Impacts of changes to the Snowy Region on the Contract Market

A report by

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EXECUTIVE SUMMARY

The AEMC is considering changes to the Snowy Region boundary proposed by Snowy Hydro, Macquarie Generation and the Southern Generators.

Nature of the public policy interest
The proposed changes have created strong interest and lobbying from market participants. Estimates of the impact on dispatch range from zero to around $3.5M per year. This intense interest is not being created by such minor dispatch impacts. The market interest is due to the impact on competition in the contract market.

Changes in the rules may advantage one group of generators in their access to the contract market and disadvantage others. This shift in generator earnings and profits is not a public policy issue. The AEMC should have regard to fair treatment, and good regulatory process, but should not base its decisions on the distribution of profits between generators.

There is however a strong public policy rationale for particular approaches to the Snowy Region. The NEM has adopted a regional, energy-only market. This market has performed well by international standards. However, the market design raises two problems:

- An energy-only market is very volatile. Financiers dislike risk, and have to be compensated for bearing it. There is a public policy interest in an efficient and liquid contract market, that enables them to move to their desired risk/return trade-offs at low cost; and

- The regions are relatively small and have limited wholesale competition. This is particularly true in New South Wales. There is a strong public policy interest in effective inter-regional competition.

Assessing the public policy impacts
Advisers often focus on the spot market. This is too narrow a framework. The AEMC should have regard to the effectiveness with which the spot market, the contract market, and the markets for inter-regional hedges perform against public policy objectives.

It is possible to model dispatch and price impacts with some degree of confidence. Very large amounts of data are in the public domain. It is possible to make reasonable assumptions on the behaviour of generators.

It is harder to assess contract market impacts. Very little data is in the public domain. The nature of the risk/return trade-off, how that is assessed within companies, and the impact on their contracting positions is uncertain.

It is unlikely that contract market impacts can credibly be reduced to a spreadsheet model. Taking account of contract market impacts will require some degree of judgement, and an assessment of the order of magnitude of the impacts on dispatch, pricing and risk.

Contract market and inter-regional hedges
Spot prices are highly volatile. Market participants mutually reduce this volatility through contracts. Surveys suggest that retailers adopt conservative contracting positions, and that generators typically contract 70-80% of their output.

The contract market in Victoria and New South Wales has an annual turnover of around $5-10 billion per year. Turnover is around one to two times spot revenues. This is relatively low in comparison with other, similar markets, but the market appears to be developing adequate liquidity. Large orders can generally be filled without major price impacts.

The market for caps and similar instruments in the same regions is around $300-500M. A higher level of vertical integration has been emerging for peak power, suggesting that this segment of the contract market may be performing more poorly than other segments.

Inter-regional contracts face an additional risk, of price separation between regions. Inter-regional price separation is three to five times higher than price volatility within regions, using the standard deviation over the mean as a measure.

The main instrument for hedging this risk is the auction of the settlement residues. The SRAs are quarterly, for up to a year ahead, and so have a shorter term than many contracts. The settlement residues are highly volatile due to the combined effects of volatility in inter-regional price separation and inter-regional transfer limits. The settlement residues between Snowy and New South Wales are ten times more volatile than the Victorian spot price (using the same measure of volatility) and five times more volatile than the New South Wales spot price.

The auction proceeds have systematically under-recovered actual residues. Some bidders at the auction, including Snowy Hydro, can influence the ex-post value of the settlement residues. This suggests an asymmetry of information which may be a factor affecting the under-recovery of actual residues in SRA auction proceeds.

Secondary markets for inter-regional hedges exist, but are weak and thinly traded. The secondary market is not sufficiently liquid to describe bid-ask spreads, or the impact of large orders. This is consistent with a high degree of information asymmetry in pricing SRAs, with the risk of adverse selection reflected in spreads.

These factors suggest that inter-regional trading risk is high and the instruments available to hedge it are weak.

Impact of changes to the regional boundary

The Snowy Region is the only region in the NEM with no load. The Snowy Region has 3,700 MW of peak capacity. This is around 45% of peak capacity in the NEM as a whole, and 65% in Victoria, Snowy and New South Wales. All contracts written against this peak capacity are exposed to the relatively inefficient market for inter-regional hedging.

Abolishing the Snowy Region would mean that 3,700 MW of peak capacity would be able to participate in the contract markets in Victoria and New South Wales without being obliged to hedge, being exposed to the mismatch between the SRAs and the contract market, or being at risk of gaming through competitors purchasing the SRAs.

The market for caps and similar peak hedges in Victoria and New South Wales is worth around $300-500M per year. Abolition of the Snowy Region would mean that 3,700 MW of peak capacity was a more effective competitor in the contract market.

The impact of a substantial increase in the effectiveness of the contract market is likely to amount to some tens of millions of dollars.

These impacts are greatest in comparison with the business as usual case. However, abolition of the Snowy Region still performs materially better against this criterion in comparison with an extension of current arrangements (the CSP/CSC at Tumut, and netting off settlement residues). In addition, abolition of the Snowy Region would allow consistent regulatory treatment of all regions. The current arrangements have unique arrangements for pricing generation at Tumut, and unique arrangements for the treatment of flows across the Snowy region.

Splitting the Snowy Region would mean that market participants contracting between Victoria and New South Wales were required to buy three rather than two SRAs. Settlement residues are substantially more volatile than the spot market as a whole. The need for additional SRAs in order to hedge inter-regional price risk will add cost and complexity.

The value of settlement residues – particular across the boundary between Tumut and Murray can be strongly affected by the bidding behaviour of Snowy Hydro. This asymmetry of information creates an adverse selection risk, and is likely to further depress the volume of trade in the SRA market.

The increase in risk, and increase in transaction costs in the SRA market, is likely to have an adverse effect on the level of competition in the overall contract market in Victoria and New South Wales, estimated at $5 – 10 billion per year. Again, the impact is likely to be some tens of millions of dollars per year.

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1 Introduction

The AEMC is considering options for the Snowy Region. Those options affect how generation in the Snowy Region is dispatched and priced. They also affect the settlement residues between regions.

In November 2006 Firecone prepared a paper which argued that the AEMC should pay close attention to the impacts on the contract market. The paper set out why contract market impacts are likely to be material, but did not attempt to quantify the possible impacts, or their scale in comparison with other impacts.

This paper builds on our earlier work. The paper seeks to estimate the possible quantitative impacts on the contract market, and to demonstrate that they are likely to be much greater than the impacts on dispatch efficiency.

The paper is structured as follows. Section 2 summarises the framework for the decision that has been established by the AEMC, and recaps the options being considered, the criteria being used, and the approach to comparison between options.

Section 3 briefly recaps market design, and why there is a public policy interest in the performance of the contract market, and in ensuring parties can trade between regions.

We then consider this public policy interest, and the performance of the current market. Section 4 does this for the contract market, and section 5 for inter-regional hedging.

Section 5 sets out our conclusions on the performance of the contract market, and the market for inter-regional hedges. Section 6 draws on this discussion to consider the impact of different options for the Snowy Region on these two markets. It also compares the possible magnitude of the impacts against other quantitative criteria established by the AEMC.

2 Framework for the Decision

2.1 Decision criteria

The AEMC's draft determination set out its decision criteria. This paper considers the materiality of the possible impacts on the contract market. It also compares the possible impacts with the likely order of magnitude of impacts on dispatch efficiency. These appear to be the most material quantitative criteria in the AEMC's decision making.

We also consider the performance of options against good regulatory practice.

2.2 Trade-off against criteria

The Commission indicated that a regional boundary change may perform well against some criteria and worse against others. The Commission may therefore need to exercise judgement in assessing the trade-off between performance against different criteria, and identifying the option which performs best overall.

We agree with this position. However, it may also be worth briefly considering why this is the case, and whether there could be options which performed best against all criteria, removing the need for trade-offs.

The regional structure of the NEM is a distinctive and deliberate feature of its design. The adoption of a regional structure contrasts with:

- a single priced region, such as the former England and Wales and current Great Britain market. The rationale for a structure of this kind, which clearly loses some dispatch efficiency, is to promote competition and liquidity in the contract market, or

- a nodally priced market, such as New Zealand and some US markets, which provides prices more consistent with marginal costs, possibly at the expense of some liquidity in the contract market.

The regional design of the NEM therefore appears to reflect a deliberate trade-off between objectives.

It would be possible to move away from this when considering the Snowy Region. For example, the AEMC could decide to move to a single NEM-wide region, on the British model. Alternatively, it could move to nodal pricing. However, it would appear inappropriate for such major changes to be introduced when considering the limited issue of the boundaries of the Snowy Region. We therefore assume that the decision should assume a continuation of the existing structure of the market, namely a regional structure with region boundaries where there are material and enduring constraints.

A related point is whether there is indeed a trade-off, or whether there is an option which both ensures dispatch efficiency and reduces inter-regional risk. We consider this below. Our conclusion is that there is indeed a trade-off, and both objectives cannot be maximised simultaneously.

Conclusion: the AEMC should conduct its analysis assuming a continuation of a NEM broken into a few regions, rather than a significant shift towards to a single region or nodal pricing. That analysis will require a trade-off between the impact of the options considered on dispatch efficiency and risk.

2.3 Options to be considered

The draft determination compared Snowy Hydro's rule change proposal for a change to the Snowy Region with a BAU scenario in the absence of the rule change.

The draft determination indicated that the AEMC was advancing its analysis of the Macquarie Generation rule change proposal, but had analysed this as an alternative. The draft also indicated that the AEMC had considered Eraring's split region option as a comparator, but not as a firm proposal.

On 5th March 2007, Macquarie Generation amended its existing proposal of splitting the region into two new NEM regions, one in northern Victoria and the other in South-West New South Wales. The new proposal is based on a proposal made informally by Eraring energy to AEMC. It recommends the following regional boundary structure:

- a regional boundary between Tumut generation and Murray generation;
- retaining the existing Snowy region boundary between Tumut generation and the existing NSW region and retaining the existing Snowy region boundary between Murray generation and the existing Victorian region; and
- a Murray region reference node at Dederang and a Tumut region reference node at lower Tumut.

On 15th March 2007, the Southern Generators submitted a proposal as a further alternative to the Snowy region boundary change proposals put forward by Snowy Hydro and Macquarie Generation. The Southern Generators proposal would extend the existing arrangements for a CSP/CSC at Tumut. The proposal would also extend the change to the treatment of negative settlement residues, which was approved by the AEMC.

As a result, there are four options under consideration for the structure of the Snowy Region:

- *Option 1:* maintain the current single region, with pricing within the region, and settlement residues across the region, treated in the same way as other regions in the NEM. This is the business-as-usual case used in the draft determination;

- *Option 1A:* maintain the current region, but also extend derogations which alter the approach to pricing, and which allow negative settlement residues between the Snowy Region and adjacent regions. This is the rule change proposal submitted by the Southern Generators on 15 March 2007;

- *Option 2:* split the current region into two regions. This is the option originally raised (but not formally proposed) by Eraring, and subsequently proposed by Macquarie Generation on 5 March 2007, and

- *Option 3:* abolish the Snowy Region, with generation at Murray generation being absorbed within the Victoria region and generation at Tumut being absorbed within the NSW region. This is the Snowy Hydro proposal.

2.4 Basis for comparison

The draft determination indicated that the proposals being considered would be compared with a Business as Usual (BAU) counter-factual. The BAU scenario was assumed to be the current regional structure, without existing interim congestion management measures.

The BAU did incorporate parts of the existing part 8 network derogation, to allow for:

- NEMMCO to develop and apply fully optimised constraint formulations, and

- NEMMCO to intervene to prevent significant counter-price flows. The intervention mechanisms maintained in the BAU scenario are clamping of flows north across the Snowy region, and reorientation of the Snowy RRN from Murray to Dederang for southward flows.

We assume that options now under consideration will continue to be compared with the same BAU counter-factual. Three options for change to the current arrangements are now being considered, rather than one. The option that performs best against the criteria should be selected.

3 Market design

The NEM is an energy-only market. The market is dispatched on the basis of bids and offers, to maximise the value of the spot market.

There are six regions. Within each region, each generator is priced with reference to a regional reference node. Allowance is made for losses through a forward looking estimate of the marginal loss factor applicable to the generator.

Prices separate when flows reach the transfer limits of transmission lines between regions. Power generally flows from low price to high price regions. The market operator, NEMMCO, intervenes to prevent sustained counter-price flows.

When prices separate between regions, this creates inter-regional settlement residues. These residues are auctioned every three months.

This is a coherent and well designed approach to market design, which has generally performed well, and better than many other markets around the world.

There are two potential problems arising from this market design, both of which are affected by the approach to the Snowy Region. First, the adoption of an energy-only market combined with volatile demand results in a high level of volatility and financial risk. The contract market enables hedging, and the reduction of risk to acceptable levels.

Second, the adoption of a regional design results in relatively small regional markets, with limited competition within the regional wholesale market. It is therefore important that there is also competition between regions.

The regional framework creates an additional risk for contracts written between regions. Price separation between regions means that there is a basis risk – a different price for the seller and buyer – which does not exist within regions. The settlement residue auctions enable this risk to be hedged and so facilitate inter-regional competition.

The overall commercial framework can therefore be regarded as the spot market itself; derivative contracts written against spot market prices; and inter-regional hedges supported through settlement residues between regions.

3.1 Implications for assessing options

This framework needs to work as a whole if the market is to effectively deliver competition, and good outcomes for consumers. However, commentators tend to focus very heavily on spot market impacts. A possible rationale is expressed in a standard text on markets:

> *"Economists like liquid markets – securities markets, contract markets, product markets, and labor markets – because their models work better when they do not have to consider how transaction costs affect economic decisions. When confronted with transaction costs, people trade less often. If the costs are high enough, they do not trade at all.*

> *Transaction costs in an economic system are therefore like frictions in a mechanical system. They both slow things down, and can ultimately stop all activity."*[1]

The proposed changes to the Snowy Region will have relatively minor effects on dispatch efficiency. However, they will strongly affect the performance of the contract market. They will also affect both the extent of inter-regional basis risk faced by generators, and the performance of SRAs as a hedge against that risk.

Much of the analysis over recent years has had an excessive focus on spot market design, and a neglect of transaction costs in the market. The AEMC has now indicated that it will take into account the likely effect on inter-regional trading and risk management, as well as dispatch and pricing outcomes.

Assessing the materiality of impacts on the contract market and on inter-regional trading will be more complex than assessing the materiality of the impact on dispatch costs. This is for three reasons.

The first is *data availability*. The bidding and dispatch process is subject to a high degree of disclosure and there is a very large amount of data that can be mined to model dispatch impacts. Much less information is available on the contract market, or on the extent of inter-regional contracts.

It might be possible over time for the AEMC to improve this information. For example, there are disagreements about the extent to which bidders at the SRA auctions are seeking to support inter-regional contracts. Other possible motivations could include speculation (given the historic under-recovery), and exclusion of competitors – for example, buying inbound links to a generator's region.

The AEMC could seek information from NEMMCO which would assist it in forming views on how the SRAs are being used, which in turn might inform its views on how effective they are at supporting inter-regional competition. However, this information is not in the public domain.

The second problem is *assessing the impact on the behaviour of individual generators*. Firecone was advising on the Snowy Hydro sale at the time the Southern Generators decision was approved by NEMMCO. As a result, we are aware that this led to a change in the contract position within limits imposed by the Board on risk.

The nature of those limits depends on the position that different companies take at board level on acceptable risk and the approach they take to assessing risk. Both are uncertain, and both are highly confidential. This create difficulties in quantifying the evident link between a change in risk due to a change in the rules, and the resulting contract market impacts.

The third problem is that stated in the quotation above. Economic models work best in liquid markets. The settlement residue market is clearly highly illiquid. There are significant problems of information asymmetry. These are reflected in a sustained inability, on average over time, to recover the actual settlement residues from auction proceeds. *Modelling illiquid markets* with problems of information asymmetry is challenging.

[1] Larry Harris, 'Trading Exchanges: Market Microstructure for Practitioners", p. 394

For the reasons set out in this paper, the contract market impacts of the proposed changes in the Snowy region are likely to substantially exceed the impacts on dispatch efficiency. For the reasons set out above, it is unlikely that a model of contract market impacts could be developed which would gain general agreement.

As a result, the AEMC will need to accept some degree of qualitative judgement as it considers the trade-off between the criteria it has established. We consider this is fully consistent with the approach the AEMC has established to date.

Conclusion: the AEMC should focus on the impact of its decisions on the efficiency of the overall commercial framework for the electricity sector, including the nature of spot and inter-regional basis risk and the ease of hedging those risks. Doing so will require some discretion and judgement in considering the trade-offs. This is consistent with the criteria and process that the AEMC has established.

4 The Contract Market

4.1 Public policy interest

The NEM has a high level of risk arising – among other sources - from volatile prices in the wholesale market. That volatility is in large part a result of market design, and the adoption of an energy-only market, with a floor of -$1,000/MWh and cap of $10,000/MWh.

The level of risk in the market means that, if they are unhedged, retail and generation businesses would have very volatile earnings. The ability to hedge through the contract market reduces volatility and the cost of capital.

There is a substantial body of literature describing the impact of volatility in earnings on company value and on the cost of capital. This literature mainly relates to listed companies. The cost of capital is then estimated by the level of diversifiable risk and non-diversifiable risk (that is, the extent to which variation in earnings is correlated with the market).

It would be difficult to apply this model in the NEM. The majority of generation is government owned. Among generation that is not privately owned, there is substantial private (unlisted) ownership. It is therefore not possible for owners to risklessly diversify risk through the share market, and not possible to assess the co-variance of risk with the share market as a whole.

Our conclusion is that a reduction in risk, or an option for parties to reduce risk at relatively low-cost through the contract market, is desirable. We are confident this is a view that would be shared by policy makers and investors.

High spot prices increase generator revenues and retailer costs, and so increase generator profits and reduce retailer profits. The fact that these impacts are similar but inverse creates an opportunity to substantially reduce volatility. Both firms can enter financial contracts, with respect to the contract market price, which reduce their risk and volatility. As a result, there is an active market for derivative contracts.

It is useful to distinguish between different rationales for participation in the contract market. One rationale is to hedge – that is, to reduce the volatility of earnings. A second possible rationale is to realise profits from trading.

Market participants' primary motivation is to reduce risk to acceptable levels by hedging, not to profit from trade. Market participants often recognise that hedging reduces the expected value of their profit, but also reduces volatility.

Market participants have to be compensated for bearing risk. They will require a high level of compensation for bearing excessive risk. When they use the contract market to move to their optimum risk/return trade-off, prices will be lower for consumers. There is therefore a direct welfare gain from enabling this reduction in risk.

The contract market also enables traders to realise profits from trading. Profits can arise from spreads – that is, if a trader buys at its bid price and sells at its asking price. The spread is the price of immediacy (the ability to execute an order immediately). Profits can also arise from informed trading, that is holding positions which increase in value.

Hedging is not a zero-sum game. Effective contracting can increase value for both parties to the contract, by reducing their risk. Unlike hedging, trading is a zero-sum game. An increase in profits for one side of the transaction implies a reduction in profits on the other side.

Market participants who are seeking to hedge, rather than to profit from trading, also benefit from the presence of traders. The liquidity provided by an active and deep contract market has a value to market participants, by enabling them to execute their desired hedging strategies.

We recognise that this distinction between hedging and trading is not an easy one to apply in practice. Most market participants use the contract market both to hedge and to speculate. In some cases this is managed through separate hedge and trade books. In other cases, businesses have decided that the risks they take on the contract market should be addressed in an integrated manner, within consistent overall risk limits and moved away from separate hedge and trade books.

However, distinguishing between these two rationales does assist with a clear public policy rationale:

- Ensuring an effective contract market enables market participants to achieve their desired risk/return positions at low cost; and

- A large and liquid contract market, with many traders, assists this objective.

Policies which facilitate a deep and liquid contract market therefore have a benefit to all market participants, other than those who are fully hedged through vertical integration. Even parties who are internally hedged are likely to face frequent imbalances between their generation and retail portfolios, and so to benefit from the ability to trade which is provided by a liquid contract market.

Conclusion: the design of the NEM creates a high level of risk. The contract market enables those risks to be hedged at low cost and reduces costs to final consumers. The presence of traders in the contract market increases liquidity and facilitates the role of the contract market in hedging.

4.2 Performance of the contract market

The discussion above made the general point that an energy-only spot market will result in a high level of volatility, and that this is likely to create a demand for hedges. This section describes how parties hedge, and the evidence on scale and liquidity of the contract market.

4.2.1 Forms of trade

Volatility is high and well documented. The demand for hedging is also clearly high. The recent PwC survey[2] concluded that retailers routinely seek hedges for 100% of their expected load. Generators typically adopt hedging strategies which leave 70-80% of their capacity contracted.

[2] PwC survey of contract market liquidity in the national electricity market, October 2006

Contract trades are carried out in three ways. Bilateral trades of forward contracts are the dominant form of trading. These trades are mainly between generators and retailers. Bilateral trades also take place between two generators, and between financial intermediaries and other market participants.

The scale of trading by financial intermediaries is uncertain. The insolvency of Enron Australia provided greater information on its trading position, and showed that the total size of the positions were relatively small compared to the positions taken by generators. Trade by financial intermediaries may have grown since then.

Forward contracts are also traded through brokers. This provides anonymity for parties seeking to buy or sell contracts, until the contract is signed.

Futures contracts are traded through the SFE. Forward contracts depend on the performance of the counter-parties, and so carry a credit risk. Future contracts traded through the SFE are exposed to daily margin calls, and so carry no credit risk.

The majority of contracts are swaps, that provide price certainty for both parties. Prices in the NSW and Victoria markets have been hardening substantially in recent months. This appears to be in response to the (probably short-term) loss of capacity due to the drought, and the emerging tightness in the supply/demand position.

Caps provide an option that can be called in the event that prices exceed an agreed strike price, and limit the price exposure of the purchaser. The most frequently traded cap instrument is a flat cap (that is, for all 8,760 hours of the year), with a strike price of $300/MWh. Cap premiums are currently a little above $10/MWh in NSW. Cap prices have been increasing in recent months.

In addition to these principal contract forms a wide variety of other contracts is available, including floors, collars, asian options and so on. They suggest a reasonable level of dynamism and innovation in the contract market.

The contract market includes long term contracts (reportedly in some cases five to ten years, but in the majority of cases not exceeding two to three years). Table 1 shows swaps, caps and other forms of contract for NSW and Victoria. The other category is dominated by other options (that is, instruments similar to caps). For each State the table shows the total volume of different contract types (in MWhs) and their share of the total contract volumes in the State.

The AFMA data also includes contract duration, broken down between less than and more than 12 months. The duration for the 'other' category is a weighted average based on MWh. Table 1 shows the share of different contract types in direct bilateral and broker trade in NSW and Victoria, during 2005/06, based on surveys. It also shows the proportion of each type of trade which is in contracts of 12 months or more.

Table 1: AFMA volumes by contract type

		NSW	Victoria	>12 months
Swaps	MWh	64,248,376	33,233,952	61.8%
	%	77.5%	83.1%	
Caps	MWh	12,955,780	5,029,060	60.70%
	%	15.6%	12.6%	
Other	MWh	5,706,128	1,728,675	71.30%
	%	6.9%	4.3%	
Total		82,910,284	39,991,687	

The SFE trades future rather than forward contracts. Contract volumes for 2005/06 by the three main contract types are shown in Table 2.

Table 2: SFE volumes by contract type in 2005/6

		NSW	Victoria
Futures	MWh	18,136,680	10,632,993
	%	83.4%	62.9%
Caps	MWh	1,863,120	1,758,720
	%	8.6%	10.4%
Options	MWh	1,752,000	4,511,400
	%	8.1%	26.7%
Total		21,751,800	6,903,113

4.2.2 Contract volumes

The contract markets in NSW and Victoria are likely to be the most materially affected by the structure of the Snowy region.

Table 3 shows the volume of the contract market in NSW. The broker data is taken from an independent survey in October 2006, commissioned by the NGF and ERAA and undertaken by PwC. AFMA data is taken from the annual report. This data covers both bilateral and brokered trades. It is based on surveys, and so will have something below 100% coverage. The SFE data covers futures contracts on the SFE.

The AFMA data covers both bilateral trade and broker trade, in both case based on surveys. As a result, the data shown in Table 4 overlap, and the AFMA data should be more comprehensive.

Table 3: Contract Volumes in NSW, GWh

	Broker data	AFMA data
FY 2003	26,289	93,582
FY 2004	36,914	107,552
FY 2005	48,806	76,482
FY 2006	46,713	82,910

Table 4: Contract Volumes in Victoria, GWh

	Broker data	AFMA data
FY 2003	27,823	94,372
FY 2004	27,737	49,608
FY 2005	40,307	48,728
FY 2006	28,838	39,992

The AFMA annual survey provides a breakdown by contract type. The figures for FY 2006 are summarised below.

In addition to the volumes recorded in the contract market, the NSW ETEF has had a similar effect to a large and rather distinctive contract for the regulated load in NSW. The ETEF is going to be phased out between September 2008 and June 2010. This will increase volumes in the contract market, as it is traditionally understood.

The timetable for phasing out ETEF is shown below. The percentages are official figures. We have not included this additional load in our assessment of the scale of the contract market, but anticipate that it will lead to increases in the contract market in NSW over the next three years.

Date	Percentage of NSW regulated load supported by ETEF
Until September 2008	100%
28 September 2008 to 28 March 2009	80%
29 March 2009 to 26 September 2009	60%
27 September 2009 to 27 March 2010	40%
28 March 2010 to 26 June 2010	20%
27 June 2010 onwards	0

We have considered a 'top down' valuation, based on the total size of the spot market and the relationship of the contract market to the spot market. We have tested this by considering the possible value of trade based on reported contract market volumes.

The value of the spot market turnover, based on the sum of half-hourly demand times half-hourly price, was $3,303M in NSW in 2005/06, and $1,827M in Victoria.

The PwC survey indicated that trading volumes are one to two times the physical market demand. If contract market prices reflect spot prices, but contract market volumes are one to times spot volumes, then total turnover in the NSW and Victoria contract markets for FY2005/06 would have been in the range $5.1 - 10.3 billion.

Most market participants we consulted felt that the multiples were closer to one than two. If this is correct, the contract market turnover would be at the lower end of this range.

Another approach to valuation is to consider the total volume of reported contract market trade; the breakdown between contract types; and a 'fair value' for different contract types.

The total reported trades in both forwards and futures, through a combination of the AFMA and SFE data, is 104 TWh in NSW and 57 TWh in Victoria, giving a total of 161 TWh.

These contracts cover a large variety of contract types. However, as reported above, trade appears to be dominated by swaps and caps, or similar instruments. The AFMA survey data shows swaps as 80% of trade on a MWh basis. The PWC survey included broker data over three financial years, broken down between swaps and caps. Swaps were a little over 80% of total MWhs contracted over that period. A survey in 2005[3] obtained responses that an average of 68% of contracts were in the form of swaps, with the remainder split equally between caps and other options.

Drawing on these different sources, the share of swaps is between 70% and 80%. The bulk of the remaining contracts are caps, with a variety of other contract types.

A 'fair value' for swaps will be set by the average pool price which stimulates market entry. A price below this will not be sustained, since as demand rises prices will tighten. A price above this will also not be sustainable, since it should lead to new generation investment and a reduction in spot and contract prices.

A 'fair value' for caps will be set by the cost per MW over the year of a peaking generator such as an open-cycle gas turbine, with a variable operating cost similar to the strike price of a cap contract, and with a low capacity factor. If the price is above this, it will be cheaper for retailers to seek a physical hedge rather than to rely on the contract market. If the price is below, there is likely to be a shortage of caps and an increase in price.

A reasonable estimate for that fair value is around $10 per MW, based on the annualised costs of new entrant peak capacity.

A very approximate valuation of the financial scale of the contract market could therefore be based on:

- 70-80% of contracted volumes being swaps or similar instruments, with a price of $40/MWh, and
- 10-20% being caps of similar instruments, with a premium of $10/MWh.

This very rough approach would suggest an annual turnover in the contract market of approximately $3.2 – 3.5 billion in NSW, $1.8 – 1.9 billion in Victoria, and $5.0 – 5.5 billion in the two states combined.

This would support a view that the turnover in the contract market, is similar to total turnover in the spot market. However, spot market data is fully reported. There will be some degree of under-reporting in the AFMA survey. As a result, this data suggests a multiple of slightly over one between the contract market and the spot market. This appears consistent with market participant views that the multiple is closer to one rather than two.

[3] Anderson, Hu and Winchester: "Forward contracts in electricity markets: the Australian experience"

The analysis is summarised in Table 5. We would stress that this estimate will have errors of perhaps +- 30%. In addition, the analysis is based on an assumption of 'fair value'. Electricity markets are subject to periods of excess and tight capacity which mean that the actual face value of contracts can vary significantly from this rough estimate of their long run average value.

Table 5: Approximate order of magnitude of the contract market in Victoria and NSW

	NSW	VIC	Combined market
Annual turnover (TWh)	104	57	161
Swaps, share of trade	70-80%	70-80%	70-80%
Swaps, $ billion	$2.91-3.33	$1.60-1.82	$4.51-5.15
Caps, share of trade	20-30%	20-30%	
Caps, $ billion	$0.21-0.33	$0.11-0.17	$0.32-0.48
Total, $ billion	$3.22-3.54	$1.77-1.94	$4.99-5.47

4.2.3 Liquidity

When markets are liquid, market participants are able to trade large sizes quickly, at low cost. This enables market participants to meet their hedging objectives efficiently.

Considerable empirical analysis has been undertaken of liquidity in contract markets in the NEM, and we will not repeat it here. The key conclusions[4] appear to be:

- Turnover in the contract market as a multiple of spot market turnover is relatively low in comparison with other, comparable spot markets. Trading volumes in NordPool are around five times greater than physical demand, and trading in the former England and Wales pool (which like the NEM was a gross energy-only pool) was 8-10 times spot

- Bid-ask spreads in the smaller markets – such as South Australia - are high, if indeed products are available. Bid-ask spreads in Victoria and New South Wales contract markets are often one dollar or more. Spreads for peak products are higher than for swaps. The survey showed spreads of $8 for Q4 NSW 2006 peak, and $5 for Q4 NSW 2007 peak

- There appears to be sufficient liquidity in the Victoria and New South Wales contract markets that market participants can execute reasonably sizeable trades without major price impacts.

Our interpretation of this is that the contract market is performing reasonably well in the large NEM regions, but that overall turnover is on the low side. We also note that the survey stated:

> *"..a number of respondents cited the existence of the Snowy region as the biggest 'artificial' constraint to increased liquidity in the contract market".*

[4] This information is taken from the PwC survey of contract market liquidity in the national electricity market, October 2006

5 Hedging inter-regional basis risk

5.1 Public policy interest

Spot prices are set within a region. Most contracts to reduce spot price risk are also between parties within a single region. However, it is also possible for parties to contract between regions.

The regional framework of the NEM creates an additional risk for those parties who contract between regions. The level of *inter-regional basis risk* is material. Price differences between regions can rise to close to $10,000/MWh. Price separation between regions is more volatile than prices within regions.

Competitive spot markets require sufficient wholesale competition to ensure that bids and offers will be reasonably aligned to underlying costs. There is no simple answer to the question of how much competition is required. However, analysis typically suggests that it is desirable to have four or more competitors at different points in the merit order.

The NEM as a whole clearly has sufficient competition in generation. However, the level of competition within individual regions is less. New South Wales is dominated by three generators. Victorian generation was sold with each generator as a separate business, but has since consolidated.

The ability of parties to contract between regions is therefore a desirable feature of NEM design. In its absence, regions could face increased problems of market power in the wholesale market.

There is an important distinction between *spot price risk* and *inter-regional basis risk*. All generators and retailers participating in the NEM are exposed to spot price risk, with the nature of the risk depending on the region in which they are located. All generators and retailers participate in their regional contract market, without exception.

Inter-regional basis risk only applies to those parties who contract between regions. As a result, while all NEM participants are exposed to spot price risk, there is a lesser level of exposure to inter-regional basis risk. In addition parties can change their level of exposure by increasing or reducing their volume of contracts between regions.

A change in spot price risk will not alter participation in the spot market, since this is mandatory. However, a change in inter-regional basis risk is likely to lead to a change in the extent of inter-regional contracting, since this is voluntary.

In the same way that the contract market can be used to hedge spot price volatility, there is scope to hedge *inter-regional basis risk*. The main instrument used to hedge this risk is the auction of settlement residues between regions. As described below, the settlement residue auctions (SRAs) enable some hedging of inter-regional basis risk, but also have some weaknesses. Since the hedge for inter-regional basis risk is weak, contracts between regions are inherently more risky than contracts within regions.

There are several alternatives to hedging inter-regional basis risk:

- Generators could avoid selling contracts outside their region[5]. Reportedly, some generating companies do completely or very largely adopt this position, or

- Generators could trade and bear the risk of price separation.

We also discuss below whether there are costless ways of hedging the risk, rather than buying the SRAs.

5.2 Performance of the market for inter-regional hedges

The discussion above made the general point that a regional framework for the NEM will result in a reduced level of competition within regions, that inter-regional trading is desirable to ensure sufficient competition, and that this creates a demand to hedge the risks arising from inter-regional trade.

This section describes the scale of the risk, how parties hedge, and the evidence on scale and liquidity of the market for inter-regional hedges.

5.2.1 Volatility of inter-regional price separation and settlement residues

The volatility of spot prices within a region creates a demand for hedging. In the same way, the volatility of price separation between regions creates a demand for hedges against inter-regional basis risk.

Price separation between regions is substantially more volatile than price separation within regions. Table 6 provides data on prices in Victoria, New South Wales and Snowy. The data covers the period July 2002 to October 2005 data set. This is the period up to the introduction of CSP/CSC trial. This appears the best measure of the BAU scenario, which is defined by the AEMC as the current regional framework without the short term derogations for the CSP/CSC trial and the 'netting off' of settlement residues.

The mean is the arithmetic average of all prices over this period. The standard deviation is a measure of the volatility of prices. If we assume prices are normally distributed then 68% of all half-hourly prices are within one standard deviation of the mean. The kurtosis is a measure of the peakiness of a distribution. Higher kurtosis means that a greater proportion of the deviation of data from the mean is due to infrequent large deviations rather than frequent small deviations.

The standard deviation divided by the mean provides one measure of volatility relative to the average.

The data in Table 6 illustrates the highly volatile nature of prices in the NEM. As discussed, an active contract market has developed to manage the risk resulting from this volatility.

[5] This would not be possible for Snowy Hydro, as there is no load in the Snowy Region.

Table 6: volatility of regional prices

	Mean ($/MWh)	Standard deviation ($/MWh)	Standard deviation / Mean	Kurtosis
Vic	27	70	2.6	3760
Snowy	31	140	4.5	1467
NSW	34	201	5.9	1274

Price differences between regions are often at very low levels. However, when congestion arises there can be very substantial price separation. Table 7 shows the flow-dependent inter-regional price differences. In other words, the price differences are only calculated when power is flowing in the direction indicated. These price differences are normally positive – with power flowing from low price to high price regions.

The median price difference – that is, the mid-point of all the differences – is around $1 in all directions. The mean – that is, the arithmetic average – is somewhat higher. The standard deviation is around 15-17 times greater than the mean, for all directions other than NSW to Snowy (which accounts for insignificantly low flow levels).

The ratio of standard deviation to the mean is around three to five times larger between regions than within regions

Table 7: distribution of inter-regional price differences

Direction of power flow	Median ($/MWh)	Mean ($/MWh)	Standard deviation ($/MWh)	Standard deviation / Mean
Snowy to Vic	1	3	38	15
Vic to Snowy	1	9	151	17
NSW to Snowy	1	1	1	1
Snowy to NSW	1	8	133	17

A further complexity in pricing inter-regional risk is the variation in transfer limits (i.e. the capacity of the power system to transfer power from one region to the other). If transfer limits were certain, then the value of the settlement residues would be directly related to the level of inter-regional price differences. Certainty on transfer limits would promote certainty the expected value of inter-regional settlement residues.

Table 8 shows that there issignificant variation in inter-regional transfer limits, with the standard deviation of transfer capability typically around a third of the mean.

Table 8: Inter-regional transfer limits

Direction of power flow	Median (MW)	Mean (MW)	Standard deviation (MW)	Standard deviation/mean
Vic to Snowy	851	903	303	0.34
Snowy to Vic	517	509	320	0.63
Snowy to NSW	1951	2069	642	0.31
NSW to Snowy	863	805	278	0.35

The volatility of settlement residues is affected by both inter-regional price separation and transfer capacity. The two are generally correlated but not systematically and hence the volatility of the settlement residues is greater than the volatility of price differences between regions. This is shown in Table 9 which illustrates the considerable volatility of inter-regional settlement residues. The standard deviation divided by the mean is 4-6 times higher than the same measure for regional prices, and the kurtosis is also significantly higher in most cases.

Table 9: volatility of half-hourly settlement residues

Direction of flows	Total ($million)	Median	Mean	Standard deviation	Standard deviation / Mean	Kurtosis
Snowy to Vic	22	198	906	16,368	18	17,175
Vic to Snowy	84	252	2570	53,456	21	2,742
NSW to Snowy	3	78	99	82	0.8	272
Snowy-NSW	251	2	5047	135,392	27	2,826

Conclusion: inter-regional price separation is substantially more volatile than prices within regions. The settlement residues are more volatile than the price separation, due to the interaction with transfer capacity.

5.2.2 Exposure to inter-regional price risk

The discussion above demonstrates that inter-regional price risk and the settlement residues are highly volatile. However, market participants have vary levels of exposure to this risk.

Snowy Hydro is unavoidably exposed to inter-regional basis risk on the 3,700 MW of hydro generating capacity located in the Snowy Region. This is because there is effectively no load in the Snowy Region, and so Snowy needs to sell in other NEM regions and so is exposed to inter-regional price risk between the Snowy region and the other regions it sells into. This risk is commonly referred to as "basis risk".

Snowy Hydro has a capacity factor of around 15% in years of normal rainfall and water flows. This would suggest a demand for a little under 5 TWh of inter-regional hedges if this output was fully contracted and fully hedged against basis risk, and a correspondingly lower demand to the extent that it was uncontracted and taking spot price risk.

Other parties are only exposed to basis risk to the extent that they take contract positions in other regions. Anecdotal evidence suggests that some generating companies adopt relatively bullish positions on inter-regional trade, and others avoid it completely. This provides little guide on the total volume of inter-regional trade.

Four factors give some illustration of the possible level of exposure. One is the *level of vertical integration within regions*. Exposure to basis risk is avoided if businesses maintain balanced generation and retail portfolios, and ensure those portfolios are geographically balanced (i.e. within regions).

Victoria has a significant degree of regional vertical integration. The recent AGL/TRU Torrens Island/Hallett swap reflects a stated desire to achieve greater regional vertical integration. However, generation and retail in New South Wales is dominated by government ownership. This limits the ability of generators in other regions to develop vertically integrated positions in all regions, and should increase the demand for inter-regional trade. This position might change in time.

The ETEF creates effective vertical integration by contract, but not mediated through the contract market. The lifting of the ETEF should increase activity in the New South Wales contract market, while any moves towards vertical integration would reduce it.

The second is *the extent of price separation between regions*. A low level of inter-regional contracting would make it more likely that regional contract markets would diverge. We note that the Southern Generators argued that there was evidence of such a separation in forward markets. However, we have not been able to find continued evidence of such a separation.

A third possible source of evidence would be *demand for the settlement residues*, as these are the main form of hedge for inter-regional contracts. Auction proceeds have tended to be substantially below the settlement residues realised. Possible reasons for this are discussed below. It may be an indicator of a relatively low level of demand for inter-regional trade, due in part to the difficulty of pricing the settlement residues.

A final possible source of information is *surveys*. The PWC survey did not cover inter-regional trade. The Andersen, Hu and Winchester survey stated:

> *"Almost all the participants said that they tried to arrange contracts between counter-parties in the same region, so as not to be exposed to inter-regional trading risks…..It seems that a substantial part of the trade in SRAs is within the participants' trade books and is speculative rather than carried out for hedging purposes."*[6]

[6] Andersen, Hu and Winchester, op.cit., page 30

We consider this rather overstates the case. For example, it does not address Snowy Hydro's evident interest in at least some degree of inter-regional hedging.

Conclusion: there is a clear public policy interest in facilitating inter-regional competition in the contract market. However, the extent of inter-regional contracting, and the demand for hedging, is uncertain.

5.2.3 Forms of trade

Parties who are exposed to inter-regional basis risk can hedge this risk by purchasing the SRAs. However, the SRA market differs in many respects from the contract market.

The SRA sales are made by NEMMCO which is (and will inevitably continue to be) bound by strict rules on the conduct of the auctions. As a result, the dynamism in developing new contract types is not evident.

The only instrument available (from the NEMMCO sales) is a share of the auction proceeds, once a quarter. The hedge has a maximum duration of 12 months. AFMA data suggests that most contracts, of all forms, are for more than 12 month. This reduces the effectiveness of the SRAs in supporting inter-regional contracts.

There is also a secondary market for inter-regional hedges. This takes different forms:

- We are aware of one (but only one) financial intermediary offering SRAs on the secondary market. Our understanding is that these are generally offered in small volumes. It is not possible to identify a bid-offer spread, since generally only bids or offers are provided. However, we did not test whether combined bids and offers can be quoted and so reveal the bid-ask spread

- It is also possible to purchase inter-regional products, that is to simultaneously buy a swap in NSW and sell a swap in VIC (or vice versa). Our consultation with traders suggested that trade is opportunistic and generally small scale – in say 5, 10 or 20 MW packages. However, on occasion larger deals are brokered by financial intermediaries

Conclusion: the main hedge for inter-regional basis risk is the SRAs. Secondary markets are limited.

5.2.4 Long and short positions in regional markets

A recent paper by Darryl Biggar asserts that inter-regional hedging can be achieved without the need to acquire inter-regional settlement residues:

> *"Intuitively, it seems desirable that a given policy should seek to 'reduce the risk of inter-regional trading'. There is, however, a potential pitfall in understanding here which it is useful to highlight, so it can be avoided.*
>
> *There is no need for access to the inter-regional settlement residues (or any form of residues) in order to perfectly hedge a transaction which involves the purchase or*

> *sale of forward contracts in another region. For example, consider the case of a generator in region A who wishes to sell a 100 MW swap contract in region B. That generator can obtain a perfect hedge for that transaction (i.e. not face any risk at all) by hedging that transaction with a portfolio which involves buying an equivalent swap in region B and selling a swap in region A.*
>
> *In other words, any market participant can engage in riskless "inter-regional trading" of hedge contracts with or without the inter-regional settlement residues".*[7]

There are two problems with this assertion. First, it does not describe the use of hedges to support competition between regions. If a generator in region A both buys and sells a 100 MW swap in region B, then its position is netted out. The generator in region A has not taken a position in region B and there is no net increase in trade (contract supply) in Region B.

In other words, it is correct to say that the generator in region A faces no inter-regional risk, but wrong to say this reduces the risk of inter-regional trading. What it effectively does is avoid inter-regional trading.

To push this argument to a logical extreme, it would for example be possible for a Victorian generator to speculate on the contract market in the UK, through buying and selling hedges. If the position was completely balanced, the Victorian generator would bear no risk on prices in the UK market.

In the unlikely event that the Victorian generator was better informed about the UK market than UK traders, then its participation in the market would be likely to put competitive pressure on other traders, and should act in a number of ways to increase market efficiency. However, if the price of swaps in the UK contract market reflected market power in the generation sector, the presence of Victorian speculators would have no effect on this underlying cost of the hedges.

Second, it is incorrect to say that any market participant can engage in riskless trading in the way described. In order for the generator in region A to sell a swap in region A, it needs to be in a region with sufficient load in order for there to be a market (demand for contracts) in region A. Snowy Hydro has 3,700 MW of hydro generation capacity in a region with effectively no load. It is unable to sell swaps in the Snowy region in the way described.

5.2.5 Performance of the market

There is little information about the inter-regional contract market (as discussed above). The market appears substantially less dynamic than the contract market as a whole. There has been a sustained failure to recover the settlement residues from auction proceeds, which suggests a difficulty in pricing the proceeds. The market has also been subject to frequent change.

The contrast in *dynamism* between the general contract market and the market for inter-regional hedges is striking. The general contract market has many players and a

[7] Darryl Biggar, "Analysing Region Boundary Changes in the NEM: what have we learned?" 13 March 2007

large number of products. Few products are available in the inter-regional contract market. The secondary market for inter-regional hedges is so under-developed that it is inappropriate to apply traditional tests of liquidity (such as the immediacy with which large orders can be filled, and their impact on market price).

There has been a *sustained under-recovery* of settlement residues. The total auction proceeds are around 60% of the residues actually realised. The total value of the SRA proceeds is shown in Table 10.

Table 10: Settlement residues and auction process by link

Link	Residues	Proceeds	Recovery
SN-NSW	$388,299,178	$138,771,375	36%
NSW-SN	$20,729,649	$6,808,158	33%
SN-VIC	$96,167,420	$166,728,800	173%
VIC-SN	$90,964,702	$43,001,893	47%
Total	**$596,160,949**	**$355,310,266**	**59.6%**

There are two possible explanations of this sustained under-recovery. The first is that instruments with values that are volatile and hard to predict are worth less than their expected value. The second would be that traders are cautious of a volatile market, with some participants (and bidders for the SRAs) able to influence their value.

Volatile markets with asymmetric information create trading problems. This is well put in a standard text on market structure:

> *"Since dealers do not know fundamental values well, they expose themselves to adverse selection from better-informed traders when they offer liquidity. The better informed traders choose the side of the market on which they trade, and the dealers end up losing money to them. When some traders are better informed than other traders, traders are asymmetrically informed.*
> *If dealers set their spreads to reflect only their normal costs of doing business, their losses to well-informed traders will eventually force them out of business. Dealers must widen their spreads to cover their losses to informed traders. This additional widening of the spread is the adverse selection spread component.*
> *Spreads will be widest when well informed traders know material information about instrument values that would have an immediate and significant on values if it were common knowledge….Since it is harder for traders to be fully informed about volatile instruments than about stable instruments, asymmetric information problems are probably greater for volatile instruments than for stable instruments. Volatility therefore has a strong secondary effect on spreads because it is a good proxy for asymmetric information."*[8]

In our previous paper we discussed transaction costs in this market. Transaction costs – that is, the cost of immediacy for market participants who need to hedge – will be high when there is a large adverse selection component in spreads.

A further significant difficulty for the market is the continuing change in the rules applying to it. The original rules for evolution of the regional boundaries were never

[8] Larry Harris, 'Trading Exchanges: Market Microstructure for Practitioners'

applied. Snowy Hydro managed to introduce a significant variation to the rules affecting pricing at Tumut and inter-regional settlement residues in 2003. The Southern Generators succeeded in introducing a significant change to the treatment of negative settlement residues (and so the effectiveness of different SRAs as an inter-regional hedge) in 2006.

The changes that have been introduced to date have resulted in changes in bidding behaviour and dispatch outcomes, and so in the nature of inter-regional basis risk and the effectiveness of the SRAs in hedging. There has been little time for the market to develop long term experience of the risk under these different arrangements. The experience is in some ways similar to developing a contract market while the rules for spot market are being continually changed and amended. This reinforces the importance of reaching a stable, long-term solution.

Recent events provide a further indication of the fragility of the market. Due to uncertainty arising from the current reviews, NEMMCO cancelled the auction of the Q4 2007 and Q1 2008 tranches in the March 2007 settlement residue auction.

This move had the support of the settlement residue committee, representing market participants. It is however hard to imagine comparable developments in the contract market. It illustrates the difficulty of relying on this product to hedge basis risk, and to support large scale long term contracts between regions.

Conclusion: the demand for inter-regional hedging is uncertain. The market for inter-regional hedges has not developed the same dynamism as the general contract market, and appears to show some problems due to significant asymmetry of information between bidders.

6 Conclusions on market performance

The energy only design of the market creates a high level of risk. There is a public policy interest in ensuring that the contract market is effective in ensuring that participants can reduce this risk to acceptable levels.

The contract market in NSW and VIC is above $5 billion per year. It has a reasonable level of dynamism, with a variety of contract types available.

Turnover is lower than other, comparable markets. However, there is a significant number of traders and speculators, and this assists liquidity and the ability of market participants to hedge. Bid-ask spreads indicate a reasonably liquid market. The higher level of vertical integration for peaking plant may suggest some weaknesses in the contract market for caps and similar instruments.

The regional design of the market, coupled with its relatively small scale in each region, creates a risk of low levels of competition in the wholesale market. There is a public policy interest in ensuring an efficient market for hedging inter-regional price risk.

It appears likely that there is a significant demand for inter-regional hedges from the Snowy Region to other regions, and across the Snowy Region. The turnover in the market is uncertain, but appears to be very low compared to other markets. There are a low number of traders, liquidity is low, and market participants face difficulty in hedging in a timely, cost effective manner. The secondary market for inter-regional hedges is very undeveloped, and the level of dynamism is low.

It is unclear how far the SRA auctions are supporting inter-regional hedging, and how far they are simply enabling speculation.

Most market participants principally contract within their own region. However, Snowy Hydro is unable to do so. This means that Snowy Hydro is exposed to the relatively inefficient inter-regional hedge market to a much greater degree than other participants. As a result, Snowy Hydro is likely to be a less effective participant in the contract markets in NSW and Victoria.

7 Impact of changes to the Snowy Region

7.1 Abolition of the Snowy Region

Snowy Hydro have submitted a proposal to abolish the Snowy Region. The abolition would locate Murray in Victoria and Tumut in New South Wales. The regional boundary between Victoria and New South Wales would be located at the point of material constraint on the transmission network.

The impact of this decision would be to move 3,7000 MW of peak generation at Murray and Tumut from regions with effectively no load into regions with load. This would provide Snowy Hydro with lower risk contracting options – that is, an ability for both generators to contract without facing inter-regional basis risk.

The impact of this change would be a function of:

- The scale of the peak generation being moved from a region with no load into a region with load;
- The materiality of the difference in basis risk, the cost of hedging that risk through SRAs; and

- The resulting impact on the market for caps and similar instruments.

The *scale* would be very major. Snowy Hydro has 3,700 MW of peak capacity located in the Snowy region. This is around 45% of total peak capacity in the NEM, and around 65% of total peak capacity in Victoria, Snowy and New South Wales. The abolition of the Snowy Region would therefore result in a tripling of the amount of peak capacity in these three regions which can be bid without bearing inter-regional basis risk.

The *materiality* of moving this peak capacity into a region with load is uncertain. There is substantial evidence that its current exposure to inter-regional basis risk causes problems. The term of hedges available is poorly matched to the contract market. The value of the settlement residues is highly volatile, and hard to forecast. The market for settlement residues has been inefficient (in the sense of under-recovery) for years. The secondary market exists but has limited liquidity.

All traders in the NEM are subject to risk limits in some form. The weakness of inter-regional hedges clearly means that Snowy Hydro will be less able to participate in the contract market if it remains in a region with no load. That is, it will more rapidly breach risk limits, due to the additional risk arising from inter-regional price separation, and the weakness of hedges against that price separation.

As Snowy Hydro's generation in the Snowy Region is such a material share of total peak generating capacity, even a minor impact on Snowy Hydro's participation in the contract market would have a relatively material effect. For example, if exposure of all of Snowy Hydro's capacity in the Snowy region to inter-regional basis risk led it to withdraw 20% of that capacity, there would be a 13% reduction in the supply of caps from generators in Victoria, Snowy and NSW.

We are also aware that the impact of change in regional risk was analysed during the proposed Snowy Hydro sale. This produced independently verified assessment of the change in risk arising from the Southern Generator's proposed rule change on the treatment of negative settlement residues, and the extent to which Snowy Hydro would be obliged to adjust its contract position. We understand this information was confidentially made available to the AEMC. However, we appreciate that the AEMC may want to base its decisions primarily on information in the public domain.

It seems clear that Snowy Hydro's exposure to inter-regional basis risk leads to some material loss of supply in the contract market for caps and similar instruments. The *impact of any loss of supply* is likely to be material. It is well documented that retailers adopt conservative hedging strategies. As a result, demand is likely to be relatively insensitive. The impact of any withdrawal from the contract market is likely to be a significant price increase. Conversely, the impact of any improved participation in the contract market – due to the abolition of the Snowy Region – is likely to be a reduction in the price of caps.

Conclusion: The market for caps is worth around $300-500M annually. Demand appears inelastic in the short term. The 3,700 MW of load in the Snowy region is a major component of total supply. Abolition of the Snowy Region would lead to a significant increase in Snowy Hydro's ability to participate in the market for caps. The order of magnitude of the benefits from a more competitive market is likely to be tens of millions of dollars per year.

7.2 Splitting the Snowy Region

Macquarie Generation has submitted a proposal to split the Snowy Region. The split would create two new regions. This would leave 3,700 MW of peak generation at Murray and Tumut in regions with effectively no load.

The impact of this change relative to the Business-as-Usual scenario would be a function of:

- The materiality of the difference in the ability to hedge basis risk across three boundaries, and
- The resulting impact on the contract market.

There are three reasons why we think that hedging basis risk in a split Snowy region will be more costly than the Business-as-Usual scenario:

- Splitting Snowy will create an additional boundary (new Snowy region 1 to new Snowy region 2) with Murray and Tumut on either side of this boundary. This creates an additional inter-regional price separation, for which an additional SRA will be needed. There is substantial evidence that generators face difficulty in pricing SRAs currently. Considering the difficulty of valuing SRAs and the very high volatility of Inter-regional Settlement Residues, the requirement to purchase another SRA will impose an additional risk management cost.
- There is likely to be a significant information asymmetry between Snowy Hydro and other market participants in the valuation of SRAs particularly between new Snowy Region 1 and new Snowy Region 2 since Snowy owns Murray and Tumut on either side of this boundary and hence can significantly affect the level of inter-regional settlement residues across this boundary.

- Splitting the Snowy region may not diminish the problem of counter-price flows across the Victoria/ Snowy region boundary.

The *materiality* of exposing this inter-regional trade to additional complexity and cost in purchasing hedges is uncertain. The *impact* is also uncertain. Inter-regional trade appears to be a relatively small proportion of the total contract market (excluding production from the Snowy region).

The impact of an increase in the complexity and cost of hedging basis risk between Victoria and New South Wales is likely to affect inter-regional trade adversely. At some point this may cause a delinking between the regional contract markets.

7.3 Extending the current derogations

The Business-as-Usual case does not have either the CSP/CSC or the netting-off of settlement residues. Under the Southern Generators' proposal, these arrangements would be extended.

The netting-off of settlement residues means that Snowy Hydro is exposed to risk if lines across the Snowy region constrain on northward flows. This leaves Snowy Hydro with two choices:

- Withhold generation, so that the lines do not constrain. This would substantially reduce the level of contracts that can be supported, or

- Bid so that more Snowy Hydro generation is dispatched, and bear the risk on any resulting price impacts and basis risk.

The impact of this change in regional risk was analysed during the proposed Snowy Hydro sale. This produced independently verified assessment of the change in risk arising from the Southern Generator's proposed rule change on the treatment of negative settlement residues, and the extent to which Snowy Hydro would be obliged to adjust its contract position. We understand this information was confidentially made available to the AEMC. However, we appreciate that the AEMC may want to base its decisions primarily on information in the public domain.

Snowy Hydro would have a greater ability to participate in the contract market under the abolition option than under an extension of the current derogations. This might be at the expense of some ability of Victorian generators to participate in inter-regional contract markets. The net effect should however be positive for competition in contract markets as:

- It seems likely that any withdrawal from inter-regional contract markets would be balanced by an increase in the host regional market; and

- Snowy Hydro dominates the supply of peak instruments, and would be able to increase its participation.

7.4 Conclusion

The largest impact of changes to the Snowy Region are likely to show up in the contract market. These impacts are hard to assess and so have tended to be neglected.

The impacts on dispatch efficiency of removing the Snowy region are estimated by the AEMC at $1-3.8M per year.

The abolition of the Snowy Region would lead to a material improvement in the ability of 3,700 MW of peak capacity to participate in the contract market. The impacts are hard to assess, but appear likely to be benefits of tens of millions per year through the increase in the competitiveness of contract markets in NSW and Victoria.

Splitting the Snowy Region would increase the difficulty of pricing SRAs and so the risks of contracting inter-regionally. The impacts are again hard to assess but it seems likely that they will add additional costs in the order of tens of millions per year through an increase in the number of SRAs and a commensurate decrease in the competitiveness of the contract markets in NSW and Victoria.

The AEMC should proceed with its proposed abolition of the Snowy Region. This will result in a more effective contract market, more competition between regions, to the long term benefit of consumers. It will also result in consistent approach to pricing all generators in the NEM, and a consistent approach to settlement residues across all regions of the NEM.