NEMMCO

National Electricity Market
Management Company Limited
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List of Regional Boundaries and Marginal Loss Factors for the 2008/09 Financial Year

Prepared by: System Operations Planning and Performance

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Date	Document Version	Amendments
20/03/08	DRAFT	Issued via NEM communication.
01/04/08	v1.0	Notice issued via NEM communication and document published on NEMMCO website.
	v2.0	Recalculation of Tasmanian MLFs due to incorrect advice from the NEM Participant of Bell Bay 1 and 2 plant retirements. Loss factors recalculated at NTNR & NTNR1C due to a data error in the direction of flow for the Terranora interconnector. Ex-Snowy connection points removed: NMur5, NMur7, NMur9, NMur11, & NMur13.
11/11/08	v3.0	Recalculation of Wattle Point Wind Farm (SSYP) and Dalrymple load (SDAL) loss factors due to Wattle Point Wind Farm being incorrectly calculated at Wattle Point rather than its registered connection point at Dalrymple Correction of TNI and Connection Point ID's for Sithe, Condamine, Isis Co-Gen and Braemar Stage 2 Power Station Inclusion of Colongra Power Station, Ti Tree BioReactor Embedded Generator and Bolingbroke load loss factors

Disclaimer

Purpose

This report has been prepared by NEMMCO for the sole purpose of producing Intra-Regional transmission loss factors and Inter-Regional loss factor equations to apply for the 2008/09 financial year pursuant to clause 3.6 of the Rules.

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1. Rules requirements

Clause 3.5 of the National Electricity Rules (referred to as the Rules) requires NEMMCO 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 NEMMCO to calculate Intra-Regional transmission loss factors and Inter-Regional loss factor equations by April 1st 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.

1.1 Inter-regional loss factor equations

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

1.2 Intra-regional loss factors

The Rules require NEMMCO to calculate a volume weighted average (intra-regional) loss factor and the associated standard deviation for each transmission network connection point. NEMMCO must publish the intra-regional loss factors and data standard deviations.

Under the National Electricity Rules, the use of virtual transmission nodes (VTNs) was gazetted on 1 November 2001. In accordance with these Rule changes, NEMMCO have 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 4.

1.3 Forward-looking Loss Factors

New Rules clauses came into effect on 1 January 2004 that requires NEMMCO 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].

[1] "Methodology for Calculating Forward-Looking Transmission Loss Factors: Final Methodology", 12 August 2003, available on the NEMMCO Website at http://www.nemmco.com.au/psplanning/psplanning.html#loss

2. Application of the forward-looking loss factor methodology for 2008/09 financial year

This section describes the process followed in applying the forward-looking loss factor methodology calculation of the marginal loss factors for 2008/09 financial year. Further details for the forward-looking loss factor methodology can be found in the methodology document on NEMMCO's website[1].

The Snowy region will be abolished as of 1 July 2008, therefore this report reflects the removal of Snowy region by relocating the previous Snowy connection points to Victoria or New South Wales regions as determined by the AEMC. The previous Snowy and Victoria – Snowy interconnectors have also been replaced with a single Victoria – New South Wales interconnector.

2.1 Overview of the Forward-looking Loss Factor Methodology

The forward-looking loss factor methodology developed by NEMMCO is based on the principle of "minimal extrapolation". An overview of the new methodology is to:

- develop a load flow model of the transmission network that includes committed augmentations for the year loss factors apply;
- 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 methodology[1]; 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.

2.2 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, Snowy, Victoria and South Australia regions for the period of 1 July 2004 to the 30 June 2005 has been obtained from the NEMMCO settlements database. For the Tasmania region Transend has obtained these data from the Transend and Hydro Tasmania historical database.
2. The historical load data was sent to the relevant TNSPs where required. The TNSPs developed forecast connection point load traces for the 2008/09 financial year by scaling the historical data. The forecast connection point load traces for 2008/09 was then sent to NEMMCO to be used in the actual loss factors calculations.

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 2007 Statement of Opportunities (SOO) and the update to the 2007 SOO.
6. The historical generation availability and on/off status data was extracted from NEMMCO's Market Management Systems (MMS) for the Queensland, New South Wales, Snowy, Victoria, Tasmania and South Australia regions.
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 is given in Section 2.16.

2.3 Connection point definitions

A list of new connection points that have been established for 2008/09 is given in the table in Appendix G. These connection points have been registered in NEMMCO's MMS and a loss factor has been calculated for each of them for 2008/09 in Appendix A.

2.4 Connection point load data

As described in section 2.2, Powerlink, TransGrid, Energy Australia, Country Energy, VENCorp, Transend and ESIPC provided NEMMCO with the forecast connection point load data that was used for Queensland, New South Wales, Victoria, South Australia and Tasmania respectively, in accordance with section 5.2.2 of the Forward-looking loss factor Methodology[1]. The SOO 2007 load growth rates were used to perform the due diligence on the forecast connection point loads.

<u>Amendments to the forecast load data</u>

Forecast of connection point loads is based on the historical data from the 2006/07 financial year. However, in New South Wales, no historical data is available for the following Energy Australia connection points:

Bunnerong 132	Bunnerong 33	Chullora 132	Campbell St 11
Campbell St 132	Canterbury 33	Drummoyne 11	Gosford 33
Gosford 66	Green Square 11	West Gosford 11	Homebush Bay 11
Lane Cove 132	Meadowbank 11	Marrickville 11	Mason Park 132
Macquarie Park 11	Mount Colah 132	Ourimbah 33	Peakhurst 33
Pyrmont 132	Pyrmont 33	Rozelle 132	Rozelle 33
Somersby 11	St Peters 11		

The metered energy was not recorded in the NEMMCO settlements database for the 2006/07 financial year. Rather they were included in the metered data at TransGrid substations (bulk supply points) at Sydney East 132, Sydney West 132, Sydney South 132, Sydney North 132 and Newcastle 132.

TransGrid provided the forecast for their substations. Then as part of their forecast, Energy Australia amended and rationalised TransGrid forecast at the bulk supply points by assigning the appropriate portion of the load to their individual downstream connection points.

2.5 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 NEMMCO 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 and 500 kV networks 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 2.7. The snapshot is thus representative of the 2008/09 system normal network.

2.6 Treatment of Yallourn Unit 1

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

VENCorp, in consultation with Yallourn, prepared a forecast of switching for Yallourn unit 1 reflecting its anticipated operation for the loss factors calculations. 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.

2.7 Network augmentations for 2008/09 financial year

The following network augmentations have been advised by the relevant TNSPs in each region of the NEM for 2008/09.

<u>Queensland</u>

Powerlink advised the following major augmentations to be completed in 2008/09 in Queensland:

- Woree 275kV transmission reinforcement
- Establish 110/33kV Mudgeeraba substation
- Reconfiguration of West Darra transmission lines – Stage 1

- Establish new 330kV Middle Ridge – Millmerran feeder
- Browns Plains 110kV reinforcement
- Wide Bay area supply reinforcement – Tee Bar Creek substation establishment
- Establish Kearney Springs 110kV substation
- Establish QAL South 132kV substation
- Establish Myrtletown 110/33kV substation
- North Queensland transmission reinforcement – Stage 1
- Replacement of Maryborough 132/66kV transformers 2 and 3
- QAL 132/11kV transformer No's 2 and 3 replacement
- Establish El Arish 132/22kV substation
- Establish Cairns North 132/22kV substation
- Egans Hill 132kV line reinforcement
- Installation of Runcorn 110/33kV 80 MVA transformer No.3
- Establish Yabulu South 132kV substation
- Establish QR Transit Centre 110/25kV substation
- Installation of 2 x 40 MVAr Wellington Road 110kV capacitor banks
- Establish Abermain 275kV substation
- North Queensland transmission reinforcement – Stage 2
- Installation of Woolooga 275kV SVC
- Installation of Greenbank 275kV SVC
- Far North Queensland rebuild; Innisfail – Edmonton, Cairns – Turkinje
- Alligator Creek 132kV substation extension to Louisa Creek
- Far North Queensland rebuild – line switching at Ingham South
- Establish Merrimac 132/11kV substation
- Postponement of Richlands West 110/11kV substation establishment

New South Wales

TransGrid, Energy Australia and Country Energy advised the following major augmentations to be completed in 2008/09 in New South Wales:

- Establish new Tuggerah 330kV - 132kV substation
- Establish new Tallawarra 132kV Generator Connection
- Establish new Macksville 132kV substation
- Establish new Raleigh 132kV substation
- Establish new West Sawtell 132kV substation
- Establish new Macarthur 132kV and 66kV substations

- Establish new Wagga North 132kV substation
- Establish new Williamsdale 132kV substation
- Establish new Sydney North – Tuggerah – Munmorah 330kV connection
- Reconstruction of Yass – Wagga 132kV connection
- Reconfiguration of Bayswater – Mt. Piper 500kV connection
- Rearrangement of Haymarket – Sydney City 132kV connections
- Modification of Marulan – Avon 330kV connection
- Modification of Marulan – Dapto 300kV connection
- Rearrangement of Wagga132 132kV area to include Wagga North 132kV connection
- Establish new Glen Innes – Inverell 132kV connection
- Rearrangement of Kemps Creek – Avon 330kV connection to include new Macarthur substation
- Rearrangement of Mt. Piper132 – Orange 132kV connection to include disconnection of Orange Tee 132kV
- Reconfiguration of Queanbeyan – Yass Tee 132kV connection
- Rearrangement of Canberra – Cooma 132kV connection to include new Williamsdale substation
- Finley 132/66kV 30 MVA transformer No.2 replaced with 132/66kV 60MVA transformer
- Tuggerah No.2 330/138.6/11kV transformer installation
- Gadara No.2 132/11/11kV transformer installation
- Kempsey 132/33/11kV 30 MVA transformer No's. 1 and 2 replaced with 132/33/11kV 60 MVA transformers
- Armidale No.4 138/142kV 200 MVA transformer installation
- Bayswater TIE1 and TIE2 525/345/34.5kV 1650 MVA transformer installations
- Mt. Piper TIE1 525/345/34.5kV 1650 MVA transformer installation
- Sydney South 330/138/11kV transformer No.2 replaced with 330/138/11kV 375 MVA transformer
- Marulan No.3 330/138/11kV 200 MVA transformer installation
- Bayswater 350/23kV 390 MVA transformers 4A and 4B replaced with 530/23kV 390 MVA transformers
- Macarthur No.1 330/138.6/11 375 MVA transformer installation
- Macarthur No.3 330/69.3/11 250 MVA transformer installation
- Orange 132/66kV 30 MVA transformers No's 1,2,3 replaced with 132/66/11kV 60 MVA transformers No's 1 and 3.
- Sydney East No.4EST 330/138.6/11kV 375 MVA transformer installation
- Williamsdale No.1 330/138.6/11kV 375 MVA transformer installation

- Beryl 8 MVAr 66kV capacitor bank installation
- Queanbeyan No.1 10 MVAr 66kV capacitor bank replaced with 8 MVAr capacitor bank
- Queanbeyan No.2 8 MVAr 66kV capacitor bank installation
- Sydney North 2 x 200 MVAr 330kV capacitor bank installation
- Sydney East 2 x 200 MVAr 330kV capacitor bank installation
- Replacement of No.1 150 MVAr reactor at Sydney South 330kV with new equipment
- New 50 MVAr reactor at Wellington 330kV
- New 2 x 150 MVAr reactors at Bayswater 33kV
- New 150 MVAr reactor at Mt. Piper 33kV
- Establish a new 132 kV connection point off Wagga 132 kV bus in NSW for Uranquinty Power Station, with four generators, each with a capacity of 153 MW.

Victoria

VENCorp advised the following major augmentations to be completed in 2008/09 in Victoria.

- Establish a third 66/22 kV transformer at APM, to supply the existing 22 kV load. Open the No. 1 – No. 2 66 kV bus tie at MWTS.
- Establish a second 500/220 kV 1000 MVA transformer in parallel with the existing unit at Moorabool Terminal Station.
- Hazelwood substation reconfigured as follows:
    - HWPS No. 3 – No. 4 220 kV bus tie CBs normally open
    - HWPS-JLTS No. 2 220 kV line normally switched on
    - New line reactors at JLGS/A & JLGS/B
- Establish a new 66 kV connection point with two 225 MVA 220/66 kV transformers and load transfer from TTS No.1,2 and TTS No.3,4 66 kV buses.
- Further extend the capacity of Portland wind farm with four additional generators, taking the total capacity to 176 MW.
- Establish a new connection point at Heywood using the tertiary windings of the existing 500/275/22 kV transformers.
- At Ringwood Terminal Station:
    - Replacement of the two existing 220/22 kV transformers with new 75 MVA units.
    - Removal of existing 66/22 kV tie-transformer
    - Existing 22 kV circuit breaker for 220/22 kV transformer L2 normally closed.

South Australia

ElectraNet advised the following major augmentations to be completed in 2008/09 in South Australia:

- Reconfiguration of the Tailem Bend-Para 275 kV double circuit lines and the Cherry Gardens-Robertstown 275 kV double circuit lines to establish the Tungkillo 275 kV Switching Station. The new configuration is as follows:
  - Robertstown – Para 275 kV line
  - Robertstown – Tungkillo 275 kV line
  - Para – Tungkillo 275 kV line
  - Cherry Gardens – Tailembend 275 kV line
  - Cherry Gardens – Tungkillo 275 kV line
  - Tailembend – Tungkillo 275 kV line
- Olympic Dam West 275/132/11 kV 140 MVA transformer installation
- Magill 275/66/11 kV 225 MVA transformer installation
- Baroota 132/33/11 kV 10 MVA transformer modified
- Keith132/33/11 kV 26 MVA transformer modified
- Lake Bonney wind farm generation configuration:
  - Connected to Mayura 132/33 kV Transformer #1: 80.5 MW Stage 1, 39 MW Stage 2.
  - Connected to Mayura 132/33 kV Transformer #2: 120 MW Stage 2.

Tasmania

Transend advised the following major augmentations to be completed in 2008/09 in Tasmania:

- Modification of Norwood – Scottsdale 110 kV line.
- Modification of Norwood – Scottsdale Tee – Derby line.
- Modification of Scottsdale Tee – Scottsdale 110 kV line section.
- Modification of Burnie – Port Latta 110 kV line.
- Modification of Burnie – Smithton 110 kV line.
- Upgrade of Port Latta Tee – Smithton 110 kV line.
- Upgrade and change of operating status to normally closed of Electrona – Knights Road 110 kV line.
- Modification of Chapel Street – Kingston Tee 1 110 kV line section.
- Modification of Chapel Street – Kingston Tee 2 110 kV line section.
- Modification of Electrona – Kingston Tee 2 – Kingston 110 kV line.
- Modification of Waddamana – Bridgewater Tee 110 kV line.
- Decommissioning of Waddamana – Lindisfarne 110 kV line.

- Establish new No.5 25 MVA 110/22 kV transformer at Electrona.
- Establish new No.1 50 MVA 110/22 kV transformer at Mowbray.
- Modification of Georgetown No.2 and No.3 220/110 kV transformers.
- Modification of Triabunna No.1 and No.2 110/22 kV transformers.
- Modification of Palmerston No.4 110/22 kV transformer.
- Modification of Derwent Bridge No.1 110/22 kV transformer.
- Modification of Queenstown No.3 and No.4 110/11 kV transformers.
- Modification of Que No.1 110/22 kV transformer.
- Establish new 2 x 28.9 MVAr 110 kV capacitors at Lindisfarne.
- Establish new 4 x 2.5 MVAr 11kV capacitors at Chapel Street.
- Establish new 2 x 2.5 MVAr 11kV capacitors at Knights Road.
- Establish new 2 x 4.7 MVAr 22kV capacitors at Railton.
- Establish new 2 x 2.5 MVAr 11kV capacitors at Electrona.
- Establish new 4 x 4.7 MVAr 22kV capacitors at Trevallyn.
- Establish new 2 x 4.7 MVAr 22kV capacitors at Hadspen.
- Establish new 2 x 4.7 MVAr 22kV capacitors at Mowbray.
- Establish new 1 x 4.7 MVAr 22kV capacitors at Smithton.
- Establish new 1 x 4.7 MVAr 22kV capacitors at Port Latta.
- Establish new 1 x 4.7 MVAr 22kV capacitors at Ulverston.

2.8 Treatment of Basslink

Basslink is a Market Network Service that consists of a new 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, NEMMCO assumed the flow is zero (not more than 1 MW) for the Basslink prior to the historical data being available. The loss model for Basslink is provided in Appendix D.

2.9 Treatment of the Regulated Terranora Interconnector (previously Directlink)

From 21 March 2006 Terranora Interconnector (previously Directlink) has been operating as a regulated interconnector. In accordance with section 5.3 of the forward-looking loss factor methodology, NEMMCO has treated the Terranora interconnector as a controllable regulated network element in parallel with the regulated Queensland to New South Wales Interconnector.

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

2.10 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, NEMMCO 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.

2.11 New and Recently Commissioned Generating Units

The Tallawarra Power Station gas turbine is due to be commissioned in June 2008. In accordance with section 5.4.2 of the forward-looking loss factor methodology, NEMMCO estimated the dispatch of this generator from the historical dispatch of Swanbank E and Pelican Point generating units. These units were chosen because they use similar technology and fuel, and are less than 5 years older than the new unit.

Uranquinty Power Station gas turbines are to be commissioned in November 2008. In accordance with section 5.4.2 of the forward-looking loss factor methodology, NEMMCO estimated the dispatch of this generator from the historical dispatch of Valley Power and Somerton generating units. These units were chosen because they use similar technology and fuel, and are less than 5 years older than the new unit.

Three generating units of the five Braemar Power Station Stage 2 plan are to be commissioned in June 2009. In accordance with section 5.4.2 of the forward-looking loss factor methodology, NEMMCO estimated the dispatch of this generator from the historical dispatch of Braemar Power Station Stage 1 generating units.

The Condamine gas turbines are due to be progressively commissioned from February 2009. In accordance with section 5.4.2 of the forward-looking loss factor methodology, NEMMCO estimated the dispatch of this generator from the historical dispatch of Swanbank E and Pelican Point generating units. These units were chosen because they use similar technology and fuel, and are less than 5 years older than the new unit.

NEMMCO obtained the dispatch of the new wind generation from the proponents of the new wind farms. The new wind generation expected to be commissioned during 2008/09 include Portland Wind Energy Project Stage 2, Hallett (Brown Hill), Lake Bonney Stage 2, Snowtown and Woolnorth/Studland Bay wind farms.

2.12 Generator Unit Capability

In accordance with section 5.5.3 of the forward-looking loss factor methodology, NEMMCO estimates 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 2007 Statement of Opportunities, NEMMCO estimated the sent-out summer and winter generator terminal capacities.

2.13 Embedded Generation

The majority of embedded generators are non-market and non-scheduled generators and hence do not require MLFs for settlement purposes. Only when embedded generators are registered as market generators are MLFs required. The MLFs for these generators are calculated for the connection points where the distribution networks they are embedded in take power from the transmission network. Between these transmission connection points and where these generators are located in the distribution networks there are further losses. These losses in the distribution networks are settled by means of Distribution Loss Factors (DLFs), which are calculated by DNSPs and approved by the Australian Energy Regulator (AER) annually.

In determining the spot price from the generation dispatch, the MLF of a scheduled embedded generator has to be adjusted by its DLF to reflect its offer price at the reference node. Up until the end of the 2007/2008 financial year, the MLF associated with the scheduled embedded generators has 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 will be separately defined in MMS for dispatch purposes only, and the DLF for settlement purposes will be applied in the Market Settlement and Transfer Solution (MSATS) as per all other market connection points (i.e. the generated energy will be 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 2008/09 Financial Year" document which is available on NEMMCO's website.

2.14 Interconnector Capability

In accordance with section 5.5.4 of the forward-looking loss factor methodology, NEMMCO estimates the following nominal interconnector limits for summer peak, summer off-peak, winter peak and winter off-peak periods. NEMMCO sought feedback from the associated TNSPs to ensure that these limits are suitable.

Interconnector limits assumed for the MLF calculation 2008/09:

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	1300	1300	1300	1300
Victoria	New South Wales	1500	1500	1500	1500
Victoria	South Australia	460	460	460	460
South Australia	Victoria	300	300	300	300
Murraylink Vic	South Australia	220	220	220	220
Murraylink SA	Victoria	30	120	70	120
Terranora Interconnector Qld	NSW	55	135	180	180
Terranora Interconnector NSW	Qld	135	175	145	180
* 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 they refer 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 new controllable network element that transfers power between the Tasmania and Victoria regions.

2.15 Data accuracy and due diligence of the forecast data

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

The historical connection point data has already been 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 can be used to indicate large errors in the data.

Once convinced that the data is reasonable and consistent using this checking method, the historical load data is sent to the relevant TNSPs upon request, to generate forecast loads for 2008/09.

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 SOO 2007 for 2008/09 financial year;
- Check that load shapes are consistent with load profile of the historical year 2006/07;
- Check that the forecast for connection points include the relevant embedded generation, if any;
- Check that industrial and auxiliary type loads are not escalated;
- Check that Energy Australia's forecast is consistent with TransGrid forecast for bulk supply connection points for all connection points on the TransGrid/Energy Australia transmission boundary.

2.16 Calculation of intra-regional loss factors

NEMMCO uses the TPRICE[2] software package to calculate the loss factors because of its ability to handle large data sets. VENCorp, TransGrid, ElectraNet SA and Powerlink Queensland also use versions of this package.

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

- The half hourly forecast load and historical generator data, unit capacity and availability data together with interconnector data, is 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, unit capacity and availability data, together with interconnector data is 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

[2] 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.

point load weighting. The standard deviation for each loss factor is also calculated.

- 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 2008/09 financial year are tabulated in Appendix A.

2.17 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 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 2008/09 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 NEMMCO 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.

2.18 Loss models for Controllable Links

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

2.19 Proportioning Inter-regional Losses to Regions

Appendix E contains the factors used to apportion the inter-regional losses to he associated regions for the 2008/09 financial year.

3. Differences in loss factors compared to the 2007/08 financial year

3.1 Queensland

The transmission reinforcements in North and Central Queensland have resulted in a significant reduction of loss factors in these areas.

In addition, the reduction in generation from Tarong and Swanbank Power Stations due to the drought has reduced the transfer to Central and North Queensland, further reducing the loss factors. The Queensland to New South Wales transfer has also reduced.

There is also a moderate reduction in loss factors around the Gold Coast and Middle Ridge areas due to reinforcement at Middle Ridge and Greenbank.

In general there is a slight reduction in loss factors for all areas due to the lower load growth forecast.

3.2 New South Wales

There is a high load growth forecast in Northern New South Wales. This combined with the effect of lower Queensland to New South Wales transfer has resulted in higher loss factors in the area.

Loss factors in other parts of New South Wales are not significantly different to the 2007/08 values. The differences in these loss factors are of a similar magnitude to those that are normally observed from one financial year to the next due to load growth and generation change.

The near energy balance between the Generation and the Pumps at Lower Tumut has resulted in a loss factor of 5.8319. Publishing this would distort the dispatch and pricing process. Therefore NEMMCO is publishing the time-weighted loss factor.

A better approach and which is recommended in the FLLF methodology is to calculate separate MLFs for the generation and pump. But the Rules requires establishing separate connection points for each of the MLFs. In addition, there are a number of issues including the legitimacy of having separate connection points for a generator-pump configuration that is the same unit.

NEMMCO will commence a consultation on changes to the MLF methodology to calculate the MLFs using time-averaging in such circumstances.

3.3 Victoria

A number of connection points near Murraylink have lower loss factors due to higher transfer from South Australia.

Loss factors in a number of hydro generation stations have been affected due to the drought.

Higher Basslink transfer from Tasmania resulted in higher interconnector transfers from Victoria to South Australia under high load conditions, and viceversa new wind farm installations in South Australia resulted in higher transfers from South Australia to Victoria under light load conditions.

Loss factors in other parts of Victoria are not significantly different to the 2007/08 values. The differences in these loss factors are of a similar magnitude to those that are normally observed from one financial year to the next due to load growth and generation change.

3.4 South Australia

Loss factors of connection points around the Murraylink area have significantly increased due to higher transfer from South Australia to Victoria.

Increased loss factors around the southern area near Snuggery has also been observed due to higher than average load growth forecast in the area, the reduction in generation of Snuggery Power Station as well as higher interconnector transfers to Victoria from excess wind farm generation.

The addition of Snowtown Wind Farm generation has decreased loss factors surrounding the York Peninsula.

Lower loss factors have been observed around the Eyre Peninsula due to higher historical wind farm output used in the calculations in accordance with the FLLF Methodology.

Loss factors in other parts of South Australia are not significantly different to the 2007/08 values. The differences in these loss factors are of a similar magnitude to those that are normally observed from one financial year to the next due to load growth and generation change.

3.5 Tasmania

There is high Basslink export due to historical data used in accordance with the FLLF Methodology.

Differences in loss factors are of a similar magnitude to those that are normally observed from one financial year to the next due to load growth and generation change.

4. Virtual transmission nodes

Six virtual transmission nodes (VTNs) have been approved by the AER for use in the NEM. The methodology used to calculate the average transmission loss factor that applies for a VTN is available on the NEMMCO website[3]. The loss factors for the VTNs are included in Appendix A.

[3] http://www.nemmco.com.au/psplanning/psplanning.html#loss

4.1 New South Wales

In accordance with clause 3.6.2(b)(3) of the Rules, the AER has approved Energy Australia's application to define the three VTNs listed in the following table[4].

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

4.2 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.

4.3 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, Creek Road 33, Lindisfarne, North Hobart, Risdon 33 and Rokeby.
TVN2	Tamar Region	Hadspen, Mowbray, Norwood, Trevallyn, George Town 22

[4] 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 changes in the definitions of some Energy Australia's TNIs.

5. Region boundaries and regional reference nodes for 2008/09

Appendix F contains the list of regional reference nodes and region boundaries that apply for the 2008/09 financial year.

Appendix A: Intra-regional loss factors for 2008/09

1. Queensland (regional reference node is South Pine 275)

Location	Voltage	TNI code	2007/08	2008/09	
			Loss factor	Loss factor	Standard deviation
Abermain	33 kV	QABM	1.0162	0.9958	0.0033
Abermain (Lockrose)	110 kV	QABR	1.0085	0.9918	0.0031
Ashgrove West	33 kV	QAGW	1.0294	1.0385	0.0121
Alligator Creek	33 kV	QALC	1.0378	1.0284	0.0412
Alligator Creek	132 kV	QALH	-	0.9976	0.0309
Algester	33kV	QALG	1.0079	1.0099	0.0042
Alan Sherriff	132kV	QASF	1.0549	0.9924	0.0555
Belmont Wecker Road 33	33 kV	QBBS	1.0097	1.0019	0.0035
Bundamba	110 kV	QBDA	1.0044	0.9913	0.0031
Biloela	66/11 kV	QBIL	0.9183	0.9080	0.0279
Bulli Creek (CE)	132kV	QBK2	0.9751	0.9733	0.0133
Bulli Creek (Waggamba)	132kV	QBLK	0.9751	0.9733	0.0133
Belmont	110 kV	QBMH	1.0006	0.9987	0.0031
BSL 275kV	275 kV	QBOH	0.9639	0.9533	0.0323
BSL 132kV	132 kV	QBOL	0.9656	0.9554	0.0324
Burton Downs	132 kV	QBUR	1.0483	1.0104	0.0424
Blackwater	132 kV	QBWH	1.0034	0.9873	0.0406
Blackwater	66&11 kV	QBWL	1.0033	0.9889	0.0409
Bolingbroke	132 kV	QBNB	-	0.9565	0.0310
Brisbane CBD	110 kV	QCBD	1.0321	1.0405	0.0132
Cardwell	22 kV	QCDW	1.1050	1.0321	0.0564
Clare	66 kV	QCLR	1.0546	0.9901	0.0479
Callemondah (Rail)	132 kV	QCMD	0.9536	0.9438	0.0337
Cairns City	132 kV	QCNS	1.1284	1.0281	0.0555
Collinsville Load	33 kV	QCOL	1.0413	0.9661	0.0456
Coppabella (Rail)	132 kV	QCOP	1.0750	1.0371	0.0441
Cairns	22 kV	QCRN	1.1322	1.0303	0.0558
Dan Gleeson	66kV	QDGL	1.0615	0.9994	0.0536

Location	Voltage	TNI code	2007/08	2008/09	
			Loss factor	Loss factor	Standard deviation
Dingo (Rail)	132 kV	QDNG	0.9913	0.9742	0.0374
Dysart	66/22 kV	QDYS	1.0426	1.0276	0.0434
Egans Hill	66 kV	QEGN	0.9451	0.9360	0.0344
Kemmis	132kV	QEMS	1.0392	0.9999	0.0411
Edmonton	22 kV	QEMT	1.1380	1.0342	0.0567
El Arish	22 kV	QELA	-	1.0456	0.0545
Garbutt	66 kV	QGAR	1.0536	0.9871	0.0545
Gladstone	132 kV	QGLA	0.9550	0.9462	0.0334
Gin Gin	132 kV	QGNG	0.9727	0.9658	0.0221
Goodna	33kV	QGDA	1.0014	0.9939	0.0033
Gregory (Rail)	132 kV	QGRE	0.9883	0.9769	0.0408
Grantleigh (Rail)	132 kV	QGRN	0.9490	0.9473	0.0367
Gladstone South	66/11 kV	QGST	0.9509	0.9450	0.0323
Innisfail	22 kV	QINF	1.1229	1.0372	0.0567
Ingham	66 kV	QING	1.0860	0.9989	0.0588
Invicta Load	132 kV	QINV	1.0555	0.9805	0.0470
Kamerunga	22 kV	QKAM	1.1348	1.0171	0.0576
King Creek	132 kV	QKCK	1.0435	0.9685	0.0460
Lilyvale (Barcaldine)	132 kV	QLCM	0.9648	0.9700	0.0397
Loganlea (110kV Supplies)	110 kV	QLGH	1.0028	1.0001	0.0033
Loganlea	33 kV	QLGL	1.0083	1.0049	0.0040
Lilyvale	66 kV	QLIL	0.9862	0.9762	0.0405
Molendinar	110 kV	QMAR	1.0141	1.0057	0.0045
Moranbah South (Rail)	132 kV	QMBS	1.0721	1.0335	0.0438
Mudgeeraba	110 kV	QMGB	1.0157	0.9957	0.0042
Mackay	33 kV	QMKA	1.0368	1.0106	0.0385
Moura	66/11 kV	QMRA	0.9580	0.9421	0.0303
Murarrie (Belmont)	110kV	QMRE	1.0017	0.9962	0.0035
Middle Ridge (Ergon)	110 kV	QMRG	0.9779	0.9777	0.0078
Middle Ridge (Energex)	110 kV	QMRX	0.9779	0.9777	0.0078
Mindi (Rail)	132 kV	QMND	1.0095	0.9734	0.0394

Location	Voltage	TNI code	2007/08	2008/09	
			Loss factor	Loss factor	Standard deviation
Moranbah (Town)	11 kV	QMRL	1.0718	1.0353	0.0446
Moranbah (Mine)	66 kV	QMRN	1.0735	1.0334	0.0444
Mt McLaren (Rail)	132 kV	QMTM	1.0790	1.0483	0.0447
Nebo	11 kV	QNEB	1.0067	0.9712	0.0390
North Goonyella	132 kV	QNGY	1.0705	1.0229	0.0448
Newlands	66 kV	QNLD	1.0770	1.0206	0.0462
Norwich Park (Rail)	132 kV	QNOR	1.0134	1.0019	0.0418
Oonooie (Rail)	132 kV	QOON	1.0408	1.0152	0.0407
Pioneer Valley	66 kV	QPIV	1.0337	1.0074	0.0401
Peak Downs (Rail)	132 kV	QPKD	1.0588	1.0306	0.0445
Proserpine	66 kV	QPRO	1.0617	1.0074	0.0431
Palmwoods	132/110 kV	QPWD	1.0111	1.0097	0.0034
QAL (Gladstone South)	132kV	QQAH	0.9558	0.9464	0.0331
QLD Nickel (Yabulu)	132kV	QQNH	1.0507	0.9920	0.0572
Runcorn	33 kV	QRBS	1.0092	1.0081	0.0040
Rocklands (Rail)	132 kV	QRCK	0.9449	0.9344	0.0362
Richlands	33 kV	QRLD	1.0164	1.0125	0.0045
Rocklea (Archerfield)	110 kV	QRLE	1.0061	1.0055	0.0031
Rockhampton	66 kV	QROC	0.9538	0.9469	0.0343
Ross	132 kV	QROS	1.0656	0.9961	0.0527
Redbank Plains	11 kV	QRPN	1.0009	0.9927	0.0032
Swanbank (Raceview)	110 kV	QSBK	0.9962	0.9887	0.0034
South Pine	110 kV	QSPN	1.0069	1.0050	0.0013
Stony Creek	132 kV	QSYC	1.0530	0.9891	0.0453
Sumner	110kV	QSUM	1.0091	1.0114	0.0047
Tangkam (Dalby)	110kV	QTKM	0.9803	0.9772	0.0088
Tully	22 kV	QTLL	1.1287	1.0456	0.0572
Teebar Creek	132 kV	QTBC	0.9814	0.9859	0.0155
Tennyson (Rail)	110 kV	QTNN	1.0091	1.0083	0.0032
Tennyson	33 kV	QTNS	1.0114	1.0107	0.0044
Tarong 132kV Load	132 kV	QTRH	0.9667	0.9676	0.0067

Location	Voltage	TNI code	2007/08	2008/09	
			Loss factor	Loss factor	Standard deviation
Tarong 66kV Load	66 kV	QTRL	0.9675	0.9686	0.0066
Turkinje (Craiglee)	132 kV	QTUH	1.1293	1.0393	0.0565
Turkinje	66 kV	QTUL	1.1309	1.0409	0.0570
Townsville East	66 kV	QTVE	-	0.9904	0.0500
Townsville South	66 kV	QTVS	1.0683	1.0032	0.0577
Townsville South (KZ)	132kV	QTZS	1.0883	1.0075	0.0514
Wandoo (Rail)	132 kV	QWAN	1.0117	0.9736	0.0395
Wivenhoe Pump	275kV	QWIP	0.9943	0.9937	0.0025
Woolooga (Energex)	132 kV	QWLG	0.9984	0.9895	0.0119
Woolooga (Ergon)	132 kV	QWLN	0.9984	0.9895	0.0119
Woree	132 kV	QWRE	1.0813	1.0263	0.0555

Generators

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
				Loss factor	Loss factor	Standard deviation
Wivenhoe Small Hydro	110kV	QABR1	QABR	1.0085	0.9918	0.0031
Barron Gorge PS Unit 1	132kV	QBGH1	QBGH	1.0695	0.9861	0.0545
Barron Gorge PS Unit 2	132kV	QBGH2	QBGH	1.0695	0.9861	0.0545
Braemar PS	275kV	QBRA1	QBRA	0.9629	0.9609	0.0113
Braemar PS	275kV	QBRA2	QBRA	0.9629	0.9609	0.0113
Braemar PS	275kV	QBRA3	QBRA	0.9629	0.9609	0.0113
Braemar Stage 2 PS Unit 5	275kV	QBRA5B	QBRA	-	0.9609	0.0113
Braemar Stage 2 PS Unit 6	275kV	QBRA6B	QBRA	-	0.9609	0.0113
Braemar Stage 2 PS Unit 7	275kV	QBRA7B	QBRA	-	0.9609	0.0113
Kogan Creek PS	275kV	QBRA4K	QBRA	0.9629	0.9609	0.0113
Callide A PS Load	132kV	QCAX	QCAX	0.9085	0.8997	0.0272
Callide A PS Unit 1	132kV	QCAA1	QCAA	0.9085	0.8997	0.0272
Callide A PS Unit 2	132kV	QCAA2	QCAA	0.9085	0.8997	0.0272
Callide A PS Unit 3	132kV	QCAA3	QCAA	0.9085	0.8997	0.0272
Callide A PS Unit 4	132kV	QCAA4	QCAA	0.9085	0.8997	0.0272
Callide B PS Unit 1	275kV	QCAB1	QCAB	0.9115	0.9049	0.0270
Callide B PS Unit 2	275kV	QCAB2	QCAB	0.9115	0.9049	0.0270
Callide C PS Unit 3	275kV	QCAC3	QCAC	0.9097	0.9041	0.0259
Callide C PS Unit 4	275kV	QCAC4	QCAC	0.9097	0.9041	0.0259
Collinsville PS Unit 1	132kV	QCVL1	QCVP	1.0253	0.9487	0.0469
Collinsville PS Unit 2	132kV	QCVL2	QCVP	1.0253	0.9487	0.0469
Collinsville PS Unit 3	132kV	QCVL3	QCVP	1.0253	0.9487	0.0469
Collinsville PS Unit 4	132kV	QCVL4	QCVP	1.0253	0.9487	0.0469
Collinsville PS Unit 5	132kV	QCVL5	QCVP	1.0253	0.9487	0.0469
Collinsville PS Load	132kV	QCLX	QCLX	1.0253	0.9487	0.0469
Gladstone PS (275 kV) Unit 1	275kV	QGLD1	QGLH	0.9434	0.9350	0.0301
Gladstone PS (275 kV) Unit 2	275kV	QGLD2	QGLH	0.9434	0.9350	0.0301
Gladstone PS (132 kV) Unit 3	132kV	QGLD3	QGLL	0.9415	0.9362	0.0314
Gladstone PS (132 kV) Unit 4	132kV	QGLD4	QGLL	0.9415	0.9362	0.0314

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
				Loss factor	Loss factor	Standard deviation
Gladstone PS (275 kV) Unit 5	275kV	QGLD5	QGLH	0.9434	0.9350	0.0301
Gladstone PS (275 kV) Unit 6	275kV	QGLD6	QGLH	0.9434	0.9350	0.0301
Gladstone PS (132kV) Load	132kV	QGLL	QGLL	0.9415	0.9362	0.0314
Kareeya PS Unit 1	11kV	QKAH1	QKAH	1.0808	0.9986	0.0533
Kareeya PS Unit 2	11kV	QKAH2	QKAH	1.0808	0.9986	0.0533
Kareeya PS Unit 3	11kV	QKAH3	QKAH	1.0808	0.9986	0.0533
Kareeya PS Unit 4	11kV	QKAH4	QKAH	1.0808	0.9986	0.0533
Koombooloomba	132kV	QKYH5	QKYH	1.0927	0.9996	0.0506
Mackay GT	33kV	QMKG	QMKG	0.9562	0.9568	0.0433
Millmerran PS Unit 1 (Millmerran)	330kV	QBCK1	QMLN	0.9725	0.9708	0.0106
Millmerran PS Unit 2 (Millmerran)	330kV	QBCK2	QMLN	0.9725	0.9708	0.0106
Mt Stuart PS Unit 1	132kV	QMSP1	QMSP	1.0367	0.9446	0.0829
Mt Stuart PS Unit 2	132kV	QMSP2	QMSP	1.0367	0.9446	0.0829
Oakey PS Unit 1	110kV	QOKY1	QOKY	0.9483	0.9389	0.0201
Oakey PS Unit 2	110kV	QOKY2	QOKY	0.9483	0.9389	0.0201
Stanwell PS Unit 1	275kV	QSTN1	QSTN	0.9320	0.9232	0.0349
Stanwell PS Unit 2	275kV	QSTN2	QSTN	0.9320	0.9232	0.0349
Stanwell PS Unit 3	275kV	QSTN3	QSTN	0.9320	0.9232	0.0349
Stanwell PS Unit 4	275kV	QSTN4	QSTN	0.9320	0.9232	0.0349
Stanwell PS Load	132kV	QSTX	QSTX	0.9320	0.9232	0.0349
Swanbank PS Load	110kV	QSW1	QSWB	0.9943	0.9887	0.0028
Swanbank B PS Unit 1	275kV	QSWB1	QSWB	0.9943	0.9887	0.0028
Swanbank B PS Unit 2	275kV	QSWB2	QSWB	0.9943	0.9887	0.0028
Swanbank B PS Unit 3	275kV	QSWB3	QSWB	0.9943	0.9887	0.0028
Swanbank B PS Unit 4	275kV	QSWB4	QSWB	0.9943	0.9887	0.0028
Swanbank E GT	275kV	QSWE	QSWE	0.9935	0.9885	0.0027
Tarong North PS	275kV	QTNT	QTNT	0.9661	0.9673	0.0067
Tarong PS Unit 1	275kV	QTRN1	QTRN	0.9663	0.9665	0.0071
Tarong PS Unit 2	275kV	QTRN2	QTRN	0.9663	0.9665	0.0071
Tarong PS Unit 3	275kV	QTRN3	QTRN	0.9663	0.9665	0.0071

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
				Loss factor	Loss factor	Standard deviation
Tarong PS Unit 4	275kV	QTRN4	QTRN	0.9663	0.9665	0.0071
Wivenhoe Pump 1	275kV	QWIP1	QWIP	0.9943	0.9937	0.0025
Wivenhoe Pump 2	275kV	QWIP2	QWIP	0.9943	0.9937	0.0025
Wivenhoe Generation Unit 1	275kV	QWIV1	QWIV	0.9890	0.9866	0.0021
Wivenhoe Generation Unit 2	275kV	QWIV2	QWIV	0.9890	0.9866	0.0021
Yabulu PS	132kV	QTYP	QTYP	1.0131	0.9668	0.0444

Embedded Generators

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
				Loss factor	Loss factor	Standard deviation
Barcaldine PS @ Lilyvale	132kV	QBCG	QBCG	0.9473	0.9305	0.0214
Oakey Creek Generator	66kV	QLIL1	QLIL	0.9862	0.9762	0.0405
Roma PS @ Tarong Unit 7	132kV	QRMA7	QRMA	0.9582	0.9598	0.0066
Roma PS @ Tarong Unit 8	132kV	QRMA8	QRMA	0.9582	0.9598	0.0066
Yabulu Steam Turbine (Garbutt 66kV)	66kV	QGAR1	QYST	1.0255	0.9711	0.0545
German Creek Generator	66kV	QLIL2	QLIL	0.9862	0.9762	0.0405
Rocky Point Gen (Loganlea 110kV)	110kV	QLGH2	QLGH	1.0028	1.0001	0.0033
Somerset Dam Hydro Gen (South Pine 110kV)	110kV	QSPN1	QSPN	1.0069	1.0050	0.0013
Stapylton (Loganlea 110kV)	110kV	QLGH1	QLGH	1.0028	1.0001	0.0033
Suncoast Gold Macadamias Co-Gen (Palmwoods 110kV)	110kV	QPWD1	QPWD	1.0111	1.0097	0.0034
Windy Hill Windfarm (Turkinje 66kV)	66kV	QTUL	QTUL	1.1309	1.0409	0.0570
Condamine PS	132kV	QCND1C	QCND	-	0.9691	0.0052
Daandine PS	110kV	QTKM1	QTKM	-	0.9772	0.0088

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
				Loss factor	Loss factor	Standard deviation
Isis CSM	132kV	QGNG1I	QTBC	0.9727	0.9859	0.0155
Paradise Dam	132kV	QGNG2P	QGNG	0.9727	0.9658	0.0221
KRC Co-Gen	110kV	QMRG1K	QMRG	0.9779	0.9777	0.0078
Moranbah Gen	11kV	QMRL1M	QMRL	1.0718	1.0353	0.0446
Ti Tree BioReactor	33kV	QABM1T	QABM	-	0.9958	0.0033

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

Loads

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Albury	132	NALB	1.0459	1.0460	0.0657
Alcan	132	NALC	1.0040	1.0051	0.0042
ANM	132	NANM	1.0438	1.0484	0.0596
Armidale	66	NAR1	0.8887	0.9160	0.0337
Balranald	22	NBAL	1.1335	1.1075	0.0751
Beryl	66	NBER	1.0079	0.9943	0.0061
Beaconsfield West	132	NBFW	1.0116	1.0100	0.0023
Bunnerong 132	132	NBG1	1.0200	1.0137	0.0081
Bunnerong 33	33	NBG3	1.0263	1.0204	0.0040
Broken Hill 22	22	NBKG	1.2024	1.1578	0.0924
Broken Hill 220	220	NBKH	1.1986	1.1558	0.0894
Beresfield	33	NBRF	1.0050	1.0045	0.0035
Burrinjuck	132	NBU2	1.0104	1.0197	0.0320
Carlingford	132	NCAR	1.0023	1.0030	0.0008
Casino	132	NCSN	0.9202	0.9537	0.0332
Coffs Harbour	66	NCH1	0.9108	0.9410	0.0345
Charmhaven	11	NCHM	0.9976	0.9898	0.0039
Chullora	132	NCHU	1.0137	1.0128	0.0024
Coleambally	132	NCLY	1.0650	1.0706	0.0594
Cooma 132 & 66	132	NCMA	1.0469	1.0395	0.0363
Canterbury	33	NCTB	1.0248	1.0236	0.0049
Cowra (CE)	66	NCW8	1.0396	1.0425	0.0246
Cowra (CE)	66	NCW9	1.0396	1.0425	0.0246
Deniliquin (CE)	66	NDN7	1.1160	1.1185	0.0682
Deniliquin (CE)	66	NDN8	1.1160	1.1185	0.0682
Darlington Point	132	NDNT	1.0626	1.0577	0.0606
Dorrigo	132	NDOR	0.9042	0.9471	0.0337
Drummoyne	11	NDRM	1.0201	1.0201	0.0042
Dapto (Integral)	132	NDT1	1.0066	1.0006	0.0072

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Dapto (CE)	132	NDT2	1.0066	1.0006	0.0072
Dunoon	132	NDUN	0.8972	0.9563	0.0298
Far North VTN (EA)		NEV1	0.9378	0.9470	-
North of Broken Bay VTN (EA)		NEV2	0.9959	0.9944	-
South of Broken Bay VTN (EA)		NEV3	1.0102	1.0089	-
Forbes	66	NFB2	1.0736	1.0587	0.0155
Finley	66	NFNY	1.1073	1.1067	0.0667
Gadara	132	NGAD	1.0272	1.0380	0.0424
Gosford 66	66	NGF3	1.0112	1.0005	0.0033
Glen Innes	66	NGLN	0.9092	0.9446	0.0334
Gunnedah	66	NGN2	0.9666	0.9880	0.0259
Griffith	33	NGRF	1.0835	1.0836	0.0621
Gosford 33	33	NGSF	1.0120	1.0018	0.0035
Green Square	11	NGSQ	1.0122	1.0101	0.0023
West Gosford	11	NGWF	1.0133	1.0025	0.0033
Homebush Bay	11	NHBB	1.0170	1.0173	0.0038
Haymarket	132	NHYM	1.0108	1.0095	0.0022
Ingleburn	66	NING	1.0007	0.9994	0.0017
Kemps Creek	330	NKCK	0.9976	0.9951	0.0020
Koolkhan	66	NKL6	0.9271	0.9625	0.0374
Kempsey 66	66	NKS2	0.9888	1.0069	0.0333
Kempsey 33	33	NKS3	0.9894	1.0067	0.0331
Kurri 33	33	NKU3	1.0037	1.0040	0.0037
Kurri 66	66	NKU6	1.0059	1.0063	0.0038
Kurri 132	132	NKUR	1.0299	0.9981	0.0037
Lane Cove	132	NLCV	1.0141	1.0147	0.0032
Liddell	33	NLD3	0.9406	0.9506	0.0079
Ilford	132	NLFD	0.9851	0.9826	0.0059
Liverpool	132	NLP1	1.0031	1.0035	0.0008
Lismore	132	NLS2	0.9116	0.9582	0.0323

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Meadowbank	11	NMBK	1.0184	1.0188	0.0038
Murrumbateman	132	NMBM	1.0105	1.0142	0.0286
Mudgee	132	NMDG	1.0029	0.9931	0.0058
Marrickville	11	NMKV	1.0195	1.0179	0.0040
Mullumbimby	132	NMLB	0.8863	0.9595	0.0300
Manildra	132	NMLD	1.0177	1.0146	0.0073
Munmorah	33	NMNP	0.9901	0.9870	0.0044
Molong	132	NMOL	1.0154	1.0126	0.0079
Mt Piper 66	66	NMP6	0.9634	0.9668	0.0071
Mason Park	132	NMPK	1.0138	1.0139	0.0029
Mt Piper 132	132	NMPP	0.9634	0.9668	0.0071
Macarthur	132	NMC1	-	0.9965	0.0026
Macarthur 66	66	NMC2	-	0.9974	0.0024
Macksville	132	NMCV	-	0.9938	0.0322
Macquarie Park	11	NMQP	1.0158	1.0168	0.0038
Marulan (IE)	132	NMR1	0.9923	0.9908	0.0111
Marulan (CE)	132	NMR2	0.9923	0.9908	0.0111
Moree	66	NMRE	1.0143	1.0312	0.0418
Muswellbrook	132	NMRK	0.9375	0.9465	0.0096
Murrumburrah	66	NMRU	1.0362	1.0371	0.0404
Munyang 11	11	NMY1	1.0691	1.0459	0.0465
Munyang 33	33	NMYG	1.0691	1.0459	0.0465
Nambucca Heads	132	NNAM	0.9351	0.9744	0.0350
Narrabri	66	NNB2	0.9988	1.0177	0.0328
Newcastle	132	NNEW	0.9913	0.9933	0.0044
Inverell	66	NNVL	0.9564	0.9772	0.0367
Ourimbah	33	NORB	1.0090	0.9963	0.0033
Peakhurst	33	NPHT	1.0134	1.0112	0.0024
Parkes 66	66	NPK6	1.0704	1.0511	0.0140
Parkes 132	132	NPKS	1.0682	1.0488	0.0127
Panorama	66	NPMA	1.0036	1.0192	0.0080

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Pt Macquarie	33	NPMQ	1.0392	1.0554	0.0323
Pyrmont 132	132	NPT1	1.0167	1.0167	0.0033
Pyrmont 33	33	NPT3	1.0153	1.0132	0.0028
Orange 132	132	NRG1	1.0176	1.0270	0.0079
Orange 66	66	NRGE	1.0222	1.0268	0.0091
Raleigh	132	NRAL	-	0.9611	0.0323
Regentville	132	NRGV	0.9976	0.9976	0.0006
Rozelle 132	132	NRZH	1.0188	1.0169	0.0004
Rozelle 33	33	NRZL	1.0171	1.0170	0.0033
Snowy Adit	132	NSAD	1.0486	1.0263	0.0453
Sydney East	132	NSE2	1.0085	1.0057	0.0019
Somersby	11	NSMB	1.0109	1.0011	0.0029
Sydney North (EA)	132	NSN1	1.0041	1.0055	0.0016
Sydney North (IE)	132	NSN2	1.0041	1.0055	0.0016
St Peters	11	NSPT	1.0161	1.0145	0.0031
Stroud	132	NSRD	1.0356	1.0409	0.0108
Sydney West (EA)	132	NSW1	1.0023	1.0030	0.0008
Sydney West (IE)	132	NSW2	1.0023	1.0030	0.0008
Sydney South	132	NSYS	1.0051	1.0021	0.0014
Tamworth	66	NTA2	0.9212	0.9396	0.0198
Tuggerah 132	132	NTG3	-	0.9915	0.0034
Tomago 330	330	NTMG	0.9881	0.9893	0.0048
Tomago 33	33	NTMJ	1.0118	1.0065	0.0035
Terranora	110	NTNR	0.9298	0.9480	0.0566
Taree (CE)	132	NTR2	1.0602	1.0764	0.0235
Tenterfield	132	NTTF	0.9115	0.9550	0.0330
Tumut	66	NTU2	1.0272	1.0423	0.0419
Vales Pt. 132	132	NVP1	0.9858	0.9845	0.0047
Vineyard	132	NVYD	0.9986	0.9988	0.0007
Wagga	132	NWG1	1.0407	1.0407	0.0567
Wagga	66	NWG2	1.0466	1.0422	0.0607

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Wagga North	132	NWG3	-	0.9959	0.0554
Wellington (CE)	132	NWL8	0.9985	0.9708	0.0065
Wellington (CE)	132	NWL9	0.9985	0.9708	0.0065
BHP (Waratah) [EA]	132	NWR1	0.9977	0.9956	0.0042
Wallerawang (CE)	132	NWW8	0.9647	0.9677	0.0068
Wallerawang (IE)	132	NWW9	0.9647	0.9677	0.0068
West Sawtell	132	NWST	-	0.9584	0.0324
Wyong	11	NWYG	1.0026	0.9933	0.0034
Yanco	33	NYA3	1.0722	1.0720	0.0614
Yass 132	132	NYS1	1.0025	1.0182	0.0202
Yass 66	66	NYS6	1.0109	1.0150	0.0287

Generators

Location	Voltage	Connection point ID	TNI code	2007/08	2008/09	
	kV			Loss factor	Loss factor	Standard deviation
Bayswater PS Unit 1	330	NBAY1	NBAY	0.9383	0.9478	0.0077
Bayswater PS Unit 2	330	NBAY2	NBAY	0.9383	0.9478	0.0077
Bayswater PS Unit 3	330	NBAY3	NBAY	0.9383	0.9478	0.0077
Bayswater PS Unit 4	330	NBAY4	NBAY	0.9383	0.9478	0.0077
Bayswater PS Load	330	NBAYL	NBAY	0.9383	0.9478	0.0077
Broken Hill GT 1	22	NBKG1	NBK1	1.2024	1.1578	0.0924
Broken Hill GT 2	22	NBKG2	NBK1	1.2024	1.1578	0.0924
Blowering	11	NBLW	NBLW	0.9815	1.0376	0.0359
Blowering Ancillary Services	11	NBLW1	NBLW	0.9815	1.0376	0.0359
Blowering	11	NBLW8	NBLW	0.9815	1.0376	0.0359
Burrinjuck	132	NBUK	NBUK	0.9854	1.0174	0.0308
Colongra PS Unit 1	330	NCLG1D	NCLG	-	0.9810	0.0048
Colongra PS Unit 2	330	NCLG2D	NCLG	-	0.9810	0.0048
Colongra PS Unit 3	330	NCLG3D	NCLG	-	0.9810	0.0048
Colongra PS Unit 4	330	NCLG4D	NCLG	-	0.9810	0.0048
Eraring 330 PS Unit 1	330	NEPS1	NEP3	0.9830	0.9818	0.0047
Eraring 330 PS Unit 2	330	NEPS2	NEP3	0.9830	0.9818	0.0047
Eraring 500 PS Unit 3	500	NEPS3	NEPS	0.9853	0.9837	0.0039
Eraring 500 PS Unit 4	500	NEPS4	NEPS	0.9853	0.9837	0.0039
Eraring PS Load	500	NEPSL	NEPS	0.9853	0.9837	0.0039
Hume (NSW Share)	132	NHUM	NHUM	1.0057	1.0703	0.0476
Liddell 330 PS Unit 1	330	NLDP1	NLDP	0.9387	0.9491	0.0077
Liddell 330 PS Unit 2	330	NLDP2	NLDP	0.9387	0.9491	0.0077
Liddell 330 PS Unit 3	330	NLDP3	NLDP	0.9387	0.9491	0.0077
Liddell 330 PS Unit 4	330	NLDP4	NLDP	0.9387	0.9491	0.0077
Liddell 330 PS Load	330	NLDPL	NLDP	0.9387	0.9491	0.0077
Munmorah Unit 3	330	NMNP3	NMN1	0.9883	0.9845	0.0044
Munmorah Unit 4	330	NMNP4	NMN1	0.9883	0.9845	0.0044

Location	Voltage	Connection point ID	TNI code	2007/08	2008/09	
	kV			Loss factor	Loss factor	Standard deviation
Munmorah 330 Load	330	NMNPL	NMN1	0.9883	0.9845	0.0044
Mt Piper PS Load	330	NMPPL	NMTP	0.9641	0.9651	0.0067
Mt Piper PS Unit 1	330	NMTP1	NMTP	0.9641	0.9651	0.0067
Mt Piper PS Unit 2	330	NMTP2	NMTP	0.9641	0.9651	0.0067
Kangaroo Valley – Bendeela (Shoalhaven) 330	330	NSHL	NSHL	1.0183	1.0162	0.0086
Kangaroo Valley Ancillary Services (SHGEN)	330	NSHL2	NSHL	1.0183	1.0162	0.0086
Kangaroo Valley (Shoalhaven) 330 Pumps	330	NSHP1	NSHL	1.0183	1.0162	0.0086
Tomago 1	330	NTMG1	NTMG	0.9881	0.9893	0.0048
Tomago 2	330	NTMG2	NTMG	0.9881	0.9893	0.0048
Tomago 3	330	NTMG3	NTMG	0.9881	0.9893	0.0048
Uranquinty PS Unit 11	132	NURQ1U	NURQ	-	0.9571	0.0701
Uranquinty PS Unit 12	132	NURQ2U	NURQ	-	0.9571	0.0701
Uranquinty PS Unit 13	132	NURQ3U	NURQ	-	0.9571	0.0701
Uranquinty PS Unit 14	132	NURQ4U	NURQ	-	0.9571	0.0701
Vales Point 330 PS Unit 5	330	NVPP5	NVPP	0.9861	0.9844	0.0045
Vales Point 330 PS Unit 6	330	NVPP6	NVPP	0.9861	0.9844	0.0045
Vales Point 330 PS Load	330	NVPPL	NVPP	0.9861	0.9844	0.0045
Wallerawang 330 Unit 7	330	NWW27	NWWP	0.9643	0.9660	0.0069
Wallerawang 330 Unit 8	330	NWW28	NWWP	0.9643	0.9660	0.0069
Wallerawang 330 PS Load	330	NWWPL	NWWP	0.9643	0.9660	0.0069
*Guthega	132	NGUT	NGUT	-	0.9798	0.0376
*Guthega Ancillary Services 2	132	NGUT2	NGUT	-	0.9798	0.0376
*Guthega	132	NGUT8	NGUT	-	0.9798	0.0376
*Lower Tumut[5]	330	NLTS	NLTS	-	1.0197	

* Ex-Snowy region connection point.

[5] The loss factor for Lower Tumut has been calculated on a time-weighted basis due to undesirable outcomes from the volume-weighted approach for a single Generator-Pump connection point. Refer to Section 3.2.

Location	Voltage	Connection point ID	TNI code	2007/08	2008/09	
	kV			Loss factor	Loss factor	Standard deviation
*Lower Tumut Ancillary Services 2 (pumps)	330	NLTS3	NLTS	-	1.0197	
*Lower Tumut	330	NLTS8	NLTS	-	1.0197	
*Upper Tumut	330	NUTS	NUTS	-	0.9796	0.0555
*Upper Tumut	330	NUTS8	NUTS	-	0.9796	0.0555

Embedded Generators

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
				Loss factor	Loss factor	Standard deviation
Liddell 33 – Hunter Valley GTs	33	NLD31	NLD3	0.9406	0.9506	0.0079
Redbank PS Unit 1	132	NMRK1	NRED	0.9265	0.9449	0.0080
Sithe	132	NSYW1	NSW2	1.0023	1.0030	0.0008
Brown Mountain	66	NCMA1	NBRM	1.0469	1.0395	0.0363
Dapto 132 (Whyte's Gully)	132	NDT11	NDT1	1.0066	1.0006	0.0072
West Nowra	132	NDT12	NDT1	1.0066	1.0006	0.0072
Glenn Innes (Pindari PS)	66	NGLN1	NGLN	0.9092	0.9446	0.0334
Keepit	66	NKPT	NKPT	0.9666	0.9880	0.0259
Liverpool 132 (Jacks Gully)	132	NLP11	NLP1	1.0031	1.0035	0.0008
Eastern Creek	132	NSW21	NSW2	1.0023	1.0030	0.0008
Grange Avenue	11	NVYD1	NVYD	0.9986	0.9988	0.0007
Tallawarra PS	132	NDT13T	NTWA	-	1.0000	0.0072
Broadwater PS	66	NLS21B	NLS2	-	0.9582	0.0323
Condong PS	66	NTNR1C	NTNR	-	0.9480	0.0566
HEZ Power Station	33	NKU31H	NKU3	0.9984	1.0040	0.0037
Woodlawn Bioreactor	132	NMR21W	NMR2	0.9923	0.9908	0.0111

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

Loads

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Canberra 132	132	ACA1	1.0158	1.0179	0.0336
Queanbeyan (ACTEW)	66	AQB1	1.0287	1.0298	0.0311
Queanbeyan (CE)	66	AQB2	1.0287	1.0298	0.0311
Williamsdale	132	AWIL	-	0.9899	0.0411

4. Victoria (regional reference node is Thomastown 66)

Loads

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Portland	500	VAPD	1.0148	1.0133	0.0064
Altona	66	VATS	0.9988	1.0061	0.0027
Ballarat	66	VBAT	1.0419	1.0383	0.0084
Bendigo	22	VBE2	1.0785	1.0735	0.0215
Bendigo	66	VBE6	1.0806	1.0727	0.0216
Brooklyn (AAE)	22	VBL2	1.0026	1.0038	0.0027
Brooklyn (POWERCOR)	22	VBL3	1.0026	1.0038	0.0027
Brooklyn (AAE)	66	VBL6	1.0050	1.0035	0.0027
Brooklyn (POWERCOR)	66	VBL7	1.0050	1.0035	0.0027
Brooklyn (CITIPOWER	66	VBL8	1.0050	1.0035	0.0027
Brunswick (CITIPOWER)	22	VBT2	0.9993	0.9979	0.0021
Brunswick (AAE)	22	VBTS	0.9993	0.9979	0.0021
Cranbourne (TXU)	66	VCBT	0.9892	0.9896	0.0027
Cranbourne (UE)	66	VCB5	0.9892	0.9896	0.0027
East Rowville (TXU)	66	VER2	0.9942	0.9924	0.0023
East Rowville (UE)	66	VERT	0.9942	0.9924	0.0023
Fishermens Bend (POWERCOR)	66	VFB2	1.0034	0.9999	0.0028
Fishermens Bend (CITIPOWER)	66	VFBT	1.0034	0.9999	0.0028
Fosterville	220	VFVT	1.0716	1.0670	0.0230
Glenrowan	66	VGNT	1.0338	1.0406	0.0359
Geelong	66	VGT6	1.0134	1.0100	0.0037
Horsham	66	VHOT	1.1015	1.0716	0.0178
Heatherton	66	VHTS	0.9952	0.9969	0.0027
BHP Western Port	220	VJLA	0.9888	0.9896	0.0027
Kerang	22	VKG2	1.1354	1.1021	0.0300
Kerang	66	VKG6	1.1294	1.1027	0.0301
Keilor (AAE)	66	VKT2	0.9993	1.0070	0.0024
Keilor (POWERCOR)	66	VKTS	0.9993	1.0070	0.0024
Loy Yang Substation	66	VLY6	0.9699	0.9709	0.0054

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Mt Beauty	66	VMBT	1.0178	1.0171	0.0337
Malvern	22	VMT2	0.9907	0.9968	0.0026
Malvern	66	VMT6	0.9904	1.0063	0.0056
Morwell TS	66	VMWT	0.9716	0.9709	0.0054
Pt Henry	220	VPTH	1.0173	1.0145	0.0045
Red Cliffs	22	VRC2	1.1688	1.1260	0.0450
Red Cliffs	66	VRC6	1.1590	1.1228	0.0455
Red Cliffs (Al)	66	VRCA	1.1590	1.1228	0.0455
Richmond	22	VRT2	0.9979	0.9963	0.0021
Richmond (UE)	66	VRT6	1.0016	1.0062	0.0033
Richmond (CITIPOWER)	66	VRT7	1.0016	1.0062	0.0033
Ringwood (UE)	22	VRW2	0.9987	1.0021	0.0032
Ringwood (TXU)	22	VRW3	0.9987	1.0021	0.0032
Ringwood (UE)	66	VRW6	0.9959	0.9999	0.0025
Ringwood (TXU)	66	VRW7	0.9959	0.9999	0.0025
Shepparton	66	VSHT	1.0504	1.0541	0.0329
Springvale (UE)	66	VSV2	0.9959	0.9993	0.0030
Springvale (CITIPOWER)	66	VSVT	0.9959	0.9993	0.0030
Loy Yang Power Station Switchyard (Basslink)	500	VTBL	0.9794	0.9758	0.0045
Tyabb	66	VTBT	0.9918	0.9924	0.0028
Terang	66	VTGT	1.0486	1.0436	0.0084
Templestowe (CITIPOWER)	66	VTS2	0.9974	1.0000	0.0027
Templestowe (TXU)	66	VTS3	0.9974	1.0000	0.0027
Templestowe (UE)	66	VTS4	0.9974	1.0000	0.0027
Templestowe (AAE)	66	VTST	0.9974	1.0000	0.0027
Thomastown (TXU)	66	VTT2	1.0000	1.0000	0.0000
Thomastown (AAE)	66	VTTS	1.0000	1.0000	0.0000
West Melbourne	22	VWM2	1.0014	1.0009	0.0025
West Melbourne (AAE)	66	VWM6	1.0039	1.0021	0.0028
West Melbourne (CITIPOWER)	66	VWM7	1.0039	1.0021	0.0028
Wodonga	22	VWO2	1.0193	1.0248	0.0453
Wodonga	66	VWO6	1.0168	1.0237	0.0460
Yallourn	11	VYP1	0.9532	0.9527	0.0085
*Khancoban	330	NKHN	-	1.0085	0.0594

* Ex-Snowy region connection point.

Generators

Location	Voltage	Connection point	TNI	2007/08	2008/09	
	kV	ID	Code	Loss factor	Loss factor	Standard deviation
Portland 500 DU 1	500	VAPD1	VAPD	1.0148	1.0133	0.0064
Portland 500 DU 2	500	VAPD2	VAPD	1.0148	1.0133	0.0064
VICSMLT	220	VAPS1	VAPS	1.0173	1.0145	0.0045
Laverton	220	VAT21	VAT2	0.9954	0.9966	0.0022
Dartmouth PS	220	VDPS	VDPS	0.9619	1.0137	0.0283
Banimboola	220	VDPS2	VDPS	0.9619	1.0137	0.0283
Eildon PS Unit 1	220	VEPS1	VEPS	0.9934	0.9900	0.0149
Eildon PS Unit 2	220	VEPS2	VEPS	0.9934	0.9900	0.0149
Hazelwood PS Unit 1	220	VHWP1	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Unit 2	220	VHWP2	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Unit 3	220	VHWP3	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Unit 4	220	VHWP4	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Unit 5	220	VHWP5	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Unit 6	220	VHWP6	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Unit 7	220	VHWP7	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Unit 8	220	VHWP8	VHWP	0.9673	0.9675	0.0051
Hazelwood PS Load	220	VHWPL	VHWP	0.9673	0.9675	0.0051
Jeeralang A PS Unit 1	220	VJLGA1	VJLG	0.9638	0.9626	0.0048
Jeeralang A PS Unit 2	220	VJLGA2	VJLG	0.9638	0.9626	0.0048
Jeeralang A PS Unit 3	220	VJLGA3	VJLG	0.9638	0.9626	0.0048
Jeeralang A PS Unit 4	220	VJLGA4	VJLG	0.9638	0.9626	0.0048
Jeeralang B PS Unit 1	220	VJLGB1	VJLG	0.9638	0.9626	0.0048
Jeeralang B PS Unit 2	220	VJLGB2	VJLG	0.9638	0.9626	0.0048
Jeeralang B PS Unit 3	220	VJLGB3	VJLG	0.9638	0.9626	0.0048
Basslink (Loy Yang Power Station Switchyard)	500	VLYP13	VTBL	0.9794	0.9758	0.0045
Loy Yang A PS Unit 1	500	VLYP1	VLYP	0.9699	0.9703	0.0050
Loy Yang A PS Unit 2	500	VLYP2	VLYP	0.9699	0.9703	0.0050
Loy Yang A PS Unit 3	500	VLYP3	VLYP	0.9699	0.9703	0.0050
Loy Yang A PS Unit 4	500	VLYP4	VLYP	0.9699	0.9703	0.0050
Loy Yang B PS Unit 1	500	VLYP5	VLYP	0.9699	0.9703	0.0050

Location	Voltage kV	Connection point ID	TNI Code	2007/08 Loss factor	2008/09 Loss factor	2008/09 Standard deviation
Loy Yang B PS Unit 2	500	VLYP6	VLYP	0.9699	0.9703	0.0050
Valley Power PS	500	VLYP7	VLYP	0.9699	0.9703	0.0050
Loy Yang A PS Load	500	VLYPL	VLYP	0.9699	0.9703	0.0050
McKay Creek PS Unit 1	220	VMKP1	VMKP	0.9738	0.9962	0.0425
McKay Creek PS Unit 2	220	VMKP2	VMKP	0.9738	0.9962	0.0425
Morwell PS G4	11	VMWP4	VMWP	0.9637	0.9623	0.0052
Morwell PS G5	11	VMWP5	VMWP	0.9637	0.9623	0.0052
Morwell PS G1, 2 and 3	11	VMWT1	VMWG	0.9715	0.9706	0.0053
Morwell PS Load	11	VMWTL	VMWT	0.9716	0.9709	0.0054
Newport PS	220	VNPS	VNPS	0.9957	0.9935	0.0023
Pt Henry DU 1	220	VPTH1	VPTH	1.0173	1.0145	0.0045
Pt Henry DU 2	220	VPTH2	VPTH	1.0173	1.0145	0.0045
Pt Henry DU 3	220	VPTH3	VPTH	1.0173	1.0145	0.0045
West Kiewa PS Unit 1	220	VWKP1	VWKP	0.9911	1.0020	0.0382
West Kiewa PS Unit 2	220	VWKP2	VWKP	0.9911	1.0020	0.0382
Yallourn W PS 220 Unit 1	220	VYP21	VYP3	0.9569	0.9566	0.0077
Yallourn W PS 220 Unit 2	220	VYP22	VYP2	0.9516	0.9502	0.0081
Yallourn W PS 220 Unit 3	220	VYP23	VYP2	0.9516	0.9502	0.0081
Yallourn W PS 220 Unit 4	220	VYP24	VYP2	0.9516	0.9502	0.0081
Yallourn W PS 220 Load	220	VYP2L	VYP2	0.9516	0.9502	0.0081
*Jindabyne pump at Guthega	132	NGJP	NGJP	-	1.1099	0.0440
Murray	330	NMUR8	NMUR	-	0.9772	0.0585

* Ex-Snowy region connection point.

Embedded Generators

Location	Voltage kV	Connection point ID	TNI Code	2007/08 Loss factor	2008/09 Loss factor	2008/09 Standard deviation
Anglesea PS	220	VAPS	VAPS	1.0173	1.0145	0.0045
Hume (Victorian Share)	66	VHUM	VHUM	1.0000	1.0003	0.0366

Bairnsdale Unit 1	66	VMWT2	VBDL	0.9691	0.9685	0.0056
Bairnsdale Unit 2	66	VMWT3	VBDL	0.9691	0.9685	0.0056
Somerton Power Station	66	VTTS1	VSOM	1.0000	1.0000	0.0000
Brooklyn Landfill	22	VBL61	VBL6	1.0050	1.0035	0.0027
Sunshine Energy Park	66	VKTS1	VKTS	0.9993	1.0070	0.0024
HRL Site (Tramway Road PS)	66	VMWT4	VMWT	0.9716	0.9709	0.0054
Toora Wind Farm	66	VMWT5	VMWT	0.9716	0.9709	0.0054
Longford	66	VMWT6	VMWT	0.9716	0.9709	0.0054
Tatura	22	VSHT1	VSHT	1.0504	1.0541	0.0329
Yambuk Wind Farm	66	VTGT1	VTGT	1.0486	1.0436	0.0084
Wonthaggi Wind Farm	22	VMWT7	VMWT	0.9716	0.9709	0.0054

5. South Australia (regional reference node is Torrens Island PS 66)

Loads

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Angas Creek	33	SANC	1.0125	1.0158	0.0030
Ardrossan West	33	SARW	0.9826	0.9415	0.0477
Baroota	33	SBAR	0.9955	0.9930	0.0101
Berri	66	SBER	0.9752	1.0249	0.0981
Berri (POWERCOR)	66	SBE1	0.9752	1.0249	0.0981
Whyalla Terminal BHP	33	SBHP	0.9917	0.9865	0.0136
Blanche	33	SBLA	0.9686	1.0075	0.0692
Blanche (POWERCOR)	33	SBL1	0.9686	1.0075	0.0692
Brinkworth	33	SBRK	0.9890	0.9847	0.0060
Bungama Industrial	33	SBUN	0.9910	0.9787	0.0083
Bungama Rural	33	SBUR	0.9911	0.9787	0.0083
Dalrymple	33	SDAL	0.9511	0.9060	0.0819
Davenport	275	SDAV	0.9735	0.9674	0.0105
Dorrien	33	SDRN	1.0247	1.0152	0.0068
East Terrace	66	SETC	1.0071	1.0076	0.0023
Hummocks	33	SHUM	0.9989	0.9589	0.0272
Happy Valley	66	SHVA	1.0087	1.0102	0.0033
South Australian VTN		SJP1	1.0001	1.0009	-
Kadina East	33	SKAD	1.0012	0.9616	0.0278
Kanmantoo	11	SKAN	1.0156	1.0211	0.0059
Keith	33	SKET	0.9960	1.0139	0.0345
Kilburn	66	SKLB	1.0025	1.0035	0.0013
Kincraig	33	SKNC	0.9769	1.0033	0.0531
Leigh Creek	33	SLCC	0.9956	0.9960	0.0130
Leigh Creek South	33	SLCS	0.9955	0.9942	0.0128
Lefevre	66	SLFE	0.9994	0.9986	0.0005
Mannum - Adelaide Pipeline 1	3.3	SMA1	1.0185	1.0284	0.0059
Mannum - Adelaide Pipeline 2	3.3	SMA2	1.0192	1.0285	0.0050
Mannum - Adelaide Pipeline 3	3.3	SMA3	1.0178	1.0261	0.0045
Magill	66	SMAG	1.0074	1.0072	0.0023
Mannum	33	SMAN	1.0144	1.0220	0.0060
Mt Barker	66	SMBA	1.0163	1.0207	0.0049
Mobilong	33	SMBL	1.0132	1.0212	0.0068
Middleback	132	SMBK	1.0064	0.9856	0.0213

Location	Voltage	TNI code	2007/08	2008/09	
	kV		Loss factor	Loss factor	Standard deviation
Middleback	33	SMDL	1.0088	0.9860	0.0213
Mt Gambier	33	SMGA	0.9693	1.0083	0.0695
Mt Gunson	33	SMGU	0.9826	0.9866	0.0108
Murray Bridge - Hahndorf Pipeline 1	11	SMH1	1.0149	1.0216	0.0066
Murray Bridge - Hahndorf Pipeline 2	11	SMH2	1.0170	1.0230	0.0062
Murray Bridge - Hahndorf Pipeline 3	11	SMH3	1.0176	1.0226	0.0054
Millbrook	33	SMLB	1.0093	1.0104	0.0024
Morphett Vale East	66	SMVE	1.0073	1.0093	0.0033
Pipeline 1 Morgan - Whyalla	3.3	SMW1	0.9862	1.0070	0.0425
Pipeline 2 Morgan - Whyalla	3.3	SMW2	0.9952	1.0070	0.0266
Pipeline 3 Morgan - Whyalla	3.3	SMW3	0.9915	0.9948	0.0129
Pipeline 4 Morgan - Whyalla	3.3	SMW4	0.9941	0.9932	0.0087
New Osborne	66	SNBN	0.9998	0.9985	0.0006
Neuroodla	33	SNEU	0.9873	0.9834	0.0111
Northfield	66	SNFD	1.0027	1.0032	0.0012
North West Bend	66	SNWB	0.9882	1.0076	0.0467
Playford	33	SPAA	0.9736	0.9744	0.0107
Para	66	SPAR	1.0031	1.0029	0.0014
Parafield Gardens West	66	SPGW	1.0017	1.0018	0.0011
Port Lincoln	33	SPLN	1.0417	1.0000	0.0635
Pimba	132	SPMB	0.9869	0.9904	0.0099
Port Pirie	33	SPPR	0.9965	0.9834	0.0085
Roseworthy	11	SRSW	1.0169	1.0129	0.0033
Snuggery Industrial	33	SSNN	0.9687	0.9966	0.0699
Snuggery Rural	33	SSNR	0.9559	0.9955	0.0709
Stony Point	11	SSPN	0.9847	0.9754	0.0117
Tailem Bend	33	STAL	1.0031	1.0145	0.0137
Templers	33	STEM	1.0184	1.0105	0.0073
Torrens Island	66	STSY	1.0000	1.0000	0.0000
Waterloo	33	SWAT	1.0078	1.0019	0.0107
Whyalla	33	SWHY	0.9909	0.9867	0.0132
Woomera	132	SWMA	0.9832	0.9902	0.0109
Wudina	66	SWUD	1.0404	1.0084	0.0424
Yadnarie	66	SYAD	1.0310	0.9960	0.0408

Generators

Location	Voltage	Connection point	TNI	2007/08	2008/09	
	kV	ID	Code	Loss factor	Loss factor	Standard deviation
Cathedral Rocks Wind Farm	132	SCRK	SCRK	0.9896	0.9278	0.0615
Dry Creek PS Unit 1	66	SDCA1	SDPS	1.0012	1.0037	0.0023
Dry Creek PS Unit 2	66	SDCA2	SDPS	1.0012	1.0037	0.0023
Dry Creek PS Unit 3	66	SDCA3	SDPS	1.0012	1.0037	0.0023
Hallet PS	275	SHPS1	SHPS	0.9802	0.9702	0.0022
Hallet Brown Hill Wind Farm	275	SHPS2W	SHPS	0.9802	0.9702	0.0022
Leigh Creek Northern PS Load 2	33	SLCCL	SLCC	0.9956	0.9960	0.0130
Lake Bonney Wind Farm	33	SMAY1	SMAY	0.9337	0.9736	0.0676
Lake Bonney Wind Farm Stage 2	33	SMAY2	SMAY2	0.9337	0.9736	0.0676
Mt Millar Wind Farm	33	SMTM1	SMTM	1.0062	0.9632	0.0382
Mintaro PS	132	SMPS	SMPS	0.9737	0.9664	0.0122
O.C.P.L. Unit 1	66	SNBN1	SOCP	0.9998	0.9985	0.0006
O.C.P.L. Unit 2	66	SNBN2	SOCP	0.9998	0.9985	0.0006
Northern PS Unit 1	275	SNPA1	SNPS	0.9706	0.9650	0.0098
Northern PS Unit 2	275	SNPA2	SNPS	0.9706	0.9650	0.0098
Playford Northern PS Load 1	33	SPAAL	SPAA	0.9736	0.9744	0.0107
Ladbroke Grove PS Unit 1	132	SPEW1	SPEW	0.9589	0.9741	0.0603
Ladbroke Grove PS Unit 2	132	SPEW2	SPEW	0.9589	0.9741	0.0603
Port Lincoln PS	132	SPLN1	SPTL	1.0226	0.9430	0.0809
Pelican Point PS	275	SPPT	SPPT	0.9989	0.9986	0.0006
Playford PS	275	SPSD1	SPPS	0.9710	0.9643	0.0105
Quarantine PS Unit 1	66	SQPS1	SQPS	0.9959	0.9943	0.0014
Quarantine PS Unit 2	66	SQPS2	SQPS	0.9959	0.9943	0.0014
Quarantine PS Unit 3	66	SQPS3	SQPS	0.9959	0.9943	0.0014
Quarantine PS Unit 4	66	SQPS4	SQPS	0.9959	0.9943	0.0014
Quarantine PS Unit 5	66	SQPS5Q	SQPS	-	0.9943	0.0014
Snowtown Wind Farm	33	SNWF1T	SNWF	0.9901	0.9393	0.0188
Snuggery PS Unit 1	132	SSGA1	SSPS	0.9636	0.9756	0.0627
Snuggery PS Unit 2	132	SSGA2	SSPS	0.9636	0.9756	0.0627
Snuggery PS Unit 3	132	SSGA3	SSPS	0.9636	0.9756	0.0627
Torrens Island PS A Unit 1	275	STSA1	STPS	0.9994	0.9995	0.0006
Torrens Island PS A Unit 2	275	STSA2	STPS	0.9994	0.9995	0.0006
Torrens Island PS A Unit 3	275	STSA3	STPS	0.9994	0.9995	0.0006
Torrens Island PS A Unit 4	275	STSA4	STPS	0.9994	0.9995	0.0006
Torrens Island PS B Unit 1	275	STSB1	STPS	0.9994	0.9995	0.0006
Torrens Island PS B Unit 2	275	STSB2	STPS	0.9994	0.9995	0.0006
Torrens Island PS B Unit 3	275	STSB3	STPS	0.9994	0.9995	0.0006
Torrens Island PS B Unit 4	275	STSB4	STPS	0.9994	0.9995	0.0006
Torrens Island PS Load	275	STSYL	STPS	0.9994	0.9995	0.0006
Wattle Point Wind Farm	132	SSYP1	SSYP	0.8748	0.8350	0.0668

Embedded Generators

Location	Voltage	Connection point	TNI	2007/08	2008/09	
	kV	ID	Code	Loss factor	Loss factor	Standard deviation
Angaston Power Station	33	SDRN1	SANG	1.0011	0.9634	0.0237
Angaston Power Station	33	SDRN2	SANG	1.0011	0.9634	0.0237
Lonsdale PS	66	SMVE1	SMVE	1.0073	1.0093	0.0033

6. Tasmania (regional reference node is George Town 220 kV)

Loads

Location	Voltage KV	TNI code	2007/08	2008/09	
			Loss factor	Loss factor	Standard deviation
Arthurs Lake	6.6	TAL2	1.0066	1.0009	0.0174
Avoca	22	TAV2	1.0183	1.0166	0.0192
Bridgewater	11	TBW2	1.0667	1.0396	0.0423
Burnie	22	TBU3	0.9923	0.9944	0.0141
Boyer SWA	6.6	TBYA	1.0508	1.0215	0.0402
Boyer SWB	6.6	TBYB	1.0500	1.0259	0.0405
Chapel St.	11	TCS3	1.0432	1.0265	0.0401
Comalco	220	TCO1	1.0005	1.0005	0.0000
Creek Road	33	TCR2	1.0486	1.0278	0.0419
Derwent Bridge	22	TDB2	0.9795	0.9538	0.0373
Derby	22	TDE2	1.0040	1.0048	0.0090
Devonport	22	TDP2	0.9944	0.9988	0.0146
Emu Bay	11	TEB2	0.9933	0.9947	0.0142
Electrona	11	TEL2	1.0574	1.0354	0.0431
Fisher (Rowallan)	220	TFI1	0.9758	0.9757	0.0144
Gordon	22	TGO2	1.0180	0.9899	0.0530
George Town (Basslink)	220	TGT1	1.0000	1.0000	0.0000
George Town	22	TGT3	1.0013	0.9990	0.0058
Hadspen	22	THA3	0.9992	0.9964	0.0096
Hampshire	110	THM2	0.9892	0.9910	0.0146
Huon River	11	THR2	1.0607	1.0460	0.0334
Kermandie	11	TKE2	1.0604	1.0390	0.0441
Kingston	11	TKI2	1.0601	1.0374	0.0431
Knights Road	11	TKR2	1.0590	1.0378	0.0437
Lindisfarne	33	TLF2	1.0665	1.0369	0.0429
Meadowbank	22	TMB2	1.0202	0.9900	0.0369
Mowbray	22	TMY2	1.0018	0.9943	0.0100
North Hobart	11	TNH2	1.0485	1.0270	0.0420

Location	Voltage KV	TNI code	2007/08	2008/09	
			Loss factor	Loss factor	Standard deviation
New Norfolk	22	TNN2	1.0470	1.0174	0.0402
Newton	22	TNT2	0.9806	0.9952	0.0278
Newton	11	TNT3	0.9726	0.9813	0.0276
Norwood	22	TNW2	1.0039	1.0008	0.0097
Port Latta	22	TPL2	0.9686	0.9676	0.0607
Palmerston	22	TPM3	0.9919	0.9859	0.0171
Queenstown	22	TQT2	0.9693	0.9802	0.0286
Queenstown	11	TQT3	0.9779	0.9867	0.0278
Que	22	TQU2	0.9778	1.0075	0.0295
Railton	22	TRA2	0.9914	0.9976	0.0151
Rosebery	44	TRB2	0.9717	0.9825	0.0280
Risdon	33	TRI4	1.0624	1.0289	0.0429
Risdon	11	TRI3	1.0602	1.0304	0.0426
Rokeby	11	TRK2	1.0694	1.0396	0.0426
Scottsdale	22	TSD2	1.0058	1.0025	0.0096
St. Marys	22	TSM2	1.0387	1.0328	0.0215
Sorell	22	TSO2	1.0773	1.0500	0.0451
Savage River	22	TSR2	0.9985	1.0174	0.0312
Smithton	22	TST2	0.9554	0.9490	0.0751
Starwood	110	TSW1	0.9997	0.9990	0.0054
Triabunna	22	TTB2	1.0836	1.0388	0.0432
Temco	110	TTE1	1.0016	1.0004	0.0056
Trevallyn	22	TTR2	1.0005	0.9968	0.0100
Tungatinah	22	TTU2	0.9789	0.9608	0.0382
Ulverstone	22	TUL2	0.9926	1.0041	0.0147
Greater Hobart Area VTN		TVN1	1.0550	1.0301	-
Greater Tamar Area VTN		TVN2	1.0014	0.9974	-
Waddamana	22	TWA2	0.9951	0.9735	0.0308
Wesley Vale	11	TWV2	0.9961	1.0018	0.0149
Wayatinah	11	TWY2	1.0034	0.9948	0.0253

Generators

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
	KV			Loss factor	Loss factor	Standard deviation
Bell Bay No.1	110	TBBA1	TBBA	0.9981	0.9929	0.0063
Bell Bay No.2	110	TBBB1	TBBB	0.9988	0.9943	0.0055
Bell Bay No.3	110	TBB11	TBB1	0.9976	0.9915	0.0065
Bell Bay No.3	110	TBB12	TBB1	0.9976	0.9915	0.0065
Bell Bay No.3	110	TBB13	TBB1	0.9976	0.9915	0.0065
Butlers Gorge	110	TBG11	TBG1	0.9745	0.9516	0.0337
Cethana	220	TCE11	TCE1	0.9741	0.9716	0.0125
Cluny[6]	220	TCL11	TCL1	1.0192	1.0004	0.0294
Repulse[8]	220	TCL12	TCL1	1.0192	1.0004	0.0294
Devils gate	110	TDG11	TDG1	0.9781	0.9764	0.0125
Bastyan	220	TFA11	TFA1	0.9565	0.9562	0.0240
Fisher[7]	220	TFI11	TFI1	0.9758	0.9757	0.0144
Rowallan[9]	220	TFI12	TFI1	0.9758	0.9757	0.0144
Gordon	220	TGO11	TGO1	0.9839	0.9644	0.0396
Basslink (George Town)	220	TGT11	TGT1	1.0000	1.0000	0.0000
John Butters	220	TJB11	TJB1	0.9514	0.9527	0.0317
Lake Echo	110	TLE11	TLE1	0.9398	0.9451	0.0267
Catagunya[8]	220	TLI11	TLI1	1.0049	0.9944	0.0254
Liapootah[10]	220	TLI11	TLI1	1.0049	0.9944	0.0254
Wayatinah[10]	220	TLI11	TLI1	1.0049	0.9944	0.0254
Mackintosh	110	TMA11	TMA1	0.9451	0.9471	0.0246
Meadowbank	110	TMB11	TMB1	1.0250	0.9935	0.0385
Paloona	110	TPA11	TPA1	0.9784	0.9891	0.0143
Poatina	220	TPM11	TPM1	0.9807	0.9777	0.0144
Poatina	110	TPM21	TPM2	0.9720	0.9732	0.0165
Reece No.1	220	TRCA1	TRCA	0.9451	0.9488	0.0240

[6] Cluny and Repulse generators are to be dispatched together and hence get the same MLF.
[7] Fisher and Rowallan generators are to be dispatched together and hence get the same MLF.
[8] Catagunya, Liapootah and Wayatinah generators are to be dispatched together and hence get the same MLF.

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
	KV			Loss factor	Loss factor	Standard deviation
Reece No.2	220	TRCB1	TRCB	0.9470	0.9462	0.0228
Lemonthyme[9]	220	TSH11	TSH1	0.9800	0.9776	0.0133
Wilmot[11]	220	TSH11	TSH1	0.9800	0.9776	0.0133
Bluff Point and Studland Bay Wind Farms	110	TST11	TST1	0.9188	0.9012	0.0656
Tarraleah	110	TTA11	TTA1	0.9712	0.9568	0.0353
Tribute	220	TTI11	TTI1	0.9474	0.9469	0.0229
Tungatinah	110	TTU11	TTU1	0.9675	0.9421	0.0353
Trevallyn	110	TTR11	TTR1	0.9957	0.9905	0.0095

Embedded Generators

Location	Voltage	Connection Point ID	TNI code	2007/08	2008/09	
				Loss factor	Loss factor	Standard deviation
Remount	22	TMY21	TMY2	1.0018	0.9943	0.0100
Burnie Paper Mill	11	TEB21B	TEB2	0.9933	0.9947	0.0142

[9] Lemonthyme and Wilmot generators are to be dispatched together and hence get the same MLF.

Appendix B: Inter-regional loss factors equations for 2008/09

NEMMCO has determined the following inter-regional loss factor equations for 2008/09 by performing a regression analysis against key variables for each interconnector.

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

= 0.9751 + 1.8839E-04*NQt –7.9144E-07*Nd + 1.1623E-05*Qd

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

= 0.9649 + 1.7257E-04*VNt – 1.4631E-05*Vd + 5.7202E-06*Nd + 1.4938E-05*Sd

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

= 1.0235 + 3.5816E-04*VSAt – 4.6640E-06*Vd + 5.9808E-06*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.

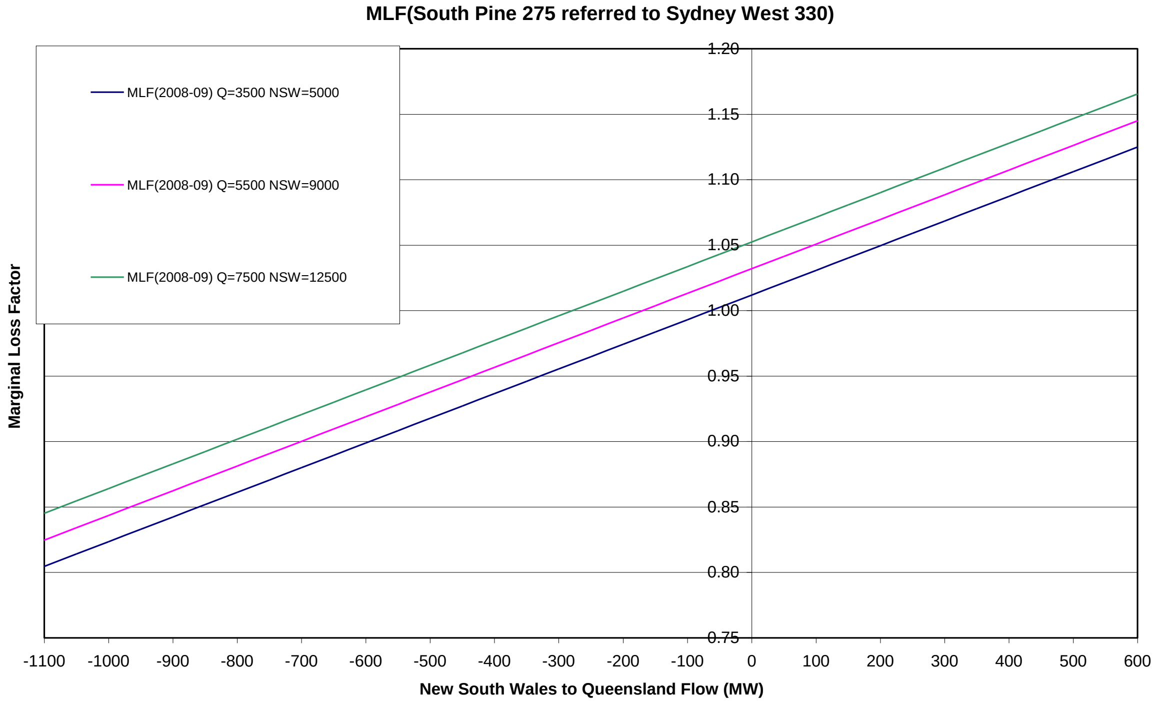


Figure B1: South Pine 275 referred to Sydney West 330 marginal loss factor verses NSW to Qld flow

Coefficient statistics

Coefficient	Q_d	N_d	NQ_t	CONSTANT
Coefficient value	1.1623E-05	-7.9144E-07	1.8839E-04	0.9751
Standard error values for the coefficients	1.3297E-07	8.4065E-08	2.3813E-07	5.3623E-04
Coefficient of determination (R^2)	0.9794			
Standard error of the y estimate	0.0092			

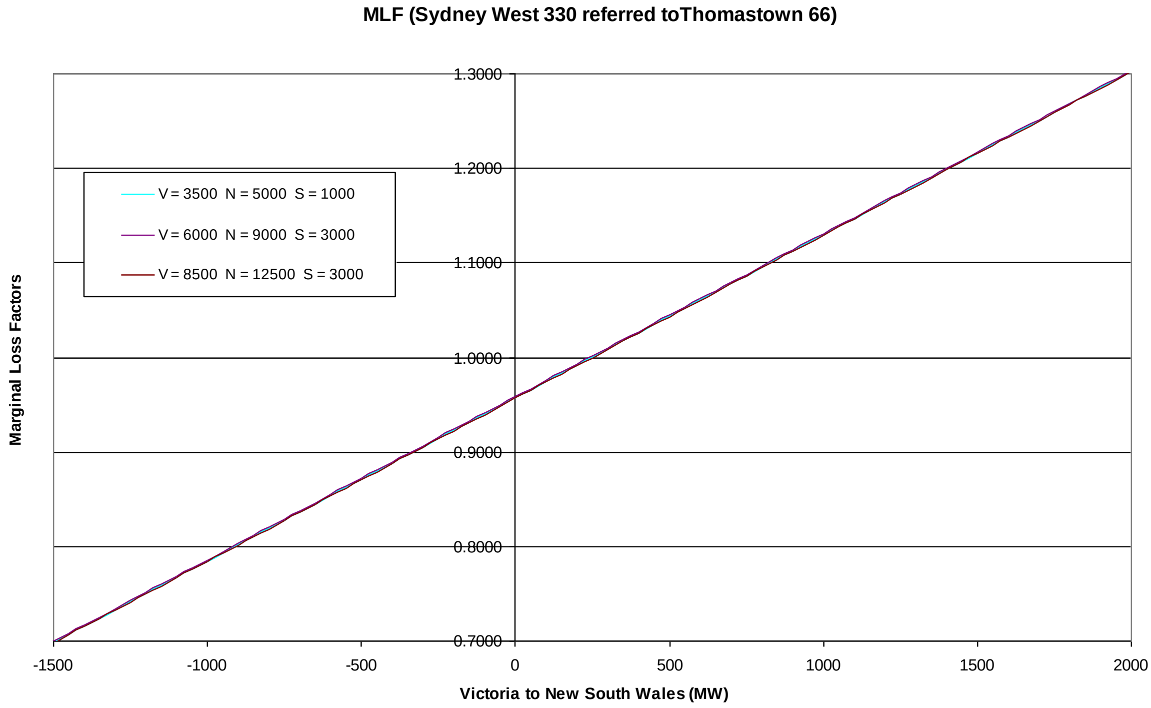


Figure B2: Sydney West 330 referred to Thomastown 66 marginal loss factor versus Victoria to NSW flow

Coefficient statistics

Coefficient	S_d	N_d	V_d	VN_t	CONSTANT
Coefficient value	1.4938E-05	5.7202E-06	-1.4631E-05	1.7257E-04	0.9649
Standard error values for the coefficients	1.1533E-06	3.7174E-07	6.5152E-07	5.3319E-07	1.6562E-03
Coefficient of determination (R^2)	0.8892				
Standard error of the y estimate	0.0328				

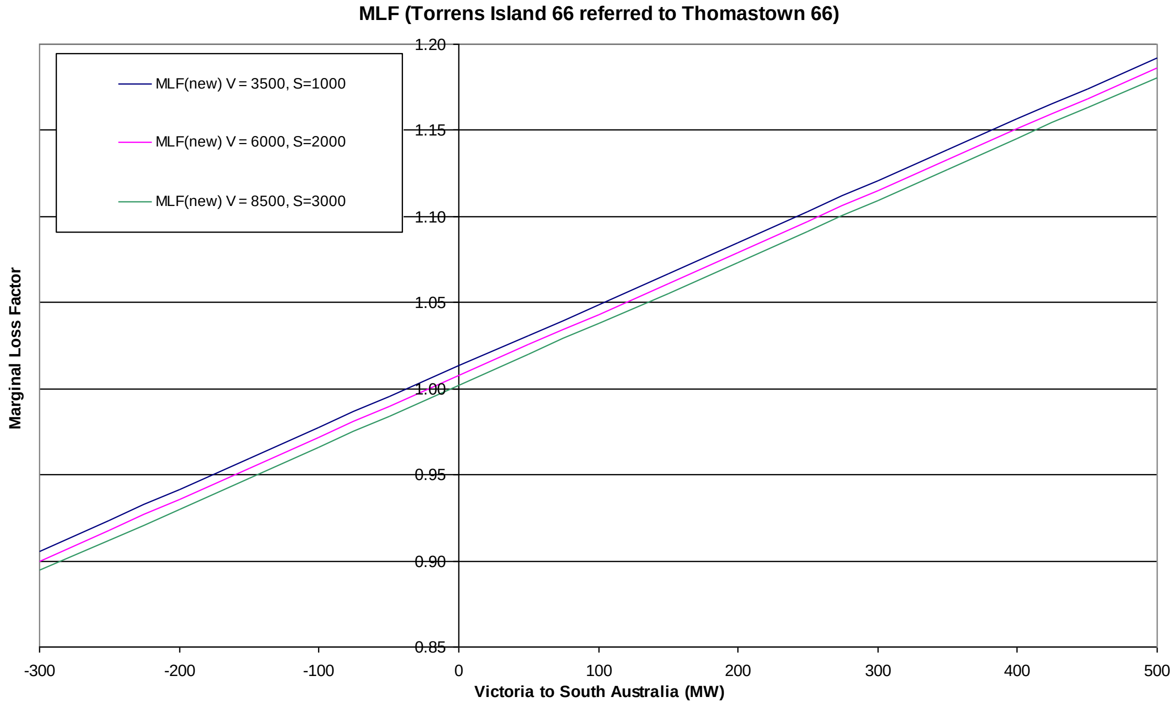


Figure B3: Torrens Island 66 referred to Thomastown 66 marginal loss factor versus Victoria to SA flow

Coefficient statistics

Coefficient	S_d	V_d	VSA_t	CONSTANT
Coefficient value	5.9808E-06	-4.6640E-06	3.5816E-04	1.0235
Standard error values for the coefficients	9.0134E-07	3.1845E-07	8.6054E-07	8.5287E-04
Coefficient of determination (R^2)	0.9570			
Standard error of the y estimate	0.0173			

Appendix C: Inter-regional loss equations for 2008/09

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

= (-0.0249 – 7.9144E-07*Nd + 1.1623E-05*Qd)*NQt + 9.4195E-05*NQt^2

Sydney West 330 referred to Thomastown 66 notional link average losses

= (-0.0351 + 1.4938E-05*Sd + 5.7202E-06*Nd –1.4631E-05*Vd)*VNt + 8.6285E-05*VNt^2

Torrens Island 66 referred to Thomastown 66 notional link average losses

= (0.0235 – 4.6640E-06*Vd + 5.9808E-06*Sd)*VSAt + 1.7908E-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.

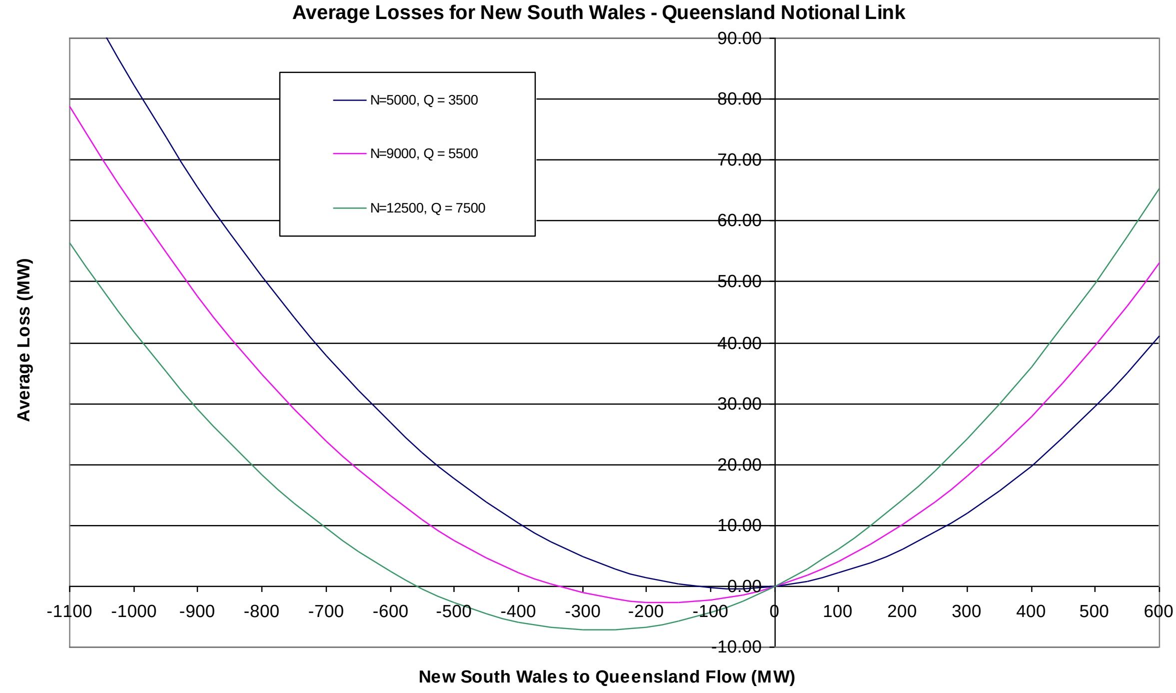


Figure C1: NSW to Queensland notional link losses versus NSW to Queensland notional link flow

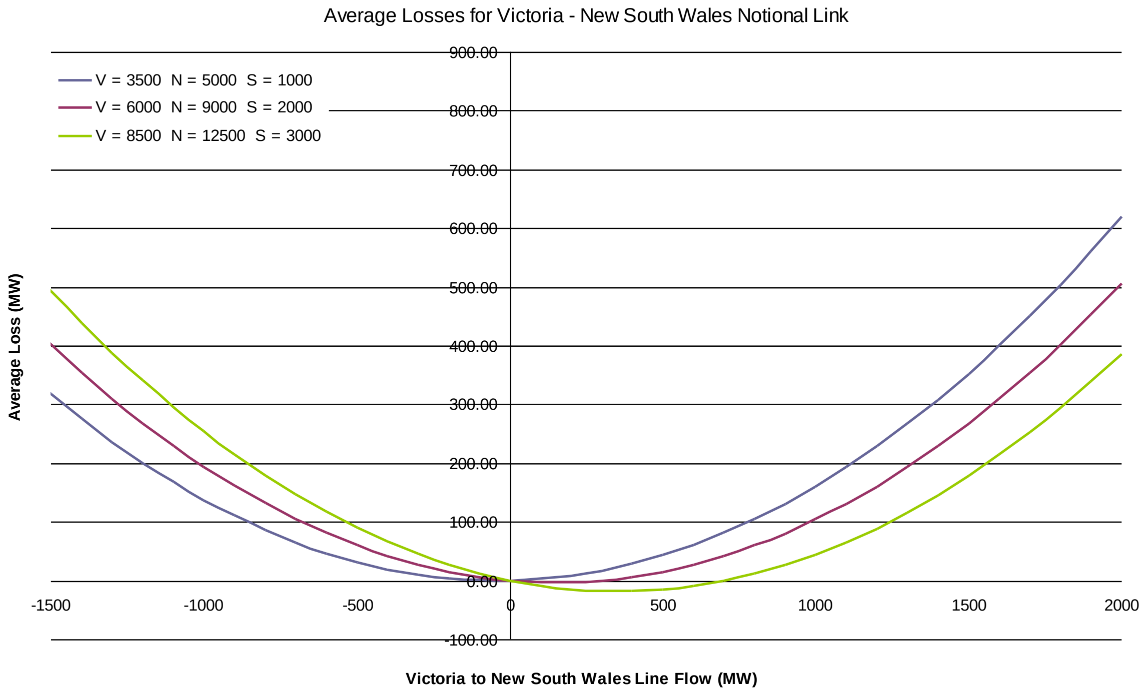


Figure C2: Victoria to NSW notional link losses versus Victoria to NSW notional link flow

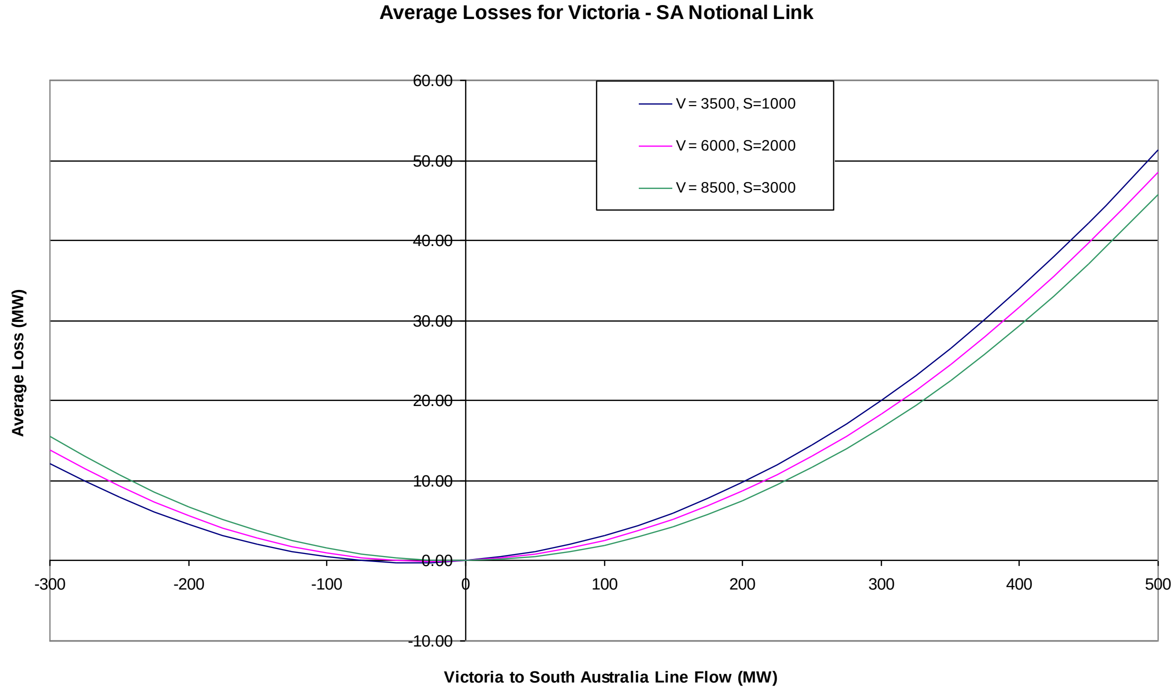


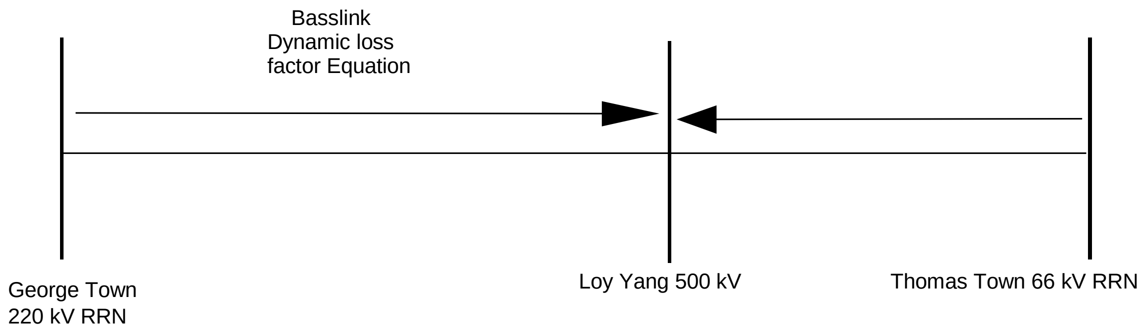
Figure C3: Victoria to SA notional link losses versus Victoria to SA notional link flow

Appendix D: Basslink, Terranora Interconnector and Murraylink loss factor models and loss equations

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 Thomas Town 66 kV = 0.9758.



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:

$$P_{(send)} = P_{(receive)} + [(-3.92x10^{-3}) * P_{(receive)} + (1.0393x10^{-4}) * P_{(receive)}^{2} + 4]$$

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. Model fails below 40MW however; this is within the ±50 MW no-go zone requirement for the 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 NEMMCO 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.

NEMMCO determined the following MLF model using regression analysis:

Murraylink MLF (Torrens Island 66 referred to Thomastown 66) = 1.0596 + 2.9540E-03*$Flow_t$

NEMMCO 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	2.9540E-03	1.0596
Standard error values for the coefficients	3.5079E-06	2.5920E-04
Coefficient of determination (R^2)	0.9759	
Standard error of the y estimate	0.0311	

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

Murraylink loss = 0.0596*$Flow_t$ + 1.4770E-03*$Flow_t^2$

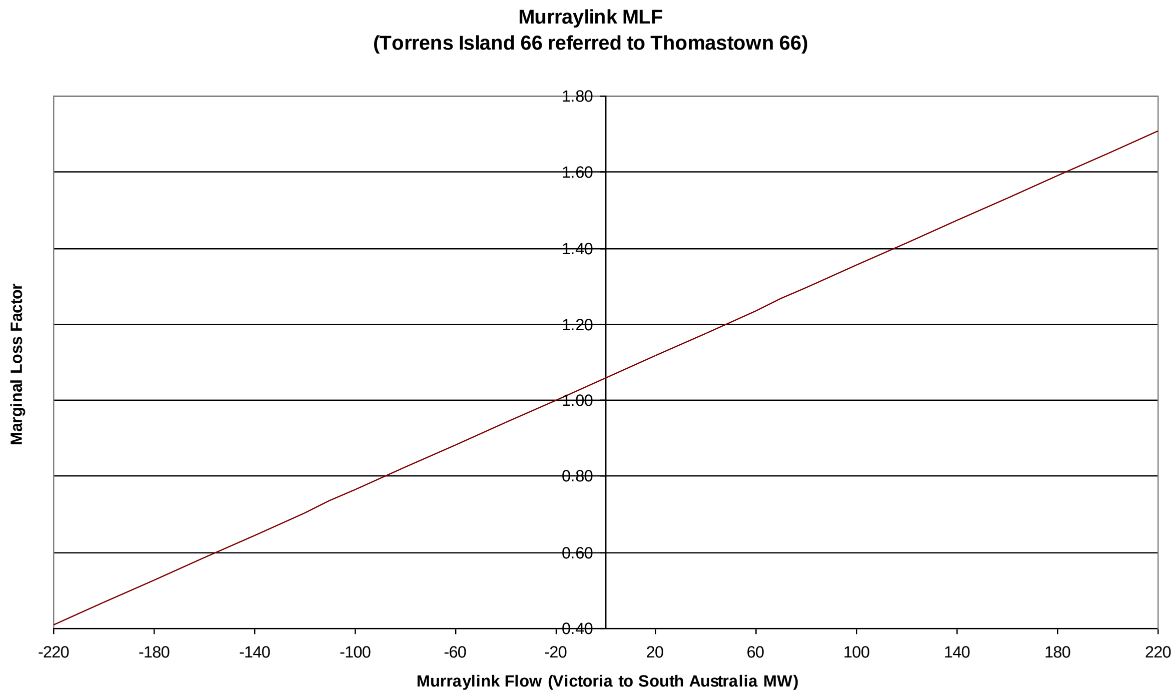


Figure D1: Torrents Island 66 referred to Thomastown 66 marginal loss factor versus Murraylink flow (Victoria to SA)

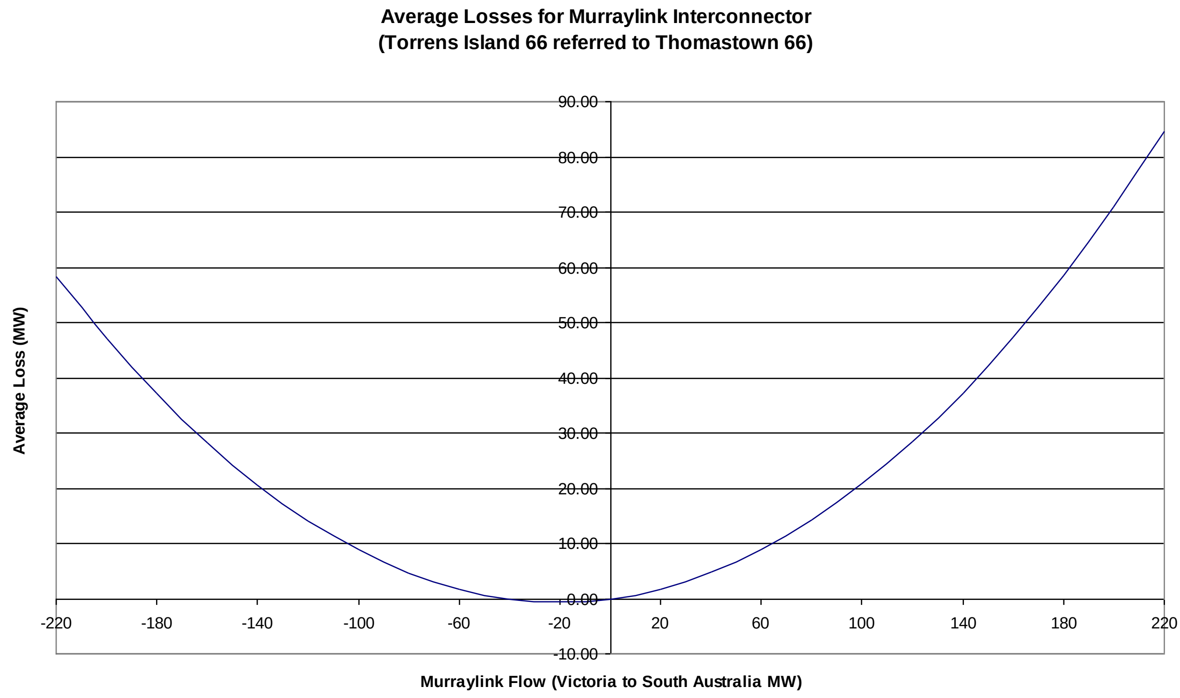


Figure D2: Murraylink notional link losses versus Murraylink flow (Victoria to SA)

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 NEMMCO 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:

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

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

Terranora interconnector MLF (South Pine 275 referred to Sydney West 330) = 1.0726 + 1.5930 -03*$Flow_t$

NEMMCO found that the simple model consisting of a constant and a Terranora interconnecor flow coefficient was suitable because most of the variation of the loss factor is due to variations in the Terranora interconnecor 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	1.5930 E-03	1.0726
Standard error values for the coefficients	3.6527E-06	3.7904E-04
Coefficient of determination (R^2)	0.9157	
Standard error of the y estimate	0.0291	

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

$$\text{Terranora interconnector loss} = 0.0726*Flow_t + 7.9652E\text{-}04*Flow_t^2$$

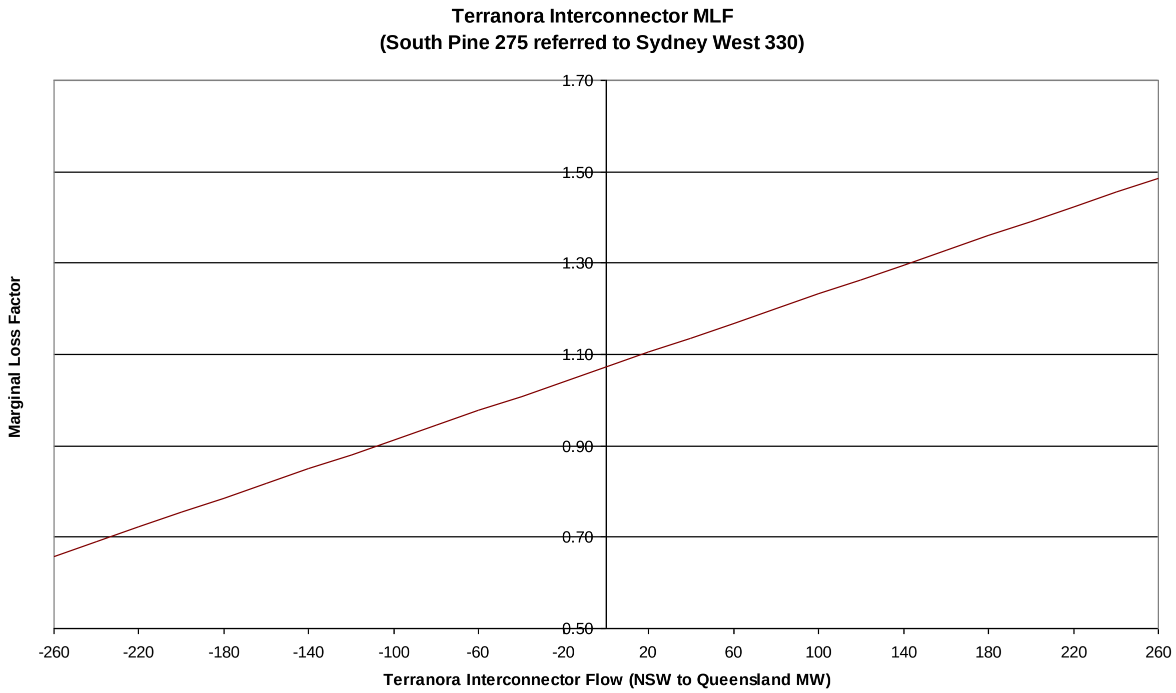


Figure D3: South Pine 275 referred to Sydney West 330 marginal loss factor versus Terranora interconnector flow (NSW to Queensland)

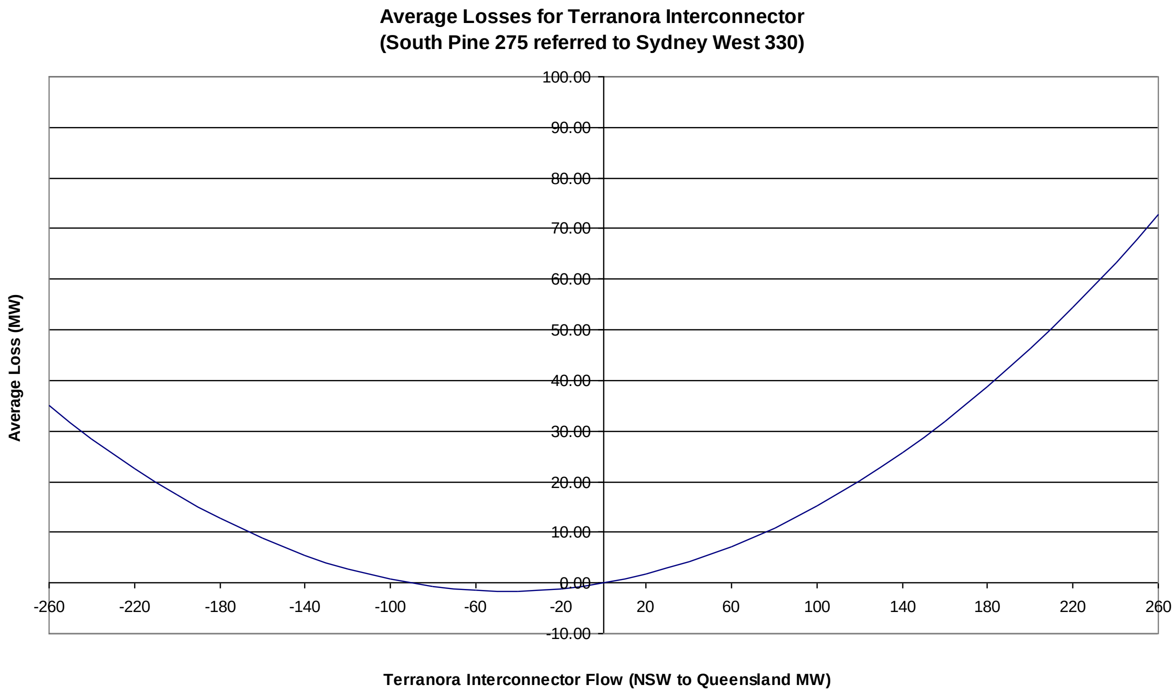


Figure D4: Terranora interconnector notional link losses versus flow (NSW to Queensland)

Appendix E: The Proportioning Inter-regional Losses to Regions

The NEMMCO 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 NEMMCO document "Proportioning Inter-Regional Losses to Regions", which is available on the NEMMCO website.

The document "Proportioning Inter-Regional Losses to Regions" documents the calculation of the proportioning of the inter-regional losses to regions. This will be available from the NEMMCO Information Centre (infocentre@nemmco.com.au).

The following table provides the factors that will be used to proportion the inter-regional losses to the associated regions for the 2008/09 financial year.

Notional interconnector	Proportioning factor	Region applied to
Queensland – New South Wales (QNI)	0.57	New South Wales
Queensland – New South Wales (Terranora Interconnector)	0.65	New South Wales
Victoria – New South Wales	0.61	New South Wales
Victoria – South Australia (Heywood)	0.70	Victoria
Victoria – South Australia (Murraylink)	0.72	Victoria

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
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[10];
  - 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.

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

Appendix G: List of new connection points for 2008/09

Name	Voltage level (kV)	Connection Point ID	TNI	Region
Alligator Creek	132	QALH	QALH	QLD
Bolingbroke	132	QBNB	QBNB	QLD
El Arish	22	QELA	QELA	QLD
Townsville East	66	QTVE	QTVE	QLD
Braemar PS Stage 2 unit 5	275	QBRA5B	QBRA	QLD
Braemar PS Stage 2 unit 6	275	QBRA6B	QBRA	QLD
Braemar PS Stage 2 unit 7	275	QBRA7B	QBRA	QLD
Condamine PS	132	QCND1C	QCND	QLD
Ti Tree BioReactor	33	QABM1T	QABM	QLD
Colongra PS unit 1	330	NCLG1D	NCLG	NSW
Colongra PS unit 2	330	NCLG2D	NCLG	NSW
Colongra PS unit 3	330	NCLG3D	NCLG	NSW
Colongra PS unit 4	330	NCLG4D	NCLG	NSW
Macarthur 66	66	NMC2	NMC2	NSW
Macarthur	132	NMC1	NMC1	NSW
Macksville	132	NMCV	NMCV	NSW
Raleigh	132	NRAL	NRAL	NSW
Tuggerah 132	132	NTG3	NTG3	NSW
Wagga North	132	NWG3	NWG3	NSW
West Sawtell	132	NWST	NWST	NSW
Tallawarra PS	132	NDT13T	NTWA	NSW
Uranquinty PS	132	NURQ	NURQ	NSW
Broadwater PS	66	NLS21B	NLS2	NSW
Condong PS	66	NTNR1C	NTNR	NSW
Williamsdale	132	AWIL	AWIL	ACT