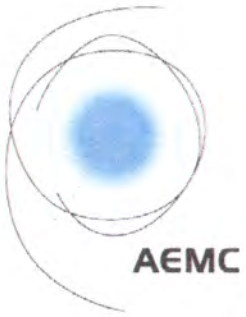

Australian Energy Market Commission

Draft Rule Determination

Draft National Electricity Amendment (Abolition of Snowy Region) Rule 2007

Rule Proponent
Snowy Hydro Limited

19 January 2007

Signed: .....

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For and on behalf of
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AEMC 2007, *Abolition of Snowy Region*, Draft Rule Determination, 19 January 2007, Sydney.

About the AEMC

The Council of Australian Governments, through its Ministerial Council on energy, established the Australian Energy Market Commission (AEMC) in July 2005 to be the Rule maker for national energy markets. The AEMC is currently responsible for Rules and policy advice covering the National Electricity Market. It is a statutory authority. Our key responsibilities are to consider Rule change proposals, conduct energy market reviews and provide policy advice to the Ministerial Council as requested, or on AEMC initiative.

Contents

This Draft Rule Determination is 208 pages. This includes these introductory pages and the Executive summary, but excludes the Draft Rule. The Draft Rule is 22 pages.

Executive Summary

Snowy Hydro has lodged a Rule change proposal (Snowy Hydro proposal) to abolish the Snowy region, which currently includes its generators located at Tumut and Murray. Snowy Hydro proposed that its Tumut plant (and Guthega) be located in the New South Wales (NSW) region and the Murray plant in the Victoria region. The Snowy Hydro proposal would reduce the number of National Electricity Market (NEM) regions and separately price Snowy Hydro's plant at NSW and Victoria region prices.

Subsequent to receiving the region boundary Rule change proposal from Snowy Hydro, the Commission formally received an alternate Rule change proposal from Macquarie Generation (Macquarie Generation proposal). Macquarie Generation proposed that the Snowy Hydro generation plant be incorporated into two new regions that separately envelop the customers of northern Victoria and southern NSW. The Macquarie Generation proposal would increase the number of regions in the NEM. It would also separately price Murray and Tumut generation, but would involve new pricing arrangements for customers in southern NSW and northern Victoria.

In addition to the Macquarie Generation proposal, in its submission to the Commission on the Snowy Hydro and Macquarie Generation proposals, Eraring Energy proposed an alternative model where the Tumut and Murray generation facilities would be located in their own separate regions. The Eraring Energy model would also increase the number of regions in the NEM. As with the Snowy Hydro proposal, the Eraring Energy model would price Tumut and Murray generation differently without introducing any new customer pricing arrangements.

The Ministerial Council on Energy (MCE) has requested that the Commission consult with the jurisdictions in relation to proposals that could result in market region boundaries being different to jurisdictional boundaries. This additional step means that the Commission's Draft Rule Determination on the Macquarie Generation proposal will be subsequent to this Draft Rule Determination on the Snowy Hydro proposal. However, the Commission will not formulate its Final Rule Determination on the Snowy Hydro proposal until it has published its Draft Rule Determination on the Macquarie Generation proposal. In the meantime, while not a formal Rule change proposal, the Commission has used the Eraring Energy model to provide an additional reference point against which to assess and compare the benefits of the Snowy Hydro proposal. In this Draft Rule Determination, the Eraring Energy model is referred to as the "Split Region Option".

The Snowy region has attracted ongoing attention since the commencement of the NEM in 1998 because of a number of "legacy issues". These legacy issues relate to the material and enduring transmission network congestion in the Snowy region and the associated market distortions that result.

The features of the transmission network in and around the Snowy region can cause outcomes inconsistent with the intended operation of the regionally priced NEM, in which power would normally flow from a lower priced region to a higher priced region. As a result of these transmission characteristics, there are occasions when power flows from a higher priced region to a lower priced region (called "counter-

price flows"). When these counter-price power flows occur, customers are paying less for power than the generators are entitled to receive. The difference, commonly referred to as "negative settlement residues", imposes a financial obligation and risk on the National Electricity Market Management Company (NEMMCO). NEMMCO has managed these financial risk by restricting (or "clamping") the flow of power from high to low priced regions to prevent negative settlement residues from occurring.

While clamping enables NEMMCO to manage its financial risks, it has the effect of undermining inter-regional competitive pressure. In turn, this affects generator bidding behaviour, which can distort production and pricing decisions and waste resources.

Since October 2005, two substantial interim measures have been introduced to address the congestion-related issues specific to the Snowy region.[a] These interim measures served two main purposes: (1) to better align market incentives with more economic efficient outcomes; and (2) to provide NEMMCO with an alternative risk management mechanism to clamping when power flow between the Snowy, Victoria, and NSW regions results in negative settlement residues.

While the Commission found the interim arrangements in the Snowy region to be effective, it considered that adopting them as a longer term solution would be suboptimal.

Possible longer term options to address the legacy issues in the Snowy region include transmission network investment and region boundary changes. It appears unlikely that these issues will be addressed by investment solutions in the medium-to-longer term. The region boundary Rule change proposals submitted by Snowy Hydro and Macquarie Generation, therefore, represent potentially feasible long-term solutions, which, as noted above, the Commission is assessing sequentially.

The Commission's assessment of the Snowy Hydro proposal, including its consideration of related submissions, indicates that the abolition of the Snowy region is likely to result in efficiency improvements and would be consistent with principles of good regulatory practice. The Commission considers, therefore, that the Snowy Hydro proposal promotes the NEM Objective. This Draft Rule Determination sets out the analysis and assessment that has informed the Commission's draft decision.

In summary, the abolition of the Snowy region is expected to result in generators offering their capacity at prices that more closely match their costs. This is expected to result in more efficient dispatch and lower prices, particularly in NSW. These lower prices should also be associated with a greater convergence of inter-regional prices. More closely matched regional prices lower the risks of inter-regional

[a] The Tumut Constraint Support Pricing/Constraint Support Contact (CSP/CSC) Trial commenced on 1 October 2005. On 14 September 2006, the Commission made the *National Electricity Amendment (Management of Negative Settlement Residues in the Snowy Region) Rule 2006* (Southern Generators Rule), which amended the Tumut CSP/CSC Trial. The Rule commenced on 1 November 2006.

hedging. This can be expected to increase inter-regional trading increasing choice and easing entry barriers for retailers and generators.

To understand why these results have emerged, it is necessary to first understand the incentives created by the current Snowy region. The next step involves understanding the effect on these incentives from the abolition of the Snowy region.

Under the assumptions of the Commission's base case for the Snowy Hydro proposal,[b] Snowy Hydro has an incentive, at time of northward flows[c], to bid in a way to force NEMMCO to clamp the interconnector between the Victoria and Snowy regions. Snowy Hydro has an incentive (and capability) to do this because clamping effectively restricts the competition for generators in adjacent regions. Lower competition allows the NSW generators to bid, and set, higher prices than they would otherwise. Snowy Hydro benefits from these higher prices. Importantly, Snowy Hydro's strategic use of its plant to control flows (and clamping) between Victoria and NSW allows both the Tumut and Murray generation facilities to earn the relatively higher prices that Snowy Hydro helps generate.

This behaviour promotes an inefficient pattern of dispatch as cheaper (inter-regional) generators are prevented from contesting the market due to the clamping of the Victoria-to-Snowy interconnector. This results in higher production costs, which represents a waste of resources. The clamping of the interconnector, together with the higher prices (which tends to increase inter-regional price differences) also increases the risks of inter-regional trading. Increased inter-regional trading risk will discourage participants from trading across regions and will reduce participant trading choices. This will also impede competition in the hedge contract market.

The abolition of the Snowy region has the effect of encouraging stronger competitive forces. It does this by reducing, but not eliminating, the profitable opportunities for Snowy Hydro to engage in strategic behaviour that increases the prices received by both its Murray and Tumut generation. This occurs because Tumut and Murray generation would receive the prices applying in separate pricing regions (NSW and Victoria respectively) rather than all of Snowy Hydro's capacity receiving a single price, as under the current region structure.

The results of the modelling undertaken for the Commission support this proposition. Importantly, the modelling indicated that there was a greater likelihood that prices would reflect more competitive bidding when Snowy Hydro was less able to set higher prices for both Tumut and Murray generation. The Commission's modelling also showed that when Snowy Hydro behaved more competitively, other generators, particularly in NSW, were also encouraged to behave more competitively. The modelling indicated that when generators behaved more competitively, output levels and prices were more reflective of the underlying generation cost structure.

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[b] The base case reflects the current Snowy region boundaries but excludes the Snowy region specific interim arrangements (i.e. the Tumut CSP/CSC Trial and Southern Generators Rule).

[c] Similar incentives and strategies are available to Snowy Hydro in the event of southward flows.

Thus, the Commission's analysis indicates that the abolition of the Snowy region would release competitive forces that would in turn drive more efficient patterns of dispatch and pricing. Closer inter-regional prices were estimated to materially reduce inter-regional trading risk, which the Commission considers will encourage further inter-regional trading and competition in the contract market.

These outcomes are expected to have a positive influence on the long term development of the NEM. More competitive dispatch and pricing will result in more efficient and predictable price signals. Together with a widening and deepening of trading resulting from lower inter-regional trading risk, more efficient dispatch and pricing will assist participants in making more efficient investment decisions, inter-temporally and locationally.

The Split Region Option of dividing the Snowy region into two separate pricing regions with Tumut in one region and Murray in the other, has a similar effect to that of separately pricing Murray and Tumut in, respectively, Victoria and NSW. As with the Snowy Hydro proposal, there are fewer opportunities for Snowy Hydro to profitably exploit its generation so as to import higher prices from adjoining regions across its portfolio of plant. For this reason, the Split Region Option results in similar dispatch and pricing outcomes to the Snowy Hydro proposal.

A potential difference with the Split Region Option not associated with the Snowy Hydro proposal is that an increase in the number of pricing regions increases the risk and complexity of trading between Victoria and NSW. The trading risk modelling did not show this outcome because the modelling assumes that participants have perfect information about the frequency, duration, and severity of inter-regional price differences. In reality, participants tend to discount the value of inter-regional hedges because they cannot predict these risk characteristics with a sufficient degree of accuracy. Also, the difficulty, cost, and risk of trading inter-regionally is likely to increase with a greater number of regions given that participants would have to buy inter-regional hedging products through an additional Snowy region.

In addition to the efficiency consequences of the Snowy Hydro proposal, the Commission has considered other aspects of the proposal, as well as that of the Split Region Option. In particular, the Commission has considered the extent to which the Snowy Hydro proposal satisfies the requirements of good regulatory practice. The Commission considers that good regulatory practice is important both as a principle in itself and also as a means to the end of promoting economic efficiency for the long-term benefit of consumers.

While good regulatory practice is difficult to comprehensively define, it is orientated towards promoting stability and predictability of the regulatory framework for the NEM and encompasses:

- minimisation of operational intervention in the NEM;
- promotion of changes that are likely to be robust over the longer term; and
- promotion of transparency of the operation of the NEM.

In these respects, the Snowy Hydro proposal compares well to the current region boundary. The current Snowy region boundary arrangements have spawned a number of interim intervention measures that do not apply generally across the NEM, including NEMMCO clamping, the Tumut CSP/CSC Trial, re-orientation of pricing to adjacent regional nodes, and positive inter-regional settlements residues being used to offset negative settlement residues elsewhere.

To the extent that the Snowy Hydro proposal reduces or eliminates the need for these special arrangements, it will be consistent with good regulatory practice. The absence of these intervention arrangements should lead to a more predictable and transparent market. On this basis, the Commission concludes that the Snowy Hydro proposal to abolish the Snowy region is consistent with good regulatory practice.

The Commission has also considered the effects Rule change proposals may have on power system security and supply reliability. The Commission does not expect that the Snowy Hydro proposal or the Split Region Option would have any adverse consequences for power system security or supply reliability. Rather, as indicated above, the Commission expects that the more economically efficient and, therefore, predictable market signals will assist investors in making more timely and locationally efficient investment decisions.

In summary, the Commission considers that the Snowy Hydro proposal is likely to promote greater competition leading to more efficient dispatch, pricing, and inter-regional trading. In turn this is likely to lead to more efficient investment production and consumption decisions in the long term. These anticipated results are consistent with the NEM Objective, which is oriented to improving outcomes for customers. The Commission has therefore concluded that the Snowy Hydro proposal promotes the NEM Objective and satisfies the Rule making test. The Commission therefore intends to make the Draft National Electricity Market Amendment (Abolition of Snowy Region) Rule 2007 (Draft Rule).[d]

This is the first significant NEM region boundary restructure since NEM commencement. The Draft Rule proposes to abolish the Snowy region on 4 November 2007. Implementation of the Snowy Hydro proposal is a complex matter. A number of implementation issues are addressed in the Draft Rule and explained in Section 7 of this Draft Rule Determination. The Commission is seeking further comment on implementation matters in preparing the Final Rule.

Interested stakeholders are invited to make comment on the issues outlined in this Draft Rule Determination. Submissions should be received by 9 March 2007. 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

[d] Note: Previously referred to as the proposed National Electricity Market Amendment (Snowy Region Boundary) Rule 2006.

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1 The Snowy Hydro proposal

On 11 November 2005, the Commission received a Rule proposal from Snowy Hydro regarding a change to the existing Victorian and NSW region boundaries that would effectively abolish the Snowy region of the NEM. Snowy Hydro submitted a revised Rule drafting 22 December 2005. This revised Rule drafting replaced the original proposed Rule drafting included in Snowy Hydro's proposal of 11 November 2005. This Section describes Snowy Hydro's Rule change proposal and the problems Snowy Hydro has identified as being addressed by its proposal.

The Snowy Hydro Proposal is for a one-off change to the Snowy region boundary. The proposed new boundary would effectively abolish the Snowy region by altering the NSW and Victorian regional boundaries, relocating Snowy Hydro's Upper and Lower Tumut generation to the NSW region and its Murray generation facility to the Victorian region. This boundary change would eliminate the current notional interconnectors between Victoria and Snowy and Snowy and NSW, replacing them with a single notional interconnector between Victoria and NSW.

Snowy Hydro stated that its proposal would address some of the detrimental impacts caused by the persistent and significant intra-regional congestion occurring within the Snowy region. In its proposal, Snowy Hydro stated that the Murray to Tumut transmission flow is the most problematic intra-regional constraint in the NEM and noted that since 2002, the Murray–Tumut constraint has bound (i.e. the line flow reached its capacity limit) for a significant number of hours.[1] Snowy Hydro argued that under the existing region structure with the Tumut Constraint Support Pricing (CSP)/Constraint Support Contract (CSC) mechanism in place[2], the treatment of this Murray-Tumut constraint has led to economically inefficient outcomes. This is because generators based in the NSW region are encouraged to bid below their costs in order to be dispatched and receive the relatively high NSW price. On the other hand, Snowy Hydro's generation at Tumut cannot compete with these generators because Tumut's bids affect the price it receives under the CSP/CSC mechanism. In addition, Snowy Hydro faces incentives to limit the available capacity of its Tumut generation in order to gain access to (high) NSW prices. Snowy Hydro stated that this has the effect of limiting available generation for the Victorian and South Australian regions, thereby increasing prices in these regions above what they would be otherwise. Snowy Hydro also argued this masking of price signals leads to inefficient generation and transmission investment decisions in the long term.[3]

Snowy Hydro considered that a region boundary change was the most appropriate long term solution to address these inefficiencies. Snowy Hydro also noted that because the Murray-Tumut constraint is located in the Kosciusko National Park,

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1 Snowy Hydro Limited, Rule Change Proposal for the Snowy Region: Revision of Transmission Connection Nodes, Rule change proposal, 11 November 2005, p.3.

2 National Electricity Rules, Chapter 8, Part 8, clauses (e1) to (m).

3 Snowy Hydro proposal, Appendix B.

there was limited prospect of transmission investment (to increase the Murray to Tumut flow capacity) in order to alleviate the congestion.

Snowy Hydro acknowledged the Ministerial Council on Energy (MCE) Rule change proposal for revising the existing regional boundary structure and change criteria. This proposal relies on a staged process to boundary change involving transitional constraint management mechanisms and investigation of investment options prior to boundary changes being considered. However, Snowy Hydro argued that the delay associated with this staged approach, which would mean that a boundary change could not be implemented until 2010[4], would mean that the inefficiencies created by the current regional topography would persist for an unnecessarily long period. Snowy Hydro considered that its Rule change proposal was complementary to the MCE's and that "the implementation of [its] Rule change [would] provide a sound basis of regional boundaries for future implementation of the MCE Rule change request"[5]. This assertion was based on notion that the MCE's approach supported region boundary change only where material and enduring congestion existed, as between Murray and Tumut.

In its proposal, Snowy Hydro stated that it had also considered two alternative boundary changes.[6] These were either to either:

- split the current Snowy region by creating a new Tumut region with Murray remaining in the Snowy region (similar to the Eraring Proposal[7]); or

- to create two new regions (Western NSW[8], and Northern Victoria[9]).

Snowy Hydro noted that a Tumut region would not meet the MCE's proposed criteria for regional boundaries as it would not contain any material load and stated that the other option of two new regions was not viable in the short-to-medium term due to the profound market disruptions to most market participants. Snowy Hydro concluded that its proposal was the most viable configuration option because the disruption to hedging contracts would be minimised and that Snowy Hydro will be the sole market participant directly affected by the change.

Snowy Hydro considered that its Rule change proposal would contribute to the NEM Objective by:

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4 Snowy Hydro proposal, p.1.

5 Snowy Hydro proposal, p.1.

6 Snowy Hydro proposal, p.4.

7 Eraring Energy, Submission to AEMC, *Review of Snowy Regional Boundary by Snowy Hydro, Review Of Snowy Regional Boundary by Macquarie Generation*, 22 March 2006.

8 The Western NSW region would include: Tumut generation; load centres at Wagga, Canberra and Yass; and generation centres at Mt. Piper, Wallerawang, Bayswater, and Liddell.

9 The Northern Victoria region would include Murray and Dederang connected generation, and loads in northern Victoria.

- reducing cost to customers by improving the incentives on Tumut to increase available generation and allowing Tumut generation to compete on a equal footing with "western ring"[10] generators;

- promoting efficient investment in transmission and generation by creating more transparent price signals through aligning the regional boundaries with significant points of congestion ; and

- contributing to the efficient pricing of electricity through improved congestion management and handling of loop flow.

Snowy Hydro recognised that the current derogation for the Tumut CSP/CSC Trial helped to restore efficient incentives for generation located at Tumut in the presence of network constraints between Murray and Tumut. However, Snowy Hydro noted that not only was the trial set to expire on 31 July 2007, but that it did not address the issues associated with generation located at Murray,[11] nor the issue of intra-regional constraints deeper in the NSW network that affected the incentives of Tumut and the NSW generators.

Regarding implementation, Snowy Hydro proposed that the Rule change commence on 1 August 2007, coinciding with the end of the Tumut CSP/CSC Trial, and should follow a one-year implementation period to allow for NEMMCO loss factor adjustment and system changes.

[10] The western ring generators are those located around western NSW and include Mt Piper, Wallerawang, Bayswater, and Liddell.

[11] These issues are currently addressed by the derogation implementing the Southern Generators Rule, National Electricity Rules, Chapter 8A, Part 8, clauses (n) to (p) inclusive.

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2 Commission's decision-making framework

2.1 Policy context for considering Rule change proposals

The Commission's Draft Rule Determination on the Snowy Hydro proposal has been made against a background of a number of reviews and Rule change proposals directed at ensuring an efficient, reliable and secure power system in the NEM. The Commission has been conducting an extensive work program involving changes that will affect the efficiency of the market, transmission investment decisions, supply reliability and security of the power system and relate to the reform of regional boundaries and the management of congestion within the NEM. Published on 7 December 2006, the Commission's "Congestion Management Program – Statement of Approach – December 2006" sets out the integrated way in which the Commission intends to consider these congestion related Rule changes and the Congestion Management Review in the context of the Commission's broader work program.[12] The program includes consideration of the:

- MCE's Rule change proposal on reform of region boundaries;
- Congestion Management Review reference by the MCE;
- Review of transmission revenue and pricing regulation (reform of Chapter 6 of the Rules dealing with the economic regulation of transmission);
- Comprehensive Reliability Review; and
- MCE's Rule change proposals on Last Resort Planning Power and Regulatory Test.[13]

Furthermore, the Commission has issued Determinations on a number of Rule changes relating to issues associated with the Snowy region. These include making the Rule Determination on the Management of negative residues in the Snowy region (the "Southern Generators Rule")[14] and Final Rule Determination on the Management of negative residues by re-orientation.[15] In addition, the Commission also made a Rule on the Recovery of Negative Inter-regional Settlements Residue.[16]

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[12] The December 2006 Statement of Approach supersedes the Commission's previously released "Congestion Management Program - Statement of Approach – June 2006".

[13] A summary of the Statement of Approach – December 2006, the reforms, and related Rule changes is included in Appendix E of this Draft Rule Determination.

[14] AEMC 2006, Management of negative settlement residues in the Snowy region, Final Rule Determination, 14 September 2006, Sydney.

[15] AEMC 2006, Management of negative settlement residues by re-orientation, Final Rule Determination, 9 November 2006, Sydney.

[16] AEMC 2006, Recovery of Negative Inter-regional Settlements Residue, Final Rule Determination, 30 March 2006, Sydney.

The Commission considers that the above reviews and Rule changes are inter-related and complementary. It notes the importance of ensuring work in these areas is co-ordinated and results in a coherent set of arrangements for the NEM.

The Commission also notes the work the Energy Reform Implementation Group (ERIG) is undertaking to recommend to the Council of Australian Governments further reforms for the Australian energy market. ERIG's review is in the areas of: the national structure of the electricity transmission network, the efficiency of energy market structures and the performance of the energy financial markets. It recently released a series of discussion papers considering possible reforms in these areas.[17]

The Commission considers that the issues of congestion management and boundary location in the Snowy region are of more immediate significance than those that may currently arise elsewhere in the NEM. This is principally because of the network topography of the Snowy area, which involves a network loop that 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.

The Commission recognises that the issues that the Snowy Hydro proposal seeks to address overlap with these other reform programs. Therefore, it is important both that the work is co-ordinated and that the approach is consistent. Consideration of the Snowy Hydro proposal must have regard to this wider reform context.

2.2 Role of the NEM Objective

When considering and making decisions on reviews and Rule change proposals, the Commission is bound by the NEM Objective, which 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."[18]

Under the Rule-making test, the Commission is only able to adopt a proposed Rule if it is satisfied that the Rule will or is likely to promote the NEM Objective. The likely economic efficiency effect of a proposal on the market is an important element of applying the NEM Objective.

Economic efficiency is commonly defined as having three elements:

- Productive efficiency – meaning the electricity system is operated on a "least cost" basis given the existing and likely network and other infrastructure. For example, generators should be dispatched in a manner that minimises the total system costs of meeting consumers' demands;

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[17] ERIG, Discussion Papers, November 2006.

[18] Section 7, National Electricity Law.

- Allocative efficiency – meaning electricity production and consumption decisions are based on prices that reflect the opportunity cost of the available resources; and

- Dynamic efficiency – meaning maximising ongoing productive and allocative efficiency over time, and is commonly linked to the promotion of efficient longer term investment decisions.

The Commission has taken the view that the NEM Objective is not solely focussed on a technical approach to the promotion of efficiency. Rather, the NEM Objective has implications for the means by which regulatory arrangements operate as well as their intended ends. This means that the Commission also seeks to promote stability and predictability of the regulatory framework. This, in turn, means that the Commission will seek to:

- Minimise operational intervention in the market – intervention in the operation of competitive markets should be limited to circumstances of market failures. Further, the Commission recognises that market failure is only a necessary and not sufficient condition for regulatory intervention;

- Promote changes that are likely to be robust over the longer term – other things being equal, the Rules for the dispatch and pricing of the market should be sufficiently stable and predictable to enable participants to plan and make both short- and long-term decisions; and

- Promote transparency in the operation of the NEM – to the extent that intervention in the market is required, it should be based on, and applied according to, transparent criteria.

These requirements are founded on the principles of good regulatory design and practice, which the Commission believes is central to its task in furthering the NEM Objective.

In applying the Rule-making test and considering the role of the NEM Objective, the Commission may give weight to any such aspect of the NEM Objective as it considers appropriate in all the circumstances, having regard to any relevant MCE statement of policy principles.

The NEM Objective requires the Commission to consider the likely effect of a Rule proposal on the quality, security, and reliability of the national electricity system. The Commission will carefully consider Rule proposals that may have implications for these important factors.

The Commission also notes that any proposed Rule change may have distributional impacts. The Commission considers that the NEM Objective is primarily concerned with efficiency and good regulatory practice. These qualities will help ensure that the market arrangements will benefit consumers in the long term. Rather than seeing distributional outcomes as a distinct limb or component of the NEM Objective, the Commission has taken the view that distributional outcomes have relevance only in so far as they may negatively influence the stability and integrity of the market arrangements. Basing fundamental decisions on the operation of the market primarily on distributional criteria rather than efficiency and good regulatory

practice is likely to be counter-productive to the interests of consumers in the long term.

2.3 Criteria for, and approach to, decision making

When considering congestion and region boundary related proposals, the Commission will have regard to a range of matters based on promotion or fulfilment of the NEM Objective. These matters form the Commission's decision criteria for, and approach to, assessing the relevant proposal.

The Commission's decision criteria are as follows:

- The likely effect of the proposal on the economic efficiency of dispatch – being the minimisation of the resource costs of dispatch to meet load;
- The likely pricing outcomes (and participant responses) – in that pricing outcomes may have implications for allocative and dynamic efficiency in the future;
- The likely effect of the proposal on inter-regional trading and risk management – which may affect the competitiveness of the market and allocative and dynamic efficiency in the future;
- The likely effect of the proposal on power system security, supply reliability, and technical factors;
- Whether the proposal is consistent with good regulatory practice;
- The likely long-term implications of the proposal and consistency with public policy; and
- The likely timing of the proposal and any issues associated with implementation of the proposal.

The Commission considers that proposals that encourage competition in the wholesale market will increase the likelihood of efficient production and pricing and this, in turn, will increase economic welfare.

The Commission understands that a regional boundary change proposal may perform positively on certain criteria and negatively on others. For example, a regional boundary proposal that involves an increase in the number of regions in the NEM may both:

- improve the technical economic efficiency of the dispatch process; and
- increase the transaction costs associated with interregional trading.

The Commission believes some degree of trade-off between a proposal's performance against the decision criteria is likely to be inherent in any Rule change that affects the location of boundaries in the NEM. The Commission's task is to exercise sound judgement in adopting the option which best meets all of the criteria on the whole.

In addition, the Commission wishes to ensure that it adopts a rigorous *approach* to evaluating Rule change proposals including by:

- Clearly describing the problem(s) to be addressed to ensure that the Commission has a clear understanding of what problem(s) the proposal is trying to address in order to develop an appropriate assessment framework;

- Assessing the materiality of these problems to ensure that the uncertainty that inevitably follows a Rule change process is justified in light of the severity of the problem;

- Applying well developed and accepted economic analysis to evaluate the effects of the proposal, supported by empirical modelling where appropriate, and

- Seeking stakeholder views on the Commission's characterisation of the problem, assessment of the materiality of the problem, approach for analysing the merit of the Rule change proposal, and, ultimately, the Commission's assessment of the merits of the proposal evaluated against the NEM Objective.

2.4 Analytical framework and modelling approach

As indicated above, the Commission's approach to the Snowy Hydro proposal begins with a characterisation of the underlying problem that the proposal is seeking to address. This does not imply that the Commission's role is to assess Rule change proposals by recasting them in such a way as to fit within a broader market design philosophy. However, without a clear understanding of the underlying problem to be addressed, the Commission would be ill-equipped to properly assess the proposal.

Section 1 noted the proponent's views on the merits of its proposal in terms of the shortcomings in the market that it seeks to address. The Commission has considered these views and, against the background of the policy context, makes the following observations:

- There is a constraint within the existing Snowy region that appears to be material and growing in its frequency and duration.

- As further discussed in Section 3, regional boundaries were intended to reflect major "pinch-points" of transmission congestion, in order to promote efficiency in dispatch, trading and investment.

- The constraints between Murray and Tumut power stations, which are both owned and operated by Snowy Hydro, presently provide it with incentives to behave in certain ways that can be inconsistent with the NEM Objective.

- This raises the question of whether and how regional boundaries should be structured in and around the Snowy region in order to minimise distortions to generator bidding and dispatch and participant contracting behaviour.

Considering the Snowy Hydro proposal in this light should help ensure that the Commission's assessment leads to the promotion of the NEM Objective.

The Commission has therefore determined in accordance with s.99 of the NEL to publish this Draft Rule Determination in relation to the Snowy Hydro proposal and a draft of the Rule to be made (the Draft Rule).

In making this Draft Determination, the Commission has taken into account:

1. the Commission's powers under the NEL to make the Rule (see Section 6.1);

2. the Snowy Hydro 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.

The Commission believes that in order to thoroughly assess the merits of the Snowy Hydro proposal, it is necessary to compare it to a number of alternative outcomes. Therefore the Commission's analytical framework has included an assessment of the Snowy Hydro proposal against two alternative cases. As discussed in Section 1, the Snowy Hydro proposal seeks to effectively abolish the Snowy region as it currently stands and replace the existing interconnectors between the Victorian and Snowy regions and Snowy and NSW regions with a single interconnector between Victoria and NSW on a permanent basis. The two alternative cases consider other possible variations to the Snowy region boundary.

The first alternative is the "business-as-usual" (BAU) base case scenario. This scenario retains the current Snowy region boundary but removes the existing interim arrangements (the modified Tumut CSP/CSC Trial, including the Southern Generators' Rule[19]) that manage the problematic congestion between Murray and Tumut. The Commission considered this scenario to be the most relevant "counterfactual" to the Snowy Hydro proposal because:

- the Snowy Hydro proposal is for a permanent change in the location of regional boundaries in the Snowy region; and

- the modified Tumut CSP/CSC Trial (including the Southern Generators' amendment) is a trial and was not intended to be a permanent solution to congestion management in the Snowy region.[20]

The second alternative is the "Split Region Option". This is an option that splits the Snowy region in two, creating a Tumut region and a Murray region with a new region boundary between Tumut generation and Murray generation. The option is based on the submission made by Eraring Energy on the Snowy Hydro and

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[19] National Electricity Rules, Chapter 8, Part 8, clauses (e1) to (p) inclusive. See also AEMC 2006, Southern Generators' Final Determination.

[20] On 14 December 2006, the Commission published a draft determination on the extension of the expiry date for the Trial and NEMMCO's power to manage negative residues by extending the expiry date of the participant derogation in Part 8 of Chapter 8A of the Rules. The Commission is proposing to extend the derogation from 31 July 2007 to the earlier of such time as there is a boundary change to the Snowy region or 30 June 2008.

Macquarie Generation boundary change proposals.[21] However, this option is not a formal Rule change proposal. Rather, the Commission has considered this option to better understand the effects of creating separate regional nodes that separately price Tumut and Murray generation.

These alternative scenarios are more fully described below.

In addition, on 6 February 2006, the Commission received a Rule change proposal to change the Snowy region boundaries from Macquarie Generation.[22] Macquarie Generation's proposal seeks to alter the NSW and Victorian regional boundaries so as to effectively abolish the existing Snowy Region and replace it with two new NEM regions: one in Northern Victoria and the other in South-West New South Wales.

The new region boundaries proposed by Macquarie Generation would provide for:

- a regional boundary between Tumut generation and Murray generation;
- the retention of a region boundary between Tumut generation and the NSW regional reference node, albeit at a more northerly location than the current Snowy region northern boundary;
- a region boundary between existing points between Dederang in northern Victoria and the Victoria regional reference node (RRN);
- a South-West NSW RRN at Wagga Wagga and a Northern Victoria RRN at Dederang;
- removal of the two existing interconnectors between Victoria and Snowy and between Snowy and NSW; and
- creation of three new interconnectors between Victoria and Northern Victoria, between Northern Victoria and South-West NSW and between South-West NSW and NSW.

Like the Snowy Hydro proposal, the purpose of Macquarie Generation's proposal is to address the perverse dispatch and pricing outcomes caused by the intra-regional congestion within the Snowy region.

The Commission has been progressing its consideration of the Macquarie Generation Rule change proposal. However, the Macquarie Generation proposal has not been analysed as an alternative to the Snowy Hydro proposal in this Draft Determination. This is partly to have regard to the MCE's desire, as expressed in its Rule Change proposal on Region Boundaries, for the Commission to consult with jurisdictions. MCE stated that the Commission should consult with the relevant jurisdictions on managing retail customer pricing implications if the Commission contemplates making a region boundary change that creates more than one region within a

[21] Eraring Energy s95 submission, Snowy Hydro and Macquarie Generation proposals, 22 March 2006, pages 5-7.

[22] Macquarie Generation, Rule Change Proposal to Establish NEM Regions in Northern Victoria and Southwest NSW, 6 February 2006.

jurisdiction before making a final determination on the boundary.[23] Consequently, as a matter of due process, such changes involve an additional step compared to other types of boundary change proposals. The Commission has commenced the jurisdictional consultation process on the Macquarie Generation boundary change proposal and needs to complete this process before publishing a Draft Rule Determination on the proposal. However, noting that the Macquarie Generation proposal is a mutually exclusive option to the Snowy Hydro proposal, the Commission intends to publish a Draft Determination on the Macquarie Generation proposal by the time it publishes its Final Rule Determination on the Snowy Hydro proposal.

In this context, the Commission makes the following preliminary observations on the Macquarie Generation proposal.

First, the proposal involves increasing the number of regions in the NEM, as does the Split Region Option. While increasing the number of regions may assist in improving productive or dispatch efficiency, a *large* increase in the number of regions could, as noted in a recent paper prepared by Firecone[24], also have detrimental effects on the market which may more than offset the positive impact of more regions in reducing mis-pricing in the NEM. For example, an increase in the number of regions could increase transactions costs for managing inter-regional price risk. This could reduce inter-regional contracting and promote alternative strategies such as participants trading *intra*-regionally or vertically integrating their operations.. While Macquarie Generation's proposal would not lead to a 'large' increase in the number of regions, it may potentially give rise to costs and participant responses similar to those described by Firecone, although to a lesser degree. This is a matter that will be given fuller consideration by the Commission in its Draft Rule Determination on the Macquarie Generation proposal.

Second, the Commission notes that the Macquarie Generation proposal is more complex and involved than the Snowy Hydro proposal and, as such, is likely to involve greater implementation delays and costs.

These objectives should not be construed as indicating that the Commission has formed any views on the merits of the Macquarie Generation boundary change proposal in terms of the NEM objective. Rather they are identifying issues of difference with the Snowy Hydro proposal which will be subject to full analysis and assessment in the Commission's separate consideration of the Macquarie Generation proposal.

Another possible alternative to address the problems in the Snowy region is to seek an investment option to augment transmission capacity in the region. This option and the difficulties with it are considered in Section 3.

The Commission has informed its Draft Rule Determination using both qualitative and quantitative analysis. A description of the quantitative approach is provided in

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[23] MCE, Rule Change Request, Reform of Regional Boundaries, 5 October 2006, p.7.

[24] Firecone Ventures, *The impact of locational pricing on the contract market*, November 2006 (Firecone report).

Appendix A. The qualitative assessments have been informed by the quantitative modelling, providing the Commission with a robust basis for arriving at its views on the Snowy Hydro proposal. The Commission's considerations and reasoning on the assessment criteria are presented in Section 5.

2.4.1 Business-as-usual (BAU) base case scenario

The purpose of the BAU counterfactual scenario is to provide a base case to assess the potential effect that implementation of the Snowy Hydro proposal may have on NEM outcomes. In particular, the comparison between the BAU counterfactual and the Snowy Hydro proposal should reveal if generator incentives change as a result a region boundary change, and if so, the effect that may have on the market.

In order to fulfil this role, the BAU base case scenario reflects the current regional structure and a market that does not include interim congestion management measures such as the Tumut CSP/CSC Trial and the Southern Generators' Rule. By using a base case scenario that excludes the Tumut CSP/CSC Trial and the Southern Generators' Rule, the Commission can isolate and properly assess the effect of the Snowy Hydro boundary change proposal on the market, and in doing so consider whether the proposal is likely to promote the NEM Objective.

However, the BAU scenario does incorporate parts (a) to (e) of the existing Part 8 network constraint derogation. These parts provide for:

- NEMMCO to develop and apply fully optimised constraint formulations (parts (a) and (b)); and
- NEMMCO to intervene to avoid significant counter-price flows (parts (c) and (d)). This includes mechanisms to restrict or "clamp" flows north from the Victorian to Snowy region and to re-orient the Snowy RRN from Murray to Dederang for southward flows when negative residues would otherwise arise.

The Commission considered that these 'core' parts of the derogation would also be retained under the Snowy Hydro proposal and the Split Region Option if they were implemented. It believes the broader issue of the need for NEMMCO to retain a power to intervene in the market to address the financing consequences of material counter-price flows is a NEM-wide matter which is beyond the scope of this Rule change proposal. That issue can be considered further in the context of the Commission's Congestion Management Review. Therefore, the capacity for NEMMCO intervention to address material counter-price flows would remain as a feature under all the options unless and until it is varied at some future time.

2.4.2 Split Region Option

In response to the Snowy Hydro and Macquarie Generation Rule change proposals, Eraring Energy (Eraring) put forward an alternative option to the two proposals in its submission.[25] Eraring suggested dividing the existing Snowy region into two

[25] Eraring Energy s95 submission, Snowy Hydro and Macquarie Generation proposals, 22 March 2006.

new regions: a Murray Region and a Tumut Region.[26] This would also create an additional interconnector between the two new regions. Eraring Energy viewed its (informal) proposal as a more robust, practical and less distortionary solution than the Snowy Hydro and Macquarie Generation proposals. The claimed benefits of this alternative included:

- creation of a new interconnector that would explicitly price the Murray to Tumut constraint;
- retention of the two existing interconnectors, thus maintaining explicit pricing of existing constraints in dispatch;
- resolution of the negative residue issues problems for Victoria to Snowy flows;
- avoidance of the creation of "basis risk" for most market participants; and consequentially
- ability to be implemented in a much shorter timeframe than the Snowy Hydro and Macquarie Generation proposals.

As noted above, Eraring Energy's suggested option was raised as part of its submission on the Snowy Hydro and Macquarie Generation proposals and is not presently a formal Rule change proposal for consideration by the Commission. Nevertheless, the Commission considers that it could be used as the basis for a comparator scenario to the Snowy Hydro proposal. However, prior to using it in this way, the Commission decided to make a modification to the option contained in the Eraring Energy submission by relocating the RRN for the Murray region from the Murray connection node to the Dederang node. This shift of the Murray RRN is designed to reduce the risk of counter-price flows arising from congestion between Murray and Tumut triggering a "spring washer" effect.[27] Nevertheless, as noted above, the Commission considered that the core parts of the current derogation – including allowing NEMMCO to intervene if material counter-price flows arise – would be retained under this option.

The Commission compared this "Split Region Option" to the Snowy Hydro proposal to inform its Draft Rule Determination.

2.4.3 Graphical depiction of the proposal and comparison scenarios

Figure 2.1 below presents a graphical explanation to the differences between the Snowy Hydro proposal and the alternative scenarios being considered to further inform the Commission.

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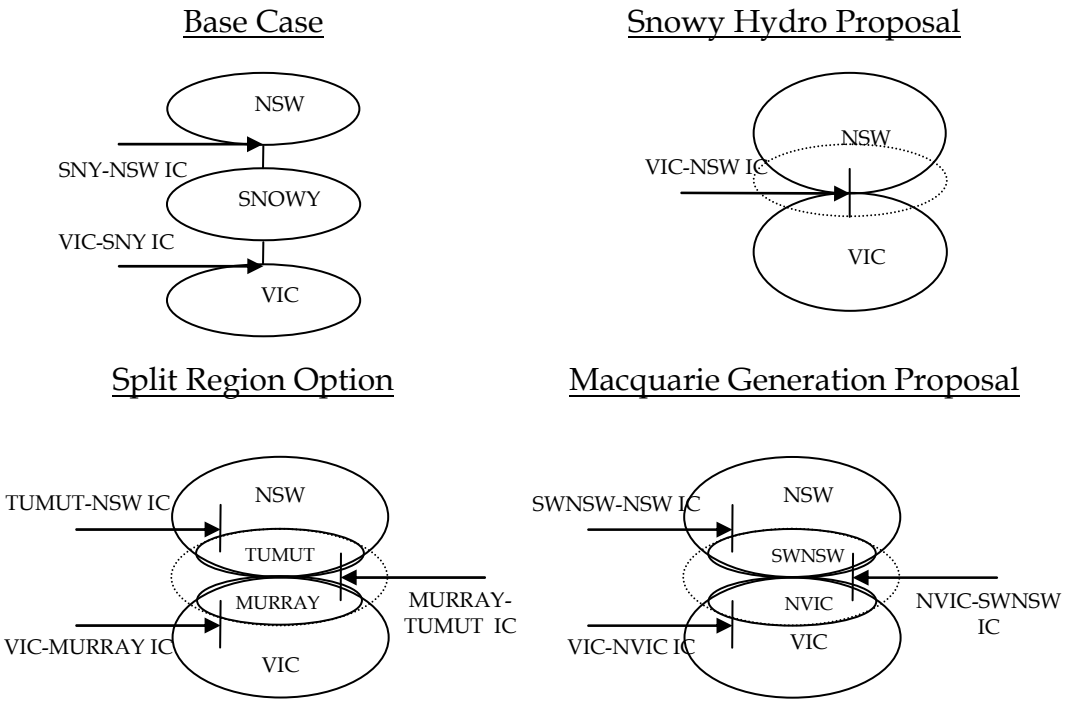
[26] Eraring Energy s95 submission, Snowy Hydro and Macquarie Generation proposals, 22 March 2006.

[27] For a further explanation see AEMC 2006, Congestion Management Review, Issues Paper, 3 March 2006, Sydney, p.65-68. Available: www.aemc.gov.au.

Figure 2.1 Presentation of the Snowy Hydro proposal and alternative cases



a IC = interconnector, SNY = Snowy, VIC = Victoria, NSW = New South Wales, NVIC = Northern Victoria, SWNSW = SouthWest NSW

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3 Background

This Section of the Draft Rule Determination provides background to the Snowy Hydro proposal by explaining the background to the NEM regional structure, the 1997 decision on the current Snowy region boundary, and describes some of the issues that are associated with the current Snowy region boundary. Appendices C and D contain additional background.

3.1 NEM regional structure and Rules on region boundaries

The NEM spot market is priced on a region basis. In 1997, the NEM was established with five regions, and expanded to six regions when Tasmania joined on 29 May 2005. The decision on the appropriate region boundaries was based on technical criteria in the National Electricity Code (NEC or Code) regarding the design of regions (clause 3.5) and modelling of losses (clause 3.6).[28] Appendix C provides further information on the 1997 Determination of Region Boundaries.

The purpose of the region division was to allow market prices to reflect the real-time cost of transmission congestion, where "cost" is based on market participants' bids and offers.[29] Region boundaries were initially established at the points across the NEM where transmission network connection was weak and hence congestion was greatest and/or most likely. This enabled the region boundaries structure to facilitate price signalling when generation and demand patterns created network congestion. Generation investors would be encouraged to develop new capacity in regions experiencing high prices and load investors would be encouraged to locate their operations in regions experiencing low prices.

The original version of the Code envisaged that region boundaries would be reviewed annually, and changed as required to reflect and price new points of "material" congestion. Materiality was to be assessed according to a number of technical criteria, including whether network constraints were likely to affect optimal dispatch (taking bids and offers as given) for more than 50 hours over a financial year. Various other technical criteria were also relevant, relating to matters such as the ease of defining transfer limits and the accuracy of static intra-regional loss factors.

Since the start of the NEM, there have been a number of reviews assessing what criteria to apply for reviewing the current region boundary structure. These reviews were accompanied by a moratorium on region boundary changes by the NEM Ministers Forum in 2002 pending the development of an appropriate long term framework for making region boundary changes.

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[28] NEMMCO – TIRC 1997, *Report on Marginal Loss Factors and Regional Boundaries for Victoria, South Australia and New South Wales in the National Electricity* Market, NEMMCO, Melbourne, September 1997 (including Recommendation on NEM Regions & MLF, dated 14/08/1998).

[29] Cost based on bids and offers received may diverge from the economic cost of dispatch, which is based on underlying resource costs, particularly where generators behave strategically.

The most recent review was initiated by the MCE submitting a Rule change proposal to the Commission on 5 October 2005 regarding the process and criteria to assess region boundary changes in the NEM. The Rule changes that may result from this proposal would supersede the current moratorium on region boundary changes contained in the Rules.[30] The MCE Rule change proposal on the reform of region boundaries is informed by a report prepared by consultants Charles River Associates (CRA), who were commissioned by the MCE to develop criteria and processes for boundary changes and initial boundary options.[31]

3.2 The Snowy region

3.2.1 Description of the network

The Snowy region provides a crucial transmission link in the middle of the NEM and Snowy Hydro is the major provider of peaking generation during periods of high Victoria and NSW demand. The transmission grid within the Snowy region and between NSW and Victoria was designed to deliver energy from the Snowy Mountains to major load centres and to connect the state-based power systems in NSW and Victoria.

A key feature of the Snowy Region is that it only contains generation and very little demand. Hence, virtually all the electricity generated by the Snowy generators is exported to other NEM regions. Figure 3.1 shows the network configuration in the Snowy region.

The critical transmission elements between Murray and Tumut are the 65 and 66 lines (see Figure 3.1). Thermal limits on these lines mean that loading of one line has to be protected against the potential loss of the other. These thermal limits largely determine the typical 1350 MW transfer limit across the Murray–Tumut cut-set of lines.[32]

There are multiple lines from the Snowy region into NSW and Victoria, with a substantially higher transfer capacity from Snowy to NSW (commonly 3100 MW) than from Snowy to Victoria (in extreme circumstances up 1900MW). The differing transfer capabilities are, in part, a legacy of water and power entitlements set out in the 1957 Commonwealth-States Agreement (the Agreement) on entitlements to power and water from the Scheme.[33]

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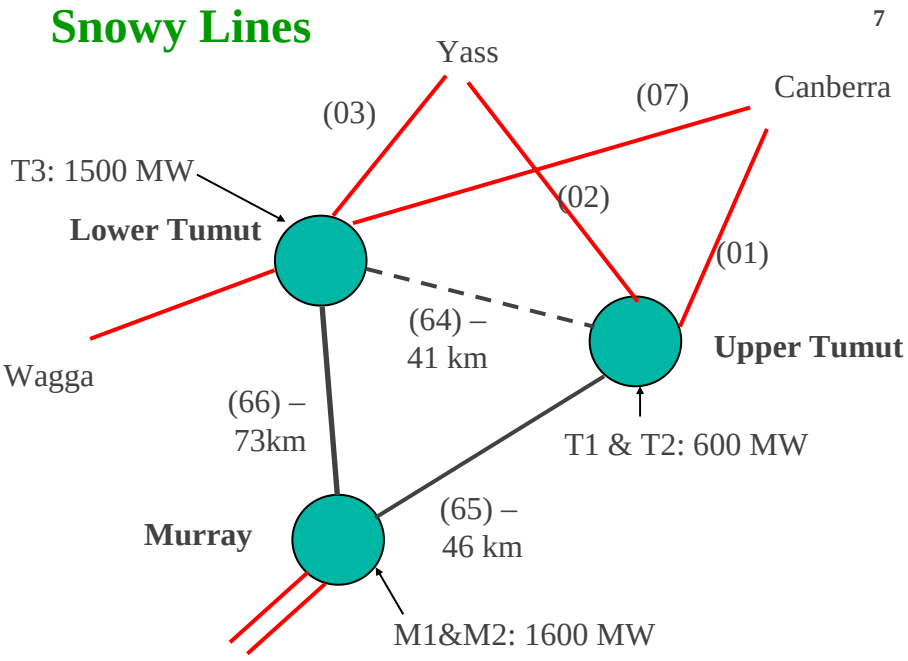
[30] Clause 3.5.4 of the Rules.

[31] Charles River Associates, *NEM – Transmission Region Boundary Structure, Final Report*, Submitted to Ministerial Council on Energy, Melbourne, September 2004.

[32] The Murray-Tumut cut-set comprises: a) the 64, 65 and 66 lines between Murray, Lower Tumut and Upper Tumut; and b) the 60, 62 and 51 lines between Wodonga, Jindera, Wagga and Tumut. The first group of lines pass over steep alpine terrain in the Kosciuszko National Park.

[33] The Agreement was ratified by the NSW and Victorian parliaments in 1958 — e.g. *Snowy Mountains Hydro-electric Agreements Act 1958 No.20 (NSW)* — and was a schedule added to the *Snowy Mountains Hydro-electric Power Act 1949*.

Figure 3.1 Transmission lines in Snowy Mountains & connections into NSW & VIC



a Transmission line numbers are in brackets. The lines between Murray, Lower Tumut , and Upper Tumut are 330kV lines. M1 and M2 represent the Murray power stations and T1, T2, and T3 represent the Tumut power stations.

Data source: TransGrid

A separate, generation only, Snowy region was decided upon at NEM start for a number of reasons including:[34]

1. Tidal flows (i.e. power switching direction) in and out of Snowy area meant that variance (as measured by the standard deviation of the static marginal loss factor (MLF) under a range of load and generation patterns) was large enough under the Code's criteria to warrant a separate region being created, with dynamic loss equations being used on the interconnectors;

2. Dispatch inefficiencies arising from the use of static loss factors. It was considered that use of a single static MLF at either Murray or Tumut would result in significant dispatch inefficiencies at those times when the actual, dynamic, loss factor diverged substantially from the static MLF; and

3. A generation only region was allowed for in the Code.

Figure 3.2 shows the looped network in and around the Snowy Region. Power flows around the loop are determined by the relative impedance of the different paths around the loop and it is common for flow across the Snowy network to alternate

[34] NEMMCO – TIRC 1997 Report.

from northwards (i.e. Victoria-to-NSW) to southwards on a daily basis. Electricity can also flow both north and south from the Snowy region simultaneously. The limit on the Murray to Upper and Lower Tumut transmission lines ranges between 1250 MW and 1350 MW under normal network conditions. The congestion on these lines has increased since NEM start, especially since 2002, and the point of congestion is referred to as the Murray-Tumut constraint. This is a cut-set constraint in the sense that it limits flows across a cut-set of lines which also include the lines between Wagga and Wodonga.

Figure 3.2 Snowy region network topology

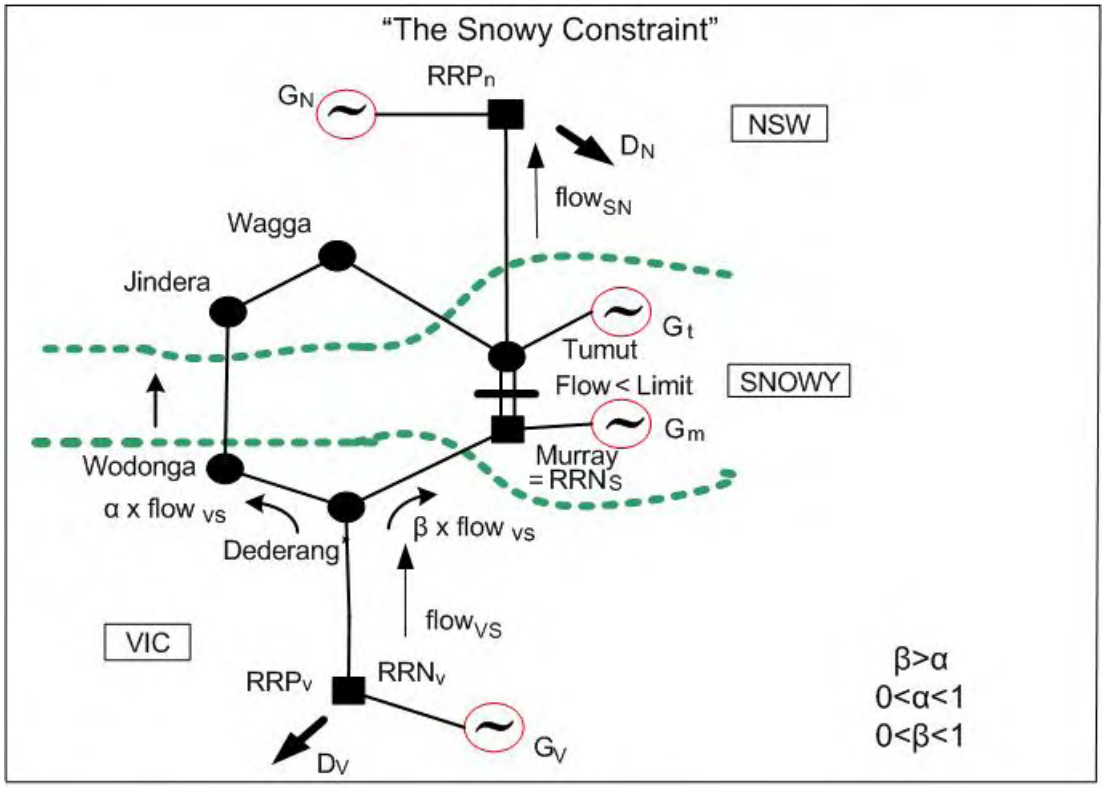


Table 3.1 details the number of hours the Murray-Tumut constraint has bound over recent years.

Table 3.1: Hours when the Murray-Tumut constraint has bound (calendar years)

Year	Number of hours
2002	100
2003	111
2004	35
2005	103 [a]
2006 to 31 January	55

[a] The Tumut CSC/CSP Trial commenced on 1 October 2005.

Data source: Macquarie Generation Rule Change Proposal to Establish NEM regions in Northern Victoria and Southwest NSW, 6 February 2006.

Further information on the historical incidence of binding constraints is provided in Appendix D of this Draft Rule Determination.

3.2.2 Implications of the Snowy network loop

The current location of the Snowy region boundary, combined with the network configuration and limitations within the region, may have a number of implications for the economic efficiency of dispatch and longer term investment incentives. This is because the regional reference price for the Snowy region is set at Murray and lies on a physical transmission loop that straddles three regions. Congestion on this loop can result in the marginal value of electricity (as measured by the "shadow price") around the loop varying when a constraint binds between Murray and Tumut.[35] Describing the network loop as going from Murray to Dederang to Tumut, if the constraint binds in a northward direction, the shadow price of electricity rises

[35] The "shadow price" of electricity is equal to the marginal value of electricity at the relevant location on the transmission network. At the regional reference node, the shadow price of electricity sets the price for the region. However, at all other nodes within a region, the shadow price can be above or below the RRN price, depending on whether the marginal value of electricity at that location is greater or less, respectively, than at the RRN. For example, if an injection of electricity at a particular location would help alleviate a constraint that affects the price at the RRN, the marginal value of electricity (and hence the shadow price) at that location would typically be greater than the price at the RRN. On the other hand, if an injection of electricity at a particular location would exacerbate a constraint that affects the price at the RRN, the shadow price at that location would typically be less than the price at the RRN.

through the loop.[36] If the constraint binds in a southward direction, the shadow price falls through the loop.[37]

This means that given that the Snowy RRN is at Murray and that, in the absence of constraints between Dederang and Melbourne, the Dederang shadow price will be similar to the Victorian RRN price, the consequences of a constraint between Murray and Tumut are that:

- The Victorian RRN price will exceed the Snowy RRN at times of northward flows – implying counter-price flows from Victoria to Snowy in the absence of intervention; and

- The Snowy RRN price will exceed the Victorian RRN at times of southward flows – implying counter-price flows from Snowy to Victoria in the absence of intervention.

These pricing outcomes may, in turn, have several important implications for dispatch and risk management.

First, Snowy Hydro and other generators may face incentives to bid their plant in a way that does not reflect their underlying costs. As discussed in more detail in Section 5, this may result in inefficient dispatch.

Second, counter-price flows (i.e. when power flows from a higher priced to a lower price region) results in negative settlement residues. This can affect the usefulness of Inter-Regional Settlement Residue (IRSR) units (sold through Settlement Residue Auctions) as a hedging mechanism for participants to manage the risk of entering inter-regional financial contracts. The occurrence of negative residues has also historically been a trigger for intervention by NEMMCO (in the form of "clamping" flows or "re-orientating" constraints under the Chapter 8A, Part 8 derogation), which can distort economic dispatch.[38]

3.2.3 Interim congestion management measures

When the current Snowy region boundary was established, there may have been less concern about trading risks arising from price divergence between VIC-Snowy-NSW regions. In addition, there appeared to be limited appreciation of the issues arising from having a region boundary overlaying a physical transmission loop and the potential for counter-price flows in the presence of congestion.

However, since then, a number of interim measures have been introduced to the Snowy region to address some of these issues. The introduction of the Tumut CSP/

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[36] In other words, the shadow price of electricity at Tumut would exceed the shadow price at Dederang (i.e. Victoria), which in turn would exceed the shadow price at Murray.

[37] In other words, the shadow price of electricity at Murray would exceed the shadow price at Dederang (i.e. Victoria), which in turn would exceed the shadow price at Tumut.

[38] A detailed explanation of the occurrence of counter price flows caused by the Snowy region is contained in the Commission's Final Rule Determination on the Management of Negative Settlement Residues in the Snowy Region, 14 September 2006, Section 2.3, p.7-8.

CSC Trial on 1 October 2005 changed the settlement outcomes (and hence bidding incentives) for generators located at Tumut at times when the Murray–Tumut constraints bound. At times of northward flows and constraint between Murray and Tumut, generators located at Tumut now receive the Tumut nodal shadow price. This is similar to the NSW RRN price in the absence of binding constraints between Tumut and Sydney. The NSW RRN price tends to be higher than the Snowy RRN price set at Murray at these times. At times of southward flows and constraints between Murray and Tumut, the trial leads to Tumut receiving the Victorian RRN price on most of its output instead of the (typically lower) NSW RRN price.

The Commission's Final Rule Determination to make the Southern Generators Rule on 14 September 2006 introduced a new mechanism for managing negative settlement residues arising on the Victoria-to-Snowy interconnector. The Rule requires positive settlement residues on the Snowy to NSW interconnector to be used to offset negative settlement residues accruing on the Victoria-to-Snowy interconnector (in both directions). This was intended to enhance the usefulness of Victoria to Snowy IRSRs, particularly for participants in Victoria seeking to hedge contracts referenced to the NSW RRN and to overcome the imperative for NEMMCO to intervene in dispatch or pricing.

These interim measures were deemed necessary pending introduction of a longer term solution to address the congestion and associated issues.[39]

3.2.4 Investment options

Investment to increase the transmission capacity between Murray and Tumut could address some of the issues associated with the Snowy region. The 2005 and 2006 Annual National Transmission Statements (ANTS) highlighted that there are potential benefits to upgrading the Victoria-to-Snowy and Snowy-to-NSW interconnectors, but that preliminary investigations concluded that such upgrades are, at best, marginal and unlikely to pass the Regulatory Test.[40] TransGrid, who owns the transmission network in the Snowy region, has (in conjunction with VENCorp) investigated a range of longer term options to upgrade the interconnectors. Two of the options (NEWVIC Stage 1 and NEWVIC Stage 2) involve upgrading the capacity of the Murray-Tumut cut-set, while the remaining two options (NEWVIC 2500 and 3500) entail construction of new transmission lines to the west of the existing Murray-Tumut cut set.[41] None are presently deemed to be worth pursuing because they are unlikely to pass the reliability limb of the Regulatory Test. However, TransGrid considers that upgrading the NSW network that supplies the Newcastle-Sydney-Wollongong area ("western ring") from 330KV to 500KV as a pre-requisite for any upgrading of the network between NSW and

[39] See AEMC, Congestion Management Review.

[40] NEMMCO, *Annual National Transmission Statement*, 2006 and 2005.

[41] For details of these four options, see TransGrid, *Annual Planning Review 2006*, pp. 88.

Victoria.[42] The 500kV upgrade has passed the Regulatory Test and TransGrid intends completing the work by 2009/10.[43]

Environmental considerations also influence the possibility of investment in the Snowy transmission network. Some of the current lines between Murray and Tumut are on some of the steepest terrain in Australia, which would make investment expensive.[44] Further, engineering works on the steep slopes have the potential to cause soil erosion, which would a factor in the decision to grant an environmental permit for the works. In addition, the lines are primarily located within the Kosciuszko National Park, which raises a range of environmental issues.[45]

The Commission has sought advice from TransGrid on the potential for a transmission upgrade to the Murray-Tumut cut-set to relieve congestion on the interconnector.

In October 2006 TranGrid advised the Commission that:[46]

1. TransGrid's 2006 Annual Planning Review (APR) contains the latest information on options to upgrade the NSW to VIC (particularly Sections 7.3.12 and 7.3.13).

2. Initial assessments of an Aerial Laser Survey (ALS) of the 64, 65 and 66 lines between Murray, Upper Tumut and Lower Tumut indicate:

   (a) that any remedial works to the Murray-Tumut lines is "unlikely to result in any material increase in the capability of these lines. Any substantial increase of this capacity would require a major reconstruction of the these lines that are wholly within the Kosciuszko National Park. That work would be subject to passing the 'Regulatory test" and extensive Environmental Approval processes";

   (b) that "uprating the lines…may not substantially change the occurrence of binding constraints in other parts of the NSW to Victoria link" which also limit interconnector flows.

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[42] TranGrid consider the most pressing transmission capacity upgrade to its network involves improving voltage support into the Newcastle-Sydney-Wollongong area, so that reliability and security of supply can be increased. TransGrid believe that the best means of improving voltage support entails finishing the construction of a 500kV transmission ring around Sydney, which will allow voltage to be better controlled.

[43] TransGrid, *2006 Annual Planning Report*, and TransGrid, *Final Report on Proposed New large transmission network asset development to the Newcastle-Sydney-Wollongong Area*, October 2006.

[44] For example, the number 65 line running between Murray and Upper Tumut Switching Stations rises from 300 metres at Murray 2 to around 1200 metres near Upper Tumut.

[45] Environmental regulations and permits relating to the operations of Scheme in the Kosciouzko National Park are set out in a range of documents, including: *Snowy Hydro Corporatisation Act 1997*; Snowy Park Lease; Kosciuszko National Park Plan of Management; Road Maintenance Agreement; Schedule of Existing Developments; Snowy Management Plan ; and *Snowy Mountains Cloud Seeding Trial Act 2004.* For details, see: NSW National Parks and Wildlife Service, *2006 Plan of Management Kosciuszko National Park*, NSWPWS, Sydney http://www.nationalparks.nsw.gov.au/npws.nsf/Content/k_np_mgmtplan

[46] TranGrid, Submission on Investment Options in the Snowy Region, 30 October 2006.

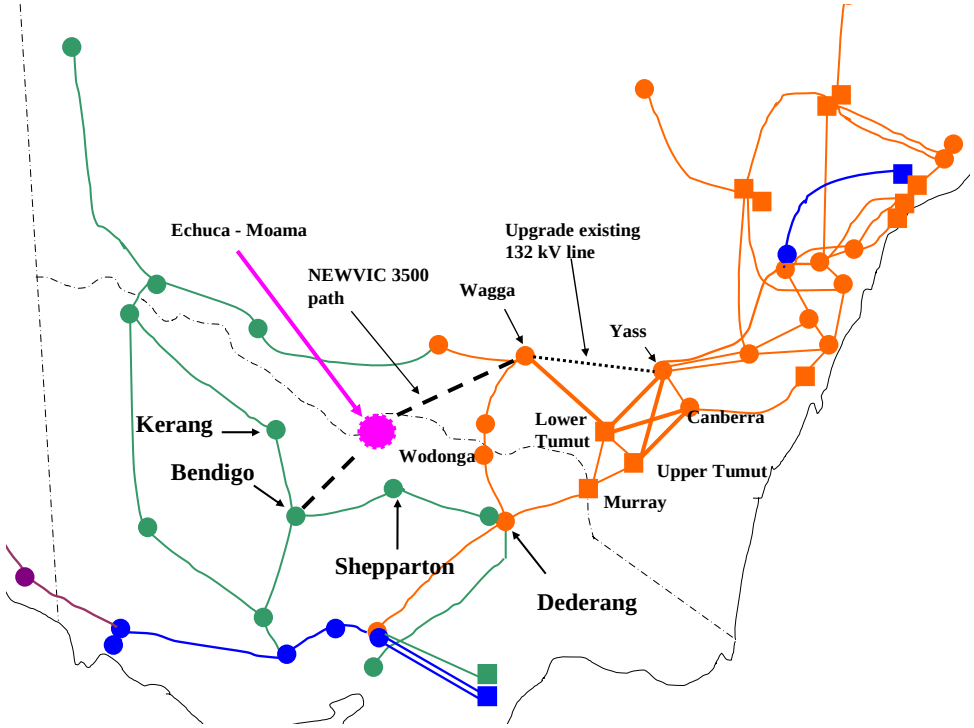
3. "As highlighted in Chapter 7 of the TransGrid's 2006 APR, a number of alternative arrangements to increase NSW-Victoria interconnection have been assessed. It is unlikely that these could be implemented in less than say the next three years. The 2006 Statement of Opportunities (SOO) and the Annual National Transmission Statement (ANTS) indicate that this project could have at best "marginal" market benefits [i.e. with an NPV of $10–$100 million]. TransGrid will continue to investigate this upgrade."

The Commission understands that two of the four longer term (5-15 years ahead) options for upgrading transmission capacity between Sydney and Melbourne involve transmission lines south west of Wagga, to the west of the Murray-Tumut cut set. These two options, NEWVIC 2500 and NEWVIC 3500 , appear to offer the greatest potential for increased transfers between the Victoria and NSW regional reference nodes in the longer term. The geography of the area west of Wagga is flat, open farmland, which is likely to mean that upgrades to transmission capacity there will be relatively cheaper than if the same upgrades were carried out in steep alpine terrain.

Further, the Commission is aware that there is significant load growth in the area to south-west of Wagga (in the Euchuca-Moama area) that may necessitate increased transmission capacity being built 5 to 15 years into the future (Figure 3.3).[47] Any such transmission upgrades could eventually form part of a new, 500kV, branch of the NEWVIC 3500 interconnector between Sydney and Melbourne. Should that potential augmentation prove to be economic in future, it could relieve the loading of lines on the Murray-Tumut cut-set by providing an alternative, higher voltage, parallel path to the existing 330kV lines.

[47] TransGrid, *Annual Planning Review 2006*, pp.86-87.

Figure 3.3 Possible route for the NEWVIC 3500 option



Note. 500kV lines (blue), 330kV lines (orange), 220kV lines (green), 275kV lines (purple),

Source: TransGrid

The Commission notes that building out the congestion across the Murray-Tumut cut-set does not appear to be a viable alternative to a boundary change in the next three to five years, based on current assessments under reliability limb of the Regulatory Test. The Commission also understands that upgrades to the Murray-Tumut lines that involve raising the height of transmission towers are likely to require extensive outages over many months. Such outages would likely lead to physical separation of the southern and northern regions of the NEM for extended periods of time, causing considerable market disruption.

If congestion in this cut-set (and other cut-sets between Melbourne and Sydney) continues to contribute to dispatch inefficiencies and reduce effectiveness of inter-regional hedging instruments, a regional boundary change may be the best means of promoting the NEM Objective in the long term, should a congestion relieving upgrade not prove to be economic. The Commission's current view is that in these circumstances, the existing interim means of pricing the congestion (i.e. Tumut CSP/CSC Trial) is not be an appropriate long-term solution compared to a region boundary change.

4 Consultation process

This Section describes the consultation process to date for considering the Snowy Hydro proposal. All submissions are available on the Commission's website (www.aemc.gov.au). A summary of all submissions received is provided in Appendix B.

4.1 Summary of statutory consultation periods

Table 4.1 below presents the Commission's statutory decisions in relation to the Snowy Hydro proposal. Reasons for the extensions are presented in Table 4.2.

Table 4.1: Consultation dates

Stage of consultation	Notice type	Date of notice	Submissions close/ Publication date
First round consultation	s.95	12 January 2006	10 March 2006
Extension first round consultation	s.107	16 February 2006	24 March 2006
Extension publication Draft Rule Determination	s.107	18 May 2006	11 August 2006
Extension publication Draft Rule Determination	s.107	10 August 2006	15 December 2006
Extension publication Draft Rule Determination	s.107	14 December 2006	25 January 2007

Table 4.2: Reasons for timeframe extensions

Date of notice	Reasoning
16 February 2006	This extension was to allow consideration of the Snowy Hydro proposal and the alternative Macquarie Generation proposal as first round consultation on the latter proposal commenced on the 16 February 2006. Aligning the consultation periods enabled the co-ordination of submissions on both proposals.
18 May 2006	This extended timeframe to publish the Draft Rule Determination was to allow the Commission adequate time to carry out the modelling and analysis necessary to make its Draft Rule Determination.
10 August 2006	This further extension enabled the Commission to align its consideration of the proposal with components of the Congestion Management Review in order to deliver a comprehensive "Congestion Management Regime".
14 December 2006	The Commission decided to release separate draft Rule determinations on the Snowy Hydro and Macquarie Generation proposals because the Commission's analysis of the Snowy Hydro proposal was well advanced and could be ready for decision earlier than the more analytically complex Macquarie Generation proposal. The Commission considered it would be beneficial to undertake early consultation on the Snowy Hydro matter, pending release of the Macquarie Generation Draft Rule Determination.

4.2 Additional consultation

4.2.1 Proponent presentation

Snowy Hydro gave a presentation to the Commission on its proposal on 10 February 2006. A copy of the presentation is available on the Commission's website (www.aemc.gov.au).

4.2.1 Information Disclosure Statement

The Commission made an early assessment that a thorough assessment of the Snowy Hydro proposal required modelling analysis. The Commission understands that modelling analysis to assess Rule change proposals is likely to generate interest amongst stakeholders in respect of both the type of quantitative modelling and the assumptions that may underpin it. This is particularly the case in relation to complex modelling exercises such as those designed to assess the impact of Rule change proposals on the technical efficiency of dispatch in the NEM.

On 15 June 2006 the Commission published an Information Disclosure Statement seeking comment on the modelling inputs and approach being adopted for the Snowy regional boundary Rule change proposals. Submissions on this public consultation closed on 23 June 2006.

4.2.2 Consultation on implementation

The Commission wrote to NEMMCO on 12 July 2006 requesting advice and clarification on understanding what process must be undertaken in order to implement a region boundary change and how long that process would take. NEMMCO responded on 25 August 2006. The Commission asked for stakeholder comments on NEMMCO's response by 13 October 2006.

4.2.3 Consultation on Draft Rule Determination and Draft Rule

The Commission invites submissions on the matters raised in this Draft Rule Determination and the Draft Rule by 9 March 2007. 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 2 February 2007.

5 Commission's assessment

In making this Draft Rule Determination, the Commission has assessed the Snowy Hydro proposal on the basis of stakeholder submissions, conceptual analysis and quantitative modelling analysis. As discussed in Section 2, the proposal has been assessed against two alternative scenarios: a Business as Usual (BAU) base case and the Split Region Option. The assessment has been undertaken based on the decision criteria identified in Section 2. The Commission has also had regard to stakeholder submissions in conducting its analysis and coming to this Draft Rule Determination on the Snowy Hydro proposal.

5.1 Economic efficiency of dispatch

5.1.2 Conceptual analysis

The (technical) economic efficiency of dispatch is typically cited as one of the key reasons for making changes to NEM region boundaries. Economic efficiency of dispatch refers to minimising the resource costs of meeting demand over a certain timeframe, taking into account current and expected load, generation and network conditions, generators' fuel costs, transmission constraints, losses and ramp rate constraints. It is also worth reiterating that although a change to region boundaries does not alter the way participants' bids and offers are processed by NEMMCO in the dispatch process, it does affect the prices at which participants are settled and hence their incentives to bid at various prices. Changes to bidding incentives can, in turn, affect the efficiency of dispatch and the optimal level of electricity consumption. These considerations relate to the productive or technical efficiency of the dispatch process in the NEM. The extent to which the dispatch process operates in a technically efficient manner is one important measure of the overall economic efficiency of the NEM. An assessment of the efficiency attributes of the NEM as a whole would encompass an assessment of other factors including the operation of the derivatives market. These other aspects of efficiency are considered in Sections 5.3, 5.5, and 5.6.

The Commission's Determination on the Southern Generators Rule recognised that the NEM dispatch engine (NEMDE) minimises the cost of dispatch taking bids and offers as given. This means that if constraints are properly taken into account and bids and offers reflect resource costs, NEMDE will produce economically efficient dispatch. In this context, the resource cost for hydro plant refers to the marginal value of their output under competitive market conditions. However, dispatch may not be efficient if either of the following occurs:

- Intervention in the dispatch process, such as clamping (intervention); or
- Bids and offers do not reflect resource costs (strategic bidding).

The Southern Generators Determination also recognised that if only one of these distortions is present, the removal of that distortion should improve the efficiency of

dispatch. However, if both distortions are present, the removal of one distortion may not necessarily result in an improvement to the efficiency of dispatch.[48]

The Snowy area of the NEM creates obstacles for efficient dispatch in two key ways.

The first way in which inefficient dispatch may occur is through NEMMCO intervention in response to counter-price flows between regions and the accrual of negative settlement residues. As noted in Section 3, the network configuration around the Snowy area implies that when constraints bind between Murray and Tumut, counter-price flows will tend to occur on the Victoria to Snowy interconnector.

In the BAU base case scenario considered by the Commission, NEMMCO is assumed to intervene to prevent counter-price flows by:

- Restricting ("clamping") power flows on the Victoria to Snowy interconnector when it expects northward counter-price flows;
- "Re-orientating" network constraints to Dederang when it expects southward counter-price flows between Snowy and Victoria, thereby effectively moving the Snowy RRN to Dederang for that period; and
- Clamping power flows on any other interconnectors that would otherwise occur from a higher-priced region to a lower-priced region.

Under the other options, NEMMCO retains the ability to intervene in dispatch to prevent or limit counter-price flows in accordance with the terms of the existing derogation. As noted in Chapter 2, an assessment of the need for NEMMCO to return this intervention power is a matter going beyond the scope of this Rule change proposal and may be considered further in the Commission's Congestion Management Review.

These interventions may harm the efficiency of dispatch. Indeed, in the Southern Generators' Determination, it was found that removal of these interventions combined with the CSP/CSC Trial at Tumut and the use of positive IRSRs on the Snowy to NSW interconnector to offset negative IRSRs on the Victoria to Snowy interconnector would improve the efficiency of dispatch.

Another factor that may adversely affect efficient dispatch in the Snowy area arises from strategic bidding. Strategic bidding can itself arise in two ways.

First, where a generator receives a price (at settlement) that deviates from its nodal shadow price, it may have incentives to either:

- bid "below cost" (down to -$1,000/MWh) or "inflexible"[49] in order to be selected to generate more, if the price that it expects to receive at settlement is attractive; and

[48] Southern Generators' Determination, Appendix A, pp.A31-A32.

- bid "above cost" (up to $10,000/MWh) or inflexible in order to avoid being selected to generate, if the price that it expects to receive at settlement is unattractive.

In this context, a bid "below cost" or "above cost" is a bid that does not reflect the generator's resource cost (the marginal value of its output under competitive market conditions).

In noting that "strategic bidding" may adversely affect the technical economic efficiency of dispatch, the Commission does not make any judgment about whether "strategic bidding" is *per se* undesirable or inconsistent with the NEM Objective. The Commission understands that such strategic bidding may not only be compatible with a workably competitive market, but that measures to directly curb strategic bidding may have unintentional and detrimental implications for consumers through the impacts of those measures on NEM participants' operating and investment decisions. However, putting this broader issue to one side, the Commission believes that it is important to understand and compare the likely impact of different reform options on the economic efficiency of dispatch, taking into account any incentives participants may have to behave strategically.

In the BAU base case scenario, both Tumut and Murray generation receive the Snowy RRN price (set at Murray). If a constraint binds between Murray and Tumut, one or both generators will be effectively "mis-priced" – that is, they will receive a price that differs from their pre-intervention nodal shadow price. At times of northward flow and assuming no other constraints, clamping intervention by NEMMCO may lead to the Snowy RRN price (set at Murray) rising to the loss-adjusted NSW RRN price. This would mean that even though Murray generation is located at the Snowy RRN, the price it received (i.e., close to the NSW RRN price) would be distorted.[50]

In the absence of clamping, Murray would not be mis-priced, but Tumut would be mis-priced because it would effectively receive the (low) loss-adjusted Victorian price when the marginal value of its generation was closer to the (higher) loss-adjusted NSW price. In the latter case, this may create incentives for Snowy Hydro to offer Tumut capacity at a price that does not reflect its underlying resource cost. If Tumut's opportunity cost is above the Victorian price but below the NSW price, Snowy Hydro will have an incentive to offer Tumut's capacity at a price of $10,000/MWh. This would be inefficient because more expensive NSW plant may run in place of Tumut, simply because Tumut is paid a price that does not reflect its relative value to the market. In fact, the Tumut CSP/CSC trial was directed at overcoming this particular problem.

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[49] In respect of a scheduled generating unit, bidding inflexible means that the scheduled generating unit is only able to be dispatched in the trading interval at a fixed loading level specified in accordance with clause 3.8.19(a) of the Rules.

[50] The Snowy RRN would still reflect the nodal shadow price at Murray, but this would have been artificially increased due to the clamping intervention. Therefore, the Commission considers that under these conditions, Murray generation would effectively be mis-priced.

Importantly, the "mis-pricing" of generation will not always have a detrimental impact on dispatch efficiency. Subject to the exercise of any transient market power[51], no change to dispatch would occur if the relevant generator's resource cost (in this case, Tumut) was either above *or* below *both* its nodal shadow price *and* the price it received. For example, if Tumut's resource cost was $40/MWh and due to a northward constraint between Murray and Tumut, it effectively received a (low) Victorian price of $20/MWh when its nodal shadow price was similar to the (high) NSW price of $30/MWh, Tumut would not generate regardless of the mis-pricing. Alternatively, if Tumut effectively received the Victorian price of $50/MWh instead of the NSW price of $100/MWh, Tumut would generate regardless of the mis-pricing.

The second means by which strategic bidding can arise does not stem from any mis-pricing of generation. Even if a generator receives its correct nodal price, it may still have incentives to behave strategically by exercising transient market power. For example, under the Tumut CSP/CSC mechanism, Snowy Hydro has incentives to withhold generation at both Murray and Tumut at times of northward flows. Withholding Murray could lead to the unbinding of the Murray-Tumut constraint, thereby "importing" the (high) NSW price to the Snowy region. Meanwhile, it may be worthwhile for Snowy Hydro to withhold Tumut generation in order to avoid constraining lines to its north and reducing the prices it receives in respect of its output. This behaviour is known as maintaining "headroom" on the relevant lines and may result in inefficient dispatch. Snowy Hydro acknowledged it had this interest in its submission on the Southern Generators' Rule change proposal. [52]

The Snowy Hydro boundary change proposal is an attempt to overcome this latter problem because it ensures that Tumut generation receives the loss-adjusted NSW price at times of constraint between Murray and Tumut, regardless of constraints north of Tumut. Therefore, although constraints north of Tumut may still lead to risks that Tumut will not be dispatched to meet high NSW demand, at least Tumut will not be exposed to price separation and consequent basis risk. This means that under the Snowy Hydro proposal, Tumut's incentives to withhold capacity at times of high NSW demand and prices are reduced.

However, the Snowy Hydro proposal does not address the mis-pricing problem mentioned earlier because at times of constraint between Tumut and the NSW RRN, Tumut continues to receive the NSW price. If Tumut's resource cost is below the NSW RRN price, then Snowy Hydro has an incentive to bid Tumut at -$1,000/MWh to be dispatched even if Tumut's resource cost is above its nodal shadow price. This can produce inefficient outcomes because higher levels of Tumut generation may displace lower cost plant in Victoria or NSW. It may also lead to counter-price flows from NSW into Victoria, potentially resulting in clamping intervention by NEMMCO.

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[51] The ability to influence the price at which the market is settled in the short term by offering to generate different levels of output and/or offering to generate at different prices.

[52] Snowy Hydro Ltd, *Submission to consultation: Management of negative settlement residues in the Snowy Region*, 10 February 2006, p.5.

The Split Region Option would overcome the mis-pricing problem because it ensures Tumut as well as Murray receive their nodal shadow prices. However, this option has the same attendant problem of the Base Cases of Tumut "maintaining headroom" on lines further north at times of northward flow, potentially leading to inefficient dispatch.

The consequence of these complex interactions is difficult to summarise conceptually because there may be trade-offs between correcting theoretical mis-pricing and limiting the scope for generators to exercise transient market power. However, based on work undertaken for the Commission by Dr Darryl Biggar,[53] it is possible to make some limited in-principle observations if it is assumed that:

- Only one constraint binds at a time; and
- Only Snowy Hydro's plant bid strategically.

These observations are separated according to whether flows between the Victorian and NSW RRNs are northward or southward.

Prior to discussing these observations, the Commission notes that its ability to draw clear conclusions based on these observations is limited due to the importance of the assumptions involved. For this reason, the Commission has been able to place only limited weight on this conceptual reasoning but notes that the qualitative findings were broadly supported by the modelling analysis (see below).

5.1.2.1 Northward flows

The first situation to consider is where only the Murray to Tumut constraint binds. As noted above, in the BAU base case, clamping of the Victoria to Snowy interconnector is implemented when the Murray-Tumut constraint binds in a northward direction. Clamping this interconnector could reduce the economic efficiency of dispatch if it leads to Murray generating on the basis of a (high) NSW RRN price when the true (pre-intervention) marginal value of electricity at Murray is actually below the (lower) Victorian RRN price.[54]

By comparison, the Snowy Hydro proposal would ensure Murray generation received the Victorian price in these circumstances (which would be lower than the NSW price but still above the correct price for Murray's location). To the extent this reduced Murray generation, the Snowy Hydro proposal could improve dispatch efficiency compared with the BAU base case.

In the Split Region Option, Murray would receive the "correct" locational price (i.e., lower than the Victorian price) when the Murray-Tumut constraint bound. However, Snowy Hydro would also have strong incentives to withhold Murray

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[53] Biggar, D., *Snowy Region Boundary Change Proposals: Further Assessment of the Option*, 12 December 2006.

[54] The reason why the Murray price would be below the Victorian price is because Murray generation places more pressure on the constraints between Murray and Tumut than generation from Victoria, because at its location on the loop and the level of electrical impedances around the loop.

generation to prevent the Murray-Tumut constraint from binding in the first place. This is because such withholding could lead to Murray "importing" the high (NSW) price to its location for its output. Such a strategy would be far less likely to be successful under the Snowy Hydro proposal because even if Murray were able to prevent the Murray-Tumut constraint from binding by withholding, it could not prevent the lines from the Victorian RRN to Murray from binding. If these lines bound, Murray would receive the (lower) Victorian price even if no constraint were binding between Murray and Tumut.

It is worth noting that this analysis ignores behaviour and outcomes in the "pre-clamping" period, the period in which Snowy Hydro expands Murray generation in order to induce clamping.

Constraints other than between Murray and Tumut

The next step in the analysis is to consider the effect of constraints other than between Murray and Tumut potentially binding.

If constraints north of Tumut *threatened* to bind in a northward direction, the above observations on the Snowy Hydro proposal may need to be modified. This is because under the BAU base case scenario and the Split Region Option, Snowy Hydro would have incentives to withhold some Tumut generation to prevent those constraints from binding and causing the Snowy (or Tumut) region price to drop. Meanwhile, under the Snowy Hydro proposal, Snowy would not have an incentive to maintain this headroom. Other things being equal, maintaining headroom could lead to less efficient dispatch because it may prevent the least-cost combination of plant (given available network capability) being used to serve demand.

If constraints immediately north of Tumut (i.e. between Tumut and Canberra/Yass) *actually bound*, the Snowy Hydro proposal may produce less technically efficient results compared to either the BAU base case or the Split Region Option. This is because in those scenarios, Snowy Hydro would have incentives to bid Tumut in accordance with its nodal shadow price (which would be aligned with the Murray price). However, under the Snowy Hydro proposal, Snowy Hydro could have incentives to bid Tumut below cost in order to be dispatched and receive the (high) NSW RRN price. Therefore, the incremental impact in moving from either the BAU base case or the Split Region Option to the Snowy Hydro proposal could be an increase in Tumut generation and a corresponding reduction in generation in the southern part of the NEM. If the increase in Tumut generation were offset by reduced low-cost generation in Victoria, dispatch would become less efficient.

If constraints further north of Tumut (i.e. between Canberra/Yass and Sydney) *actually bound* and were the only ones binding, the Snowy Hydro proposal may also result in less technically efficient outcomes compared to either the BAU base case and the Split Region Option. This is because if these constraints bound in those scenarios, some NSW generators could have incentives to bid below cost in order to be dispatched and receive the (high) NSW RRN price. The Snowy Hydro proposal allows Tumut generation to compete, as it were, on a "level playing field" with these generators, who already have incentives to bid below cost under these circumstances. The outcome in terms of economic efficiency of dispatch would depend on the relative resource costs of Tumut and the affected NSW "Western Ring" generators. If Tumut's resource cost were relatively higher than those of the

"Western Ring" generators, the Snowy Hydro proposal might reduce dispatch efficiency. The reverse case also holds.

If the only constraint that bound was between the Victorian RRN at Melbourne and Dederang, the Snowy Hydro proposal may again produce less technically efficient results compared to the BAU scenario and the Split Region Option. Under the BAU base case and the Split Region Option, northern Victorian generation close to Dederang would receive the Victorian price even if its shadow price was higher than the Victorian price.[55] This could lead to northern Victorian generators bidding well above resource cost to avoid being dispatched at a price below their resource costs. However, in all cases, at least Murray generation would face its nodal price and – in the absence of any transient market power – would generate at an efficient level.

Under the Snowy Hydro proposal, Murray generation would also effectively receive the Victorian RRN price. This means that if constraints immediately north of Melbourne bound, Snowy Hydro could also have incentives to bid well above resource cost to avoid being dispatched.[56] This means that the incremental impact in moving from either the BAU base case or the Split Region Option to the Snowy Hydro proposal could be a reduction in Murray generation and a corresponding increase in generation elsewhere in the NEM. If the reduction in Murray generation were offset by increased higher-cost generation in northern Victoria, dispatch would become less efficient.

It is important to reiterate that this analysis is very limited because it assumes that only one constraint binds (or threatens to bind) at once and that the exercise of transient market power is limited to Snowy Hydro's plant.

5.1.2.2 Southward flows

Once again, the analysis begins with a consideration of the Murray to Tumut constraint and an assumption that it is the only constraint binding in the NEM.

Under the BAU base case, if the Murray-Tumut constraint bound in a southwards direction, NEMMCO would re-orientate the affected constraints to Dederang.

Under the BAU scenario, due to re-orientation, this would effectively mean that *all* of Snowy Hydro's generation received the (high) Victorian RRN price, even thought the nodal shadow price at Tumut would be close to the (lower) NSW price. This could encourage Snowy Hydro to bid Tumut generation at -$1,000/MWh to be dispatched and receive the higher price. This could displace lower cost plant elsewhere, which would reduce dispatch efficiency. Murray generation would also be mis-priced to some extent, because the nodal shadow price at Murray would exceed the Victorian RRN price at these times. Whether this *actually* led to inefficient dispatch would depend on whether Murray's resource cost lay between the Murray nodal shadow

[55] This is because northern Victorian generation would not place pressure on the constraint whilst generation at the Victorian RRN would place additional pressure on the constraint. Hence, the value of northern Victorian generation would be greater than generation at the Victorian RRN.

[56] Subject to its contract position.

price and the Victorian RRN price. As noted above, where a generator's resource cost is above or below *both* its nodal shadow price as well as the RRN price at which it is settled, dispatch would not be affected by mis-pricing.

Under the Split Region Option, Murray generation would receive a price higher than the Victorian RRN price but Tumut would receive the NSW price (assuming no other constraints). This could mitigate much of the inefficiency (if any) that could arise under the BAU base case because Snowy Hydro would no longer have incentives to bid Tumut generation below resource cost in order to be dispatched. On the other hand, Snowy Hydro would have incentives to withhold Tumut generation to avoid the constraint from binding in the first place (i.e. leave some headroom on the Tumut-Murray lines). Whether on balance this would lead to more or less efficient dispatch than the BAU base case is difficult to determine conceptually.

By comparison, under the Snowy Hydro proposal, Tumut generation would receive the (lower) NSW price, without any real ability and incentive to withhold Tumut output. This should lead to greater alignment between dispatch and settlement and more efficient outcomes if no other constraints were relevant.

Constraints other than between Murray and Tumut

As is the case with northward flows, if constraints other than Murray to Tumut bound, the dispatch efficiency case in favour of the Snowy Hydro proposal becomes less clear. Under both the Split Region Option and the BAU base case scenarios, potential constraints south of Murray could lead to Snowy Hydro holding back some Murray output to avoid being constrained-off from higher Victorian prices. Leaving headroom on the power flows in this manner could reduce the efficiency of dispatch, just as in the situation where flows were northward and Tumut preserved some headroom on the lines to its north. By contrast, under the Snowy Hydro proposal, Murray generation would still get paid the Victorian RRN price even if constraints bound to its south, providing it with incentives to bid below cost to secure its desired dispatch values. To the extent this led to the displacement of plant in the northern regions, it would be likely to cause inefficiency (because these plants would otherwise receive their correct locational price). However, to the extent Murray's below-cost bidding displaced higher cost generation in northern Victoria, this could enhance dispatch efficiency *compared with all the other cases*.

On the other hand, the impacts of the Snowy Hydro proposal on dispatch efficiency are more likely to be detrimental if constraints bound north of Tumut at times of southward flows. This is principally because such constraints could encourage Snowy Hydro to bid Tumut generation as unavailable or at $10,000/MWh (i.e. above its resource cost), which could lead to an increase in the output of higher cost plant in the southern regions of the NEM. What gives rise to these incentives is that Tumut's nodal shadow price in these circumstances would be above the NSW RRN price (which Tumut would be paid under the Snowy Hydro proposal). By contrast, under the Split Region Option or the BAU base case, Tumut would be paid the equivalent of the (higher) Victorian price when constraints north of Tumut bound. Hence, Snowy Hydro would not face incentives to withhold Tumut generation.

Importantly, all of these observations assume that plant apart from Snowy Hydro approximately bid at their resource cost. In other words, the observations made

above regarding dispatch efficiency impacts assume that plant other than Snowy Hydro do not exercise any transient market power.

Once again, if this assumption is relaxed, it becomes extremely difficult to make worthwhile comments on dispatch efficiency impacts based solely on conceptual analysis.

Nevertheless, the Commission notes that the conceptual findings in relation to dispatch efficiency when the Murray-Tumut constraint binds (in either direction) are generally supported by the quantitative market modelling analysis.

5.1.3 Modelling analysis

As noted above, due to the difficulty of assessing the productive efficiency impact across the full range of constraints and available bidding behaviours, the Commission has placed only limited weight on the conceptual analysis of the dispatch efficiency impacts of the Snowy Hydro proposal.

To supplement the conceptual analysis, the Commission requested market modelling to be undertaken to provide a quantitative indication of the likely effect of the Snowy Hydro proposal, the BAU base case and the Split Region Option on the efficiency of dispatch. However, the modelling analysis of the Snowy Hydro and Split Region alternatives did not incorporate the scope for NEMMCO intervention through clamping or re-orientation.

The model used to test the various boundary change proposals was the same as was used to test the Southern Generators' proposal and the Snowy Hydro Reorientation proposal. The model replicates the NEM dispatch engine's operation of dispatching the least-priced combination of generation to meet a given demand subject to power system constraints. When compared to the BAU base case, the changes in output under the Snowy Hydro proposal and the Split Region Option (combined with the underlying resource costs of that generation) were used to determine whether dispatch efficiency had improved. Details of the modelling approach and assumptions can be found in Appendix A.

An important aspect of the modelling approach is that it specifically examined the effect of the various scenarios on generator bidding behaviour, and thus generator dispatch and pricing. The model achieved this by using game-theoretic solution techniques. This approach allowed the Commission to test the overall effects of the different options over a very wide range of bidding and contracting conditions. As Snowy Hydro's behaviour was a key focus of the analysis, Snowy Hydro was permitted an extremely wide range of potential bidding strategies: Tumut and Murray were each able to offer their capacity at $1/MWh in 12.5% increments from 0% to 100%. In total, this allowed Snowy Hydro to choose between 81 (9 x 9) strategies. Other key generators in the NEM were permitted to choose between a narrower, but realistic, set of withdrawal strategies. The quantity of thermal generation offered to the market was offered at short-run marginal cost.

The modelling divided the year into load blocks and modelled strategic behaviour and dispatch in each load block, as set out in Table 5.1.

Table 5.1: Modelling Periods

Description	Load blocks	Hours of year
Summer peak	27	250
Winter peak	15	470
Other	20	8040
Total	62	8760

*NB: The terms "summer peak" and "winter peak" refer to the extreme peak load times across the season as a whole, not merely the peak times during each summer or winter day.

The modelling was undertaken using an assumption of strategic bidding amongst key generator participants, and a full constraint representation based on a constraint set provided by NEMMCO and based on the 2005 SOO/ANTS. These constraints were modified by NEMMCO to reflect the region boundary configurations of the Snowy Hydro proposal and the Split Region Option. The BAU base case used the ANTS constraints from the 2005 SOO/ANTS, which reflect the existing region boundary structure. Further details are provided in Appendix A.

The modelling indicated that both the Snowy Hydro proposal and the Split Region Option were likely to produce production cost savings compared to the BAU base case scenario (see Figure 5.1 and Figure 5.2). This was largely due to increased Snowy Hydro generation at high demand times (comprising summer and winter extreme demand peaks) and lower Snowy Hydro generation at other times, compared to the BAU scenario (see Figure 5.3). This result was robust across both High and Low contracting cases and over the three years of the modelling (2008-2010).

Other findings of the analysis were that:

- Counter-price flows under the Snowy Hydro proposal and the Split Region Option scenarios were not substantial, despite the removal of clamping intervention (see Appendix A). At the same time, it was not able to be confirmed if incidences of counter-price flows would have been different – due to changed bidding incentives – if the scope for clamping intervention had been modelled in these two boundary change scenarios; and

- Other constraints (including Murray-Tumut) did not bind substantially in the Snowy Hydro proposal scenario and the Split Region Option (see Appendix A).

Figure 5.1 Annual production costs ($m)

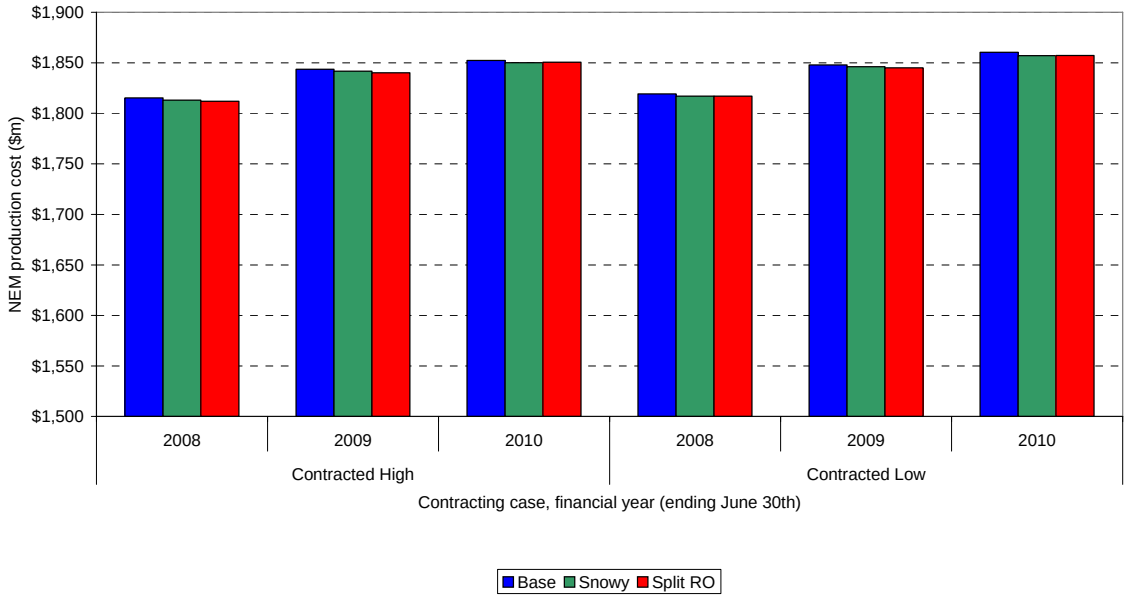


Figure 5.2 Annual Production cost savings ($m)

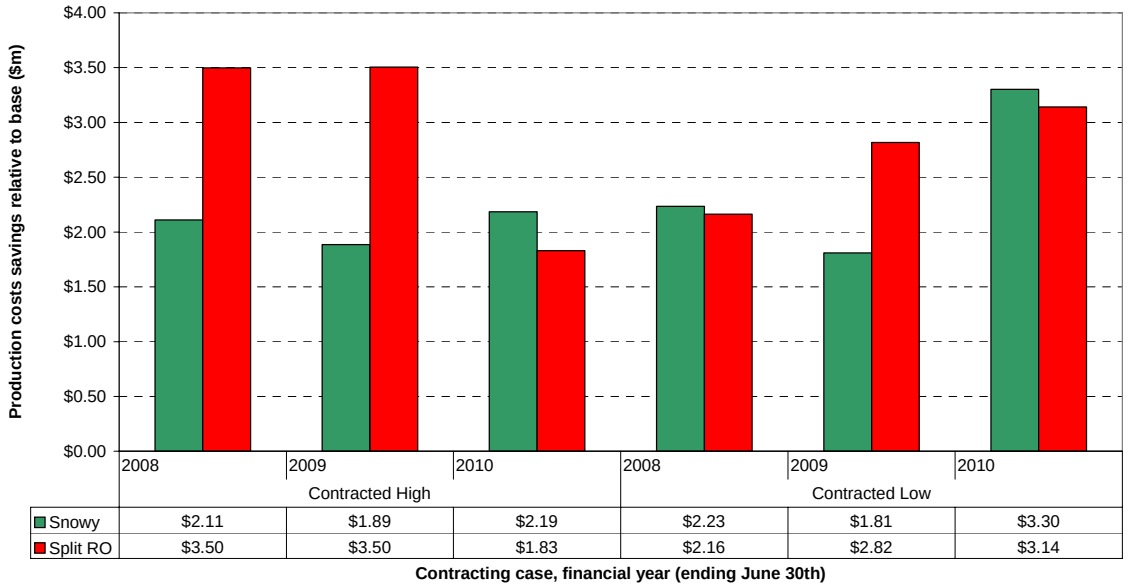
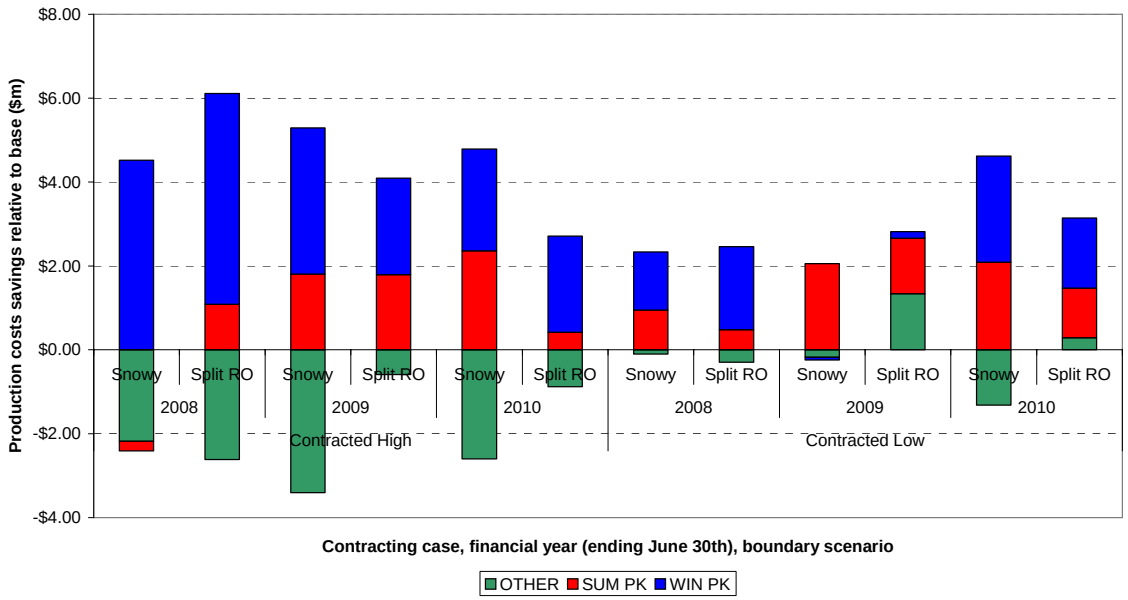
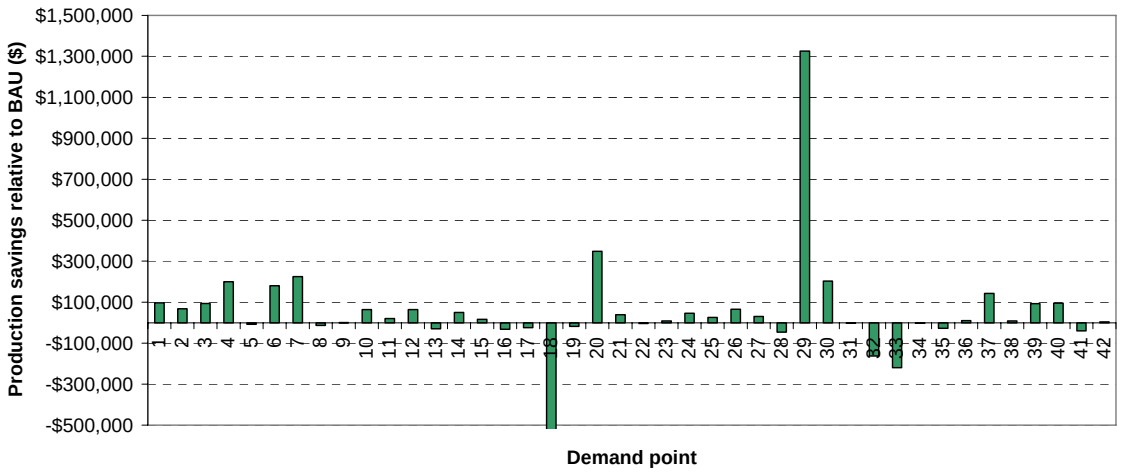


Figure 5.3 Annual production cost savings by time of year ($m)



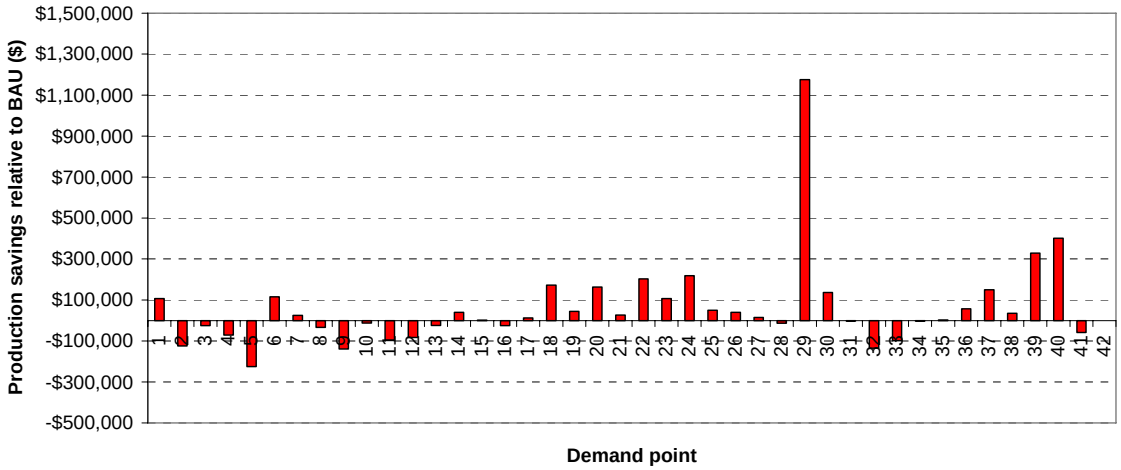
One key demand point was selected to ascertain how and why this displacement of other plant by Snowy Hydro occurred at high demand times. The demand point chosen (point 29) reflected high demand across the NEM, particularly in South Australia and Victoria and accounted for a significant portion of dispatch cost savings from the Snowy Hydro proposal and the Split Region Option (see Figure 5.4 and Figure 5.5).

Figure 5.4 Production cost savings by demand point (Snowy proposal, Contracted Low, 2007/08)



[a] A note. Positive values denote a saving under the boundary change.

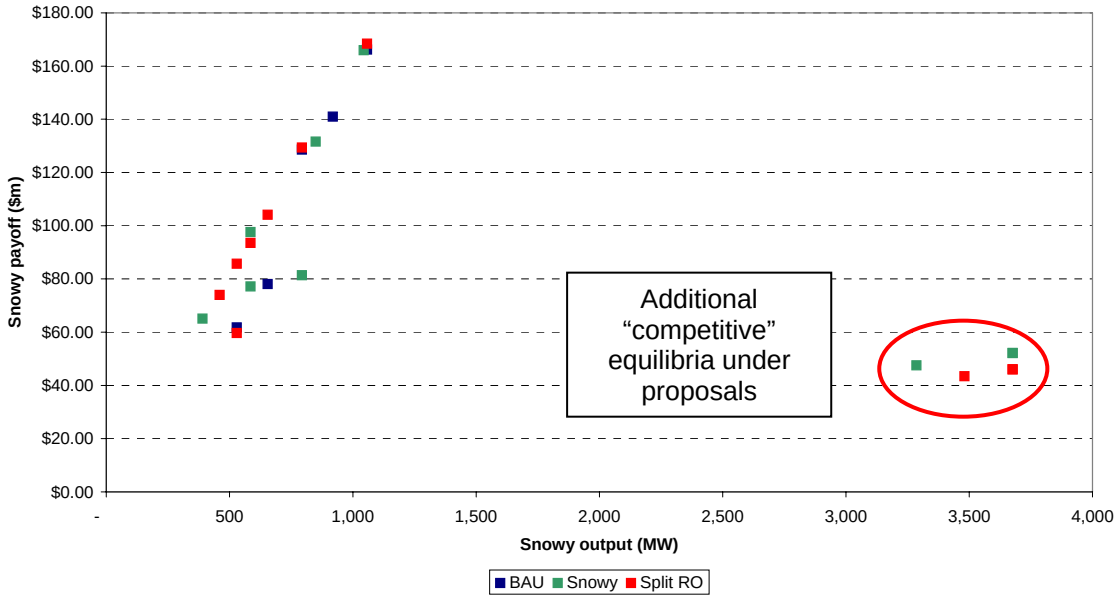
Figure 5.5 **Production cost savings relative to BAU by demand point (Split RO, Contracted Low, 2007/08)**



a A note. Positive values denote a savings under the boundary change.

A number of Nash Equilibrium outcomes comprise the results for this point. In all three scenarios (BAU, Snowy Hydro and Split Region Option) a range of equilibria in which Murray and Tumut offer a relatively small proportion of capacity (<50%) exist. However, under both the Snowy Hydro proposal and the Split Region Option, a number of equilibria were also found where Snowy Hydro essentially offers all of its capacity to the market. Therefore, on balance, combined Tumut and Murray generation were higher in the Snowy Hydro proposal scenario compared with the BAU base case scenario at this point (see Figure 5.6).

Figure 5.6 Snowy Hydro equilibria payoffs and output for demand point 29



The intuition for these results is as follows.

In the BAU base case, Snowy Hydro typically has the incentive to seek to withhold some capacity in order to import high prices from either Victoria or NSW (depending on market conditions and the direction of flow). For example, at times of southward flows, Snowy Hydro has incentives to withhold output at Murray to import the (high) Victorian price to the Snowy region. Under the Snowy Hydro proposal and the Split Region Option, while patterns of bidding incorporating a degree of capacity withholding still represent sustainable equilibrium strategies, additional equilibria exist where Snowy Hydro in effect bids competitively, offering the bulk of its capacity (100% or close to 100%) to the market at low cost (as do other market participants).

In the BAU base case scenario under conditions of southward flow, competitive bidding equilibria are not sustainable as Nash Equilibria. This is because Snowy Hydro has an incentive to initially offer a large volume of Tumut generation. This has the effect of inducing clamping of the Snowy to NSW interconnector. Following the implementation of clamping, Snowy Hydro has an incentive to withhold most of its output in order to receive the (high) Victorian price on its *entire* output. Withholding has the benefit of both:

- ensuring the Snowy to Victoria interconnector does not bind, which would cause the Snowy RRN price to collapse towards the (lower) NSW price; and
- helping to boost the Victorian RRN price, from which Snowy Hydro benefits *on its entire output*.

This limitation of output also reduces the competitive pressure on plant in Victoria.

Such a strategy leads to inefficient dispatch because reduced levels of Snowy Hydro generation does not allow for the maximisation of flows southward into Victoria at times of high Victorian demand. Consequently, dispatch across the NEM is less efficient than some of the potential outcomes under the Snowy Hydro proposal, in which:

- Murray generation has reduced incentives to withhold output. This is partly because it no longer needs to be concerned to avoid constraining the Snowy to Victoria interconnector (which in the BAU base case scenario would push the Snowy RRN price down towards the NSW price). It is also partly because withdrawal of Murray output only benefits the price received by Murray generation, *rather than all Snowy Hydro output*;

- Tumut generation often does not find it profitable to withhold, as the price/quantity trade-off may not be worthwhile. Rather, Tumut has incentives to generate based on the prevailing NSW price. This may lead to a significant increase in Tumut generation (compared to the BAU), which competes with NSW generation; and

- In total, Snowy Hydro generation can in some cases be significantly higher than under the BAU scenario.

Therefore, under the Snowy Hydro proposal, there may be increased generation at both Murray and Tumut. Increased generation at Murray can also facilitate higher flows southwards through the Murray-Tumut cut-set. The increased flow into Victoria further encourages more competitive bidding in Victoria, which in turn helps produce more competitive and efficient dispatch across the NEM.

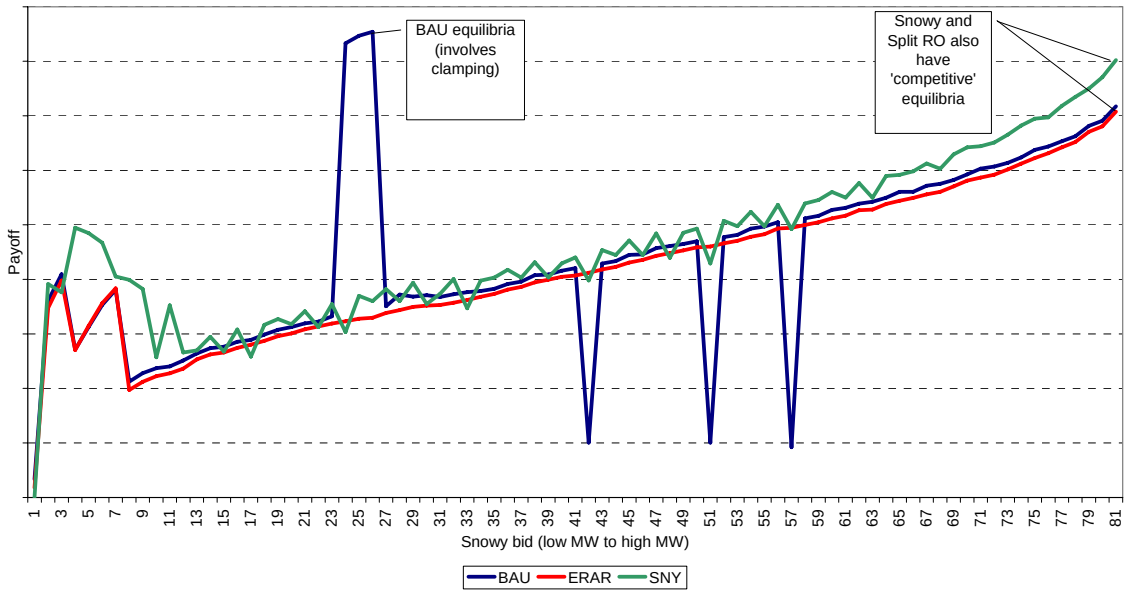
Under the Split Region Option, both Murray and Tumut have some incentives to withhold some output to ensure that constraints south of them do not bind at times of southward flows. However, unlike in the BAU base case scenario, there are some equilibria in which Snowy Hydro does not find it profitable to withhold its generation. In these cases, a large proportion of Tumut output is offered to the market. This may even lead to a reversal of southward flows on the NSW to Tumut interconnector. This promotes lower-cost and more competitive outcomes in NSW. Meanwhile, Snowy Hydro's incentives to withhold Murray generation are reduced because such withdrawal only benefits the price received by Murray generation, *rather than all Snowy Hydro output*.

The higher output at Murray means that total flows into Victoria are higher than under the BAU base case (in part due to the position of Murray generation in the Snowy loop). The increased flow into Victoria across the cut-set helps produce more competitive and efficient dispatch across the NEM. It is worth noting, however, that this outcome is not as efficient at this demand point as the Snowy Hydro proposal (compare Figure 5.4 and Figure 5.5). This is due to the lack of incentive under the Snowy Hydro proposal for Snowy Hydro to withhold Murray output to some extent to keep the lines south of Murray unconstrained.

The result of these effects for demand point 29 can be seen in Figure 5.7. Under the Snowy Hydro proposal and the Split Region Option, the absence of clamping

removes the spike in payoffs and the resultant equilibria include the competitive bidding outcomes shown in the far right of Figure 5.7.

Figure 5.7 Snowy Hydro payoff curve for demand point 29



The offering of additional output under the Snowy Hydro proposal leads to the displacement of considerable other (thermal) generation at these times. Given that these times represent high levels of demand in the system, it is relatively high cost thermal plant that is displaced. Figure 5.8 and Figure 5.9 show the effect of the Snowy Hydro proposal on generation of different levels of variable cost compared to the BAU base case in 2007/08. The Snowy Hydro proposal overwhelmingly leads to lower dispatch of mid-merit and peaking plant.

Figure 5.8 **Snowy scenario annual output changes relative to the base scenario by financial year and cost band, Contracted Low**

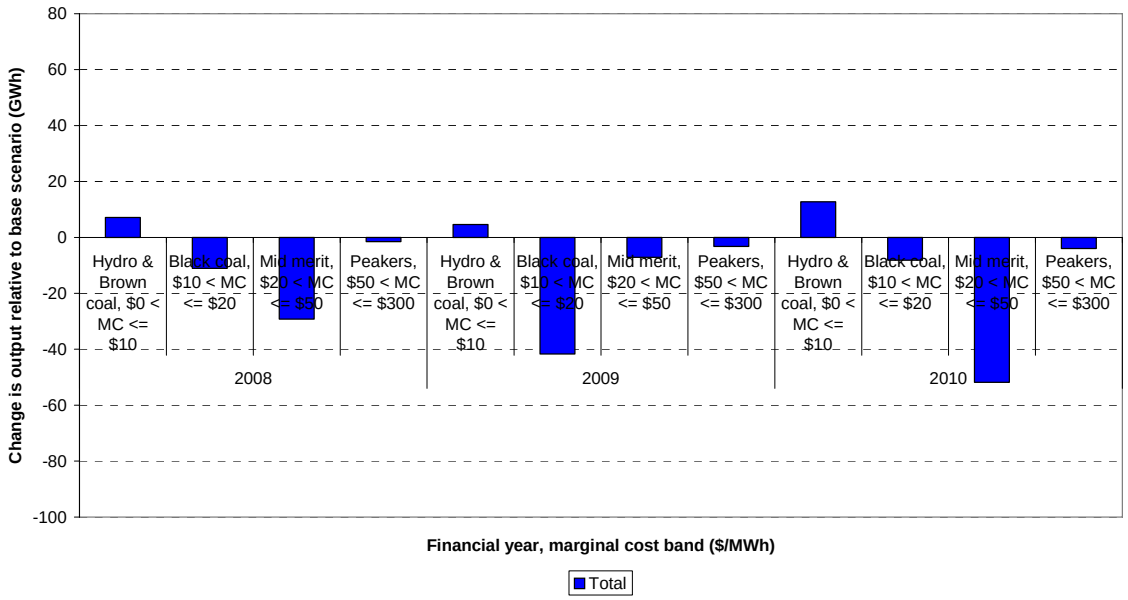
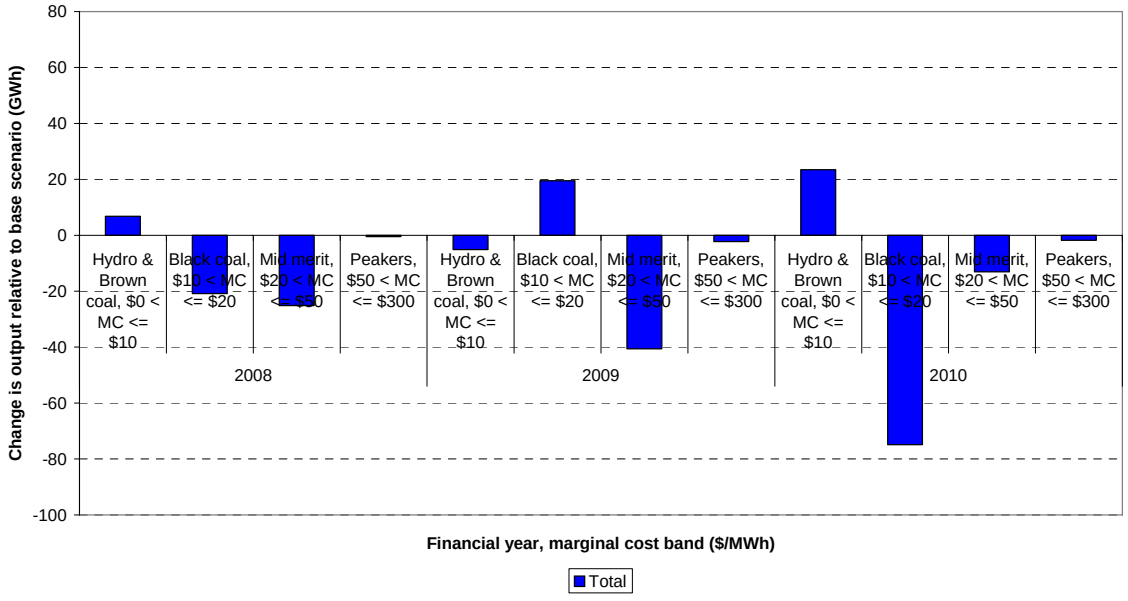


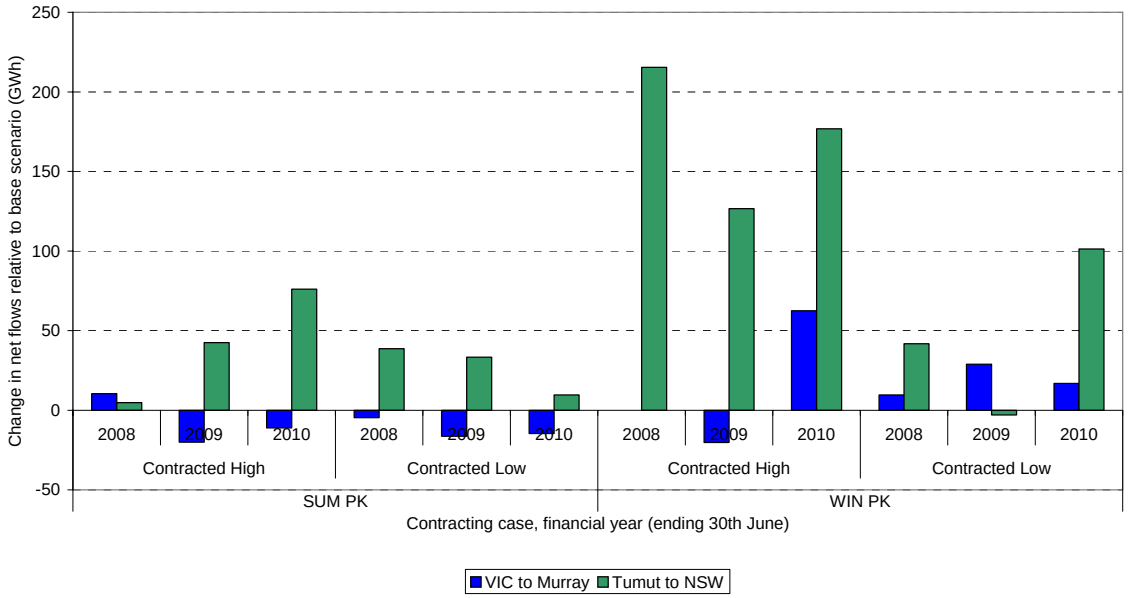
Figure 5.9 **Snowy scenario annual output changes relative to the base scenario by financial year and cost band, Contracted High**



Similar favourable results were found for the Split Region Option (see Appendix A).

Finally, Figure 5.10 shows that the Snowy Hydro proposal leads to increased flows from Tumut to NSW compared to the BAU base case scenario. This is consistent with predicted changes to bidding behaviour.

Figure 5.10 Snowy scenario changes in net flows relative to the base scenario



The implications of the Snowy Hydro proposal and the Split Region Option on pricing and other aspects of market performance are discussed in later sections.

5.1.4 Commission's Assessment

The Commission has taken into account both conceptual and modelling analysis, as well as the views expressed in stakeholder submissions, in making its assessment of the likely dispatch efficiency implications of the Snowy Hydro proposal. In the Commission's view, the Snowy Hydro proposal appears likely to be associated with more competitive and efficient dispatch outcomes than the BAU base case.

As noted above, the conceptual analysis of dispatch outcomes under the various options was ambiguous, being highly dependant on the nature of binding constraints and generators' bidding behaviour. Therefore, the Commission has placed only limited weight on the conceptual analysis of dispatch. However, within this context, the Commission notes that the conceptual analysis did predict more efficient dispatch under the Snowy Hydro proposal in cases where the Murray-Tumut constraint was the key constraint of interest.

Submissions views were mixed on this issue (see Appendix B for details). Origin Energy considered that Energy considered that by increasing the number of generators observing the same price signals, the Snowy Hydro proposal would enhance competitive neutrality, decrease bidding distortions, and lower the ability for each generator to influence its price for output. Other submissions expressed concern at the move away from explicitly pricing congestion on the existing interconnectors. Westpac thought that Snowy Hydro ability to act as gate-keeper would remain, and Snowy Hydro would act to shut out Victorian generators from the NSW market, even when there is no counter-price flows.

The quantitative modelling analysis undertaken for the Commission gives a stronger basis for the view that the Snowy Hydro proposal is likely to produce dispatch efficiency benefits. The modelling results indicated lower production costs under the Snowy Hydro proposal and the Split Region Option than in the BAU base case. These effects were partly due to higher average equilibrium levels of Snowy Hydro output under both change options. The modelling suggested that during extreme peak summer and winter periods, Snowy Hydro could have incentives to offer a much greater proportion of its capacity to the market. This was because, in at least some cases, there was much less prospect for Snowy Hydro to profitably bid in such a way as to boost prices in adjacent regions and then "import" those high prices to its own region. The placing of Murray and Tumut in separate regions appeared to be central to overcoming Snowy Hydro's incentives to bid in this undesirable way, because the gains from withholding generation were limited to the output of one or other of its plant rather than applying to both of their outputs (as is the case under the BAU). For the Snowy Hydro proposal, this would also result in larger flows northward from Tumut to NSW.

At the same time, the modelling results showed few significant constraints arising under the Snowy Hydro proposal or the Split Region Option and no major counter-price flows outside of DirectLink. That said, it was not clear whether allowing scope for clamping in the quantitative modelling of the Snowy Hydro proposal or the Split Region Option would have changed generators' incentives in such a way as to materially affect the dispatch results.

The modelling found that the higher output at Snowy Hydro (and low-cost coal-fired plant) could displace mid-merit coal and higher-cost gas plant elsewhere. While this would mean (due to Snowy Hydro's assumed energy budget) that Snowy Hydro plant would be less likely to run at lower-demand times of the year, this would have a smaller negative effect on production costs than the positive effect of Snowy Hydro plant operating more during peak times. In short, the quantitative analysis found that the Snowy Hydro boundary change proposal should lead to more efficient patterns of Snowy Hydro (and other plant) dispatch across the year than in the BAU base case scenario.

Overall, the Commission considers that compared to the BAU base case, the Snowy Hydro proposal should enable more free-flowing interconnection and support more competitive bidding strategies across the NEM, leading to more efficient dispatch.

5.2 Pricing outcomes and participant responses

5.2.1 Background

The effect of the Snowy Hydro proposal on price outcomes in the NEM is a further consideration in the Commission's assessment. Wholesale prices can affect both allocative efficiency and dynamic efficiency.

Allocative efficiency is based on the notion that resources will generally be allocated efficiently where prices equal the opportunity cost of supply. At this point, the price consumers pay to consume electricity will equal the cost generators incur to produce electricity. Prices that are higher than the opportunity cost of supply imply that

consumers are required to pay more than the cost of providing more electricity. Therefore, if a consumer values electricity above the cost of supply but below the price, he or she will choose not to consume electricity. This results in a loss of welfare in the electricity market equal to the difference between the consumer's value of electricity and the opportunity cost of supply. Similarly, if prices are below the opportunity cost of supply, this implies that consumers are required to pay less than the cost of providing more electricity. If a consumer values electricity below the cost of supply but above the price, he or she will choose to consume electricity. This results in a loss of welfare in the electricity market equal to the difference between the opportunity cost of supply and the consumer's value of electricity. The same principles can be applied to producers' operational decisions about whether or not to produce electricity.

For these reasons, a move to prices that more closely reflect the opportunity cost of supply would be likely to produce improvements in allocative efficiency. However, there are normally lags in the process of moving from more efficient spot prices to economic welfare gains. This is partly because very few, if any, consumers directly pay the spot price of electricity and many producers are partly or largely hedged against spot price movements in the short to medium term. Therefore, the impact of the Snowy Hydro proposal on spot prices is relevant to the NEM Objective to the extent those impacts flow through and are reflected in prices paid by consumers or received by producers. It is the change in consumption and production behaviour in response to the new prices that are the sources of efficiency gains (or losses). 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 or opportunity costs of supply.

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 may be more inclined to sell more contracts and/or 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-boundary change 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 consumers to lower electricity prices will vary from the short to long term. In the short term, lower electricity prices may not change consumption behaviour a great deal. This is because consumers 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 consumers cannot exploit the benefits of lower prices in the short term. For example, they can use the savings in lower electricity costs to purchase other goods or services that they could not

afford before the change in prices. Consumers could also change how much power 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.

Wholesale price outcomes can also affect dynamic efficiency. Dynamic efficiency is concerned with the efficiency of longer-term decisions, including investment timing and location of generation and load. Wholesale price outcomes that better reflect underlying demand and supply conditions should encourage more efficient longer-term decisions. For example, if a change to region boundaries leads to lower and more cost-reflective prices in a region, proponents of generation investment would have greater incentives to locate their plant elsewhere than before the change. Similarly, prospective investors in load would have greater incentives to locate in that location. Both of these impacts should increase economic welfare in the long term.

Despite the presence of some lags in the translation of more efficient wholesale prices into changed behaviour, the Commission considers that, generally speaking, Rule changes that move prices closer to economically efficient costs (for example by promoting greater competitiveness) should be encouraged. The Commission has relied on a combination of conceptual analysis and market modelling to determine whether the Snowy Hydro proposal is likely to lead to such changes in regional spot prices.

5.2.2 Conceptual analysis

Work undertaken for the Commission by Darryl Biggar[57] attempted to shed light on the potential pricing impacts of the Snowy Hydro proposal and the Split Region Option compared with the BAU base case. As with the analysis of dispatch efficiency, this analysis focussed on these impacts assuming a particular constraint (and only that constraint) between the Victorian RRN and NSW RRN was binding.

However, it is very difficult to conceptually determine whether and to what extent spot prices might change following the implementation of the Snowy Hydro proposal or the Split Region Option compared with the BAU base case. This is because spot pricing outcomes depend on a number of factors. These are:

- which constraints are binding in each case;
- which constraints are *close* to binding or could potentially bind with a small change in demand or generation output; and
- the behaviour of all the relevant generators – including whether any decide to exercise transient market power.

Importantly, in electricity markets there is often interdependence between:

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[57] Biggar, D., *Snowy Region Boundary Change Proposals: Further Assessment of the Option*, 12 December 2006.

- Each of the above three factors, because the identity of binding or near-binding constraints may affect generator bidding behaviour and generator bidding behaviour will influence which constraints bind or do not bind; and

- The bidding behaviour of different generators – the bidding behaviour of a particular generator often depends on the bidding behaviour of other generators and vice versa.

Using conceptual analysis only, it is difficult to predict which constraints are binding (or near binding) and which generators might find it worthwhile to exercise transient market power (and to what extent) under various boundary change configurations and demand conditions. While these interactions affect predictions of dispatch outcomes (as discussed above), making conceptual predictions about dispatch problematic, the Commission considers that pricing outcomes are *even more* sensitive to strategic behaviour by generators than dispatch outcomes. This is because the effect of generators bidding substantially below or above their resource costs can have a major impact on prices even if the effect on dispatch outcomes is relatively minor.

For these reasons, the Commission concluded that further conceptual discussion on potential pricing outcomes would be unlikely to provide clear guidance on the likely outcomes. The Commission has therefore placed only weight on the conceptual analysis of pricing impacts and has sought to better understand these impacts through quantitative modelling analysis.

5.2.3 Modelling analysis

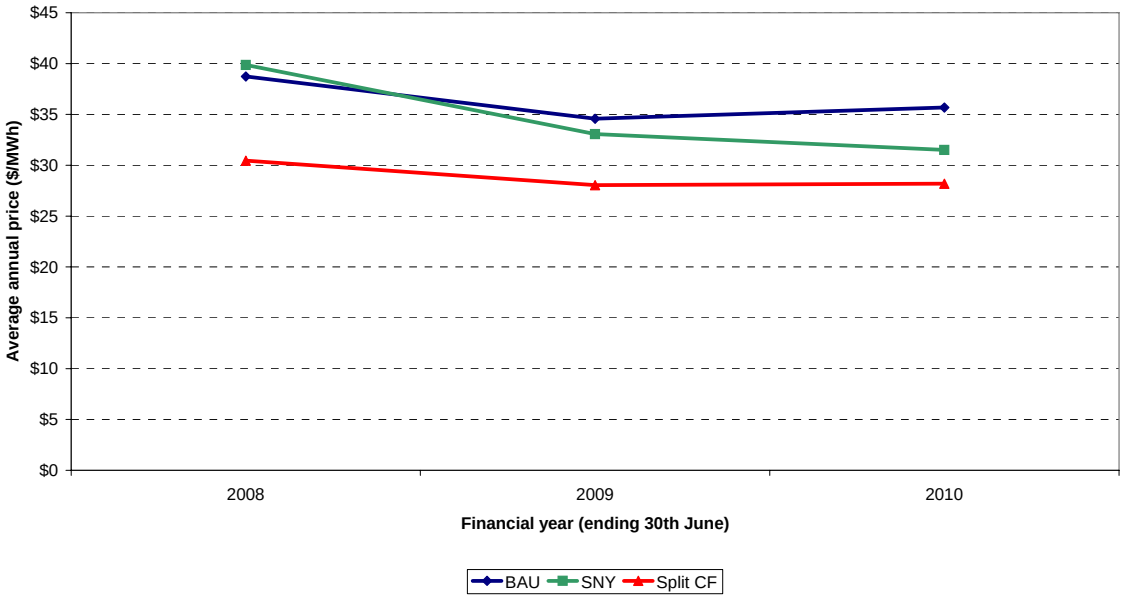
The modelling undertaken to assess the dispatch efficiency impacts of the Snowy Hydro boundary change proposal and the Split Region Option also produced average regional prices for summer peak, winter peak and the remainder of the year periods. A very wide range of bidding conditions and scenarios were modelled. The scenarios considered different patterns of hedging (which can affect, in the short term, bidding behaviour and prices), IRSR unit holdings and strategic bidding options (see Appendix A).

The results of the wholesale price modelling were driven by the same factors that led to the modelled dispatch outcomes discussed in the previous section. That is, the Snowy Hydro proposal led, in some cases, to more competitive bidding equilibria brought about by Snowy Hydro (and, in response, other generators) offering more of their capacity to the market. This more competitive behaviour was, in turn, caused by Snowy Hydro's reduced profitability of engaging in withdrawal strategies to boost prices and then "import" high prices to its region to apply to its entire output. A key driver for this reduction in profitability of the withdrawal strategies was the allocation of Murray and Tumut into separate regions, so that only one or the other (but not both) would typically benefit from the exercise of transient market power.

The modelling results indicate that, relative to the BAU base case, implementation of the Snowy Hydro proposal or the Split Region Option could lead to lower prices in

both NSW and Victoria under both High and Low contracting cases (see below Figure 5.11 to Figure 5.14).[58] This occurs due to the occurrence of certain equilibria under both the Snowy Hydro proposal and the Split Region Option that involve high levels of Snowy Hydro (Murray and Tumut) generation. This behaviour, in turn, drives more competitive bidding from generation in the rest of the NEM. Further, most of the price reductions are caused by changes in bidding behaviour during peak summer and winter times rather than during the remainder of the year (see Appendix A). Focussing on the same demand point as in the discussion of dispatch efficiency (demand point 29), the prices across the NEM regions for that period were much lower under the Snowy Hydro proposal compared with the BAU scenario (see Appendix A).

Figure 5.11 Average annual prices – NSW, Contracted Low



[58] Except for the Snowy Hydro proposal being associated with a slight price increase in NSW for 2008 only.

Figure 5.12 Average annual prices - NSW, Contracted High

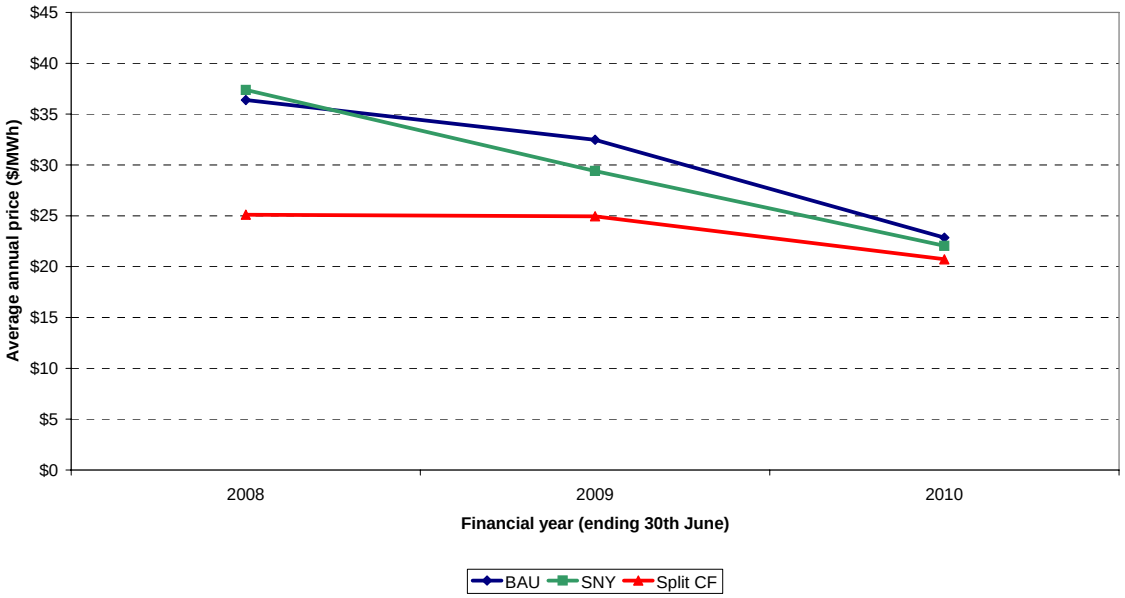


Figure 5.13 Average annual prices - Victoria, Contracted Low

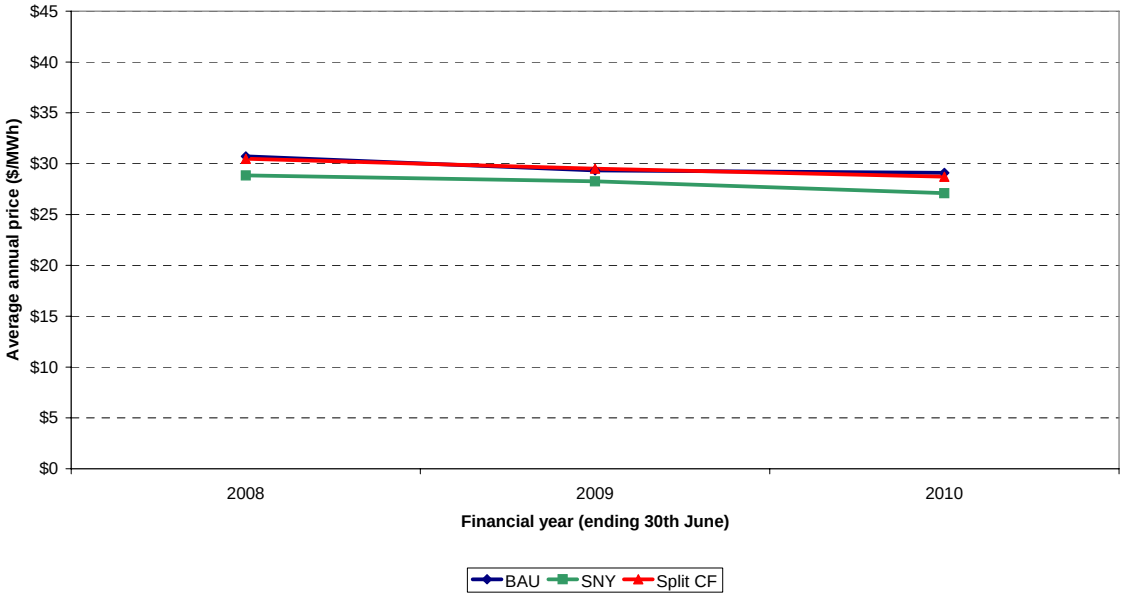
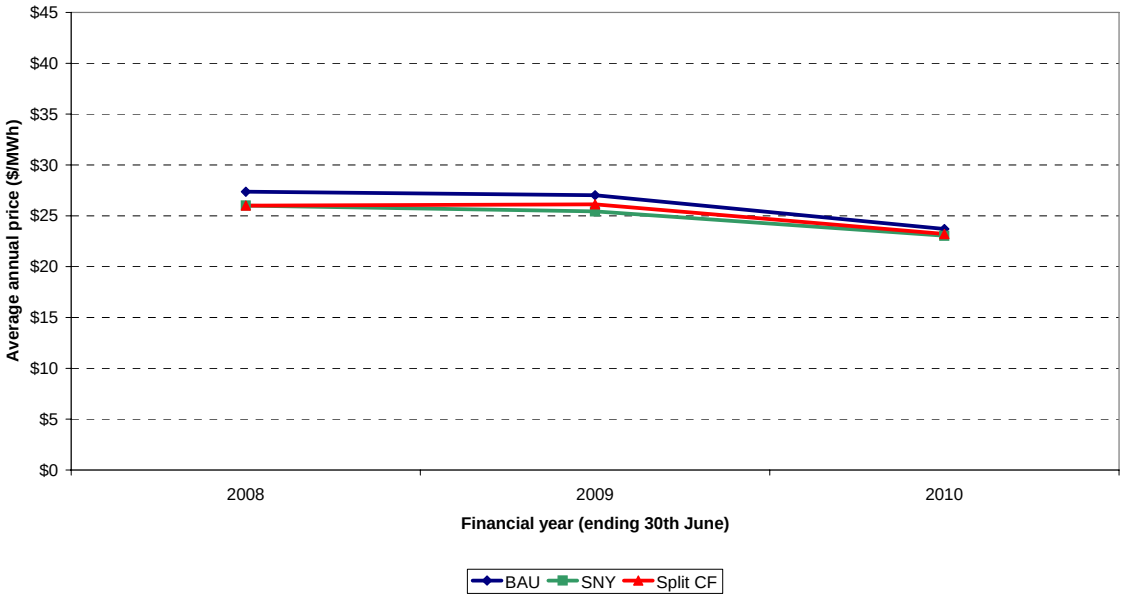


Figure 5.14 Average annual prices - Victoria, Contracted High



5.2.4 Commission's Assessment

The Commission has taken into account both conceptual and modelling analysis, as well as the views expressed in stakeholder submissions, in making its assessment of the likely wholesale pricing implications of the Snowy Hydro proposal. Based largely on the quantitative modelling analysis undertaken, the Commission believes that the Snowy Hydro proposal could lead to lower and more cost-reflective prices in those regions in which it is likely to have the greatest effect (Victoria and NSW). Its view that lower price outcomes are likely to also be consistent with more cost-reflective prices is based on the indications in the modelling results that both Snowy Hydro and other generators are likely to adopt more competitive bidding strategies by offering more of their capacity to market under the Snowy Hydro boundary change proposal.

There was little direction emerging from submissions on whether the Snowy Hydro proposal would lead to favourable pricing outcomes (see Appendix B). Origin Energy noted that the Snowy Hydro proposal should lead to less volatile prices because in larger regions more generators observed the same price signals and there is more trade around prices that reflect a higher concentration of generation and load. Although Transgrid commented that the Snowy Hydro proposal may lead to lower Settlement Residues Auction proceeds which would lead to higher transmission charges.

Although favourable wholesale price impacts for consumers are not a distinct component of the NEM Objective, the Commission believes that greater alignment between costs and prices has many desirable implications. Over time, reductions in wholesale prices towards supply costs should lead to lower retail prices. This should promote allocative and dynamic efficiency as actual and potential consumers consume electricity up to the point where the value they place on it equals the

incremental cost of provision. Further, owners of generators are encouraged to produce electricity (and invest in more plant) in response to accurate price signals instead of those artificially boosted by either operational intervention in dispatch or settlement or transient market power. Therefore, the Commission considers that both the price impacts of the Snowy Hydro proposal and the consequential participant responses are likely to promote the NEM Objective.

5.3 Inter-regional trading and risk management

5.3.1 Background

Generators in the NEM face both physical (dispatch) risk and financial (price) risk. Dispatch risk refers to uncertainty about whether their plant will be selected to generate, while price risk refers to uncertainty about the price they will be paid for their output.

Generators often try to manage their price risk by entering into financial contracts with other market participants.

The NEM is an energy-only market, which means that the spot price is designed to provide the means for generators to make investment decisions and recover both their variable *and fixed* costs. There is no separate market for generation capacity or the provision of reserve energy and all power must be sold to and acquired from the spot market. The price in an energy-only market reflects demand and supply conditions on a half-hour by half-hour basis. However, due to the volatility of demand, often due to weather conditions and sudden shifts in supply caused by generator bidding and transmission limitations, such spot prices can be highly volatile. This makes participation in the market risky for generation participants because they have substantial fixed capital costs at risk while the prices they receive can vary substantially. Participation is also risky for retailers, since they tend to have contracts to supply customers at relatively fixed prices but have to pay a variable price for the electricity they need to supply those customers.

However, as the risks faced by retailers and generators are often the inverse of one another, retailers and generators can manage these financial risks by contracting with each other. A large proportion of generators' output in the NEM (often as high as two-thirds or more) is hedged via financial contracts, so generators face much less revenue volatility than they would if they were solely reliant on the spot price for their income. The most common type of contract (but far from the only type) is the "swap", in which the contract sets a strike price and one party (typically a generator) makes a difference payment to the other party (typically a retailer) if the spot market exceeds the strike price while the retailer makes a difference payment to the generator if the spot price drops below the strike price.

The key interest of a risk-averse generator that is contracted (via firm swaps) in respect of a share of its capacity is to ensure it is dispatched and receives the prevailing spot market price. If a generator earns the spot price on its contracted output, the sum of its spot market revenue and its swap transaction revenue should equal the strike price. That is, the generator receives a fixed price for its contract volume.

Generators' interests in being dispatched in relation to their contracted output raises the problem of dispatch risk. The NEMDE selects generators to run based on a comparison of their bids against the marginal value of electricity at their locations (ie the local nodal shadow price of electricity). The locational marginal prices are implicitly calculated by NEMDE based on bids, offers, electrical losses and constraints. If a generator's offer is less than its nodal shadow price, it will generally be dispatched, whereas if a generator's offer is more than its nodal shadow price, it will generally not be dispatched. Consequently, generators located at the regional reference node will be dispatched if their offers are below the RRN price because the RRN price *is* equal to the marginal value of electricity at the RRN. However, generators at locations other than the RRN may experience nodal shadow prices that diverge from the RRN price. Hence, these generators may not be dispatched even if their offers are below the RRN price, or they may be dispatched even if their offers are above the RRN price.

The effect of introducing more regions is effectively to create more regional reference nodes, which means that more generators are likely to experience greater consistency in the relationship between their offers and the RRN and whether they are dispatched.[59] Therefore, a greater number of regions can reduce generators' dispatch risks and more generally, improve the (technical) economic efficiency of dispatch.

However, a reduction in dispatch risks caused by a more refined region boundary structure can come at the expense of increased price/revenue risk. Generators typically enter contracts with counterparties in other locations. Where these counterparties are located in other regions, generators may face price risk arising from differences in the price they are paid for their output and the price at which the contract is settled. These differences (and risks) arise where transmission constraints (or losses) lead to price separation between regions. For example, a Victorian generator entering a swap contract with a NSW retailer will be required to make difference payments based on the differences between the contract strike price and the NSW RRN price. However, the Victorian generator will receive the Victorian RRN price for its output. If, due to a transmission constraint, the NSW RRN price rises to $1,000/MWh while the Victorian RRN price remains at $30/MWh, and if the contract strike price is also $40/MWh, the generator will have to make a difference payment to the retailer of $960/MWh even though the generator only earns the Victorian price of $30/MWh on its output.

In the NEM, IRSRs are auctioned to participants in the form of units, which represent a proportion of the transmission rentals arising on particular directional interconnectors.[60] These IRSR units enable participants to hedge inter-regional price risk by buying the rights to a share of settlement residues for a period.

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[59] In other words, generators would have greater confidence that if their bid was below the (local) RRN price, they would be dispatched and not otherwise.

[60] A directional interconnector is a reference to a particular direction of flow on an interconnector. For example, the Snowy to NSW interconnector comprises the SN_NSW directional interconnector (for northward flows) and the NSW_SN directional interconnector (for southward flows) (see 3.18.1(c) of the Rules).

IRSR units are sold as non-firm instruments in that they provide a right only to the residues that accrue to physical flows on an interconnector. If flows are reduced for any reason, prices can still separate but the holders of the units have a reduced hedge, or no hedge, against those price differences. The issue of non-firmness and its consequences for competition and efficiency are discussed in more detail below.[61]

5.3.2 Conceptual analysis

The discussion above considered the impact of region boundaries on the physical and financial risks faced by NEM participants.

As noted in Section 2, the impact of a region boundary change proposal on participants' willingness to enter contracts with counter-parties in other regions is an important consideration for the Commission. This is because the greater the willingness of participants to hedge inter-regionally, the greater the likely depth of electricity derivative markets. The Commission determination on the Southern Generators' proposal also noted that hedging instruments provide important signals for long term investment and entry decisions by generators, retailers and large loads.[62]

For these reasons, the Commission is of the view that region boundary changes can affect the competitiveness of the NEM and the likely extent to which consumers will benefit from the market in the long run. As noted in a recent report by Firecone, although an increase in the number of regions may reduce the extent of mis-pricing in the NEM, it can also raise transactions costs for participants wishing to enter into inter-regional financial contracts for electricity.[63] This can lead to a decline in inter-regional contracting, more geographically-specific development of new generation plant and increased impetus for vertical integration. This suggests that there may be a trade-off between dispatch efficiency (which can be promoted by more regions) and dynamic efficiency (which can be harmed by more difficult-to-manage price risk caused by an increased number of regions).

A key determinant of participants' willingness to trade inter-regionally is the availability, price and degree of "firmness" of IRSR units between the relevant regions. A fully firm IRSR unit would compensate the holder for price differences between regions where such differences only arose at times when the flow on the interconnector reached a certain fixed limit. For example, if price differences between regions A and B only occurred when the flow on the A_B interconnector reached 1,000 MW, an A_B IRSR unit would be fully firm, provided that the units were only sold for this capability (1,000 MW).

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61 Apart from changes to regional boundaries, there are ways to make IRSR units financially firmer, such as by changing the definition of IRSR units or by making a party accountable for funding shortfalls in residues. These options (which have their own issues) lie beyond the scope of this determination.

62 AEMC, *National Energy Amendment (Management of Negative Settlement Residues in the Snowy Region) Rule 2006, Final Rule Determination*, 14 September 2006, pp.A43-44.

63 Firecone report, p.25.

However, in many cases, transmission constraints in the underlying network may occur and price differences may arise even when flows on an interconnector have not reached a fixed limit. This can be for several reasons.

First, transmission network outages or deratings may reduce interconnector capability below typical expected levels. This means, for example, that a participant that purchases 100 of 1,000 units relating to a 1,000 MW interconnector will not receive sufficient residues to hedge a 100 MW transaction. If the interconnector capability is, say, reduced to 500 MW, each unit will only hedge a 0.5 MW transaction – half the desired amount – with the result being a non-firm inter-regional hedge.

Second, constraints causing regional price separation may arise even when interconnector flows are below nominal limits. This is because the occurrence of constraints often depends not only on interconnector flows but on the output of one or more generators. Since the output of these generators can vary with dispatch, the underlying network may become constrained at different levels of interconnector flow. For example, flows to the Queensland RRN can be limited not only by limits on the QNI, but also by transmission limits between the Tarong generators and Brisbane. If, at times of high Queensland demand, the Tarong group of generators is dispatched at a relatively high level, the Queensland RRN price may rise above the NSW RRN price (ignoring losses) even though northward flows on QNI are below typical limits (or even if flows on QNI are southward – ie counter-price flows). As participants cannot easily predict when and to what extent the relevant generators will be dispatched, they cannot be confident that a particular volume of IRSR units will provide a perfect hedge for a correspondingly-sized inter-regional transaction.

This can be illustrated with the aid of a more specific example. If the northward QNI limit is 1,000 MW and the "Tarong limit" to South Pine is 2,000 MW, and if the Tarong group of generators is dispatched at 1,200 MW, price divergence will occur even though northward flows on QNI are only 800 MW. This means that a NSW_QLD IRSR unit holder will receive a non-firm hedge in a similar way as if the QNI northward limit was reduced to 800 MW due to a derating. The IRSR units will be even less firm if the Tarong generators produce more than 1,200 MW and the units will be totally non-firm if southward (counter-price) flows occur due to Tarong group generators bidding below cost.

Similarly, where there are loops between regions, binding constraints can arise on an interconnector due to constraints on another interconnector or intra-regional link. This is due to electricity following the path of least impedance across multiple lines.

Analysis undertaken for the Commission by Dr Biggar suggests that none of the boundary proposals will lead to *fully firm* IRSRs between the Victorian and NSW RRNs.[64] While both the Snowy Hydro proposal and the Split Region Option eliminate any counter-price flows arising from loop flow between regions, neither option overcomes the problem of constraints and price separation due to the output

[64] Biggar, D., *Region Boundary Change Proposals: Analytical Assessment of the Options*, 1 December 2006.

of particular generators.[65] For example, under the Snowy Hydro proposal, the nominal limit on interconnector flows would be equivalent to the current limit between Murray and Tumut of 1,350 MW. However, price separation between Victoria and NSW could still occur at times of northward flows if Tumut generation is such that constraints between Tumut and Sydney bound before Murray to Tumut flows hit 1,350 MW.

Analysis undertaken for the Commission shows that even under a full nodal pricing regime, some IRSRs between Melbourne and Sydney will be non-firm.[66] That said, the problem of IRSR non-firmness can be exacerbated by the "mis-pricing" of certain generators, which could provide them with incentives to either bid well above cost in order to avoid being dispatched at prices below their opportunity cost or bid well below cost in order to be dispatched at prices above their opportunity cost. This could lead to clamping in the BAU base case or counter-price flows more generally. Under the:

- BAU base case – counter-price flows on the Victoria to Snowy interconnector could occur whenever the Murray-Tumut constraint bound, leading to clamping (northwards) or reorientation to Dederang (southwards). Clamping could also occur on the Snowy to NSW interconnector if Tumut output was offered at a low or negative price;

- Snowy Hydro proposal – counter-price flows on the Victoria-NSW interconnector could occur if transmission constraints bound north of Tumut or south of Murray. This is because Snowy Hydro could be encouraged to bid its plant well below cost to be dispatched and receive the importing region's (relatively high) price;

- Split Region Option – counter-price flows may also occur because constraints between Melbourne and northern Victoria or between southern NSW and Sydney could lead to northern Victorian or southern NSW generators, respectively, bidding below cost. However, so long as constraints only bound between northern Victoria and Murray or between Tumut and southern NSW, mis-pricing and counter-price flows may not occur.

However, unless it is known which constraints will bind how often, it is not possible to make definitive statements regarding the effect of the boundary change options on IRSR firmness, much less make statements regarding the willingness of participants to enter inter-regional hedges and consequential impacts on entry and investment decisions.

Another issue relating to inter-regional trading and risk management relates to the historic restrictions (in section 3.18.2(h) of the Rules) on Snowy Hydro's acquisition of IRSR units for directional interconnectors into the Snowy region (i.e., VIC_SN and NSW_SN). These restrictions were imposed by the ACCC because of its concerns

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[65] Biggar, D., *Region Boundary Change Proposals: Analytical Assessment of the Options*, 1 December 2006, paras 22-28.

[66] Biggar, D., *Region Boundary Change Proposals: Analytical Assessment of the Options*, 1 December 2006, pp.31-32.

about Snowy Hydro's ability to increase the Snowy RRN price by exercising market power – given that it is the monopoly generator in the region with no load.[67] Such price increases would increase the value of the IRSR units on directional interconnectors into the Snowy region (i.e. import flows into Snowy) and provide a strong benefit to Snowy Hydro at the expense of other NEM participants and ultimately, end-use consumers. The Snowy Hydro proposal was silent on what would happen to these restrictions in the event that the Snowy region was abolished. This issue is discussed further in Section 7.

5.3.3 Modelling analysis

The details of the modelling approach used to assess the nature of changes to interregional trading are described in more detail in Appendix A. In summary, the approach involved establishing a hypothetical contracting scenario using modern portfolio theory.

Portfolio theory provides a framework for analysing how rational investors would use diversification to optimise their portfolios in terms of risk and return and how an asset should be priced given its risk relative to the market as a whole. For a given expected return, a rational investor would choose the least risky portfolio. In portfolio theory, this relationship between risk and reward is represented by an efficient frontier

As market conditions change, so too does the efficient frontier. This enables the impact of changes in spot price volatility and IRSR firmness arising from the Snowy Hydro boundary change proposal to be compared to both the BAU base case and the Split Region Option.

The risk modelling was undertaken for several key scenarios:

- A Victorian generator hedging at the NSW RRN;
- A NSW generator hedging at the Victorian RRN; and
- A Snowy generator hedging at both the Victorian and NSW RRNs concurrently.

In each case, the risk model was run to calculate the efficient frontier for the given set of price duration curves and IRSR units. Wholesale prices and IRSR firmness under each scenario were derived from the results of the dispatch modelling discussed in previous sections.

The portfolio analysis assumes a generator in a given region has a fixed inter-regional position and determines the minimal risk associated with that same position under each of the BAU base case, the Snowy Hydro proposal and the Split Region Option.

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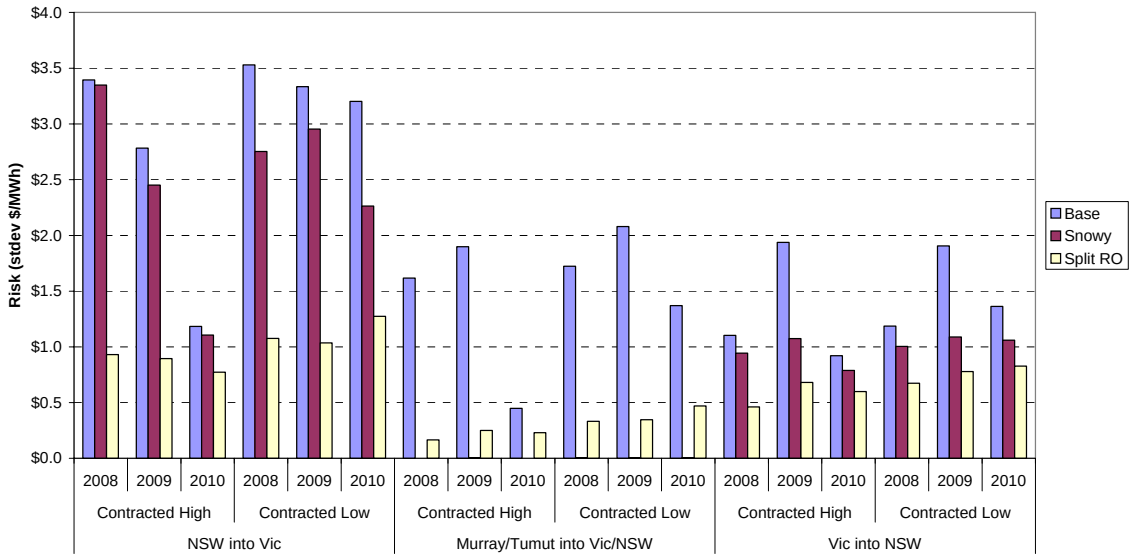
[67] ACCC Final Determination, Application for Authorisation, NEC Settlement Residue Auction Process, 22 December 1999

The modelling analysis found that the Snowy Hydro proposal and the Split Region Option produced, in all cases, lower levels of risk associated with a given inter-regional position compared to the BAU base case (see Figure 5.15). The results show the level of risk associated with the inter-regional position (including a risk-minimising mix of relevant IRSR units). Risk is shown in terms of the standard deviation of returns for the optimised portfolio, in terms of $ per MWh covered by the inter-regional position.

These results were due to the general pro-competitive effects of both of the boundary change options, which, as noted in previous sections, tended to lead to lower and less volatile wholesale prices and insubstantial incidences of transmission constraints causing counter-price flows (outside of Directlink). These effects help reduce inter-regional trading risk.

Figure 5.15 Inter-regional risk results



The results indicated that the Split Region Option could enable lower risk inter-regional hedging for NSW into Victoria and Victoria into NSW, compared to the Snowy Hydro proposal. However, this assumes that the optimal quantity and mix of IRSR units are available to the hedging generator at an actuarially fair cost and ignores transaction costs and execution risk. In reality, participants find it difficult to make these predictions accurately and procure the number of IRSR units they wish.

For example, inter-regional hedging between Victoria and NSW (and NSW to Victoria) in the Split Region Option involves procuring a mix of three separate IRSR units (Vic-Murray, Murray-Tumut and Tumut-NSW), compared to the Snowy Hydro proposal that would only involve a single IRSR product (Vic-NSW). The transaction costs and execution risk associated with procuring a mix of three IRSR products would be materially higher than that for procuring a single IRSR product. The net result is that is that it is unclear whether the Snowy Hydro proposal or the Split

Region Option would deliver less risky inter-regional contracting. It is clear, however, that the Snowy Hydro proposal delivers lower risk inter-regional contracting than the BAU base case:

- Inter-regional price risk is lower for Victoria to NSW and NSW to Victoria hedging – as shown in Figure 5.15; and

- Inter-regional hedging between Victoria and NSW requires only a single IRSR product under the Snowy Hydro proposal, compared to two products under the BAU base case.

For hedging from Murray/Tumut into Victoria/NSW, the analysis indicates that the Snowy Hydro proposal produces the lowest risk outcome. This is intuitively obvious, as there is no inter-regional pricing risk for Snowy Hydro's generators under its proposal – Murray earns the Victorian price and Tumut earns the NSW price.[68]

5.3.4 Commission's Assessment

The Commission has taken into account both conceptual and modelling analysis, as well as the views expressed in stakeholder submissions, in making its assessment of the likely hedging and risk management implications of the Snowy Hydro proposal. Based primarily on the results of quantitative risk modelling and supported by the submissions, the Commission considers that the Snowy Hydro proposal is likely to lead to a material reduction in the risk of inter-regional contracting in the NEM compared to the BAU base case. In particular, generators presently located in either Victorian, NSW or the Snowy regions should face reduced risk in managing their inter-regional contractual exposures. This should help deepen financial derivative markets and encourage new and existing participants to invest where underlying demand and supply conditions suggest is appropriate rather than where potential counterparties are physically located. In the Commission's view, this should contribute to the promotion of the NEM Objective.

In terms of increase inter-regional trading and risk management, the majority of the submissions favoured the Snowy Hydro Proposal over the Macquarie Generation proposal (see Appendix B). They considered that it would improve hedging contract liquidity, and through creating fewer regions, reduce basis risk and increase trading.

While the modelling results showed some additional reduction in risk from the Split Region Option scenario compared to the Snowy Hydro proposal, the Commission recognises that this may not be borne out in reality. In practice, trading across a larger number of regional boundaries (as required in the Split Region Option) may be more difficult than trading across a smaller number of boundaries, other things being equal. This could be partly attributable to a larger number of regions leading to increased complexity in pricing risk and reduced liquidity in trading across each region, as well as to the higher transactions cost and execution risk of acquiring

[68] So long as the contractual exposure does not exceed the relevant plant's operating capacity.

multiple sets of IRSR units across multiple interconnectors.[69] For example, under the Split Region Option, the value of Victoria to Murray IRSRs may be of little value to a participant for hedging purposes unless the participant can also successfully acquire Murray to Tumut and Tumut to NSW IRSR units.

This observation would apply more generally to any proposed arrangements that resulted in participants having to acquire additional sets of IRSR units to hedge the same quantity of the capacity/load that is currently hedged.

With respect to the current restrictions on Snowy Hydro's procurement of "inward" IRSR units, the Commission observes the following:

- Snowy Hydro had the opportunity under the Rules (and previously the Code) to apply to the ACCC for removal of the restrictions at any time – to the Commission's knowledge, it has not done so;

- As noted above, Snowy Hydro's proposal was silent on the future of the restrictions; no explicit case was put forward for their removal; and

- The Commission has not consulted stakeholders on the appropriate future treatment of those restrictions.

The Commission considers that in the absence of a positive case for the removal of the IRSR restrictions, it may be appropriate for them to be replicated under a new boundary structure (with one interconnector between Victoria and NSW rather than two) and remain in force. However, this is a matter on which the Commission is particularly keen to understand the views of stakeholders.

5.4 Power system security, supply reliability, and technical issues

As noted above in Section 2, the Commission does not expect a change to the Victorian and NSW region boundaries to have impacts on power system security and supply reliability. This is because changes to the Snowy region boundary should only affect pricing and settlement rather than the dispatch process. Moreover, NEMMCO will continue to have an overarching responsibility to maintain power system security and the power to make directions if necessary.

In the longer term, region boundary changes that change production and pricing (spot and contract) outcomes are likely to influence the timing, location and type of new investment in load and generation plant. Investors in new plant typically rely on long term contracts to help underwrite their investments. This is especially the case for investors in large baseload plant. To the extent that changes to region boundaries result in more competitive and, hence, predictable behaviour this is likely to ease entry conditions for investors. In turn, a more predictable market is likely to reduce the risk of ill-timed investment and reduce the costs associated with capacity shortages in the market.

[69] While enabling such linked bids to be made may reduce the difficulty of trading across regional boundaries, such changes are, beyond the scope of the Rule change proposal and the Commission's assessment of it.

As noted in Section 2, current metering infrastructure in place in the NEM should not prevent the Snowy Hydro boundary change proposal or the Split Region Option from being implemented.

5.4.1 Commission's Assessment

The Commission has taken into account both its own analysis, as well as the views expressed in stakeholder submissions, in making its assessment of the likely security and reliability implications of the Snowy Hydro proposal. The Commission considers that none of the options will have significant direct impacts on system security, reliability or the technical functioning of the NEM.

5.5 Good regulatory practice

The Commission has previously highlighted that good regulatory practice is an important consideration in evaluating Rule change proposals.[70] The Commission considers that good regulatory practice is important both as a principle in itself and also as a means to the end of promoting economic efficiency for the long term benefit of consumers.

While good regulatory practice is difficult to comprehensively define, it is orientated towards promoting stability and predictability of the regulatory framework for the NEM and encompasses:

- Minimisation of operational intervention in the NEM;
- Promotion of changes that are likely to be robust over the longer term; and
- Promotion of transparency of the operation of the NEM.

All of these characteristics are likely to help sustain the integrity of the NEM regulatory framework.

Considering the issue of operational intervention first, as noted in Section 2, the Commission intends that the scope for NEMMCO intervention to address material counter-price flows would remain a feature under all the options. However, the discussion of the dispatch efficiency modelling analysis – which did not directly assess the implications of clamping – highlighted that under the Snowy Hydro proposal and the Split Region Option, counter-price flows were found to be minimal outside of Directlink.

Thus to the extent that the Snowy Hydro proposal results in minimal counter-price flows in a more competitive market environment the need for intervention in the form of clamping would also be reduced substantially. This is a desirable outcome in terms of the objectives.

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[70] AEMC. Southern Generators' Final Determination, p.12.

With respect to promoting the long-run robustness of change, the Commission notes that none of the options for change would *fully* address transmission congestion issues in and around the current Snowy region. This is because no one option will ensure:

- that there is no mis-pricing of generation in Victoria and NSW; and
- that IRSR units for trading between the Victorian RRN and the NSW RRN will be fully firm.

That said, the Murray-Tumut constraint is unlikely to ever be built out through transmission investment, due to reasons of both high cost and environmental restrictions. By contrast, the outer boundaries in the Split Region Option or the BAU base case scenario are likely to change in the future as pinch points of congestion change. For example, in the Split Region Option, the precise location of the boundary between the Tumut region and the NSW region may need to change to reflect the most pressing points of congestion. This potential need for change is unlikely to affect the boundary between Murray and Tumut under the Snowy Hydro proposal.

On the matter of transparency, one argument made by Snowy Hydro in favour of its proposal is that it improves transparency because it removes Snowy Hydro's incentives to maintain headroom on the lines north of Tumut at times of northward flows, revealing the full extent of potential congestion on those lines.[71] This would give TNSPs clearer incentives to assess whether action to relieve these constraints is warranted under the Regulatory Test.

However, this will not necessarily lead to desirable outcomes. The Snowy Hydro proposal gives Tumut incentives to bid well below cost (eg -$1,000) at times of constraint north of Tumut. This means that Tumut generation is likely to be higher at these times than if Tumut bid as it would in a competitive market. Consequently, outcomes under the Snowy Hydro proposal could produce artificially high levels of constraint north of Tumut. If TNSPs acted to alleviate these constraints, network augmentation decisions could be inefficiently distorted.

5.5.1 Commission's Assessment

The Commission has taken into account both conceptual and modelling analysis, as well as the views expressed in stakeholder submissions, in making its assessment of whether the Snowy Hydro proposal and the Split Region Option are likely to promote good regulatory practice.

The Commission believes that the Snowy Hydro proposal will promote stability and predictability of the NEM arrangements and thereby reflect good regulatory practice. Rule changes should not only offer demonstrated efficiency benefits to promote the NEM Objective, but should minimise the scope for operational intervention in the market, avoid short-term changes that are not robustly beneficial over time and

[71] Snowy Hydro, *Rule Change Proposal for the Snowy Region: Revision of Transmission Connection Nodes*, 11 November 2005, Appendix B.

improve the transparency of market operation. The Commission notes the submissions' comments that stability of region boundaries is crucial for market certainty.

The Commission considers that the Snowy Hydro proposal has the potential to both reduce operational intervention in the NEM while implementing a "no regrets" change that should be robust over time. Operational intervention should be reduced due to reduced the likelihood of, and incentives for, Snowy Hydro behave in such a way as to trigger NEMMCO intervention in dispatch.

While transient market power may be a feature of even highly competitive markets – the corner store has market power in a hail storm – an enduring ability to unilaterally manipulate dispatch and price outcomes (even if only in peak periods) will diminish both the stability of the regulatory arrangements and the efficient operation of the market. The Commission considers that the potential for the proposed boundary change to expose Snowy Hydro to a more competitive market environment (as indicated by the modelling results) is likely to reduce Snowy Hydro's capacity and incentive to engage in strategic bidding behaviour while at the same time reducing the incidence of counter-price flows and the need for intervention by NEMMCO.

On the other hand, the Commission is not convinced of Snowy Hydro's claim that its proposal would make "potential" network constraints north of Tumut explicit, which would assist TNSPs in their planning responsibilities. The Commission considers that as TNSPs consider various investment options, they should model both competitive and strategic generator bidding behaviours, as required by the Regulatory Test. In undertaking market modelling using strategic bidding strategies, TNSPs should be able to ascertain the extent of benefits from augmenting lines north of Tumut, *even without actually observing substantial constraints north of Tumut*. Nevertheless, the Commission considers that on balance the Snowy Hydro proposal is likely to promote good regulatory practice.

Finally, the Snowy Hydro proposal could be said to represent a "no regrets" boundary change in that it is unlikely that the proposed region boundary between Murray and Tumut would be eliminated in the foreseeable future. In other words, the boundary change is likely to be robust over the longer term

5.6 Long term implications and consistency with public policy settings

At this stage of the NEM's development, radical changes to the market design and operation are unlikely to be either necessary or desirable in terms of promoting the NEM Objective. The Commission therefore appreciates that most Rule change proposals submitted to the Commission will, at most, result in relatively modest efficiency improvements compared to the overall costs of operating the power system. While the gains from individual Rule changes may be relatively small, the Commission is prepared to support these changes where they are consistent with a path of incremental improvement to the market.

In this regard, the NEM Objective provides the Commission with guidance on what is meant by incremental improvement to the market. The NEM Objective is oriented towards greater economic efficiency for the benefit of consumers. To the extent that Rule changes provide opportunities to improve economic efficiency, the Commission

considers that these changes are desirable. These efficiency improvements can be secured by Rule changes that unlock competitive forces in the market that subsequently cause participant to produce and price electricity more efficiently. The Commission believes that a more competitive market results in more efficient and predictable prices. Such prices should, in turn, lead to greater inter-regional price convergence and ultimately a widening and deepening of inter-regional derivatives trading. This means that participants should be able to make more efficient investment decisions, both inter-temporally and locationally. These outcomes resulting from the unlocking of further competitive pressure will therefore be consistent with advancing the NEM Objective.

In addition to the value of making incremental beneficial changes to the market arrangements, the Commission's assessment of Rule changes needs to be cognisant of broader public policy settings.

For example, in respect of this particular Rule change proposal, the MCE made a Rule change request in August 2005 in relation to the reform of region boundaries.[72] The Rule change request referred to the MCE's Statement on Transmission,[73] where the MCE set out its views on region boundaries. These views included the position that the regional structure for the wholesale market should be stable, based on current boundaries and with robust economic criteria to support incremental change as required.[74] Finally, the MCE's Statement on Transmission considered that, on the basis of advice it had received, no material benefits would arise from a move to nodal pricing at this time.

The MCE's Rule Change Request also noted that as boundary changes create uncertainty for market participants and investors, they should only occur where material congestion is enduring and investment solutions have not been forthcoming.[75] The MCE therefore proposed a "staged approach" to managing congestion in the NEM, beginning with a congestion management regime, consideration of investment solutions and finally, a region boundary change.

5.6.1 Commission's Assessment

The Commission considers that the Snowy Hydro Rule Change is likely to yield valuable incremental benefits to the NEM by releasing further competitive forces which will result in increased efficiencies through lower cost production and more cost reflective pricing. Consumers would be expected to gain from these efficiency improvements, as competition delivers lower cost production and more cost-reflective prices throughout the spot, wholesale contract and retail contract markets. These gains should be sustained, as the Snowy Hydro boundary change is likely to be a long-term proposition given the enduring nature of the congestion between Murray and Tumut and having regard to the policy objective of a stable regional

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72 MCE, *National Electricity Rules – Rule Change Request, Reform of Regional Boundaries* (5 October 2005) (MCE Rule Change Request).

73 MCE, *Statement on NEM Electricity Transmission*, May 2005.

74 MCE, *Statement on NEM Electricity Transmission*, May 2005, p.4.

75 MCE Rule Change Request, p.5.

structure and relatively infrequent boundary changes. In any case, once the Snowy region has been removed, any proposal to subsequently alter the region boundary definition would have to demonstrate efficiency gains from such a change. None of the submissions raised concerns that the Snowy Hydro proposal would damage long term investment incentives.

The Commission considers that the Snowy Hydro proposal appears to be consistent with existing overarching public policy settings, including those set out in the MCE's Statement on Transmission. This is because, as noted above, the Snowy Hydro proposal will reflect a point of likely material and enduring congestion which is unlikely to be addressed by investment in transmission or generation in the short to medium term due to the difficulties of developing transmission between Murray and Tumut (see Section 3.2.4). Alternatives such as the Split Region Option or the Macquarie Generation proposal, if adopted, may be more subject to change in the medium simply because development of transmission or generation is likely to eventually occur in these new regions, diminishing the requirement for these new region boundaries. Many submissions agreed on this point, acknowledging that the problems with the Murray to Tumut constraint would not be addressed through network augmentation in the short to medium term, and hence left a region boundary change as the remaining option to address congestion (see Appendix B).

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6 Assessment of Draft Rule to be made - Rule making test and National Electricity Market Objective

6.1 Commission's powers to make the Draft Rule

The Draft Rule implements the Snowy Hydro proposal by directly abolishing the existing Snowy region. The NSW and Victoria region boundaries will be altered to relocate Snowy Hydro's generation at Upper and Lower Tumut to the NSW region and its generation at Murray to the Victoria region.[76]

The existing regions of the NEM were established under the old National Electricity Code regime and were continued by the initial National Electricity Rules made by the South Australian Minister on 1 July 2005. The NEM regions are described by reference to regional reference nodes and transmission connection points allocated to the relevant regions, and these descriptions are published by NEMMCO each year.

The subject matter of the Draft Rule covers:

- the direct abolition of the existing Snowy region by operation of the Draft Rule and the resulting modification of the New South Wales and Victoria regions (new clause 3.5.6);
- the creation of a time limited implementation regime (rule 11.X) that confers powers on NEMMCO for the period up until the date when the new regions start;
- arrangements to ensure continuity for the transition to the new region boundaries resulting from the abolition of the Snowy region; and
- other consequential changes to the Rules.

The Commission is satisfied that the subject matter of the Draft Rule is for or with respect to the general subject matters for which the Commission can make rules as set out in s.34(1) of the National Electricity Law (NEL).

In addition, the subject matter of the Draft Rule is for or with respect to the specific subject matters referred to in s.34(2) of the NEL, and set out in the following items of Schedule 1 of the NEL:

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[76] The current region boundary structure was established under the old National Electricity Code regime and continued by the initial National Electricity Rules made by the South Australian Minister on 1 July 2005. The descriptions of the regions of the NEM are published by NEMMCO each year under the Rules, by reference to regional reference nodes and transmission connection points allocated to the relevant regions.

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 purpose of the operation of the wholesale exchange operated and administered by NEMMCO; …

27 The metering of electricity to record the production or consumption of electricity; … [and]

36 Any other matter or thing that is the subject of, or is of a kind dealt with by, a provision of the National Electricity Code as in operation and effect immediately before the commencement of section 12 of the *National Electricity (South Australia) (New National Electricity Law) Amendment Act 2005* of South Australia.

The Commission is satisfied that a Rule change to abolish the Snowy region, as proposed by Snowy Hydro, is for or with respect to a matter that the Commission may make Rules under the NEL.

The following section presents the Commission's reasoning as to whether the Snowy Hydro proposal satisfies the NEM Objective and the statutory Rule making test.

6.2 Assessment against the Rule making test and NEM Objective

As outlined in Section 2.2, 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 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."

On the basis of its assessment of the information and analysis before it, the Commission is satisfied that the Draft Rule contributes to the achievement of the NEM Objective as it is likely to result in significant efficiency and related improvements compared to the circumstances that would exist in the longer run in the absence of the proposal. The reasons for this view have been considered in detail in the preceding chapters and are summarised below.

In assessing the Draft Rule, the Commission compared the Snowy Hydro proposal with the current boundary structure (BAU base case) and a "Split Region Option" based on a submission made by Eraring Energy. While the Split Region Option is not presently a formal Rule change proposal, it was used by the Commission to help it identify the potential sources of benefits and costs of the Snowy Hydro proposal.

The Commission adopted the following 8 criteria to assess the likely affects of the Draft Rule and its alternatives against the NEM Objective:

- The likely effect of the proposal on the economic efficiency of dispatch, indicating likely impacts of the Draft Rule on productive or technical efficiency;
- The likely pricing outcomes (and participant responses), indicating potential future impacts of the Draft Rule on allocative efficiency;
- The likely effect of the Draft Rule on inter-regional trading and risk management, indicating potential impacts on the competitiveness of the market and so on future allocative and dynamic efficiency;
- The likely effect of the Draft Rule on power system security, supply reliability, and technical factors;
- The consistency of the Draft Rule with principles of good regulatory practice;
- The likely long-term implications of the Draft Rule including the promotion of efficient investment and dynamic efficiency and its consistency with public policy; and
- The likely timing of the Draft Rule and any issues associated with implementation of the proposal.

As noted above, the Commission believes some trade-offs may be necessary between these criteria, as any Rule change that affects the location of boundaries in the NEM is likely to have positive as well as negative impacts. However, on balance, the Commission considers that the Draft Rule satisfies the NEM Objective for a number of reasons.

On the basis of both conceptual and modelling analysis, as well as the views expressed in stakeholder submissions, the Draft Rule appears likely to yield more competitive and efficient market outcomes than the BAU base case. The change to region boundaries brought about by the Draft Rule should allow more free-flowing interconnection and enable more competitive bidding strategies to be sustained. As a result, lower resource costs should be incurred in meeting demand and wholesale prices should be lower, especially in NSW, and more closely aligned to generation costs.

Lower resource costs to meet demand implies that the Draft Rule is likely to enhance the economic efficiency of dispatch. Lower and more cost-reflective wholesale prices could be expected to improve allocative efficiency in the longer term, as they are reflected in future wholesale hedging contracts and passed through to retail electricity prices. Lower retail prices should, in turn, provide electricity consumers

with incentives to consume electricity more efficiently than previously by encouraging its use at times and in quantities that better reflect the cost of its production.

Changes to wholesale prices resulting from the Draft Rule should also provide more dynamically efficient signals for investment and locational decisions. For example, proponents of new generation will have stronger incentives to locate their investments in areas where the value of electricity is greater than elsewhere, rather than merely where prices are high due to inefficient dispatch or artificially-enhanced transient market power. For similar reasons, larger loads should have incentives to locate in areas where the value of electricity is lower than elsewhere. While these potential allocative and dynamic efficiency improvements have not been quantified in this Draft Rule Determination, the Commission considers that the likely directional impact of these changes is clearly positive.

The Draft Rule can also be expected to promote dynamic efficiency by reducing inter-regional trading risk compared to the BAU base case. The ease of new entry and the efficiency of investment location can be affected by the ability of participants to enter financial contracts with counter-parties in different regions. Other things being equal, reduced risk in inter-regional contracting should deepen financial derivative markets and make it less necessary for actual and potential participants to invest where counter-parties or assets are physically located instead of where underlying demand or supply conditions are most favourable. The analysis undertaken by the Commission and the views expressed in stakeholder submissions support the view that the Draft Rule will reduce these risks.

The Commission also considers that the Draft Rule should improve the predictability and stability of the NEM regulatory arrangements, thereby reflecting good regulatory practice. This is because the Draft Rule effects a boundary change that is likely to be robust over the long term.. Further, the Commission is of the view that the Draft Rule is consistent with existing public policy settings and should move the market in a desirable long-term direction by effecting a change that is likely to promote greater competition and efficiency over time.

The Commission is satisfied that the Draft Rule will not have adverse effects from the perspective of power system security and reliability of supply. Rather, the positive longer term implications are likely to promote efficient and timely investment, which supports power system security and supply reliability.

The requirements for efficient implementation can also be addressed efficiently and effectively and are described in further detail in Section 7.

6.3 Commission's Draft Rule Determination

The Commission has therefore determined in accordance with s.99 of the NEL to publish this Draft Rule Determination in relation to the Snowy Hydro proposal and a draft of the Rule to be made (the Draft Rule).

7 Implementation

This Section discusses issues relating to the implementation of a change to the Snowy region's boundaries. Importantly, any change to the boundaries of the existing Snowy region would be the first such change to region boundaries since the start of the NEM in 1998.[77] Also, it is the first time a region boundary change would be implemented via a Rule change, rather than through the review mechanism in the Rules (clauses 3.5.2 and 3.5.3). This review regime is currently suspended by the MCE's moratorium on boundary changes (current clause 3.5.4 has, since the making of the initial Rules on 1 July 2005, provided that clauses 3.5.2 and 3.5.3 have not commenced). Consequently, the Commission has sought advice from NEMMCO and input from market participants on the steps required to implement both the Snowy Hydro proposal and the Macquarie Generation proposal for changing the existing Snowy region boundaries.

There are a number of common steps required to implement both proposals. However, it appears to be generally acknowledged by market participants and NEMMCO that the Snowy Hydro proposal would be simpler to implement than the Macquarie Generation proposal because:

1. it involves the abolition of a region and effectively, two interconnectors;

2. it is likely to require smaller changes in the contract portfolios, IRSR unit holdings, and risk positions of a smaller number of market participants than the Macquarie Generation proposal; and

3. it requires fewer changes to data inputs used in dispatch–such as stability limits and regional reserve levels – prudential requirements of market participants, metering and settlements.

Based on advice from NEMMCO and subsequent input from market participants, both proposals will require changes to: data used in dispatch; market information and dispatch systems; and, most significantly for market participants, changes in financial hedging arrangements and risks. These changes are outlined below, prior to discussing the following issues associated with implementing the Snowy Hydro proposal:

- execution and operational risks;
- transactions costs;
- transition arrangements; and
- implementation timeframe.

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[77] Excluding: a) the addition of Tasmania to the NEM in 2005, which did not require any change in boundaries, but involved the addition of a region previously electrically separated from the other parts of the NEM; and b) reassignment of load at the Terranora node from the QLD region to the NSW region as part of the conversion of Directlink to regulated network asset.

Section 7.3 sets out the Commission's assessment of these matters.

7.1 NEMMCO's advice

On 12 July 2006, the AEMC wrote to NEMMCO seeking its advice on the steps and timeframes required to implement a region boundary change, in particular the two boundary change proposals for the Snowy region. After conducting an internal assessment process, NEMMCO wrote to the Commission on 25 August 2006.[78] NEMMCO's letter was published on the Commission's website and interested parties invited to make submissions regarding issues relating to implementation of a Snowy region boundary change.

7.1.1 Changes required

NEMMCO advised that implementation of either proposal is likely to require changes to:

1. Physical systems and data used to manage the market:
    (a) NEMMCO's market management systems (MMS);
    (b) Participant computer systems interfacing with NEMMCO's;
    (c) Marginal loss factors — static and dynamic;
    (d) Transmission constraints and limits;
    (e) Energy and demand projections for new regions;
    (f) Minimum Reserve Requirements of each region; and
    (g) Settlements Residue Auction (SRA) arrangements;
2. Financial risk management arrangements of market participants:
    (a) Prudential limits calculated by NEMMCO for market participants;
    (b) Credit-support arrangements of market participants;
    (c) Financial hedge contracts; and
    (d) Inter-regional settlement residue unit holdings;
3. Information concerning:
    (a) SOO ANTS; and

[78] NEMMCO, Letter to Dr John Tamblyn, Implementation of a region boundary change, 25 August 2006.

(b) Mapping National Metering Identifiers, generator and load connection points to new regions; and

4. Metering. A change in the Snowy region boundary may require the installation of revenue quality metering on the new boundaries so that the distribution of settlement residues to Auction Participants could be calculated to a very high degree of accuracy. At present, two types of metering are used in the NEM — operational (or "SCADA") metering and revenue quality metering.[79] At present, there is revenue quality metering installed at various points along the existing Snowy region's boundaries, as well as operational metering, but it is not apparent that revenue quality metering must be used for the purpose of calculating settlement residue distributions. NEMMCO stated that this issue relates more to the Macquarie Generation proposal than the Snowy Hydro proposal, with existing metering likely to be appropriate for the Snowy Hydro proposal. However, in both cases, as a transitional step, lower accuracy SCADA metering could be used prior to the installation of revenue metering at the new regional boundaries.

7.1.2 Implementation Timeframe

NEMMCO stated that if a Draft Rule Determination recommending a change to the Snowy region boundaries was made in December 2006, it estimated that it could implement either Snowy Hydro's or Macquarie Generation's proposal by November 2007. This implementation timeframe would:

- fit in with its procedure and cycle for implementing changes to its Market Management System (MMS); and
- allow time for market participants to modify and test their Information Technology (IT) systems and inter-faces with the MMS.

NEMMCO highlighted that there were a number of uncertainties relating to its estimated timeframe, in particular the need to install revenue metering and sourcing new data on transmission limits from TNSPs for inclusion in NEMMCO's dispatch constraints. There was potential for these risks to be managed through:

1. using SCADA data on interconnector flows in place of revenue metering to calculate settlement residue distribution;
2. permitting NEMMCO to substitute estimated limit equations where it is not practicable for TNSPs to deliver within NEMMCO's timeframes; and
3. using estimates of reserve margin levels for the new regions prior to the completion of a formal review of these levels, which will take at least nine months to complete.

[79] Operational metering requirements, which relate to monitoring power flows between transmission the ends of each transmission line (i.e. between *nodes)*, are set out in clauses 4.11.1 and 4.11.2 of the Rules. Revenue metering requirements, which relate to *connection points*, are set out in rule 7.9 and Item 1 of Table S7.2.3.2 of Schedule 7.2.

NEMMCO also stated that a range of matters which affected the implementation timeframe related to obligations in the Rules, which could be addressed by savings and transitional Rules. In particular, NEMMCO noted there was scope to trade-off implementation time by:

- Using Minimum reserve margins for each region that might not be fully consistent with the Reliability Standard;
- Using SCADA metering in place of revenue metering for calculating payments to SRA unit holders; and
- Temporarily using NEMMCO estimates of transmission limits, and regional energy and demand projections.

NEMMCO noted that delaying TNSP's delivery of 10-year regional energy and demand projections beyond the regular time of May might delay the publication of the SOO/ANTS beyond its Rule requirement deadline of 31 October.

NEMMCO stated that the Commission's determination on a new region boundary would need to provide further technical detail on the exact placement of the boundary change, so that NEMMCO and TNSPs could initiated detailed technical work on implementation. In particular, NEMMCO needed details of:

- "cutsets that form the interconnectors including specification of the line end; and
- substations that form the regional reference node."[80]

Without these details, the implementation of the boundary change may be delayed because NEMMCO might need to conduct a consultation "to determine the placement of a regional reference node and the transmission lines and line ends constituting an interconnector".[81]

Finally, NEMMCO stated that the Macquarie Generation proposal would likely involve further development of transitional arrangements, compared to the Snowy Hydro proposal, because it had a greater impact on loads whereas the Snowy Hydro proposal largely affected generation.

7.2 Submissions by market participants

A number of market participants responded to NEMMCO's advise on implementation and others commented on implementation issues in their first round submissions. Their comments can be grouped into four broad categories:

1. Execution and operational risk;
2. Transaction costs;

[80] NEMMCO, Letter on implementation, p.9
[81] NEMMCO, Letter on implementation, p.9

3. Transitional arrangements; and

4. Implementation lead time.

The views in these submissions are outlined below, before the Commission's consideration of implementation issues are discussed in Section 7. 3.

7.2.1 Execution and operational risk

Snowy Hydro noted that NEMMCO had already initiated a region boundary change during its processing of the Directlink conversion to regulated interconnector status. Part of the conversion was to redefine Terranora load to another NEM market region.[82]

Under the Macquarie Generation proposal, the ERAA noted, the "rapid partitioning of a customer base into multiple price regions" would introduce major challenges for retailers operationally" (e.g. risk management and providing regulated price/service offering to all customers.) The ERAA also commented that the majority of customers were insensitive to electricity prices and therefore such a region boundary change was unlikely to produce much efficiency benefit.[83] Origin Energy concurred stating that the Macquarie Generation proposal would increase the complexity for retailers to ensure customer prices in each state remained uniform in line with State requirements.[84]

Regarding the setting of reserve margins for its proposal, Macquarie Generation suggested that NEMMCO currently set a combined minimum reserve level for Victoria and South Australia. It did not see a reason why a similar methodology could not be extended for South West NSW with the NSW region, and Northern Victoria with the join Victoria/South Australia region. Macquarie Generation considered the calculations were unlikely to change significantly in two years and NEMMCO could consider individual regional reserve levels when it undertook its next NEM-wide review in 2008.[85]

Considering NEMMCO's advise on receiving demand forecasts from relevant TNSPs, Macquarie Generation commented that TransGrid and VENCorp currently prepare subregional load forecasts as inputs to their Annual Planning Reviews and network planning processes. It may be possible, it suggested, that these TNSPs already have forecast load levels in the new regions it proposed.[86]

Snowy Hydro and NEMMCO raised complications with the proposed Macquarie Generation boundary between Ballarat and Horsham as it was across a semi-distribution line rather than across a transmission line. NEMMCO's proposed solution was to move the boundary south of Ballarat to accommodate for the lack of

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[82] Snowy Hydro, Submission on implementation, 12 October 2006, p.4.

[83] ERAA, Submission on implementation, 13 October 2006, p.2.

[84] Origin Energy, s.95 submission, Snowy Hydro and Macquarie Generation proposals, 4 April 2006, p.2.

[85] Macquarie Generation, Submission on implementation, 17 October 2006, p.2.

[86] Macquarie Generation, Submission on implementation, p.2.

appropriate metering on the proposed boundary. Macquarie Generation had no objection to this approach.[87]

Snowy Hydro also raised an issue with the lack of revenue quality metering to measure flows on the Macquarie Generation proposed region boundaries. It also flagged the implementation risks for the TNSPs in determining new regional energy and demand forecasts for the modified region loads.[88] Country Energy expressed concern about the generation to load ratio in the Macquarie Generation proposed regions.[89]

7.2.2 Transaction costs

Macquarie Generation expressed the view that implementation costs represented a small fraction of the overall gains recognised from eliminating distortions created by misaligned region boundaries and intra-regional congestion.[90]

However, one of the transaction costs raised in multiple submissions was that of renegotiating contracts. These costs were seen to be significantly greater under the Macquarie Generation proposal compared to the Snowy Hydro proposal.

Under the International Swaps and Derivatives Association Master Agreements (ISDA MA), a change in region boundaries is considered a "Market Disruption Event". This can trigger renegotiation of affected contracts. Many submissions commented on the implications of such renegotiation such as the requirement for parties to enter into complex and time and resource consuming renegotiations.[91]

Snowy Hydro and the ERAA consider that while there may be some contracts affected under the Snowy Hydro proposal, they suspect most contracts would not be affected.[92]

The ERAA suggested that under the Macquarie Generation proposal, there may be a need to consider introducing new risk management instruments to assist retailers in meeting their obligations to supply customers with regulated price or service offering across multiple regions. Under the Snowy Hydro proposal, the ERAA commented that retailers would need to reassess their inter-regional trading and hedging strategies, including Settlement Residue Auction requirements.[93]

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87 Snowy Hydro, Submission on implementation, p.3; NEMMCO, Letter on implementation, p.13; Macquarie Generation, Submission on implementation, p.2.

88 Snowy Hydro, Submission on implementation, p.2-3.

89 Country Energy, Submission on implementation, 13 October 2006, p.3.

90 Macquarie Generation, Submission on implementation, p.1.

91 Delta Electricity, Submission on implementation, 11 October 2006, p.2; ERAA, Submission on implementation, p.2; Snowy Hydro, s.95 submission, Snowy Hydro proposal, 23 March 2006, p.8.

92 Snowy Hydro, Submission on implementation, p.3; ERAA, Submission on implementation, p.2.

93 ERAA, Submission on implementation, p.3.

Delta Electricity and the ERAA raised the point in their submissions that there would be significant work to incorporate additional regions into existing IT systems.[94] Snowy Hydro added that the Macquarie Generation proposal would require extensive updating of region-based data in NEMMCO's market system and a solution to the problem of no revenue quality metering to measure flows on the proposed region boundaries.[95]

In its advice on implementation, NEMMCO noted that its "ability to implement additional 2007 initiatives without additional costs may be restricted."[96] Snowy Hydro noted this point in its submission, commenting that the NEM was set up to allow on-going changes in region boundaries so it would expect that NEMMCO's market systems would be flexible enough to accommodate this market design feature.[97]

7.2.3 Transition

ERAA, Country Energy, CS Energy, and Macquarie Generation all supported the extension of the Tumut CSP/CSC Trial until implementation of a boundary change in the Snowy region.[98]

7.2.4 Implementation lead time

In its first round submission, NEMMCO stated that the proposed commencement dates of 1 July 2007 (Snowy Hydro) and 1 August 2006 (Macquarie Generation) did not provide sufficient time to formally assess and then implement either proposal. In its advice to the Commission on implementation, NEMMCO articulated that it could implement either proposal by November 2007. This was conditional on the Commission issuing its Draft Rule Determination on 15 December 2006 and its Final Rule Determination in March 2007.

Eraring Energy commented that market participants required "adequate forward notice" for implementing a region boundary change.[99]

The Southern Generators preferred a lead time of two years, but at a minimum, proposed four quarters.[100]

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[94] Delta Electricity, Submission on implementation, p.2.

[95] Snowy Hydro, Submission on implementation, p.2-3.

[96] NEMMCO, Letter on implementation, p.1.

[97] Snowy Hydro, Submission on implementation, p.2.

[98] ERAA, Submission on implementation, p.1-2; Country Energy, Submission on implementation, p.3; CS Energy, s.95 submission, Snowy Hydro, 24 March 2006, p.1.; Macquarie Generation, Submission on implementation, p.3.

[99] Eraring Energy, s.95 submission, Snowy Hydro and Macquarie Generation proposals, 22 March 2006, p.2.

[100] Southern Generators, s.95 submission, Snowy Hydro and Macquarie Generation proposals, 24 March 2006, p.10.

ERAA considers the minimum lead time for any region boundary change should be three years to account for the impact of any region boundary change on customer load and the value of financial instruments.[101] This is particularly relevant for the Macquarie Generation proposal, the ERAA noted, because the "rapid partitioning of a customer base into multiple price regions introduces major challenges for retailers operationally" (e.g. risk management and providing regulated price/service offering to all customers). Ergon Energy supported this approach, noting that NEMMCO's proposed timeframe would greatly stretch NEMMCO's resources, which may impact the efficient delivery of other services, increase the possibility of errors, and reduce the ability to deliver the necessary changes as an efficient cost.[102]

Macquarie Generation stated it had no problem with a proposed commencement date of 1 July 2008 for its proposal. It considered the deferred commencement date would: decrease the number of existing hedge and retail contracts affected by the realignment of region boundaries; greater notice period for SRA participants; reduce NEMMCO's implementation costs due to increased planning and implementation time; greater time for TNSPs to provide their necessary information to NEMMCO; and allow for new loss factors to be introduced at the start of a financial year.[103] ERAA supported a commencement date aligned with the start of a financial or calendar year, or at an absolute minimum, a start of a quarter.[104]

Delta Electricity commented that the complexities with the contract market make it difficult to quantify the exact impact on implementation of a region boundary change. It considered further review was necessary to determine the extent to which these issues would undermine NEMMCO's estimate of earliest implementation of November 2007.[105]

7.3 Commission's assessment of implementation

Implementing a change to the NEM's existing region boundaries presents a significant challenge to NEMMCO, TNSPs and market participants because the pricing regions have been static since market start in December 1998.[106] Although two regions—Queensland and Tasmania—that were previously electrically islanded from other parts of the NEM, have been added to the four original interconnected regions (SA, VIC, Snowy and NSW), there has been no significant change to the location of region boundaries recommended by NEMMCO and the TIRC in late 1997.[107] The consequence of this is that the trading environment for wholesale electricity has been relatively stable, with financial contract positions and risk

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[101] ERAA, Submission on implementation, p.2.

[102] Ergon Energy, Submission on implementation, 31 October 2006, p.1, 2.

[103] Macquarie Generation, Submission on implementation, p.3.

[104] ERAA, Submission on implementation, p.3.

[105] Delta Electricity, Submission on implementation, p.2.

[106] Excluding: a) the addition of Tasmania to the NEM in 2005, which did not require any change in boundaries, but involved the addition of a region previously electrically separated from the other parts of the NEM; and b) reassignment of load at the Terranora node from the QLD region to the NSW region as part of the conversion of Directlink to regulated network asset.

[107] For further detail, see Section 3.1 of this Draft Rule Determination.

management strategies evolving over time, based on the existing regional structure and its pricing relationships. Any boundary change will require significant adjustments, which will take time to implement and involve a degree of disruption to market participants' operations.

The Commission understands that implementation of a boundary change:

1. Requires significant effort on the part of NEMMCO, TNSPs and Market Participants to alter data, IT systems and financial contract positions;

2. Alters the financial risks faced by market participants, including inter-regional trading risks;

3. Must manage existing Rule requirements concerning: reserve levels, publication of data on losses and the location region boundaries, metering, Settlements Residue Auctions, publication of the SOO/ANTS, and other matters; and

4. Is likely to affect investment decisions in the longer term, via its impacts on spot and financial contract prices.

The Commission agrees that the Snowy Hydro proposal is simpler to implement than the alternative Macquarie Generation proposal, though many implementation steps are the same.

Given that the Commission has decided to issue separate Draft Rule Determinations on the Snowy Hydro and Macquarie Generation proposals, and this is the Draft Rule Determination on the former, the focus of the discussion below is on implementation of the Snowy Hydro proposal.

Based on NEMMCO's advice, the views of market participants, and the Commission's analysis, the Commission considers:

1. Implementation of the Snowy Hydro proposal can be achieved in a relatively short time if appropriate transitional steps are taken prior to the date on which the new regions commence. These are discussed further below; and

2. Abolition of the Snowy region is likely to have significantly lower transactions costs than the creation of a new region because it is likely to require portfolio adjustments by a smaller number of market participants and a smaller volume of contracts. The Snowy Hydro proposal is unlikely to require the:

   (a) restructuring of a significant volume of hedge contracts for customer loads in Northern Victoria and Southern NSW; and

   (b) purchase of IRSR units for two new interconnectors (VIC-NVIC and SNSW – NSW), whose pricing relationship will be uncertain. Instead, the Snowy Hydro proposal effectively abolishes two interconnectors (VIC-SNY and SNY-NSW) and replaces them with a single interconnector (VIC-NSW). Although the settlements residues on the new VIC-NSW interconnector will also be uncertain, the pricing relationship between VIC and NSW is arguably better understood, together with the way in which Murray and Tumut generation can affect the NSW and VIC region prices.

The Commission notes that the drafting approach reflected in the Draft Rule adopts a different implementation approach than the one reflected in the originally proposed Rule that formed part of Snowy Hydro's proposal. The Commission has taken into account the advice received from NEMMCO and other market participants from it's consultations, as to how to implement a region boundary change via a Rule change. The Draft Rule therefore reflects these further inputs, and the Commission believes the approach adopted will achieve greater certainty for the implementation of the region boundary change, and is a more robust and comprehensive way of achieving the substantive outcomes of the Snowy Hydro proposal.

The Commission has taken steps to ensure a smooth transition towards any new region boundary arrangement by seeking to extend the Part 8 derogation of the Rules until the earlier of: a) a Snowy region boundary change being implemented; or b) 30 June 2008. A separate draft determination recommending this extension was published on 14 December 2006, with submissions due by 31 January 2007.[108] This Draft Rule Determination on the Snowy Hydro proposal supersedes the Commission's 14 December 2006 draft determination on the extension of the Part 8 derogation. In the course of preparing the attached Draft Rule, the Commission has recognised the benefits of separating the existing Part 8 derogation into two components:

1. those clauses that specifically relate to NEMMCO's ability to formulate constraints in the fully optimised form (i.e. Part 8, clauses (a) and (b)) and provide NEMMCO with general powers to manage the accumulation of negative residues by utilising alternative constraint formulations (i.e. Part 8, clause (c)); and

2. those clauses that implement the Tumut CSP/CSC Trial (as amended by the Southern Generators' Final Rule Determination)[109] — that is, Part 8, clauses (c1) and (f) to (p). These clauses replace the general powers conferred by Part 8, clause (c) with specific arrangements for managing negative residues arising from congestion within the Snowy region.

In the attached Draft Rule, the former are retained and included in a new derogation to the Rules, (Chapter 8A Part 4), while the latter remain in Part 8. This separation has the benefit of allowing the expiry of each component to be different, thereby allowing NEMMCO's specific authority to manage negative residues in the Snowy region to expire simultaneously with implementation of the boundary change, while retaining NEMMCO's general powers to manage negative residues and formulate constraints.

The attached Draft Rule allows Part 8, with its specific arrangements for managing negative residues in the Snowy region via the Tumut CSP/CSC Trial and financial transfers of residues from the Snowy-NSW interconnector to the VIC-Snowy

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[108] AEMC 2006, *Extension of the Participant Derogation in Part 8 of Chapter 8A of the National Electricity Rules*, (Draft) Determination, 14 December 2006, Sydney.

[109] *National Electricity Amendment (Management of negative settlement residues in the Snowy Region) Rule 2006*, Rule No. 14, AEMC, Sydney, 14 September 2006.

interconnector, to expire on the proposed abolition date of the Snowy region , 4 November 2007 (see below).

In addition, the Draft Rule provides for Part 4 of Chapter 8A to expire on the earlier of 30 June 2008 or as otherwise determined by the Commission. The purpose of this decision is to ensure that negative residues across the NEM could continue to be managed until an efficient long-term mechanism could be identified as part of the Commission's Congestion Management Review. That Review, together with the Commission's assessment of the MCE's proposal to implement a robust framework and process for assessing future region boundary change proposals, are expected to develop a NEM-wide regulatory framework for congestion management and region boundary change in the longer term.

The Commission indicated it plans to provide the MCE with its Final Report on the Congestion Management Review and publish a Final Rule Determination on the MCE boundary change criteria proposal in the second half of 2007.[110] While work in these areas will inform the Commission on a "congestion management regime" for the NEM going forward, any potential interim congestion management measures will not be fully considered and consulted on as a possible alternative to the current interim measure for managing congestion in the Snowy region (i.e. the Part 8 derogation).

The Commission considers extending the Part 4 derogation to the earlier of such time as there is a boundary change to the Snowy region or 30 June 2008 would provide market participants with a more certain regulatory environment in which to consider the Commission's recommendations and longer-term options for the NEM's region boundaries.

As discussed in Section 5, after considering a range of matters relating to the NEM objective, the Commission believes that Snowy Hydro's proposed abolition of the Snowy region and the consequential changes to the NSW and Victoria region boundaries, will advance the NEM objective, and as such should be implemented. The Commission believes that this change will provide a long term solution to many of the economic distortions arising from "legacy issues" related to the current boundaries,[111] and will locate a new region boundary at a point of significant and enduring congestion that is unlikely to be addressed through network augmentation in the next few years.

7.3.1 Implementation period

The Commission considers that implementation of a boundary change to the Snowy region should occur before summer 2007/08. There are several reasons for this:

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[110] See AEMC "Congestion Management Review – Statement of Approach – December 2006". http://www.aemc.gov.au/pdfs/reviews/Congestion%20Management%20Review/stmtofapproach1206.pdf

[111] Legacy issues, discussed in Section 3, include: increasing congestion between Murray and Tumut, Snowy Hydro being a monopoly generator in the Snowy region; the transmission network's topology; and insufficient benefits from upgrading the capacity of the Murray to Tumut lines to justify the costs.

- increase certainty around contract negotiations currently underway relating to the gradual roll-off of ETEF in NSW, which commences in 2008 and proceeds to 2010;

- address a range of long-standing legacy issues relating to the Snowy region's boundaries, transmission network topology and inter-regional risk management at the earliest possible time; and

- replace the temporary arrangements put in place by the Tumut CSP/CSC Trial, which sought to address mis-pricing of Tumut generation and the accumulation of negative residues on the VIC-Snowy and Snowy-NSW interconnectors in the absence of a change to the Snowy region's boundaries.[112]

The Commission has determined that the date and time on which the abolition of the existing Snowy region is to take effect should be midnight on 4 November 2007 (i.e. 00:00 hours Australian Eastern Standard Time (AEST), 4 November 2007).[113] This coincides with the start of a new settlement week and the season where hot weather is likely to put stress on the power system, which results in volatile prices. During summer when prices can be highly volatile, the potential benefits of increased economic efficiency in dispatch and reductions in risk are likely to be greater than under low price volatility situations.

Although the period from the date of this Draft Rule Determination until the proposed abolition date of 4 November 2007 is less than the four quarter minimum called for by some market participants, and considerably less than the three year period others advocate, for the reasons outlined above, the Commission considers that urgent change is required to the Snowy region boundary. Importantly, after considering submissions, the Commission is of the view that implementation of The Snowy Hydro proposal can be achieved with relatively low transaction costs being incurred by market participants adjusting their hedging contract positions.

As provided for in the Draft Rule, at the time of commencement of the new regions,(the abolition date) the existing Snowy region and its Regional Reference Node will be abolished, and this results in the removal of the existing VIC-Snowy and Snowy-NSW interconnectors. The existing regions of NSW and Victoria will be modified by having transmission connection points from the former Snowy region

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112 The Commission has found that in the absence of the Trial, the existing regional structure could create distorted bidding incentives, which could exacerbate negative residues accumulating on a physical loop in the network that spanned the NSW, Snowy and VIC regions. Sufficiently large negative residues resulted in interventions by NEMMCO to manage its financial cost of carrying debts associated with the negative residues. These interventions further distorted bidding incentives, and a reduction in the economic efficiency of dispatch and the firmness of inter-regional settlements residues. The Tumut CSP/CSP Trial and the subsequent modification to that Trial via the Southern Generators' Rule change aimed to improve the efficiency of dispatch, firmness of inter-regional hedging using IRSR units, and competition in the market for hedge contracts. For further details, see: i) Sections 4 and 5; and ii) AEMC 2006, *Management of negative settlement residues in the Snowy region,* Final Rule Determination, 14 September 2006, Sydney.

113 Note that 00:00 hours AEST on 4 November 2007 is equivalent to 14:00 hours Greenwich Mean Time (GMT) plus ten hours (i.e. GMT+10) on 3 November 2006.

added to them.[114] Finally, a new interconnector between Victoria and NSW (VIC-NSW) will be defined by the connection points at either end of transmission elements that link the two regions. These transmission elements comprise a cut-set, with the precise location of the region boundary—including which end of the line it is located—to be set out in the Commission's Final Rule Determination and Rule, after consultation with NEMMCO, TNSPs, and other market participants.

The abolition date in the Draft Rule is consistent with the Commission's earlier draft determination on the extension of the Part 8 derogation. Schedule 2 of the Draft Rule contains amendments that separate the Part 8 NEMMCO network constraints derogation into two components: 1) those that implement the Tumut CSP/CSC Trial; and 2) those that allow NEMMCO to formulate network constraints in the fully optimised form and in general manage negative residues. The Tumut CSP/CSC Trial is effectively ended when the Snowy region is abolished, while NEMMCO's other powers are preserved until the either 1 July 2008 or as otherwise determined by the Commission following the outcomes of the Congestion Management Review.

The Commission's proposed 4 November 2007 abolition date is based on three working assumptions.

First, a number of savings and transitional arrangements, flagged in the Draft Rule will be confirmed in the Final Rule, to enable expeditious implementation of the abolition of the Snowy region.

Second, NEMMCO and TNSPs will immediately commence the work for implementation of the region boundary change based on this Draft Rule Determination, notwithstanding that the Commission is yet to release a Draft Rule Determination on the alternative Macquarie Generation proposal. Clause 11.X.4(b) of the Draft Rule is intended to give any actions taken by NEMMCO for the purpose of implementing the Snowy Hydro proposal (i.e. abolition of the Snowy region) between the date that this Draft Rule Determination is published and the date of commencement of the Final Rule, recognition and effect under the Final Rule.

Third, that this Draft Rule Determination and the corresponding Draft Rule provides sufficient technical details for NEMMCO and TNSPs to specify the location of region boundaries, metering points, and undertake technical analysis required to implement the changes. Where such detail is not sufficient, the Commission seeks input from NEMMCO, TNSPs and market participants to ensure that such detail is provided in a Final Determination and Rule.

In particular, the Commission is seeking comments on technical details regarding:

1. Revenue metering for the revised region boundary;

2. Boundary location detail, especially the specification of which end of a transmission line the boundary should be assigned; and

[114] See Clause 3.5.6 and Schedule 3.2 of the Draft Rule.

3. The merits or otherwise of having the Guthega Power Station located in NSW and the Jindabyne Pumps located in Victoria, even though both are normally linked to the Murray 300kV node, which will be located in Victoria.

These three issues are discussed further below in Sections 7.3.3 and 7.3.4 and highlighted in the Draft Rule. Having this detail in the Final Rule Determination should assist in expediting the implementation because it avoids NEMMCO having to separately consult on these issues.

Comment is also sought on whether or not there are likely to be residual matters of an implementation or operational nature, to be completed after the abolition date by NEMMCO, that require the extension of the implementation period beyond 4 November 2007.

7.3.2 Savings and transitional arrangements and consequential matters

The savings and transitional arrangements contained in the Draft Rule include:

1. Definitions specific to the implementation of the Draft Rule (Clause 11.X.1), a statement of the purpose of the implementation rules (Clause 11.X.2) and an express statement that implementation may proceed in accordance with the implementation rules despite any other provision of the Rules (Clause 11.X.3);

2. Specification of the implementation period, which starts on the Rule commencement date and ends at 00:00 hours on 4 November 2007 (Clause 11.X.4);

3. Requiring NEMMCO to develop, publish and update an implementation plan (Clause 11.X.5);

4. Conferring on NEMMCO "implementation functions" and requiring NEMMCO to execute those functions in accordance with a published implementation plan (Clause 11.X.6);

5. Specific implementation powers during the implementation period are given to NEMMCO, including:

    (a) Software modifications to implement abolition of Snowy region (Clause 11.X.7);

    (b) Amendment of current Regions Publication (Clause 11.X.8);

    (c) Allowing NEMMCO to estimate regional reserve requirements in the period prior to a completing its normal (9 month) review of regional reserve levels (Clause 11.X.10);

    (d) Re-calculation of network constraints and transmission loss factors (Clause 11.X.11). This allows NEMMCO to estimate limits, including stability limits, and apply those limits in the event that TNSPs are not able to calculate new limits in time for the Rule commencement date;

(e) Amendment of current Loss Factors Publication (Clause 11.X.12), which requires NEMMCO to publish new loss factors for the period from 00:00 hours 4 November 2007 to 1 April 2008; and

(f) Modification of Settlement Residue Auction rules procedures (Clause 11.X.13), to allow NEMMCO—in consultation with the Settlements Residue Committee—to amend the *auction rules* so that IRSR units on existing VIC-Snowy and Snowy-NSW interconnectors can be withdrawn and replaced by units defined on the new VIC–NSW interconnector, with appropriate re-alignment of *auction expense fees* to the new categories of units for *settlement residues*;

6. Express recognition and continuity in the Rules of previous Regions Publications (Clause 11.X.9);

7. A statement that expressly continues the regions —South Australia, Queensland, Tasmania— unaffected by the Snowy Hydro proposal (Clause 11.X.14) as well as the New South Wales and Victoria regions, as modified by the Draft Rule; and

8. Transitioning of pending transactions (Clause 11.X.13), which allows for a transaction commenced but not completed before 00:00 hours on 4 November 2007 to be completed as if the new regions had not commenced. The purpose of this is to allow the processing of any settlement statements and revisions applying to transactions relating to the regional structure applying up until the implementation date.

The Commission seeks comment from stakeholders as to other savings and transitional Rules that may be required by different categories of Registered Participants to smooth transition from the old regions to the new regions (as defined in Clause 11.X.1).

A further minor consequential amendment in the Draft Rule relates to the definition of "time". The implementation of the abolition of the Snowy region must commence at a precisely stated time (proposed as 00:00 hours on 4 November 2007). In order to ensure the necessary precision, the definition of time in the current Rules needs to be updated.

Under the National Measurement Act 1960 (C'th), Australia now sets standard time by reference to Co-Ordinated Universal Time (UTC) rather than Greenwich Mean Time (GMT). The defined term "time" in the current Rules is used in only a small number of places, and in each case, should be referenced specifically to the updated definition of EST. This draft amendment makes no substantive change to the operation of the existing Rules, however, the Commission invites stakeholders to make any comments in relation to this change.

7.3.3 Revenue Metering for the Revised Region Boundary

NEMMCO has advised that changes to region boundaries will change the requirements for revenue metering that is used in the distribution of settlement residue to Auction Participants. The Commission understands that this metering is used to measure the actual flow across the region boundary in each half hour, and

that the result of this metering is then referred to the relevant regional reference nodes where it is combined with the Regional Reference Prices to determine the inter-regional settlement residue.

NEMMCO has advised that as a first step, it is necessary to assess whether existing equipment would be suitable for use as a revenue metering installation at the location of any revised region boundary. The Commission therefore seeks information from NEMMCO or other interested parties as to the suitability of metering equipment for use in conjunction with the revised region boundary, and the availability of any suitable installation for use by the proposed date of abolition of the Snowy region.

In the event that suitable metering equipment is not available, the Commission seeks details of the estimated cost of new equipment, any alternative that could be used to alleviate the need for revenue metering in this instance, or interim measures in lieu of revenue metering, that could facilitate abolition of the Snowy region by the proposed date.

7.3.4 Boundary location detail

NEMMCO has advised the Commission that the Determination will need to provide detail on the placement of a revised boundary, to facilitate detailed technical work on implementation. In particular, NEMMCO has identified "cutsets that form the interconnectors, including specification of the line ends". However, as yet, no information has been provided by NEMMCO, TNSPs or other market participants to guide the Commission in respect to the drivers or criteria for nomination of line ends in the determination.

In this Draft Rule Determination, the Commission has specified the allocation of connection points from the current Snowy region to revised regions NSW and Victoria regions, but has not specified which line ends coincide with the revised region boundaries.

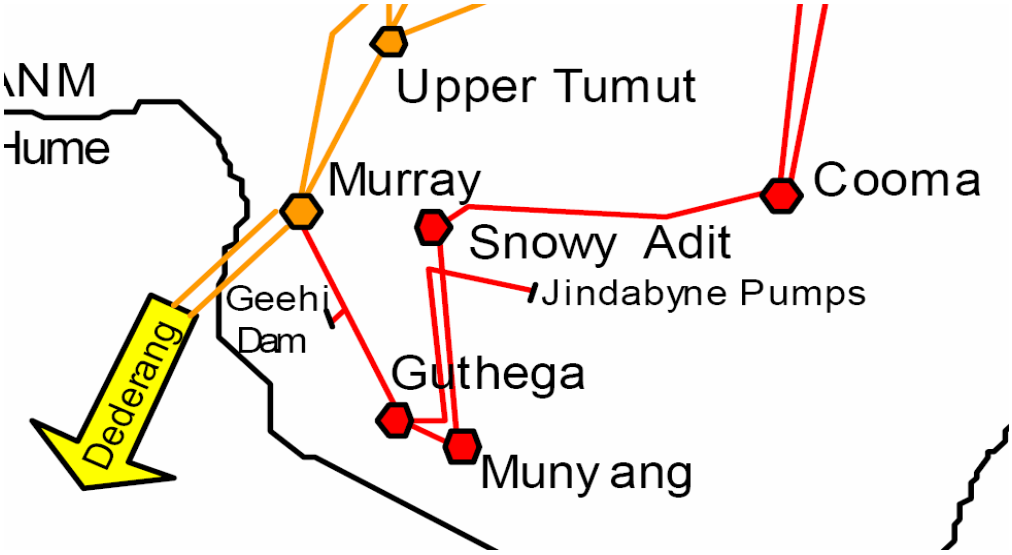
Having published this Draft Rule Determination, the Commission is now seeking further information on the specific drivers and criteria for specification of the line ends in the final determination, and advice on which ends of the relevant lines should be nominated.

7.3.4.1 Allocation of Connection Points

A specific issue on the detail of the region boundary changes relates to the proposed allocation of the connection points for the Guthega Power Station and Jindabyne Pumps to, respectively, NSW and Victoria. Schedule 2 of the Draft Rule follows the proposal of Snowy Hydro by allocating Guthega Power Station to the NSW region and the Jindabyne Pumps to the Victoria region. The Commission understands that both the Guthega Power Station and Jindabyne Pumps are normally connected to the Murray 330kV node, with the Jindabyne pumps fed by a 20km dedicated line from

Guthega (see Figure 7.1 below).[115] The Commission also understands that the Guthega to Munyang line is normally open, with both Guthega and the Jindabyne pumps being connected to Murray (which will be in new VIC region) via the 0976 line.[116] The existing region boundaries appear to recognise this by having Munyang in NSW and Guthega and Jindabyne pumps in the Snowy region, even though Guthega can be switched to connect to either VIC (via Murray) or NSW (via Munyang then Cooma).

Figure 7.1 Transmission network near Guthega and Jindabyne Pumps



Source: TransGrid, *Annual Planning Review 2003*, p. 145

Snowy Hydro's proposal seeks to have the Jindabyne pumps in the Victoria region and the Guthega Power Station in NSW, which appears at odds with the usual switching of the network.

If implemented as proposed, the Jindabyne Pumps would be an islanded part of the Victoria region that is not directly connected to any other part of the Victoria region. That is, the Victoria region will not be closed. This appears at odds with Section 3.5.1(b)(2)(i) of the Rules, which requires regions to be closed. The Commission considers there is merit in having the connection point for the Jindabyne Pumps being allocated to the new Victoria region because it:

- is consistent with the normal network topology of having the Jindabyne Pumps supplied from the Murray node; and

[115] See NEMMCO 2006, Statement of Opportunities 2006, Appendix D, pp.14-15; and TransGrid 2006, *Network Management Plan 2007-2011*, TransGrid, Sydney, p.99 http://www.transgrid.com.au/trim/trim211409.pdf

[116] See TransGrid 2006, *Annual Planning Review 2006*, TransGrid, Sydney, p.63;

- maintains the Victoria region as a closed region, in accordance with Section 3.5.1(b)(2)(i) of the Rules.

The Commission seeks comment from market participants on the pros and cons of altering Schedule 3.2 of the Draft Rule so that the Jindabyne Pumps the three connection points relating to Guthega are all assigned to the new Victoria region.[117]

[117] That is, Connection Point Identifiers NGJP, NGUT, NGUT2 and NGUT8 in Schedule 3.2 of the Draft Rule.