LIST OF REGIONAL BOUNDARIES AND MARGINAL LOSS FACTORS FOR THE 2013-14 FINANCIAL YEAR

PREPARED BY:	Systems Capability
VERSION:	1.1
DATE:	30/05/2013

FINAL

Contents

Version Release History

VERSION	DATE	CHANGES
0.1	11/03/2013	Draft regional boundaries and marginal loss factors for the 2013/14 financial year.
1.0	28/03/2013	Final regional boundaries and marginal loss factors for the 2013/14 financial year.
1.1	30/05/2013	• Corrections to the MLF values of Remount Generator, Mortons Lane Wind Farm and Yambuk Wind Farm. • Publication of the MLF values for new connection points at Moranbah Substation and Wyhalla Central Substation.

Acknowledgement

AEMO is indebted to all the participants who have provided strong support for the 2013-14 Forward Looking Loss Factor calculation process. In particular AEMO would like to thank Powerlink, TransGrid, AusGrid, Essential Energy, and Transend for providing load forecasting data and network augmentation data. AEMO is also grateful for timely response from ElectraNet, ETSA Utilities, wind farm proponents, generator participants and major industrial load participants in providing AEMO with information required for the calculation of MLFs.

Disclaimer

(a) ***Purpose*** *– This document has been prepared by the Australian Energy Market Operator Limited (**AEMO**) for the purpose of complying with clauses 3.5 and 3.6 of the National Electricity Rules (**Rules**).*

(b) ***Supplementary Information*** *– This document might also contain information the publication of which is not required by the Rules. Such information is included for information purposes only, does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the National Electricity Law, the Rules, or any other relevant laws, codes, rules, procedures or policies or any aspect of the national electricity market, or the electricity industry. While AEMO has used due care and skill in the production of this document, neither AEMO, nor any of its employees, agents and consultants make any representation or warranty as to the accuracy, reliability, completeness, currency or suitability for particular purposes of the information in this document.*

(c) ***Limitation of Liability*** *– To the extent permitted by law, AEMO and its advisers, consultants and other contributors to this document (or their respective associated companies, businesses, partners, directors, officers or employees) shall not be liable for any errors, omissions, defects or misrepresentations in the information contained in this document or for any loss or damage suffered by persons who use or rely on this information (including by reason of negligence, negligent misstatement or otherwise). If any law prohibits the exclusion of such liability, AEMO's liability is limited, at AEMO's option, to the re-supply of the information, provided that this limitation is permitted by law and is fair and reasonable.*

1 Introduction

In electricity pricing, it is widely accepted that marginal costs are the appropriate basis for pricing generation. Transmission pricing involves expanding this view to usage in different locations. It follows that electricity presents complex computational problems, but they are mostly similar to transport problems of other product markets.

For any market, the value of losses is always included in the cost of transport and recovered through increased prices at the receiving end. For electricity transmission, the percentage losses also increase with the load transmitted. Therefore, the more the transmission line is loaded, the higher the percentage losses. Thus the price differences between the sending and receiving ends will be determined not by the average losses, but by the marginal losses of the last MW of load delivered.

This document details the marginal loss factors representing losses across the five National Electricity Market (NEM) regions - Queensland, New South Wales, Victoria, South Australia, and Tasmania - calculated in accordance with Clause 3.6 of the National Electricity Rules (NER). The NER requires that the losses between regions be calculated dynamically by inter-regional loss factor equations. Within each region, the losses from sending electricity from the Regional Reference Node (RRN) to generators and customers are represented by static intra-regional loss factors.

In the dispatch process, generator bid prices within each region are adjusted by the intra-regional loss factors in dispatching generators to meet demand. In addition, depending on the flows between regions, the inter-regional loss factors obtained from the dynamic equations are also used to adjust the generator prices in determining which generators are dispatched to meet demand.

After the RRN prices are calculated for each region, prices for customers' connection points on the network are calculated using the intra-regional loss factors between these points and the RRN.

2 MLF calculation

The wholesale electricity market trades electricity power via the pool managed by AEMO. There are two basic components of the pool: the central dispatch and the spot price. The central dispatch process schedules generators to meet demand with the objective of minimising the cost of meeting demand based on the offers and generator bid prices.

For each half hour period, a spot price for electricity is calculated for matching supply and demand. AEMO calculates this spot price using daily price offers and bids. Another major factor that is required to be accounted for in calculating spot prices is the electrical losses in delivering electricity from generators to customers.

The NEM consists of five regions and the spot price at each regional reference node is calculated dynamically taking into account the losses between regions as generators are scheduled to meet demand. These losses between regions are pre-calculated and given in inter-regional loss factor equations. The inter-regional loss factors between regional reference nodes are then used to adjust the offer and bid prices when determining which generators are to be dispatched to meet demand.

Within a region, the losses between generators and the regional reference node and between the regional reference node and customers are represented by intra-regional loss factors relative to the regional reference node. These loss factors are pre-calculated from studies using forecast demands based on historical load and generator profiles. In the central dispatch process, offer and bid prices are adjusted by these intra-regional loss factors in dispatching generators to meet demand.

The following are the Rules requirements for the calculation of inter and intra regional loss factors.

2.1 Rules requirements

Clause 3.5 of the National Electricity Rules (referred to as the Rules) requires AEMO to establish, maintain, review and by April 1st each year, publish a list of regions, regional reference nodes and the region to which each market connection point is assigned. In addition, clause 3.6 of the Rules requires AEMO to calculate intra-regional transmission loss factors and inter-regional loss factor equations by 1st April each year to apply for the next financial year.

Clauses 3.6.1, 3.6.2 and 3.6.2(A) specify the requirements for calculating the inter-regional and intra-regional loss factors, and the data to be used in the calculation.

2.2 Inter-regional loss factor equations

The Rules require that AEMO apply a regression analysis to determine the significant variables and variable coefficients for an equation that describes the loss factor between regional reference nodes. AEMO must publish the equations resulting from the regression analysis, the correlation factors and the associated variances.

2.3 Intra-regional loss factors

The Rules require AEMO to calculate and publish a single volume weighted average (intra-regional) loss factor for each transmission network connection point. The Rules also require AEMO to calculate and publish dual MLFs for transmission network connection points where one MLF does not satisfactorily represent transmission network losses for active energy generation and consumption.

Under the National Electricity Rules, the use of virtual transmission nodes (VTNs) was gazetted on 1 November 2001. In accordance with these Rule changes, AEMO has developed a methodology to average transmission loss factors for each VTN authorised by the relevant Jurisdictional Regulator. Six VTNs have been approved in the NEM and these are described in section 5.

2.4 Forward-looking Loss Factors

New Rules clauses came into effect on 1 January 2004 requiring AEMO to use a ‘forward looking’ methodology for calculating loss factors.

Following a consultation process NEMMCO published the final version of the forward-looking loss factor methodology on 12 August 2003[1]. This document has since been revised, most recently in June 2011.

3 Application of the forward-looking loss factor methodology for 2013/14 financial year

This section describes the process followed in applying the forward-looking loss factor methodology to the calculation of the marginal loss factors for 2013/14 financial year. Further details regarding the forward-looking loss factor methodology can be found in the methodology document on AEMO’s website[1].

3.1 Overview of the Forward-looking Loss Factor Methodology

The forward-looking loss factor methodology developed by AEMO is based on the principle of “minimal extrapolation”. An overview of the methodology is to:

- develop a load flow model of the transmission network that includes committed augmentations for the year that the loss factors apply;

[1] “Methodology for Calculating Forward-Looking Transmission Loss Factors: Final Methodology”, 12 August 2003 (revised 29 June 2011), is available on the AEMO Website.

- obtain from the TNSPs, connection point demand forecasts for the year that the loss factors apply;
- estimate the dispatch of committed new generating units;
- adjust the dispatch of new and existing generating units to restore the supply/demand balance using the rules defined in the published forward-looking loss factors methodology and
- calculate the loss factors using the resulting power flows in the transmission network.

The steps taken when calculating the forward-looking loss factors are explained below in detail.

3.2 Data requirements

The following steps were taken in preparing the basic data for calculating loss factors using the forward-looking methodology:

1. A set of historical load and generator real power (MW) and reactive power (MVAr) data for each trading interval (half hour) covering every transmission connection point in the Queensland, New South Wales, Victoria, South Australia and Tasmanian regions for the period 1 July 2011 to 30 June 2012 has been obtained from the AEMO settlements database.
2. The historical load data was sent to the relevant TNSPs where required. The TNSPs developed forecast connection point load traces for the 2013/14 financial year by scaling the historical data. The forecast connection point load traces for 2013/14 were then sent to AEMO to be used in the actual loss factor calculations. Transend has provided the demand forecast for Tasmania. In the case of Queensland, Powerlink provided energy and demand forecasts, and the load traces were developed by AEMO. For New South Wales, load traces provided by TransGrid, Ausgrid and Essential Energy were scaled to be consistent with the 2012 National Energy Forecasting Report (NEFR[2]). The table below provides the annual energy targets used in load forecasting for 2013-14 MLF calculations.

Region	Sent-out energy[3] [GWh]
New South Wales	70,887
Victoria	48,012
Queensland	51,873
South Australia	13,226
Tasmania	10,494

3. The TNSPs also provided information and data for any network augmentations, i.e., new connection points, load, generation, and transmission line augmentations, etc.
4. The interconnector limits were confirmed with the relevant TNSPs.
5. Generation capacity data was derived from the 2012 ESOO and the update to the 2012 ESOO, which was published on 22 February 2013.
6. The historical generation availability and on/off status data was extracted from AEMO's Market Management Systems (MMS) for the all the study regions.

[2] Available on the AEMO website.
[3] In 2012 NEFR report, the sent out energy for all regions is defined as Native energy that includes non-scheduled generators. For the MLF calculation process, the forecast sent-out energy was adjusted to ensure consistencey between forecast load energy and generators being modelled.

7. The historical generation data, forecast load, generation capacity, availability (on/off status data), interconnector limits and network augmentation data as described in steps 1 to 6 was then used in the calculation of forward-looking loss factors.
8. The details of the loss factor calculation algorithm are provided in Section 3.15.

3.3 Connection point load data

As described in section 3.2, Powerlink, TransGrid, AusGrid, Essential Energy and Transend provided AEMO with the forecast connection point load data that was used for Queensland, New South Wales and Tasmania, in accordance with section 5.2.2 of the Forward-looking loss factor Methodology. Forecast connection point load data for the South Australia and Victoria regions was calculated by AEMO.

3.4 Network representation

The NEM interconnected power system load flow model used to calculate loss factors for the Queensland, New South Wales, Victoria, South Australia and Tasmania regions is based on an actual network configuration recorded by the AEMO Energy Management System (EMS). This recording is referred to as a snapshot.

The snapshot was checked and modified where necessary to accurately represent all normally connected equipment. The switching arrangement for the Victorian 220 kV and 500 kV networks in the Latrobe Valley was also checked to ensure that it reflected normal operating conditions. The load flow was also modified to include the relevant augmentations identified from consultation with the TNSPs, as described in section 3.6. The snapshot is thus representative of the 2013/14 system normal network.

3.5 Treatment of Yallourn Unit 1

The Yallourn unit 1 can be connected to either the 220 kV or 500 kV network in Victoria.

AEMO, in consultation with Yallourn, prepared a forecast of switching for Yallourn unit 1 reflecting its anticipated operation for the loss factors calculation. Both the 220 kV connection points for Yallourn units 2-4 and the 500 kV connection points for the other Latrobe Valley power stations will have loss factors that reflect the predicted time the Yallourn unit 1 would be in each configuration. A weighted average of the loss factors calculated for the Yallourn unit 1 on both buses will then apply to this unit.

3.6 Network augmentations for 2013/14 financial year

The following network augmentations have been advised by the relevant TNSPs in each region of the NEM for 2013/14.

Queensland

Powerlink has provided the following list of major augmentations to be completed in 2013/14 in Queensland:

- Establishment of 275 kV connection point at Braemar – Kumbarilla Park
- Establishment of 132 kV connection point at Columboola (LNG)
- Establishment of 132 kV connection point at Eagle Downs (Ripstone)
- Establishment of 66 kV connection point at Wandoan South (Ergon)
- Establishment of 132 kV connection point at Wandoan South (LNG)
- Modification of an Algester – Rocklea 132 kV line
- Replacement of two 132/33 kV transformers at Richlands
- Replacement of a 275/132/19 kV transformer at Nebo

- Replacement of a 275/132/19 kV transformer at Woolooga
- Installation of a new 275/132/19 kV transformer at Bouldercombe
- Replacement of two 110/33 kV transformers at Ashgrove West
- Installation of two new 275 kV lines from Stanwell to Calvale
- Replacement of two 132/110 kV transformers at Palmwoods with a single transformer
- Modification of two 132 kV Wandoan South – Woleebee Creek lines
- Replacement of a 132 kV Ingham South – Yabulu South line
- Installation of a new 132 kV Ingham South – Cardwell line
- Installation of a new 132 kV Cardwell – Ingham line
- Installation of two new 132 kV Columboola – Condabri North lines.
- Installation of two new 132 kV Condabri North – Condabri Central lines
- Installation of two new 132 kV Condabri Central – Condabri South lines
- Installation of two new 132 kV capacitors at Condabri Central
- Decommissioning of 132 kV Collinsville substation
- Establishment of new 132 kV Collinsville North substation
- Decommissioning of 275 kV Swanbank B substation
- Modification of 275 kV line between Swanbank E and Greenbank
- Installation of two 275 kV lines between Greenbank and Blackstone
- Installation of two new 275 kV/110 kV transformers at Blackstone
- Installation of two new 275 kV lines from Columboola to Western Downs
- Installation of two new 275 kV lines from Columboola to Wandoan South
- Decommissioning of two 132 kV lines from Columboola to Wandoan South
- Installation of two new 275/132/19 kV transformers at Columboola
- Installation of two new 275/132/19 kV transformers at Wandoan South
- Installation a new 132/66/11 kV transformer at Wandoan South

New South Wales

TransGrid and AusGrid have provided the following list of major augmentations to be completed in 2013/14 in New South Wales. Essential Energy has advised there are no augmentations planned for 2013/14:

- Establishment of a new 132 kV connection point at Brandy Hill
- Establishment of a new 132 kV connection point at Rookwood Road
- Establishment of a new 132 kV connection point at Holroyd
- Establishment of a new 132 kV connection point at Herons Creek
- Establishment of a new 330 kV connection point at Gullen Range
- Establishment of a new 132 kV connection point at Hurstville North
- Establishment of a new 132 kV connection point at Lake Munmorah
- Establishment of a new 132 kV connection point at Belmore Park
- Establishment of a new 132 kV connection point at North Sydney
- Reconfiguration of 132 kV network between Tomago – Tarro and Tarro – Stroud
- Installation of two new 330/138.6/11 kV transformers at Holroyd
- Installation of two new 330 kV lines from Holroyd to Rookwood Road
- Installation of three new 330/138.6/11 kV transformers at Rookwood Road
- Installation of a new 132/66/11 kV transformer at Yass
- Installation of two new 330 kV 200 MVAR capacitors at Armidale
- Installation of a new 330 kV 200 MVAR capacitor at Sydney
- Decommissioning of a 330 kV line from Bannaby to Yass
- Installation of a new 330 kV line from Bannaby to Gullen Range
- Installation of a new 330 kV line from Gullen Range to Yass
- Replacement of two 132/33/11 transformers at Yanco
- Replacement of a 132/33/11 kV transformer at Griffith
- Decommissioning of a 132 kV line from Taree to Port Macquarie

- Installation of a new 132 kV line from Taree - Herons Creek and Herons Creek - Port Macquarie
- Installation of a new 330/138.6/11 kV transformer at Sydney East
- Installation of a 132 kV 120 MVAR capacitor at Canberra
- Installation of a 132 kV 80 MVAR capacitor at Yass
- Replacement of three 330/132/16 kV transformers at Newcastle
- Installation of a new 132 kV line from Vales Point to Lake Munmorha
- Modification of a 132 kV line from Munmorah to Lake Munmorah
- Establishment of a new 132 kV line from Munmorah to Charmhaven
- Installation of two new 132/11 kV transformers at Lake Munmorah
- Reconfiguration of 132 kV network at Belmore Park substation
- Installation of four new 132/11 kV transformers at Belmore Park
- Decommissioning of 132 kV line from Sydney South to Kurnell
- Reconfiguration of 132 kV network at Gwawley Bay
- Installation of new 132 kV line from Haymarket to Beaconsfield West
- Installation of two new 132 kV lines from Peakhurst to Hurstville North
- Installation of two new 132/11 kV transformers at Hurstville North
- Installation of new 132 kV line from Beaconsfield West to Canterbury

Victoria

AEMO Network Development has provided the following list of major augmentations to be completed in 2013/14 in Victoria.

- Installation of three new 220/66 kV transformers at Brooklyn Terminal Station
- Installation of two new 220/22 kV transformers at Brooklyn Terminal Station
- Decommissioning of four 220/66/6.6 kV transformers at Brooklyn Terminal Station
- Decommissioning of a 220/66/11 kV transformer at Brooklyn Terminal Station
- Decommissioning of three 220/22/6.6 kV transformers at Brooklyn Terminal Station
- Installation of a new 220/66/11 kV transformer at Richmond Terminal Station
- Installation of two new 220/22 kV transformers at Bendigo Terminal Station
- Installation of a 220/66/11 kV transformer at Tyabb Terminal Station
- Modification of a 220/66/11 kV transformer at Altona Terminal Station

South Australia

ElectraNet has provided the following list of major augmentations to be completed in 2013/14 in South Australia:

- Establishment of a new 275 kV connection point at Blyth
- Decommissioning of two 132 kV transmission lines from Davenport to Whyalla Terminal
- Installation of two 132 kV transmission lines from Cultana to Whyalla Central
- Installation of a new 132 kV transmission line from Whyalla Central to Whyalla Terminal
- Decommissioning of a 132 kV transmission line Whyalla to Middleback
- Installation of a new 132 kV transmission line from Cultana to Middleback
- Installation of a new 275 kV transmission line from Davenport to Cultana
- Decommissioning a 275 kV transmission line from Para to Bungama
- Installation of a new 275 kV transmission line from Blyth to Bungama
- Installation of a new 275 kV transmission line from Para to Blyth
- Installation of a new 275 kV transmission line from Blyth to Snowtown Wind Farm 2
- Replacement of two 132/33/11 kV transformers at Whyalla
- Installation of a new 275/132/11 kV transformer at Cultana
- Replacement of two 132/33/11 kV transformers at Waterloo
- Decommissioning of two 33/33/0.43 transformers at Waterloo

- Replacement of two 132/33/3.22 kV transformers at Hummocks
- Decommissioning of two 33/33 kV transformers at Hummocks
- Installation of two 275/33 kV transformers at Snowtown Wind Farm 2
- Installation of two 33/0.69 kV transformers at Snowtown Wind Farm 2
- Decommissioning of two 11 kV 5.3 MVAR capacitors at Whyalla Terminal
- Installation of two new 132 kV 15 MVAR capacitors at Whyalla Central
- Decommissioning of a 275 kV 30 MVAR reactor at Davenport
- Installation of a new 275 kV 50 MVAR reactor at Davenport
- Installation of a new 132 kV 15 MVAR capacitor at Kadina East
- Installation of a new 132 kV 30 MVAR capacitor at Tailem Bend
- Installation of five new 33 kV 13 MVAR capacitors at Snowtown Wind Farm 2

Tasmania

Transend has provided the following list of major augmentations to be completed in 2013/14 in Tasmania:

- Establishment of a new 22 kV connection point at St Leonards
- Establishment of a new 33 kV connection point at Kingston
- Establishment of a new 110 kV connection point at Derby
- Installation of a 110 kV transmission line from Norwood to St Leonards
- Installation of a 110 kV transmission line from St Leonards to Mowbray
- Modification of a 110 kV transmission line from Rosebery to Rosebery Tee
- Decommissioning of a 110 kV transmission line from Creek Road to Creek Road Tee
- Decommissioning of a 110 kV transmission line from Chapel Street to Creek Road Tee
- Decommissioning of a 110 kV transmission line from Creek Road Tee to Risdon
- Installation of a 110 kV transmission line from Chapel Street to Creek Road
- Installation of a 110 kV transmission line from Creek Road to Risdon
- Modification of two 110 kV transmission lines from Tarraleah to Tungatinah
- Decommissioning of a 110 kV transmission line from Tarraleah to Meadowbank
- Decommissioning of two 110 kV transmission lines from Tarraleah to New Norfolk
- Installation of a 110 kV transmission line from Tungatinah to Meadowbank
- Installation of two 110 kV transmission lines from Tungatinah to New Norfolk
- Installation of two new 110/33 kV transformers at Kingston
- Installation of two new 110/22 kV transformers at St Leonards
- Replacement of a 110/6.6 kV transformer at Arthurs Lake
- Replacement of a 110/22 kV transformer at Newton
- Replacement of a 110/11 kV transformer at Derby
- Replacement of a 110/22 kV transformer at Tungatinah
- Installation of a new 110 kV transmission line from Derby to Musselroe
- Installation of two new 110/33 kV transformers at Musselroe
- Installation of four new 33 kV 10 MVAR capacitor banks at Musselroe

3.7 Treatment of Basslink

Basslink is a Market Network Service that consists of a controllable network element that transfers power between the Tasmania and Victoria regions.

In accordance with section 5.3.2 of the forward-looking loss factor methodology, historical data are used for the calculation. The loss model for Basslink is provided in Appendix D.

3.8 Treatment of the Regulated Terranora Interconnector (previously Directlink)

From 21 March 2006 Terranora Interconnector (previously Directlink) has been operating as a regulated interconnector. The boundary between Queensland and New South Wales located between Terranora and Mudgeeraba is North of Directlink. As such Directlink is now part of the New South Wales network. The Terranora interconnector is in series with Directlink and in the MLF calculation the Terranora interconnector limit is managed by varying the Directlink limit when necessary.

The inter-regional loss factor equation for Terranora Interconnector is provided in Appendix D.

3.9 Treatment of the Regulated Murraylink Interconnector

In October 2003 Murraylink became a regulated interconnector. In accordance with section 5.3 of the forward-looking loss factor methodology, AEMO has treated the Murraylink interconnector as a controllable regulated network element in parallel with the regulated Heywood interconnector.

The inter-regional loss factor equation for Murraylink is provided in Appendix D.

3.10 New and Recently Commissioned Generating Units

For new generating units, AEMO calculates the initial estimate of the output by identifying similar technology and fuel type in accordance with 5.4.2 of the forward-looking loss factor methodology.

For generating units with an incomplete year of historical data from the previous financial year, AEMO uses a combination of existing and estimated data.

3.10.1 Queensland

There are no committed new generation projects in the Queensland region during the financial year 2013/14.

3.10.2 New South Wales

The proponent of Gullen Range windfarm has informed AEMO that it is intending to connect to the grid in the financial year 2013-14

3.10.3 Victoria

There are no committed new generation projects in the Victoria region during the financial year 2013/14.

3.10.4 South Australia

Snowtown Wind Farm 2 is expected to be commissioned in the South Australia region during the financial year 2013/14.

3.10.5 Tasmania

Musselroe Windfarm is expected to be commissioned in Tasmania region in the first quarter of 2013. There are no committed new generation projects in the Tasmania region during the financial year 2013/14.

3.11 Generator Unit Capability

In accordance with section 5.5.3 of the forward-looking loss factor methodology, AEMO has estimated the auxiliary requirements of the scheduled generating units by measuring the generator terminal and metered sent-out capacities at periods of high output. From this estimate of the unit auxiliaries, and the summer and winter generator terminal capacities in the 2012 ESOO and 2012 ESOO update, AEMO estimated the sent-out summer and winter generator terminal capacities.

3.12 Embedded Generation

An embedded generator is one connected to a distribution network, which is in turn connected to the transmission network. An embedded generator can be market or non-market and scheduled or non-scheduled.

MLFs are not required for non-market generators. For a market generator, the MLF is calculated for the transmission connection point, where the distribution network it is embedded in takes power from the transmission network. Between this transmission connection point and the embedded generator, there are also losses that have to be accounted for. These additional losses are calculated on an average basis and reflected through the Distribution Loss Factor (DLF). They are calculated each year by the DNSPs and then approved by the AER before submitting to AEMO for publication.

For dispatch purposes, the MLF of an embedded generator has to be adjusted by the DLF to reflect its offer price at the regional reference node. Similarly, adjustment of the MLF by the DLF is necessary for settlement purposes.

Up until the end of the 2007/08 financial year, the MLF associated with the scheduled embedded generators had been adjusted by their DLF in the dispatch process as well as in the settlement process (the DLF is applied to the spot price). Following the implementation of the Mid Year 2008 release into the Market Management System (MMS), the DLF is now separately defined in MMS for dispatch purposes only, and the DLF for settlement purposes is applied in the Market Settlement and Transfer Solution (MSATS) as per all other market connection points (i.e. the generated energy is adjusted by the DLF). The MLF in MMS will no longer be adjusted by the DLF.

The site specific DLFs for embedded generators (scheduled and non-scheduled) are published separately in the "Distribution Loss Factors for the 2013/14 Financial Year" document which is available on AEMO's website[4].

3.13 Interconnector Capability

In accordance with section 5.5.4 of the forward-looking loss factor methodology, AEMO has estimated nominal interconnector limits for summer peak, summer off-peak, winter peak and winter off-peak periods. These values are listed in the table below. AEMO sought feedback from the associated TNSPs to ensure that these limits are suitable.

[4] http://aemo.com.au/Electricity/Market-Operations/Loss-Factors-and-Regional-Boundaries/Proportioning-InterRegional-Losses-to-Regions

From region	To region	Summer peak	Summer off-peak	Winter peak	Winter off-peak
Queensland	New South Wales	1078	1078	1078	1078
New South Wales	Queensland	400	550	400	550
New South Wales	Victoria	1900 minus Murray Generation	1900 minus Murray Generation	1900 minus Murray Generation	1900 minus Murray Generation
Victoria	New South Wales	3200 minus Upper & Lower Tumut Generation	3000 minus Upper & Lower Tumut Generation	3200 minus Upper & Lower Tumut Generation	3000 minus Upper & Lower Tumut Generation
Victoria	South Australia	460	460	460	460
South Australia	Victoria	460	460	460	460
Murraylink Vic	South Australia	220	220	220	220
Murraylink SA	Victoria	188 – North West Bend & Berri loads	198 – North West Bend & Berri loads	215 – North West Bend & Berri loads	215 – North West Bend & Berri loads
Terranora Interconnector Qld	NSW	220	220	220	220
Terranora Interconnector NSW	Qld	122	122	122	122
* Basslink VIC	Tasmania	478	478	478	478
* Basslink TAS	Victoria	594	594	594	594

The peak interconnector capability does not necessarily correspond to the network capability at the time of the maximum regional demand; rather it refers to average capability during the peak periods which corresponds to 7 AM to 10 PM on week days.

* Note that Basslink is a Market Network Service Provider that consists of a controllable network element that transfers power between the Tasmania and Victoria regions.

3.14 Data accuracy and due diligence of the forecast data

The marginal loss factors have been calculated by AEMO using the relevant load forecast data from TNSPs and historical generation data from the AEMO settlements database.

The historical connection point data used was checked and finalised as part of the settlements process. For each region and half hour trading interval, the losses were calculated by adding the summated generation values to the interconnector flow and subtracting the summated load values. These transmission losses are used to indicate large errors in the data. Once convinced that the data was reasonable and consistent using this checking method, the historical load data was sent to the relevant TNSPs, to generate forecast loads for 2013/14.

The due diligence of the forecast data was performed as follows:

- Check that forecast data for each connection point is provided;

- Confirm that load growth is consistent with ESOO 2012 and ESOO 2012 update for 2013/14 financial year;
- Check that load shapes are consistent with the load profile for the historical year 2011/12;
- Check that the forecast for connection points includes the relevant embedded generation, if any;
- Check that industrial and auxiliary type loads are not scaled;
- Check that AusGrid's forecast is consistent with the TransGrid forecast for bulk supply connection points for all connection points on the TransGrid/Ausgrid transmission boundary.

3.15 Calculation of intra-regional loss factors

AEMO uses the TPRICE[5] software package to calculate the loss factors because of its ability to handle large data sets.

The loss factors for each connection point have been calculated as follows:

- The half hourly forecast load and historical generator data, generating unit capacity and availability data together with interconnector data, are converted into a format suitable for input to the TPRICE program.
- The load flow case is adjusted to ensure a reasonable voltage profile is maintained in each region at times of high demand.
- The load flow case is converted into a format suitable for use in TPRICE.
- The half hourly generator and load data for each connection point, generating unit capacity and availability data, together with interconnector data are fed into the TPRICE program one trading interval at a time. The TPRICE program allocates the load and generator values to the appropriate connection points in the load flow case.
- TPRICE iteratively dispatches generators to meet forecast demand and solves each half hourly load flow case and calculates the loss factors appropriate to the load flow conditions.
- The Regional Reference Node (RRN) and connection points are defined for each region. The loss factors in each region are therefore referred to the appropriate RRN.
- Once all the trading intervals have been processed, TPRICE averages the loss factors for the full year for each connection point using connection point load weighting.
- Typically, generation loss factors are weighted against generator output and load loss factors against load consumption. However, where load and generation are connected to the same connection point and individual metering is not available for the separate components, the same loss factor is calculated for both the generator and load.

The static intra-regional loss factors that apply for the 2013/14 financial year are tabulated in Appendix A. MLFs for transmission connection points shown in the load tables in Appendix A also apply to non-market embedded generators that are assigned to those transmission connection points.

3.16 Inter-regional loss factor equations

Inter-regional loss factor equations describe the variation in loss factor at one RRN with respect to an adjacent RRN. These equations are referred to as dynamic inter-regional loss factor equations, and are necessary to cater for the large variations in loss factors that may occur between reference

[5] TPRICE is a commercially available transmission pricing software package. It is capable of running a large number of consecutive load flow cases quickly. The program outputs loss factors for each trading interval as well as averaged over a financial year using volume weighting.

nodes resulting from different (and particularly tidal) energy flow patterns. This is important in minimising the distortion of economic dispatch of generating units.

The inter-regional loss factor equations to apply for the 2013/14 financial year are provided in Appendix B. These equations have been obtained by applying linear regression to the full set of loss factor data for the RRNs. Relevant power system variables were used in the regression analysis. To meet the requirements of the AEMO dispatch algorithm the choice of variables and equation formulation has been restricted as follows:

- Only linear terms are permitted in the equation;
- Only the notional link flow between the reference nodes for which the loss factor difference is being determined can be used;
- Region demands are allowed as equation variables; and
- Other variables such as generator outputs cannot be used.
- Graphs of variation in inter-regional loss factor with notional link flow for typical system conditions are also included in Appendix B.
- The inter-regional loss equations, obtained by integrating the (inter-regional loss factor – 1) equations, are provided in Appendix C.
- The inter-regional loss equations for Basslink, Terranora Interconnector and Murraylink are provided in Appendix D.

3.17 Loss models for Controllable Links

Appendix D contains loss factor and loss models for controllable links, including the Terranora Interconnector loss factor model, Murraylink loss factor model and the Basslink loss equation.

3.18 Proportioning Inter-regional Losses to Regions

Appendix E contains the factors used to apportion the inter-regional losses to the associated regions for the 2013/14 financial year.

4 Differences in loss factors compared to the 2012/13 financial year

4.1 MLFs

Under marginal pricing, the spot price for electricity is defined as the incremental cost of additional generation (or demand reduction) for each spot market interval.

Consistent with this is that the marginal loss is the addition to the total loss for each additional unit of electricity (MW) delivered, given by the MLF calculated.

The tables in Appendix A show the intra-regional loss factors for each region in the NEM. As discussed in the introduction, the price of electricity at a connection point within a region is the price at the RRN multiplied by the Intra-regional loss factor between it and the RRN. Depending on network and loading configurations, loss factor values can vary quite significantly, ranging from below 1.0 to above 1.0.

4.1.1 MLFs greater than 1

At any instant at a connection point, the marginal value of electricity will equal the cost of generating additional supplies at the RRN and transmitting it to that point. Any increase or decrease in total losses is then the marginal loss associated with the transmission of electricity from the RRN to this connection point. If the marginal loss is positive, this means that less can be taken from this point than is supplied at the RRN, the difference having been lost in the network. In this case, the MLF is above 1.0. This would normally be expected to apply to loads. However, this would also apply to generators situated in areas where the local load is greater than the local level of generation.

For example, a generator supplying an additional 1 MW at the RRN may find that its customer at the connection point can only receive an additional 0.95 MW. Marginal losses are 0.05 MW, or 5% of generation, resulting in MLF = 1.05.

4.1.2 MLFs less than 1

In general, losses increase with distance, so that the further the distance between the RRN and a connection point is, the higher the MLF value. However, additional line flow only raises total losses if it moves in the same direction as the existing net flow. At any instant, when the additional flow is against the net flow, total losses on the network will be reduced. In this case, the MLF is below 1.0. This would normally be expected to apply to generators. However, this would also apply to loads situated in areas where the local level of generation is greater than the local load.

Using the example above, if the net flow is in the direction from the connection point to the RRN, then the generator at the RRN will only be required to supply an additional 0.95 MW to meet an additional load of 1 MW at the connection point. Marginal losses are then -0.05 MW, or 5% reduction in generation, resulting in MLF = 0.95.

4.2 Comparison of 2013/14 MLFs with 2012/13 MLFs

The energy demand forecast for 2013/14 has reduced for all regions compared to the forecast energy values used for the 2012/13 calculation. Basslink energy transfer has changed to predominantly an import of approximately 300 GWh from Victoria into Tasmania, as opposed to a 200 GWh export from Tasmania to Victoria in 2012-13 MLF calculation. The energy transfer between South Australia and Victoria has also changed direction, as this year Victoria is importing excess energy from South Australia and exporting it to New South Wales. While Queensland continues to export energy to New South Wales in this year's MLF calculation, the quantity of energy transferred has reduced.

The MLF values in this year's calculation remain relatively similar to last year, with the exception of some localised changes. These differences are in part due to changes in the direction and the quantity of energy transfer between adjacent regions, new network augmentations, changes to generation or load growth patterns and the withdrawal of existing generation from service.

The following sections provide an overview of changes between 2012/13 and 2013/14 MLF values by region.

4.2.1 Victoria

The Victorian energy demand forecast for 2013/14 has reduced while the amount of generation remains similar to 2012/13 MLF calculation. In addition, Victoria is importing a moderate amount of energy from South Australia. Surplus energy in Victoria is meeting the requirement for the export of energy into Tasmania and a modest increase in energy export into New South Wales. Overall, there were only minor changes in MLF values for most connection points in Victoria.

Changes in the generation profile at the Murray and Hume (Victoria) stations have resulted in reduced MLFs for these stations.

Basslink (Loy Yang Power Station Switchyard) has a Net Energy Balance (NEB) of less than 30%. Therefore under clause 3.6.2 of the NER, two MLFs have been determined for Basslink (Loy Yang Power Station Switchyard).

4.2.2 New South Wales

For the 2013/14 MLF calculation, there is a reduction of generation and reduced flow into New South Wales from Queensland.At the same time the flow from Victoria into New South Wales has increased, counteracting the impact of the lower New South Wales energy demand forecast. The net effect is that MLF values in the major load centres remain relatively unchanged, with the exception of connection points in the northern part of New South Wales and those in close proximity to Wallerawang Power Station.

The reduction in transfer from Queensland has contributed to increased MLF values for connection points located in Northern New South Wales (e.g. Armidale, Mullumbimby, Lismore, Moree and Coffs Harbour). The withdrawal of one of the Wallerawang generating units from service has contributed to the increase in MLF values for connection points North West of Wallerawang and Mt Piper Power Stations.

Changes in the generation profiles at Upper Tumut and Hume (NSW) stations have resulted in increased MLFs for these stations. Changes in the generation / pumping profile at Lower Tumut have resulted in a reduced pump MLF and increased generator MLF for this station.

4.2.3 Queensland

The Queensland energy demand forecast for 2013-14 has decreased slightly, however the reduction is not uniformally distributed across the region. The Northern, Central and South West region forecasts show a slight increase, while the energy consumed in the South East has decreased.

The withdrawal of two Tarong Power Station units and the entire Collinsville Power Station reduces the generation capacity in Northern and Southern Queensland. This has resulted in an increase in energy transfer from Central Queensland to both Northern and Southern Queensland. The inter-regional transfer from Queensland to New South Wales has also decreased.

The withdrawal of Collinsville Power Station from service has contributed to an increase in MLF values for connection points located near to the power station, namely Stoney Creek, Newlands Proserpine and Clare. North of Ross, the network augmentation between Cardwell and Ingham has contributed to a reduction in generator and load MLF values in this area.

An increase in Central Queensland generation coupled with the installation of new transmission lines between Stanwell and Calvale substations has contributed to a decrease in MLF values for most connection points in Central Queensland.

The MLF values for most connection points in Southern Queensland remain relatively unchanged from last year, with the exception of loads and generators in the South West Queensland area. The energy demand in this area is forecast to increase in 2013/14 resulting in higher MLF values.

4.2.4 South Australia

The South Australia energy demand forecast for 2013/14 has reduced compared to last year's MLF process while generated energy has remained about the same. The reduction in output from thermal generating units is offset by an increase in generation from windfarms. This has contributed to South Australia exporting more energy to Victoria in this year's calculation. Even so, most connection points MLF values in South Australia are similar to the 2012/13 MLF calculation.

Snuggery industrial load has reduced its energy consumption due to the operation of embedded generation within Snuggery Industry load connection point, meeting part of the industrial load. This has contributed to a reduction in the MLF values for the Snuggery Power Station connection points.

4.2.5 Tasmania

The Tasmania energy demand forecast for 2013/14 is less than last year. In addition Basslink energy transfer has changed to an import of approximately 300 GWh from Victoria this year, compared to a 200 GWh export from Tasmania last year. This increase in import combined with a reduction in generation at Gordon, Trevallyn and Meadowbank Power Stations has resulted in a higher energy flow from the Regional Reference Node at Georgetown towards Central and Southern Tasmania. This has contributed to a slight increase in MLF values across much of the Tasmania region.

The location of Gordon Power Station in the Tasmanian transmission network and the large reduction in its generation for 2013/14 relative to the 2012/13 MLF calculation, has contributed to an increase in its MLF value.

The operation of Musselroe windfarm connected at Derby counteracts the reduction in Trevallyn generation, reducing the MLF values for Scottsdale, Norwood, St Leonards and Mowbray.

5 Virtual transmission nodes

Six virtual transmission nodes (VTNs) have been approved by the AER for use in the NEM. The loss factors for the VTNs are included in Appendix A.

5.1 New South Wales

In accordance with clause 3.6.2(b)(3) of the Rules, the AER has approved Ausgrid's application to define the three VTNs listed in the following table[6].

VTN TNI code	Description	Associated transmission connection points (TCPs)
NEV1	Far North	Muswellbrook 132 and Liddell 33
NEV2	North of Broken Bay	Kurri 11, Kurri 33, Kurri 66, Kurri 132, Newcastle 132, Munmorah 330, Munmorah 33, Vales Pt. 132, Beresfield 33, Charmhaven 11, Gosford 33, Gosford 66, West Gosford 11, Ourimbah 33, Somersby 11, Tomago 33, BHP Waratah 132 and Wyong 11
NEV3	South of Broken Bay	Sydney North 132 (Ausgrid), Lane Cove 132, Meadowbank 11, Mason Park 132, Homebush Bay 11, Chullora 132 kV, Chullora 11, Peakhurst 132, Peakhurst 33, Drummoyne 11, Rozelle 33, Pyrmont 132, Pyrmont 33, Marrickville 11, St Peters 11, Beaconsfield West 132, Canterbury 33, Bunnerong 33, Bunnerong 132, Sydney East 132, Sydney West 132 (Ausgrid) and Sydney South 132, Macquarie Park 11, Rozelle 132 and Haymarket 132

5.2 South Australia

The AER has approved ETSA Utilities' application to define the SJP1 VTN for South Australia. The South Australian VTN includes all load transmission connection points excluding:

Snuggery Industrial as nearly its entire capacity services an industrial facility at Millicent; and

Whyalla MLF as its entire capacity services an industrial plant in Whyalla.

5.3 Tasmania

The AER has approved Aurora application to define the two VTNs listed in the following table:

VTN TNI code	Description	Associated transmission connection points (TCPs)
TVN1	Greater Hobart Area	Chapel Street 11, Creek Road 33, Lindisfarne 33, North Hobart 11, Risdon 33 and Rokeby 11.
TVN2	Tamar Region	Hadspen 22, Mowbray 22, Norwood 22, Trevallyn 22, George Town 22

6 Region boundaries and regional reference nodes for 2013/14

Appendix F comprises the list of regional reference nodes and region boundaries that apply for the 2013/14 financial year.

[6] These VTNs are based on old definitions determined by IPART. They will be revised in due course to include newly classified transmission assets as well as changes in the definitions of some AusGrid TNIs.

7 Appendix A: Intra-regional loss factors for 2013/14

Queensland (regional reference node is South Pine 275 kV)

Queensland Loads

Location	Voltage	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Abermain	33	QABM	0.9986	0.9968
Abermain (Lockrose)	110	QABR	0.9967	0.9948
Alan Sherriff	132	QASF	1.1076	1.0942
Algester	33	QALG	1.0148	1.0123
Alligator Creek	33	QALC	1.0767	1.0813
Alligator Creek	132	QALH	1.0782	1.0836
Ashgrove West	33	QAGW	1.0191	1.0172
Ashgrove West	110	QCBW	1.0151	1.0164
Belmont	110	QBMH	1.0088	1.0057
Belmont Wecker Rd	11	QMOB	1.0218	1.0380
Belmont Wecker Rd	33	QBBS	0.9965	1.0093
Biloela	66	QBIL	0.9457	0.9489
Blackstone	110	QBKS	1.0012	0.9941
Blackwater	132	QBWH	1.0552	1.0620
Blackwater	66	QBWL	1.0564	1.0650
Bluff	132	QBLF	1.0558	1.0644
Bolingbroke (Rail)	132	QBNB	1.0735	1.0553
Bowen North	66	QBNN	1.0679	1.0729
Boyne Island	275	QBOH	1.0051	0.9945
Boyne Island	132	QBOL	1.0046	0.9930
Braemar - Kumbarilla Park	275	QBRE	0.9493	0.9556
Bulli Creek (Essential Energy)	132	QBK2	0.9585	0.9615
Bulli Creek (Waggamba)	132	QBLK	0.9585	0.9612
Bundamba	110	QBDA	1.0000	0.9958
Burton Downs	132	QBUR	1.0905	1.0975
Cairns	22	QCRN	1.1348	1.1192
Cairns City	132	QCNS	1.1331	1.1168
Callemondah (Rail)	132	QCMD	0.9969	0.9880
Cardwell	22	QCDW	1.1435	1.1131
Chinchilla	132	QCHA	0.9418	0.9806
Clare	66	QCLR	1.0922	1.1000
Collinsville Load	33	QCOL	1.0697	1.0761
Columboola	132	QCBL	0.9219	0.9547
Coppabella (Rail)	132	QCOP	1.1312	1.1297
Dan Gleeson	66	QDGL	1.1253	1.1117
Dingo (Rail)	132	QDNG	1.0387	1.0496
Duaringa	132	QDRG	1.0191	1.0330
Dysart	66	QDYS	1.1129	1.1079
Eagle Downs Mine (Ripstone)	132	QEGD	1.1114	1.1167
Edmonton	22	QEMT	1.1373	1.1245
Egans Hill	66	QEGN	0.9992	0.9860
El Arish	22	QELA	1.1417	1.1203

Location	Voltage	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Garbutt	66	QGAR	1.1170	1.1033
Gin Gin	132	QGNG	1.0075	0.9988
Gladstone	132	QGLA	0.9953	0.9884
Gladstone South	66	QGST	1.0002	0.9903
Goodna	33	QGDA	1.0030	1.0010
Goonyella Riverside Mine	132	QGYR	1.1430	1.1405
Grantleigh (Rail)	132	QGRN	1.0100	1.0002
Gregory (Rail)	132	QGRE	1.0427	1.0416
Ingham	66	QING	1.1092	1.1169
Innisfail	22	QINF	1.1444	1.1257
Invicta Load	132	QINV	1.1027	1.0841
Kamerunga	22	QKAM	1.1291	1.1228
Kemmis	132	QEMS	1.0778	1.0793
King Creek	132	QKCK	1.0825	1.1084
Lilyvale	66	QLIL	1.0426	1.0425
Lilyvale (Barcaldine)	132	QLCM	1.0383	1.0384
Loganlea	110	QLGH	1.0049	1.0051
Loganlea	33	QLGL	1.0079	1.0120
Mackay	33	QMKA	1.0761	1.0744
Middle Ridge (Energex)	110	QMRX	0.9700	0.9731
Middle Ridge (Ergon)	110	QMRG	0.9700	0.9731
Mindi (Rail)	110	QMND	1.0469	1.0462
Molendinar	33	QMAL	1.0086	1.0064
Molendinar	110	QMAR	1.0089	1.0069
Moranbah Substation	132	QMRH		1.1295
Moranbah (Mine)	66	QMRN	1.1206	1.1318
Moranbah (Town)	11	QMRL	1.1112	1.1235
Moranbah Sth (Rail)	132	QMBS	1.1203	1.1276
Moura	66	QMRA	0.9973	1.0044
Mt McLaren (Rail)	132	QMTM	1.1482	1.1649
Mudgeeraba	110	QMGB	1.0109	1.0067
Mudgeeraba	33	QMGL	1.0107	1.0073
Murarrie (Belmont)	110	QMRE	1.0088	1.0072
Nebo	11	QNEB	1.0418	1.0417
Newlands	66	QNLD	1.1141	1.1353
North Goonyella	132	QNGY	1.1395	1.1420
Norwich Park (Rail)	132	QNOR	1.0766	1.0755
Oakey	110	QOKT	0.9712	0.9755
Oonooie (Rail)	132	QOON	1.0810	1.0864
Palmwoods	110	QPWD	1.0272	1.0270
Pandoin	66	QPAL	1.0027	0.9894
Pandoin	132	QPAN	1.0027	0.9894
Peak Downs (Rail)	132	QPKD	1.1171	1.1288
Pioneer Valley	66	QPIV	1.0727	1.0733
Proserpine	66	QPRO	1.0890	1.1220
QLD Nickel (Yabulu)	132	QQNH	1.1055	1.0805
Queensland Alumina Ltd (Gladstone South)	132	QQAH	1.0015	0.9923
Raglan	275	QRGL	0.9947	0.9897
Redbank Plains	11	QRPN	1.0024	0.9990
Richlands	33	QRLD	1.0129	1.0116

Location	Voltage	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Rockhampton	66	QROC	1.0032	0.9871
Runcorn	33	QRBS	1.0151	1.0130
Rocklea (Archerfield)	110	QRLE	1.0027	1.0037
Ross	132	QROS	1.1006	1.0883
Rocklands (Rail)	132	QRCK	0.9960	0.9814
South Pine	110	QSPN	1.0056	1.0060
Stony Creek	132	QSYC	1.1020	1.1588
Sumner	110	QSUM	1.0045	1.0043
Swanbank (Raceview)	110	QSBK	1.0011	0.9941
Tangkam (Dalby)	110	QTKM	0.9468	0.9673
Tarong	66	QTRL	0.9640	0.9703
Teebar Creek	132	QTBC	1.0161	1.0120
Tennyson	33	QTNS	1.0076	1.0080
Tennyson (Rail)	110	QTNN	1.0051	1.0059
Townsville East	66	QTVE	1.1266	1.1123
Townsville South	66	QTVS	1.1223	1.1100
Townsville South (KZ)	132	QTZS	1.1165	1.1016
Tully	22	QTLL	1.1504	1.1368
Turkinje	66	QTUL	1.1524	1.1370
Turkinje (Craiglee)	132	QTUH	1.1522	1.1360
Wandoo (Rail)	132	QWAN	1.0467	1.0468
Wivenhoe Pump	275	QWIP	0.9933	0.9942
Woolooga (Energex)	132	QWLG	1.0111	1.0057
Woolooga (Ergon)	132	QWLN	1.0111	1.0057
Woree	132	QWRE	1.1310	1.1164
Wycarbah	132	QWCB	0.9978	0.9914
Yarwun - Boat Creek (Ergon)	132	QYAE	1.0016	0.9965
Yarwun - Rio Tinto	132	QYAR	0.9945	0.9878

Queensland Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Barron Gorge PS Unit 1	132	BARRON-1	QBGH1	QBGH	1.1135	1.0924
Barron Gorge PS Unit 2	132	BARRON-2	QBGH2	QBGH	1.1135	1.0924
Braemar PS Unit 1	275	BRAEMAR1	QBRA1	QBRA	0.9471	0.9533
Braemar PS Unit 2	275	BRAEMAR2	QBRA2	QBRA	0.9471	0.9533
Braemar PS Unit 3	275	BRAEMAR3	QBRA3	QBRA	0.9471	0.9533
Braemar Stage 2 PS Unit 5	275	BRAEMAR5	QBRA5B	QBRA	0.9471	0.9533
Braemar Stage 2 PS Unit 6	275	BRAEMAR6	QBRA6B	QBRA	0.9471	0.9533
Braemar Stage 2 PS Unit 7	275	BRAEMAR7	QBRA7B	QBRA	0.9471	0.9533
Callide PS Load	132	CALLNL1	QCAX	QCAX	0.9383	0.9396
Callide A PS Unit 4	132	CALL_A_4	QCAA4	QCAA	0.9446	0.9330
Callide A PS Unit 4 Load	132	CALLNL4	QCAA2	QCAA	0.9446	0.9330
Callide B PS Unit 1	275	CALL_B_1	QCAB1	QCAB	0.9471	0.9527
Callide B PS Unit 2	275	CALL_B_2	QCAB2	QCAB	0.9471	0.9527
Callide C PS Unit 3	275	CPP_3	QCAC3	QCAC	0.9476	0.9515
Callide C PS Unit 4	275	CPP_4	QCAC4	QCAC	0.9476	0.9515
Collinsville PS	132		QCVP	QCVP	1.0389	1.0714
Collinsville PS Load	132		QCLX	QCLX	1.0389	1.0714
Condamine PS UN 1	132	CPSA	QCND1C	QCND	0.8895	0.9543
Darling Downs PS UN 1	275	DDPS1	QBRA8D	QBRA	0.9471	0.9533
Gladstone PS (132 kV) Unit 3	132	GSTONE3	QGLD3	QGLL	0.9885	0.9761
Gladstone PS (132 kV) Unit 4	132	GSTONE4	QGLD4	QGLL	0.9885	0.9761
Gladstone PS (275 kV) Unit 1	275	GSTONE1	QGLD1	QGLH	0.9919	0.9821
Gladstone PS (275 kV) Unit 2	275	GSTONE2	QGLD2	QGLH	0.9919	0.9821
Gladstone PS (275 kV) Unit 5	275	GSTONE5	QGLD5	QGLH	0.9919	0.9821
Gladstone PS (275 kV) Unit 6	275	GSTONE6	QGLD6	QGLH	0.9919	0.9821
Gladstone PS Load	132		QGLL	QGLL	0.9885	0.9761
Kareeya PS Unit 1	132	KAREEYA1	QKAH1	QKYH	1.1144	1.0884
Kareeya PS Unit 2	132	KAREEYA2	QKAH2	QKYH	1.1144	1.0884
Kareeya PS Unit 3	132	KAREEYA3	QKAH3	QKYH	1.1144	1.0884
Kareeya PS Unit 4	132	KAREEYA4	QKAH4	QKYH	1.1144	1.0884
Kogan Creek PS	275	KPP_1	QBRA4K	QWDN	0.9464	0.9516
Koombooloomba	132	KAREEYA5	QKYH5	QKYH	1.1144	1.0884
Mackay GT	33	MACKAYGT	QMKG	QMKG	1.0674	1.0492
Millmerran Energy Trader Unit 1	330	MPP_1	QBCK1	QMLN	0.9578	0.9612
Millmerran Energy Trader Unit 2	330	MPP_2	QBCK2	QMLN	0.9578	0.9612
Mt Stuart PS Unit 1	132	MSTUART1	QMSP1	QMSP	0.9813	1.0421
Mt Stuart PS Unit 2	132	MSTUART2	QMSP2	QMSP	0.9813	1.0421
Mt Stuart PS Unit 3	132	MSTUART3	QMSP3M	QMSP	0.9813	1.0421

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Oakey PS 1	110	OAKEY1	QOKY1	QOKY	0.9395	0.9472
Oakey PS 2	110	OAKEY2	QOKY2	QOKY	0.9395	0.9472
Stanwell PS Load	132	STANNL1	QSTX	QSTX	0.9876	0.9740
Stanwell PS Unit 1	275	STAN-1	QSTN1	QSTN	0.9876	0.9740
Stanwell PS Unit 2	275	STAN-2	QSTN2	QSTN	0.9876	0.9740
Stanwell PS Unit 3	275	STAN-3	QSTN3	QSTN	0.9876	0.9740
Stanwell PS Unit 4	275	STAN-4	QSTN4	QSTN	0.9876	0.9740
Swanbank B PS Unit 1	275	SWAN_B_1	QSWB1	QSWB	1.0011	0.9959
Swanbank B PS Unit 3	275	SWAN_B_3	QSWB3	QSWB	1.0011	0.9959
Swanbank E GT	275	SWAN_E	QSWE	QSWE	0.9963	0.9963
Swanbank PS Load	275	SWANNL2	QSW1	QSWB	1.0011	0.9959
Tarong North PS	275	TNPS1	QTNT	QTNT	0.9633	0.9692
Tarong PS Unit 1	275	TARONG#1	QTRN1	QTRN	0.9631	0.9697
Tarong PS Unit 2	275	TARONG#2	QTRN2	QTRN	0.9631	0.9697
Tarong PS Unit 3	275	TARONG#3	QTRN3	QTRN	0.9631	0.9697
Tarong PS Unit 4	275	TARONG#4	QTRN4	QTRN	0.9631	0.9697
Wivenhoe Generation 1	275	W/HOE#1	QWIV1	QWIV	0.9871	0.9888
Wivenhoe Generation 2	275	W/HOE#2	QWIV2	QWIV	0.9871	0.9888
Wivenhoe Pump 1	275	PUMP1	QWIP1	QWIP	0.9933	0.9942
Wivenhoe Pump 2	275	PUMP2	QWIP2	QWIP	0.9933	0.9942
Wivenhoe Small Hydro	110	WIVENSH	QABR1	QABR	0.9967	0.9948
Yabulu PS (Townsville)	132	YABULU	QTYP	QTYP	1.0524	1.0369
Yarwun Generator	132	YARWUN_1	QYAG1R	QYAG	0.9934	0.9872

Queensland Embedded Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Barcaldine PS	132	BARCALDN	QBCG	QBCG	1.0235	0.9985
Browns Plains Landfill Gas PS	110	BPLANDF1	QLGH3B	QLGH	1.0049	1.0051
Daandine PS	110	DAANDINE	QTKM1	QTKM	0.9468	0.9673
German Creek Generator	66	GERMCRK	QLIL2	QLIL	1.0426	1.0425
Isis CSM	132	ICSM	QGNG1I	QTBC	1.0161	1.0120
Moranbah Gen	11	MORANBAH	QMRL1M	QMRL	1.1112	1.1235
Moranbah North PS	66	MBAHNTH	QMRN1P	QMRN	1.1206	1.1318
Oaky Creek PS	66	OAKYCREK	QLIL1	QLIL	1.0426	1.0425
Rochedale Renewable Energy Plant	110	ROCHEDAL	QBMH2	QBMH	1.0088	1.0057
Rocky Point Gen	110	RPCG	QLGH2	QLGH	1.0049	1.0051
Roghan Road Generator	110	EDLRGNRD	QSPN2	QSPN	1.0056	1.0060
Roma PS Unit 7	132	ROMA_7	QRMA7	QRMA	0.8640	0.9347
Roma PS Unit 8	132	ROMA_8	QRMA8	QRMA	0.8640	0.9347
Southbank Institute Of Technology	110	STHBKTEC	QCBD1S	QCBW	1.0151	1.0164
Suncoast Gold Macadamias Co-generation Plant	110	SUNCOAST	QPWD1	QPWD	1.0272	1.0270
Ti Tree Bioreactor	33	TITREE	QABM1T	QABM	0.9986	0.9968
Whitwood Rd Renewable Energy Plant	110	WHIT1	QSBK1	QSBK	1.0011	0.9941
Windy Hill Turkinje	66	WHILL1	QTUL	QTUL	1.1524	1.1370
Yabulu PS	66	YABULU2	QGAR1	QYST	1.0634	1.0444

New South Wales (regional reference node is Sydney West 330 kV)

New South Wales Loads

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Albury	132	NALB	0.9976	1.0067
Alcan	132	NALC	1.0025	0.9924
Armidale	66	NAR1	0.9428	0.9799
Aust Newsprint Mill	132	NANM	1.0063	0.9999
Balranald	22	NBAL	1.0537	1.0411
Beaconsfield South	132	NBFS	1.0081	1.0075
Beaconsfield West	132	NBFW	1.0081	1.0075
Beresfield	33	NBRF	0.9988	0.9991
Beryl	66	NBER	0.9964	1.0140
Brandy Hill	132	NBH1	0.9962	0.9979
Broken Hill	22	NBKG	1.1026	1.0806
Broken Hill	220	NBKH	1.0935	1.0720
Bunnerong	132	NBG1	1.0093	1.0085
Bunnerong	33	NBG3	1.0146	1.0174
Burrinjuck	132	NBU2	1.0001	0.9956
Canterbury	33	NCTB	1.0145	1.0120
Carlingford	132	NCAR	1.0053	1.0038
Casino	132	NCSN	0.9795	1.0207
Charmhaven	11	NCHM	0.9960	0.9970
Chullora	132	NCHU	1.0093	1.0107
Coffs Harbour	66	NCH1	0.9681	1.0090
Coleambally	132	NCLY	1.0222	1.0216
Cooma	66	NCMA	1.0071	1.0156
Cooma (SPI)	66	NCM2	1.0071	1.0156
Cowra	66	NCW8	1.0151	1.0257
Dapto (Endeavour Energy)	132	NDT1	0.9942	0.9946
Dapto (Essenial Energy)	132	NDT2	0.9942	0.9946
Darlington Point	132	NDNT	1.0169	1.0174
Deniliquin	66	NDN7	1.0519	1.0531
Dorrigo	132	NDOR	0.9602	1.0002
Drummoyne	11	NDRM	1.0157	1.0172
Dunoon	132	NDUN	0.9640	1.0204
Far North VTN		NEV1	0.9595	0.9674
Finley	66	NFNY	1.0497	1.0426
Forbes	66	NFB2	1.0348	1.0565
Gadara	132	NGAD	1.0242	1.0145
Glen Innes	66	NGLN	0.9772	1.0196
Gosford	66	NGF3	1.0040	1.0045
Gosford	33	NGSF	1.0049	1.0056
Green Square	11	NGSQ	1.0084	1.0077
Griffith	33	NGRF	1.0382	1.0465
Gunnedah	66	NGN2	1.0001	1.0383
Haymarket	132	NHYM	1.0079	1.0073
Homebush Bay	11	NHBB	1.0132	1.0147
Ilford	132	NLFD	0.9793	0.9880

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Ingleburn	66	NING	0.9979	0.9983
Inverell	66	NNVL	0.9944	1.0387
Kemps Creek	330	NKCK	0.9963	0.9964
Kempsey	66	NKS2	1.0043	1.0592
Kempsey	33	NKS3	1.0061	1.0556
Koolkhan	66	NKL6	0.9837	1.0245
Kurnell	132	NKN1	1.0082	1.0043
Kurri	11	NKU1	0.9992	0.9921
Kurri	33	NKU3	1.0023	0.9951
Kurri	66	NKU6	1.0027	0.9956
Kurri	132	NKUR	0.9998	0.9879
Lake Munmorah	132	NMUN	0.9910	0.9904
Lane Cove	132	NLCV	1.0109	1.0137
Liddell	33	NLD3	0.9641	0.9675
Lismore	132	NLS2	0.9836	1.0217
Liverpool	132	NLP1	0.9999	1.0007
Macarthur	132	NMC1	0.9965	0.9966
Macarthur	66	NMC2	0.9974	0.9978
Macksville	132	NMCV	0.9879	1.0323
Macquarie Park	11	NMQP	1.0132	1.0166
Manildra	132	NMLD	1.0203	1.0407
Marrickville	11	NMKV	1.0149	1.0146
Marulan (Endeavour Energy)	132	NMR1	0.9837	0.9851
Marulan (Essential Energy)	132	NMR2	0.9837	0.9851
Mason Park	132	NMPK	1.0105	1.0120
Meadowbank	11	NMBK	1.0148	1.0212
Molong	132	NMOL	1.0147	1.0339
Moree	66	NMRE	1.0527	1.1059
Morven BSP	132	NMVN	1.0005	1.0012
Mt Piper	66	NMP6	0.9616	0.9684
Mt Piper	132	NMPP	0.9616	0.9684
Mudgee	132	NMDG	0.9929	1.0080
Mullumbimby	11	NML1	0.9514	1.0294
Mullumbimby	132	NMLB	0.9502	0.9935
Munmorah	33	NMNP	0.9919	0.9934
Munyang	11	NMY1	1.0281	1.0279
Munyang	33	NMYG	1.0281	1.0279
Murrumbateman	132	NMBM	0.9886	0.9919
Murrumburrah	66	NMRU	1.0055	1.0115
Muswellbrook	132	NMRK	0.9588	0.9673
Nambucca	132	NNAM	0.9797	1.0266
Narrabri	66	NNB2	1.0426	1.0936
Newcastle	132	NNEW	0.9933	0.9904
North Of Broken Bay VTN		NEV2	0.9961	0.9950
Orange	132	NRG1	1.0173	1.0388
Orange	66	NRGE	1.0190	1.0412
Orange North	132	NONO	1.0173	1.0411
Orimbah	33	NORB	1.0026	1.0035
Ourimbah	132	NOR1	1.0006	1.0012
Ourimbah	66	NOR6	1.0003	1.0005

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Panorama	66	NPMA	1.0099	1.0274
Parkes	66	NPK6	1.0346	1.0561
Parkes	132	NPKS	1.0331	1.0546
Peakhurst	132	NPH1	1.0039	1.0032
Peakhurst	33	NPHT	1.0074	1.0065
Pt Macquarie	33	NPMQ	1.0191	1.0688
Pyrmont	132	NPT1	1.0082	1.0073
Pyrmont	33	NPT3	1.0088	1.0080
Raleigh	132	NRAL	0.9718	1.0162
Regentville	132	NRGV	0.9979	0.9982
Rozelle	132	NRZH	1.0131	1.0141
Rozelle	33	NRZL	1.0123	1.0142
Snowy Adit	132	NSAD	1.0008	1.0137
Somersby	11	NSMB	1.0052	1.0055
South of Broken Bay VTN		NEV3	1.0076	1.0082
St Peters	11	NSPT	1.0118	1.0113
Stroud	132	NSRD	1.0050	1.0145
Sydney East	132	NSE2	1.0083	1.0078
Sydney North (Ausgrid)	132	NSN1	1.0030	1.0038
Sydney North (Endeavour Energy)	132	NSN2	1.0030	1.0038
Sydney South	132	NSYS	1.0024	1.0018
Sydney West (Ausgrid)	132	NSW1	1.0053	1.0057
Sydney West (Endeavour Energy)	132	NSW2	1.0053	1.0057
Tamworth	66	NTA2	0.9578	0.9785
Taree	132	NTR2	1.0282	1.0647
Tenterfield	132	NTTF	0.9820	1.0241
Terranora	110	NTNR	1.0090	1.0394
Tomago	330	NTMG	0.9922	0.9932
Tomago	33	NTMJ	0.9932	0.9946
Tomago (Ausgrid)	132	NTME	0.9925	0.9945
Tomago (Essential Energy)	132	NTMC	0.9925	0.9945
Top Ryde	11	NTPR	1.0109	1.0142
Tuggerah	132	NTG3	0.9965	0.9970
Tumut	66	NTU2	1.0210	1.0137
Vales Point	132	NVP1	0.9882	0.9903
Vineyard	132	NVYD	0.9997	0.9987
Wagga	66	NWG2	1.0036	1.0109
Wagga North	66	NWG6	0.9942	1.0107
Wagga North	132	NWGN	1.0058	1.0065
Wallerawang (Essential Energy)	132	NWW8	0.9608	0.9670
Wallerawang (Endeavour Energy)	132	NWW9	0.9608	0.9670
Waratah BHP	132	NWR1	0.9908	0.9918
Wellington	132	NWL8	0.9795	0.9878
West Gosford	11	NGWF	1.0059	1.0063
West Sawtell	132	NWST	0.9707	1.0140
Williamsdale	132	NWDL	0.9941	1.0005
Wyong	11	NWYG	0.9996	0.9998
Yanco	33	NYA3	1.0226	1.0270
Yass	132	NYS1	0.9852	0.9860
Yass	66	NYS6	0.9895	0.9930

New South Wales Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Bayswater Unit 1	330	BW01	NBAY1	NBAY	0.9552	0.9584
Bayswater Unit 2	330	BW02	NBAY2	NBAY	0.9552	0.9584
Bayswater Unit 3	500	BW03	NBAY3	NBYW	0.9558	0.9587
Bayswater Unit 4	500	BW04	NBAY4	NBYW	0.9558	0.9587
Blowering	132	BLOWERNG	NBLW8	NBLW	0.9709	0.9848
Blowering Ancillary Services	132		NBLW1	NBLW	0.9709	0.9848
Broken Hill GT 1	22	GB01	NBKG1	NBKG	1.1026	1.0806
Burrinjuck PS	132	BURRIN	NBUK	NBUK	0.9816	0.9902
Capital WF	330	CAPTL_WF	NCWF1R	NCWF	0.9845	0.9880
Colongra PS UN 1	330	CG1	NCLG1D	NCLG	0.9860	0.9896
Colongra PS UN 2	330	CG2	NCLG2D	NCLG	0.9860	0.9896
Colongra PS UN 3	330	CG3	NCLG3D	NCLG	0.9860	0.9896
Colongra PS UN 4	330	CG4	NCLG4D	NCLG	0.9860	0.9896
Cullerin Range WF	132	CULLRGWF	NYS11C	NYS1	0.9852	0.9860
Eraring PS Load	500	ERNL1	NEPSL	NEPS	0.9859	0.9875
Eraring Unit 1	330	ER01	NEPS1	NEP3	0.9859	0.9863
Eraring Unit 2	330	ER02	NEPS2	NEP3	0.9859	0.9863
Eraring Unit 3	500	ER03	NEPS3	NEPS	0.9859	0.9875
Eraring Unit 4	500	ER04	NEPS4	NEPS	0.9859	0.9875
Gunning WF	132	GUNNING1	NYS12A	NYS1	0.9852	0.9860
Guthega	132	GUTH-1	NGUT	NGUT	0.9484	0.9428
Guthega	132	GUTHEGA	NGUT8	NGUT	0.9484	0.9428
Guthega Ancillary Services 2	132	GUTH-2	NGUT2	NGUT	0.9484	0.9428
Hume (NSW Share)	132	HUMENSW	NHUM	NHUM	0.9704	0.9881
Kangaroo Valley - Bendeela (Shoalhaven)	330	SHGEN	NSHL	NSHL	0.9798	0.9838
Kangaroo Valley (Shoalhaven) Pumps	330	SHPUMP	NSHP1	NSHL	1.0017	0.9952
Liddell Load	330	LIDDNL1	NLDPL	NLDP	0.9556	0.9588
Liddell Unit 1	330	LD01	NLDP1	NLDP	0.9556	0.9588
Liddell Unit 2	330	LD02	NLDP2	NLDP	0.9556	0.9588
Liddell Unit 3	330	LD03	NLDP3	NLDP	0.9556	0.9588
Liddell Unit 4	330	LD04	NLDP4	NLDP	0.9556	0.9588
Lower Tumut	330	TUMUT3	NLTS8	NLTS	0.9233	0.9729
Lower Tumut Pipeline Auxiliary	66	TUMT3NL3	NTU2L3	NTU2	1.0210	1.0137
Lower Tumut Pumps	330	SNOWYP	NLTS3	NLTS	1.0069	0.9875
Lower Tumut T2 Auxiliary	66	TUMT3NL1	NTU2L1	NTU2	1.0210	1.0137
Lower Tumut T4 Auxiliary	66	TUMT3NL2	NTU2L2	NTU2	1.0210	1.0137
Mt Piper PS Load	330	MPNL1	NMPPL	NMTP	0.9629	0.9680
Mt Piper PS Unit 1	330	MP1	NMTP1	NMTP	0.9629	0.9680
Mt Piper PS Unit 2	330	MP2	NMTP2	NMTP	0.9629	0.9680
Munmorah Load	330	MMNL1	NMNPL	NMN1	0.9857	0.9926
Munmorah Unit 3	330	MM3	NMNP3	NMN1	0.9857	0.9926
Munmorah Unit 4	330	MM4	NMNP4	NMN1	0.9857	0.9926
Tomago 1	330		NTMG1	NTMG	0.9922	0.9932
Tomago 2	330		NTMG2	NTMG	0.9922	0.9932
Tomago 3	330		NTMG3	NTMG	0.9922	0.9932

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Upper Tumut	330	UPPTUMUT	NUTS8	NUTS	0.9453	0.9783
Uranquinty PS UN 11	132	URANQ11	NURQ1U	NURQ	0.9665	0.9189
Uranquinty PS UN 12	132	URANQ12	NURQ2U	NURQ	0.9665	0.9189
Uranquinty PS UN 13	132	URANQ13	NURQ3U	NURQ	0.9665	0.9189
Uranquinty PS UN 14	132	URANQ14	NURQ4U	NURQ	0.9665	0.9189
Vales Point Load	330	VPNL1	NVPPL	NVPP	0.9877	0.9894
Vales Point Unit 5	330	VP5	NVPP5	NVPP	0.9877	0.9894
Vales Point Unit 6	330	VP6	NVPP6	NVPP	0.9877	0.9894
Wallerawang Unit 7	330	WW7	NWW27	NWWP	0.9633	0.9699
Wallerawang Unit 8	330	WW8	NWW28	NWWP	0.9633	0.9699
Woodlawn WF	330	WOODLWN1	NCWF2W	NCWF	0.9845	0.9880

New South Wales Embedded Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Awaba Renewable Energy Facility	132	AWABAREF	NNEW2	NNEW	0.9933	0.9904
Bankstown Sport Club	132	BANKSPT1	NSYS3R	NSYS	1.0024	1.0018
Broadwater Co Gen	132	BWTR1	NLS21B	NLS2	0.9836	1.0217
Brown Mountain generator	66	BROWNMT	NCMA1	NCMA	1.0071	1.0156
Burrendong Hydro PS	132	BDONGHYD	NWL81B	NWL8	0.9795	0.9878
Campbelltown WSLC	66	WESTCBT1	NING1C	NING	0.9979	0.9983
Condong PS	110	CONDONG1	NTNR1C	NTNR	1.0090	1.0394
Copeton Hydro PS	66	COPTNHYD	NNVL1C	NNVL	0.9944	1.0387
Eastern Creek	132	EASTCRK	NSW21	NSW2	1.0053	1.0057
Eraring BS UN (GT)	330	ERGT01	NEP35B	NEP3	0.9859	0.9863
Glenbawn Hydro PS	132	GLBWNHYD	NMRK2G	NMRK	0.9588	0.9673
Glenn Innes (Pindari HPS)	66	PINDARI	NGLN1	NGLN	0.9772	1.0196
Grange Ave	132	GRANGEAV	NVYD1	NVYD	0.9997	0.9987
Hez PS	33	HEZ	NKU31H	NKU3	1.0023	0.9951
Jindabyne Generator	66	JNDABNE1	NCMA2	NCMA	1.0071	1.0156
Jounama PS	66	JOUNAMA1	NTU21J	NTU2	1.0210	1.0137
Keepit PS	66	KEEPIT	NKPT	NKPT	1.0001	1.0383
Liddell - Hunter Valley GTs	33	HVGTS	NLD31	NLD3	0.9641	0.9675
Liverpool (Jacks Gully)	132	JACKSGUL	NLP11	NSW2	1.0053	1.0057
Lucas Heights Stage 2 Power Station	132	LUCAS2S2	NSYS1	NSYS	1.0024	1.0018
Nine Willoughby	132	NINEWIL1	NSE21R	NSE2	1.0083	1.0078
Redbank PS Unit 1	132	REDBANK1	NMRK1	NRED	0.9572	0.9510
Smithfield Energy Facility (Sithe)	132	SITHE01	NSYW1	NSW2	1.0053	1.0057
St George Leagues Club	33	STGEORG1	NPHT1E	NPHT	1.0074	1.0065
Tallawarra PS	132	TALWA1	NDT13T	NTWA	0.9934	0.9860
Teralba Power Station	132	TERALBA	NNEW1	NNEW	0.9933	0.9904
The Drop Power Station	22	THEDROP1	NFNY1D	NFNY	1.0497	1.0426
West Nowra	132	AGLNOW1	NDT12	NDT1	0.9942	0.9946
Wests Illawara Leagues Club	132	WESTILL1	NDT14E	NDT1	0.9942	0.9946
Woodlawn Bioreactor	132	WDLNGN01	NMR21W	NMR2	0.9837	0.9851
Wyangala A PS	66	WYANGALA	NCW81A	NCW8	1.0151	1.0257
Wyangala B PS	66	WYANGALB	NCW82B	NCW8	1.0151	1.0257

Australian Capital Territory (regional reference node is Sydney West 330 kV)

Australian Capital Territory Loads

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Canberra	132	ACA1	0.9896	0.9971
Queanbeyan (ACTEW)	66	AQB1	1.0082	1.0150
Queanbeyan (Essential Energy)	66	AQB2	1.0082	1.0150

Victoria (regional reference node is Thomastown 66 kV)

Victoria Loads

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Altona	220	VAT2	0.9980	0.9968
Altona	66	VATS	1.0072	1.0057
Ballarat	66	VBAT	1.0313	1.0274
Bendigo	22	VBE2	1.0715	1.0665
Bendigo	66	VBE6	1.0711	1.0699
BHP Western Port	220	VJLA	0.9908	0.9900
Brooklyn (Jemena)	22	VBL2	1.0086	1.0054
Brooklyn (Jemena)	66	VBL6	1.0090	1.0049
Brooklyn [POWERCOR]	22	VBL3	1.0086	1.0054
Brooklyn [POWERCOR]	66	VBL7	1.0090	1.0049
Brunswick (Jemena)	22	VBTS	0.9997	0.9991
Brunswick [CitiPower]	22	VBT2	0.9997	0.9991
Cranbourne	220	VCB2	0.9889	0.9885
Cranbourne (SPI Electricity)	66	VCBT	0.9915	0.9909
Cranbourne (UE)	66	VCB5	0.9915	0.9909
East Rowville (SP Ausnet)	66	VER2	0.9928	0.9923
East Rowville (UE)	66	VERT	0.9928	0.9923
Fishermans Bend [CitiPower]	66	VFBT	1.0056	1.0033
Fishermans Bend [POWERCOR]	66	VFB2	1.0056	1.0033
Fosterville	220	VFVT	1.0667	1.0683
Geelong	66	VGT6	1.0096	1.0058
Glenrowan	66	VGNT	1.0459	1.0579
Heatherton	66	VHTS	0.9978	0.9980
Heywood	22	VHY2	1.0083	1.0050
Horsham	66	VHOT	1.0764	1.0812
Keilor (Jemena)	66	VKT2	1.0038	1.0032
Keilor [Powercor]	66	VKTS	1.0038	1.0032
Kerang	22	VKG2	1.0969	1.0944
Kerang	66	VKG6	1.0969	1.0944
Khancoban	330	NKHN	1.0236	1.0449
Loy Yang	66	VLY6	0.9709	0.9684
Malvern	22	VMT2	0.9958	0.9958
Malvern	66	VMT6	0.9946	0.9945
Morwell TS	66	VMWT	0.9713	0.9780
Mt Beauty	66	VMBT	1.0217	1.0345
Portland	500	VAPD	1.0103	1.0073
Pt Henry	220	VPTH	1.0135	1.0112
Red Cliffs	22	VRC2	1.1220	1.1169
Red Cliffs	66	VRC6	1.1197	1.1139
Red Cliffs (CE)	66	VRCA	1.1197	1.1139
Richmond	22	VRT2	0.9982	0.9976
Richmond [CitiPower]	66	VRT7	1.0009	1.0045
Richmond [UE]	66	VRT6	1.0009	1.0045
Ringwood (SPI Electricity)	66	VRW7	0.9991	0.9990
Ringwood (UE)	22	VRW2	0.9991	1.0013
Ringwood [SPI Electricity]	22	VRW3	0.9991	1.0013

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Ringwood [UE]	66	VRW6	0.9991	0.9990
Shepparton	66	VSHT	1.0569	1.0675
South Morang (Jemena)	66	VSM6	0.9980	0.9987
South Morang (SPI)	66	VSMT	0.9980	0.9987
Springvale [CitiPower]	66	VSVT	0.9964	0.9964
Springvale [UE]	66	VSV2	0.9964	0.9964
Templestowe [CitiPower]	66	VTS2	0.9993	0.9991
Templestowe [Jemena]	66	VTST	0.9993	0.9991
Templestowe [SPI Electricity]	66	VTS3	0.9993	0.9991
Templestowe [UE]	66	VTS4	0.9993	0.9991
Terang	66	VTGT	1.0347	1.0284
Thomastown [Jemena]	66	VTTS	1.0000	1.0000
Thomastown [SPI Electricity]	66	VTT2	1.0000	1.0000
Tyabb	66	VTBT	0.9935	0.9920
Wemen	66	VWET	1.1160	1.1137
West Melbourne	22	VWM2	1.0033	1.0018
West Melbourne [CitiPower]	66	VWM7	1.0066	1.0044
West Melbourne [Jemena]	66	VWM6	1.0066	1.0044
Wodonga	22	VWO2	1.0340	1.0509
Wodonga	66	VWO6	1.0327	1.0489
Yallourn	11	VYP1	0.9519	0.9495

Victoria Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Banimboola	220	BAPS	VDPS2	VDPS	0.9885	0.9834
Basslink (Loy Yang Power Station Switchyard) Tasmania to Victoria	500	BLNKVIC	VLYP13	VTBL	0.9684	0.9683
Basslink (Loy Yang Power Station Switchyard) Victoria to Tasmania	500	BLNKVIC	VLYP13	VTBL	0.9742	0.9726
Bogong & McKay Creek PS	220	MCKAY1	VMKP1	VT14	0.9993	0.9919
Dartmouth PS	220	DARTM1	VDPS	VDPS	0.9885	0.9834
Eildon PS 1	220	EILDON1	VEPS1	VEPS	0.9902	0.9944
Eildon PS 2	220	EILDON2	VEPS2	VEPS	0.9902	0.9944
Guthega - Jindabyne Pump	132	SNOWYGJP	NGJP	NGJP	1.1047	1.1211
Hazelwood PS Load	220	HWPNL1	VHWPL	VHWP	0.9685	0.9673
Hazelwood PS Unit 1	220	HWPS1	VHWP1	VHWP	0.9685	0.9673
Hazelwood PS Unit 2	220	HWPS2	VHWP2	VHWP	0.9685	0.9673
Hazelwood PS Unit 3	220	HWPS3	VHWP3	VHWP	0.9685	0.9673
Hazelwood PS Unit 4	220	HWPS4	VHWP4	VHWP	0.9685	0.9673
Hazelwood PS Unit 5	220	HWPS5	VHWP5	VHWP	0.9685	0.9673
Hazelwood PS Unit 6	220	HWPS6	VHWP6	VHWP	0.9685	0.9673
Hazelwood PS Unit 7	220	HWPS7	VHWP7	VHWP	0.9685	0.9673
Hazelwood PS Unit 8	220	HWPS8	VHWP8	VHWP	0.9685	0.9673
Jeeralang A PS Unit 1	220	JLA01	VJLGA1	VJLG	0.9640	0.9633
Jeeralang A PS Unit 2	220	JLA02	VJLGA2	VJLG	0.9640	0.9633
Jeeralang A PS Unit 3	220	JLA03	VJLGA3	VJLG	0.9640	0.9633
Jeeralang A PS Unit 4	220	JLA04	VJLGA4	VJLG	0.9640	0.9633
Jeeralang B PS Unit 1	220	JLB01	VJLGB1	VJLG	0.9640	0.9633
Jeeralang B PS Unit 2	220	JLB02	VJLGB2	VJLG	0.9640	0.9633
Jeeralang B PS Unit 3	220	JLB03	VJLGB3	VJLG	0.9640	0.9633
Laverton PS	220	LAVNORTH	VAT21	VAT2	0.9980	0.9968
Loy Yang A PS Load	500	LYNL1	VLYPL	VLYP	0.9709	0.9699
Loy Yang A PS Unit 1	500	LYA1	VLYP1	VLYP	0.9709	0.9699
Loy Yang A PS Unit 2	500	LYA2	VLYP2	VLYP	0.9709	0.9699
Loy Yang A PS Unit 3	500	LYA3	VLYP3	VLYP	0.9709	0.9699
Loy Yang A PS Unit 4	500	LYA4	VLYP4	VLYP	0.9709	0.9699
Loy Yang B PS Unit 1	500	LOYYB1	VLYP5	VLYP	0.9709	0.9699
Loy Yang B PS Unit 2	500	LOYYB2	VLYP6	VLYP	0.9709	0.9699
Macarthur WF	500	MACARTH1	VTRT1M	VTRT	1.0050	1.0042
Mortlake PS Unit 1	500	MORTLK11	VM0P1O	VM0P	0.9971	0.9980
Mortlake PS Unit 2	500	MORTLK12	VM0P2O	VM0P	0.9971	0.9980
Morwell PS G1 G2 And G3	66	MOR1	VMWT1	VMWG	0.9713	0.9694
Morwell PS G4	11	MOR2	VMWP4	VMWP	0.9619	0.9649
Morwell PS G5	11	MOR3	VMWP5	VMWP	0.9619	0.9649
Morwell PS Load	66	MORNL1	VMWTL	VMWT	0.9713	0.9780
Murray	330	MURRAY	NMUR8	NMUR	1.0110	0.9864
Newport PS	220	NPS	VNPS	VNPS	0.9969	0.9943
Oaklands Hill WF	66	OAKLAND1	VTGT3A	VTGT	1.0347	1.0284
Portland DU 1	500	APD01	VAPD1	VAPD	1.0103	1.0073

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Portland DU 2	500	APD02	VAPD2	VAPD	1.0103	1.0073
Pt H - Anglesea PS - Vic SMLT	220	VICSMLT	VAPS1	VAPS	1.0135	1.0112
Pt Henry 1	220	PTH01	VPTH1	VPTH	1.0135	1.0112
Pt Henry 2	220	PTH02	VPTH2	VPTH	1.0135	1.0112
Pt Henry 3	220	PTH03	VPTH3	VPTH	1.0135	1.0112
Valley Power Unit 1	500	VPGS	VLYP7	VLYP	0.9709	0.9699
Waubra WF	220	WAUBRAWF	VWBT1A	VWBT	1.0252	1.0182
West Kiewa PS 1	220	WKIEWA1	VWKP1	VWKP	1.0191	1.0279
West Kiewa PS 2	220	WKIEWA2	VWKP2	VWKP	1.0191	1.0279
Yallourn W PS 220 Unit 2	220	YWPS2	VYP22	VYP2	0.9494	0.9481
Yallourn W PS Load	220	YWNL1	VYP2L	VYP2	0.9494	0.9481
Yallourn W PS Unit 1	220	YWPS1	VYP21	VYP3	0.9560	0.9497
Yallourn W PS Unit 3	220	YWPS3	VYP23	VYP2	0.9494	0.9481
Yallourn W PS Unit 4	220	YWPS4	VYP24	VYP2	0.9494	0.9481

Victoria Embedded Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Anglesea PS	220	APS	VAPS	VAPS	1.0135	1.0112
Bairnsdale Power Station Generator Unit 1	66	BDL01	VMWT2	VBDL	0.9701	0.9752
Bairnsdale Power Station Generator Unit 2	66	BDL02	VMWT3	VBDL	0.9701	0.9752
Ballarat Health Services	66	BBASEHOS	VBAT1H	VBAT	1.0313	1.0274
Brooklyn Landfill & Recycling Facility	66	BROOKLYN	VBL61	VBL6	1.0090	1.0049
Codrington WF	66	CODRNGTON	VTGT2C	VTGT	1.0347	1.0284
Hepburn WF	66	HEPWIND1	VBAT2L	VBAT	1.0313	1.0274
Hume PS (Victorian Share)	66	HUMEV	VHUM	VHUM	1.0912	0.9888
Longford	66	LONGFORD	VMWT6	VMWT	0.9713	0.9780
Mornington Landfill Site Generator	66	MORNW	VTBT1	VTBT	0.9935	0.9920
Mortons Lane Wind Farm	66	MLWF1	VTGT4M	VTGT	1.0347	1.0284
Shepparton Waste Gas	66	SHEP1	VSHT2S	VSHT	1.0569	1.0675
Somerton Power Station	66	AGLSOM	VTTS1	VSOM	0.9960	0.9954
Tatura Generator	66	TATURA01	VSHT1	VSHT	1.0569	1.0675
Toora Wind farm	66	TOORAWF	VMWT5	VMWT	0.9713	0.9780
Wonthaggi WF	66	WONWP	VMWT7	VMWT	0.9713	0.9780
Wyndham Landfill Site Generator	66	WYNDW	VATS1	VATS	1.0072	1.0057
Yambuk Wind Farm	66	YAMBUKWF	VTGT1	VTGT	1.0347	1.0284

South Australia (regional reference node is Torrens Island PS 66 kV[7])

South Australia Loads

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Angas Creek	33	SANC	1.0124	1.0111
Ardrossan West	33	SARW	0.9438	0.9567
Back Callington	11	SBAC	1.0100	1.0130
Baroota	33	SBAR	0.9839	0.9911
Berri	66	SBER	1.0389	1.0683
Berri (Powercor Border Flow)	66	SBE1	1.0389	1.0683
Blanche	33	SBLA	0.9988	0.9981
Blanche (Powercor Border Flow)	33	SBL1	0.9988	0.9981
Brinkworth	33	SBRK	0.9835	0.9886
Bungama Industrial	33	SBUN	0.9800	0.9872
Bungama Rural	33	SBUR	0.9800	0.9872
City West	66	SACR	1.0012	1.0041
Clare North	33	SCLN	0.9844	0.9895
Dalrymple	33	SDAL	0.9067	0.9141
Davenport	275	SDAV	0.9678	0.9803
Davenport	33	SDAW	0.9683	0.9812
Dorrien	33	SDRN	1.0040	1.0047
East Terrace	66	SETC	1.0027	1.0036
Happy Valley	66	SHVA	1.0080	1.0070
Hummocks	33	SHUM	0.9672	0.9752
Kadina East	33	SKAD	0.9676	0.9823
Kanmantoo	11	SKAN	1.0126	1.0124
Keith	33	SKET	1.0100	1.0133
Kilburn	66	SKLB	1.0029	1.0036
Kincraig	33	SKNC	1.0051	1.0096
Lefevre	66	SLFE	0.9999	0.9992
Leigh Creek	33	SLCC	0.9884	1.0005
Leigh Creek South	33	SLCS	0.9914	1.0036
Magill	66	SMAG	1.0066	1.0063
Mannum	33	SMAN	1.0146	1.0156
Mannum - Adelaide Pipeline 1	3.3	SMA1	1.0209	1.0205
Mannum - Adelaide Pipeline 2	3.3	SMA2	1.0206	1.0199
Mannum - Adelaide Pipeline 3	3.3	SMA3	1.0190	1.0183
Middleback	132	SMBK	0.9784	0.9833
Middleback	33	SMDL	0.9785	0.9834
Millbrook	132	SMLB	1.0067	1.0047
Mobilong	33	SMBL	1.0134	1.0148
Morgan - Whyalla Pipeline 1	3.3	SMW1	1.0178	1.0264
Morgan - Whyalla Pipeline 2	3.3	SMW2	1.0059	1.0127

[7] AEMO was recently advised of a requirement to split the Torrens Island 66kV bus in the South Australia region. This has not been included in the network representation for the 2013/14 MLFs.

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Morgan - Whyalla Pipeline 3	3.3	SMW3	0.9941	0.9998
Morgan - Whyalla Pipeline 4	3.3	SMW4	0.9890	0.9938
Morphett Vale East	66	SMVE	1.0092	1.0084
Mt Barker	66	SMBA	1.0071	1.0065
Mt Barker Sth	66	SMBS	1.0060	1.0065
Mt Gambier	33	SMGA	0.9977	1.0002
Mt Gunson	33	SMGU	0.9869	0.9936
Murray Bridge - Hahndorf Pipeline 1	11	SMH1	1.0180	1.0176
Murray Bridge - Hahndorf Pipeline 2	11	SMH2	1.0193	1.0185
Murray Bridge - Hahndorf Pipeline 3	11	SMH3	1.0168	1.0167
Neuroodla	33	SNEU	0.9844	0.9975
New Osborne	66	SNBN	0.9999	0.9990
North West Bend	66	SNWB	1.0150	1.0281
Northfield	66	SNFD	1.0035	1.0032
Para	66	SPAR	1.0029	1.0036
Parafield Gardens West	66	SPGW	1.0020	1.0022
Penola West 33	33	SPEN	0.9964	0.9970
Pimba	132	SPMB	0.9888	0.9915
Playford	33	SPAA	0.9675	0.9792
Port Lincoln	33	SPLN	0.9748	0.9690
Port Pirie	33	SPPR	0.9832	0.9916
Roseworthy	11	SRSW	1.0083	1.0091
South Australia VTN		SJP1	0.9981	1.0005
Snuggery Industrial	33	SSNN	0.9809	0.9636
Snuggery Rural	33	SSNR	0.9827	0.9708
Stony Point	11	SSPN	0.9741	0.9867
Tailem Bend	33	STAL	1.0103	1.0132
Templers	33	STEM	1.0028	1.0037
Torrens Island	66	STSY	1.0000	1.0000
Waterloo	33	SWAT	0.9932	0.9901
Whyalla	33	SWHY	0.9754	0.9884
Whyalla Central Substation	132	SWYC		0.9884
Whyalla Terminal BHP	132	SBHP	0.9759	0.9883
Woomera	132	SWMA	0.9889	0.9944
Wudina	66	SWUD	0.9837	0.9829
Yadnarie	66	SYAD	0.9738	0.9753

South Australia Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss factor	2013/14 Loss Factor
Cathedral Rocks WF	132	CATHROCK	SCRK	SCRK	0.8729	0.8777
Clements Gap WF	132	CLEMGPWF	SCGW1P	SCGW	0.9589	0.9645
Dry Creek PS 1	66	DRYCGT1	SDCA1	SDPS	1.0009	1.0009
Dry Creek PS 2	66	DRYCGT2	SDCA2	SDPS	1.0009	1.0009
Dry Creek PS 3	66	DRYCGT3	SDCA3	SDPS	1.0009	1.0009
Hallett 2 WF	275	HALLWF2	SMOK1H	SMOK	0.9718	0.9778
Hallett PS	275	AGLHAL	SHPS1	SHPS	0.9705	0.9794
Hallett WF	275	HALLWF1	SHPS2W	SHPS	0.9705	0.9794
Ladbroke Grove 1	132	LADBROK1	SPEW1	SPEW	0.9626	0.9674
Ladbroke Grove 2	132	LADBROK2	SPEW2	SPEW	0.9626	0.9674
Lake Bonney Wind Farm	33	LKBONNY1	SMAY1	SMAY	0.9404	0.9426
Lake Bonney Wind Farm Stage 2	33	LKBONNY2	SMAY2	SMAY	0.9404	0.9426
Lake Bonney Wind Farm Stage 3	33	LKBONNY3	SMAY3W	SMAY	0.9404	0.9426
Leigh Creek Northern PS Load 2	33	NPSNL2	SLCCL	SLCC	0.9884	1.0005
Mintaro PS	132	MINTARO	SMPS	SMPS	0.9778	0.9819
Mt Millar WF	33	MTMILLAR	SMTM1	SMTM	0.8983	0.9036
North Brown Hill WF	275	NBHWF1	SBEL1A	SBEL	0.9694	0.9740
Northern PS 1	275	NPS1	SNPA1	SNPS	0.9638	0.9746
Northern PS 2	275	NPS2	SNPA2	SNPS	0.9638	0.9746
O.C.P.L. Unit 1	66	OSB-AG	SNBN1	SOCP	0.9997	0.9989
Pelican Point PS	275	PPCCGT	SPPT	SPPT	0.9990	0.9992
Playford Northern PS Load 1	33	NPSNL1	SPAAL	SPAA	0.9675	0.9792
Playford PS	275	PLAYB-AG	SPSD1	SPPS	0.9573	0.9767
Port Lincoln PS	132	POR01	SPLN1	SPTL	0.9300	0.8772
Port Lincoln Unit 3	33	POR03	SPL31P	SPL3	0.9038	0.8783
Quarantine PS Unit 1	66	QPS1	SQPS1	SQPS	1.0000	0.9949
Quarantine PS Unit 2	66	QPS2	SQPS2	SQPS	1.0000	0.9949
Quarantine PS Unit 3	66	QPS3	SQPS3	SQPS	1.0000	0.9949
Quarantine PS Unit 4	66	QPS4	SQPS4	SQPS	1.0000	0.9949
Quarantine PS Unit 5	66	QPS5	SQPS5Q	SQPS	1.0000	0.9949
Snowtown WF	33	SNOWTWN1	SNWF1T	SNWF	0.9154	0.9272
Snuggery 1	132	SNUG1	SSGA1	SSPS	1.0289	0.9579
Snuggery 2	132	SNUG2	SSGA2	SSPS	1.0289	0.9579
Snuggery 3	132	SNUG3	SSGA3	SSPS	1.0289	0.9579
The Bluff WF	275	BLUFF1	SBEL2P	SBEL	0.9694	0.9740
Torrens Island PS A Unit 1	275	TORRA1	STSA1	STPS	0.9999	0.9999
Torrens Island PS A Unit 2	275	TORRA2	STSA2	STPS	0.9999	0.9999
Torrens Island PS A Unit 3	275	TORRA3	STSA3	STPS	0.9999	0.9999
Torrens Island PS A Unit 4	275	TORRA4	STSA4	STPS	0.9999	0.9999
Torrens Island PS B Unit 1	275	TORRB1	STSB1	STPS	0.9999	0.9999
Torrens Island PS B Unit 2	275	TORRB2	STSB2	STPS	0.9999	0.9999
Torrens Island PS B Unit 3	275	TORRB3	STSB3	STPS	0.9999	0.9999
Torrens Island PS B Unit 4	275	TORRB4	STSB4	STPS	0.9999	0.9999

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss factor	2013/14 Loss Factor
Torrens Island PS Load	275	TORNL1	STSYL	STPS	0.9999	0.9999
Waterloo WF	132	WATERLWF	SWLE1R	SWLE	0.9747	0.9783
Wattle Point Wind Farm	132	WPWF	SSYP1	SSYP	0.8138	0.8309

South Australia Embedded Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss factor	2013/14 Loss Factor
Amcor Glass UN 1	11	AMCORGR	SRSW1E	SRSW	1.0083	1.0091
Angaston Power Station	33	ANGAS1	SDRN1	SANG	0.9222	0.9554
Angaston Power Station	33	ANGAS2	SDRN2	SANG	0.9222	0.9554
Blue Lake Milling	33	BLULAKE1	SKET2B	SKET	1.0100	1.0133
Cummins Lonsdale PS	66	LONSDALE	SMVE1	SMVE	1.0092	1.0084
Pt Stanvac PS Unit 1	66	STANV1	SMVE3P	SMVE	1.0092	1.0084
Pt Stanvac PS Unit 2	66	STANV2	SMVE4P	SMVE	1.0092	1.0084
Starfish Hill WF	66	STARHLWF	SMVE2	SMVE	1.0092	1.0084
Tatiara Meat Co	33	TATIARA1	SKET1E	SKET	1.0100	1.0133
Terminal Storage Mini-Hydro	66	TERMSTOR	SNFD1	SNFD	1.0035	1.0032

Tasmania (regional reference node is George Town 220 kV)

Tasmania Loads

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Arthurs Lake	6.6	TAL2	0.9964	0.9991
Avoca	22	TAV2	1.0282	1.0287
Boyer SWA	6.6	TBYA	1.0370	1.0401
Boyer SWB	6.6	TBYB	1.0377	1.0412
Bridgewater	11	TBW2	1.0394	1.0359
Burnie	22	TBU3	0.9850	0.9861
Chapel St.	11	TCS3	1.0333	1.0351
Comalco	220	TCO1	1.0006	1.0005
Creek Road	33	TCR2	1.0370	1.0380
Derby	22	TDE2	1.0072	0.9642
Derwent Bridge	22	TDB2	0.9518	0.9497
Devonport	22	TDP2	0.9919	0.9918
Electrona	11	TEL2	1.0420	1.0513
Emu Bay	11	TEB2	0.9820	0.9840
Fisher (Rowallan)	220	TFI1	0.9717	0.9729
George Town	22	TGT3	1.0033	1.0035
George Town (Basslink)	220	TGT1	1.0000	1.0000
Gordon	22	TGO2	1.0173	1.0269
Greater Hobart Area VTN		TVN1	1.0372	1.0378
Greater Tamar Area VTN		TVN2	1.0024	0.9970
Hadspen	22	THA3	1.0008	0.9963
Hampshire	110	THM2	0.9731	0.9843
Huon River	11	THR2	1.0456	1.0478
Kermandie	11	TKE2	1.0521	1.0523
Kingston	11	TKI2	1.0424	1.0454
Kingston	33	TKI3	1.0407	1.0430
Knights Road	11	TKR2	1.0486	1.0552
Lindisfarne	33	TLF2	1.0407	1.0393
Meadowbank	22	TMB2	1.0147	1.0188
Mornington	33	TMT2	1.0394	1.0466
Mowbray	22	TMY2	1.0025	0.9954
New Norfolk	22	TNN2	1.0332	1.0351
Newton	22	TNT2	0.9726	0.9811
Newton	11	TNT3	0.9647	0.9716
North Hobart	11	TNH2	1.0360	1.0368
Norwood	22	TNW2	1.0040	0.9951
Palmerston	22	TPM3	0.9955	0.9934
Port Latta	22	TPL2	0.9617	0.9663
Que	22	TQU2	0.9808	0.9811
Queenstown	22	TQT2	0.9636	0.9707
Queenstown	11	TQT3	0.9732	0.9818
Railton	22	TRA2	0.9877	0.9905
Risdon	33	TRI4	1.0374	1.0380
Risdon	11	TRI3	1.0397	1.0383
Rokeby	11	TRK2	1.0410	1.0382

Location	Voltage [kV]	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Rosebery	44	TRB2	0.9680	0.9765
Savage River	22	TSR2	0.9912	0.9984
Scottsdale	22	TSD2	1.0053	0.9761
Smithton	22	TST2	0.9453	0.9524
Sorell	22	TSO2	1.0471	1.0447
ST. Leonards	22	TSL2	1.0027	0.9951
St. Marys	22	TSM2	1.0499	1.0535
Starwood	110	TSW1	1.0008	1.0011
Temco	110	TTE1	1.0035	1.0039
Trevallyn	22	TTR2	1.0020	0.9951
Triabunna	22	TTB2	1.0580	1.0476
Tungatinah	22	TTU2	0.9537	0.9531
Ulverstone	22	TUL2	0.9890	0.9888
Waddamana	22	TWA2	0.9740	0.9718
Wayatinah	11	TWY2	1.0076	1.0074
Wesley Vale	11	TWV2	0.9841	0.9852
Wilmot	220	TSH1	0.9746	0.9752

Tasmania Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 MLF	2013/14 Loss factor
Basslink (George Town)	220	BLNKTAS	TGT11	TGT1	1.0000	1.0000
Bastyan	220	BASTYAN	TFA11	TFA1	0.9436	0.9478
Bell Bay No.3	110	BBTHREE1	TBB11	TBB1	0.9994	0.9999
Bell Bay No.3	110	BBTHREE2	TBB12	TBB1	0.9994	0.9999
Bell Bay No.3	110	BBTHREE3	TBB13	TBB1	0.9994	0.9999
Bluff Point and Studland Bay Wind Farms	110	WOOLNTH1	TST11	TST1	0.8972	0.9037
Butlers Gorge	110	BUTLERSG	TBG11	TBG1	0.9480	0.9453
Catagunya	220	LI_WY_CA	TLI11	TLI1	1.0062	1.0055
Cethana	220	CETHANA	TCE11	TCE1	0.9668	0.9676
Cluny	220	CLUNY	TCL11	TCL1	1.0095	1.0095
Devils gate	110	DEVILS_G	TDG11	TDG1	0.9715	0.9710
Fisher	220	FISHER	TFI11	TFI1	0.9717	0.9729
Gordon	220	GORDON	TGO11	TGO1	0.9672	1.0037
John Butters	220	JBUTTERS	TJB11	TJB1	0.9420	0.9393
Lake Echo	110	LK_ECHO	TLE11	TLE1	0.9428	0.9538
Lemonthyme	220	LEM_WIL	TSH11	TSH1	0.9746	0.9752
Liapootah	220	LI_WY_CA	TLI11	TLI1	1.0062	1.0055
Mackintosh	110	MACKNTSH	TMA11	TMA1	0.9270	0.9370
Meadowbank	110	MEADOWBK	TMB11	TMB1	1.0064	1.0168
Musselroe	110	MUSSELR1	TDE11M	TDE1	0.9130	0.9203
Paloona	110	PALOONA	TPA11	TPA1	0.9736	0.9732
Poatina	220	POAT220	TPM11	TPM1	0.9883	0.9901
Poatina	110	POAT110	TPM21	TPM2	0.9758	0.9777
Reece No.1	220	REECE1	TRCA1	TRCA	0.9348	0.9400
Reece No.2	220	REECE2	TRCB1	TRCB	0.9365	0.9376
Repulse	220	REPULSE	TCL12	TCL1	1.0095	1.0095
Rowallan	220	ROWALLAN	TFI12	TFI1	0.9717	0.9729
Tamar Valley CCGT	220	TVCC201	TTV11A	TTV1	0.9989	0.9991
Tamar Valley OCGT	110	TVPP104	TBB14A	TBB1	0.9994	0.9999
Tarraleah	110	TARRALEA	TTA11	TTA1	0.9522	0.9513
Trevallyn	110	TREVALLN	TTR11	TTR1	0.9974	0.9901
Tribute	220	TRIBUTE	TTI11	TTI1	0.9378	0.9397
Tungatinah	110	TUNGATIN	TTU11	TTU1	0.9395	0.9427
Wayatinah	220	LI_WY_CA	TLI11	TLI1	1.0062	1.0055
Wilmot	22	LEM_WIL	TSH11	TSH1	0.9746	0.9752

Tasmania Embedded Generators

Location	Voltage [kV]	Dispatchable Unit ID (DUID)	Connection Point ID	TNI code	2012/13 Loss Factor	2013/14 Loss Factor
Remount	22	REMOUNT	TMY21	TMY2	1.0025	0.9954

8 Appendix B: Inter-regional loss factor equations for 2013/14

Loss factor equation (South Pine 275 referred to Sydney West 330)

= 1.0012 + 2.1078E-04*NQt - 4.1356E-06*Nd + 1.3764E-05*Qd

Loss factor equation (Sydney West 330 referred to Thomastown 66)

= 1.0481 + 1.7209E-04*VNt - 1.5862E-05*Vd + 2.1234E-06*Nd - 6.0645E-07*Sd

Loss factor equation (Torrens Island 66 referred to Thomastown 66)

= 1.0216 + 2.7755E-04*VSAt - 6.1093E-06*Vd + 1.8161E-05*Sd

where,

Qd	**= Queensland demand**
Vd	**= Victorian demand**
Nd	**= New South Wales demand**
Sd	**= South Australian demand**
NQt	**= transfer from New South Wales to Queensland**
VNt	**= transfer from Victoria to New South Wales**
VSAt	**= transfer from Victoria to South Australia**

The loss factor for the regulated Murraylink and Terranora interconnector is provided in Appendix D.

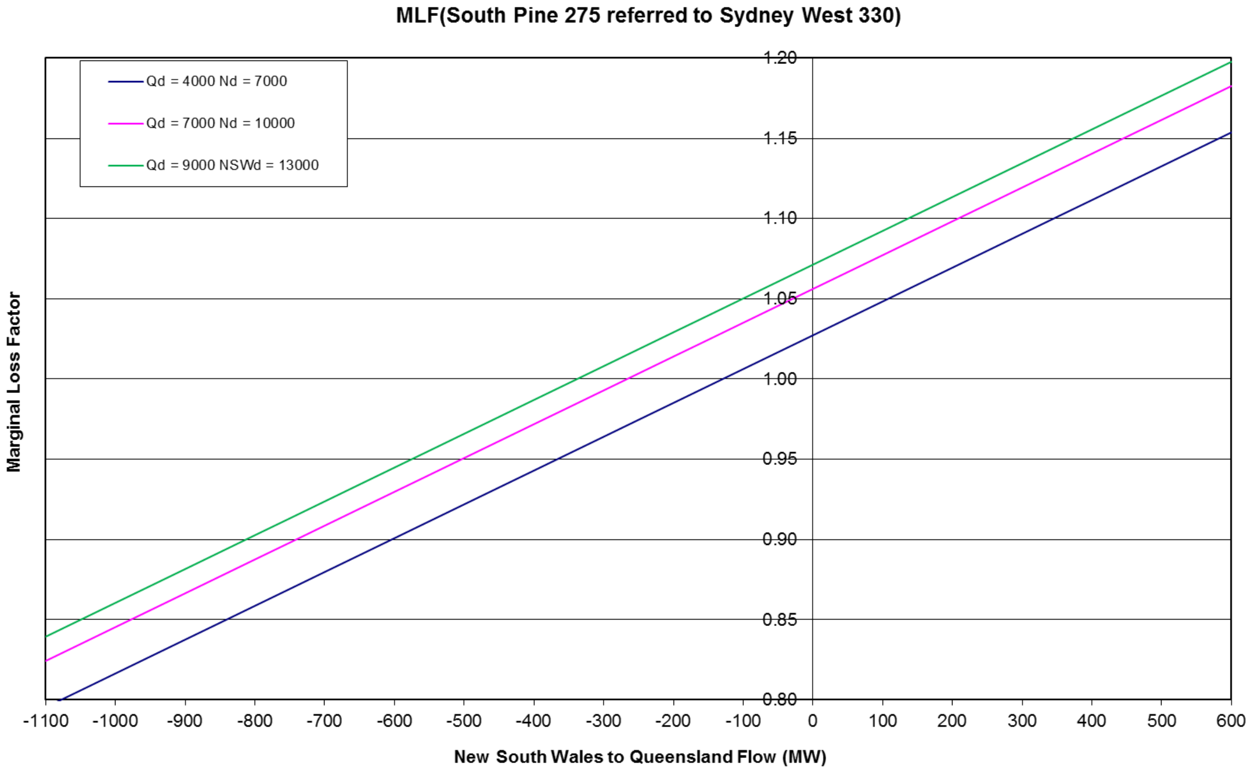


Figure B1: South Pine 275 referred to Sydney West 330 marginal loss factor verses NSW to Qld flow

Coefficient statistics

Coefficient	**Q_d**	**N_d**	**NQ_t**	**CONSTANT**
Coefficient value	1.3764E-05	-4.1356E-06	2.1078E-04	1.0012
Standard error values for the coefficients	1.8029E-07	1.1653E-07	2.9397E-07	6.1374E-04
Coefficient of determination (R2)	0.9742			
Standard error of the y estimate	0.0103			

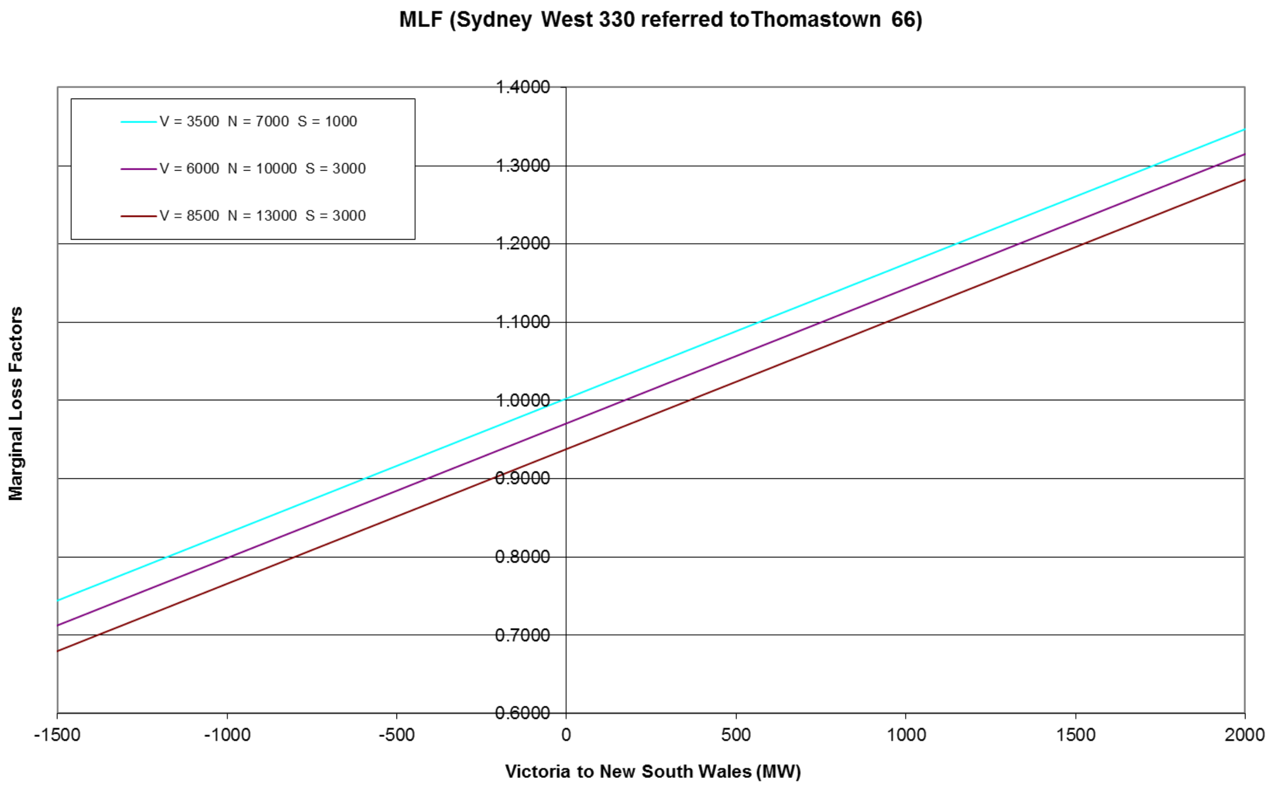


Figure B2: Sydney West 330 referred to Thomastown 66 marginal loss factor versus Victoria to NSW flow

Coefficient statistics

Coefficient	S_d	N_d	V_d	VN_t	CONSTANT
Coefficient value	-6.0645E-07	2.1234E-06	-1.5862E-05	1.7209E-04	1.0481
Standard error values for the coefficients	1.1339E-06	2.8636E-07	4.9039E-07	5.1956E-07	1.7663E-03
Coefficient of determination (R^2)	0.9384				
Standard error of the y estimate	0.0245				

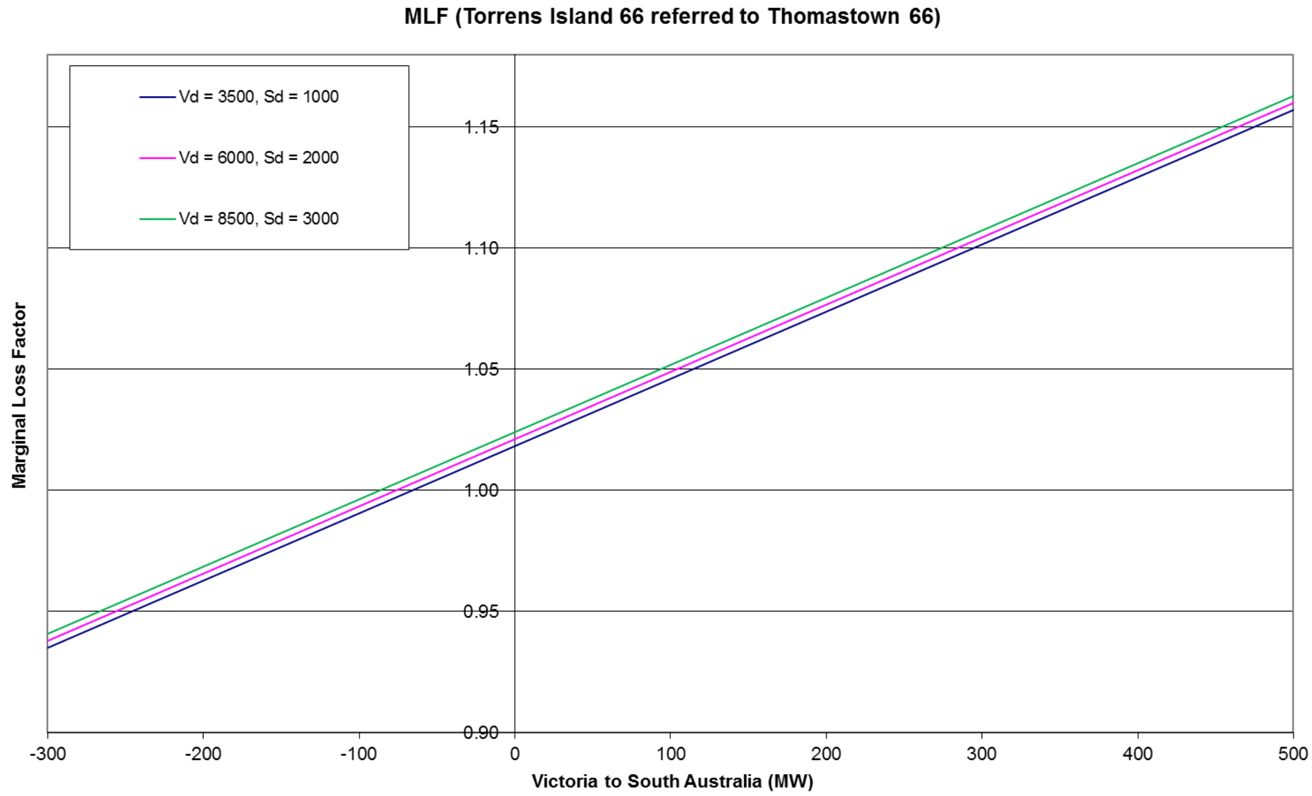


Figure B3: Torrens Island 66 referred to Thomastown 66 marginal loss factor versus Victoria to SA flow

Coefficient statistics

Coefficient	S_d	V_d	VSA_t	CONSTANT
Coefficient value	1.8161E-05	-6.1093E-06	2.7755E-04	1.0216
Standard error values for the coefficients	7.7870E-07	2.4866E-07	8.2439E-07	8.2584E-04
Coefficient of determination (R^2)	0.8750			
Standard error of the y estimate	0.0173			

9 Appendix C: Inter-regional loss equations for 2013/14

The loss equation is derived by integrating the equation *(Loss factor – 1)* with respect to the interconnector flow, i.e.

Losses = ∫(Loss factor – 1) dFlow

Then, with the loss factor equations in Appendix B, we get the following inter-regional loss equations for each interconnector.

South Pine 275 referred to Sydney West 330 notional link average losses

= (0.0012 - 4.1356E-06*Nd + 1.3764E-05*Qd)*NQt + 1.0539E-04*NQt^2

Sydney West 330 referred to Thomastown 66 notional link average losses

= (0.0481- 1.5862E-05*Vd + 2.1234E-06*Nd - 6.0645E-07*Sd)*VNt + 8.6045E-05*VNt^2

Torrens Island 66 referred to Thomastown 66 notional link average losses

= (0.0216 - 6.1093E-06*Vd + 1.8161E-05*Sd)*VSAt + 1.3878E-04*VSAt^2

where,

Qd	**= Queensland demand**
Vd	**= Victorian demand**
Nd	**= New South Wales demand**
Sd	**= South Australia demand**
NQt	**= transfer from New South Wales to Queensland**
VNt	**= transfer from Victoria to New South Wales**
VSAt	**= transfer from Victoria to South Australia**

The loss model for regulated Murraylink and Terranora interconnector is provided in Appendix D.

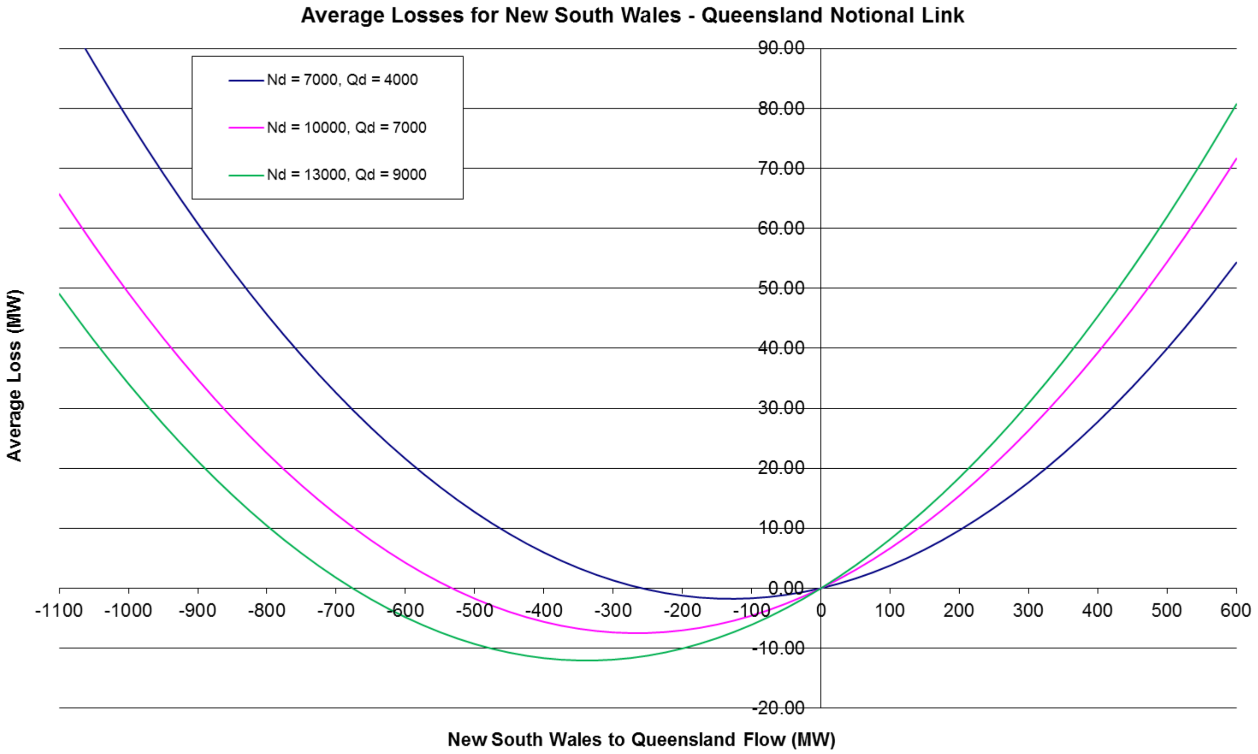


Figure C1: NSW to Queensland notional link losses versus NSW to Queensland notional link flow

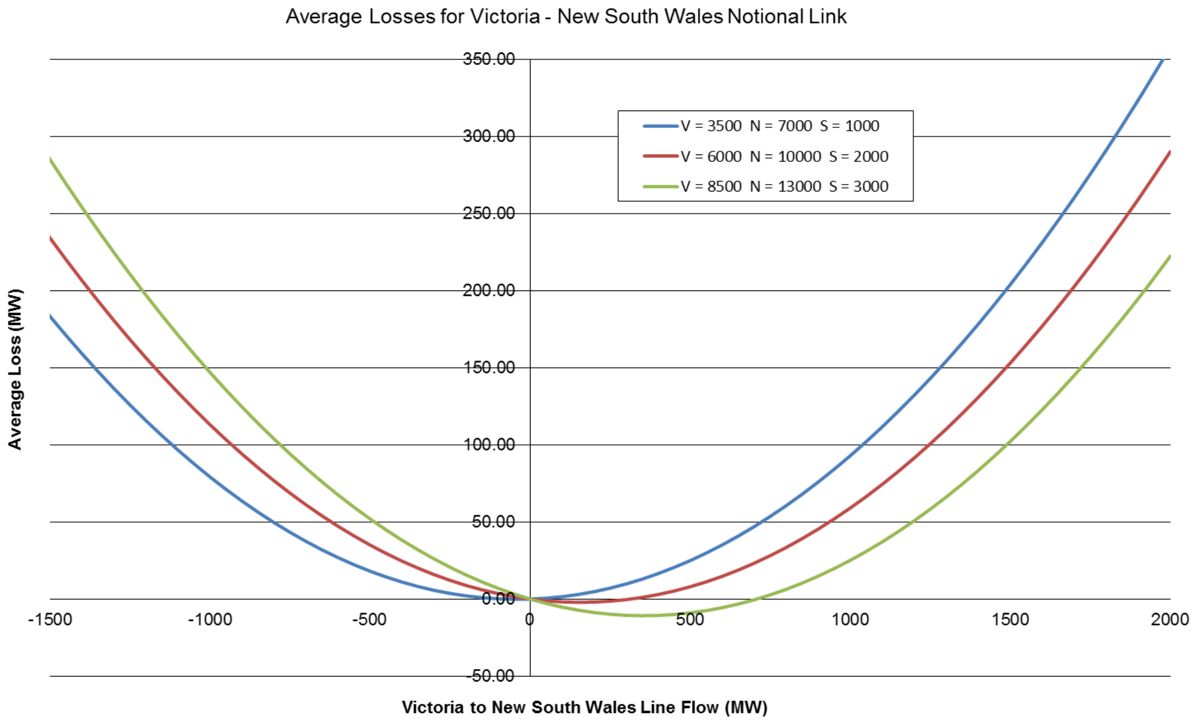


Figure C2: Victoria to NSW notional link losses versus Victoria to NSW notional link flow

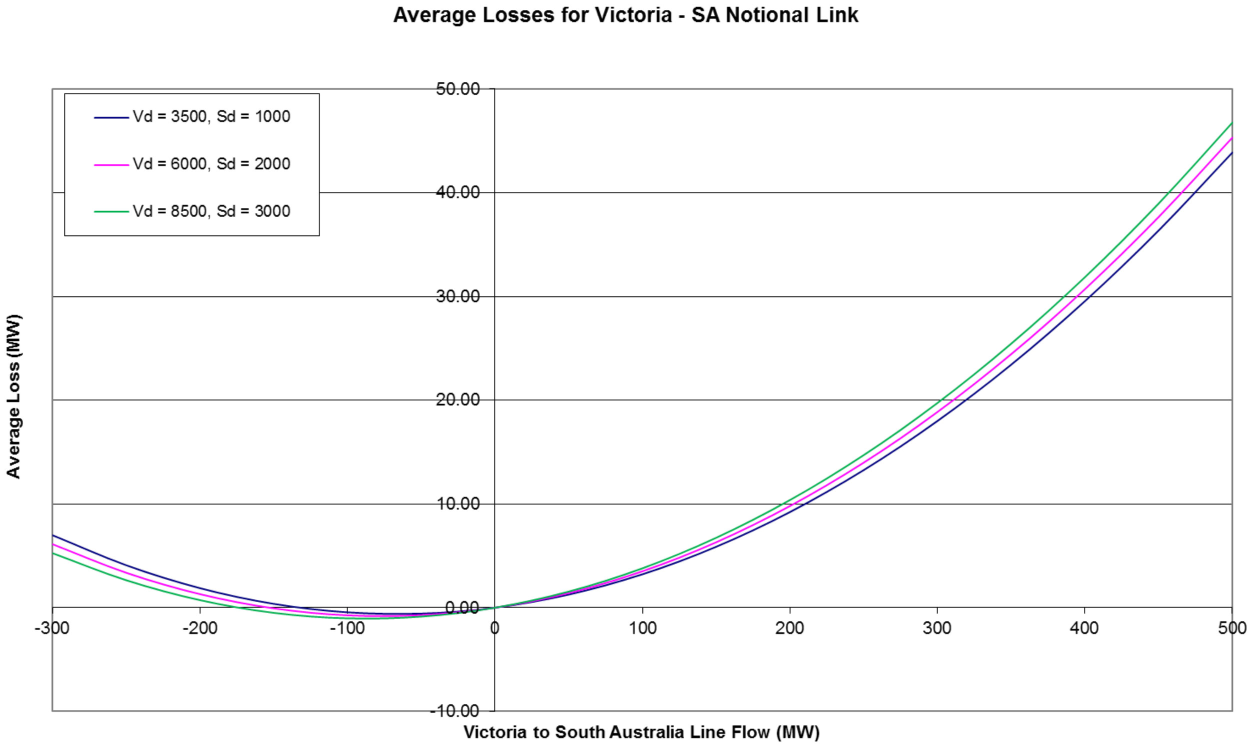


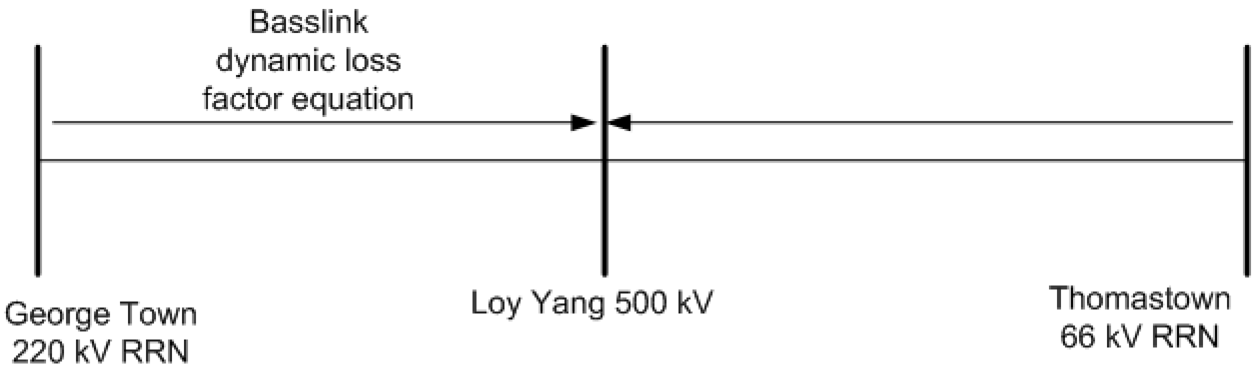
Figure C3: Victoria to SA notional link losses versus Victoria to SA notional link flow

10 Appendix D: Basslink, Terranora Interconnector and Murraylink loss factor models and loss equations for 2013/14

Basslink

The loss factor model for Basslink is made up of the following portions:

- George Town 220 kV intra-regional loss factor referred to Tasmania RRN Georgetown 220 = 1.0000
- Receiving end dynamic loss factor referred to the sending end= 0.99608 + 2.0786* 10^{-4} * $P_{(receive)}$, where $P_{(receive)}$ is the Basslink flow measured at the receiving end.
- Basslink (Loy Yang Power Station Switchyard) intra-regional loss factor referred to Thomastown 66 kV = 0.9726 when exporting power to Tasmania and 0.9683 when importing power from Tasmania.



The equation describing the losses between the George Town 220 kV and Loy Yang 500 kV connection points can be determined by integrating the (loss factor equation – 1), giving:

$$P_{(send)} = P_{(receive)} + [(-3.92 \times 10^{-3}) * P_{(receive)} + (1.0393 \times 10^{-4}) * P_{(receive)}^{2} + 4]$$

where:

$P_{(send)}$ – Power in MW measured at the sending end,

$P_{(receive)}$ – Power in MW measured at the receiving end.

New model is limited from 40MW to 630MW. While the model fails below 40MW, this is within the ±50 MW no-go zone requirement for Basslink operation.

Murraylink (Regulated)

From 9 October 2003 Murraylink commenced operation as a regulated interconnector. To be compliant with Clause 3.6.1(a), the regulated Murraylink loss model needs to consist of a single dynamic MLF from the Victorian RRN to the South Australian RRN.

For the purposes of the AEMO market systems the measurement point of the regulated Murraylink interconnector is the 132 kV connection to the Monash converter. This effectively forms part of the boundary between the Victorian and South Australian regions.

The losses between Red Cliffs 220 kV and Monash 132 kV connection points in relation to flow are as described previously by the following equation:

$$= (0.0039 * Flow_t + 2.8182 * 10^{-4} * Flow_t^{\ 2})$$

AEMO determined the following MLF model using regression analysis:

Murraylink MLF (Torrens Island 66 referred to Thomastown 66) = 2.4379E-03*$Flow_t$ +1.0884

AEMO found that the simple model consisting of a constant and a Murraylink flow coefficient was suitable because most of the variation of the loss factor is due to variations in the Murraylink flow and other potential explanatory variables did not significantly improve the model.

The regression statistics for this Murraylink loss factor model are presented in the following table.

Coefficient	***$Flow_t$***	**CONSTANT**
Coefficient Value	2.4379E-03	1.0884
Standard error values for the coefficient	3.0544E-06	2.2715E-04
Coefficient of determination (R^2)	0.9732	
Standard error of the y estimate	0.0297	

The loss model for a regulated Murraylink interconnector can be determined by integrating (MLF-1), giving:

Murraylink loss = 0.0884*Flowt + 1.2189E-03*$Flowt^2$

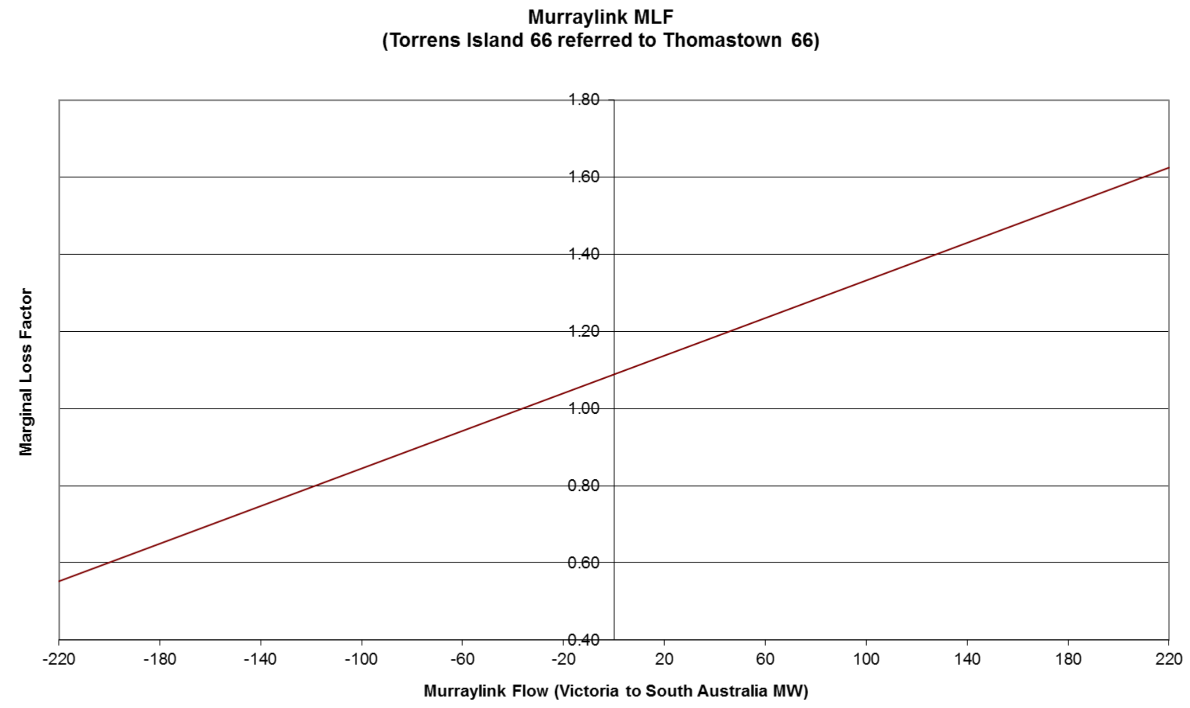


Figure D1: Torrens Island 66 referred to Thomastown 66 marginal loss factor versus Murraylink flow (Victoria to SA)

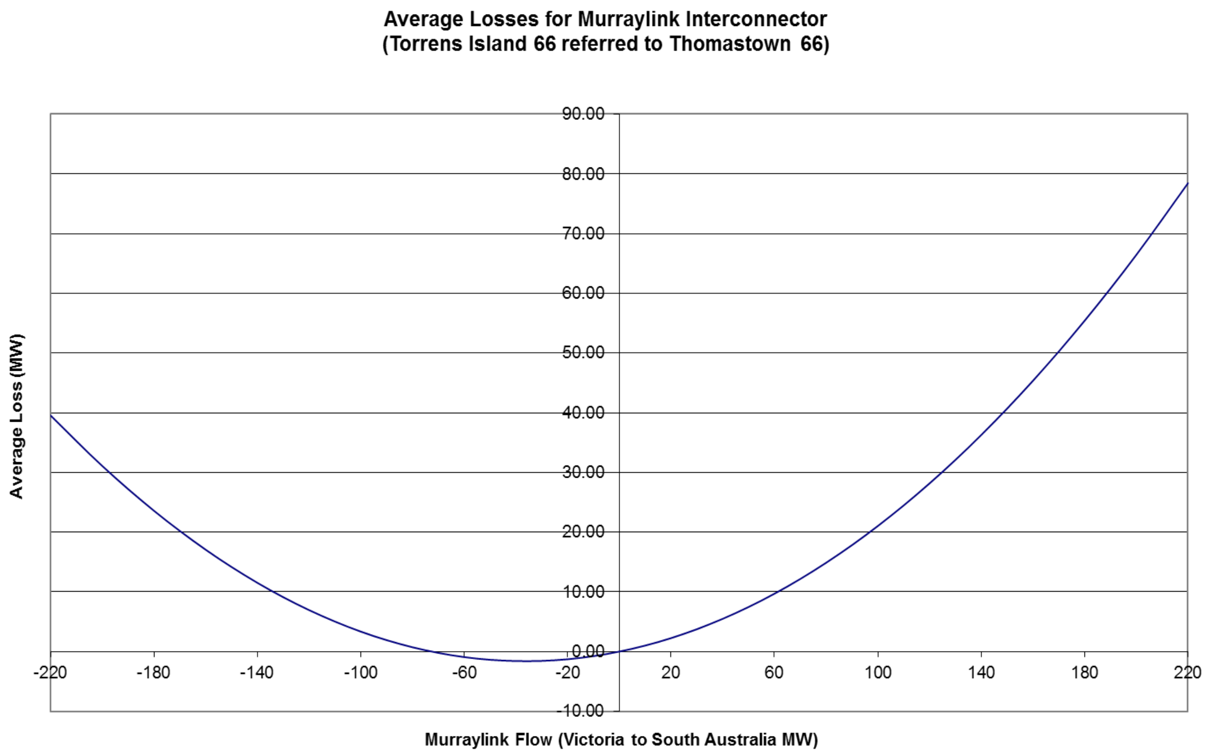


Figure D2: Murraylink notional link losses versus Murraylink flow (Victoria to SA)

Regulated Terranora Inerconnector (Previously Directlink)

From 21 March 2006 Terranora interconnector commenced operation as a regulated interconnector. To be compliant with Clause 3.6.1(a), the regulated Terranora interconnector loss model needs to consist of a single dynamic MLF from the New South Wales RRN to the Queensland RRN.

For the purposes of the AEMO market systems the measurement point of the regulated Terranora interconnector is 10.8 km north from Terranora on the two 110 kV lines between Terranora and Mudgeeraba. This effectively forms part of the boundary between the New South Wales and Queensland regions.

The losses between the Mullumbimby 132 kV and Terranora 110 kV connection points in relation to flow are as described previously by the following equation:

$$= (-0.0013 * Flow_t + 2.7372 * 10^{-4} * Flow_t^{\ 2})$$

AEMO determined the following Terranora interconnector MLF model using regression analysis:

Terranora interconnector MLF (South Pine 275 referred to Sydney West 330) = 1.1266 + 2.1687E-03*Flowt

AEMO found that the simple model consisting of a constant and a Terranora interconnector flow coefficient was suitable because most of the variation of the loss factor is due to variations in the Terranora interconnector flow and other potential explanatory variables did not significantly improve the model.

The regression statistics for this Terranora interconnector loss factor model are presented in the following table.

Coefficient	***$Flow_t$***	**CONSTANT**
Coefficient value	2.1687E-03	1.1266
Standard error values for the coefficients	4.2577E-06	3.9444E-04
Coefficient of determination (R^2)	0.9366	
Standard error of the y estimate	0.0377	

The loss model for a regulated Terranora interconnector can be determined by integrating (MLF-1), giving:

Terranora interconnector loss = 0.1266*Flowt + 1.0843E-03*$Flowt^2$

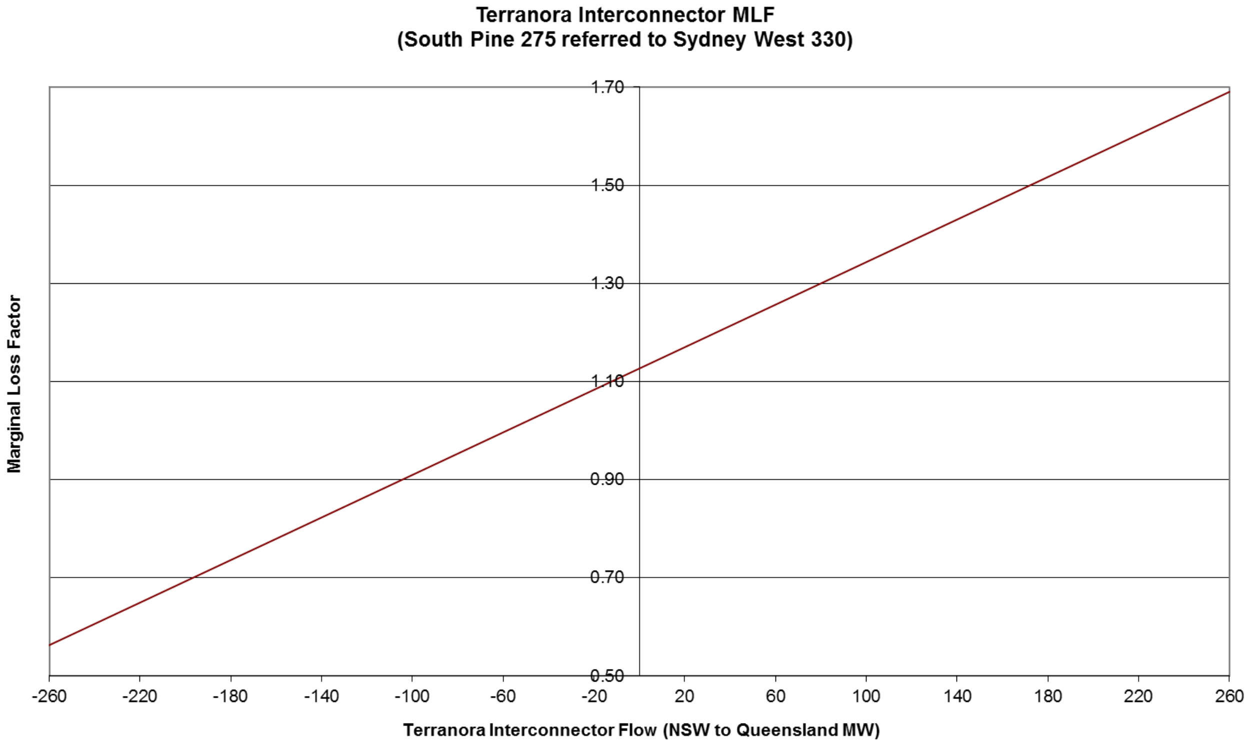


Figure D3: South Pine 275 referred to Sydney West 330 marginal loss factor versus Terranora interconnector flow (NSW to Queensland)

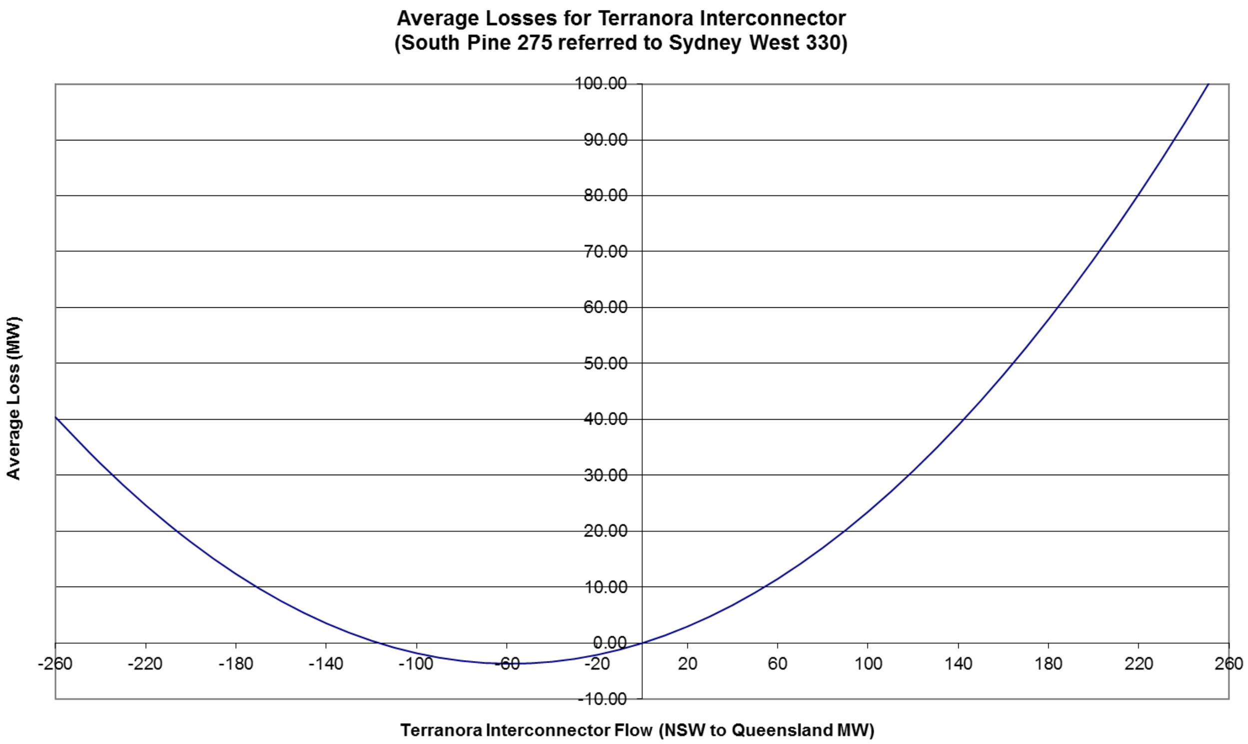


Figure D4: Terranora interconnector notional link losses versus flow (NSW to Queensland)

11 Appendix E: The proportioning of Inter-regional Losses to Regions for 2013/14

The AEMO dispatch engine (NEMDE) implements inter-regional loss factors by allocating the inter-regional losses defined by the equations in Appendix C to the two regions associated with the notional interconnector.

The factors used to proportion the inter-regional losses to the two regions are calculated by supplying an increment of load at one RRN from the second RRN. The incremental changes to the inter-regional losses in each region can be found from the changes to the interconnector flow and additional generation at the second RRN. The proportion of inter-regional losses in each region is then averaged over various system conditions to produce a single static factor. A detailed description of the process is defined in the AEMO document “Proportioning Inter-Regional Losses to Regions”, which is available on the AEMO website.

The document “Proportioning Inter-Regional Losses to Regions” specifies the calculation of the proportioning of the inter-regional losses to regions. This document is available from the AEMO website at: http://www.aemo.com.au/electricityops/701.html.

The following table provides the factors that will be used to proportion the inter-regional losses to the associated regions for the 2013/14 financial year.

Notional interconnector	Proportioning factor	Applied to
Queensland – New South Wales (QNI)	0.34	New South Wales
Queensland – New South Wales (Terranora Interconnector)	0.39	New South Wales
Victoria – New South Wales	0.39	New South Wales
Victoria – South Australia (Heywood)	0.84	Victoria
Victoria – South Australia (Murraylink)	0.81	Victoria

12 Appendix F: Regions and Regional Reference Nodes

Regional Reference Nodes

Region	Regional Reference Node
Queensland	South Pine 275kV node
New South Wales	Sydney West 330kV node
Victoria	Thomastown 66kV node
South Australia	Torrens Island Power Station 66kV node[8]
Tasmania	George Town 220 kV node

Physical Location of Region Boundary Metering Points

The physical metering points defining the region boundaries are located at:

- **Between the Queensland and New South Wales regions**
  - At Dumaresq Substation on the 8L and 8M Dumaresq to Bulli Creek 330kV lines[9];
  - 10.8km north of Terranora on the two 110kV lines between Terranora and Mudgeeraba (lines 757 & 758). Metering at Mudgeeraba adjusted for that point.
- **Between the New South Wales and Victorian regions**
  - At Wodonga Terminal Station (WOTS) on the 060 Wodonga to Jindera 330kV line;
  - At Red Cliffs Terminal Station (RCTS) on the Red Cliffs to Buronga 220kV line;
  - At Murray Switching Station on the MSS to UTSS 330kV lines;
  - At Murray Switching Station on the MSS to LTSS 330kV line;
  - At Guthega Switching Station on the Guthega to Jindabyne PS 132kV line;
  - At Guthega Switching Station on the Guthega to Geehi Dam Tee 132kV line.
- **Between the Victorian and South Australian regions**
  - At South East Switching Station (SESS) on the SESS to Heywood 275kV lines.
  - At Monash Switching Station (MSS) on the Berri (Murraylink) converter 132kV line.
- **Between the Victorian and Tasmanian regions**

  Basslink is not a regulated interconnector; rather it is an MNSP with the following metering points allocated:
  - At Loy Yang 500 kV Power Station.
  - At George Town 220 kV Switching Station.

[8] AEMO was recently advised of a requirement to split the Torrens Island 66kV bus in the South Australia region. This has not been included in the network representation for the 2013/14 MLFs

[9] The metering at Dumaresq is internally scaled to produce an equivalent flow at the NSW/Queensland State borders.