ELECTRICITY MARKET EVENT REPORT

Negative Intra-regional Residues in New South Wales – Billing Week Commencing Sunday 30 January 2011

PREPARED BY: Electricity Market Performance

DATE: 11 April 2011

FINAL

Contents

1 Introduction

This report has been prepared to explain the level of negative intra-regional residues that accumulated in New South Wales during billing period commencing 0000 hrs Sunday 30 January 2011 (2011 week 6).

During that week, the net intra-regional settlements residue in New South Wales was approximately -$12.6 million. This week coincided with hot weather, high prices and high demand in New South Wales.

The outcome is a result of static loss factors in NSW being high so that the cost of losses was not fully covered in that region.

2 Intra-regional Losses, Loss Factors and Residues

2.1 Treatment of intra-regional losses in the NEM

Intra-regional losses are electrical energy losses that occur due to the transfer of electricity between a regional reference node and transmission network connection points in the same region.

Intra-regional loss factors are static and determined annually by using power system analysis to model half hourly marginal loss factors over a year then averaging them[1]. The intra-regional loss factors are used in central dispatch to scale the bid or offer price of a scheduled generator, scheduled load or scheduled network service from its local price to the regional reference node. They are used in settlement of the market to scale the price paid by or to a market participant. The difference between the overall volume of generation and the overall volume of loads settled by AEMO will be due to electrical losses. Loss factors are determined so that they generally reduce the price for generation and increase the price for loads. Because loss factors are based on marginal (rather than average) losses, the reduced price paid to Market Generators and increased price by Market Customers is generally more than required to cover the costs of electrical losses, and intra-regional settlements residues will be positive.

2.2 Negative Intra-regional Settlements Residues

Negative intra-regional residues in a region occur when the amount AEMO collects is less than the amount AEMO pays from or to Market Participants in that region. It can occur because:

- The price adjustments through intra-regional marginal loss factors do not sufficiently cover the cost electrical losses within a region.
- There are issues with the metering data provided to AEMO.

Pricing issues generally occur during periods of high network flows within a region that are beyond the ability of static loss factors to accurately model the actual losses. Pricing issues are larger when flows coincide with a high spot price.

The abolition of the Snowy region in 2008 (see section 2.4) effectively resulted in the application of a static intra-regional marginal loss factor to replace a dynamic inter-regional marginal loss equation for transfers between Snowy and the New South Wales regional reference node. In the event of significantly varying operating conditions, this increases the risk of pricing issues arising in NSW.

Variations of actual losses in real time away from fixed marginal loss factors, coinciding with periods of high spot price, have historically been the primary reason for negative intra-regional residues.

[1] AEMO. “Methodology for Calculating Forward-looking Transmission Loss Factors”. Version 3, 55 pp. Available http://www.aemo.com.au/electricityops/172-0032.html. April 2010.

Metering data issues are less common and AEMO procedures[2] ensure ongoing quality of metering data.

2.3 Impact of Loss Factors

Loss factors can affect market outcomes in dispatch and settlement of the market. In dispatch, band prices are divided by the loss factor so that a high loss factor will reduce the bid price at the regional reference node. Conversely, in settlement the loss factor is multiplied by the region reference price so that a higher loss factor will make the local price higher.

If the losses for actual system conditions at a particular time is significantly different to the intra-regional marginal loss factor then both dispatch and settlement can be distorted. To reduce the potential for this, AEMO uses the volume-weighted average of loss factors calculated over a range of system conditions.

Pumped storage schemes such as at Tumut 3 Power Station pose particular difficulties for the calculation of intra-regional loss factors when the annual net energy imported and exported by the scheme is relatively close to zero. Where this occurs, AEMO uses a time-based average as is currently the case with Tumut 3. In February 2009, NEMMCO completed a consultation on the methodology for determining intra-regional loss factors[3]. In that consultation, NEMMCO indicated it would be pursuing a change to the National Electricity Rules to allow separate loss factors for pumped storage schemes which would apply to generation and pump modes of operation.

2.4 Region Boundaries

From commencement of the NEM, region boundaries were reviewed annually by NEMMCO against a number of criteria including (in priority order) hours of congestion, definition of transfer limits, minimal impact of static factors on central dispatch, and minimal variation and errors of loss factors.

From 1 July 2008, a region boundary around the Snowy hydro power stations was abolished following a Rule change determination by the AEMC[4]. Also from 1 July 2008, a new process for region change was adopted following another Rule change determination by the AEMC[5].

The new process allows Registered Participants or AEMO to make a region change application to the AEMC. In order to be a complete application, a region change application must identify a congestion problem to be solved, among other things. Other criteria including those related to loss factors issues were removed with the new process.

3 New South Wales Intra-regional Residue and Price Outcomes

Hot weather in New South Wales resulted in high demand and high prices throughout the week. Figure 1 shows the cumulative residues and the New South Wales regional reference price for 2011 week 6.

[2] AEMO. “Substitution Estimation and Validation Procedure”. Version 4. 61 pp. Available http://www.aemo.com.au/electricityops/700-0069.html. February 2010.
[3] NEMMCO. “Changes to Forward Looking Loss Factor Methodology”. Version 1.0. 16 pp. Available http://www.aemo.com.au/electricityops/178-0099.html. February 2009.
[4] AEMC. “Abolition of Snowy Region”. AEMC Reference ERC0016. Available http://www.aemc.gov.au/Electricity/Rule-changes/Completed/Abolition-of-Snowy-Region.html. August 2007.
[5] AEMC. “Process for Region Change”. AEMC Reference ERC0005. Available http://www.aemc.gov.au/Electricity/Rule-changes/Completed/Process-for-Region-Change-formerly-called-Region-Boundaries.html. December 2007.

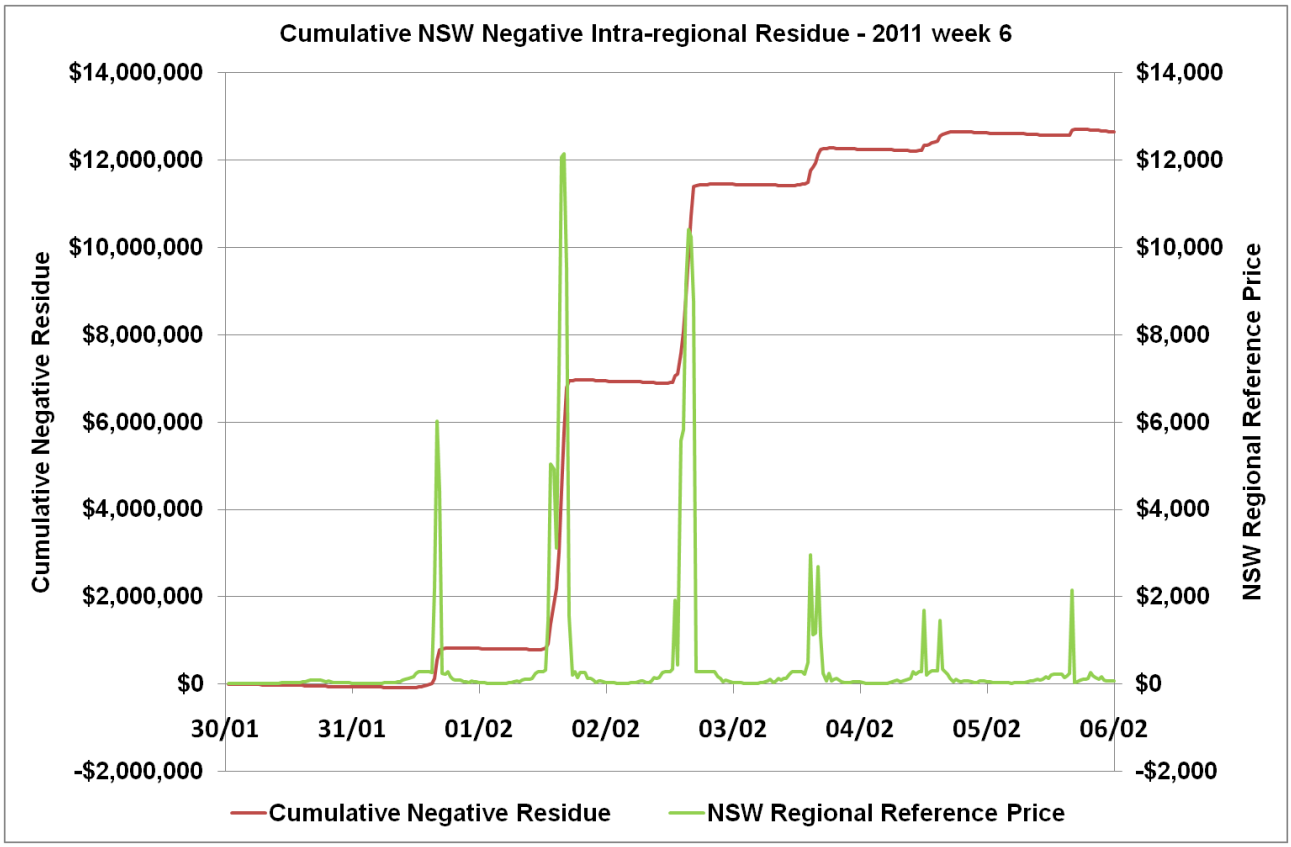

Figure 1 New South Wales Cumulative Negative Intra-Regional Residues and Regional Reference Price

Under the NER, the net negative intra-regional residues in a week are recovered from the TNSP in the region, in this case TransGrid. This is passed through to network users through transmission pricing arrangements. This appears to have been a transfer of wealth from consumers of transmission services to Market Participants.

The negative residues in 2011 week 6 are most likely due to approximations in the way losses are modelled in New South Wales. The high intra-regional losses are mostly closely correlated with dispatch of generation in southern New South Wales and particularly at Tumut 3 Power Station.

To examine the effect of higher losses, “residue energy” can be determined by normalising the intra-regional residues (that is dividing the overall residue by the spot price). Residue energy is a measure of the effective balance of demand and supply for all connection points in the region referred to the regional reference node.

Figure 2 shows the New South Wales residue energy and New South Wales regional reference price for the week, indicating significant negative residue energy occurred whenever the New South Wales price was high. Figure 3 shows the correlation of New South Wales residue energy with generation at Tumut 3 Power Station.

Other significant negative residue days in New South Wales shows a similar pattern associated with southern New South Wales generation.

Note that residue energy is an indicator of the effectiveness of fixed loss factors to reflect actual losses of transporting energy to connection points within a region. Variations in losses from changes in power flows on the network are not reflected in fixed loss factors. In contrast, there is no clear correlation between residue energy and the Victoria-New South Wales interconnector flow, where losses are modelled by a dynamic loss equation, during these periods.

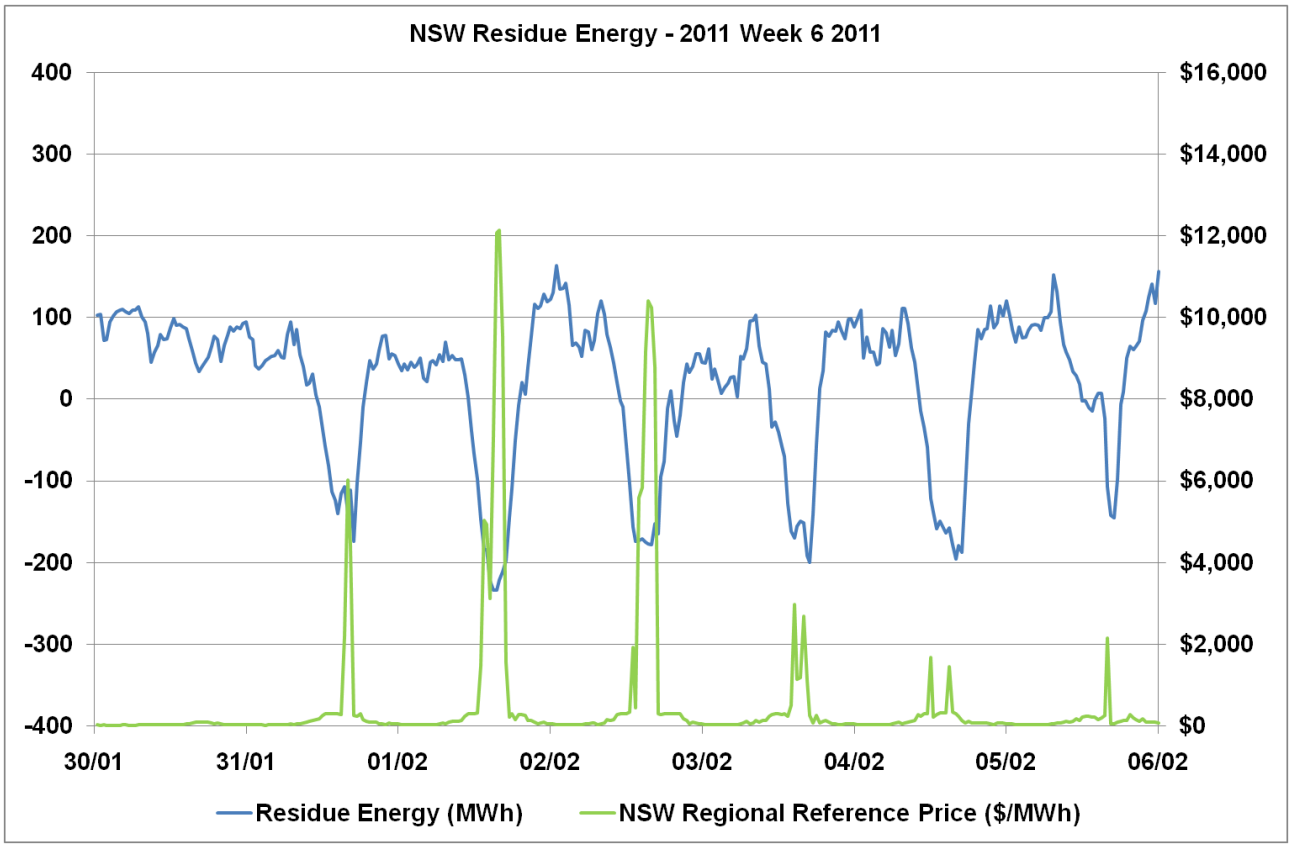

Figure 2 New South Wales Residue Energy and Regional Reference Price

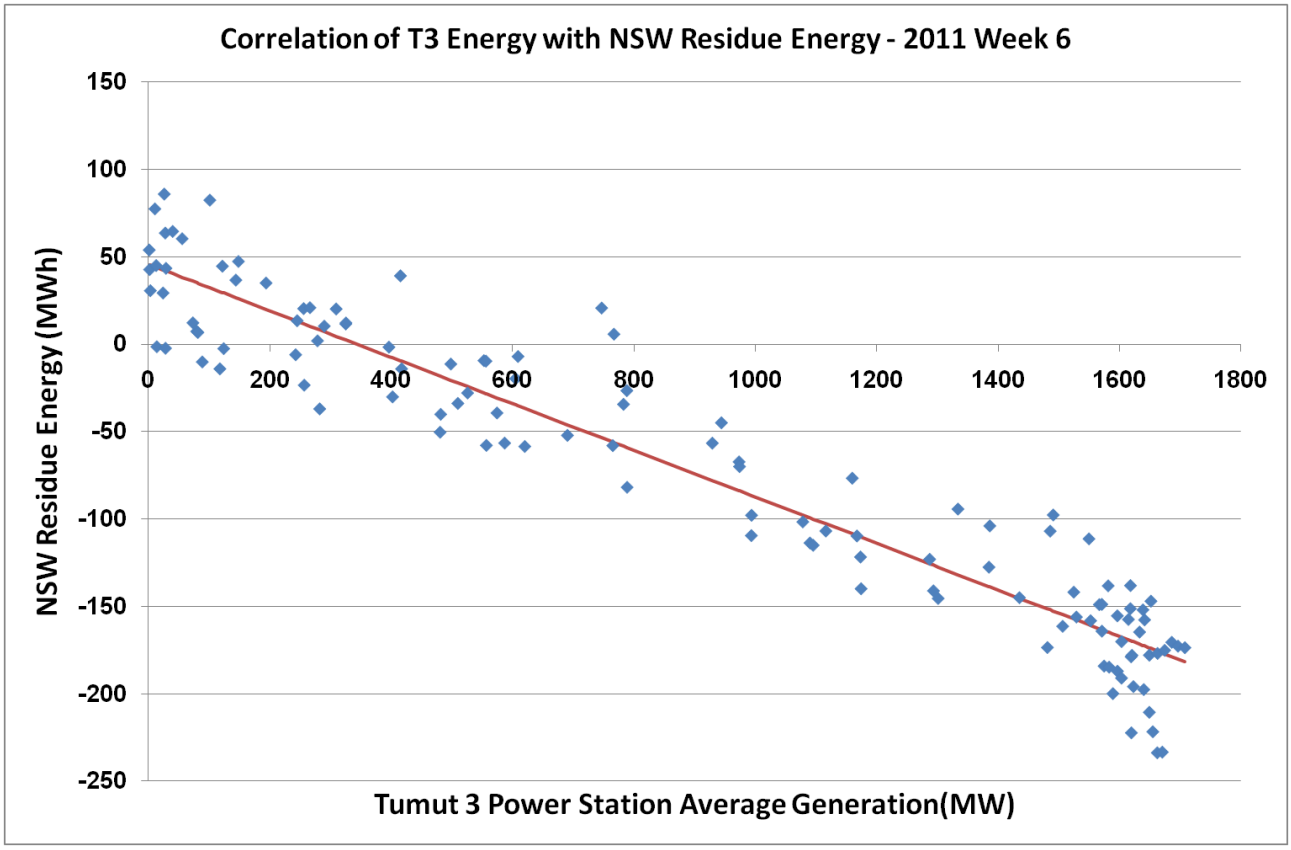

Figure 3 Correlation of New South Wales Residue Energy against Tumut 3 Power Station Generation

4 Historical Residues in New South Wales

Since the abolition of the Snowy region in 2007, net intra-regional settlements residues in New South Wales have reduced as shown in Table 1. Before 2011 week 6, the largest net negative residues in a week had been around $4,000,000.

Table 1 suggests the occurrence of negative residues in New South Wales is increasing. AEMO anticipates that net residues for 2010/11 are unlikely to be net positive based on the latest available data.

Prima facie, this appears to show that the 2011 week 6 event might not be an isolated event and that wealth transfers from consumers to Market Participants are ongoing.

Year	New South Wales Intra-regional Settlements Residue		
	Net	Positive	negative
2004/05	$26,037,384	$26,037,407	$23
2005/06	$25,990,820	$26,038,317	$47,497
2006/07	$60,818,885	$60,818,885	$0
2007/08	$43,624,664	$43,624,664	$0
2008/09	$23,134,649	$26,203,590	$3,068,941
2009/10	-$859,744	$16,525,531	$17,385,275
2010/11*	-$5,459,706	$8,556,142	$14,015,848

Table 1 Net New South Wales Intra-regional Settlements Residues (2010/11 data incomplete)*

5 Recent and Current Activity Relating to Loss Factors

5.1 Recovery of Negative Settlements Residue

Under rule changes implemented from 1 July 2010[6], negative inter-regional settlements residue is recovered from the Transmission Network Service Provider in the region. This amount is then recovered by the TNSP through normal transmission use of system arrangements.

Under the current rules, AEMO is permitted to determine that a TNSP make payment prior to the settlement date for negative inter-regional settlements residues. However, the rules do not allow such arrangements for negative intra-regional settlements residues. This has highlighted a prudential risk with the current arrangements.

5.2 Application of Dual Marginal Loss Factors

The AEMC has commenced consultation on a rule change proposal from AEMO to apply dual marginal loss factors to transmission connection points with a net energy balance that is less than a threshold determined by AEMO[7]. In recent years, total generation at Tumut 3 Power Station has been only slightly greater than pumping and would be subject to the proposed rule if this pattern continues.

[6] AEMC. "Arrangements for Managing Risks Associated with Transmission Network Congestion – Negative Inter-Regional Settlements Residue Amounts". AEMC Reference ERC0076. Available http://www.aemc.gov.au/Electricity/Rule-changes/Completed/Arrangements-for-Managing-Risks-Associated-with-Transmission-Network-Congestion-Rule-17.html. August 2009.

[7] AEMO currently applies an energy balance of less than 30% to determine whether to time weighted averaging instead of volume weighted averaging.

AEMO indicated[8] that the proposed methodology would change the loss factor from 1.0092 (for combined generation & pumping) to 0.9774 (for generation) and 1.0242 (for pumping load). While this would have the effect of reducing the settlement amount paid to Snowy under the same generation and spot prices, the marginal loss factor would have needed to be lower than this cover the cost of losses in 2011 week 6. This suggests that negative intra-regional residues in New South Wales are likely to continue in the future but not at the level experienced in this week.

Snowy Hydro Trading has also indicated[9] that the reason for high MLF calculations for Tumut 3 Power Station has been a result of changed generation and consumption patterns due to severe drought conditions.

5.3 Publication of Marginal Loss Factors for 2011-12 Financial Year

The marginal loss factors for 2011-12 financial year[10] showed a significant reduction in the loss factor at Tumut 3 Power Station from 1.0092 to 0.8292, due to increased generation at Lower Tumut. Under the current single loss factor methodology, loss factors can be volatile from year to year if the net energy balance varies. It is unlikely that net negative intra-regional residues would occur in New South Wales in 2011-12 with the new loss factors, but this could change in future years.

On the assumption that the "Application of Dual Marginal Loss Factors" rule change is made, AEMO intends to consult on the methodology for calculating loss factors to take into account the calculation of two loss factors for connection points where energy is both generated and consumed. If the rule change and consultation are completed in time, AEMO would apply the new methodology in 2011-12 financial year. Under a dual marginal loss factor methodology, negative intra-regional residues may still occur but be at a lower level.

6 Conclusions

The New South Wales region experienced large negative intra-regional residues during 2011 week 6 (billing week commencing 0000 hrs Sunday 30 January 2011). This appears to be due to approximations inherent in the use of a single loss factor to represent the broad range of potential operating conditions experienced by particular plants and network elements in southern New South Wales. The approximations are particularly influential during periods of high demand and high prices in the region.

The incident has highlighted that arrangements for recovery of negative intra-regional residues from the TNSP in the region pose a potential prudential risk to the market. AEMO is considering whether to propose a rule to address this issue.

Since the Snowy region was abolished in 2007, the occurrence of negative intra-regional settlements residues in New South Wales has progressively increased and net residue is likely to be negative for the 2010/11 financial year. This would be likely to be reversed for 2011-12 as the published Lower Tumut marginal loss factor is significantly lower than in previous years. The volatility in marginal loss factors at Lower Tumut is a result of the single marginal loss factor methodology and changes in the net energy balance at this connection point.

Application of dual marginal loss factors is likely to reduce the possibility of significant negative intra-regional residues in New South Wales in the future and would see less volatility in the marginal loss factors from year to year.

[8] AEMO. "Application of Dual Marginal Loss Factors Rule Change Request". AEMC Reference ERC0117. Available http://www.aemc.gov.au/Electricity/Rule-changes/Open/Application-of-Dual-Marginal-Loss-Factors.html. October 2010.

[9] Snowy Hydro Trading. "Submission to: Consultation Paper - Application of Dual Marginal Loss Factors". AEMC Reference ERC0117. 4 pp. Available http://www.aemc.gov.au/Media/docs/Snowy%20Hydro%20Limited-a406758a-2c31-4887-9d19-f16fb9acba81-0.PDF. February 2011.

[10] AEMO. "List of Regional Boundaries and Marginal Loss Factors for the 2011-12 Financial Year". Version 1.0. 61 pp. Available http://www.aemo.com.au/electricityops/0172-0005.html. April 2011.