affected constraints to Dederang. The overall result would be little net change in the ability of NSW generators to hedge contracts written against the Victorian node.

For a participant trading "out of" the Snowy region rather than "through" it, the implementation of the Southern Generators' proposal is likely to:

- Reduce the payments to Snowy-NSW IRSR unit holders, including those trading out of the Snowy Region, relative to the case under the status quo arrangements, because of the transfer from the Snowy-NSW IRSR fund to the VIC-Snowy IRSR fund;

- Create a level of unfunded difference payment risk on contracts that have been written based on the assumption of dispatch at high prices when clamping occurs; and

- Reduce the ability of those trading out of the Snowy region to closely align the Snowy region price with a high NSW price than is possible under clamping, because of the introduction of competitive pressures from southern regions at times when clamping would otherwise have occurred.

The net effect of the Southern Generators' proposal on the inter-regional financial risks and returns of a participant trading out of the Snowy region is difficult to gauge analytically

because of the combination of effects that the proposal is likely to have. The extent of that impact is also highly dependent on contracting positions, something the Commission does not know with certainty.[43]

The Commission considers that participants trading out of the Snowy region are likely to have a wider range of tools for managing inter-regional trading risks than other participants due to the unique characteristics of the Snowy region and has taken this into account in assessing this issue.

The positive effect of the Southern Generators proposal on inter-regional trade is likely to have some side benefits. For example, to the extent that participants have a wider range of contract counterparties to trade with, this will allow participants to diversify credit risk and, potentially, reduce the costs of credit support.

Given the complexity of the interactions between the effects noted above and the potential for changed incentives on participants, the Commission considered it important to confirm the arguments and conclusions described above with some empirical modelling.

Modelling results

The details of the modelling approach used to assess the nature of changes to inter-regional trading are described in more detail in Appendix 1. In summary, the approach involved establishing an experiment using Modern Portfolio Theory to determine the change in contracting behaviour under the current arrangements and the conditions that are likely to prevail under the proposal. The aim of the experiment was to determine whether generators in Victoria would find it more efficient (at minimum risk as measure by the standard deviation of returns) to buy IRSR units to meet a fixed load (100 MW) in NSW or sell to the load at spot prices. The reverse was tested for NSW generators selling to a load in Victoria and for Snowy selling into either NSW or Victoria.

This modelling showed that, under the proposal, there would be a greater propensity for southern generators to trade inter-regionally using IRSR units to hedge a contract referenced to NSW. As indicated above, this result is due to a combination of the greater firmness of the VIC-Snowy IRSR units and lower expected price differentials between the Victorian and NSW regions.

When NSW generation is used to cover a Victorian hedge, the results show a very slight decrease in the attractiveness of inter-regional trade – perhaps due to declines in the value of NSW-Snowy IRSRs at those times when NSW-Snowy IRSRs are used to fund deficits on the Snowy-VIC interconnector.

For Snowy Hydro using its Snowy region capacity to hedge loads in adjoining regions, there is a slight decrease in the attractiveness of hedging loads in NSW, but an increase in the attractiveness of hedging loads in Victoria. This change in financial attractiveness of hedging between NSW and Victoria for Snowy region generation may have the potential to result in a rebalancing of Snowy Hydro's contract portfolio, such that a greater share of its contracts are referenced to the Victorian node if hedging was assumed to be the only or main way of managing inter-regional basis risk.

43 Because the Commission does not know with any certainty any generator's contracting position, the modelling assumes a position, and to compensate for the unknown factors, it includes a number of sensitivities.

Overall, the results of the modelling indicate that implementation of the Southern Generators' proposal is likely to increase the extent of inter-regional trading between the largest regions in the NEM - NSW and Victoria. The increased competition in NSW appears likely to stem from generators in the southern regions (VIC, SA, TAS) being able to offer more contracts into NSW, thereby competing with other suppliers of contracts in NSW. Competition for Victorian reference node contracts appears likely to increase if Snowy Hydro increases the share (and/or volume) of its contracts referenced to the Victorian node.

Commission's findings

The analytical reasoning and modelling results provide support for the proposition that the Southern Generators' proposal can be expected to increase inter-regional trade and competition in the NEM compared to the status quo.

Overall, the Commission considers that the Southern Generators proposal will:

- decrease inter-regional price differentials which will increase participants preparedness to enter into inter-regional trades;
- reduce the risks and, therefore, enhance the value of inter-regional trading by removing NEMMCO clamping; and
- reduce the complexity of inter-regional trading by removing the risks of NEMMCO clamping.

In combination these expected changes are likely to have a net positive effect on the market by enabling risk to be better managed across the whole market which will enhance the effectiveness of competition and the efficiency of pricing in the NEM.

6.4 Power system security and reliability

The NEM objective emphasises the need for market reforms to serve the long-term interests of consumers, including with respect to the reliability and severity of electricity supply. It is important therefore that any changes to the market arrangements do not compromise the security and reliability of the power system and desirable delivery of improvements in those respects.

NEMMCO is obliged under the Rules to operate the power system in a secure and reliable manner. An assessment is necessary of whether changes to the way NEMMCO manages counter-price flows, as proposed by the Southern Generators, could have implications for the reliability of supply.

Southern Generators' perspective

In their proposal, the Southern Generators stated that in addition to resulting in "economically efficient pricing signals", it:

> *will also increase the reliability of supply to NSW for northward flows and Victoria for southward flows and hence meets the market objective..*[44]

44 Southern Generators, Rule change proposal, p. 5.

Submissions

The Southern Generators clarified the above statement in their submission. Although, they still held the view that during normal market operation, with no artificial network constraints (such as interconnector clamping), generator access to load would improve, allowing for more competitive options for power.

The Southern Generators noted, however, that:

> *where NSW reliability is threatened, [they] now understand that NEMMCO would remove the intervention and allow negative residue to accumulate…Where reliability [was] threatened, [their] Rule change actually has no effect…and makes no change to NSW reliability.*[45]

Snowy Hydro argued from a different perspective, disagreeing with the Southern Generators' claims of both additional supply and supply reliability. Regarding additional supply into NSW, it stated that under the proposal:

> *There is only substitution of Tumut generation with Victorian/SA generation. Hence, contrary to [the Southern Generators'] claim, NSW customers are not the beneficiaries of this Rule change as there is no additional supply.*
>
> *In addition, if Murray generation is withheld (as it is incentivised to do under the [Southern Generators'] proposal), supply to NSW is in fact reduced.*[46]

With respect to supply reliability, Snowy Hydro argued that:

> *while this point is not significant in magnitude, it is worth noting in the case of scarce supply into NSW (e.g. as seen by dispatch outcomes during load shedding incident on 1/12/04) Murray generation will be supply more MWs to NSW due to fact that lines 03 and 07 (Lower Tumut to Yass & Canberra) were constrained while lines 01 and 02 (Upper Tumut to Canberra & Yass) were not fully utilised.*
>
> *Conclusion: the [Southern Generators'] proposal will (marginally) reduce supply reliability into NSW.*[47]

The AER, through Dr. Biggar's attachment, supported the Southern Generators' position that the impact of the proposal could increase the total flow into NSW under conditions where there are no constraints north of Tumut power station.[48]

Commission's considerations and reasoning

The Southern Generators' proposal is effectively a change to the settlement arrangements in the NEM. As such it is not expected to change the underlying network transfer limits between Victoria, Snowy and NSW, although it will change the commercial incentives that drive participants' generation offers. The implications for supply reliability are examined below.

As discussed in Section 6.2, for northward flows through the Snowy constraint Murray generation exerts greater pressure on the constraint than does the Victorian interconnector.

45 Southern Generators, s.95 submission, p. 17.
46 Snowy Hydro, s.95 submission, p. 7.
47 Snowy Hydro, s.95 submission, p. 7.
48 AER, s.95 submission, p. 4-5.

At times when the constraint is binding, it would be expected therefore that increasing the flow on the VIC-Snowy interconnector relative to Murray generation would allow a greater flow of power to NSW from Murray/southern region generators, subject to any interconnector limits in NSW. Conversely, when NEMMCO intervenes by restricting interconnector flows and Murray generation is high relative to Victorian exports, transfer through the constrained loop to NSW may be reduced.

However, the derogation in Chapter 8A Part 8 of the Rules requires that NEMMCO not "[prejudice] its obligations to maintain power system security" when it intervenes to manage counter price flows.[49] Furthermore, following discussions with NEMMCO, the Commission understands that generation will be dispatched to meet demand even if it is necessary to divert from the dispatch merit order expressed in offer prices, subject to use of the fully optimised constraint form in the dispatch process regardless of the nominated mechanism to manage counter price flows. The Rules also empower NEMMCO to direct generation to achieve either supply reliability or power system security.

The Commission notes the comment in Snowy Hydro's submission that Tumut generation and Victorian/South Australian generation are substitutes on the northern side of the constraint and therefore the Southern Generators' proposal does not improve supply reliability in NSW. This comment is described more fully in Snowy Hydro's Re-orientation Rule change proposal.[50] While this approach will influence the flow of power into NSW through time, the Commission understands the upper limit of flow to remain available for use by NEMMCO if necessary.

Snowy Hydro has also commented that it would have an incentive to withhold Murray generation under the Southern Generators' proposal. Snowy Hydro describes this strategy more fully in its Re-orientation Rule change proposal. The Commission agrees that Murray generation would have an incentive under the Southern Generators' proposal to keep the Murray-Tumut constraint from binding, but considers that mechanisms are available to NEMMCO to dispatch generation if necessary to maintain power system security.

On this basis, the Commission considers that while the Southern Generators' proposal will influence participants' operational behaviour in the market would be unlikely to have a material impact on power system security or supply reliability.

Commission's findings

Because of NEMMCO's overriding obligation to maintain power system security and reliability, the Commission considers that the Southern Generators' proposal is unlikely to alter the existing reliability of supply to NSW.

6.5 Good regulatory practice

An important consideration in assessing the Southern Generators' proposal is the extent to which it contributes to achieving best practice in the regulation and operation of the NEM.

In the context of changes to the NEM Rules the concept of good regulatory practice is intimately linked to the NEM objective. The Commission considers that good regulatory

49 Clause (c), Chapter 8A, Part 8, *National Electricity Rules*.
50 Snowy Hydro Limited, *Rule change proposal for: Management of Negative Residues in the Snowy Region by reorientation of constraints*, p.5-6, available: http://www.aemc.gov.au/electricity.php?cat=rc.

design and practice promotes confidence in markets, benefits consumers, and provides greater predictability and regulatory certainty for investors.

This Section considers whether the Southern Generator's proposal is likely to be consistent with these principles of good regulatory practice and, therefore, enhances the efficiency and performance of the NEM and the long term interest of electricity consumers as a result. By removing NEMMCO's need to intervene in the dispatch process through clamping, the Southern Generators proposal would have the effect of removing a potential distortion in the operation of the market. As discussed in Sections 6.1, 6.2, and 6.3, this intervention can distort efficient dispatch, hinder competition, and impede inter-regional trade.

Southern Generators' perspective

The Southern Generators state that NEMMCO's intervention to manage negative settlement residues "distort[s] efficient dispatch and thus degrade[s] the performance of the market in relation to the objectives" by having a:

> *detrimental impact on inter-regional competition and reduce[ing] the value of the settlement residue stream that would otherwise be available to hedge transfers between the Victorian and Snowy regions.*[51]

Submissions

In their submission, the Southern Generators' submitted that there should be a focus to:

> *eliminate market intervention by NEMMCO other than on system security grounds.*[52]

Origin Energy agreed with the Southern Generators, stating in its submission that NEMMCO's intervention:

> *creates uncertainty in the minds of participants as to the likely impacts of the NEMMCO intervention on the market…*[53]

Delta Electricity expressed in its submission the problem of certainty with the status quo:

> *the management of congestion and settlement residues are currently not aligned in a manner that delivers certainties to market participants.*[54]

Commission's considerations and reasoning

In the context of the Rule proposal, the Southern Generators have proposed regulatory action to replace one form of intervention with another. The relevant consideration for the Commission is whether the intervention in the settlement process proposed by the Southern Generators proposal is superior to NEMMCO's clamping, in the context of good regulatory design and practice principles.

51 Southern Generators, Rule change proposal, p. 4.
52 Southern Generators, s.95 submission, p. 4.
53 Origin Energy, s.95 submission, p. 1.
54 Delta Electricity, s.95 submission, p. 1.

Intervention that distorts competition

The Organisation for Economic Co-ordination and Development (OECD) and the Council of Australian Governments (COAG) provide broad guidance on the principles and criteria for "good regulation".

Among other things, the OECD noted that good regulation should:

> *(iv) minimise costs and market distortions.*
>
> *(viii) be compatible as far as possible with competition trade and investment-facilitating principles.*[55]

The COAG Principles and Guidelines for National Standard Setting and Regulatory Action include the following principle among others:

> *Regulation should be designed to have minimum effect on competition.*[56]

The COAG Competition Principles Agreement of 25 February 1994 contains the following guiding principle with respect to legislation review:

> *13.5(1) The guiding principle is that legislation should not restrict competition unless it can be demonstrated that:*
>
> *(a) the benefits of the restriction to the community as a whole outweigh the costs*
>
> *(b) the objectives of the legislation can only be achieved by restricting competition.*[57]

The common thread in these guiding principles is that regulatory interventions which distort the operations of competitive markets should be avoided or minimised particularly where the objective can be achieved by alternative non-distorting means.

Distribution of effects of regulatory change

The OECD noted that good regulation should "produce benefits that justify costs, considering the distribution of effects across society".

The costs and benefits of the Southern Generators' proposal relative to the status quo and the re-orientation counterfactual have been identified and considered throughout this draft determination, and are a central consideration in the Commission's assessment of the proposal against the NEM objective.

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55 OECD, The OECD Report on Regulatory Reform, 1997, p. 28, available: http://www.oecd.org/dataoecd/17/25/2391768.pdf

56 Council of Australian Governments, Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-Setting Bodies, as amended by COAG, June 2004, p. 5, available: http://www.coag.gov.au/meetings/250604/coagpg04.pdf

57 COAG also noted a further two principles, however these have limited application to the NEM and the Commission's decision making:

- Wherever possible, regulatory measures or standards should be compatible with relevant internationally accepted standards or practices;
- Regulations should not restrict international trade; and
- Regulation should be reviewed periodically.

However, another aspect of the principles of good economic regulatory design and practice is to have regard to the extent to which Participants and consumers are likely to be affected, either positively or negatively, by a proposal. This may involve identifying and, where possible, quantifying wealth transfers. Consequently, the Commission may consider wealth transfer effects where it considers that this could undermine the achievement of the NEM Objective, for example by creating a perception of policy or regulatory instability thereby undermining confidence in the market arrangements.

The Commission recognises that the Southern Generators' proposal may have some wealth transfer consequences for market participants. Those potential effects will be considered in the context of the broader costs and benefits of the proposal.

Simplicity, transparency, predictability, and consistency

The OECD also noted that good regulation should "be clear, simple, and practical for users" and "be consistent with other regulations and policies".

The operation of clamping is defined through a NEMMCO operating procedure. In practice this procedure is not precise nor entirely predictable. In any case, a NEMMCO procedure may be considered less transparent and less robust than a process defined clearly in the Rules, such as would be the case for the Southern Generators' proposal. Clamping also requires a decision to intervene on NEMMCO's part and an assessment of the level of clamping required. In the case of the Southern Generators' proposal, the Rules define a clear process for transferring the residues between the interconnectors, which will happen on a mechanical basis rather than requiring a discretionary decision to be made.

The Commission also notes that while both clamping and the Southern Generators proposal may achieve a similar outcome in terms of addressing accrued negative settlements residues on the VIC-Snowy interconnector, clamping can tend to be unpredictable in its operation and results. This unpredictability can have an adverse impact on market participants and is likely to increase the perceived riskiness of the market.

In terms of consistency, the Commission notes that the Southern Generators' proposal will be unique in the Rules in its proposal to transfer residues between interconnectors. Currently, NEMMCO has the power to intervene wherever significant negative residues accrue, so clamping on the VIC-Snowy interconnector may be considered more consistent with NEMMCO's wider powers of intervention for negative residues.

Flexibility and discretion

COAG's regulatory principles noted the importance of regulation to be flexible in its operation provided that flexibility does not result in undue uncertainty in business operations and in so doing, impose excessive costs. COAG also noted that good regulation should attempt to standardise the exercise of bureaucratic discretion, so as to reduce discrepancies between government regulators, reduce uncertainty and lower compliance costs.[58]

As noted above, clamping involves a level of discretion on the part on NEMMCO in determining when to begin restricting flows on the VIC-Snowy interconnector, and for how

58 See previous reference note.

long. The Southern Generators' proposal would remove that discretion. The Commission considers that the Southern Generators' proposal is likely to provide a greater amount of certainty regarding intervention to address negative residues. Under the Southern Generators' proposal, the intervention will be more predictable and clearly defined.

Commission's findings

Having considered the market efficiency and competition implications of the proposal against the status quo, the Commission considers that the Southern Generators proposal is superior to clamping in terms of good regulatory practice.

This is because the proposal removes the uncertainty of when, by how much and how long NEMMCO will restrict flows over the VIC-Snowy interconnector. The proposal replaces that uncertainty with a clear and transparent mechanism that can be consistently applied for the duration of the derogation that it amends.

While the Southern Generators' proposal may have a short-term application, its implementation would remove an inefficient, arbitrary, unpredictable intervention and replace it with a more simple, transparent and predictable approach to managing negative settlement residues in the Snowy region. Accordingly, the Commission considers it is more consistent with good regulatory design and practice in the NEM and therefore with the NEM objective.

6.6 Revenue adequacy

Revenue adequacy is concerned with whether the proposal is self-funding. That is, whether the positive residues accruing on the Snowy-NSW interconnector are sufficient to cover the negative residues accruing on the VIC-Snowy interconnector, for both northward and southward flows.

Southern Generators' perspective

In their proposal, the Southern Generators argue that their Rule change proposal is revenue adequate, i.e. self-funding. They believe there will always be sufficient inter-regional settlement residues on the Snowy-NSW interconnector to fund any negative residues on the VIC-Snowy interconnector.[59]

The Southern Generators proof assumed a particular relationship between the regional prices (in Victoria, Snowy, and NSW) that occurs when the constraint between Murray and Tumut is binding (Murray-Tumut constraint).

The proof sought to demonstrate that on the basis of this relationship and maximum interconnector capacities, the surplus on one interconnector was greater than the deficit on the other interconnector for both northward and southward flows.

59 Southern Generators, Rule change proposal, p. 12-14,

Submissions

Westpac concurred with the Southern Generators' analysis, that there would be sufficient funds available on the Snowy-NSW interconnector to cover the negative residues on the VIC-Snowy interconnector.[60]

In the attachment to the AER submission, Dr. Biggar supported the revenue adequacy of the Southern Generators' proposal by demonstrating through a generalised mathematical proof that, having regard to the CSP/CSC trial, the total settlement residues across the VIC-Snowy and Snowy-NSW interconnectors were positive.

The proof demonstrated that

> *in a market with efficient locational pricing (i.e. no intra-regional transmission constraints), the total settlement residue must always be positive. This means that if there are negative settlement residues on one interconnector, they must arise positive residues on at least one other interconnector… Analysis…show[ed] that the Snowy-NSW interconnector [was] "benefiting" precisely at the expense of the VIC-Snowy interconnector.*[61]

Commission's considerations and reasoning

Both revenue adequacy proofs submitted are based on a single constraint binding (the Murray-Tumut constraint) under system normal conditions. The Commission agrees that the pricing relationship that underpins the proofs is representative of the relationship between dispatch interval prices produced by NEMDE given those conditions. The Commission also accepts that these proofs support revenue adequacy on a five-minute or dispatch interval basis.

There are a few limitations with the analysis though. For instance, both proofs assume a particular relationship between regional prices that occur during particular market conditions, e.g. a single binding constraint and normal operating conditions. If operating conditions were not normal (e.g. there is a network outage), it may be necessary for NEMMCO to invoke an alternative constraint. This could change the assumed relationship between regional prices at times when the Murray-Tumut constraint binds. These proofs of revenue adequacy may not hold under these conditions.

Another limitation is while the proofs hold on a five-minute or dispatch interval basis, they may not necessarily hold on a thirty-minute, or trading interval basis, the period over which NEMMCO calculates settlement residues in the NEM. When only some of the dispatch intervals in a trading interval have binding Snowy constraints, the assumed relationship between regional prices does not hold over the trading interval; the revenue adequacy condition may not hold. It is possible to demonstrate this using a simple example where flows between Victoria and NSW through Snowy switch from northward to southward within a trading interval. This example includes a number of (potentially unrealistic) assumptions such as low or limited generation from Tumut and Murray power stations during the period of southward flows.

The Commission considers that the Southern Generators' proposal is likely to be revenue adequate in most operating situations but recognises they may not hold in all conceivable

60 Westpac, s.95 submission, p. 2.
61 AER, s.95 submission, p. 4.

situations. However, the Commission does not consider that revenue adequacy in all circumstances is a necessary requirement for the implementation of the Southern Generators' proposal, particularly when account is taken of the other potential benefits, including improved competition dispatch efficiency and inter-regional trade.

Should revenue adequacy not hold continuously, the Rules currently provide NEMMCO with a mechanism for recovering outstanding net negative residues. The Commission's intention would be that NEMMCO would recover any outstanding net negative residues in accordance with clause 3.6.5(a)(4), before 1 July 2006, and clause 3.6.5(a)(4A), after 1 July 2006, following commencement of the *National Electricity Amendment (Negative Inter-Regional Settlements Residue) Rule 2006 No. 4*.

Commission's findings

In view of the potential benefits of the proposal in promoting greater competition and economic efficiency in the NEM, including dispatch efficiency and inter-regional trade, the Commission does not believe that revenue adequacy in every conceivable network configuration should be a necessary requirement for its implementation. It notes in this regard the alternative mechanisms available to NEMMCO to address any negative settlement residues that may arise.

6.7 Long term implications

While the Rule change proposal is for a relatively short period, accepting this proposal can alter the direction in which the market is heading and, therefore, can have longer term implications which must be considered. This Section examines the nature of the longer term effects the proposal may have on the direction of the market, typically referred to as the dynamic efficiency effects.

Southern Generators' perspective

The Southern generators' stated that their proposal is "a specific response to an acute problem in the National Market implementation". Over time, the Southern generators anticipated that a more general measure may replace their specific proposal.[62]

Submissions

The Southern Generator's submission was the only one that specifically addressed the longer term implications of implementing their proposal. They raised concerns that NEMMCO intervention was harming investment efficiency by distorting contract prices. In particular, they suggested that NEMMCO intervention artificially inflated contract prices in NSW and depressed contract prices in Victoria. This in turn encouraged inefficient investment in the northern regions while discouraging efficient investment in the southern regions.[63]

Commission's considerations and reasoning

Earlier in this Section of the report the Commission described the importance of consistency and predictability in achieving the NEM Objective and how the proposal is consistent with its general direction of adopting changes that result in lower costs and prices and of promoting the competitive process to achieve these aims.

62 Southern Generators, Rule change proposal, p. 5.
63 Southern Generators, s.95 submission, p. 5.

In a capital intensive industry like the power sector, large efficiency gains can be achieved by ensuring new investment arrives in optimal types (e.g. networks, generation, or demand side management), sizes, locations, and at optimal times. These outcomes are most likely to be achieved where the market is competitive and prices reflect efficient capital and operating costs.

The Commission is aware that the risks to investors in the NEM are high, particularly those operating in the generation and retailing sectors. Investors are constantly assessing the investment environment to determine the best time and location for their investments. The Commission is mindful of the need to provide a clear signal of the direction it will take in modifying the market Rules that determine the revenues they receive from their investments. Thus, even though the proposal is for a short period the Commission is keen to ensure that its decision on the proposal is seen as taking the market in a direction that is consistent with a longer term trajectory of change.

In this regard, the Commission draws attention to the earlier discussions in Section 6 which found that the proposal is likely to:

- lower the costs of production;
- cause prices to better reflect costs by promoting competition directly through the spot market and indirectly by encouraging inter-regional trading; and
- providing a more predictable market/price setting mechanism.

These short term effects are consistent with the Commission's long term objective for the market. These long term gains will be realised sooner if timely incremental improvements are made to the design and performance of the market. In any case, as noted in Section 6.2 the Commission expects the price effects of the proposal to have both short- and medium-term influences on longer-term pricing decisions. It is also important for the many investors who are currently considering new generation proposals in NSW and Victoria to be aware of the Commission's approach to Rule changes so that they can factor this into their long term planning.

In summary, while the Southern Generators' proposal addresses a specific problem in the NEM, the Commission notes its implementation will inform a more generalised approach to decision-making on Rule proposals that seek to improve the efficiency of the NEM and the approach to managing network congestion in the NEM.

Commission's findings

While recognising that the Southern Generators' proposal would operate for a relatively short period (pending consideration and possible adoption of longer term solutions to the Snowy Region loop flow and network constraint issues), the expected improvements in NEM wide competition, dispatch efficiency and inter-regional trade suggest that the proposal is likely to influence longer term decision making and to promote dynamic efficiency. In addition, acceptance of the Southern Generators' proposal would reinforce the message to the market that the Commission will be seeking to promote through the Rule change process incremental changes to the operation and performance of the NEM which can be shown to deliver more competitive and more economically efficient outcomes in the longer term.

6.8 An alternative option – re-orientation counterfactual

This Section examines an alternative means of addressing negative settlement residues in the Snowy region by means of reorientating the Snowy constraints to Dederang at times of potential counter-price flows on the VIC-Snowy interconnector. The Commission has used its assessment of the re-orientation alternative as a "counterfactual" against which to compare the market impacts of the Southern Generators' proposal. However, the re-orientation counterfactual has not been subject to full analysis or further consultation in being used for this limited purpose in the draft decision.

As noted in Section 6.1, the Commission has also received on 24 May 2006, a formal Rule change application from Snowy Hydro proposing to address the Snowy region negative settlement residue issue by means of re-orientation to Dederang. The two proposals, (which appear to be alternatives) will each be considered on their merits in the Commission's formal Rule change process and the Commission will seek to co-ordinate the decision-making process as far as possible.[64] The Commission proposes to issue a draft Rule determination in relation to the Snowy Hydro proposal in conjunction with issuing a final Rule determination in respect of the Southern Generators' proposal. This will enable the relative merits of the two proposals to be clearly tested.

At times of southward flows, to prevent the accumulation of negative residues on the Snowy-VIC interconnector, NEMMCO currently intervenes by re-orienting Murray-Tumut constraints to Dederang. The policy effect of this action is that the Snowy regional reference price is set at the Dederang nodal price, rather than at the Murray nodal price for the period during which the constraint is oriented towards Dederang. The network loop configuration in the Snowy region means that for flows south, when the constraint between Tumut and Murray binds, the nodal price at Murray (the Snowy regional reference node) is higher than the nodal price at Dederang, the Dederang price being likely to be more closely related to the Victorian price.

Through this mechanism, re-orientation of the constraint eliminates negative residues as flows no longer go from a higher-priced region to a lower-priced region. Dispatch outcomes are not affected by re-orientation of the constraint, for a given set of offer prices. However, Murray generation may have incentives to alter its bids, potentially leading to changes to dispatch.

Southern Generators' perspective

In considering NEMMCO's current intervention practice for southward flows, the Southern Generators referred to conclusions reached by NEMMCO when it consulted on the benefits of re-orientation as a way to manage negative residues. The Southern Generators stated that NEMMCO's conclusion identified a trade-off between removing negative residues and introducing a mis-pricing of generation at the Murray node. The Southern Generators argued that the re-orientation approach resulted in:

64 The Southern Generators' first submitted their proposal to NECA in May 2005. The proposal was transferred to the Commission's consideration on 1 July 2005. The Southern Generators and NEMMCO resubmitted their application to comply with the amended National Electricity Law. The Commission received Snowy Hydro's Re-orientation Rule change proposal on 24 May 2006.

a distortion of efficient dispatch and thus degrade[d] the performance of the market in relation to the objectives.[65]

Submissions

In its submission, Snowy Hydro acknowledged that all the current options to deal with the Snowy region were "unsatisfactory".[66] It acknowledged that although re-orientation of constraints in the Snowy region to the Dederang node for northerly flows was not an ideal solution, it was "the most appropriate transitional solution".[67] It proposed that this, in conjunction with its boundary change proposal, offered "the best holistic solution".[68]

Snowy Hydro also argued that the Southern Generators' proposal was "simply attempting to enforce" full nodal pricing at a single point to the "competitive detriment to their major competitor." They stated that:

it [was] only a matter of months since the multi year market consultation and MCE policy review with the resulting clear rejection of full nodal pricing in favour of stable large load regions.[69]

In its supplementary correspondence dated 2 March 2006, Snowy Hydro reiterated this point, stating that the proposal "contradicts the MCE policy direction of rejecting Full Nodal Pricing".[70]

Dr. Biggar, as part of the AER's submission, included a paper in which he discussed the implications of re-orientating Snowy region constraints to Dederang ("the problems with merging two regions").[71] He concluded that the effective merger of the Murray node with the Victorian region still resulted in an "inefficiency in dispatch" despite eliminating negative residues, and with it, NEMMCO's need to intervene. This resulted, he said, from the "mis-match between pricing and dispatch" at the Murray node. Under this scenario, Murray generation would be paid the Victorian price, even though, for northerly flows, the efficient price for Murray output would be significantly less than the Victorian price. Murray would have the incentive to reduce its bids "to a level it would like to be dispatched at the VIC price". While re-orientation would eliminate negative residues, it may introduce a new pricing distortion at Murray, which could be, in Dr. Biggar's view:

just as significant [a] distortion in dispatch as if NEMMCO intervened directly to control flows as [limiting Victorian exports].[72]

On the 2 March 2006, Snowy Hydro lodged an additional submission to "highlight some apparent misconceptions that have been evident in the first round of submissions."[73] Included in the submission was a request for the Commission to consider implementing re-orientation for northerly flows (as used currently for southerly flows) as an alternative to the

65 Southern Generators, Rule change proposal, p. 4.
66 Snowy Hydro, s.95 submission, p.3.
67 Snowy Hydro, s.95 submission, p.9.
68 Snowy Hydro, s.95 submission, p.1.
69 Snowy Hydro, s.95 submission, p.3.
70 Snowy Hydro, supplementary submission on Southern Generators' Rule change proposal, 2 March 2006, p.3.
71 Darryl Biggar, "Managing Negative Settlement Residues on the VIC-Snowy Interconnector", 20 May 2005, p. 9.
72 AER, s.95 submission, p.9
73 Snowy Hydro, Supplementary submission, p.1

Southern Generators' proposal. Snowy Hydro attached Rule drafting that they suggested could be used to implement re-orientation.[74]

While not a submission on this Rule change proposal, it is noteworthy that Snowy Hydro's recent Re-orientation Rule change proposal supported the view that the status quo involving clamping by NEMMCO is inferior to both re-orientation (which it favours) and the Southern Generators' proposal. In particular Snowy Hydro notes that the status quo:

- *[Led to] some unpredictability relating to the speed with which NEMMCO will respond to negative residues between Victoria and Snowy;*
- *Reduces dispatch options during high demand periods with northerly flows by placing a constraint on Victorian exports;*
- *Clamping usually results in a fall in prices in Victoria, a sharp increase in prices in Snowy to a level slightly below New South Wales, and no change in prices in New South Wales;*
- *Victorian participants have a reduced ability to manage inter-regional price risks, as there are little or no settlement residues between Victoria and Snowy when NEMMCO clamps; and*
- *Snowy has a strong ability to manage inter-regional price risk, off-set only by the uncertainty in the way NEMMCO applies clamping to Victoria to Snowy/NSW exports.*[75]

Commission's considerations and reasoning

The Commission notes that both the Southern Generators and Snowy Hydro have argued that the current arrangements for managing congestion in the Snowy region are inefficient and introduce distortions into the dispatch process. Each is advocating a different approach to resolution of NEMMCO's intervention, however.

As noted above, preliminary analysis of the re-orientation option, advocated by Snowy Hydro in its supplementary submission on the Southern Generators' proposal, has been used by the Commission as a counterfactual in its assessment of the proposal. The results of the limited modelling are included in Appendix 1. Assessment of the proposal and the re-orientation counterfactual, in that context, revealed that a clear case exists for change from the status quo. However, the benefits of one proposal over the other are less clear.

The following observations arise from the Commission's assessments of the counterfactual and the Southern Generators' proposal:

- Dispatch efficiency - quantitative modelling indicated that both the proposal and counterfactual have potential to deliver gains in dispatch efficiency over the status quo. This is consistent with both approaches resulting in the elimination of the clamping action to control negative residues, permitting wider participation in the dispatch process by generators in southern regions. The relatively small quantum of dispatch cost savings is consistent with the avoidance of clamping for a limited number of hours per year, and also the relatively small underlying fuel cost differentials;

74 Snowy Hydro, supplementary submission, p.1.
75 Snowy Hydro, Re-orientation Rule change proposal, p14.

- Price impacts – quantitative modelling indicated that either the proposal or the counterfactual could potentially result in a reduction in NSW spot prices, with no appreciable change to Victorian spot prices. Again, the results did not identify a material difference between the price effects of the proposal and re-orientation counterfactual; and

- Risk – modelling indicated that both the proposal and counterfactual may improve the optimal level of contracting from Victoria into NSW, for northern flows, and from Snowy into Victoria, for southern flows. A potential reduction in Snowy Hydro's optimal contracting level into NSW was indicated. In each case, the Southern Generators' proposal was indicated to be marginally, but not materially, superior to the re-orientation counterfactual from a risk perspective.

In addition to the above modelling outcomes, the Commission notes the following differentiating factors between the Southern Generators' proposal and re-orientation counterfactual:

- Analysis of re-orientation as a counterfactual, indicates that it is likely to change the competition between Victorian and Murray generation for dispatch through the constraint when flows are northward. With Murray generation being paid the Dederang price regardless of its offer, Murray generation is likely to be able to offer reduced prices in order to get dispatched, resulting in little or no impact on its settlement price. In this sense, Murray generation would be exposed to a less economically efficient price signalling, which would directly affect its offer and dispatch behaviour. Notwithstanding this reduction in competitive pressure on the Murray generation, the re-orientation counterfactual does have similarities to the situation faced by other generators in the NEM, which are settled at regional prices.

- For southern flows, when the Murray-Tumut constraint is binding and negative settlement residues result on the Snowy-VIC interconnector, NEMMCO currently re-orientates the Murray-Tumut constraint to the Dederang node to prevent the further accumulation of negative residues. When compared to the Murray nodal price, Murray generation would be settled at a relatively lower price. This may reduce the incentive to generate at the Murray node, as Murray generation would receive a price lower than the value of its generation to the market. Less generation at the Murray node may limit the flow of generation north of the constraint as Murray generation relieves the constraint for southward flows.] The re-orientation counterfactual is likely to introduce generator bidding incentives that exacerbate the existing congestion on the Murray-Tumut constraint.

- Both the Southern Generators' proposal and re-orientation counterfactual analysis shows there is likely to be a transfer of funds from the NSW interconnector residue to offset what would otherwise be negative residues on the Victoria interconnector. In addition, the re-orientation counterfactual would result in a further transfer of funds from the NSW interconnector to Snowy (Murray) for northerly flows, and vice-versa for southerly flows.

The Commission now has before it a formal Rule proposal from Snowy Hydro seeking implementation of the re-orientation approach. That option will now be subject to public consultation and full analysis in the formal Rule change process. As noted in the Commission's public statement on its approach to its congestion management program (see

Appendix 2), its decision-making on the two Rule proposals will be managed in a co-ordinated manner.

Commission's findings

The Commission has carried out preliminary modelling of the re-orientation option as a counterfactual because it was raised in submissions. The analysis has supported the case for a change from the status quo, with the Southern Generators' proposal and re-orientation as a counterfactual, showing the potential for superior competition and market efficiency outcomes compared to the current arrangements. While the purpose of the counterfactual analysis was simply to inform the assessment of the Southern Generators' proposal, the limited analysis undertaken did not identify clear differences between the two alternatives in terms of their market impacts. A more detailed analysis is required to determine whether the Re-orientation proposal is superior to the Southern Generators' proposal.

6.9 Implementation

This Section considers issues associated with implementing the Southern Generators' proposal. This includes the way in which NEMMCO could integrate the proposal into its Market Management Systems (MMS), the likely time this would take, and the impact on settlement residue distribution units for the interconnectors between the Victorian, Snowy, and NSW regions.

Southern Generators' perspective

The Southern Generators did not refer to the implementation issues in their proposal to change the derogation.

Submissions

In their submission, the Southern Generators considered there were no impediments to implementing their proposal "as soon as the rule change process [had] completed".[76] They saw no conflict between the proposal and the Commission's concurrent boundary change consultations that would support delayed consideration of the proposal and saw no reason for delay so that NEMMCO could adjust settlement systems or execute a Settlement Residue option surrender/re-auction cycle. They considered this was because:

- the actual settlement adjustment is sufficiently minor for NEMMCO to be able to do it manually;
- IRSR units have been devalued as a consequence of interventions; and
- the proposal would return value to the current units and improve market efficiency significantly.[77]

The Southern Generators commented that the adverse effects of the current delay and any further delay would "endure" because of the three to four year lead time in hedge contract trading.[78]

76 Southern Generators, s.95 submission, p. 10.
77 Southern Generators, s.95 submission, p. 10.
78 Southern Generators, s.95 submission, p. 10.

The only other submission that addressed implementation was from Westpac, expressing a preference for the proposal to be introduced "sooner rather than later in the interests of market efficiency."[79]

Commission's considerations and reasoning

The Commission sought input from NEMMCO, as the market and system operator, regarding the implementation timing for the Southern Generators' proposal. NEMMCO's response is published on the Commission's website. NEMMCO identified two implementation processes that would influence the final Rule's start date:

- Necessary changes to the Market Management System (MMS); and
- Requirements under the Settlement Residue Auction Participation Agreements.

Changes to the Market Management System

NEMMCO has expressed a preference for implementation of the Southern Generators' proposal by incorporating necessary changes into the MMS directly rather than through an independent system. NEMMCO indicated that it was currently integrating the external management system for the CSP/CSC trial into the MMS with a view to having the integrated system ready for the summer of 2006/07.[80] In order to be able to incorporate any implementation of the Southern Generators' proposal with the CSP/CSC trial into the MMS, NEMMCO indicated it could commence work to develop the design on the basis of the draft Rule determination.

Assuming there were no substantial changes between the Commission's draft and final Rule determinations, NEMMCO anticipated the Southern Generators' proposal could be incorporated into the MMS on 1 December 2006. This would be in line with the MMS release cycle, which includes an established process with NEM participants to change the MMS across the market on a six-monthly cycle.

If the final Rule determination required a change to NEMMCO's design based on the draft determination, NEMMCO considered that implementation would slip to 1 June 2007, only two months before the relevant derogation expires.

If the final Rule involved a significant change from the process defined in the draft Rule, and implementation was required before 1 June 2007, NEMMCO considered that could only be achieved by developing an external ad hoc system. NEMMCO expressed the concern that implementation in systems outside the main MMS involves increased risk of audit and stability issues. NEMMCO believed the earliest an independent system approach could implement the Rule would be mid-February 2007.

In a subsequent meeting with the Commission, NEMMCO clarified that implementation prior to 1 December 2006 would necessitate the use of interim or temporary approaches.

79 Southern Generators, s.95 submission, p. 2.

80 The CSP/CSC process for the Snowy region is currently performed by a specialised process that was developed external to the main MMS due to the tight deadlines required for implementation of the Snowy trial and the uncertainty as to whether it was to be implemented.

If a Rule or process change impacts on the method of calculating the settlements residue, the Auction Participant Agreement enables auction participants to terminate any IRSR units they hold with respect to impacted future periods.[81] NEMMCO anticipates that the implementation of the Southern Generators' proposal would constitute such a change for the VIC-Snowy, Snowy-VIC, Snowy-NSW, and NSW-Snowy directional interconnectors.

If auction participants terminate and return their units to NEMMCO with sufficient notice, NEMMCO would be able to re-auction those returned units along with any new units being offered. The settlement residue auction rules require NEMMCO to notify units for sale at least ten business days before the auction.[82] If the implementation date for the proposal did not allow for sufficient time to re-auction terminated units, NEMMCO would retain those unsold units and would pass on to the relevant Transmission Network Service Provider the settlement residue allocated to those unsold units.[83]

As discussed in Section 6.3, the combined value of IRSR units for both the northern and southern interconnectors is likely to increase, improving their value as a tool to manage inter-regional trading. The Commission notes that some IRSR units holders may decide to terminate their holdings. However, given the potential improvement in the units as a hedging tool, it is possible that only a small portion of units would be surrendered.

Given the potential benefits to the market of implementing this Rule proposal, and that the benefits are most likely to accrue over the summer period, the Commission considers it important to implement the proposal as soon as realistically possible. This may mean there would not be sufficient time to re-auction any surrendered IRSR units. While re-auctioning any terminated IRSR units may be preferable, the Commission does not consider that any benefits from delaying implementation to enable the re-auctioning the units are likely to outweigh the efficiency benefits from of implementing the proposal as soon as practicable. The Commission would welcome comments on this matter during the consultation period on this draft Rule determination and draft Rule. Subject to stakeholder comment, the Commission would prefer a commencement date that enabled the proposal to be implemented before summer.

Commission's findings

Subject to stakeholder comment, and feedback from NEMMCO, the Commission's preferred commencement date for this Rule is 1 November 2006.

6.10 Summary of differences between the proposed Rule and draft Rule

The draft Rule does not differ substantially from the proposed Rule. The Commission has modified the structure of the draft Rule to promote ease of understanding and consistency in drafting.

81 NEMMCO, section 13.5, Auction Participant Agreement, 1 September 2004, p. 13.
82 NEMMCO, section 4.6, National Electricity Market Settlement Residue Auction Rules, 1 September 2004, p. 8.
83 This process is explained in clause 3.18.4(a)(2) of the National Electricity Rules.

7. Assessment of draft Rule – Rule making test and National Electricity Market objective

Factors that the Commission may consider in interpreting the NEM Objective

> *Under s.88 of the NEL, the Commission may only make a Rule if "it is satisfied that the Rule will or is likely to contribute to the achievement of the national electricity market objective.*

The NEM objective, as set out in s.7 of the NEL, is to:

> *promote efficient investment in, and efficient use of, electricity services for the long term interests of consumers of electricity with respect to price, quality, reliability and security of supply of electricity and the reliability, safety and security of the national electricity system.*

In Section 6 of this determination, the Commission considered the likely advantages and disadvantages of the proposal in contributing to more economically efficient operation and performance of the NEM based on the analysis and the quantitative modelling the Commission has undertaken. This Section presents the main conclusions of that analysis and provides the Commission's assessment of the extent to which the Southern Generators' proposal promotes the NEM objective and satisfies the Rule making test.

Assessment of the proposal against the NEM Objective

On the basis of its analysis, the Commission has decided to approve the change requested in the Rule proposal. For the reasons given below the Commission is satisfied that the proposal will promote improvements in competition and efficiency in the NEM compared to maintaining the status quo. That is, the proposal will be in the long term interests of consumers of electricity services.

The improvements to the performance of the NEM that are expected to result from adoption of the proposal arise principally from the removal of clamping as an inefficient intervention in the competitive dispatch process. Removal of this distortion will allow the immediate development of more effective and broadly-based competition in the dispatch process, the contract market, and inter-regional trading. This strengthening and broadening of competition in the inter-connected NEM is the principal driver of the expected economic efficiency improvements. These improvements are in the form of lower cost dispatch and reduced scope for generators to bid above their costs which will result in more cost-reflective pricing.

While the Southern Generators' proposal would operate for a relatively short period of time (pending longer-term solutions to the Snowy constraint issues) the resulting improvements in NEM-wide competition, dispatch efficiency, and inter-regional trading opportunities are consistent with the long term direction for reform of the market through the Commission's Rule change process. The Commission recognises that the performance of the market is most likely to be improved by a series of incremental, efficiency enhancing changes rather than large changes to the market design. The proposal is one step in this process of constant and, ultimately, material improvement in the market for the long term benefit of customers.

Analysis in support of the assessment

In making its assessment of the proposal, the Commission has had particular regard to the following outcomes of its analysis:

- **Pricing outcomes.** The removal of clamping by NEMMCO should result in a greater level of competition in the wholesale electricity market compared to the status quo. The incentives that this additional competition provides will tend to discipline the ability of participants to raise prices above costs under certain market conditions. In particular, the removal of NEMMCO's intervention for northward flows should allow greater exports from Victoria to NSW at times of high NSW demand and prices. Based on its analysis and assessment, the Commission notes this may marginally increase Victorian prices due to the dispatch of higher-priced plant for export, but should decrease NSW prices more materially as additional competition is introduced to the price setting process. These competitive effects are expected to translate into an immediate change in generator contracting behaviour. In the face of more competitive spot market conditions generators will be more inclined to offer contacts to hedge themselves against the downsides of lower spot prices. It is also likely to immediately affect the price at which cap contracts are offered to customers in NSW. These effects will, over time, be reflected in the prices paid by retailers as they progressively recontract. Lower contract prices paid by retailers should be passed on to customers over time as retailers compete on price to increase market share. The economic benefits stem from the change in consumption and production behaviour due to the changes in price. Initially, these should be small, but as the price changes become factored into longer-term production and consumption decisions, these benefits can be expected to grow.

- **Dispatch efficiency.** By removing NEMMCO's clamping, NEMMCO will have access to a wider range of generators to meet NSW demand. The Commission's modelling results suggested that the proposal is likely to result in some generation fuel cost savings in the short-term as result of being able to choose to operate cheaper plant to meet demand.

- **Inter-regional trading.** The Commission considers that the benefits of enhanced inter-regional trade, through firmer IRSRs, reduced inter-regional price differences, and greater availability of and competition for contracts should increase competition in the NEM and promote greater pricing efficiency.

- **Long term implications.** The environment for efficient investment should be improved by a number of the elements of the proposal. Improved inter-regional trade and likely spot price changes should enable better use of existing generation capacity, provide more efficient signals for new investment, and reduce the barriers to entry in the NEM. A more predictable and transparent regime should also improve confidence of investors. The short term gains in the market are consistent with the Commission's long term view of the appropriate direction for progressive reform of the market – that is, positive incremental changes such as this will progressively deliver material improvements in competition and efficiency and establish an improved investment environment in the NEM.

- **Good regulatory practice.** By removing clamping when the Snowy constraint binds the proposal will remove an inefficient, arbitrary, and difficult to predict intervention from the market. The Southern Generators' proposal will provide a simpler, more transparent, predictable approach to managing negative settlement residues in the Snowy Region. The operation of the proposal will be clearly defined in the Rules and implemented through the NEM settlement procedures. This contrasts with the current approach under the Rules, which provides broad

discretion for NEMMCO, and requires a level of judgement by the system operator for its implementation. While the proposal may result in the need for some adjustments in the market, its greater clarity, predictability, and transparency should enhance the confidence of investors in the NEM and improve dynamic efficiency.

Power system security and supply reliability are identified as specific criteria in the NEM objective, and therefore need to be considered in assessing a Rule proposal. In this case the Commission has concluded that the proposal will have no material impact on the capacity of NEMMCO to maintain power system security or supply reliability.

The Commission is satisfied that the proposal is likely to be revenue adequate in most, but not every, conceivable network configuration. It notes, however, that if a situation arises where the mechanism is not revenue adequate, the Rules contain a default means of funding the resulting negative settlement residues. The issue of revenue adequacy is therefore not considered an impediment to implementation of the proposal.

As the potential benefits to the market from implementing this Rule proposal are most likely to accrue over the summer period, the Commission considers it important to implement the proposal as soon as possible. The Commission has noted NEMMCO's view that implementation of the proposal prior to 1 December 2006 would necessitate the development of a system which is independent of the Market Management System. The Commission has also noted that there may not be sufficient time to re-auction any surrendered IRSR units to achieve a pre-summer start date. These factors have both been taken into account by the Commission in reaching its decision as to whether to approve the proposed Rule and the appropriate commencement date for the proposal.

The Commission recognises that the optimum long-term arrangements for congestion management are likely to be informed by implementation of the mechanism proposed by the Southern Generators. However, this does not suggest that the Commission's draft determination on this matter foreshadows any particular position in respect of its broader consideration of the "Congestion Management Regime". The Commission's "Congestion Management Program – Statement of Approach" provides information about the co-ordination of a number of congestion related matters under consideration by the Commission, leading to the development of a comprehensive "Congestion Management Regime" for the NEM in the longer-term.

Taking all these factors into account the Commission considers that the proposal will enhance the efficient use of and the efficient investment in electricity services. Productive efficiency enhancements will be gained, primarily through lower risk management costs and more efficient dispatch. Greater allocative efficiency is likely over time as prices better reflect underlying costs, potentially leading to changes in consumption and a more efficient allocation of resources. Dynamic efficiency benefits may also be gained through greater confidence in the regulatory framework and lower barriers to entry.

An alternative Rule change proposal

The Commission recognises that the Southern Generators' proposal is not the only solution to the negative settlements residue issue in the Snowy region. Snowy Hydro has recently put forward a Rule change proposal seeking to address that issue through re-orientation of the network constraint to Dederang. That application will be fully tested and analysed including by references to the analysis of the re-orientation counterfactual undertaken for the purposes of this draft determination. The Commission intends to proceed to a draft determination in

relation to Snowy Hydro re-orientation application at approximately the same time as issuing a final determination in respect of the Southern Generators proposal, so that the relative merits of both proposals can be thoroughly tested.

The Commission notes, however, that in making its Re-orientation proposal, Snowy Hydro has acknowledged that both the re-orientation to Dederang option (which it supports) and the Southern Generators' proposal offer significant improvements on the economic efficiently of the NEM compared to the status quo involving inefficient clamping by NEMMCO.[84]

This assessment by Snowy Hydro provides further support for the Commission's conclusion that a change away from the status quo is warranted, whether achieved by the Southern Generators' or Snowy Hydro proposals.

84 Snowy Hydro, Re-orientation Rule change proposal, p. 3.

Appendix 1 Modelling

This Appendix describes the approach, assumptions, and data sources used in the modelling undertaken by the Commission's consultants in considering the Southern Generators' Rule change proposal. It begins by discussing the approach the Commission adopted to consultation, before outlining the modelling framework. It then discusses the analysis of historical data before considering the methodology, assumptions, results, and conclusions for the each of the forward-looking dispatch modelling and the forward-looking risk modelling in turn.

1.1 Process

The Commission recognises the importance of ensuring that the assumptions and data sources used in the modelling are as appropriate as possible. To this end, the Commission arranged one meeting of selected experts (the Congestion Management Technical Reference Group or Technical Reference Group) for the purpose of discussing the assumptions and data sources. The Technical Reference Group was invited to comment on the:

- questions the modelling was seeking to answer;
- approach to the modelling task; and
- proposed assumptions for the modelling.

The following industry representatives on Technical Reference Group attended the meeting at the AEMC office on 5 April 2006:

- Col Parker – TransGrid;
- Roger Oakley – LYMMCO;
- Russell Skelton – Macquarie Generation;
- Nenad Tufegdzic – Snowy Hydro;
- John Barbera – CS Energy; and
- Greg Jarvis – Origin Energy.

David Bones (NEMMCO) did not attend, but was subsequently briefed by the AEMC staff. The meeting was chaired by Tendai Gregan (AEMC), with Scott Stacey (AEMC) also in attendance.

The comments made by the Technical Reference Group on each of these points were taken into account in the modelling.

Following consultation with the Technical Reference Group, the Commission released a public description of the modelling approach adopted for the Southern Generators' Rule change proposal. The Information Disclosure Statement was published on the

Commission's website on 9 May 2006 and set out the analytical framework, modelling methodology and assumptions for the information of interested parties, prior to the release of this draft Rule determination.

The results of the modelling analysis were not made available to any external party, nor members of the Technical Reference Group. This draft Rule determination represents the first release of the results of the modelling analysis.

1.2 Modelling framework and approach

The modelling framework is oriented towards the decision-making criteria to be applied by the Commission. These criteria, in turn, are guided by the nature of the issue the proposed Rule change is seeking to address and the NEM objective. The modelling framework for the Southern Generators' Rule change proposal aims to answer the following key questions:

- How do the proposals affect the **economic efficiency of dispatch**? The economic efficiency of dispatch is concerned with the costs of producing electricity to meet customer demand. The economic efficiency of dispatch will be *maximised* where the thermal costs of supplying customer load are *minimised* over a given time period. In particular, the Commission is interested in testing whether the thermal costs of meeting load are likely to be reduced by either the Southern Generators' proposal or the re-orientation counterfactual; and, if so, how large this reduction is likely to be over the period of the Rule change (i.e. until the expiry of the CSP/CSC trial). As hydro plant have insignificant variable fuel and operating costs, from a dispatch efficiency perspective, they should be run at those times when they can displace the highest cost thermal plant. This should help minimise the fuel and other operating costs of supplying electricity demand; and

- How do the proposals affect the **risk associated with inter-regional trade**? This is a function of both the price differences between regions and the firmness of IRSR units that can be used to hedge inter-regional price differences. In particular, we are interested in testing whether inter-regional price differences converge and/or IRSRs are "firmed up" by either the Southern Generators' proposal or the re-orientation counterfactual, and the implications for inter-regional trade. This is important since the functionality of the hedging market potentially affects both future wholesale and retail prices and participants' future investment decisions. In the medium to longer term, these impacts could affect the achievement of the NEM objective.

As a starting point for the modelling analysis, we undertook an analysis of **historical data**. The analysis of historical market outcomes is useful for two reasons:

- First, it helps identify the nature and timing of NEMMCO intervention to limit counter-price flows on the Victoria-Snowy interconnector (referred to as "clamping"). Clamping is the catalyst for what the Southern Generators claim create the problems which have led to their Rule change proposal; and

- Second, it helps guide the forward-looking market modelling of the potential impacts of the proposal assuming strategic bidding of relevant participants.

The analysis of historical data is discussed in Section 1.3 below.

The proposed Rule change potentially gives rise to complex behavioural changes in the market, which means that it is not possible to draw conclusions as to the likely effect of the Southern Generators' proposal purely from analysis of historical data or by reference to a conceptual model. Forward-looking empirical modelling was therefore undertaken to test the effect of removing clamping on the economic efficiency of dispatch and the firmness of IRSRs. There are two key parts to the forward-looking modelling analysis:

- **Dispatch/price modelling** to examine market outcomes in terms of generator output and revenues and spot market prices, which involves participants being allowed to engage in strategic bidding to maximise their operating margins under different market conditions. This modelling aims to test the behavioural changes resulting from implementation of the proposal and the differences in dispatch, price and revenue outcomes relative to the status quo and/or other counterfactuals; and

- **Risk modelling** to consider the risk management implications for market participants. In particular this aims to examine whether the proposal increases or decreases the extent of inter-regional trading either by making prices more volatile and hence more difficult and costly to hedge, and/or by making inter-regional hedging more or less valuable.

Both the forward-looking dispatch and the risk modelling analysis were undertaken for three key scenarios:

- **a base case**, which reflects the existing Rules including the Chapter 8A, Part 8 derogation enabling the Tumut CSP/CSC trial. In this case NEMMCO manages counter price flows at times when there are northward flows on the Victoria-Snowy interconnector by clamping and when there are southward flows on the Victoria-Snowy interconnector by re-orientating relevant Snowy constraints to Dederang;

- **a Southern Generators' case**, which reflects the Southern Generators' Rule change proposal. In this case, NEMMCO does not clamp northward flows on the Victoria-Snowy interconnector to manage counter price flows. Instead, any negative settlement residues that accrue on the Victoria-Snowy interconnector are funded by positive residues on the Snowy-NSW interconnector; and

- **a re-orientation counterfactual**, which effectively involves setting the Snowy regional reference price to the Dederang nodal price during times of northbound *and* southbound constraint. The way this is done in practice is discussed in more detail in the modelling assumptions. Snowy Hydro proposed re-orientation in their submissions on the Southern Generators' proposal[1] and recently formally requested re-orientation to be considered as a Rule change proposal.[2] While this proposal is under separate consideration by the Commission, a re-orientation counterfactual was modelled as part of the evaluation of the Southern Generators' proposal to test the robustness of primary results and give an indication of relative advantages and disadvantages of the Southern Generators' proposal.

1 See Snowy Hydro's two submissions on the Southern Generators' rule change proposal, available on the AEMC website at http://www.aemc.gov.au/electricity.php?r=20051214.200416.
2 Available on the AEMC website at: http://www.aemc.gov.au/electricity.php?cat=rc.

The approach to each of these types of modelling, including a brief description of the models used, is discussed in Sections 1.4 and 1.5 below. Those Sections also present the modelling assumptions, sensitivities, results, and conclusions for each of the scenarios.

1.3 Historical analysis

This section highlights some of the key findings from the historical analysis for the period 7 August 2004 to 3 March 2006 (see below). This period from 7 August 2004 was chosen because it was the date of the first recorded intervention to manage counter price flows according to the data series provided by NEMMCO. The CSP/CSC trial began on 1 October 2005.

The analysis of historical market outcomes also separately considered the following periods in respect of each episode of NEMMCO clamping:

- The periods of 6 hours prior to the implementation of clamping (referred to as the "pre-clamping" period) – these were typically periods when the Murray-Tumut constraint bound, resulting in counter-price flows but before NEMMCO intervened to address them; and

- The periods in which clamping applied.

The key findings of the historical analysis were as follows:

- the vast majority of clamping interventions to manage counter price flows were on the Victoria-Snowy interconnector at times of northward flows. This usually occurred at peak times in the spring and summer months and times of high NSW demand;

- the imposition of clamping at times of northward flows tended to coincide with widening price differences between NSW and Victoria;

- northward flows across the Snowy-NSW interconnector appeared to be higher after clamping commenced than immediately before clamping;

- the Victoria-Snowy interconnector was relatively non-firm at times of northward flows compared to the Snowy-NSW interconnector; and

- in line with anecdotal accounts, Snowy output during both pre-clamping and clamping periods has been higher since the trial began, while the Southern Generators' output has been lower.

Notwithstanding these observations, it is difficult to make definitive statements about clamping being the "cause" of changes like widening inter-regional price differences or changes to Snowy output. This is because market conditions such as levels of demand change over time. This means it may not be appropriate to attribute the cause of changes solely to clamping.

Hours of counter-price flows and counter price flow management

Figure A1 shows that counter-price flows and clamping have usually arisen during times of northward flows from Victoria to NSW and that this has mostly often been during the spring/summer months (Q4 and Q1).

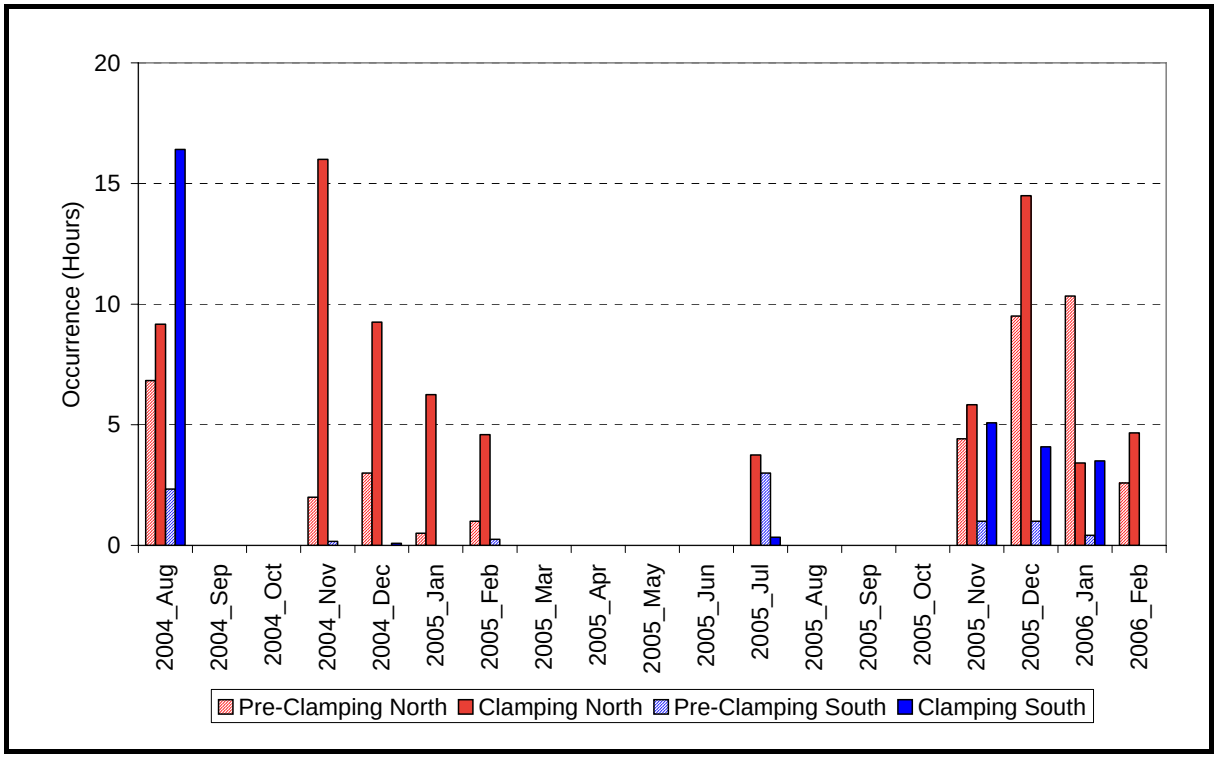


Figure A1: Monthly hours of counter-price flows and clamping (north and south)

Clamping during southward flows occurred in August 2004, but on few occasions since then. This is likely to be at least in part because NEMMCO amended its procedure to allow for re-orientation to manage counter price flows on the Snowy-Victoria interconnector when flows are southward from NSW to Victoria.[3] Re-orientation is discussed in more detail later in this Section.

NSW demand and prices prior to and during clamping

It would be expected that clamping of the Victoria-Snowy interconnector would generally take place at times of high NSW demand. This is because these are the times when the constraint between Murray and Tumut would be expected to bind in a northward direction, resulting in a "springwasher effect" around the network loop passing through the Snowy region (the springwasher effect is what leads to Snowy prices being lower than Victorian prices at times of northward flows, thereby inducing NEMMCO to implement clamping). Figure A2 shows that NSW demand at times of northward counter-price flows and clamping tends to be relatively high both at pre-clamping and clamping times. Consistent with this finding, separate analysis shows that NSW prices tend to be higher than average at times of northward flows and clamping.

3 See Section 3 of the Southern Generators' draft Rule determination.

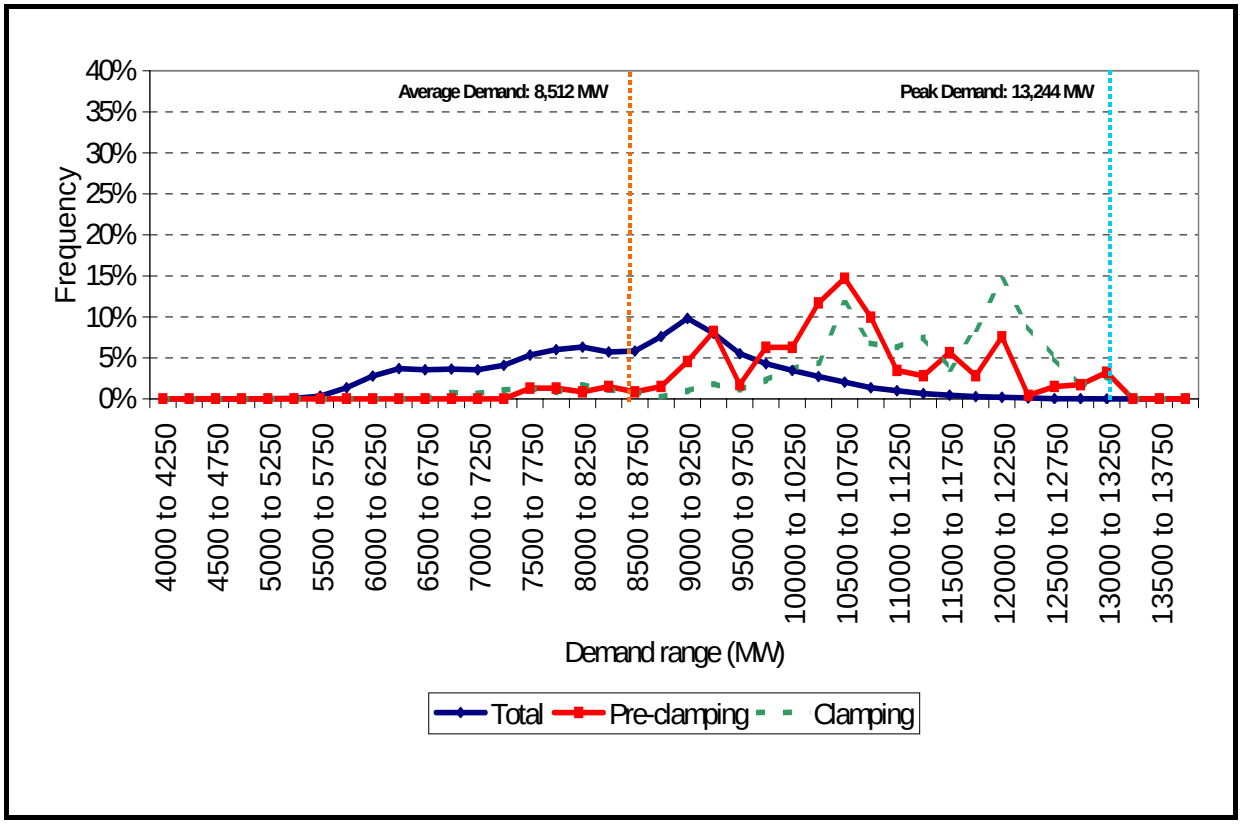


Figure A2: Distribution of NSW Demand at times of northward flows

The analysis also shows that since the CSP/CSC trial commenced, clamping appears to occur at slightly higher demand levels than it did before the trial. However, this may be due to higher demand generally since the trial began.

NSW-Victoria price differences and northward flows

Figure A3 shows that NSW-Victoria price differences tend to be relatively small at times of northward counter-price flows (i.e. during pre-clamping periods) but are relatively wide at times of clamping. This is consistent with the notion that clamping gives rise to greater price separation. However, once again, attributing causation is difficult due to higher NSW demand prevailing at times of clamping compared with pre-clamping periods.

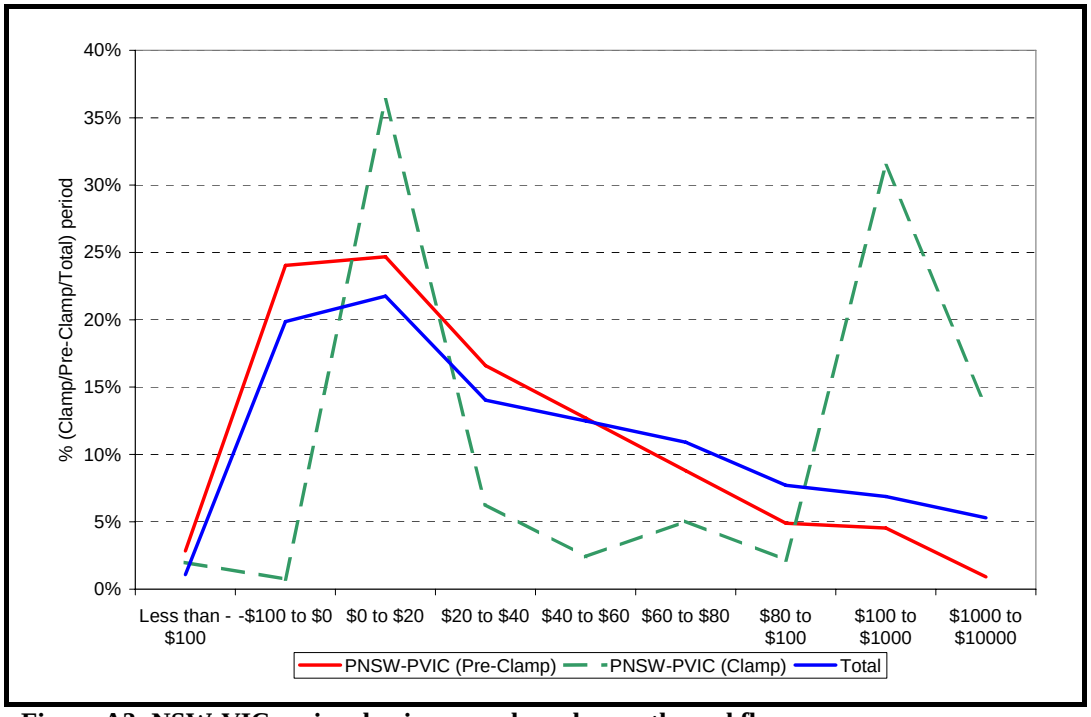


Figure A3: NSW-VIC regional price spreads under northward flows

Snowy-NSW northward interconnector flows during pre-clamp and clamping

One important matter of dispute in relation to the Southern Generators' proposal was whether clamping led to reduced flows from Snowy to NSW.

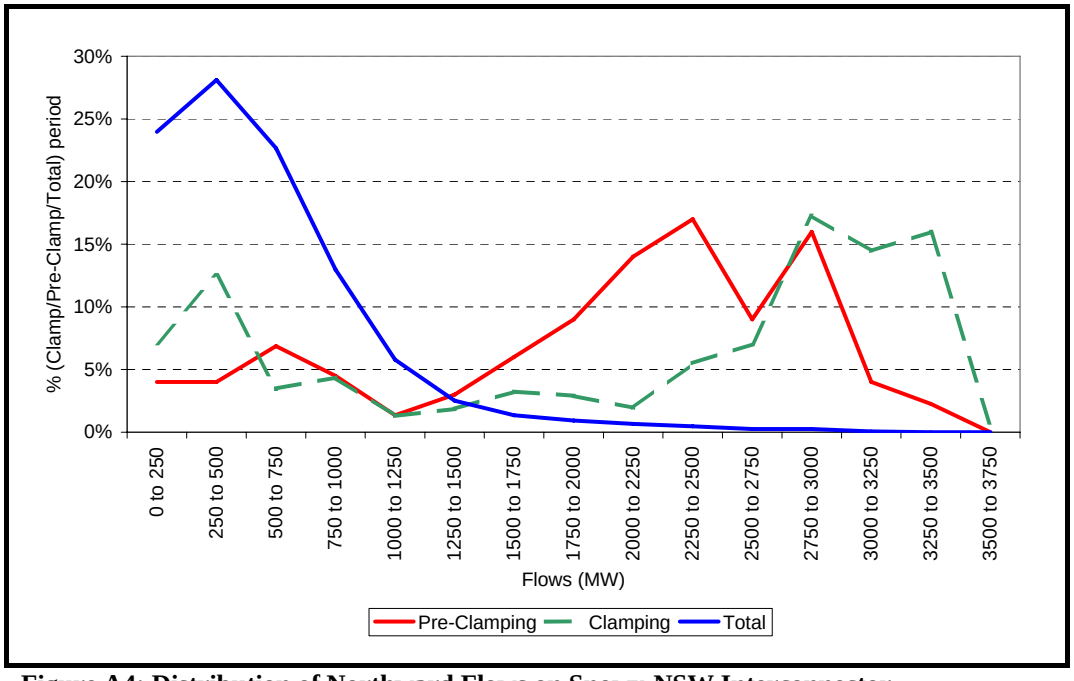


Figure A4: Distribution of Northward Flows on Snowy-NSW Interconnector

Figure A4 shows that northward flows on the Snowy-NSW interconnector have generally not fallen from pre-clamping to clamping periods. However, the analysis does not control for levels of NSW demand, which is higher in clamping periods than pre-clamping periods. Therefore, the analysis cannot demonstrate that clamping does not reduce Snowy-NSW

interconnector flows compared to what would have been the case without clamping. That would require modelling of an appropriate counterfactual.

Counter price flows and re-orientation

NEMMCO's procedure allows for re-orientation to manage counter price flows on the Snowy-Victoria interconnector when flows are southward from NSW to Victoria. Figure A5 reveals that re-orientation tends to occur at times of relatively high Victorian prices compared with NSW prices. This is the outcome one would expect given that these are the times the constraint between Tumut and Murray would be expected to bind in a southward direction.

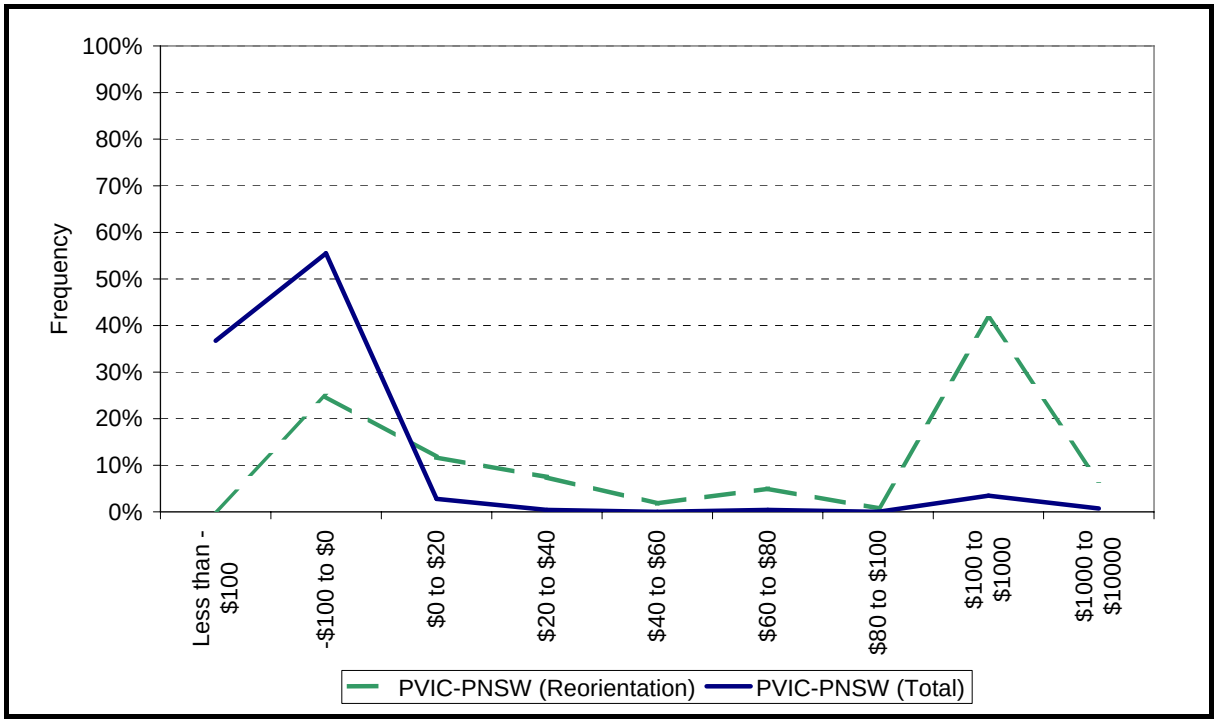


Figure A5: VIC-NSW regional price spreads during re-orientation

Firmness of SRAs

In terms of the impact of clamping on inter-regional trading, a key question is the extent to which the IRSRs have provided a 'firm' hedge to participants to manage inter-regional price differences. This particularly applies to the Victoria-Snowy IRSRs. If clamping means that these IRSRs have a low level of firmness, they may deter Victorian generators entering contracts with retailers in NSW. This may in turn:

- discourage generation investment in Victoria because of the difficulty of trading power from Victorian plant to customers in other regions; and/or

- reduce retail competition in NSW by dampening competition in the NSW hedge contract market and increasing retailers' costs of managing counter-party risk. NSW retailers may have fewer potential counterparties, which could lead to higher contract prices. The lack of potential counterparties could also increase retailers' credit support costs because of higher counter-party credit risks in dealing with a smaller number of generators.

Table A1 shows the number of hours that flows on the interconnector are limited (i.e. there is a binding constraint), and the proportion of these hours where the binding limit (in MW) is less than the maximum available number of IRSR units. This may be because of NEMMCO intervention to manage counter price flows or because of a transmission outage.

The table shows that in respect of northbound flows, IRSRs on the Victoria-Snowy interconnector are virtually always non-firm. That is, most of the time when the limit binds it does so at an amount less than the IRSR unit volumes sold at auction. In contrast, most of the time when the limit binds on the Snowy-NSW interconnector the volume transferred is greater than the maximum IRSR unit volumes sold, implying that these IRSR units are relatively firm.

In all cases the proportion of time when the interconnector binds at less than the SRA volumes is relatively small (less than 1% in most cases). However, the previous analysis demonstrated that intervention tends to occur at times of relatively high demand and large inter-regional price spreads, and may therefore have a disproportionate effect on market outcomes and participant positions.

	Vic-Snowy	**Snowy-NSW**
South		
No. binding hours	127	26
No. binding hours less than SRA Volumes	127	7
% of constrained hours when the interconnector is binding at less than SRA volumes	100%	27%
% of total sample period when the interconnector is binding at less than SRA volumes	0.92%	0.004%
North		
No. binding hours	349	5
No. binding hours less than SRA Volumes	335	2
% of constrained hours when theinterconnector is binding at less than SRA volumes	96%	38%
% of total sample period when the interconnector is binding at less than SRA volumes	2.44%	0.01%

Table A1: Firmness of interconnectors

Output at times of intervention

In addition to the analysis of demand, prices, and residues at times of intervention, it is also useful to consider patterns of generator output. Analysis of generator outputs can provide further insight into the behaviour emerging during episodes of intervention. The figures below focus on outputs of the major generators north and south of the constraint at times of northward flows. The generators considered are:

- *Snowy* — Snowy Hydro's Murray, Guthega, Upper Tumut and Tumut 3 generators;
- *Southern Generators (SG)*— AGL, Energy Brix, International Power, Loy Yang Power, NRG and SECV; and
- *Northern Generators (NG)* — CS Energy, Delta Electricity, Enertrade, Eraring Energy, InterGen, Macquarie Generation, Origin Energy, Redbank, Sithe, Stanwell, Tarong Energy and Wambo.

The figure below shows that in both pre-clamping and clamping periods, Snowy output is generally higher than it was before the CSP/CSC trial commenced. Closer inspection of the data reveals that both Murray and Tumut have been generating more during these periods since the Snowy trial commenced. Importantly, this analysis does not control for demand or price.

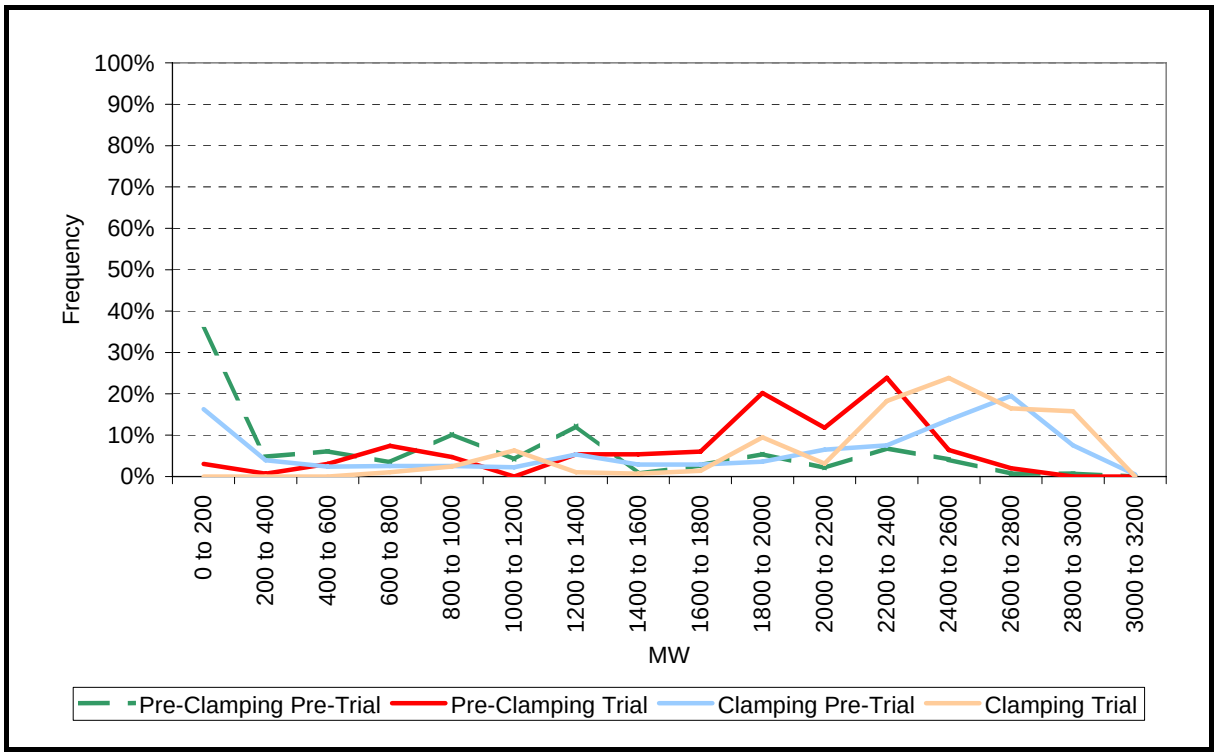


Figure A6: Snowy Generators' Output Pre/Trial (North Flows)

Figure A7 shows that while the Southern Generators have been generating at least as much in pre-clamping periods following the start of the Snowy trial, their output in periods of clamping has fallen significantly. This accords with anecdotal accounts of recent market

outcomes. In short, it appears that Snowy region output has been substituting for Southern Generators' output at clamping times since the trial began.

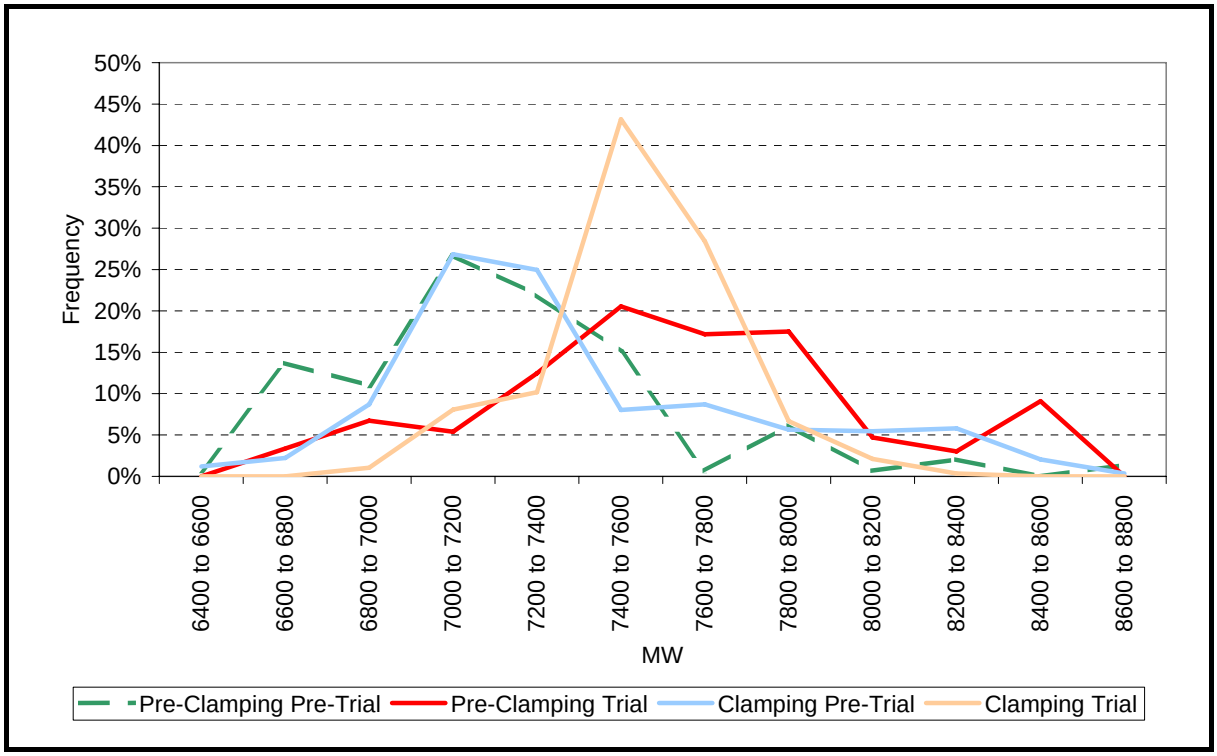


Figure A7: Southern Generators' Output Pre/Trial (North Flows)

The data for the Northern Generators show that they have been generating substantially more during pre-clamping periods and slightly more during clamping periods since the trial began.

1.4 Forward-looking dispatch/price modelling

This Section discusses the approach, assumptions, results, and conclusions for the forward-looking dispatch/price modelling analysis.

Approach

The dispatch/price modelling was undertaken using Frontier Economics' game-theoretic wholesale market model, *SPARK*. It is worth describing some of the key features of this model before discussing the methodology used to calculate the dispatch and price implications of the Southern Generators' proposal and the counterfactual of re-orientation.

Key features of *SPARK*

SPARK incorporates a representation of the physical system and is purpose built to examine strategic behaviour in a wholesale electricity market. The model contains the following features:

- a realistic treatment of plant characteristics, including for example minimum generation levels, variable operation costs, etc;

- a realistic treatment of the network and losses, including inter-regional quadratic loss curves, and constraints within and between regions;

- the ability to model systems from a single region down to full nodal pricing; and

- the capability to optimise the operation of fuel constrained plant (e.g. hydro plant), and pumped storage plant over some period of time.

In addition, *SPARK* uses game theory to determine equilibrium generator bidding patterns in an environment of imperfect competition. Game theory provides a systematic tool for determining generator bids in such an environment, obviating the need for subjective judgements on bidding behaviour. This effectively makes generator bids an output of the model rather than an input. This allows an investigation of the changes in pricing and output behaviour resulting from changes in market rules or structure.

SPARK applies game-theoretic techniques by allowing selected strategic players to choose from a set of quantity change strategies (Cournot competition) and/or price change strategies (Bertrand competition) for each set of market conditions having regard to the market rules, power system conditions and the extent of intervention. In addition, the model has the capability to model portfolios of generators, both within and across regional boundaries.

Once each participant is provided with a set of bidding choices, *SPARK* tests the potentially millions of bidding combinations for their sustainability. Sustainability in this context refers to the application of the Nash Equilibrium solution concept. A Nash Equilibrium is a set of strategies for all generators in which no individual generator has an incentive to unilaterally deviate from its bidding strategy. *SPARK* finds the Nash Equilibrium by assessing the "payoffs" of each generator in response to the bidding behaviour of every other generator in the NEM. The 'payoff' relates to the difference between each generator's $/MWh pool revenue and its assumed $/MWh variable cost as well as any contract difference payments the generator may make or receive. If a generator can increase its payoff by changing its bids, that means that its original bid was not consistent with a Nash Equilibrium.

SPARK uses the Nash Equilibria bidding strategies to produce a range of results. The outputs produced by *SPARK* for each level of demand modelled include:

- Generator bids;

- Generator dispatch/outputs;

- Regional prices; and

- Interconnector directions and MW flows.

Methodology

As noted above, *SPARK* can be used to determine optimal bids, market prices, and generator outputs under a given set of market assumptions. As these assumptions change, so too does the model-determined optimal set of bids and, hence, market prices and generator outputs. This enables *SPARK* to be used to calculate the dispatch and pricing

impacts of changes to the market design such as the Southern Generators' Rule change proposal and the re-orientation counterfactual proposed by Snowy Hydro in its submission to the Southern Generators' proposal.

The first step in the methodology is to describe the base case against which market design changes can be compared. This allows comparison of the base case with the alternatives, namely the Southern Generators' proposal and the re-orientation counterfactual. Each of these cases is briefly outlined below. Detailed modelling assumptions are discussed in the following section.

Base case

The base case includes:

- **CSP/CSC trial** – consistent with the Chapter 8A, Part 8 derogation in the Rules. Under the arrangements transfers are made between Snowy Hydro and the Snowy-NSW IRSRs to reflect CSP and CSC payments. CSP payments are based on the dual (or shadow) price of the relevant binding Snowy constraint, consistent with the derogation. CSC payments are modelled by allocating Snowy Hydro a 41% (550/1350) share of NSW-Snowy (i.e. southward) IRSRs at times when there is a binding constraint from Tumut to Murray; and

- **NEMMCO clamping** – in accordance with NEMMCO, *Operating Procedure: Dispatch, Document Number SO_OP3705*. This includes reducing flows on the Victoria-Snowy interconnector (i.e. "clamping") to manage counter price flows at times of northward flows and re-orientation of the constraints to Dederang to manage counter price flows at times of southward flows. Clamping is modelled assuming perfect foresight: That is, setting the Victoria-Snowy interconnector limit to zero when there would otherwise have been negative settlement residues on the interconnector for northward flows.

Southern Generators' case

In the Southern Generators' case, negative settlement residues on the Victoria-Snowy interconnector are funded by positive settlement residues on the NSW-Snowy interconnector (after adjusting for CSP/CSC allocations). Because of this, clamping is not used to prevent counter-price flows at times of northward flows and re-orientation is not used to prevent counter-price flows at times of southward flows.

Re-orientation counterfactual assumptions

In the re-orientation counterfactual, the re-oriented form of constraints pertaining to northward flows are included in the model. The re-orientated constraints for the management of northward counter price flows are taken from *NEMMCO, Constraint List for the Snowy CSP/CSC trial, March 2006*. Under the re-orientation counterfactual, the Snowy price is effectively set equal to the nodal price at Dederang in Victoria at times of northward (as well as southward) constraints between Murray and Tumut. This means that counter-price flows between the Victorian and Snowy regions are unlikely to arise at either of these times because the Dederang price will typically be nearly identical to the Victorian reference price (i.e. separated only by losses) and hence the need for clamping does not arise.

Required steps

After establishing each of the cases for examination (base case, Southern Generators' proposal and re-orientation), the dispatch modelling analysis was progressed in several steps:

- first, *SPARK* is used to model a short run marginal cost (SRMC) bidding scenario to determine the optimal pattern of dispatch for all *non-strategic hydro plant* (see the discussion of modelling assumptions below for a discussion of this terminology). In the SRMC scenario, all (non-run-of-river) hydro plant (e.g. McKay Creek) are dispatched at those times and in those quantities that minimise the variable dispatch cost of all thermal plant in the system. However, while strategic hydro plant (such as Snowy Hydro) are not restricted to this pattern of dispatch in future scenarios, the pattern of dispatch for all non-strategic hydro plant are not altered for the remainder of the analysis;

- second, *SPARK* is used to model the dispatch and pricing outcomes of a strategic bidding scenario. Snowy Hydro and key thermal generators in other regions are assumed to bid strategically. The modelling focuses on a number of key demand levels when counter price flows are most likely to occur – i.e. peak demand times in summer and winter; and

- finally, a number of demand levels representing the remainder of the year are modelled under the assumption of competitive dispatch, where the output of the hydro generators is energy constrained to ensure that their output over the year reflects energy limitations.

The detailed assumptions and sensitivities used for the dispatch/pricing modelling are discussed in more detail below.

Modelling assumptions

The specific modelling assumptions used for the analysis of the Southern Generators' proposal and the re-orientation counterfactual were as follows.

Generation capacity

Existing and committed generation capacities for scheduled generators were taken from *NEMMCO, Statement of Opportunities for the National Electricity Market, October 2005* (the SOO). The portfolio structure of existing generation was based on *NEMMCO, List of Scheduled Generators and Loads, 21 February 2006* adjusted for those portfolios where dispatch rights have recently been transferred under contract or via sale.

Generator bids

Game theory analysis in a market such as the NEM with multiple pricing zones, transmission constraints and a significant number of players is computationally demanding. Comprehensive analysis quickly becomes intractable as each player has effectively an infinite number of possible bids to be assessed against all possible combinations of bids from the other players.

The number of combinations of bids to be evaluated increases exponentially with the number of strategic players, as well as the number of available bidding strategies available to

each strategic player. Simplifying assumptions are therefore made to ensure the computational requirements of the analysis remain manageable:

- The types and ranges of strategies can be limited. In *SPARK*, bidding strategies can involve bidding the available capacity at different prices, or making more or less capacity available to the market, or a combination of both. Within these choices, the price range over which generators are allowed to bid, and the increments within this range, can be limited. Similarly, the extent of capacity withdrawal choices can be contained to a level that is plausible, and again the number of discrete choices within this range can be restricted to make the computational problem more tractable;

- The number of strategic players can be limited. Players can be categorised as either 'strategic' or 'non-strategic':

    - *Non-strategic* players are given fixed bids (i.e. their bids remain constant no matter how other players bid – fixed bids can be in any form or level, just as so long as they are fixed); and

    - *Strategic* players are given a set of potential bids to choose from and will respond to changes in other players' bids in order to maximise their payoff by choosing the most profitable bid from those available; and

- The set of potential bids available to strategic players can be limited to decrease the number of bidding combinations to be evaluated.

The strategic participants and their strategic power stations used in this analysis are shown in Table A2. To limit the number of strategic participants, only the largest generation portfolios in each region of the NEM were assumed to behave strategically. They were given options to alter the *quantities* they offer into the market using a number of strategies (i.e. Cournot competition). For instance a strategy of 75% shown in the table corresponds to a participant bidding 75% of the combined capacity of their strategic power stations at or near SRMC and the remainder at VoLL.

Given the importance of understanding the effect of the Southern Generators' proposal and the re-orientation counterfactual on the incentives for Snowy Hydro, Snowy Hydro was allowed a relatively large number of strategies. Snowy Hydro was given options to offer from 0% to 100% of its capacity in 12.5% increments. Murray and Tumut Power Stations were assumed to be able to separately engage in these bidding strategies. This allowed for nine strategies for each of Murray and Tumut Power Stations, or a total of 81 combinations for Snowy Hydro. Snowy Hydro capacity that was offered into the market was bid at $1/MWh. This allowed Snowy Hydro to engage in behaviour that is anecdotally observed, such as bidding Murray at close to $0/MWh.

Major generators in other regions of the NEM were assumed to be able to offer 80% or 90% of capacity at or close to SRMC (with the remainder at VoLL). The largest players in NSW and Victoria – Macquarie Generation and International Power, respectively – were also given the option to offer only 70% of capacity at or close to SRMC.

Table A2: Strategic participants

Strategic participant	Strategic stations	Bidding strategies (proportion of capacity offered at or close to SRMC)
Snowy Hydro	Tumut, Murray	0%, 12.5%, 25%, 37.5%, 50%, 62.5%, 75%, 87.5%, 100% (Murray and Tumut given flexibility to bid separately)
Delta	Mt. Piper, Munmorah, Vales Pt, Wallerawang C	90%, 80%
International Power	Hazelwood, Loy Yang B	90%, 80%, 70%
LYMMCO	Loy Yang A	90%, 80%
Macquarie Generation	Liddell, Bayswater, Hunter Valley GT	90%, 80%, 70%
QPTC (Enertrade)	Gladstone, Collinsville, Mt Stuart GT	90%, 70%
TRU Energy	Yallourn	90%, 80%

Hydro Tasmania was not modelled as a strategic player due to its present high level of vesting and other contract cover. This level of contract cover is expected to remain relatively high throughout the modelling period. Therefore, Hydro Tasmania was treated as any other non-strategic hydro plant – its pattern of dispatch was determined through the competitive SPARK runs.

All non-strategic thermal generators were assumed to bid into the market at SRMC. For the demand levels where generators were allowed to behave strategically, non-strategic thermal baseload units were bid in at SRMC for 100% of capacity and peaking units were bid in at five times marginal cost, resulting in bids of $100-1500/MWh. The demand levels comprising the rest of the year were dispatched with all plant (strategic and non-strategic) bid in at SRMC. For strategic and peaking plant, only 90% of capacity was bid at SRMC, with the remainder at VoLL.

Thermal generation SRMC were taken from *ACIL, SRMC and LRMC of Generators in the NEM, February 2005*. As noted above, non-strategic hydro plant were assumed to generate in the same manner as in the SRMC scenario.

Contract levels and sensitivities

The level of contract cover can be an important determinant of bidding behaviour because some generators manage the risks of unfunded difference payments by bidding their contracted capacity at their SRMC. This approach to risk management can dampen spot prices in the short term.

Therefore, a number of different assumptions on contracting levels were modelled for each of the scenarios. In constructing the various contracting cases three degrees of freedom were considered:

1. *Overall levels of contracts in the market* – strategic players were assumed to sell contracts equal to different percentages of their installed capacity;

2. *Volume of IRSR units Snowy holds with respect to the contracts it has struck in Victoria and NSW* –Snowy Hydro was assumed to hold IRSRs equal to, greater than or less than its inter-regional contracting volume; and

3. *Split of Snowy's aggregate contract volume between the Victorian and NSW nodes* – Snowy Hydro was assumed to split the total volume of inter-regional contracts it sold between the Victorian and NSW nodes. The cases considered were V40/N60 (40% of contracts at the Victorian node and 60% at the NSW node), V50/N50 and V60/N40.

Table A3 summarises the combinations arising from the first two degrees of contracting freedom considered. NSW strategic generators have been assumed to contract to a lower level than players in other regions to account for the effect of the ETEF arrangement.

Table A3: Contracting cases

Contracting case	Snowy contract level	Snowy IRSR units	NSW players	Other players
Medium	60% of capacity	Equal to contract level	65% of capacity	75% of capacity
Low	50% of capacity	Equal to contract level	55% of capacity	65% of capacity
High	65% of capacity	Equal to contract level	70% of capacity	80% of capacity
Over	60% of capacity	20% *above* contract level	65% of capacity	75% of capacity
Under	60% of capacity	20% *below* contract level	65% of capacity	75% of capacity

The base case and Southern Generators' proposal were modelled for all contracting cases and a range of Snowy interregional contracting splits. The re-orientation counterfactual was also modelled for a select number of contract/split combinations. This resulted in a total of 15 different model runs. These are listed in Table A4 below:

Table A4: Scenarios modelled

Scenario	Constraint regime	Snowy split	Contracting case
1	Base case	V40/N60	medium
2	Southern Generators (SG)	V40/N60	medium
3	Base case	V50/N50	high
4	SG	V50/N50	high
5	Base case	V50/N50	low
6	SG	V50/N50	low
7	Base case	V50/N50	medium
8	Re-orientation (ReOrient)	V50/N50	medium
9	SG	V50/N50	medium
10	Base case	V50/N50	over
11	SG	V50/N50	over
12	Base case	V50/N50	under
13	SG	V50/N50	under
14	Base case	V60/N40	medium
15	SG	V60/N40	medium

Modelling period

For the purposes of considering the effects of the Southern Generators' proposal, the modelling was undertaken for the financial year 2006/07.

Demand

To streamline the modelling, the analysis focused on a number of representative demand points (i.e. load blocks), rather than modelling each hour of the year. The time saved by modelling fewer demand points allowed a larger number of strategic players and strategies to be modelled. Each demand point was weighted by its expected time frequency of occurrence during the year so that yearly average results could be found by adding up the frequency-weighted outcomes for each demand point. This meant that points of low and average demand, which occur frequently throughout the year, received a higher weighting than the peak demand points, which occur infrequently.

The electricity demand for 2006/07 was based on the medium growth, 50% probability of exceedence (POE) forecasts from NEMMCO's 2005 Statement of Opportunities (SOO)

and was characterised using 62 representative demand points. The demand profile was based on the 2004/05 load profile.

The first 27 points focused on levels of NSW and Victorian demand that led to clamping (as informed by the historic analysis) during summer peak hours. These points accounted for 250 hours of the year. Another 15 points were allocated to winter peak hours in a similar manner, corresponding to a further 470 hours. The remainder of the year, 8040 hours, was represented by a final 20 demand points.

Demand side bids were included, with the volume taken from the SOO at an assumed offer price of $500/MWh. No additional demand elasticity was assumed at any given demand point.

Loss factors and equations

Static marginal loss factors and dynamic marginal loss factor equations were taken from a pre-release draft version of NEMMCO's document, *List of Regional Boundaries and Marginal Loss Factors for the 2006/07 Financial Year, March 2006*.

Constraint equations

The constraints for the Snowy region were taken from NEMMCO's document, *Constraint List for the Snowy CSP/CSC trial, March 2006*. This document lists the constraints for which Snowy receives CSP payments, including re-oriented formulations if applicable.

The constraint equations for all other constraints were taken from the Constraint Spreadsheet provided with the *Annual Transmission Statement (ANTS)* data attached to the NEMMCO 2005 SOO. The full list of system normal, national transmission flow path (NTFP) constraints was included in the modelling.

Interconnectors

This analysis used a six region representation of the NEM: Queensland, NSW, Snowy, Victoria, South Australia and Tasmania. The interconnector transfer capabilities were limited by the network constraints represented in the ANTS and the Snowy constraint list under system normal conditions. Basslink was assumed to be fully commissioned from the commencement of the modelling period, with limits of 590MW north or 300MW south, consistent with the detailed information provided with the 2005 SOO. Murraylink, Directlink and Basslink were dispatched as regulated interconnectors. For Basslink, this was justified on the basis that Hydro Tasmania was not nominated as a strategic generator for the reasons given above.

Outages

The modelling was conducted on a system normal basis, meaning it did not include any outages (scheduled or random). This was done to increase flexibility for the gaming analysis and is consistent with the assumption that generator outages are unlikely to be scheduled during the summer months, which were the focus of the modelling analysis. Random or forced outages were excluded from the analysis for simplicity. This may have slightly overstated the potential dispatch efficiencies emerging from the results.

Energy constrained plant

Hydro plant were modelled to reflect energy limitations. That means that run of river plant were assumed to run flat across all demand periods and other hydro plant were assumed to run to meet annual energy budgets, based on the assumption that water would be used at times it was most valuable. The modelling also incorporated pumping units (Wivenhoe, Shoalhaven and Tumut), which were assumed to have a 70% pumping efficiency and be dispatched when economic.

Dispatch/price modelling results

This section discusses the dispatch and pricing modelling results obtained for each scenario 1 to 15 described above. The results obtained included:

- Production costs – annual NEM-wide variable electricity production costs in the summer peak period, winter peak period and remaining ('other') times of the year;

- Generator outputs – Snowy output, Southern Generators' output and Northern Generators' output in the summer peak period, winter peak period and other times of the year;

- Interconnector outcomes – interconnector flows into NSW, hours of transmission constraints and hours of clamping, as well as confirming revenue adequacy on the Snowy-NSW interconnector to ensure deficits on the Victoria-Snowy interconnector can be fully funded; and

- Annual Regional (time-weighted) prices for Queensland, NSW, Snowy, Victoria, South Australian, and Tasmania.

Each of these results is discussed in turn below.

Production costs

As discussed above, savings in variable production costs represent the dispatch efficiency benefits of a change in the market design. Figure A8 illustrates the annual production costs from each scenario, while Figure A9 focuses on summer and winter peak times only.

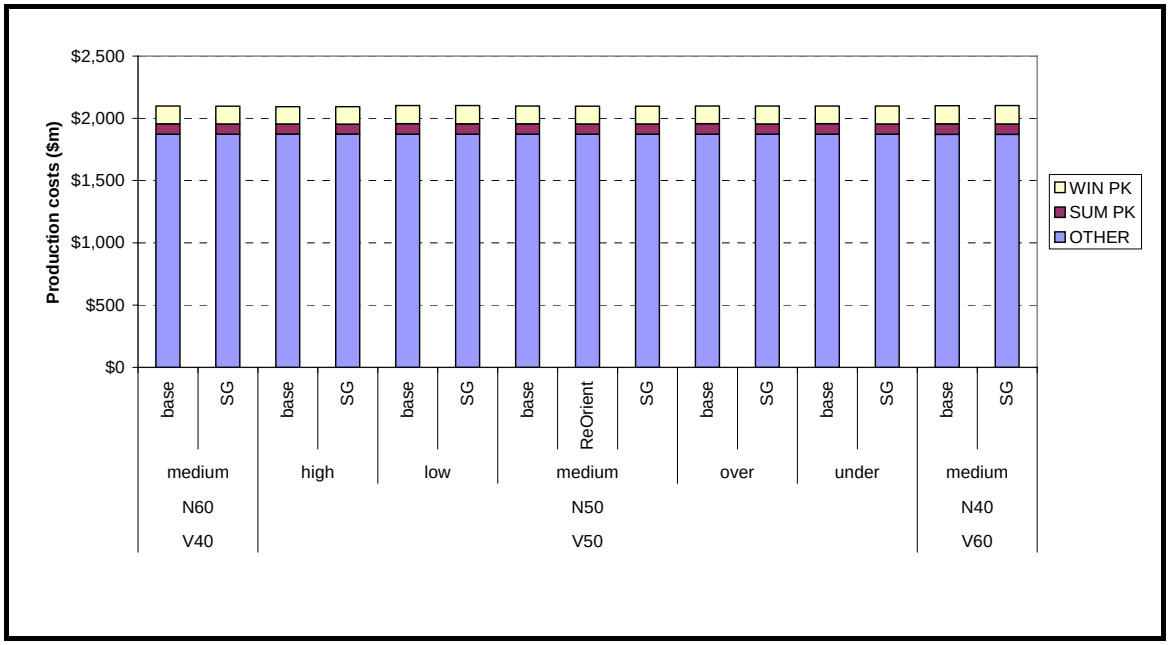


Figure A8: Annual production costs ($m)

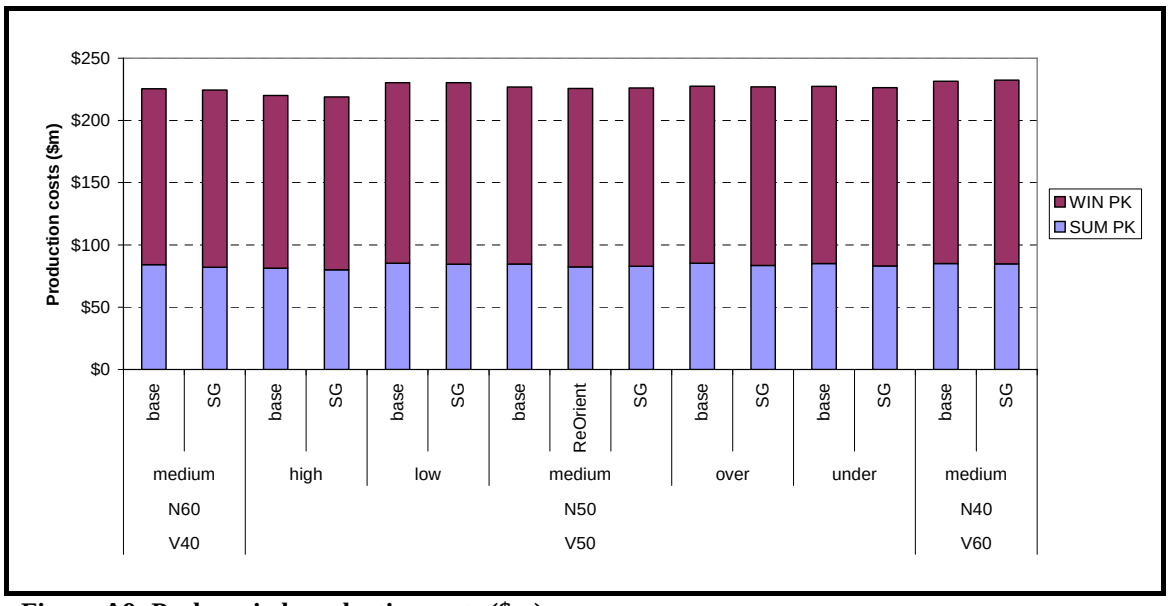


Figure A9: Peak period production costs ($m)

Table A5 below confirms that the production costs for each modelling scenario were very similar over peak and off-peak seasons, as well as on an annual basis.

Table A5: Production costs by scenario ($m)

Scenario	Contracting case	Split	Management regime	OTHER	SUM PK	WIN PK	Total
1	medium	V40/N60	base	$1,873	$84	$141	$2,098
2			SG	$1,873	$82	$142	$2,097
3	high	V50/N50	base	$1,873	$81	$139	$2,093
4			SG	$1,873	$80	$139	$2,092
5	low		base	$1,872	$85	$145	$2,103
6			SG	$1,872	$85	$146	$2,102
7	medium		base	$1,872	$85	$142	$2,098
8			ReOrient	$1,872	$82	$143	$2,098
9			SG	$1,872	$83	$143	$2,098
10	over		base	$1,872	$85	$142	$2,099
11			SG	$1,872	$84	$143	$2,098
12	under		base	$1,872	$85	$142	$2,099
13			SG	$1,872	$83	$143	$2,098
14	medium	V60/N40	base	$1,870	$85	$146	$2,102
15			SG	$1,870	$85	$147	$2,103

The results above show the total production costs for each scenario. Table A6 focuses on production cost *differences* yielded by the Southern Generators' proposal (and the re-orientation counterfactual in one instance) compared to the contractually-equivalent base

case. Reductions in production costs (i.e. production cost savings) are shown as positive values.

Table A6: Production cost savings relative to a base case under a new regime ($m)

Scenario	Contracting case	Split	Management regime	Relative to	OTHER	SUM PK	WIN PK	Total
2	medium	V40/N60	SG	base	$0.0	$2.0	-$0.9	$1.0
4	high	V50/N50	SG	base	$0.0	$1.3	-$0.2	$1.1
6	low		SG	base	$0.3	$0.8	-$0.9	$0.2
8	medium		ReOrient	base	-$0.3	$2.3	-$1.1	$0.9
9			SG	base	$0.0	$1.8	-$1.1	$0.7
11	over		SG	base	-$0.1	$1.8	-$1.1	$0.6
13	under		SG	base	-$0.2	$2.0	-$1.1	$0.7
15	medium	V60/N40	SG	base	$0.2	$0.2	-$1.1	-$0.7

Generally speaking, the Southern Generators' proposal (compared to the base case) led to:

- slightly lower production costs in the peak summer period; and
- slightly higher production costs in the peak winter period; with
- overall production costs falling marginally over the year.

In all cases, the Southern Generators' proposal led to an expected annual production cost saving of $1.1 million or less. The changes in production costs appear to be driven largely by changes in Tumut and Murray output at peak summer times leading to slight changes in the thermal plant displaced throughout the year (see next section). In our view, the overall savings in production costs were small because the ultimate modelled impact of the Southern Generators' proposal was a substitution between brown coal and black coal generation at various times rather than avoidance of higher cost gas-fired generation.

It appears that re-orientation yielded a fractionally larger production cost saving than the Southern Generators' proposal in the case where both management regimes were modelled. However, given the very small size of the difference and the fact that only one modelling scenario was considered, it is not presently possible to be confident this result is robust.

Generator outputs

Patterns of generator output are discussed for Snowy Hydro, the Northern Generators, and the Southern Generators in turn below.

Snowy Hydro

As Snowy Hydro's hydro plant are all energy constrained, its *annual hydro* output was not affected by the contracting scenario or the congestion management option in place. However, the output of Snowy Hydro's hydro plant did vary *across* the year.

Indeed, the lower peak summer production costs relative to the base case noted above appears to have been driven by slightly higher Snowy Hydro summer output across most contracting scenarios under the Southern Generators proposal, which led to greater displacement of thermal plant compared to the base case at these times (see Figure A10). Within the peak summer results, it is noticeable that Tumut generated slightly more under the Southern Generators' proposal (or the re-orientation counterfactual) compared to the base case, while Murray generated slightly less.

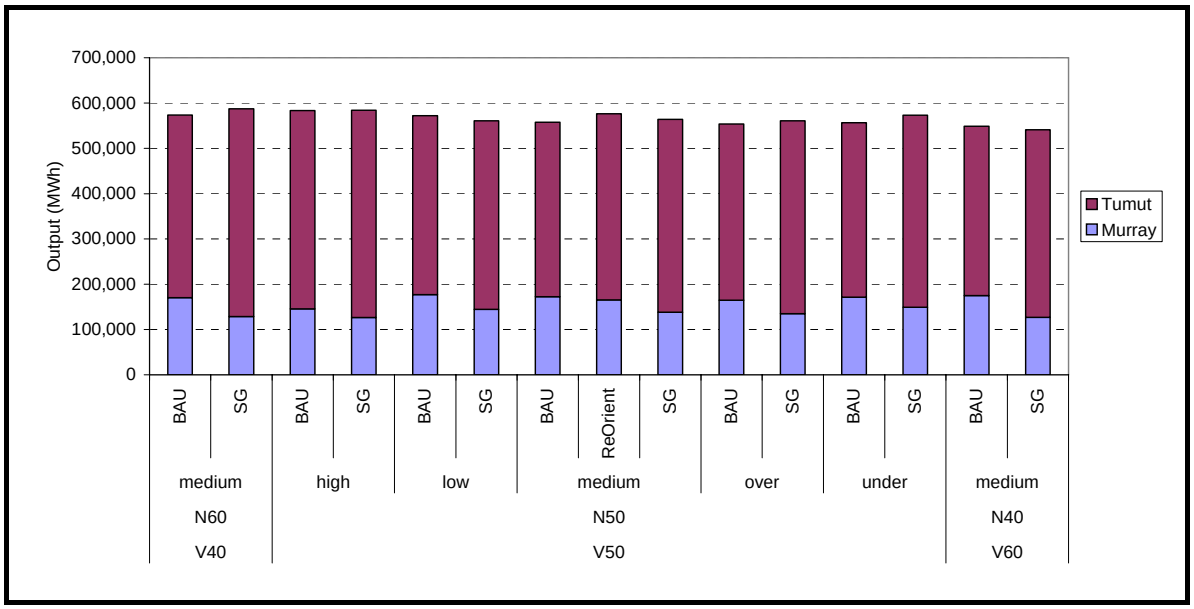


Figure A10: Snowy Hydro peak summer output (MWh)

This is an intuitive result, because it is consistent with the observation that under the existing base case assumptions, Murray "over-generates" at times of high demand to induce NEMMCO clamping of the Victoria-Snowy interconnector and maximise the pool revenue received across the entire Snowy portfolio. Under the Southern Generators' proposal (or re-orientation), Murray's incentives to over-generate to induce clamping do not arise, allowing dispatch to be based more on the underlying value of generation in various locations at various times.

Meanwhile, the higher winter production cost noted above appears to have been driven by slightly lower Snowy Hydro winter output compared to the base case (see Figure A11).

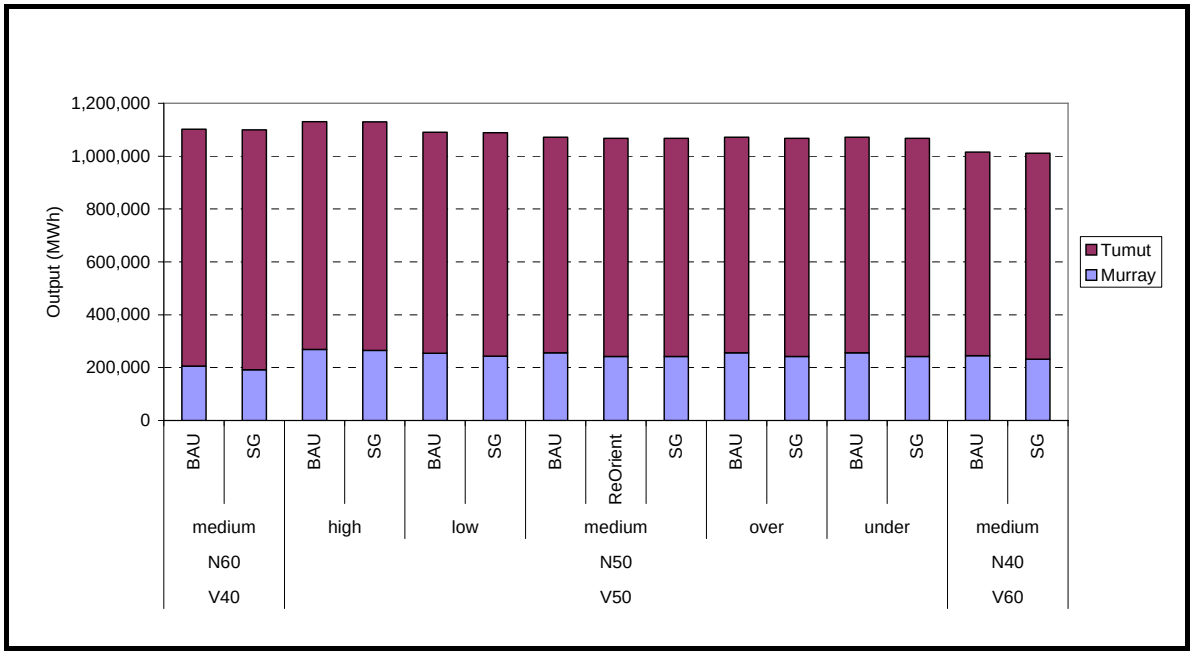


Figure A11: Snowy Hydro peak winter output (MWh)

Southern and Northern Generators' output

Table A7 below details the output of Southern and Northern Generators under a range of scenarios. The differences in outputs occurring under different scenarios are small, particularly when compared to annual outputs in GWh. For example, in the first scenario (medium contracting, V40/N60), the Southern Generators reduced summer output by 2 GWh and increased winter output by 1 GWh against an annual output of nearly 60,000 GWh. In most cases, Southern Generator output only increased by 1 to 4 GWh during the winter peak and increased or decreased during the peak summer period by 10 GWh. Impacts for the Northern Generators were similarly small relative to annual outputs.

Table A7: Output by generator group (GWh)

Scenario	Contracting case	Split	Management regime	Other		Summer peak		Winter Peak		Annual	
				NG	SG	NG	SG	NG	SG	NG	SG
1	medium	V40/N60	base	119,124	53,800	4,449	1,985	8,039	3,638	131,612	59,422
2			SG	119,126	53,800	4,444	1,983	8,039	3,639	131,610	59,422
3	high	V50/N50	base	119,156	53,800	4,456	1,978	8,072	3,604	131,684	59,381
4			SG	119,155	53,800	4,453	1,979	8,072	3,604	131,680	59,383
5	low		base	119,100	53,800	4,473	1,963	8,045	3,621	131,618	59,384
6			SG	119,087	53,799	4,475	1,970	8,043	3,625	131,606	59,394
7	medium		base	119,076	53,792	4,468	1,986	8,047	3,651	131,591	59,429
8			ReOrient	119,081	53,799	4,459	1,980	8,046	3,652	131,587	59,431

Scenario	Contracting case	Split	Management regime	Other		Summer peak		Winter Peak		Annual	
				NG	SG	NG	SG	NG	SG	NG	SG
9			SG	119,077	53,793	4,464	1,984	8,046	3,652	131,587	59,430
10	over		base	119,072	53,792	4,468	1,988	8,047	3,651	131,587	59,431
11			SG	119,075	53,792	4,463	1,986	8,046	3,652	131,584	59,431
12	under		base	119,077	53,797	4,459	1,987	8,047	3,651	131,582	59,434
13			SG	119,087	53,799	4,443	1,986	8,046	3,652	131,576	59,437
14	medium	V60/N40	base	119,013	53,789	4,476	1,987	8,055	3,688	131,543	59,464
15			SG	119,005	53,786	4,470	1,995	8,055	3,690	131,530	59,471

Interconnector outcomes

The modelling results show hours of clamping on the Victoria-Snowy interconnector for northward flows under the base case in each of the contracting scenarios. In each base case, clamping occurred for between 27 to 51 hours annually (see Figure A12 below), a higher incidence than historically, but consistent with rising levels of demand. The bulk of clamping incidences were during summer peak times. There was no clamping under either the Southern Generators' proposal or the re-orientation counterfactual.

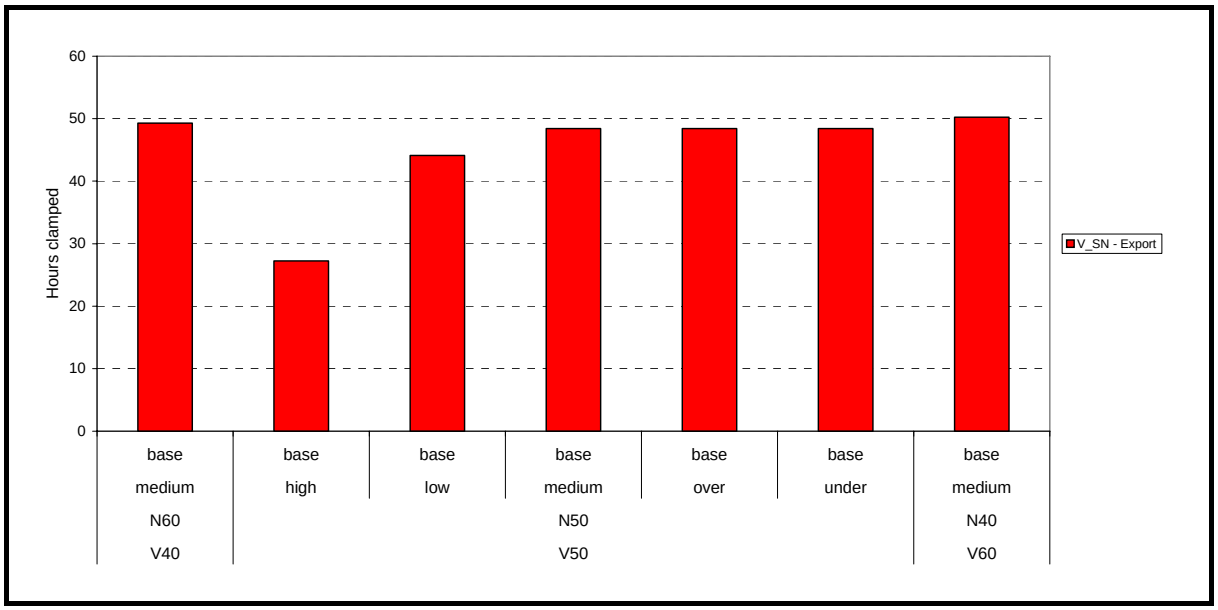


Figure A12: Annual incidence of clamping

Figure A13 shows the peak summer flows on the Snowy-NSW interconnector. This reveals that the Southern Generators' proposal (and re-orientation counterfactual) led to *slightly* higher flows into NSW compared with the base case in most of the contracting scenarios.

By contrast, winter peak flows north on the Snowy-NSW interconnector were barely affected by the choice of proposal. Similarly, summer and winter peak flows into Victoria on the Snowy-Victoria interconnector were not systematically higher or lower under the Southern Generators' proposal across a range of contracting scenarios.

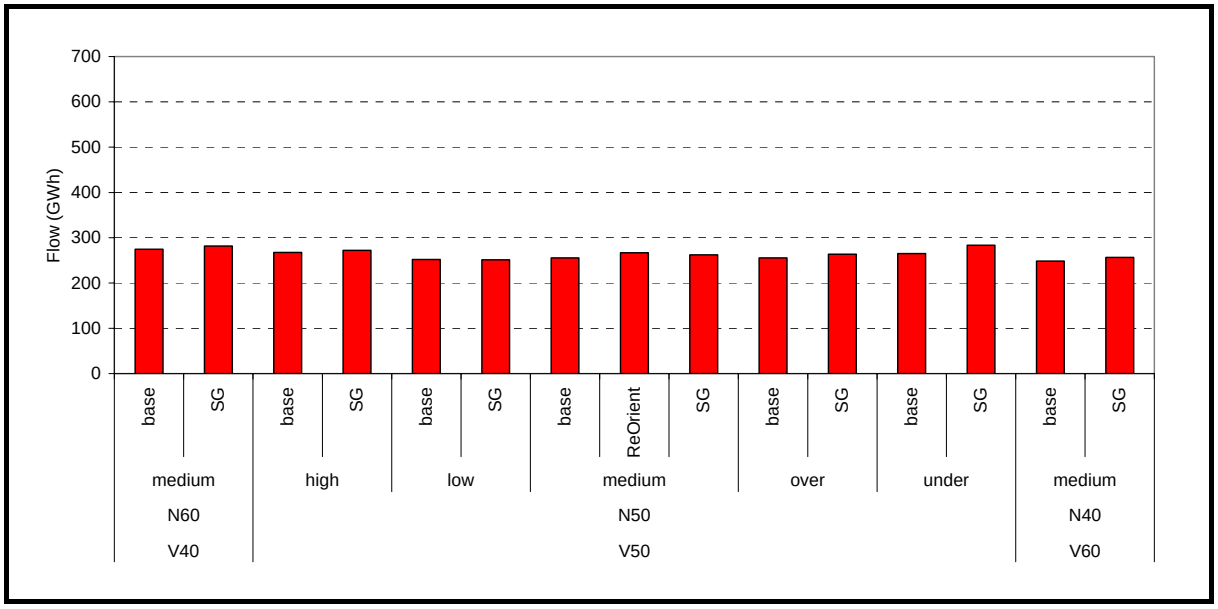


Figure A13: Summer peak flows on Snowy-NSW interconnector (total GWh north, no southerly flows)

Prices

The analysis shows that across most contracting scenarios and on an annual time-weighted basis, the Southern Generators' proposal generally led to:

- Lower prices in the NSW and Snowy regions – by $2 to $4/MWh. In many scenarios, this led to convergence between NSW and Victorian prices, with implications for the risk analysis (discussed in the next section); and

- Little change to prices in other regions – Victorian, South Australian and Queensland prices stayed within about $1/MWh of their base case levels.

These results are presented in Figure A14 and Table A8 below.

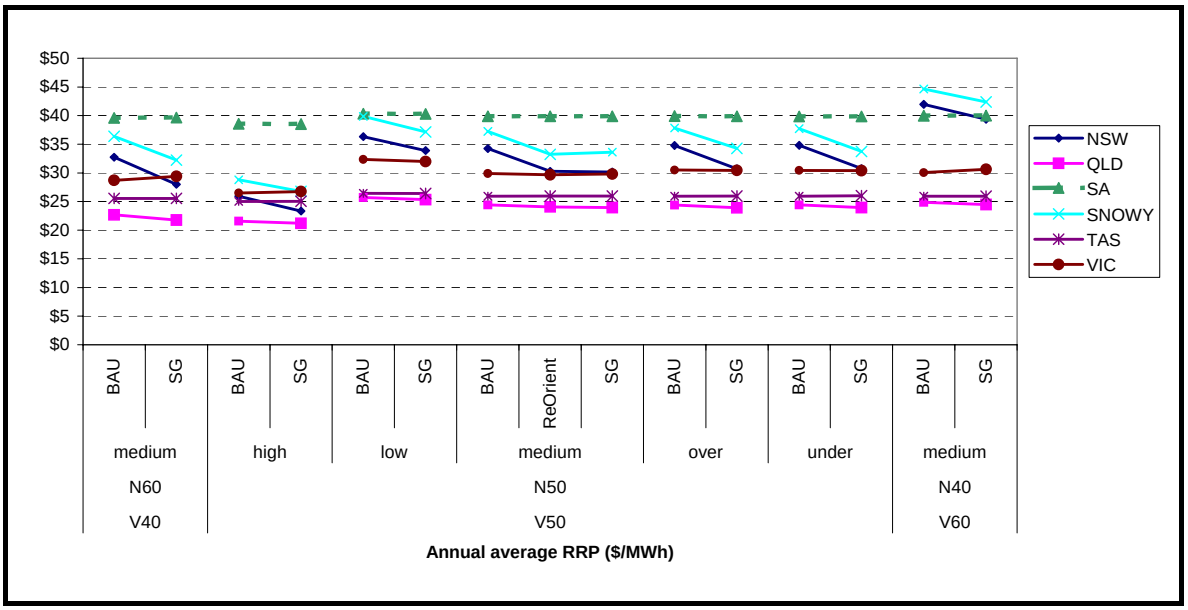


Figure A14: Expected annual (time weighted) price changes ($/MWh)

Table A8: Annual average prices (time weighted) by scenario ($/MWh)

Scenario	Contracting case	Split	Management regime	NSW	QLD	SA	SNOWY	TAS	VIC
1	medium	V40/ N60	base	$32.73	$22.70	$39.62	$36.37	$25.56	$28.72
2			SG	$28.02	$21.79	$39.66	$32.23	$25.55	$29.39
3	high	V50/ N50	base	$25.91	$21.59	$38.57	$28.79	$25.01	$26.50
4			SG	$23.33	$21.19	$38.55	$26.77	$25.06	$26.75
5	low		base	$36.32	$25.71	$40.33	$39.85	$26.45	$32.36
6			SG	$33.90	$25.32	$40.31	$37.14	$26.39	$31.99
7	medium		base	$34.26	$24.42	$39.90	$37.25	$25.94	$29.91
8			ReOrient	$30.27	$24.06	$39.90	$33.24	$25.95	$29.68
9			SG	$30.16	$23.93	$39.87	$33.62	$25.97	$29.82
10	over		base	$34.79	$24.39	$39.91	$37.85	$25.94	$30.50
11			SG	$30.73	$23.92	$39.89	$34.26	$25.96	$30.42
12	under		base	$34.80	$24.41	$39.85	$37.70	$25.95	$30.43
13			SG	$30.75	$23.93	$39.85	$33.74	$26.02	$30.42
14	medium	V60/ N40	base	$41.97	$24.85	$39.99	$44.65	$25.92	$30.06
15			SG	$39.34	$24.48	$40.01	$42.38	$25.94	$30.63

Once again, the price impacts of the re-orientation counterfactual appear very similar to those arising from the Southern Generators' proposal.

The price reductions in NSW and Snowy were typically greater (about $4/MWh) in scenarios where:

- medium levels of contracting prevailed; and
- Snowy Hydro was equally contracted at the Victorian and NSW regional reference nodes or contracted more in NSW than in Victoria.

Smaller price reductions appear to have occurred where either low or high overall levels of contracting were involved or where Snowy Hydro was contracted more in Victoria than in NSW. Whether Snowy Hydro was over- or under-contracted in terms of IRSR units for its contractual exposure did not appear to significantly affect the results.

When considering the results by time of year, it becomes clear that the price reductions noted above from the Southern Generators' proposal and the re-orientation counterfactual occurred primarily during peak summer times (see Figure A15).

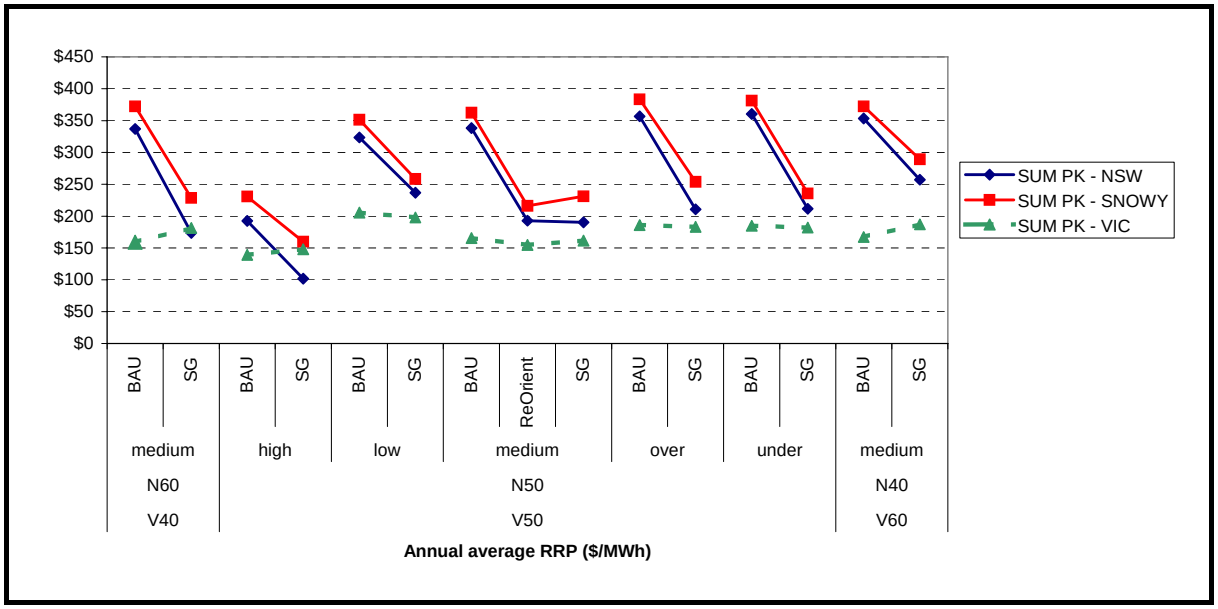


Figure A15: Expected peak summer price changes ($/MWh)

The price outcomes during other parts of the year (peak winter and the rest of the year) were virtually unchanged (see Figure A16 and Figure A17).

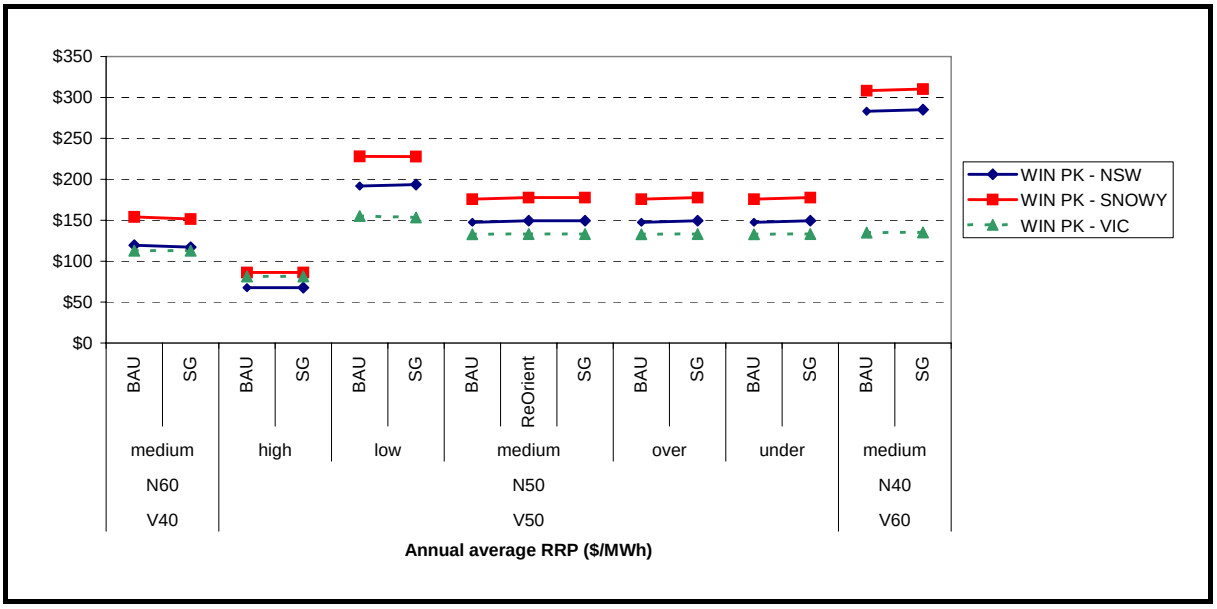


Figure A16: Expected peak winter price changes ($/MWh)

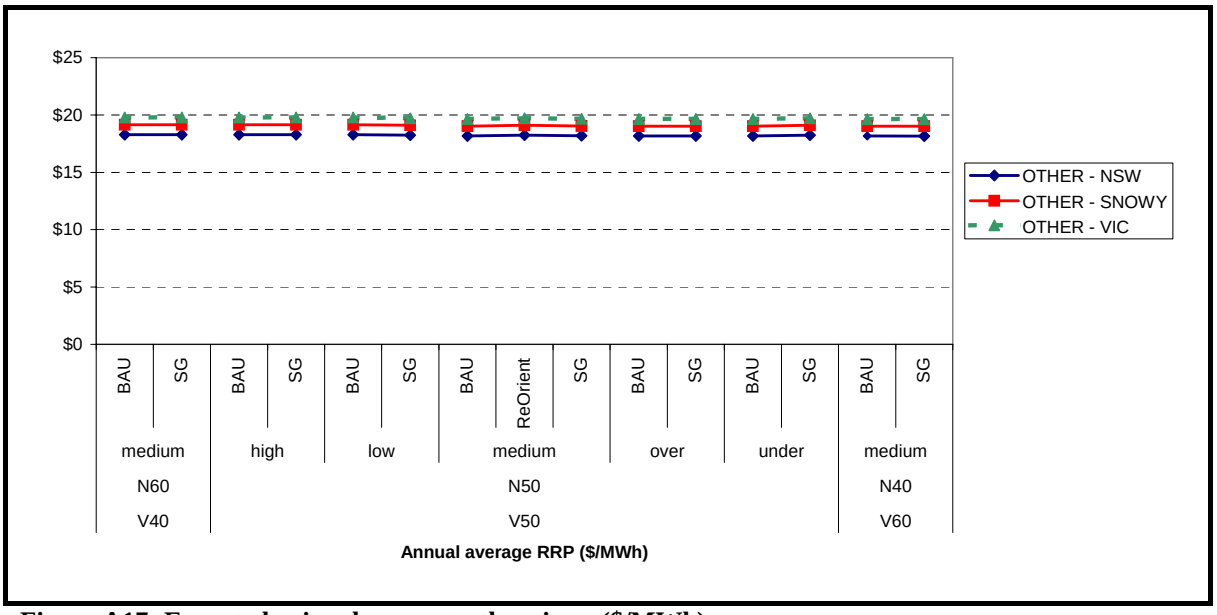


Figure A17: Expected price changes at other times ($/MWh)

Another important finding that affects the risk modelling (see below) was that the Southern Generators' proposal appeared to tighten the distribution of price outcomes compared to the base case (see Figure A18). This corresponds to a reduction in price volatility.

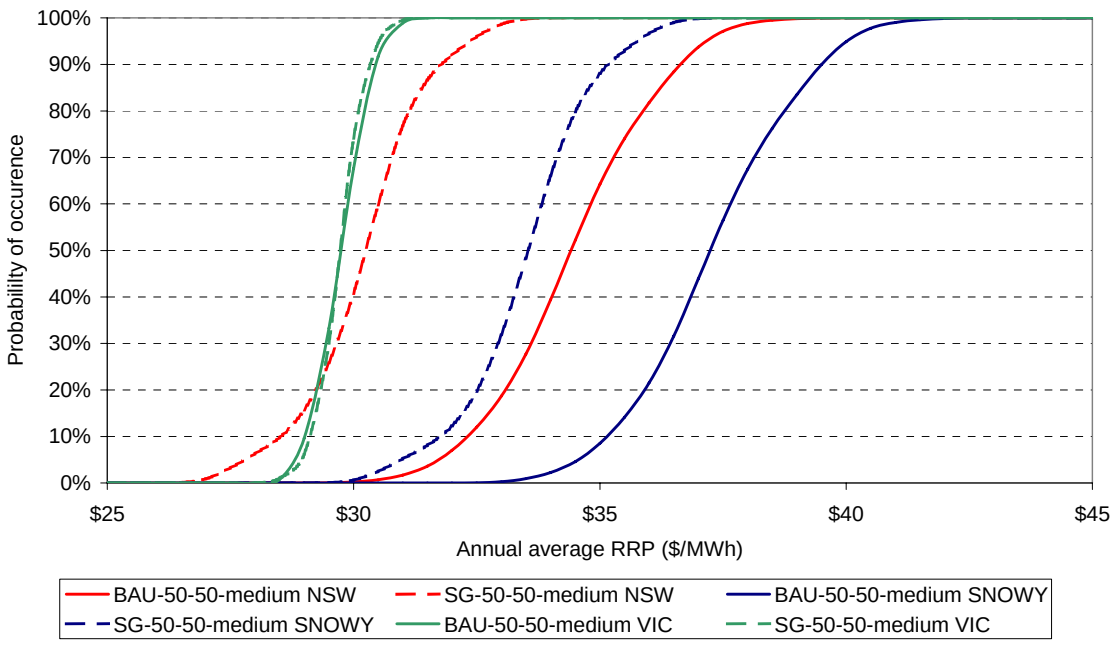


Figure A18: Expected distribution of price outcomes ($/MWh)

Incidence of price reductions

Given the short length of the Southern Generators' proposal, which is assumed to end on 31 July 2007, only a fraction of the estimated price reductions in NSW would be passed through to NSW end-use consumers within the proposals' timeframe. To see why this is the case, it is worth beginning by considering an individual half-hour in which retailers were fully contracted (through swaps) with generators in respect of their entire retail load. In this case, a lower spot price would result in retailers making a higher difference payment to generators to compensate for the lower spot price. The effective wholesale price for electricity between retailers and generators in respect of that half-hour would not change. Both retailers and generators would therefore be indifferent to the change in spot price in respect of that particular half hour.

Over a longer timeframe, retailers in NSW may gradually renegotiate their wholesale contracts with generators to reflect the expected lower spot prices. As this occurs, lower spot prices may lead to lower wholesale contract prices. This would allow retailers to capture some of the benefits of lower spot prices. Eventually, competition between retailers could lead to lower wholesale contract prices being reflected in lower prices offered to NSW retail customers. However, this process could take several months or even years to filter through to all end-use customers.

Lower prices to end-use customers at the expense of the revenues of particular market participants would represent a transfer rather than a net gain to the market. However, to the extent that end-users responded to lower prices by expanding consumption, increases in overall market benefit may arise. Given the short period of the Southern Generators' proposal, the modelling presented in this section did not estimate such long term efficiency gains.

Conclusions

Overall, the dispatch and price modelling suggest that the Southern Generators' proposal may lead to very small dispatch efficiency gains compared to the base case in which clamping occurs. These gains were matched by the modelled production cost savings arising from implementation of the re-orientation counterfactual.

The reductions in production costs under both alternatives appear to be due to slightly higher Snowy Hydro generation during peak summer times and slightly lower Snowy generation during the remainder of the year.

The Southern Generators' proposal also seems to have affected the average price results. Average annual prices in the NSW and Snowy regions were approximately $2 to $4/MWh lower under the Southern Generators' proposal and re-orientation counterfactual compared to the base case. This impact largely occurred during peak summer times, with prices during the remainder of the year generally unaffected by either option. In many scenarios, NSW prices converged with Victorian prices, with implications for the risk analysis (see next section). While price reductions are not equivalent to overall efficiency gains, to the extent customers respond to lower retail prices by expanding consumption in the longer term, an overall market benefit may be created.

1.5 Risk modelling

This Section discusses the approach, assumptions, results, and conclusions for the forward-looking risk modelling analysis.

Approach

The risk modelling was undertaken using Frontier Economics' portfolio optimisation model, *STRIKE*. This discussion begins by describing some of the key features of this model before discussing the methodology used to calculate the risk implications of the Southern Generators' proposal and the re-orientation counterfactual.

Key features of *STRIKE*

The *STRIKE* financial model uses portfolio theory to determine an efficient mix of energy purchasing instruments from a suite of options (spot, physical and financial) for a range of risk levels. Each efficient combination of instruments is represented as a point on a frontier, against which other portfolios can be compared.

Portfolio theory sets out how rational investors would use diversification to optimise their portfolios and how an asset should be priced given its risk relative to the market as a whole. More specifically, portfolio theory estimates the return of an asset as a random variable and a portfolio as a weighted combination of assets. The return of a portfolio is therefore a random variable and consequently has an expected value and a variance. Risk in this economic model is usually identified with the standard deviation of portfolio return (although other measures of risk can be used). For a given expected return, a rational investor would choose a less risky portfolio. In portfolio theory this relationship between risk and reward is represented by an efficient frontier (see Figure A19).

The efficient frontier describes the outer edge of every possible combination of assets that could be plotted in risk-return space. Combinations of assets along this line represent portfolios for which there is lowest risk for a given level of expected return. Conversely, for a given amount of risk, the portfolio lying on the efficient frontier represents the combination of assets offering the best possible expected return. The model calculates the outer edge (frontier) of every possible combination using an advanced quadratic mixed integer programming technique.

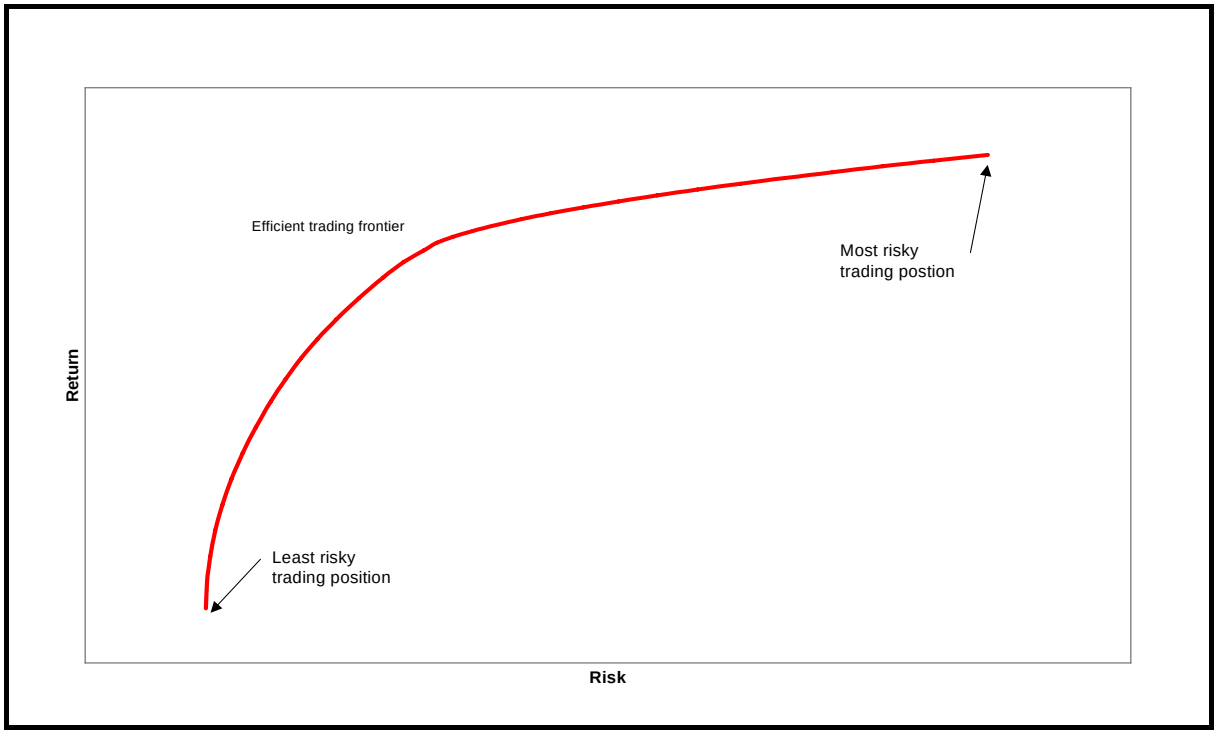


Figure A19: A generalised efficient frontier for hedging energy trading risks

Methodology

As assumptions change, so does the efficient frontier. This enables the impact of changes in spot price volatility and IRSR firmness on the ability of participants to efficiently hedge between regions, arising from the Southern Generators' Rule change proposal, to be compared to both the base case and the re-orientation counterfactual.

The risk modelling was undertaken for several key scenarios:

- A Victorian generator hedging at the NSW node;
- A NSW generator hedging at the Victorian node; and
- A Snowy generator hedging at both the Victorian and NSW nodes concurrently.

The Southern Generators' Rule change proposal directly affects settlement residues on the Victoria-Snowy and Snowy-NSW interconnectors. The above scenarios cover the range of likely risk-management applications using combinations of these residues.

In each case *STRIKE* was run to calculate the efficient frontier for the given set of price duration curves and IRSRs.

The precise effect on risk will depend on where participants choose to locate on the efficient frontier – that is their risk preferences. Given we are primarily concerned with the relative effects of the alternative proposals, for simplicity the results here are presented for the most conservative risk position on the efficient frontier (that is, the bottom left point of the efficient frontier). The results represent the optimal volume that would be hedged inter-regionally at the most conservative risk position.

Assumptions

The risk modelling was based on the price duration curves and IRSRs produced by the dispatch modelling for the base case, Southern Generators' proposal and the re-orientation counterfactual described above.

For each of the price duration curves and associated IRSRs, we compared the efficient frontiers for each of the following hypothetical generators seeking to hedge inter-regionally using Victoria-Snowy, Snowy-Victoria, Snowy-NSW, and NSW-Snowy IRSRs:

- A 100 MW Victorian generator seeking to enter contracts in NSW and able to purchase a mix of Victoria-Snowy and Snowy-NSW IRSR units;
- A 100 MW NSW generator seeking to enter contracts in Victoria and able to purchase a mix of NSW-Snowy and Snowy-Victoria IRSR units; and
- A 100 MW Snowy generator seeking to enter contracts in Victoria and NSW and able to purchase a mix of Snowy-Victoria and Snowy-NSW IRSR units.

For the purposes of comparison, the generation and loads were assumed to be flat in each case. IRSR units were assumed to be available to the generator at break-even cost (i.e. the cost of the unit was equal to the expected return of the residues).

Results

The *STRIKE* analysis found that the Southern Generators' proposal (and to a lesser extent re-orientation) produced, on average:

- Significant increases in the Victorian generator's willingness to enter contracts in NSW (See Figure A20);
- Minor reductions in the NSW generator's willingness to enter contracts in Victoria (See Figure A21);
- Minor reductions in the Snowy generator's willingness to enter contracts in NSW (See Figure A22); and
- Minor increases in the Snowy generator's willingness to enter contracts in Victoria (See Figure A23).

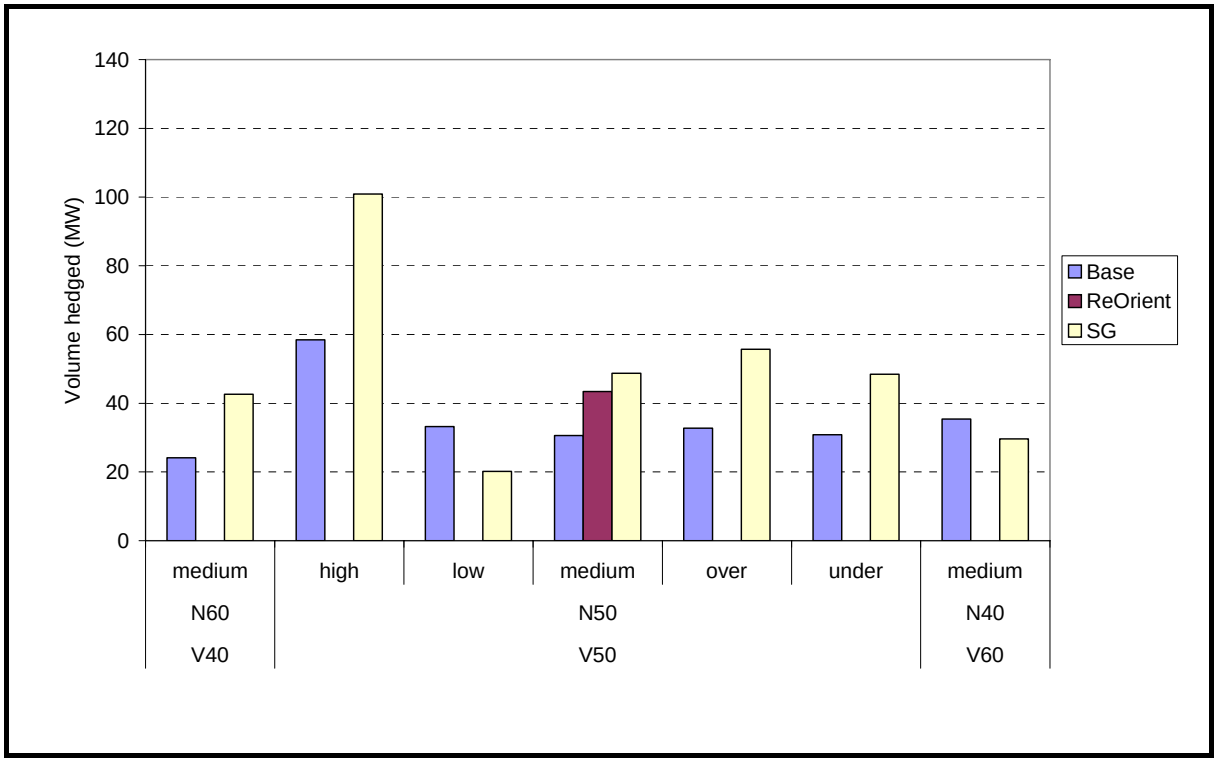


Figure A20: Victorian generator's optimal contracting in NSW

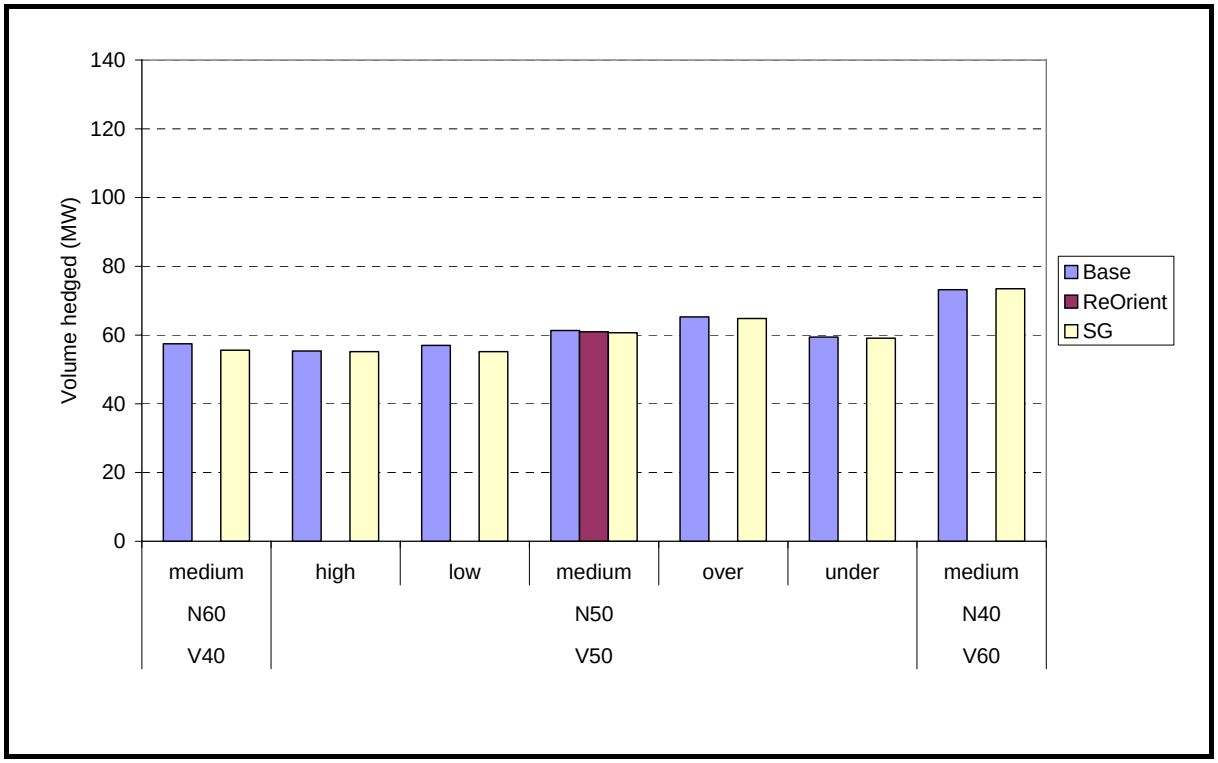


Figure A21: NSW generator's optimal contracting in Victoria

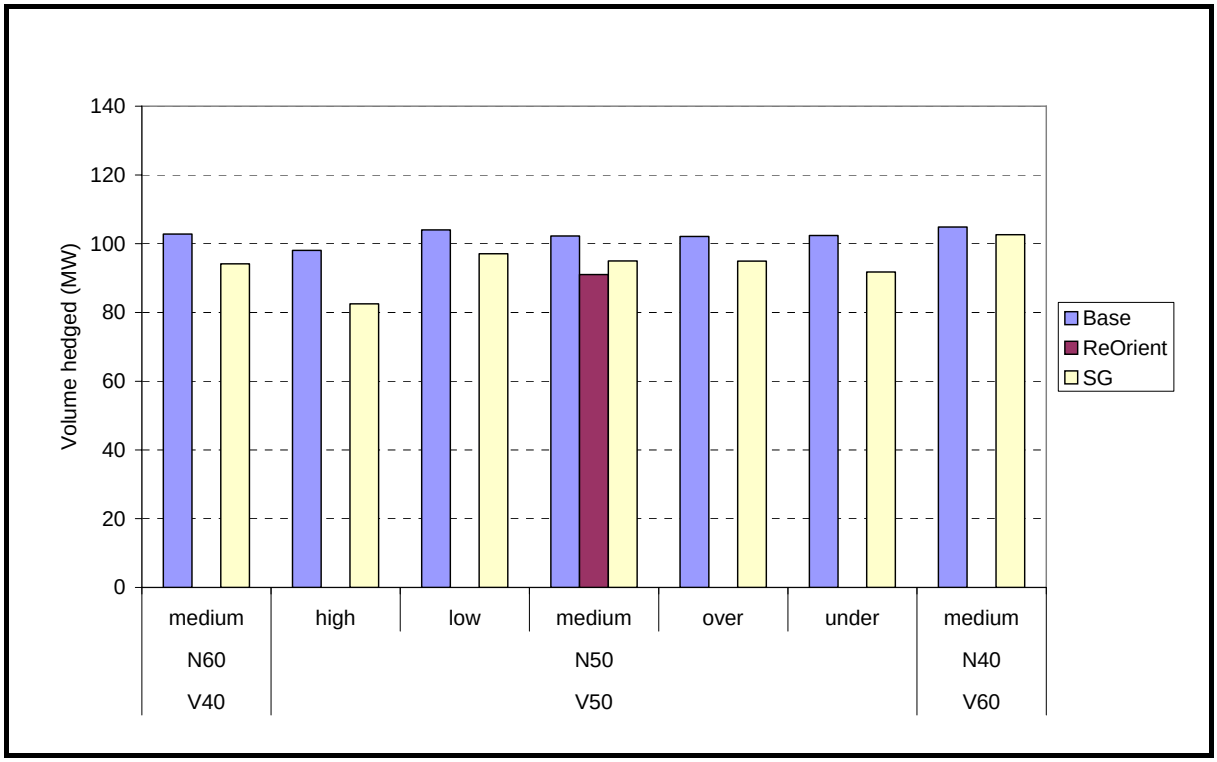


Figure A22: Snowy generator's optimal contracting in NSW

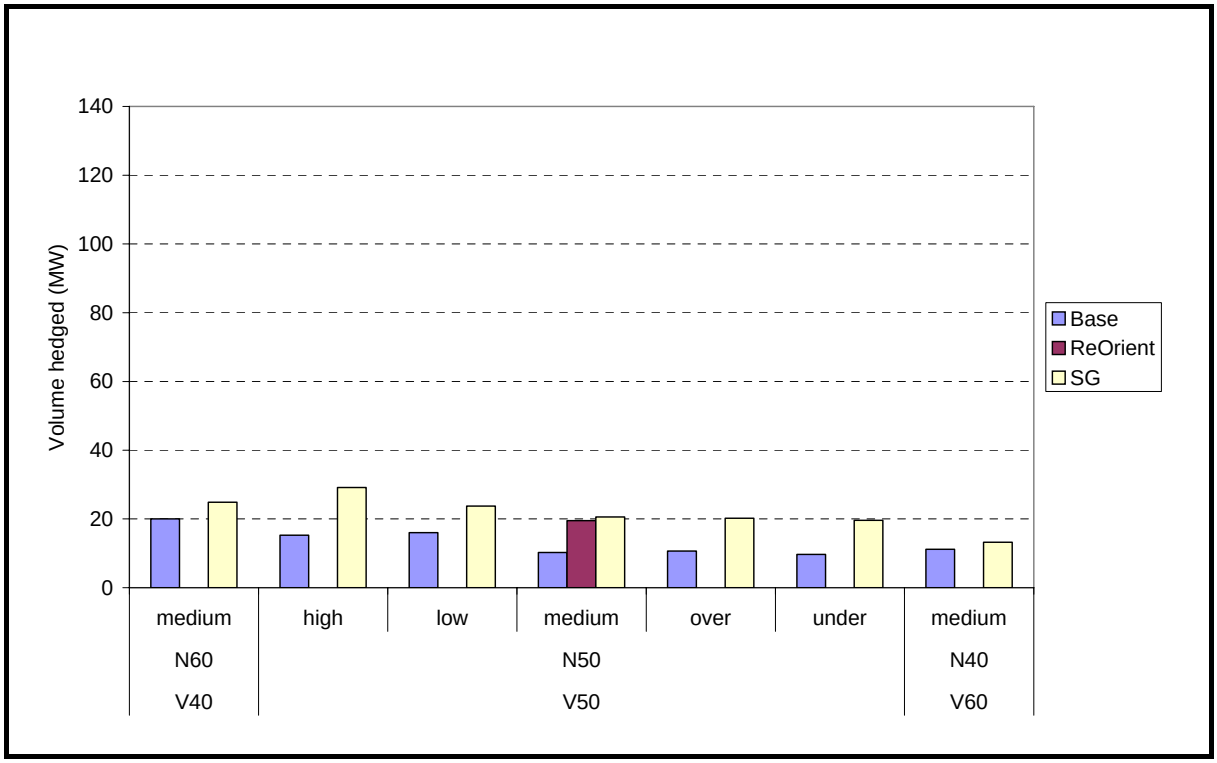


Figure A23: Snowy generator's optimal contracting in Victoria

The figures show that it is optimal for the Snowy generator to hedge more than its 100 MW of physical capacity inter-regionally. While this may at first appear to be counter-intuitive, it is driven by the fact that the Snowy region price is *slightly* more volatile than the NSW price

but *much more* volatile than the Victorian price. This means that each MW of generation in the Snowy region requires more than 1MW of hedge cover in either NSW or Victoria to minimise the risk of the participant.

Conclusions

The results of the risk analysis suggest that the Southern Generators' proposal would increase the willingness of Victorian (and possibly South Australian) generators to enter contracts referenced to the NSW regional reference node. This is due to both the greater firmness of the Victoria-Snowy IRSR units — due to the elimination of clamping — and lower expected price differences between Victoria and NSW (see price analysis above). However, the willingness of NSW generators to enter into contracts at the Victorian regional reference node might be slightly reduced, perhaps due to the use of NSW-Snowy IRSRs to fund occasional deficits on the Snowy-Victoria interconnector. Meanwhile, the willingness of a generator located within the Snowy region to enter contracts inter-regionally is slightly increased for contracts referenced to the Victorian regional reference node and slightly reduced for contracts referenced to the NSW regional reference node.

Appendix 2 Congestion Management Program – Statement of Approach

See attached.

Congestion Management Program – Statement of Approach

The effective management of congestion is critical to the efficient operation of the National Electricity Market (NEM). Congestion occurs when electricity demand cannot be met using the lowest priced combination of generation available due to transmission capacity or power system security limitations. It would not be efficient to eliminate all transmission congestion, because of the likely cost of doing so compared with the benefits. This means that some congestion, and its management, is inevitable.

Congestion management is necessary to maintain the physical and operational security of the power system and has important implications for spot prices, the degree of competition, the bidding incentives for market participants, and the level of price and volume risk borne by participants. In the long-term, the manner in which congestion is managed affects the investment decisions of new generators, load, network service providers, and the opportunities for alternative energy sources.

The Commission has before it one Ministerial Council for Energy (MCE) reference for Review (Congestion Management Review), and five National Electricity Rule (Rule) change proposals that relate to various aspects of how network congestion is managed in the NEM.[1] It is essential that this work is co-ordinated by the Commission to deliver a comprehensive "Congestion Management Regime" for the market going forward. Predictability in respect of the general direction of the development of the regulatory framework, and confidence that any necessary transitions will be managed, is also essential to those investing in electricity infrastructure. This Statement of Approach is intended to provide information and clarity about the way in which the Commission is going to deal with the five Rule change proposals and the Congestion Management Review in an integrated manner.

The Commission considers that the integrated "Congestion Management Regime" includes all the elements currently under consideration, such as identifying congestion, managing congestion, and setting out appropriate processes for assessing and determining a region boundary change. The "Congestion Management Regime" should be in place for the longer-term, incorporating mechanisms necessary to address network congestion in the short-to-medium term. While the details of these future arrangements are yet to be finally determined, it appears to the Commission that any comprehensive "Congestion Management Regime" is likely to include:

- Information disclosure to the market, such as the NEM Management Company's (NEMMCO's) current Statement of Opportunities (SOO)/Annual National Transmission Statement (ANTS) process;
- Incentives to address congestion, such as investment in transmission and generation, and demand-side alternatives;
- Intervention mechanisms such as those relating to price determination, energy dispatch, and /or planner of last resort powers in respect of transmission investment; and
- The potential and process (which itself is clear and stable) for longer-term structural change through the alteration of regional boundaries if this is found to be necessary and appropriate.

The Congestion Management Review, proposed Rules for a revised boundary change process, and the introduction of a last resort planning mechanism have been referred to the Commission by the MCE. These relate to the NEM wide regulatory framework for congestion management and boundary change in the longer term. Two market participant proposals for a short-term change to the current

[1] These matters are: the MCE-directed Congestion Management Review; Southern Generators/NEMMCO Management of Negative Settlement Residues in the Snowy Region Rule change proposal; MCE Reform of Regional Boundaries Rule change proposal; Snowy Hydro Ltd Review of the Snowy Regional Boundary Rule change proposal; Macquarie Generation Review of the Snowy Regional Boundary Rule change proposal; and Snowy Hydro Ltd. Management of Negative Settlement Residues – Re-orientation Rule change proposal.

mechanisms for managing negative settlement residues at Snowy, and two other market participant proposals to change the Snowy region boundary as a long-term means of addressing existing material congestion in that area, have been submitted to the Commission.

These Rule change proposals, the Congestion Management Review issues paper, and stakeholder submissions on the matters, are available on the Commission's website (www.aemc.gov.au).

The Commission is bound by the NEM Objective when making decisions on these matters, requiring the promotion of efficient investment in, and use of electricity services for the long-term interests of consumers, with respect to price, quality of supply reliability, and system security. When considering congestion and region boundary related proposals, the Commission will have regard to a range of matters and in particular, the impact of the proposals on: dispatch efficiency; facilitation of trading in the NEM, including inter-regional trading; and the promotion of good regulatory practice, including sound regulatory principles regarding the design of the NEM and the National Electricity Rules.

The Commission considers that the issues of congestion management and boundary location in the Snowy region are of more immediate significance than those that currently may arise elsewhere in the NEM, principally because the region sits between the two largest regions in the NEM (measured by MW and MWhs) and because of the particular circumstance that a network loop traverses two region boundaries. The Commission notes that there are "legacy" issues associated with congestion management in and around the Snowy regional boundary that give these matters a priority in the consideration of congestion management and boundary issues in the NEM as a whole. The Commission notes that this view was widely reflected in the submissions received in response to the Congestion Management Review issues paper, the first round consultation for the Rule proposal on managing negative settlement residues in the Snowy region, and the first round consultation on the two Snowy region boundary Rule change proposals.

The current Snowy trial of Constraint Support Pricing/Constraint Support Contracts (CSP/CSC) arrangements is providing an opportunity to assess one option for congestion management, which is not currently part of the permanent design framework of the NEM.

Two of the current Rule change proposals (Southern Generators', transferred to the Commission from the National Electricity Code Administrator on 1 July 2005, and Snowy Hydro's received on 24 May 2006) propose to modify the trial addressing the issue of negative settlement residues in the Snowy region, which would eliminate the need for NEMMCO to restrict flows from Victoria into the Snowy region in order to manage those residues. These two proposals to modify the Snowy trial are each being considered on their merits. The Commission has issued a draft Rule determination proposing to make the Rule change submitted by the Southern Generators and has also commenced consultation on the Snowy Hydro Re-orientation proposal. The Commission proposes to issue a draft Rule determination in relation to the Snowy Hydro Re-orientation proposal in conjunction with issuing a final Rule determination in respect of the Southern Generators' proposal. This will enable the analysis as to the relative merits of the two proposals to be clearly understood. The Commission also notes that the two proposals advocate a different approach to resolve the same problem of NEMMCO's intervention in the Snowy region.

The Snowy trial is currently due to expire on 31 July 2007. If the Commission decides to make the Rules proposed by the Southern Generators or Snowy Hydro (Re-orientation), the Commission would expect that the new arrangements affecting the trial could be implemented by NEMMCO by the start of the coming summer (2006-07), and would expire with the expiry of the trial. That is, the proposals by the Southern Generators and Snowy Hydro (Re-orientation) are short-term in nature.

The Commission anticipates that if it decides to make any of the Rules proposed for a change to the Snowy boundary, implementation may not be practicable before 31 July 2007. That is, the

Commission's decisions on the relevant proposals for changes to the Snowy Boundary are medium-term in nature.

The Congestion Management Review and MCE Rule proposals go to the enduring design of the NEM across all regions. The Commission is currently of the view that any Rules it makes for the short- and medium-term management of congestion and boundary change in the Snowy region should be consistent with the long-term NEM wide framework. Consequently, the Commission intends to co-ordinate its decision making in respect of all of these related matters.

The Commission considers that by adopting this Statement of Approach, the key elements of "Congestion Management Regime" will be announced in draft form by the end of 2006, including the following package of draft Rule determinations and decisions:

- Draft Rule determinations with respect to resolving the Snowy region boundary;
- Draft Rule determination on the future process for boundary changes in the NEM; and
- Draft Report of the Congestion Management Review.

By the end of March 2007, the Commission will release its final Rule determinations on the Snowy region boundary proposals, the future boundary change process, and will submit its final report on the Congestion Management Review to the MCE. It is noted that the final decisions will also have been made on related matters such as Rules for transmission revenue and price regulation, Regulatory Test principles, and a last resort planning mechanism.

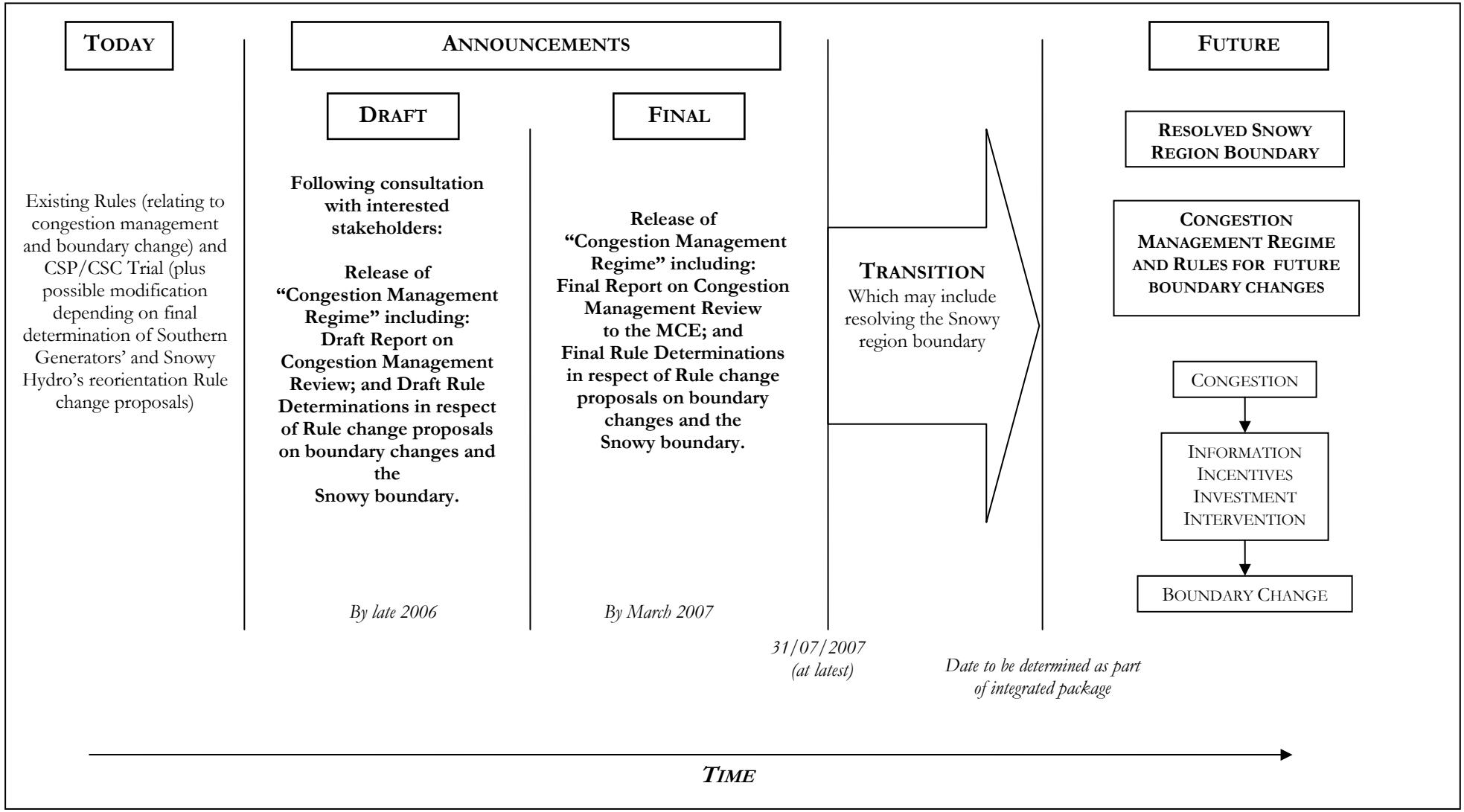
By the end of March 2007, the Commission will also clarify transitional arrangements that would be necessary as a consequence of any staged implementation of components of the "Congestion Management Regime" to avoid participant dislocation and disruption to the market. If a decision were to be made to change the Snowy region boundary and implementation of the change was not possible by 31 July 2007 (the expiry of the Snowy trial), the co-ordinated transition process may consider the extension of the Snowy trial (as amended) if necessary, as one possible transition option.

The diagram below shows the Commission's intended approach to its congestion management program.

The Commission considers that it is important for stakeholders to be well informed about the process the Commission will adopt in finalising these inter-related proposals. This Statement of Approach reflects the Commission's commitment to: adopt an open process; be clear about its analytical approach; manage related matters in a co-ordinated and integrated manner; and provide interested stakeholders with the earliest opportunities to understand and respond to issues.

Australian Energy Market Commission
6 June 2006

Congestion Management Program - Statement of Approach



Appendix 3 Draft Rule

See attached "Draft Rule".

DRAFT RULE

Draft National Electricity Amendment (Management of negative settlement residues in the Snowy Region) Rule 2006

under the National Electricity Law as applied by:

(a) the National Electricity (South Australia) Act 1996; and
(b) the Electricity (National Scheme) Act 1997 of the Australian Capital Territory; and
(c) the National Electricity (New South Wales) Act 1997 of New South Wales; and
(d) the Electricity - National Scheme (Queensland) Act 1997 of Queensland; and
(e) the Electricity - National Scheme (Tasmania) Act 1999 of Tasmania; and
(f) the National Electricity (Victoria) Act 1997 of Victoria; and
(g) the Australian Energy Market Act 2004 of the Commonwealth.

The Australian Energy Market Commission makes the following Rule under the National Electricity Law.

John Tamblyn
Chairman
Australian Energy Market Commission

DRAFT RULE

Draft National Electricity Amendment (Management of negative settlement residues in the Snowy Region) Rule 2006

1. Title of Rule

This Rule is the *National Electricity Amendment (Management of negative settlement residues in the Snowy Region) Rule 2006.*

2. Commencement

This Rule commences operation on [insert date].

3. Amendment of the National Electricity Rules

The National Electricity Rules are amended as set out in Schedule 1.

4. Notes

Notes do not form part of this Rule

DRAFT RULE

Schedule 1 Amendment of National Electricity Rules

(Clause 3)

[1] Chapter 8A, Part 8 Network Constraint Formulation

In Part 8 after paragraph (c), insert:

(c1) Clause (c) does not apply to the use of a *network constraint* referred to in the 'Murray/Tumut constraint list' developed pursuant to clause (f).

[2] Chapter 8A, Part 8

Omit Part 8 sub-paragraph (n)(2), and insert:

(2) *Trading amounts* determined as follows:

$$TA_1 = \text{Min}\ (\ EVA_N, IRSR_{Sn\text{-}NSW}\ )$$

$$TA_7 = -1 \times \text{Min}\ (\ 0, IRSR_{Vic\text{-}Sn}\ )$$

$$TA_2 = -1 \times TA_1 - TA_7$$

Where:

TA_1	is a *trading amount* for Snowy Hydro Limited;
$IRSR_{Sn–NSW}$	is the inter-regional settlement residue allocated to flows **from the Snowy *region* to the NSW *region*** for the relevant *trading interval*;
$IRSR_{Vic–Sn}$	is the inter-regional settlement residue allocated to flows **from the Victorian *region* to the Snowy *region*** for the relevant *trading interval*;
TA_2	is a *trading amount* for the inter-regional settlement residue allocated to flows **from the Snowy *region* to the NSW *region***; and
TA_7	is a *trading amount* for the inter-regional settlement residue allocated to flows **from the Victorian *region* to the Snowy *region*.**

[Drafting Note – The highlighted text is for the purpose of clearly indicating the changes being made for the purposes of this draft Rule only.]

DRAFT RULE

[3] Chapter 8A, Part 8

Omit Part 8 subparagraph(o)(4) and substitute:

(4) A *settlements residue trading amount* determined as follows:

$$TA_8 = -1 \times \text{Min}(0, IRSR_{Sn\text{-}Vic})$$

Where:

TA_8 is a *trading amount* for the inter-regional settlement residue allocated to flows **from the Snowy *region* to the Victorian *region***; and

$IRSR_{Sn–Vic}$ is the inter-regional settlement residue allocated to flows **from the Snowy *region* to the Victorian *region*** for the relevant *trading interval*.

(5) A *settlements residue trading amount* determined as follows:

$$TA_6 = (-1 \times TA_3) - TA_4 - TA_5 - TA_8$$

Where:

TA_6 is a *trading amount* for the inter-regional settlement residue allocated to flows **from the NSW *region* to the Snowy *region***; and

$IRSR_{Sn–Vic}$ is the inter-regional settlement residue allocated to flows **from the Snowy *region* to the Victorian *region*** for the relevant *trading interval*.

[Drafting Note – The highlighted text is for the purpose of clearly indicating the changes being made for the purposes of this draft Rule only.]