

**Loy Yang Marketing Management Company Pty. Ltd.**

**AGL Hydro Pty. Ltd.**

**International Power (Hazelwood, Synergen, Pelican Point and Loy Yang B)**

**TRUenergy Pty. Ltd.**

**Flinders Power**

**Hydro Tasmania**

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Dr John Tamblyn  
Chairman  
AEMC  
Level 16, 1 Margaret St,  
SYDNEY NSW 2000

By email: [submissions@aemc.gov.au](mailto:submissions@aemc.gov.au)

Dear Dr Tamblyn

## **Supplementary Submission to Snowy Region Boundary Change and Southern Generators Rule Extension**

### **Summary**

The Southern Generators group has considered the letter to you from Snowy Hydro on 26<sup>th</sup> March 2007. We are concerned by misunderstandings which are evident in the views it has propagated.

We therefore have taken this opportunity to correct these misunderstandings.



In summary, the case we are presenting is –

- The dispatch outcomes that Snowy has cited are not, in any reasonable sense, attributable to the Southern Generators Rule change.
- These dispatch outcomes are due to the physical characteristics of the network, particularly the effect of a network limitation close to Melbourne.
- The removal of a distortion in the market (ie interconnector clamping) has highlighted underlying network limitations which have largely been masked to date.
- The dispatch outcomes show features typical of the effects of an intra-regional constraint, and are due to a limitation deep within the Victorian region. Hence, these outcomes are unlikely to be altered by any region boundary change, and they therefore appear to be properly a subject for the Congestion Management Review being conducted by the Commission.
- The proposition that effectively subsidising Murray generation by including it into the Victorian region will improve the dispatch outcome is inconsistent with the facts of the physical network. Distorting generator incentives through mis-pricing will not address the underlying network limitation, or improve market outcomes.

## **1. A note on losses**

Before moving to the discussion of these issues, we note that following the practice of Snowy Hydro and others, we will avoid the complexity of loss factors in the following discussions.

However, this is for simplicity of exposition and not because we see loss factors as a minor issue. On the contrary, we see the elimination of accurate real-time loss modelling on the long interconnectors between Snowy and both Sydney and Melbourne as a serious detriment to the market that would likely follow if the Snowy region were to be abolished (unless means were found to restore accurate loss modelling despite the region boundary changes).

## **2. The Nature and effect of the Southern Generators Rule change**

The Southern Generators Rule change (SGR for short), like the CSP/CSC trial introduced earlier through a Snowy Hydro proposal, deals with an issue that appears more generally in the market, but deliberately deals with it only in the particular context of the Snowy constraint. Both of these proposals were intended to provide a trial of the solution on a small scale before wider application was contemplated.

The issue addressed by the SGR was the earlier need for NEMMCO to prevent significant counter-price flows on the Vic-Snowy interconnector despite these being an essential feature of efficient dispatch when the flow between Murray and Tumut within the Snowy region is congested.

The action that NEMMCO was required to take in this case was very drastic, intervening in the market to prevent (or drastically reduce) flow on the Vic-Snowy interconnector. Hence in the case of actual congestion within Snowy, NEMMCO was required to apply an “artificial congestion” on another interconnector. This restricted competition by preventing economic flows between two large segments of the NEM, the “southern” and “northern” groups of regions. The limit that NEMMCO needed to impose in such cases had the same effect as network congestion, but did not relate to any actual limit in the physical network.

The SGR has worked as intended; allowing NEMMCO to avoid imposing artificial congestion in the relevant circumstances. In the cases that Snowy Hydro has cited, the dispatch outcomes are determined by the physical nature of the network and not by artificial congestion, except in the case of NEMMCO preventing counter-price flows on the Vic-SA interconnector.

We therefore contend that it is a misunderstanding when Snowy claims –

- That the SGR is creating a “market problem and inefficiency” when it is simply allowing the underlying physical network to determine dispatch rather than the serious distortion caused by NEMMCO intervening to apply artificial congestion.
- That NEMMCO intervention on the **Vic-SA** interconnector demonstrates that this Rule (which is deliberately and explicitly applicable only to **Vic-Snowy** interconnector) has failed. The Vic-SA interconnector is clearly outside the scope of the SGR.
- That there is an interaction between the SGR and the South Morang constraint. The South Morang constraint is a reflection of the physical limits and layout of the network and is not altered in any way by the SGR; the physical constraint equations remain unaltered, as acknowledged by Snowy. This network limitation is simply revealed more often in the absence of artificial congestion (which impacts on one of the flows relevant to this constraint).

Because of these misunderstandings, Snowy has wrongly attributed certain features of the market outcomes to the Southern Generators Rule. Thus, regardless of whether one accepts Snowy’s description of these features as representing “market problems and inefficiency”, it is **not** reasonable to treat these outcomes as an argument against the continuation of the SGR.

We will consider elsewhere the question of whether Snowy’s description of these outcomes is apt. At this point we simply note that it is not reasonable to attribute the outcomes to the SGR, which has simply removed a major barrier to efficient dispatch to reveal the natural consequences of the underlying physical situation and market dispatch.

### **3. Effect of termination of the Southern Generators Rule**

Snowy is advocating the termination of the SGR, and we will therefore briefly review the case for its implementation and its continuation, until overtaken at some future time by better arrangements.

We take as an example the situation of high price in NSW and hence northward flow through Snowy, the situation considered in the Snowy letter at issue.

In this situation, if there is sufficient economic supply in the southern regions then the limitation to flow through Snowy is likely to bind. When this occurs, an aspect of the physical arrangement of the network becomes evident. This is that flow from Victoria (and beyond) makes less demand on the limiting Snowy lines than does generation at Murray, given the characteristics of the network loop at this location. Thus Victorian generation is more effective in supplying into the high-priced NSW region, and consequently the price in Victoria is determined as a price higher than the price determined at Murray.

Thus, in this situation the flow from Victoria is necessarily counter-priced because of the nature of the network. If NEMMCO does not have the means to fund the resulting deficit in interconnector settlement, they will be forced to prevent this desirable flow. In this case –

- All generators south of Snowy are prevented from competing into NSW, and
- The total flow that can be provided into NSW through the Snowy network is reduced (because the flow that uses the network most effectively is prevented from being dispatched).

Each of these outcomes is a serious detriment to efficient dispatch in the market.

The SGR avoids these detriments by avoiding the need for NEMMCO to prevent the flow by applying artificial congestion. By removing the need for intervention this Rule allows the network to be more fully utilised, up to the point where actual physical congestion occurs.

#### **4. Relationship between constraints**

Snowy has also misunderstood the relationship between the two constraints that were binding in the case they have cited. They have attributed the relationship to the Southern Generators Rule.

The truth is much simpler.

The two constraints relate to power flow (a) through the “F2” transformer at South Morang, and (b) through the transmission lines between Murray and both Upper Tumut and Lower Tumut.

The relationship between these is simply that power flow from Victoria to Snowy contributes to both power flow through the F2 transformer, and through the relevant Snowy lines. Therefore both constraint equations must necessarily include this northward power flow.

Each of these constraint equations also contains other power flows in such a way that their flow can be traded against the Vic-Snowy flow. In this situation it is not uncommon

for both equations to bind simultaneously, as neither creates a “hard” limit to Vic-Snowy flow, but rather a “soft” limit in the sense that it varies with related circumstances.

Hence both the relationship between the constraints, and the fact that they were binding simultaneously are both consequences of the physical configuration of the network, and not of the market rules. Both constraints remain unaltered, with or without the SGR.

## **5. Relationship between prices**

Snowy has derived a mathematical relationship between prices for the case where both these constraints are binding, but has then misunderstood the meaning of this relationship.

Where a constraint that includes more than one interconnector term is binding, it is natural that the price differences across these interconnectors are related to one another by the coefficients in the constraint equation. Where more than one such equation is binding, and there is a common interconnector, as in the case cited, these price relationships compound.

So far we are in agreement with Snowy.

But Snowy has expressed this relationship in a way that implies that the Victorian price must necessarily be determined by other prices. While this happened to be the case in the example cited, it is wrong to generalise from this.

Under slightly different conditions it could, for example, have been the Murray price that was set by the relationship to other prices while the Victorian price was set by a local offer price.

We agree that the prices are necessarily related (ultimately due to network configuration), but do not agree that there is a single direction of causation in all circumstances.

## **6. Incentives for Murray generation**

Snowy has misunderstood the incentives for Murray generation that apply under the current market arrangements, and hence believes that these incentives are wrong. In order to clarify the incentives on Murray generation, it is necessary to consider the market situation in terms of constraints and prices over the range of Murray generation.

Under the circumstances of 12 January 2007, with the F2 transformer constraint binding, the flow from Victoria to Snowy was limited to about 500 to 600 MW. This limit is not fixed, but relates to a number of other variables including Latrobe Valley generation and flows from Tasmania to Victoria and from South Australia to Victoria.

These other influences are not directly impacted by Murray generation, and for simplicity of exposition we will not explore the minor variations in Vic-SN limit that could occur with changing Murray generation.

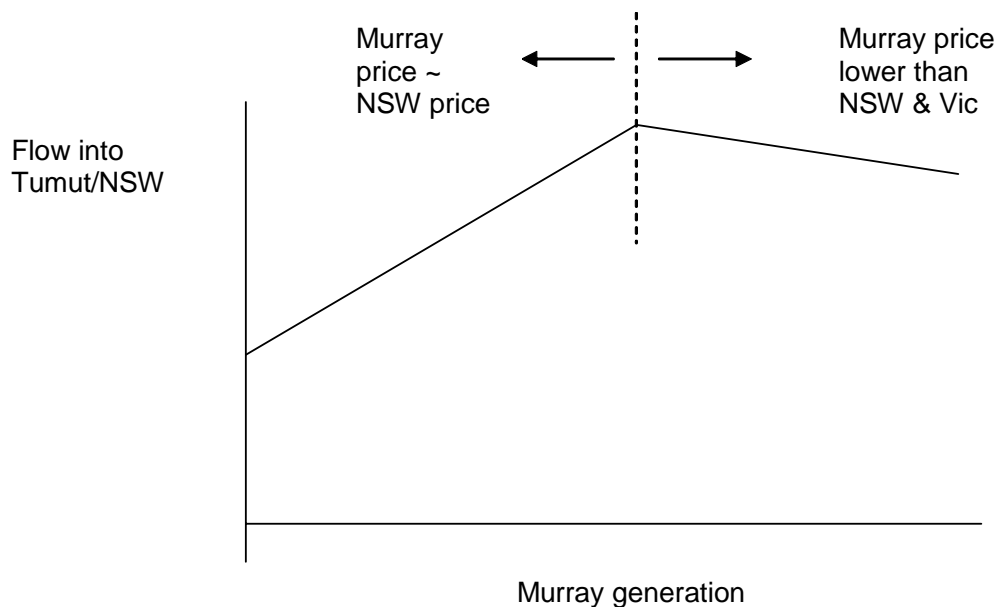
With low Murray generation the constrained flow from Victoria plus Murray generation will be insufficient to cause congestion of the Snowy lines. With no constraint between Murray and Sydney, the Murray price would approximate the NSW price, while the Victorian price would be separated from it by the F2 constraint, and these related prices will be set consistent with the relationship imposed by the F2 constraint equation.

In this condition, an increment of Murray generation provides a matching increment of supply into NSW (ignoring losses). Murray is thus appropriately incentivised by its price.

At some level of Murray generation, about (1350 - 600) or 750 MW, the Snowy limit will also bind. The binding of this constraint creates a relationship between the price at Murray and the Victorian and NSW prices, such that the Murray price is below the Victorian price (and hence the Vic-SN flow is counter-price) given the nature of the network.

In this condition, incremental Murray generation does **not** provide an increment of flow into NSW, but instead reduces this flow because energy from Murray makes more intensive use of the critical lines than does energy from Victoria.

The variation of the flow into Tumut/NSW is illustrated below –



In the upper range of Murray generation, because increased generation at Murray is reducing the flow into the higher-priced NSW region and displacing lower-priced southern generation, the incentive for additional Murray generation should be low. Under the current market arrangements the Murray price is correctly determined as a lower price than that in Victoria, thus giving the appropriate incentive.

In this range, the flow from Victoria to Snowy will be reduced for two reasons; first because Murray generation displaces southern generation, and second because the flow into Tumut/NSW is reduced. With higher levels of Murray generation the F2 transformer constraint may not bind because the low level of flow from Victoria that

remains possible may fall below the limit. Very high levels of Murray generation would force a southerly flow into Victoria. In all these cases the Murray price will remain consistent with the relationship to NSW and Victorian prices, but would likely be lower at high Murray production because the Victorian price would be lower with less southern production.

It is therefore apparent that the incentive for Murray generation varies with the production level chosen by Snowy, and in a way which provides the appropriate incentive in each circumstance. For example, under northward flow the incentives under the present arrangements drive Murray generation to increase output, which helps to relieve the South Morang constraint, up to the limit of the Murray Tumut constraint.

In contrast, if incentives based on settlement at Victorian price were to apply, then with one of these constraints binding the incentive would not match the value of production at any level of Murray production, and mispricing would result.

## **7. Inefficient dispatch due to F2 constraint**

As we have discussed above, the dispatch in relation to the Snowy constraint is efficient now, although it would not be if the Snowy region were abolished.

But in the case of the F2 transformer constraint, Snowy's contention of inefficient dispatch appears to be more soundly based. The market outcomes resulting from this underlying network limitation appear to provide a material example of intra-regional congestion.

The contention that it is inefficient is unsurprising because this is an intra-regional constraint, and currently, of all the intra-regional constraints in the market, only the set of Snowy-line constraints has a constraint management scheme.

Thus the proposition that the F2 transformer constraint (like other intra-regional constraints) leads to market inefficiency is to be expected. This issue appears to be properly a matter for the Congestion Management Review.

However, we do consider that some comment in relation to the severity of the problem is appropriate in the context of Snowy Hydro's letter.

In our view, the measure that Snowy has adopted to consider severity is not very useful. They have considered the price variation between the local price and Regional Reference Node price. But any intra-regional constraint is likely to lead to the same incentive for extreme price offers. This measure does not usefully distinguish between the effects of different intra-regional constraints.

We suggest that a more useful measure is the difference between the actual dispatch outcome and the dispatch outcome that would apply if all participants were incentivised by the true value of their production.

In the case of the Latrobe Valley, the great majority of the generation is low marginal cost, base-load plant. This plant would operate at high capacity factor if incentivised at its true value, and is rebid to achieve the same outcome under conditions of intra-

regional constraint. Only in the case of the small proportion of higher marginal cost plant is there a likelihood of inefficient dispatch.

While we do not support any inefficient dispatch, we believe that it is important to note that the extent of dispatch inefficiency in the Latrobe valley due to the F2 transformer constraint is relatively small, because it is only likely in the case of the two peak-load stations (which are relatively small).

In contrast, the Murray power station has an opportunity cost which relates to the availability of water and to the expected future market prices, and hence is within the common range of market prices. Therefore it is much more subject to inefficient dispatch because large production changes may result from relatively small pricing errors.

As highlighted in the Congestion Management Review, the impact of intra-regional congestion is most material when the true offer price of the generator lies between the nodal price and the regional reference price (leading to either inefficiently constrained-on or constrained-off generation).

## **8. “Assumption” of the same offers**

Snowy appear to have formed the view that we expect that market offers would be the same whether or not Murray was incorporated into the Victorian region.

We wish to make clear that this was not our view.

The point we made was that Snowy would receive a windfall gain in settlement, due to the proposed region boundary change, even if all the market offers were the same. This was to make clear that the region boundary change would cause the windfall gain, without in the first instance considering the complication of offer changes. We wished to explain one effect at a time for the purpose of clarity.

We were also concerned that some comments by Snowy could be interpreted as saying that the proposed region boundary change, of itself, would lead to lower Victorian prices in the circumstances considered, and we wished to make clear that this would be an incorrect assumption.

We clearly recognised that Snowy would be likely to make different offers if it was receiving the Victorian price instead of the actual value of its production. We assume that it would change its offer in whatever way increased its net revenue.

Hence if a reduction in Murray production led to a relatively large increase in Victorian price, we assume that the offer would reflect the benefit to Snowy of such reduced production. Likewise if increased production at Murray caused only a relatively small depression in the Victorian price, presumably Snowy would offer accordingly.

We note that the incorporation of Murray into the Victorian region would not directly affect the incentives for generators in Victoria, South Australia or Tasmania, but their incentives may then differ as a secondary consequence of the different incentives on Murray, and hence potentially different Murray production.



## **9. Incentives for Murray generation**

Snowy has suggested that under their region boundary change proposal, Murray generation would have “strong and efficient signals to generate”.

However as we have discussed above, the value of Murray generation depends critically on which constraints are binding, with very different values when, for example, only the F2 transformer limit is binding, compared with the case where the Murray-Tumut line limit is binding (with or without the F2 transformer limit).

Thus it is apparent that the region boundary change would lead to incentives for Murray generation that are at times inefficiently low, and at other times are inefficiently high. This mispricing would not address the underlying network limitations present in the Victorian region nor improve the efficiency of market outcomes, as discussed above.

## **Conclusion**

The market outcomes observed on the dates in question are a natural consequence of the underlying limitations of the physical network, as represented in the dispatch process by constraint equations.

While providing a serious example of intra-regional congestion, these outcomes are in no way attributable to the SGR, but have arisen since inefficient interconnect clamping has ceased and the network has been more fully utilised, revealing underlying network limitations which have largely been avoided to date.

Under present arrangements, Murray generation faces efficient incentives to increase generation when it assists in relieving constraints, and to reduce generation when it contributes to constraints.

The termination of current arrangements or abolition of the Snowy region would give rise to serious mispricing and intervention that would distort these incentives, and result in less efficient market outcomes, while failing to address the underlying physical limitations present on the network.

If you have any questions regarding this submission please contact Roger Oakley on (03) 96122211.

Yours faithfully,



**Roger Oakley**  
Loy Yang Marketing Management Company Pty. Ltd.  
Level 27, 459 Collins Street,  
Melbourne, Victoria 3000

(on behalf of the participants listed)

..... <b>Ken Thompson</b> General Manager Loy Yang Marketing Management Company Pty Ltd	..... <b>Alex Cruickshank</b> Manager NEM Development AGL Hydro Pty Ltd
..... <b>Ben Skinner</b> Regulatory Manager, Wholesale Markets TRUenergy Pty Ltd	..... <b>David Hoch</b> Market Specialist International Power
..... <b>David Bowker</b> Manager Regulatory Affairs Hydro Tasmania	..... <b>Reza Evans</b> Manager Energy Policy & Regulation Flinders Power