REGIONS AND MARGINAL LOSS FACTORS: FY 2017-18

NATIONAL ELECTRICITY MARKET

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

IMPORTANT NOTICE

Purpose

This document has been prepared by AEMO as the 'Regions Publication' under clause 2A.1.3 of the National Electricity Rules (Rules), and to inform Registered Participants of the inter-regional loss factor equations and intra-regional loss factors for 2017-18 under clauses 3.6.1 and 3.6.2 of the Rules, and has effect only for the purposes set out in the Rules. The Rules and the National Electricity Law (Law) prevail over this document to the extent of any inconsistency.

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VERSION RELEASE HISTORY

Version No.	Release date	Description
4.0	06 November 2017	Added MLFs for: • Columboola 132kV, Grosvenor PS Unit 1 and Unit 2, Staplyton in Queensland • Leichardt Zone SS (Ausgrid), Williamsdale, Williamsdale (Essential Energy), Gullen Range solar farm, Smithfield Energy Facility, White Rock wind farm in New South Wales • Mugga Lane solar farm, Royalla solar farm in Australian Capital Territory • Deer Park, Kiata wind farm in Victoria • Hornsdale Wind farm stage 1, stage 2 and stage 3, Edinburgh Generatation, Lonsdale Generation in South Australia Correction of: • Typo on the MLF for Wivenhoe Small Hydro connection point (QABR1) – Table 3
3.0	01 June 2017	Update to: • MLF values for Canberra (ACA1), Williamsdale (NWDL) Mugga Lane Solar Farm and Royalla Solar Farm – Table 4, Table 7 and Table 8
2.0	15 May 2017	Correction of: • MLF value for Wivenhoe Small Hydro connection point (QABR1) – Table 3 • typo on the Vd term for the SA – Vic Inter-regional loss factor equation (pages 35 and 38)
1.0	31 March 2017	Final version. MLFs updated to reflect: • Reduction in Queensland region consumption forecast • Two committed solar farms at Griffith and Parkes • 12 new TNIs and a new VTN in ACT
0.1	3 March 2017	Draft version

EXECUTIVE SUMMARY

This document details the 2017–18 inter-regional loss factor equations and the intra-regional loss factors, or marginal loss factors (MLF). MLFs represent electrical transmission losses across the five regions in the National Electricity Market (NEM) – Queensland, New South Wales (NSW), Victoria, South Australia, and Tasmania. AEMO publishes this information annually by 1 April as required by clause 3.6 of the National Electricity Rules (Rules). This document also serves as the Regions Publication under clause 2A.1.3 of the Rules.

Supply and demand patterns in the NEM are changing at a growing rate, influenced by a combination of drivers, leading to potentially greater uncertainty and volatility of power system flows. AEMO has completed a review and consultation on the Forward Looking Loss Factors (FLLF) methodology (Methodology), and the changes to the Methodology have been reflected in the 2017-18 MLFs calculation.

Major changes in load and generation patterns leading to differences between the 2017-18 and 2016-17 MLFs are as follows:

- Retirement of Hazelwood Power Station (PS) in Victoria in March 2017 has increased modelled power imports from Queensland to NSW, and from NSW to Victoria. Reduced forecast generation in Victoria has reduced power exports from Victoria to South Australia.
- Forecast Liquefied Natural Gas (LNG) and industrial consumption have decreased in Queensland.
- Forecast regional consumption has decreased in Queensland, South Australia and Tasmania.
- Forecast regional consumption has increased in NSW and Victoria.
- Increased forecast generation in Tasmania has decreased modelled power imports from Victoria.

These flow changes have an impact on electrical losses, and drive significant changes in MLFs in 2017–18 compared to 2016–17. They are:

- A reduction in MLFs at connection points in central and northern Queensland.
- A reduction in MLFs at connection points in northern NSW, and an increase in southern NSW.
- A reduction in MLFs at connection points in northern Victoria.
- An increase in MLFs at connection points in South Australia’s Riverland, and an increase in MLFs at connection points in south-east South Australia.
- A general decrease in MLFs at connection points in Tasmania.

As well as the MLFs, this document includes other information related to marginal losses for 2017–18, that is:

- Inter-regional loss factor and loss equations.
- Virtual Transmission Nodes (VTNs).
- Connection point Transmission Node Identifiers (TNIs).
- Regions, Regional Reference Nodes (RRNs), and region boundaries.
- Brief overview of the Methodology AEMO uses to calculate MLFs and inter-regional loss factor equations.

AEMO applies a number of quality assurance steps when calculating MLFs. This includes engaging Ernst and Young to perform a two-step parallel MLF calculation to identify and resolve outcomes inconsistent with the Methodology.

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TABLES

1. MARGINAL LOSS FACTORS BY REGION

This section shows the intra-regional loss factors, commonly known as marginal loss factors (MLFs), for financial year 2017-18, for every load or generation transmission node identity (TNI) in each NEM region.

1.1 Queensland Marginal Loss Factors

Table 1 Queensland Loads

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Abermain	33	QABM	1.0016	0.9990	
Abermain (Dual MLF – Generation)	110	QABR	0.9990	0.9951	
Abermain (Dual MLF – Load)	110	QABR	1.0018	0.9951	
Alan Sherriff	132	QASF	1.0383	1.0781	
Algester	33	QALG	1.0153	1.0138	
Alligator Creek	132	QALH	1.0050	1.0383	
Alligator Creek	33	QALC	1.0060	1.0452	
Ashgrove West	33	QAGW	1.0149	1.0152	
Ashgrove West	110	QCBW	1.0129	1.0125	
Belmont	110	QBMH	1.0114	1.0091	
Belmont Wecker Road	33	QBBS	1.0089	0.9993	
Belmont Wecker Road	11	QMOB	1.0340	1.0308	
Biloela	66/11	QBIL	0.9235	0.9456	
Blackstone	110	QBKS	0.9999	0.9968	
Blackwater	66/11	QBWL	1.0001	1.0265	
Blackwater	132	QBWH	0.9988	1.0262	
Bluff	132	QBLF	0.9985	1.0252	
Bolingbroke	132	QBNB	0.9931	1.0240	
Bowen North	66	QBNN	1.0090	1.0337	
Boyne Island	275	QBOH	0.9593	0.9868	
Boyne Island	132	QBOL	0.9574	0.9824	
Braemar - Kumbarilla Park	275	QBRE	0.9654	0.9573	
Bulli Creek (Essential Energy)	132	QBK2	0.9752	0.9638	
Bulli Creek (Waggamba)	132	QBLK	0.9752	0.9638	
Bundamba	110	QBDA	1.0011	0.9983	
Burton Downs	132	QBUR	1.0116	1.0425	
Cairns	22	QCRN	1.0550	1.0904	
Cairns City	132	QCNS	1.0547	1.0895	
Callemondah (Rail)	132	QCMD	0.9494	0.9750	
Calliope River	132	QCAR	0.9472	0.9747	
Cardwell	22	QCDW	1.0482	1.0856	
Chinchilla	132	QCHA	0.9750	0.9705	
Clare	66	QCLR	1.0457	1.0910	
Collinsville Load	33	QCOL	1.0126	1.0444	

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Columboola 132kV	132	QCBB	0.9724		Effective from 19/09/2017
Columboola	132	QCBL	0.9715	0.9692	
Coppabella (Rail)	132	QCOP	1.0294	1.0610	
Dan Gleeson	66	QDGL	1.0391	1.0786	
Dingo (Rail)	132	QDNG	0.9838	1.0059	
Duaringa	132	QDRG	0.9754	0.9955	
Dysart	66/22	QDYS	1.0156	1.0494	
Eagle Downs Mine	132	QEGD	1.0269	1.0617	
Edmonton	22	QEMT	1.0603	1.0946	
Egans Hill	66	QEGN	0.9428	0.9686	
El Arish	22	QELA	1.0533	1.0883	
Garbutt	66	QGAR	1.0420	1.0816	
Gin Gin	132	QGNG	0.9693	0.9883	
Gladstone South	66/11	QGST	0.9534	0.9784	
Goodna	33	QGDA	1.0050	1.0027	
Goonyella Riverside Mine	132	QGYR	1.0483	1.0813	
Grantleigh (Rail)	132	QGRN	0.9426	0.9672	
Gregory (Rail)	132	QGRE	0.9791	1.0091	
Ingham	66	QING	1.0660	1.1260	
Innisfail	22	QINF	1.0600	1.1001	
Invicta Load	132	QINV	0.9644	1.0327	
Kamerunga	22	QKAM	1.0612	1.0945	
Kemmis	132	QEMS	1.0084	1.0370	
King Creek	132	QKCK	1.0175	1.0475	
Lilyvale	66	QLIL	0.9808	1.0122	
Lilyvale (Barcaldine)	132	QLCM	0.9775	1.0061	
Loganlea	33	QLGL	1.0148	1.0117	
Loganlea	110	QLGH	1.0112	1.0080	
Mackay	33	QMKA	1.0021	1.0392	
Middle Ridge (Energex)	110	QMRX	0.9833	0.9746	
Middle Ridge (Ergon)	110	QMRG	0.9833	0.9746	
Mindi (Rail)	132	QMND	0.9846	1.0177	
Molendinar	110	QMAR	1.0147	1.0106	
Molendinar	33	QMAL	1.0142	1.0102	
Moranbah (Mine)	66	QMRN	1.0364	1.0721	
Moranbah (Town)	11	QMRL	1.0441	1.0526	
Moranbah South (Rail)	132	QMBS	1.0342	1.0730	
Moranbah Substation	132	QMRH	1.0333	1.0719	
Moura	66/11	QMRA	0.9609	0.9779	
Mt McLaren (Rail)	132	QMTM	1.0478	1.0783	
Mudgeeraba	33	QMGL	1.0169	1.0121	
Mudgeeraba	110	QMGB	1.0165	1.0113	
Murarrie (Belmont)	110	QMRE	1.0121	1.0100	

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Nebo	11	QNEB	0.9846	1.0116	
Newlands	66	QNLD	1.0715	1.0809	
North Goonyella	132	QNGY	1.0499	1.0820	
Norwich Park (Rail)	132	QNOR	1.0007	1.0362	
Oakey	110	QOKT	0.9779	0.9684	
Oonooie (Rail)	132	QOON	1.0103	1.0399	
Orana LNG	275	QORH	0.9678	0.9633	
Palmwoods	132	QPWD	1.0056	1.0120	
Pandoin	132	QPAN	0.9461	0.9699	
Pandoin	66	QPAL	0.9457	0.9700	
Peak Downs (Rail)	132	QPKD	1.0280	1.0672	
Pioneer Valley	66	QPIV	1.0060	1.0487	
Proserpine	66	QPRO	1.0439	1.0770	
Queensland Alumina Ltd (Gladstone South)	132	QQAH	0.9565	0.9829	
Queensland Nickel (Yabulu)	132	QQNH	1.0344	1.0735	
Raglan	275	QRGL	0.9427	0.9686	
Redbank Plains	11	QRPN	1.0030	1.0007	
Richlands	33	QRLD	1.0136	1.0129	
Rockhampton	66	QROC	0.9481	0.9726	
Rocklands (Rail)	132	QRCK	0.9399	0.9657	
Rocklea (Archerfield)	110	QRLE	1.0059	1.0052	
Ross	132	QROS	1.0292	1.0667	
Runcorn	33	QRBS	1.0161	1.0150	
South Pine	110	QSPN	1.0044	1.0049	
Stony Creek	132	QSYC	1.0289	1.0449	
Sumner	110	QSUM	1.0068	1.0057	
Tangkam (Dalby)	110	QTKM	0.9816	0.9717	
Tarong	66	QTRL	0.9715	0.9691	
Teebar Creek	132	QTBC	0.9870	1.0033	
Tennyson	33	QTNS	1.0100	1.0100	
Tennyson (Rail)	110	QTNN	1.0085	1.0082	
Townsville East	66	QTVE	1.0367	1.0763	
Townsville South	66	QTVS	1.0373	1.0774	
Townsville South (KZ)	132	QTZS	1.0419	1.0765	
Tully	22	QTLL	1.0779	1.1188	
Turkinje	66	QTUL	1.0877	1.1103	
Turkinje (Craiglee)	132	QTUH	1.0762	1.1077	
Wandoan South	132	QWSH	0.9854	0.9810	
Wandoan South (NW Surat)	275	QWST	0.9846	0.9800	
Wandoo (Rail)	132	QWAN	0.9897	1.0236	
Wivenhoe Pump	275	QWIP	0.9975	0.9940	
Woolooga (Energex)	132	QWLG	0.9850	0.9984	
Woolooga (Ergon)	132	QWLN	0.9850	0.9984	

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Woree	132	QWRE	1.0541	1.0887	
Wotonga (Rail)	132	QWOT	1.0290	1.0616	
Wycarbah	132	QWCB	0.9351	0.9585	
Yarwun – Boat Creek (Ergon)	132	QYAE	0.9478	0.9717	
Yarwun – Rio Tinto	132	QYAR	0.9461	0.9716	

Table 2 Queensland Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Barron Gorge PS Unit 1	132	BARRON-1	QBGH1	QBGH	1.0238	1.0530	
Barron Gorge PS Unit 2	132	BARRON-2	QBGH2	QBGH	1.0238	1.0530	
Braemar PS Unit 1	275	BRAEMAR1	QBRA1	QBRA	0.9607	0.9549	
Braemar PS Unit 2	275	BRAEMAR2	QBRA2	QBRA	0.9607	0.9549	
Braemar PS Unit 3	275	BRAEMAR3	QBRA3	QBRA	0.9607	0.9549	
Braemar Stage 2 PS Unit 5	275	BRAEMAR5	QBRA5B	QBRA	0.9607	0.9549	
Braemar Stage 2 PS Unit 6	275	BRAEMAR6	QBRA6B	QBRA	0.9607	0.9549	
Braemar Stage 2 PS Unit 7	275	BRAEMAR7	QBRA7B	QBRA	0.9607	0.9549	
Callide PS Load	132	CALLNL1	QCAX	QCAX	0.9146	0.9344	
Callide A PS Unit 4	132	CALL_A_4	QCAA4	QCAA	0.9161	0.9268	
Callide A PS Unit 4 Load	132	CALLNL4	QCAA2	QCAA	0.9161	0.9268	
Callide B PS Unit 1	275	CALL_B_1	QCAB1	QCAB	0.9235	0.9456	
Callide B PS Unit 2	275	CALL_B_2	QCAB2	QCAB	0.9235	0.9456	
Callide C PS Unit 3	275	CPP_3	QCAC3	QCAC	0.9211	0.9410	
Callide C PS Unit 4	275	CPP_4	QCAC4	QCAC	0.9211	0.9410	
Condamine PS	132	CPSA	QCND1C	QCND	0.9688	0.9685	
Darling Downs PS	275	DDPS1	QBRA8D	QBRA	0.9607	0.9549	
Gladstone PS (132 kV) Unit 3	132	GSTONE3	QGLD3	QGLL	0.9402	0.9603	
Gladstone PS (132 kV) Unit 4	132	GSTONE4	QGLD4	QGLL	0.9402	0.9603	
Gladstone PS (132kV) Load	132	GLADNL1	QGLL	QGLL	0.9402	0.9603	
Gladstone PS (275 kV) Unit 1	275	GSTONE1	QGLD1	QGLH	0.9431	0.9662	
Gladstone PS (275 kV) Unit 2	275	GSTONE2	QGLD2	QGLH	0.9431	0.9662	
Gladstone PS (275 kV) Unit 5	275	GSTONE5	QGLD5	QGLH	0.9431	0.9662	
Gladstone PS (275 kV) Unit 6	275	GSTONE6	QGLD6	QGLH	0.9431	0.9662	
Grosvenor PS	66	GROSV1	QMRN2G	QMRV	1.0252	--	Effective from 27/09/2017
Grosvenor PS No2	66	GROSV2	QMRV1G	QMRV	1.0252	--	Effective from 27/09/2017
Kareeya PS Unit 1	132	KAREEYA1	QKAH1	QKYH	1.0181	1.0495	

Kareeya PS Unit 2	132	KAREEYA2	QKAH2	QKYH	1.0181	1.0495	
Kareeya PS Unit 3	132	KAREEYA3	QKAH3	QKYH	1.0181	1.0495	
Kareeya PS Unit 4	132	KAREEYA4	QKAH4	QKYH	1.0181	1.0495	
Kogan Creek PS	275	KPP_1	QBRA4K	QWDN	0.9635	0.9588	
Koombooloomba	132	KAREEYA5	QKYH5	QKYH	1.0181	1.0495	
Millmerran PS Unit 1	330	MPP_1	QBCK1	QMLN	0.9737	0.9642	
Millmerran PS Unit 2	330	MPP_2	QBCK2	QMLN	0.9737	0.9642	
Mt Stuart PS Unit 1	132	MSTUART1	QMSP1	QMSP	0.9964	0.9834	
Mt Stuart PS Unit 2	132	MSTUART2	QMSP2	QMSP	0.9964	0.9834	
Mt Stuart PS Unit 3	132	MSTUART3	QMSP3M	QMSP	0.9964	0.9834	
Oakey PS Unit 1	110	OAKEY1	QOKY1	QOKY	0.9667	0.9420	
Oakey PS Unit 2	110	OAKEY2	QOKY2	QOKY	0.9667	0.9420	
Stanwell PS Load	132	STANNL1	QSTX	QSTX	0.9366	0.9618	
Stanwell PS Unit 1	275	STAN-1	QSTN1	QSTN	0.9329	0.9561	
Stanwell PS Unit 2	275	STAN-2	QSTN2	QSTN	0.9329	0.9561	
Stanwell PS Unit 3	275	STAN-3	QSTN3	QSTN	0.9329	0.9561	
Stanwell PS Unit 4	275	STAN-4	QSTN4	QSTN	0.9329	0.9561	
Swanbank E GT	275	SWAN_E	QSWE	QSWE	1.0019	0.9984	
Tarong North PS	275	TNPS1	QTNT	QTNT	0.9713	0.9678	
Tarong PS Unit 1	275	TARONG#1	QTRN1	QTRN	0.9712	0.9686	
Tarong PS Unit 2	275	TARONG#2	QTRN2	QTRN	0.9712	0.9686	
Tarong PS Unit 3	275	TARONG#3	QTRN3	QTRN	0.9712	0.9686	
Tarong PS Unit 4	275	TARONG#4	QTRN4	QTRN	0.9712	0.9686	
Staplyton	110	STAPYLTON1	QLGH4S	QLGH	1.0112	--	Effective from 18/07/2017
Wivenhoe Generation Unit 1	275	W/HOE#1	QWIV1	QWIV	0.9935	0.9902	
Wivenhoe Generation Unit 2	275	W/HOE#2	QWIV2	QWIV	0.9935	0.9902	
Wivenhoe Pump 1	275	PUMP1	QWIP1	QWIP	0.9975	0.9940	
Wivenhoe Pump 2	275	PUMP2	QWIP2	QWIP	0.9975	0.9940	
Yabulu PS	132	YABULU	QTYP	QTYP	1.0035	1.0073	
Yarwun PS	132	YARWUN_1	QYAG1R	QYAG	0.9435	0.9693	

Table 3 Queensland Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF
Barcaldine PS - Lilyvale	132	BARCALDN	QBCG	QBCG	0.9507	0.9777
Barcaldine Solar - Lilyvale	132	BARCSF1	QLLV1B	QLLV	0.9715	1.0107
Browns Plains Landfill Gas PS	110	BPLANDF1	QLGH3B	QLGH	1.0112	1.0080

Daandine PS	110	DAANDINE	QTKM1	QTKM	0.9816	0.9717
German Creek Generator	66	GERMCRK	QLIL2	QLIL	0.9808	1.0122
Grosvenor PS At Moranbah 66	66	GROSV1	QMRN2G	QMRV	1.0320	1.0727
Isis CSM	132	ICSM	QGNG1I	QTBC	0.9870	1.0033
Mackay GT	33	MACKAYGT	QMKG	QMKG	0.9577	0.9737
Moranbah Gen	11	MORANBAH	QMRL1M	QMRL	1.0441	1.0526
Moranbah North PS	66	MBAHNTH	QMRN1P	QMRN	1.0364	1.0721
Oaky Creek Generator	66	OAKYCREK	QLIL1	QLIL	0.9808	1.0122
Oaky Creek 2	66	OAKY2	QLIL3O	QLIL	0.9808	1.0122
Racecourse Mill PS 1 - 3	66	RACOMIL1	QMKA1R	QPIV	1.0060	1.0487
Rochedale Renewable Energy Plant	110	ROCHEDAL	QBMH2	QBMH	1.0114	1.0091
Rocky Point Gen (Loganlea 110kV)	110	RPCG	QLGH2	QLGH	1.0112	1.0080
Roghan Road Generator	110	EDLRGNRD	QSPN2	QSPN	1.0044	1.0049
Roma PS Unit 7 - Columboola	132	ROMA_7	QRMA7	QRMA	0.9623	0.9629
Roma PS Unit 8 - Columboola	132	ROMA_8	QRMA8	QRMA	0.9623	0.9629
Southbank Institute Of Technology	110	STHBKTEC	QCBD1S	QCBW	1.0129	1.0125
Ti Tree BioReactor	33	TITREE	QABM1T	QABM	1.0016	0.9990
Whitwood Rd Renewable Energy Plant	110	WHIT1	QSBK1	QBKS	0.9999	0.9968
Windy Hill WF	66	WHILL1	QTUL	QTUL	1.0877	1.1103
Wivenhoe Small Hydro	110	WIVENSH	QABR1	QABR	0.9990	0.9951
Yabulu Steam Turbine (Garbutt 66kV)	66	YABULU2	QGAR1	QYST	0.9778	0.9992

1.2 NSW Marginal Loss Factors[1]

Table 4 NSW Loads

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Albury	132	NALB	1.1080	1.0305	
Alcan	132	NALC	0.9920	0.9933	
Armidale	66	NAR1	0.9020	0.9435	
Australian Newsprint Mill	132	NANM	1.1110	1.0294	
Balranald	22	NBAL	1.2097	1.1166	
Beaconsfield North	132	NBFN	1.0081	1.0078	
Beaconsfield South	132	NBFS	1.0081	1.0078	
Beaconsfield West	132	NBFW	1.0081	1.0078	

[1] The NSW region includes the ACT. ACT generation and load are detailed separately for ease of reference.

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Belmore Park	132	NBM1	1.0082	1.0079	
Beresfield	33	NBRF	0.9947	0.9965	
Beryl	66	NBER	1.0067	1.0145	
BHP (Waratah)	132	NWR1	0.9886	0.9898	
Boambee South	132	NWST	0.9190	0.9680	
Boggabri East	132	NBGE	0.9677	1.0022	
Boggabri North	132	NBGN	0.9694	1.0056	
Brandy Hill	11	NBHL	0.9924	0.9941	
Broken Hill	22	NBKG	1.2841	1.1714	
Broken Hill	220	NBKH	1.2757	1.1632	
Bunnerong	132	NBG1	1.0080	1.0076	
Bunnerong	33	NBG3	1.0099	1.0097	
Burrinjuck	132	NBU2	1.0324	1.0045	
Canterbury	33	NCTB	1.0135	1.0134	
Carlingford	132	NCAR	1.0041	1.0035	
Casino	132	NCSN	0.9021	0.9648	
Charmhaven	11	NCHM	0.9925	0.9935	
Chullora	132	NCHU	1.0076	1.0077	
Coffs Harbour	66	NCH1	0.9139	0.9634	
Coleambally	132	NCLY	1.1222	1.0477	
Cooma	66	NCMA	1.0387	1.0106	
Cooma (AusNet Services)	66	NCM2	1.0387	1.0106	
Croydon	11	NCRD	1.0113	1.0104	
Cowra	66	NCW8	1.0435	1.0355	
Dapto (Endeavour Energy)	132	NDT1	1.0023	0.9986	
Dapto (Essential Energy)	132	NDT2	1.0023	0.9986	
Darlington Point	132	NDNT	1.1114	1.0470	
Deniliquin	66	NDN7	1.1400	1.0715	
Dorrigo	132	NDOR	0.9116	0.9568	
Drummoyne	11	NDRM	1.0090	1.0090	
Dunoon	132	NDUN	0.8881	0.9553	
Far North VTN		NEV1	0.9632	0.9745	
Finley	66	NFNY	1.1256	1.0825	
Forbes	66	NFB2	1.0551	1.0535	
Gadara	132	NGAD	1.0756	1.0328	
Glen Innes	66	NGLN	0.9000	0.9696	
Gosford	66	NGF3	1.0008	1.0015	
Gosford	33	NGSF	1.0014	1.0021	
Green Square	11	NGSQ	1.0094	1.0081	
Griffith	33	NGRF	1.1321	1.0665	
Gunnedah	66	NGN2	0.9592	0.9879	
Haymarket	132	NHYM	1.0082	1.0079	
Heron's Creek	132	NHNC	0.9921	1.0226	
Holroyd	132	NHLD	0.9998	1.0001	

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Hurstville North	11	NHVN	1.0068	1.0063	
Homebush Bay	11	NHBB	1.0112	1.0112	
Ilford	132	NLFD	0.9868	0.9928	
Ingleburn	66	NING	1.0001	1.0005	
Inverell	66	NNVL	0.9127	0.9823	
Kemps Creek	330	NKCK	0.9965	0.9957	
Kempsey	66	NKS2	0.9572	0.9976	
Kempsey	33	NKS3	0.9600	1.0006	
Koolkhan	66	NKL6	0.9255	0.9776	
Kurnell	132	NKN1	1.0055	1.0052	
Kogarah	11	NKOG	1.0120	1.0086	
Kurri	33	NKU3	0.9951	0.9967	
Kurri	11	NKU1	0.9932	0.9932	
Kurri	132	NKUR	0.9930	0.9941	
Lake Munmorah	132	NMUN	0.9810	0.9791	
Lane Cove	132	NLCV	1.0088	1.0086	
Leichhardt Zone SS (Ausgrid)	11	NLDT	1.0106	--	Effective from 04/10/2017
Liddell	33	NLD3	0.9582	0.9679	
Lismore	132	NLS2	0.9051	0.9661	
Liverpool	132	NLP1	1.0022	1.0019	
Macarthur	132	NMC1	0.9972	0.9953	
Macarthur	66	NMC2	0.9998	0.9986	
Macksville	132	NMCV	0.9362	0.9824	
Macquarie Park	11	NMQP	1.0123	1.0116	
Manildra	132	NMLD	1.0346	1.0410	
Marrickville	11	NMKV	1.0136	1.0132	
Marulan (Endeavour Energy)	132	NMR1	0.9998	0.9922	
Marulan (Essential Energy)	132	NMR2	0.9998	0.9922	
Mason Park	132	NMPK	1.0086	1.0087	
Meadowbank	11	NMBK	1.0120	1.0117	
Molong	132	NMOL	1.0303	1.0359	
Moree	66	NMRE	0.9479	1.0039	
Morven	132	NMVN	1.1004	1.0316	
Mt Piper	66	NMP6	0.9713	0.9765	
Mudgee	132	NMDG	1.0026	1.0095	
Mullumbimby	11	NML1	0.8710	0.9494	
Mullumbimby	132	NMLB	0.8644	0.9403	
Munmorah STS 33	33	NMU3	0.9969	0.9895	
Munmorah	330	NMN1	0.9875	0.9882	
Munyang	11	NMY1	1.0426	1.0148	
Munyang	33	NMYG	1.0426	1.0148	
Murrumbateman	132	NMBM	1.0179	1.0009	
Murrumburrah	66	NMRU	1.0596	1.0245	

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Muswellbrook	132	NMRK	0.9637	0.9754	
Nambucca Heads	132	NNAM	0.9307	0.9773	
Narrabri	66	NNB2	0.9746	1.0154	
Newcastle	132	NNEW	0.9892	0.9907	
North of Broken Bay VTN		NEV2	0.9926	0.9937	
Orange	66	NRGE	1.0363	1.0450	
Orange	132	NRG1	1.0374	1.0453	
Orange North	132	NONO	1.0343	1.0437	
Ourimbah	33	NORB	0.9977	0.9987	
Ourimbah	132	NOR1	0.9968	0.9976	
Ourimbah	66	NOR6	0.9967	0.9975	
Panorama	66	NPMA	1.0251	1.0292	
Parkes	66	NPK6	1.0497	1.0527	
Parkes	132	NPKS	1.0476	1.0506	
Peakhurst	33	NPHT	1.0069	1.0071	
Pt Macquarie	33	NPMQ	0.9833	1.0187	
Pyrmont	33	NPT3	1.0089	1.0085	
Pyrmont	132	NPT1	1.0084	1.0080	
Queanbeyan 132	132	NQBY	1.0555	1.0250	
Raleigh	132	NRAL	0.9223	0.9691	
Regentville	132	NRGV	0.9993	0.9991	
Rookwood Road	132	NRWR	1.0019	1.0013	
Rozelle	132	NRZH	1.0089	1.0101	
Rozelle	33	NRZL	1.0100	1.0098	
Snowy Adit	132	NSAD	1.0263	0.9741	
Somersby	11	NSMB	1.0018	1.0024	
South of Broken Bay VTN		NEV3	1.0064	1.0060	
St Peters	11	NSPT	1.0113	1.0109	
Stroud	132	NSRD	1.0010	1.0057	
Sydney East	132	NSE2	1.0048	1.0050	
Sydney North (Ausgrid)	132	NSN1	1.0015	1.0016	
Sydney North (Endeavour Energy)	132	NSN2	1.0015	1.0016	
Sydney South	132	NSYS	1.0033	1.0029	
Sydney West (Ausgrid)	132	NSW1	1.0041	1.0035	
Sydney West (Endeavour Energy)	132	NSW2	1.0041	1.0035	
Tamworth	66	NTA2	0.9372	0.9638	
Taree (Essential Energy)	132	NTR2	1.0111	1.0295	
Tenterfield	132	NTTF	0.9028	0.9705	
Terranora	110	NTNR	0.9406	0.9986	
Tomago	330	NTMG	0.9888	0.9905	
Tomago (Ausgrid)	132	NTME	0.9915	0.9923	
Tomago (Essential Energy)	132	NTMC	0.9915	0.9923	
Top Ryde	11	NTPR	1.0095	1.0094	

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Tuggerah	132	NTG3	0.9930	0.9938	
Tumut	66	NTU2	1.0748	1.0314	
Vales Pt.	132	NVP1	0.9878	0.9883	
Vineyard	132	NVYD	0.9989	0.9991	
Wagga	66	NWG2	1.0888	1.0313	
Wagga North	132	NWGN	1.0889	1.0292	
Wagga North	66	NWG6	1.0941	1.0319	
Wallerawang (Endeavour Energy)	132	NWW6	0.9714	0.9766	
Wallerawang (Essential Energy)	132	NWW5	0.9714	0.9766	
Wallerawang 66 (Essential Energy)	66	NWW4	0.9718	0.9771	
Wallerawang 66	66	NWW7	0.9718	0.9771	
Wallerawang 330 PS Load	330	NWWP	0.9754	0.9798	
Wellington	132	NWL8	0.9831	0.9909	
West Gosford	11	NGWF	1.0024	1.0031	
Williamsdale[2]	132	NWDL	1.0356	1.0090	
Williamsdale (Essential Energy)	132	NWD1	1.0382	--	Effective from 30/08/2017
Wyong	11	NWYG	0.9953	0.9963	
Yanco	33	NYA3	1.1197	1.0546	
Yass	66	NYS6	1.0191	1.0016	
Yass	132	NYS1	1.0135	0.9914	

Table 5 NSW Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Bayswater PS Unit 1	330	BW01	NBAY1	NBAY	0.9520	0.9590	
Bayswater PS Unit 2	330	BW02	NBAY2	NBAY	0.9520	0.9590	
Bayswater PS Unit 3	500	BW03	NBAY3	NBYW	0.9532	0.9603	
Bayswater PS Unit 4	500	BW04	NBAY4	NBYW	0.9532	0.9603	
Blowering	132	BLOWERNG	NBLW8	NBLW	1.0506	0.9815	
Broken Hill GT 1	22	GB01	NBKG1	NBKG	1.2841	1.1714	
Burrinjuck	132	BURRIN	NBUK	NBUK	1.0275	0.9915	
Capital Wind Farm	330	CAPTL_WF	NCWF1R	NCWF	1.0163	0.9931	
Colongra PS Unit 1	330	CG1	NCLG1D	NCLG	0.9831	0.9872	
Colongra PS Unit 2	330	CG2	NCLG2D	NCLG	0.9831	0.9872	
Colongra PS Unit 3	330	CG3	NCLG3D	NCLG	0.9831	0.9872	
Colongra PS Unit 4	330	CG4	NCLG4D	NCLG	0.9831	0.9872	
Eraring 330 PS Unit 1	330	ER01	NEPS1	NEP3	0.9820	0.9829	

[2] There is currently a registration process in place to replace ACA1 and NWDL TNIs by 12 new TNIs in the ActewAGL network. Royalla and Mugga Lane Solar Farms will also have separate TNIs as part of the forementioned process. The 2017-18 MLF for NWDL listed in the table above will apply from 01 July 2017 until the time when the 12 new TNIs are registered and in commercial operation. Refer to Table 7 for more information on the TNI changes.

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Eraring 330 PS Unit 2	330	ER02	NEPS2	NEP3	0.9820	0.9829	
Eraring 500 PS Unit 3	500	ER03	NEPS3	NEPS	0.9846	0.9846	
Eraring 500 PS Unit 4	500	ER04	NEPS4	NEPS	0.9846	0.9846	
Eraring PS Load	500	ERNL1	NEPSL	NEPS	0.9846	0.9846	
Gullen Range Solar	330	GULLRSF1	NGUR2G	NGUR	1.0010	--	Effective from 15/08/2017
Gullen Range Wind Farm	330	GULLRWF1	NGUR1G	NGUR	1.0010	0.9909	
Guthega	132	GUTHEGA	NGUT8	NGUT	0.9658	0.9371	
Guthega Auxiliary Supply	11	GUTHNL1	NMY11	NMY1	1.0426	1.0148	
Hume (NSW Share)	132	HUMENSW	NHUM	NHUM	1.1055	1.0020	
Kangaroo Valley – Bendeela (Shoalhaven) Generation - dual MLF	330	SHGEN	NSHL	NSHN	0.9931	0.9904	
Kangaroo Valley (Shoalhaven) Pumps - dual MLF	330	SHPUMP	NSHP1	NSHN	1.0141	1.0100	
Liddell 330 PS Load	330	LIDDNL1	NLDPL	NLDP	0.9509	0.9593	
Liddell 330 PS Unit 1	330	LD01	NLDP1	NLDP	0.9509	0.9593	
Liddell 330 PS Unit 2	330	LD02	NLDP2	NLDP	0.9509	0.9593	
Liddell 330 PS Unit 3	330	LD03	NLDP3	NLDP	0.9509	0.9593	
Liddell 330 PS Unit 4	330	LD04	NLDP4	NLDP	0.9509	0.9593	
Lower Tumut Generation - dual MLF	330	TUMUT3	NLTS8	NLTS	1.0155	0.9897	
Lower Tumut Pipeline Auxiliary	66	TUMT3NL3	NTU2L3	NTU2	1.0748	1.0314	
Lower Tumut Pumps - dual MLF	330	SNOWYP	NLTS3	NLTS	1.0533	1.0142	
Lower Tumut T2 Auxiliary	66	TUMT3NL1	NTU2L1	NTU2	1.0748	1.0314	
Lower Tumut T4 Auxiliary	66	TUMT3NL2	NTU2L2	NTU2	1.0748	1.0314	
Mt Piper PS Load	330	MPNL1	NMPPL	NMTP	0.9725	0.9753	
Mt Piper PS Unit 1	330	MP1	NMTP1	NMTP	0.9725	0.9753	
Mt Piper PS Unit 2	330	MP2	NMTP2	NMTP	0.9725	0.9753	
Smithfield Energy Facility (Sithe)	132	SITHE01	NSYW1	NHD2	0.9979	--	Effective from 01/11/2017
Upper Tumut	330	UPPTUMUT	NUTS8	NUTS	1.0356	0.9943	
Uranquinty PS Unit 11	132	URANQ11	NURQ1U	NURQ	1.0087	0.9291	
Uranquinty PS Unit 12	132	URANQ12	NURQ2U	NURQ	1.0087	0.9291	
Uranquinty PS Unit 13	132	URANQ13	NURQ3U	NURQ	1.0087	0.9291	
Uranquinty PS Unit 14	132	URANQ14	NURQ4U	NURQ	1.0087	0.9291	
Vales Point 330 PS Load	330	VPNL1	NVPPL	NVPP	0.9845	0.9853	
Vales Point 330 PS Unit 5	330	VP5	NVPP5	NVPP	0.9845	0.9853	
Vales Point 330 PS Unit 6	330	VP6	NVPP6	NVPP	0.9845	0.9853	
White Rock Wind Farm	132	WRWF1	NWRK1W	NWRK	0.8468	--	Effective from 06/07/2017

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Woodlawn Wind Farm	330	WOODLWN 1	NCWF2W	NCWF	1.0163	0.9931	

Table 6 NSW Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Appin PS	66	APPIN	NAPP1A	NAPP	1.0000	0.9986	
Awaba Renewable Energy Facility	132	AWABAREF	NNEW2	NNEW	0.9892	0.9907	
Bankstown Sport Club	132	BANKSPT1	NSYS3R	NSYS	1.0033	1.0029	
Boco Rock Wind Farm	132	BOCORWF1	NCMA3B	NBCO	1.0167	0.9882	
Broadwater PS	132	BWTR1	NLS21B	NLS2	0.9051	0.9661	
Broken Hill Solar Farm	22	BROKENH1	NBK11B	NBK1	1.2456	1.1220	
Brown Mountain	66	BROWNMT	NCMA1	NCMA	1.0387	1.0106	
Burrendong Hydro PS	132	BDONGHYD	NWL81B	NWL8	0.9831	0.9909	
Campbelltown WSLC	66	WESTCBT1	NING1C	NING	1.0001	1.0005	
Condong PS	110	CONDONG1	NTNR1C	NTNR	0.9406	0.9986	
Copeton Hydro PS	66	COPTNHYD	NNVL1C	NNVL	0.9127	0.9823	
Cullerin Range Wind Farm	132	CULLRGWF	NYS11C	NYS1	1.0135	0.9914	
Eastern Creek	132	EASTCRK	NSW21	NSW2	1.0041	1.0035	
Eraring 330 BS UN (GT)	330	ERGT01	NEP35B	NEP3	0.9820	0.9829	
Glenbawn Hydro PS	132	GLBWNHYD	NMRK2G	NMRK	0.9637	0.9754	
Glenn Innes (Pindari PS)	66	PINDARI	NGLN1	NGLN	0.9000	0.9696	
Grange Avenue	132	GRANGEAV	NVYD1	NVYD	0.9989	0.9991	
Gunning Wind Farm	132	GUNNING1	NYS12A	NYS1	1.0135	0.9914	
Jindabyne Generator	66	JNDABNE1	NCMA2	NCMA	1.0387	1.0106	
Jounama PS	66	JOUNAMA1	NTU21J	NTU2	1.0748	1.0314	
Keepit	66	KEEPIT	NKPT	NKPT	0.9592	0.9879	
Kincumber Landfill	66	KINCUM1	NGF31K	NGF3	1.0008	1.0015	
Liddell 33 – Hunter Valley GTs	33	HVGTS	NLD31	NLD3	0.9582	0.9679	
Liverpool 132 (Jacks Gully)	132	JACKSGUL	NLP11	NSW2	1.0041	1.0035	
Lucas Heights II Power Plant	132	LUCASHGT	NSYS2G	NSYS	1.0033	1.0029	
Lucas Heights Stage 2 Power Station	132	LUCAS2S2	NSYS1	NSYS	1.0033	1.0029	
Moree Solar Farm	66	MOREESF1	NMR41M	NMR4	0.8911	0.9433	
Nine Willoughby	132	NINEWIL1	NSE21R	NSE2	1.0048	1.0050	
Nyngan Solar Farm	132	NYNGAN1	NWL82N	NWL8	0.9831	0.9909	
Sithe	132	SITHE01	NSYW1	NSW2	1.0041	1.0035	
St George Leagues Club	33	STGEORG1	NPHT1E	NPHT	1.0069	1.0071	
Tahmoor PS	132	TAHMOOR1	NLP12T	NLP1	1.0022	1.0019	
Tallawarra PS	132	TALWA1	NDT13T	NTWA	1.0013	0.9967	
Taralga Wind Farm	132	TARALGA1	NMR22T	NMR2	0.9998	0.9922	
Teralba Power Station	132	TERALBA	NNEW1	NNEW	0.9892	0.9907	

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
The Drop PS	66	THEDROP1	NFNY1D	NFNY	1.1256	1.0157	
Tower Power Plant	132	TOWER	NLP11T	NLP1	1.0022	1.0019	
West Nowra	132	AGLNOW1	NDT12	NDT1	1.0023	0.9986	
Wests Illawara Leagues Club	132	WESTILL1	NDT14E	NDT1	1.0023	0.9986	
Wilga Park A	66	WILGAPK	NNB21W	NNB2	0.9746	1.0154	
Wilga Park B	66	WILGB01	NNB22W	NNB2	0.9746	1.0154	
Woodlawn Bioreactor	132	WDLNGN01	NMR21W	NMR2	0.9998	0.9922	
Woy Woy Landfill	66	WOYWOY1	NGF32W	NGF3	1.0008	1.0015	
Wyangala A PS	66	WYANGALA	NCW81A	NCW8	1.0435	1.0355	
Wyangala B PS	66	WYANGALB	NCW82B	NCW8	1.0435	1.0355	

Table 7 ACT Loads

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Canberra[3]	132	ACA1	1.0362	1.0095	
Angle Crossing[4]	132	AAXG	1.0371	--	
Belconnen[4]	132	ABCN	1.0388	--	
City East[4]	132	ACTE	1.0419	--	
Civic[4]	132	ACVC	1.0394	--	
East lake[4]	132	AELK	1.0406	--	
Gilmore[4]	132	AGLM	1.0397	--	
Gold Creek[4]	132	AGCK	1.0383	--	
Latham[4]	132	ALTM	1.0377	--	
Telopia Park[4]	132	ATLP	1.0415	--	
Theodore[4]	132	ATDR	1.0389	--	
Wanniassa[4]	132	AWSA	1.0400	--	
Woden[4]	132	AWDN	1.0394	--	
ACT VTN[4]	132	AAVT	1.0396	--	
Queanbeyan (ACTEW)	66	AQB1	1.0563	1.0257	
Queanbeyan (Essential Energy)	66	AQB2	1.0563	1.0257	

Table 8 ACT Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Capital East Solar Farm	66	CESF1	AQB21C	AQB2	1.0563	1.0257	
Mugga Lane Solar Farm[3]	132	MLSP1	ACA12M	ACA1	1.0362	1.0095	
Mugga Lane Solar Farm (at Gilmore)	132	MLSP1	ACA12M	AMS1	1.0395	--	
Royalla Solar Farm[3]	132	ROYALLA1	ACA11R	ACA1	1.0362	1.0095	

[3] There is a currently a registration process in place to replace ACA1 and NWDL TNIs by 12 new TNIs in the ActewAGL network. Royalla and Mugga Lane Solar Farms will also have separate TNIs as part of the forementioned process. The 2017-18 MLF for ACA1 listed in the table above will apply from 01 July 2017 until the time when the 12 new TNIs are registered and in commercial operation.

[4] The 2017-18 MLF value will apply once the TNI registration process is complete and in commercial operation. (see note above).

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Royalla Solar Farm (at Theodore)	132	ROYALLA1	ACA11R	ARS1	1.0386	--	

The Regional Reference Node (RRN) for ACT load and generation is the Sydney West 330kV node.

1.3 Victoria Marginal Loss Factors

Table 9 Victorian Loads

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Altona	66	VATS	1.0084	1.0068	
Altona	220	VAT2	1.0081	1.001	
Ballarat	66	VBAT	1.016	1.0209	
Bendigo	66	VBE6	1.0398	1.0664	
Bendigo	22	VBE2	1.0405	1.0658	
BHP Western Port	220	VJLA	0.9948	0.9909	
Brooklyn (Jemena)	22	VBL2	1.0081	1.0064	
Brooklyn (Jemena)	66	VBL6	1.0069	1.0054	
Brooklyn (Powercor)	22	VBL3	1.0081	1.0064	
Brooklyn (Powercor)	66	VBL7	1.0069	1.0054	
Brunswick (CitiPower)	22	VBT2	1.0008	1.0003	
Brunswick (Jemena)	22	VBTS	1.0008	1.0003	
Brunswick 66 kV (CitiPower)	66	VBT6	0.9993	0.9987	
Cranbourne	220	VCB2	0.9933	0.9897	
Cranbourne (AusNet Services)	66	VCBT	0.9962	0.9919	
Cranbourne (United Energy)	66	VCB5	0.9962	0.9919	
Deer Park	66	VDPT	1.0069	--	Effective from 09/06/2017
East Rowville (AusNet Services)	66	VER2	0.9962	0.9932	
East Rowville (United Energy)	66	VERT	0.9962	0.9932	
Fishermens Bend (CitiPower)	66	VFBT	1.0046	1.0036	
Fishermens Bend (Powercor)	66	VFB2	1.0046	1.0036	
Fosterville	220	VFVT	1.0305	1.0619	
Geelong	66	VGT6	1.0055	1.0048	
Glenrowan	66	VGNT	0.9884	1.0368	
Heatherton	66	VHTS	1.0007	0.9986	
Heywood	22	VHY2	1.0096	1.0111	
Horsham	66	VHOT	1.0473	1.0803	
Keilor (Jemena)	66	VKT2	1.0048	1.0037	
Keilor (Powercor)	66	VKTS	1.0048	1.0037	
Kerang	22	VKG2	1.0779	1.1124	
Kerang	66	VKG6	1.0755	1.1118	
Khancoban	330	NKHN	0.9369	1.0123	
Loy Yang Substation	66	VLY6	0.9826	0.9709	

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF	Remark
Malvern	22	VMT2	0.9982	0.9962	
Malvern	66	VMT6	0.9971	0.995	
Morwell Power Station Units 1 to 3	66	VMWG	0.982	0.9707	
Morwell PS (G4&5)	11	VMWP	0.9821	0.9708	
Morwell TS	66	VMWT	0.9886	0.9759	
Mt Beauty	66	VMBT	0.9743	1.0189	
Portland	500	VAPD	1.0121	1.0135	
Pt Henry	220	VPTH	1.003	1.0023	
Red Cliffs	22	VRC2	1.1108	1.1621	
Red Cliffs	66	VRC6	1.1068	1.1602	
Red Cliffs (Essential Energy)	66	VRCA	1.1068	1.1602	
Richmond	22	VRT2	0.9997	0.9979	
Richmond (CitiPower)	66	VRT7	1.0015	1.0000	
Richmond (United Energy)	66	VRT6	1.0015	1.0000	
Ringwood (AusNet Services)	22	VRW3	1.0005	0.9989	
Ringwood (AusNet Services)	66	VRW7	1.0005	0.9990	
Ringwood (United Energy)	22	VRW2	1.0005	0.9989	
Ringwood (United Energy)	66	VRW6	1.0005	0.9990	
Shepparton	66	VSHT	1.0037	1.0502	
South Morang (Jemena)	66	VSM6	0.9980	0.9985	
South Morang (AusNet Services)	66	VSMT	0.9980	0.9985	
Springvale (CitiPower)	66	VSVT	0.9989	0.9972	
Springvale (United Energy)	66	VSV2	0.9989	0.9972	
Templestowe (CitiPower)	66	VTS2	1.0005	0.9995	
Templestowe (Jemena)	66	VTST	1.0005	0.9995	
Templestowe (AusNet Services)	66	VTS3	1.0005	0.9995	
Templestowe (United Energy)	66	VTS4	1.0005	0.9995	
Terang	66	VTGT	1.0322	1.0339	
Thomastown (Jemena)	66	VTTS	1.0000	1.0000	
Thomastown (AusNet Services)	66	VTT2	1.0000	1.0000	
Tyabb	66	VTBT	0.9963	0.9925	
Wemen 66 kV (Essential Energy)	66	VWEA	1.1038	1.1513	
Wemen TS	66	VWET	1.1038	1.1513	
West Melbourne	22	VWM2	1.0027	1.0021	
West Melbourne (CitiPower)	66	VWM7	1.0041	1.0031	
West Melbourne (Jemena)	66	VWM6	1.0041	1.0031	
Wodonga	22	VWO2	0.9654	1.0252	
Wodonga	66	VWO6	0.9621	1.0235	
Yallourn	11	VYP1	0.9582	0.9528	

Table 10 Victoria Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Ararat WF	220	ARWF1	VART1A	VART	1.0019	1.0299	
Banimboola	220	BAPS	VDPS2	VDPS	0.9372	0.9812	
Basslink (Loy Yang PS Switchyard) Tasmania to Victoria	500	BLNKVIC	VLYP13	VTBL	0.9874	0.9765	
Dartmouth PS	220	DARTM1	VDPS	VDPS	0.9372	0.9812	
Eildon PS Unit 1	220	EILDON1	VEPS1	VEPS	0.9696	0.9945	
Eildon PS Unit 2	220	EILDON2	VEPS2	VEPS	0.9696	0.9945	
Hazelwood PS Load[5]	220	HWPNL1	VHWPL	VHWP	0.9820	0.9701	
Jeeralang A PS Unit 1	220	JLA01	VJLGA1	VJLG	0.9830	0.9641	
Jeeralang A PS Unit 2	220	JLA02	VJLGA2	VJLG	0.9830	0.9641	
Jeeralang A PS Unit 3	220	JLA03	VJLGA3	VJLG	0.9830	0.9641	
Jeeralang A PS Unit 4	220	JLA04	VJLGA4	VJLG	0.9830	0.9641	
Jeeralang B PS Unit 1	220	JLB01	VJLGB1	VJLG	0.9830	0.9641	
Jeeralang B PS Unit 2	220	JLB02	VJLGB2	VJLG	0.9830	0.9641	
Jeeralang B PS Unit 3	220	JLB03	VJLGB3	VJLG	0.9830	0.9641	
Jindabyne pump at Guthega	132	SNOWYGJP	NGJP	NGJP	1.0474	1.1115	
Kiata Wind farm	66	KIATAWF1	VHOG1K	VHOG	1.0357	--	Effective from 03/11/2017
Laverton PS (LNGS1)	220	LNGS1	VAT21L	VAT2	1.0081	1.0010	
Laverton PS (LNGS2)	220	LNGS2	VAT22L	VAT2	1.0081	1.0010	
Loy Yang A PS Load	500	LYNL1	VLYPL	VLYP	0.9801	0.9723	
Loy Yang A PS Unit 1	500	LYA1	VLYP1	VLYP	0.9801	0.9723	
Loy Yang A PS Unit 2	500	LYA2	VLYP2	VLYP	0.9801	0.9723	
Loy Yang A PS Unit 3	500	LYA3	VLYP3	VLYP	0.9801	0.9723	
Loy Yang A PS Unit 4	500	LYA4	VLYP4	VLYP	0.9801	0.9723	
Loy Yang B PS Unit 1	500	LOYYB1	VLYP5	VLYP	0.9801	0.9723	
Loy Yang B PS Unit 2	500	LOYYB2	VLYP6	VLYP	0.9801	0.9723	
MacArthur Wind Farm	500	MACARTH1	VTRT1M	VTRT	1.0017	1.0022	
McKay Creek / Bogong PS	220	MCKAY1	VMKP1	VT14	0.9213	0.9543	
Mortlake Unit 1	500	MORTLK11	VM0P1O	VM0P	1.0050	1.0015	
Mortlake Unit 2	500	MORTLK12	VM0P2O	VM0P	1.0050	1.0015	
Mt Mercer Windfarm	220	MERCER01	VELT1M	VELT	1.0010	1.0048	
Murray	330	MURRAY	NMUR8	NMUR	0.8964	0.9590	
Newport PS	220	NPS	VNPS	VNPS	0.9990	0.9939	
Valley Power Unit 1	500	VPGS1	VLYP07	VLYP	0.9801	0.9723	
Valley Power Unit 2	500	VPGS2	VLYP08	VLYP	0.9801	0.9723	
Valley Power Unit 3	500	VPGS3	VLYP09	VLYP	0.9801	0.9723	
Valley Power Unit 4	500	VPGS4	VLYP010	VLYP	0.9801	0.9723	
Valley Power Unit 5	500	VPGS5	VLYP011	VLYP	0.9801	0.9723	
Valley Power Unit 6	500	VPGS6	VLYP012	VLYP	0.9801	0.9723	

[5] 2017/18 MLFs include the retirement of Hazelwood PS

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Waubra Wind Farm	220	WAUBRAWF	VWBT1A	VWBT	0.9997	1.0111	
West Kiewa PS Unit 1	220	WKIEWA1	VWKP1	VWKP	0.9540	1.0026	
West Kiewa PS Unit 2	220	WKIEWA2	VWKP2	VWKP	0.9540	1.0026	
Yallourn W PS 220 Load	220	YWNL1	VYP2L	VYP2	0.9558	0.9509	
Yallourn W PS 220 Unit 1	220	YWPS1	VYP21	VYP3	0.9702	0.9541	
Yallourn W PS 220 Unit 2	220	YWPS2	VYP22	VYP2	0.9558	0.9509	
Yallourn W PS 220 Unit 3	220	YWPS3	VYP23	VYP2	0.9558	0.9509	
Yallourn W PS 220 Unit 4	220	YWPS4	VYP24	VYP2	0.9558	0.9509	

Table 11 Victoria Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF
Bairnsdale Power Station	66	BDL01	VMWT2	VBDL	0.9863	0.9745
Bairnsdale PS Generator Unit 2	66	BDL02	VMWT3	VBDL	0.9863	0.9745
Bald Hills WF	66	BALDHWF1	VMWT9B	VMWT	0.9886	0.9759
Ballarat Health Services	66	BBASEHOS	VBAT1H	VBAT	1.0160	1.0209
Broadmeadows Power Plant	66	BROADMDW	VTTS2B	VTTS	1.0000	1.0000
Brooklyn Landfill & Recycling Facility	66	BROOKLYN	VBL61	VBL6	1.0069	1.0054
Chepstowe Wind Farm	66	CHPSTWF1	VBAT3C	VBAT	1.0160	1.0209
Clayton Landfill Gas Power Station	66	CLAYTON	VSV21B	VSV2	0.9989	0.9972
Codrington Wind Farm	66	CODRNGTON	VTGT2C	VTGT	1.0322	1.0339
Coonooer Bridge WF	66	CBWF1	VBE61C	VBE6	1.0398	1.0664
Corio LFG PS	66	CORIO1	VGT61C	VGT6	1.0055	1.0048
Eildon Hydro PS	66	EILDON3	VTT22E	VSMT	0.9980	0.9985
Glenmaggie Hydro PS	66	GLENMAG1	VMWT8G	VMWT	0.9886	0.9759
Hallam Mini Hydro	66	HLMSEW01	VER21H	VER2	0.9962	0.9932
Hallam Road Renewable Energy Facility	66	HALAMRD1	VER22L	VER2	0.9962	0.9932
Hepburn Community WF	66	HEPWIND1	VBAT2L	VBAT	1.0160	1.0209
Hume (Victorian Share)	66	HUMEV	VHUM	VHUM	0.8911	0.9947
Longford	66	LONGFORD	VMWT6	VMWT	0.9886	0.9759
Mornington Landfill Site Generator	66	MORNW	VTBT1	VTBT	0.9963	0.9925
Mortons Lane Wind Farm	66	MLWF1	VTGT4M	VTGT	1.0322	1.0339
Oaklands Hill Wind Farm	66	OAKLAND1	VTGT3A	VTGT	1.0322	1.0339
Shepparton Waste Gas	66	SHEP1	VSHT2S	VSHT	1.0037	1.0502
Somerton Power Station	66	AGLSOM	VTTS1	VSOM	0.9968	0.9949
Springvale Power Plant	66	SVALE1	VSV22S	VSV2	0.9989	0.9972
Tatura	66	TATURA01	VSHT1	VSHT	1.0037	1.0502

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF
Toora Wind Farm	66	TOORAWF	VMWT5	VMWT	0.9886	0.9759
Traralgon NSS	66	TGNSS1	VMWT1T	VMWT	0.9886	0.9759
William Horvell Hydro PS	66	WILLHOV1	VW061W	VWO6	0.9621	1.0235
Wollert Renewable Energy Facility	66	WOLLERT1	VSMT1W	VSMT	0.9980	0.9985
Wonthaggi Wind Farm	66	WONWP	VMWT7	VMWT	0.9886	0.9759
Wyndham Landfill Site Generator	66	WYNDW	VATS1	VATS	1.0084	1.0068
Yambuk Wind Farm	66	YAMBUKWF	VTGT1	VTGT	1.0322	1.0339
Yarrawonga Hydro PS	66	YWNGAHYD	VSHT3Y	VSHT	1.0037	1.0502

1.4 South Australia Marginal Loss Factors

Table 12 South Australia Loads

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF
Angas Creek	33	SANC	1.0096	1.0093
Ardrossan West	33	SARW	0.9541	0.9544
Back Callington	11	SBAC	1.0092	1.0071
Baroota	33	SBAR	1.0066	1.0125
Berri	66	SBER	0.9485	0.9379
Berri (Powercor)	66	SBE1	0.9485	0.9379
Blanche	33	SBLA	0.9371	0.9218
Blanche (Powercor)	33	SBL1	0.9371	0.9218
Brinkworth	33	SBRK	1.0011	1.0061
Bungama Industrial	33	SBUN	1.0016	1.0078
Bungama Rural	33	SBUR	1.0114	1.0194
City West	66	SACR	1.0045	1.0047
Clare North	33	SCLN	0.9972	1.0012
Dalrymple	33	SDAL	0.9193	0.9153
Davenport	275	SDAV	1.0048	1.0114
Davenport	33	SDAW	1.0066	1.0129
Dorrien	33	SDRN	1.0083	1.0114
East Terrace	66	SETC	1.0047	1.0048
Happy Valley	66	SHVA	1.0051	1.0050
Hummocks	33	SHUM	0.9751	0.9758
Kadina East	33	SKAD	0.9804	0.9815
Kanmantoo	11	SKAN	1.0089	1.0070
Keith	33	SKET	0.9780	0.9703
Kilburn	66	SKLB	1.0035	1.0017
Kincraig	33	SKNC	0.9571	0.9452
Lefevre	66	SLFE	0.9995	0.9997
Leigh Creek	33	SLCC	1.0575	1.0791
Leigh Creek South	33	SLCS	1.0589	1.0719
Magill	66	SMAG	1.0044	1.0044

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF
Mannum	33	SMAN	1.0098	1.0071
Mannum – Adelaide Pipeline 1	3.3	SMA1	1.0143	1.0137
Mannum – Adelaide Pipeline 2	3.3	SMA2	1.0134	1.0132
Mannum – Adelaide Pipeline 3	3.3	SMA3	1.0136	1.0135
Middleback	33	SMDL	1.0085	1.0170
Middleback	132	SMBK	1.0102	1.0202
Millbrook	132	SMLB	1.0055	1.0046
Mobilong	33	SMBL	1.0065	1.0032
Morgan – Whyalla Pipeline 1	3.3	SMW1	0.9797	0.9810
Morgan – Whyalla Pipeline 2	3.3	SMW2	0.9872	0.9908
Morgan – Whyalla Pipeline 3	3.3	SMW3	0.9921	0.9972
Morgan – Whyalla Pipeline 4	3.3	SMW4	0.9926	0.9978
Morphett Vale East	66	SMVE	1.0047	1.0051
Mount Barker South	66	SMBS	1.0041	1.0037
Mt Barker	66	SMBA	1.0041	1.0029
Mt Gambier	33	SMGA	0.9390	0.9231
Mt Gunson	33	SMGU	1.0373	1.0445
Munno Para	66	SMUP	1.0035	1.0044
Murray Bridge - Hahndorf Pipeline 1	11	SMH1	1.0088	1.0096
Murray Bridge - Hahndorf Pipeline 2	11	SMH2	1.0105	1.0120
Murray Bridge - Hahndorf Pipeline 3	11	SMH3	1.0102	1.0119
Neuroodla	33	SNEU	1.0308	1.0392
New Osborne	66	SNBN	0.9990	0.9995
North West Bend	66	SNWB	0.9778	0.9754
Northfield	66	SNFD	1.0034	1.0037
Para	66	SPAR	1.0041	1.0042
Parafield Gardens West	66	SPGW	1.0039	1.0054
Penola West 33	33	SPEN	0.9376	0.9241
Pimba	132	SPMB	1.0429	1.0493
Playford	132	SPAA	1.0038	1.0132
Port Lincoln	33	SPLN	0.9900	1.0021
Port Pirie	33	SPPR	1.0110	1.0150
Roseworthy	11	SRSW	1.0103	1.0134
Snuggery Industrial (Dual MLF – Generation)	33	SSNN	0.9174	0.9176
Snuggery Industrial (Dual MLF – Load)	33	SSNN	0.9102	0.9176
Snuggery Rural	33	SSNR	0.9181	0.9016
South Australian VTN		SJP1	0.9994	1.0001
Stony Point	11	SSPN	1.0109	1.0189
Tailem Bend	33	STAL	0.9936	0.9896
Templers	33	STEM	1.0061	1.0086
Torrens Island	66	STSY	1.0000	1.0000
Waterloo	33	SWAT	0.9897	0.9931
Whyalla Central Substation	33	SWYC	1.0112	1.0196
Whyalla Terminal BHP	33	SBHP	1.0107	1.0181

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF
Woomera	132	SWMA	1.0432	1.0510
Wudina	66	SWUD	1.0118	1.0229
Yadnarie	66	SYAD	0.9986	1.0080

Table 13 South Australia Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Cathedral Rocks Wind Farm	132	CATHROCK	SCRK	SCRK	0.8965	0.8896	
Clements Gap Wind Farm	132	CLEMGPWF	SCGW1P	SCGW	0.9787	0.9822	
Dry Creek PS Unit 1	66	DRYCGT1	SDCA1	SDPS	1.0019	1.0011	
Dry Creek PS Unit 2	66	DRYCGT2	SDCA2	SDPS	1.0019	1.0011	
Dry Creek PS Unit 3	66	DRYCGT3	SDCA3	SDPS	1.0019	1.0011	
Hallett 2 WF	275	HALLWF2	SMOK1H	SMOK	0.9818	0.9871	
Hallett PS	275	AGLHAL	SHPS1	SHPS	0.9820	0.9900	
Hallett WF	275	HALLWF1	SHPS2W	SHPS	0.9820	0.9900	
Hornsdale WF Stage 1	275	HDWF1	SHDW1H	SHDW	0.9799	0.9918	Effective from 14/08/2017
Hornsdale WF Stage 2	275	HDWF2	SHDW2H	SHDW	0.9799	0.9918	Effective from 14/08/2017
Hornsdale WF Stage 3	275	HDWF3	SHDW3H	SHDW	0.9799	--	Effective from 14/08/2017
Ladbroke Grove PS Unit 1	132	LADBROK1	SPEW1	SPEW	0.9170	0.8872	
Ladbroke Grove PS Unit 2	132	LADBROK2	SPEW2	SPEW	0.9170	0.8872	
Lake Bonney Wind Farm	33	LKBONNY1	SMAY1	SMAY	0.8906	0.8768	
Lake Bonney Wind Farm Stage 2	33	LKBONNY2	SMAY2	SMAY	0.8906	0.8768	
Lake Bonney Wind Farm Stage 3	33	LKBONNY3	SMAY3W	SMAY	0.8906	0.8768	
Mintaro PS	132	MINTARO	SMPS	SMPS	0.9941	0.9889	
Mt Millar Wind Farm	33	MTMILLAR	SMTM1	SMTM	0.9172	0.9120	
North Brown Hill Wind Farm	275	NBHWF1	SBEL1A	SBEL	0.9798	0.9863	
O.C.P.L. Unit 1	66	OSB-AG	SNBN1	SOCP	0.9988	0.9994	
Pelican Point PS	275	PPCCGT	SPPT	SPPT	1.0012	1.0009	
Port Lincoln 3	33	POR03	SPL31P	SPL3	1.0510	1.0064	
Port Lincoln PS	132	POR01	SPLN1	SPTL	1.0158	1.0011	
Quarantine PS Unit 1	66	QPS1	SQPS1	SQPS	0.9856	0.9864	
Quarantine PS Unit 2	66	QPS2	SQPS2	SQPS	0.9856	0.9864	
Quarantine PS Unit 3	66	QPS3	SQPS3	SQPS	0.9856	0.9864	
Quarantine PS Unit 4	66	QPS4	SQPS4	SQPS	0.9856	0.9864	
Quarantine PS Unit 5	66	QPS5	SQPS5Q	SQPS	0.9856	0.9864	
Snowtown WF Stage 2 - North	275	SNOWNTH1	SBLWS1	SBLW	0.9869	0.9888	
Snowtown WF Stage 2 - South	275	SNOWSTH1	SBLWS2	SBLW	0.9869	0.9888	
Snowtown Wind Farm	33	SNOWTWN1	SNWF1T	SNWF	0.9296	0.9289	
Snuggery PS Units 1 to 3	132	SNUG1	SSGA1	SSPS	0.9318	0.8417	
The Bluff wind Farm	275	BLUFF1	SBEL2P	SBEL	0.9798	0.9863	

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Torrens Island PS A Unit 1	275	TORRA1	STSA1	STPS	1.0016	1.0014	
Torrens Island PS A Unit 2	275	TORRA2	STSA2	STPS	1.0016	1.0014	
Torrens Island PS A Unit 3	275	TORRA3	STSA3	STPS	1.0016	1.0014	
Torrens Island PS A Unit 4	275	TORRA4	STSA4	STPS	1.0016	1.0014	
Torrens Island PS B Unit 1	275	TORRB1	STSB1	STPS	1.0016	1.0014	
Torrens Island PS B Unit 2	275	TORRB2	STSB2	STPS	1.0016	1.0014	
Torrens Island PS B Unit 3	275	TORRB3	STSB3	STPS	1.0016	1.0014	
Torrens Island PS B Unit 4	275	TORRB4	STSB4	STPS	1.0016	1.0014	
Torrens Island PS Load	66	TORNL1	STSYL	STSY	1.0000	1.0000	
Waterloo Wind Farm	132	WATERLWF	SWLE1R	SWLE	0.9751	0.9784	
Wattle Point Wind Farm	132	WPWF	SSYP1	SSYP	0.8330	0.8185	

Table 14 South Australia Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF	Remark
Amcor Glass UN 1	11	AMCORGR	SRSW1E	SRSW	1.0103	1.0134	
Angaston Power Station	33	ANGAST1	SDRN1	SANG	1.0121	1.0042	
Blue Lake Milling	33	BLULAKE1	SKET2B	SKET	0.9780	0.9703	
Bolivar WWT Plant (NEW)	66	BOLIVAR1	SPGW1B	SPGW	1.0039	1.0054	
Canunda Wind Farm	33	CNUNDAWF	SSNN1	SCND	0.8967	0.885	
Cummins Lonsdale PS	66	LONSDALE	SMVE1	SMVE	1.0047	1.0051	
Pedler Creek Landfill Gas PS	66	PEDLER1	SMVE5C	SMVE	1.0047	1.0051	
Pt Stanvac Power Station	66	PTSTAN1	SMVE3P	SMVE	1.0047	1.0051	
Starfish Hill Wind Farm	66	STARHLWF	SMVE2	SMVE	1.0047	1.0051	
Tatiara Meat Co	33	TATIARA1	SKET1E	SKET	0.9780	0.9703	
Terminal Storage Mini-Hydro	66	TERMSTOR	SNFD1	SNFD	1.0034	1.0037	
Wingfield 1 LFG PS	66	WINGF1_1	SKLB1W	SKLB	1.0035	1.0017	
Wingfield 2 LFG PS	66	WINGF2_1	SNBN2W	SNBN	0.9990	0.9995	
Edinburgh Generation (at Para 66)	66	SATGN1	SPAG1E	SPAG	1.0022	--	Effective from 20/10/2017
Lonsdale Generation (at Morphett Vale East 66)	66	SATGS1	SMVG1L	SMVG	1.0007	--	Effective from 20/10/2017

1.5 Tasmania Marginal Loss Factors

Table 15 Tasmania Loads

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF
Arthurs Lake	6.6	TAL2	0.9937	1.0012
Avoca	22	TAV2	1.0017	1.0301
Boyer SWA	6.6	TBYA	1.0199	1.0322
Boyer SWB	6.6	TBYB	1.0197	1.0325

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF
Bridgewater	11	TBW2	1.0141	1.0278
Burnie	22	TBU3	0.9855	0.9905
Chapel St.	11	TCS3	1.0127	1.0264
Comalco	220	TCO1	1.0006	1.0006
Creek Road	33	TCR2	1.0140	1.0276
Derby	22	TDE2	0.9672	0.9695
Derwent Bridge	22	TDB2	0.9368	0.9390
Devonport	22	TDP2	0.9884	0.9895
Electrona	11	TEL2	1.0255	1.0381
Emu Bay	11	TEB2	0.9829	0.9877
Fisher (Rowallan)	220	TFI1	0.9671	0.9755
George Town	22	TGT3	1.0023	1.0021
George Town (Basslink)	220	TGT1	1.0000	1.0000
Gordon	22	TGO2	1.0012	1.0155
Greater Hobart Area VTN		TVN1	1.0155	1.0287
Hadspen	22	THA3	0.9941	0.9988
Hampshire	110	THM2	0.9834	0.9865
Huon River	11	THR2	1.0316	1.0409
Kermandie	11	TKE2	1.0312	1.0435
Kingston	33	TK13	1.0188	1.0323
Kingston	11	TKI2	1.0196	1.0329
Knights Road	11	TKR2	1.0353	1.0455
Lindisfarne	33	TLF2	1.0159	1.0301
Meadowbank	22	TMB2	0.9919	0.9933
Mornington	33	TMT2	1.0162	1.0283
Mowbray	22	TMY2	0.9927	0.9971
New Norfolk	22	TNN2	1.0128	1.0244
Newton	22	TNT2	0.9712	0.9809
Newton	11	TNT3	0.9607	0.9710
North Hobart	11	TNH2	1.0150	1.0276
Norwood	22	TNW2	0.9926	0.9974
Palmerston	22	TPM3	0.9870	0.9951
Port Latta	22	TPL2	0.9664	0.9722
Que	22	TQU2	0.9708	0.9759
Queenstown	11	TQT3	0.9546	0.9730
Queenstown	22	TQT2	0.9629	0.9687
Railton	22	TRA2	0.9899	0.9895
Risdon	33	TRI4	1.0180	1.0305
Risdon	11	TRI3	1.0228	1.0351
Rokeby	11	TRK2	1.0163	1.0296
Rosebery	44	TRB2	0.9727	0.9753
Savage River	22	TSR2	1.0013	1.0049
Scottsdale	22	TSD2	0.9735	0.9791
Smithton	22	TST2	0.9493	0.9574
Sorell	22	TSO2	1.0239	1.0365

Location	Voltage (kV)	TNI	2017-18 MLF	2016-17 MLF
St Leonard	22	TSL2	0.9915	0.9964
St. Marys	22	TSM2	1.0165	1.0435
Starwood	110	TSW1	1.0009	1.0008
Tamar Region VTN		TVN2	0.9938	0.9982
Temco	110	TTE1	1.0039	1.0037
Trevallyn	22	TTR2	0.9931	0.9980
Triabunna	22	TTB2	1.0382	1.0533
Tungatinah	22	TTU2	0.9367	0.9417
Ulverstone	22	TUL2	0.9868	0.9888
Waddamana	22	TWA2	0.9537	0.9667
Wayatinah	11	TWY2	0.9979	1.0079
Wesley Vale	22	TWV2	0.9863	0.9810

Table 16 Tasmania Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF
Basslink (George Town)	220	BLNKTAS	TGT11	TGT1	1.0000	1.0000
Bastyan	220	BASTYAN	TFA11	TFA1	0.9486	0.9496
Bell Bay No.3	110	BBTHREE1	TBB11	TBB1	1.0001	1.0001
Bell Bay No.3	110	BBTHREE2	TBB12	TBB1	1.0001	1.0001
Bell Bay No.3	110	BBTHREE3	TBB13	TBB1	1.0001	1.0001
Bluff Point and Studland Bay Wind Farms	110	WOOLNTH1	TST11	TST1	0.9025	0.9120
Butlers Gorge	110	BUTLERSG	TBG11	TBG1	0.9216	0.9399
Catagunya	220	LI_WY_CA	TLI11	TLI1	0.9919	1.0028
Cethana	220	CETHANA	TCE11	TCE1	0.9630	0.9723
Cluny	220	CLUNY	TCL11	TCL1	0.9908	1.0055
Devils gate	110	DEVILS_G	TDG11	TDG1	0.9703	0.9700
Fisher	220	FISHER	TFI11	TFI1	0.9671	0.9755
Gordon	220	GORDON	TGO11	TGO1	0.9594	0.9676
John Butters	220	JBUTTERS	TJB11	TJB1	0.9445	0.9456
Lake Echo	110	LK_ECHO	TLE11	TLE1	0.9487	0.9360
Lemonthyme	220	LEM_WIL	TSH11	TSH1	0.9711	0.9749
Liapootah	220	LI_WY_CA	TLI11	TLI1	0.9919	1.0028
Mackintosh	110	MACKNTSH	TMA11	TMA1	0.9402	0.9367
Meadowbank	110	MEADOWBK	TMB11	TMB1	0.9770	0.9756
Musselroe	110	MUSSELR1	TDE11M	TDE1	0.9133	0.9193
Paloona	110	PALOONA	TPA11	TPA1	0.9668	0.9754
Poatina	220	POAT220	TPM11	TPM1	0.9813	0.9929
Poatina	110	POAT110	TPM21	TPM2	0.9677	0.9824
Reece No.1	220	REECE1	TRCA1	TRCA	0.9399	0.9413
Reece No.2	220	REECE2	TRCB1	TRCB	0.9402	0.9390
Repulse	220	REPULSE	TCL12	TCL1	0.9908	1.0055
Rowallan	220	ROWALLAN	TFI12	TFI1	0.9671	0.9755
Tamar Valley CCGT	220	TVCC201	TTV11A	TTV1	1.0000	1.0000

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF
Tamar Valley OCGT	110	TVPP104	TBB14A	TBB1	1.0001	1.0001
Tarraleah	110	TARRALEA	TTA11	TTA1	0.9338	0.9453
Trevallyn	110	TREVALLN	TTR11	TTR1	0.9898	0.9927
Tribute	220	TRIBUTE	TTI11	TTI1	0.9466	0.9437
Tungatinah	110	TUNGATIN	TTU11	TTU1	0.9233	0.9091
Wayatinah	220	LI_WY_CA	TLI11	TLI1	0.9919	1.0028
Wilmot	220	LEM_WIL	TSH11	TSH1	0.9711	0.9749

Table 17 Tasmania Embedded Generation

Location	Voltage [kV]	DUID	Connection Point ID	TNI	2017-18 MLF	2016-17 MLF
Midlands PS	22	MIDLDPS1	TAV21M	TAV2	1.0017	1.0301
Remount	22	REMOUNT	TMY21	TVN2	0.9938	0.9982

2. CHANGES IN MARGINAL LOSS FACTORS

This section summarises the changes in MLFs for 2017–18 from the 2016–17 MLFs, and the trends driving them.

The following major trends in the NEM caused changes in MLFs in 2017–18 from 2016–17:

- Retirement of Hazelwood Power Station (PS) in Victoria.
- Decreased forecast consumption in Southern Queensland, in particular decreased consumption in production of LNG, and other major industrial load forecasts.
- Increased regional consumption forecast in NSW and Victoria.
- Decreased regional consumption forecast in Queensland, South Australia and Tasmania.
- Increased hydro generation forecast in Tasmania.
- Increased in installed wind capacity in South Australia.
- Forecast reduction in Basslink power transfers from Victoria to Tasmania.

These major trends dictated the following changes in modelled net power transfer on interconnectors:

- Increased power flow from Queensland to NSW when compared to the 2016-17 MLF study.
- Increased power from NSW to Victoria when compared to the 2016-17 MLF study.
- Reduced power flow from Victoria to South Australia when compared to the 2016-17 MLF study.
- Reduced power flow from Victoria to Tasmania when compared to the 2016-17 MLF study.

These changes have a consequent effect on MLFs, in particular at locations geographically close to interconnectors.

2.1 Changes to Marginal Loss Factors in Queensland

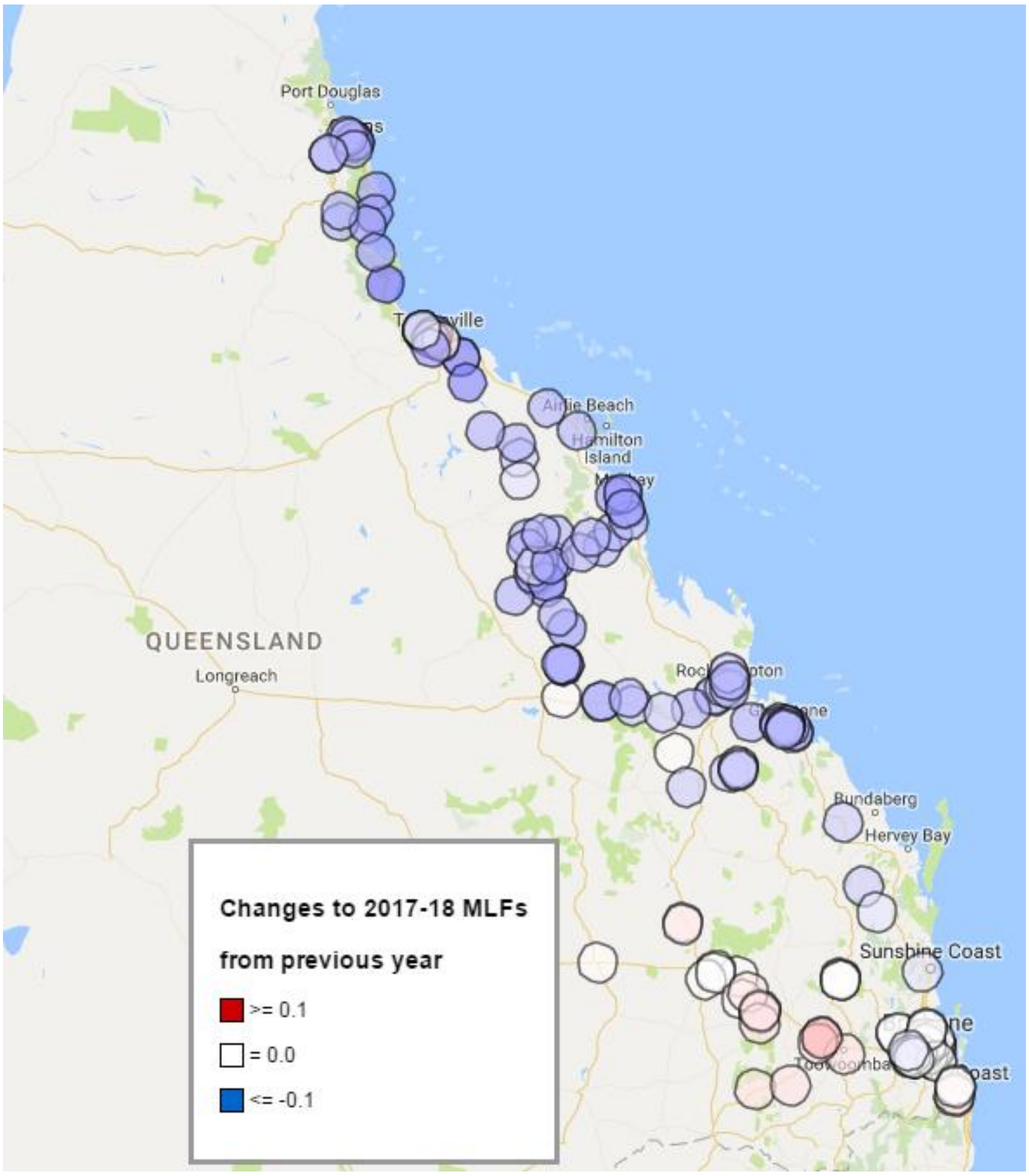
The 2017-18 Queensland region consumption forecast is 6.1% lower than the 2016-17 forecast used in 2016-17 MLF calculations. The decrease is largely due to the decrease in LNG and other major industrial load forecasts in central and southern Queensland[6]. This along with reduced generation in Victoria due to the retirement of Hazelwood PS, has led to an increase in Queensland generation and exports when compared to the 2016-17 MLF study.

These two factors have resulted in an increase in power flow from central Queensland toward the regional reference node; hence there is a general reduction in MLFs at connection points in Central and Northern Queensland.

Figure 1 shows the changes to MLFs at Queensland connection points in the 2017-18 study compared to the previous year.

[6] Forecast Operational consumption – as sent out. It was sourced from the 2016 NEFR Report, and the update to the report. See link http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Electricity-Forecasting-Report

Figure 1 Queensland changes to 2017–18 MLFs



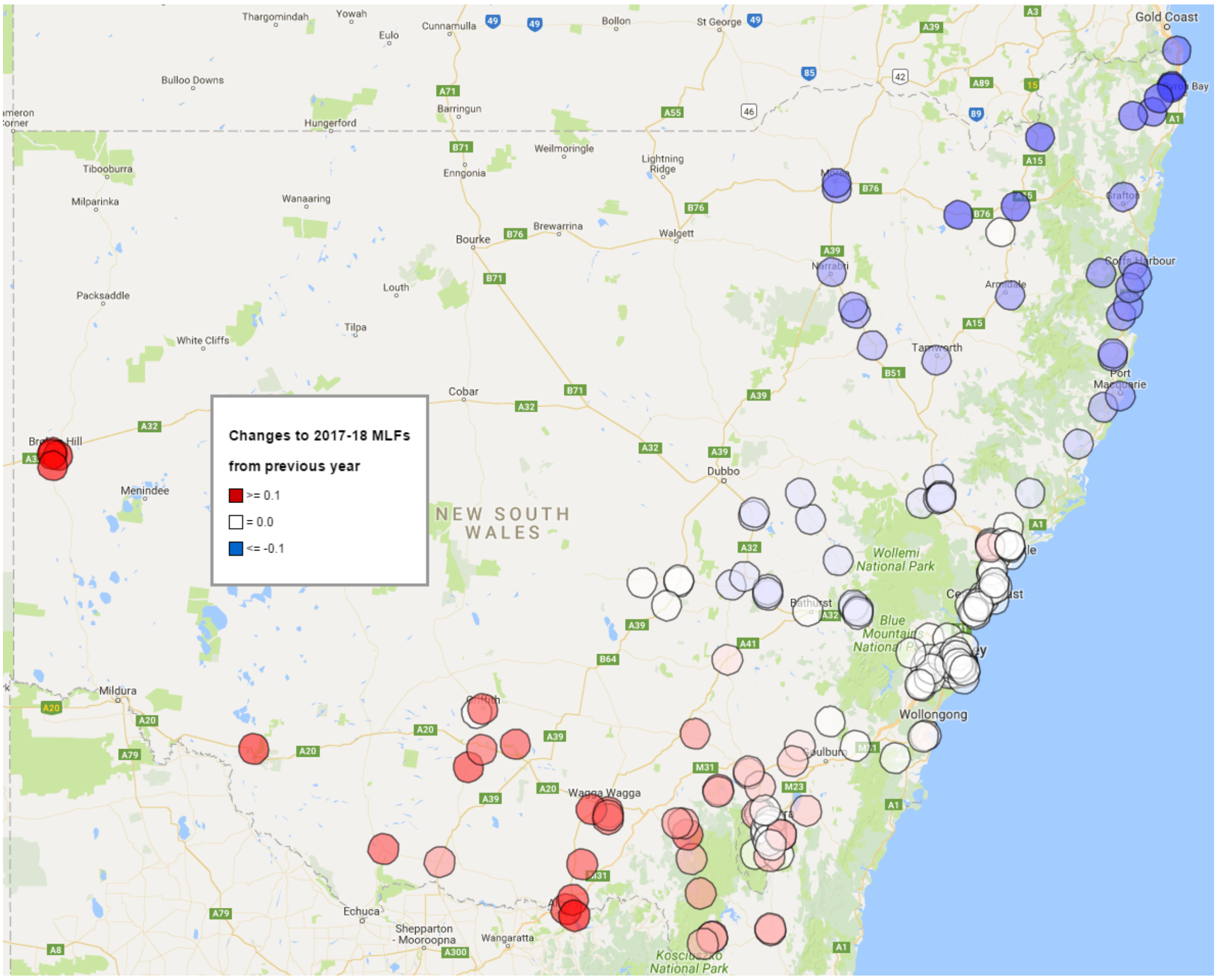
2.2 Changes to Marginal Loss Factors in NSW

The NSW energy consumption forecast for 2017-18 has increased by 0.5% when compared to the 2016-17 MLF study[6]. Generation in Victoria has reduced when compared to the 2016-17 MLF study due to retirement of Hazelwood PS. This has driven an increase in NSW generation, and an increase in NSW export to Victoria. As a result:

- MLFs at connection points in Southern NSW have increased due to anticipated increased power exports to Victoria.
- MLFs at connection points in Northern NSW have reduced due to anticipated increased power imports from Queensland.

Figure 2 shows the changes to MLFs at NSW connection points in the 2017–18 study compared to the previous year.

Figure 2 NSW changes to 2017–18 MLFs



2.3 Changes to Marginal Loss Factors in Victoria

Victoria's energy consumption forecast for 2017-18 has increased by 0.17% when compared to the 2016-17 MLF study[6]. Hazelwood PS is due to be retired at the end of March 2017. To balance supply and demand, an anticipated increase in imports into Victoria and an increase in generation in the Latrobe Valley was modelled.

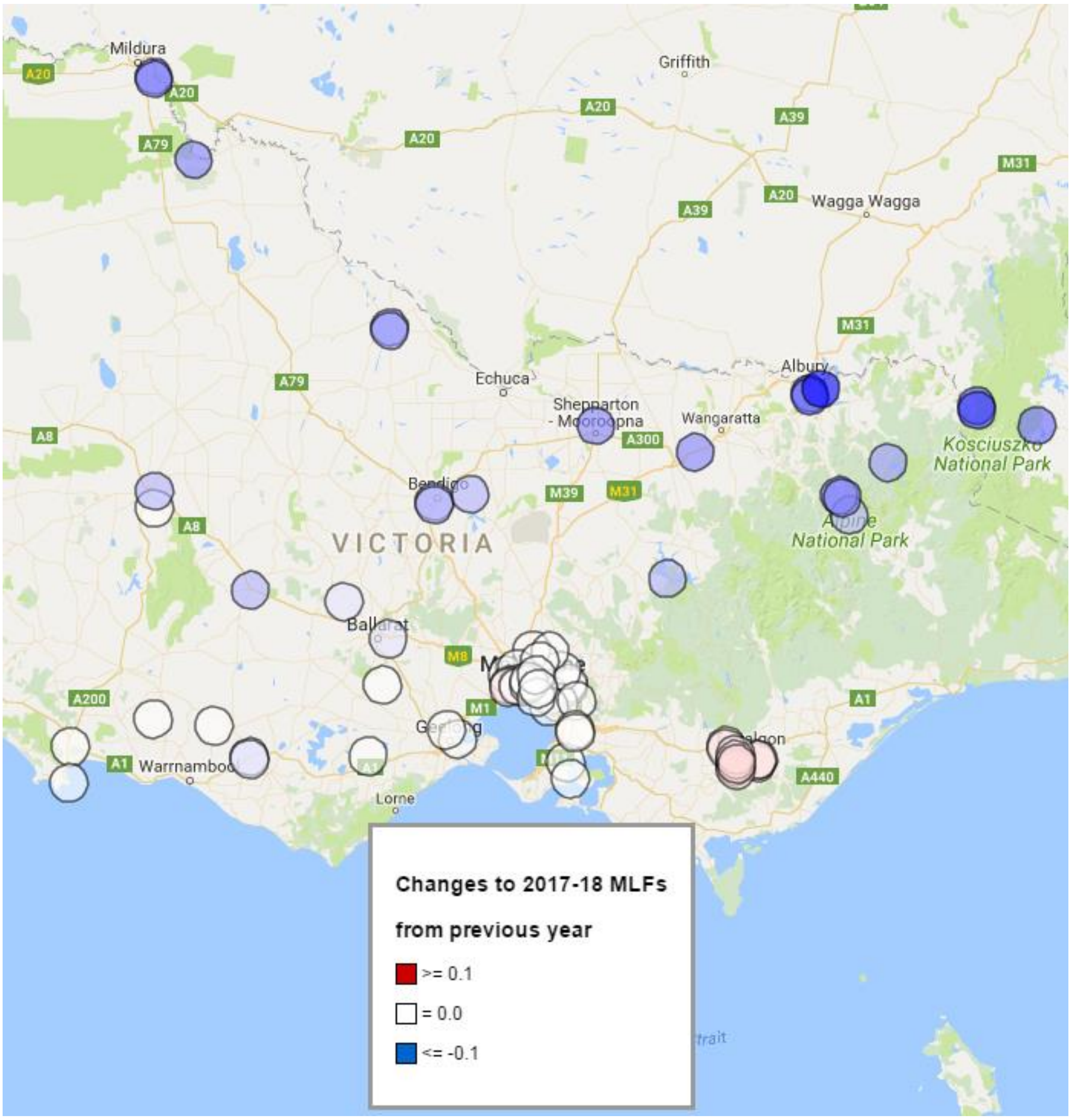
Forecast generation in Tasmania has increased by 3.1% when compared to the 2016-17 MLF study (refer to section B.3.3). This has resulted in reduced transfers from Victoria to Tasmania in the MLF model.

In general, Victoria is forecast to export less energy to Tasmania and South Australia, and import more energy from NSW in 2017-18 compared to the 2016-17 MLF study. As a result:

- MLFs at connection points near the Victoria-NSW interconnector have reduced along with increased power transfers from NSW to Victoria.
- MLFs at connection points near the Victoria-SA interconnector have reduced due to reduced power transfers from Victoria to South Australia.

Figure 3 shows the changes to MLFs at Victorian connection points in the 2017–18 study compared to the previous year.

Figure 3 Victoria changes to 2017–18 MLFs



2.4 Changes to Marginal Loss Factors in South Australia

The South Australian energy consumption forecast for 2017-18 has reduced by 3.2% when compared to the 2016-17 MLF study[6]. The forecast imports from Victoria to South Australia have also reduced due to the retirement of Hazelwood PS. As a result:

- MLFs at connection points in South East South Australia and in the Riverland have increased due to reduced power transfers from Victoria to South Australia.
- MLFs at connection points in Northern South Australia have decreased due to increased wind generation at Hornsdale wind farm.

Figure 4 shows the changes to MLFs at South Australian connection points in the 2017–18 study compared to the previous year.

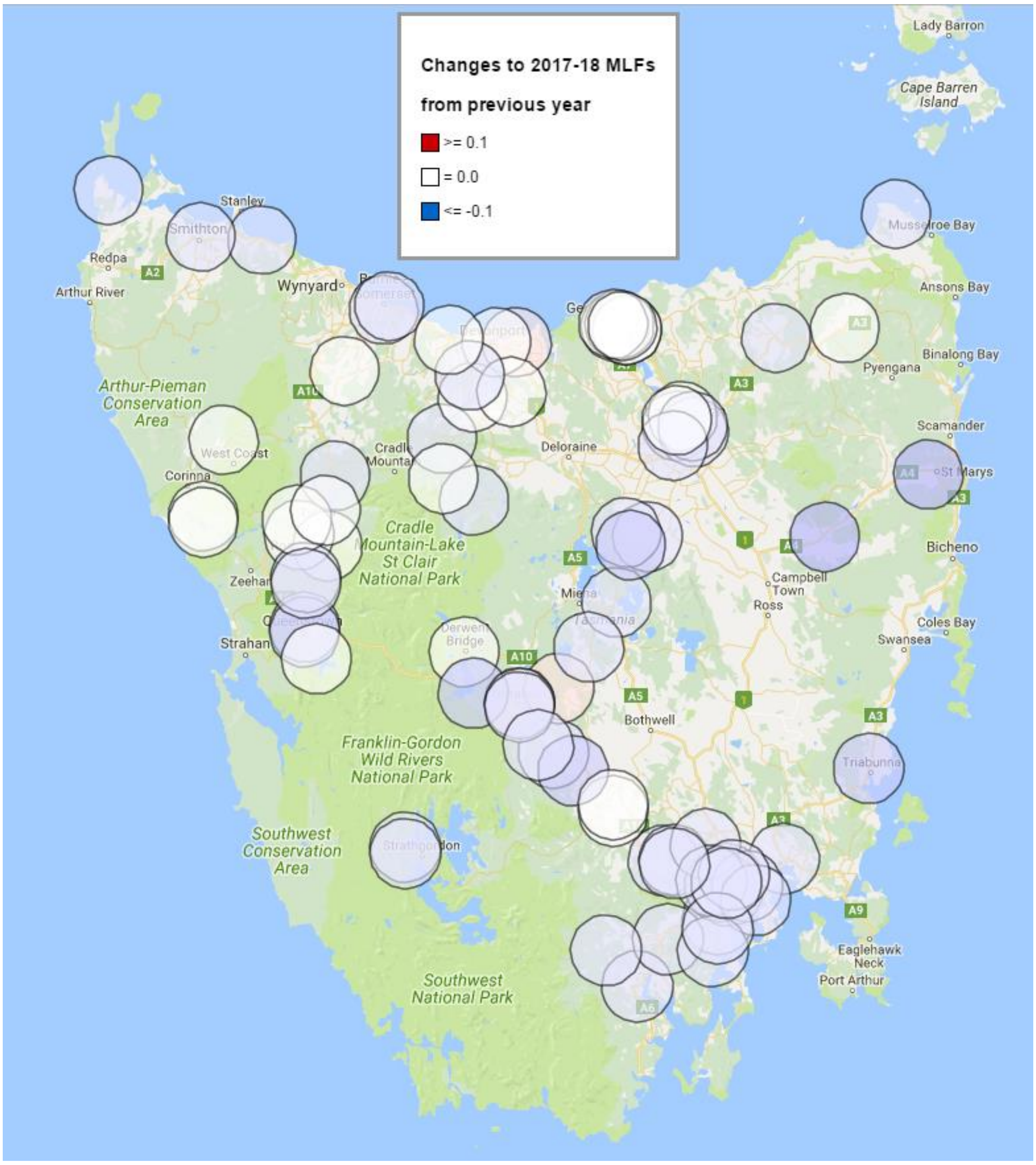
Figure 4 South Australia changes to 2017–18 MLFs

2.5 Changes to Marginal Loss Factors in Tasmania

The Tasmanian energy consumption forecast for 2017-18 has reduced when compared to the 2016-17 MLF study[6]. Forecast generation in Tasmania has increased (refer to section B.3.3), resulting in reduced imports from Victoria via Basslink. Consequently there has been a general decrease in MLFs in Tasmania.

Figure 5 shows the changes to MLFs at Tasmanian connection points in the 2017–18 study compared to the previous year.

Figure 5 Tasmania changes to 2017–18 MLFs



3. INTER-REGIONAL LOSS FACTOR EQUATIONS

This section describes inter-regional loss factor equations.

Inter-regional loss factor equations describe the variation in loss factor at one regional reference node (RRN) with respect to an adjacent RRN. These equations are necessary to cater for the large variations in loss factors that may occur between RRNs as a result of different power flow patterns. This is important in minimising the distortion of economic dispatch of generating units.

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

= 0.9618 + 1.9372E-04*NQt – 1.3618E-06*Nd + 1.2071E-05*Qd

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

= 1.0285 + 1.4963E-04*VNt – 2.4526E-05*Vd + 9.9748E-06*Nd – 6.1947E-06*Sd

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

= 1.0154 + 3.3384E-04*VSAt – 2.5314E-06*Vd + 1.4872E-05*Sd

Where:

Qd = Queensland demand

Vd = Victorian demand

Nd = NSW demand

Sd = South Australian demand

NQt = transfer from NSW to Queensland

VNt = transfer from Victoria to NSW

VSAt = transfer from Victoria to South Australia

Figure 6 MLF (South Pine 275 referred to Sydney West 330)

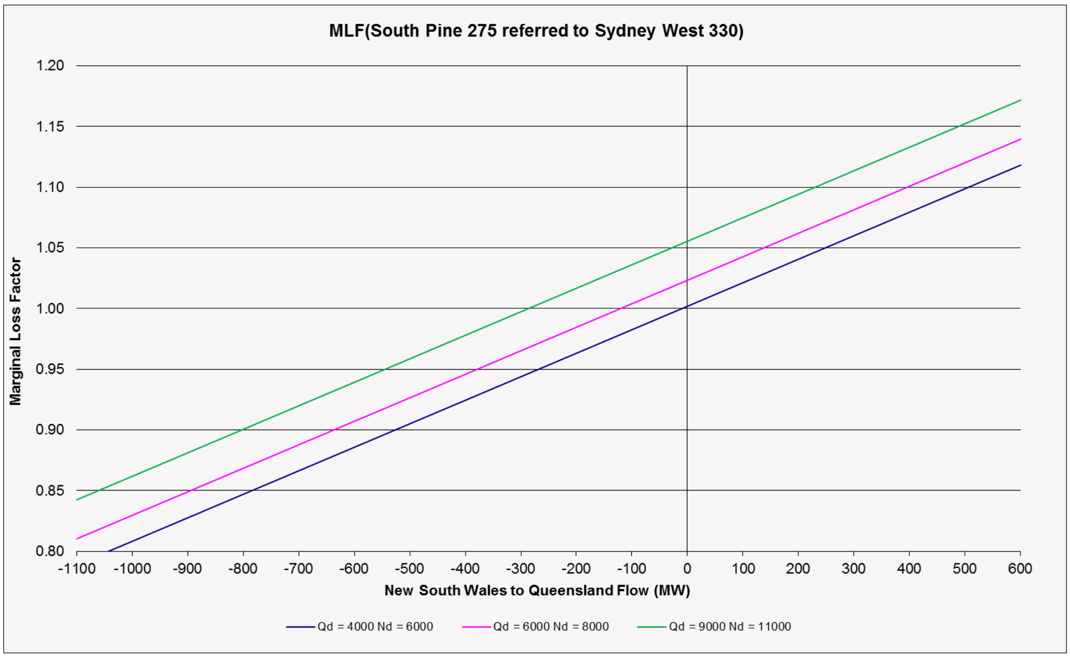


Table 18 South Pine 275 referred to Sydney West 330 MLF versus NSW to Queensland flow Coefficient statistics

Coefficient	Q_d	N_d	NQ_t	CONSTANT
Coefficient value	1.2071E-05	-1.3618E-06	1.9372E-04	0.9618
Standard error values for the coefficients	1.2920E-07	8.0919E-08	2.4359E-07	5.5863E-04
Coefficient of determination (R^2)	0.9794			
Standard error of the y estimate	0.0089			

Figure 7 MLF (Sydney West 330 referred to Thomastown 66)

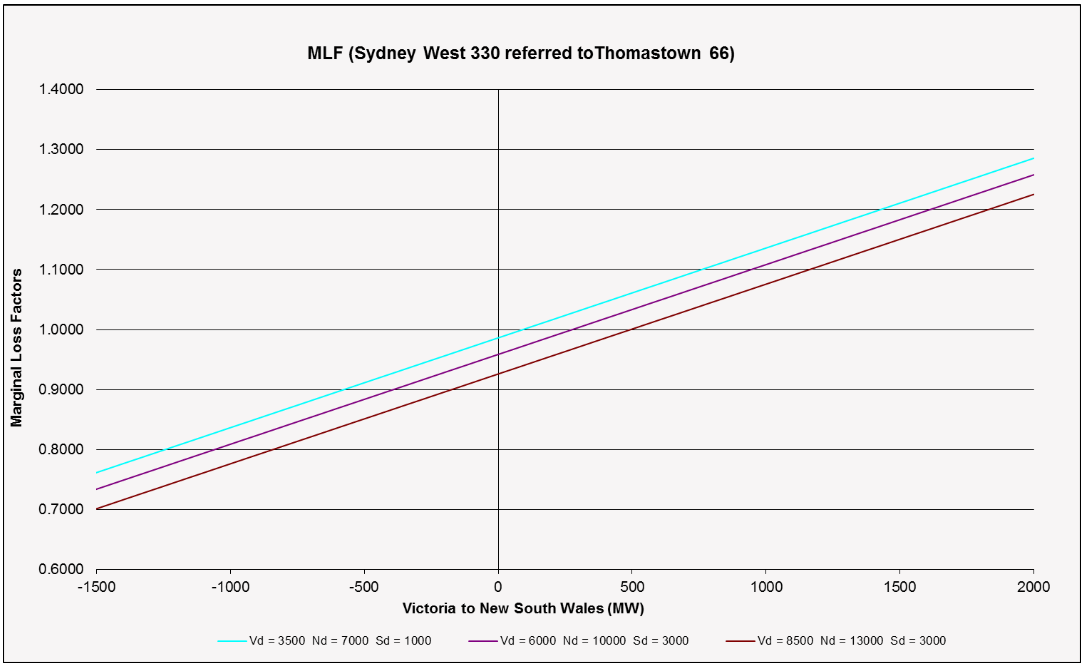


Table 19 Sydney West 330 referred to Thomastown 66 MLF versus Victoria to NSW flow Coefficient statistics

Coefficient	S_d	N_d	V_d	VN_t	CONSTANT
Coefficient value	-6.1947E-06	9.9748E-06	-2.4526E-05	1.4963E-04	1.0285
Standard error values for the coefficients	9.8264E-07	2.8001E-07	4.4991E-07	3.5305E-07	1.1741E-03
Coefficient of determination (R^2)	0.9247				
Standard error of the y estimate	0.0238				

Figure 8 MLF (Torrens Island 66 referred to Thomastown 66)

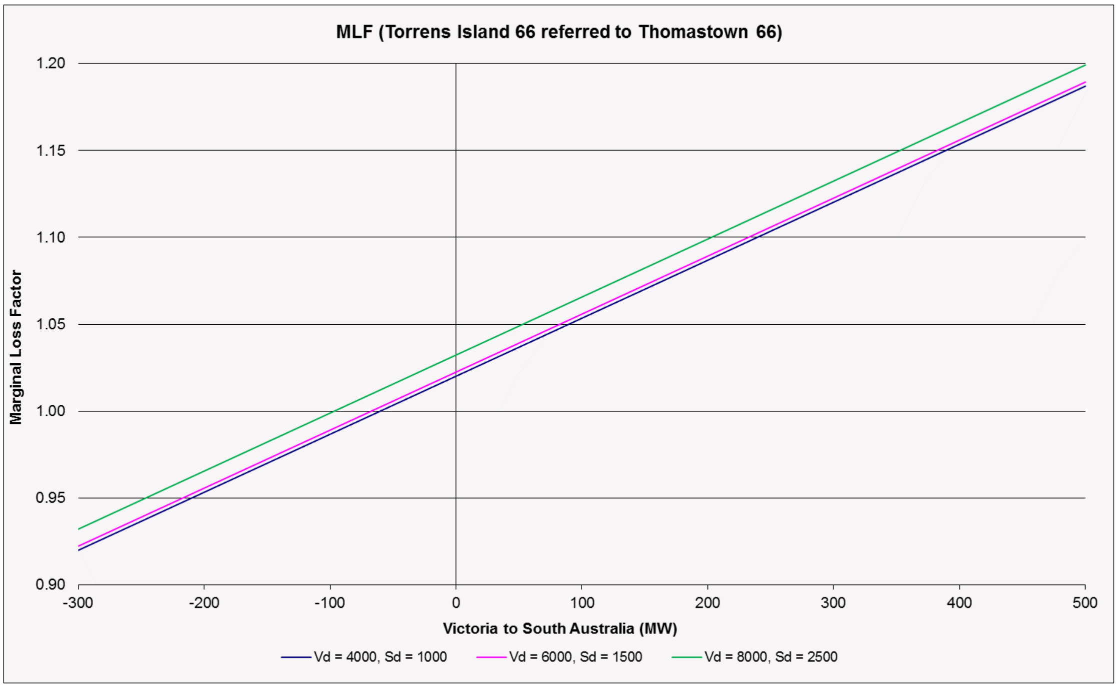


Table 20 Torrens Island 66 referred to Thomastown 66 MLF versus Victoria to South Australia flow Coefficient statistics

Coefficient	Sd	Vd	VSAt	CONSTANT
Coefficient value	1.4872E-05	-2.5314E-06	3.3384E-04	1.0154
Standard error values for the coefficients	7.4565E-07	2.2896E-07	6.5518E-07	7.4770E-04
Coefficient of determination (R2)	0.9416			
Standard error of the y estimate	0.0175			

4. INTER-REGIONAL LOSS EQUATIONS

This section describes how inter-regional loss equations are derived.

Inter-regional loss equations are derived by integrating the equation (Loss factor – 1) with respect to the interconnector flow, i.e.:

$$\text{Losses} = \int(\text{Loss factor} - 1)\, d\text{Flow}$$

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

$$= (-0.0382 - 1.3618\text{E-}06 * Nd + 1.2071\text{E-}05 * Qd) * NQt + 9.6858\text{E-}05 * NQt^2$$

Sydney West 330 referred to Thomastown 66 notional link average losses

$$= (0.0285 - 2.4526\text{E-}05 * Vd + 9.9748\text{E-}06 * Nd - 6.1947\text{E-}06 * Sd) * VNt + 7.4815\text{E-}05 * VNt^2$$

Torrens Island 66 referred to Thomastown 66 notional link average losses

$$= (0.0154 - 2.5314\text{E-}06 * Vd + 1.4872\text{E-}05 * Sd) * VSAt + 1.6692\text{E-}04 * VSAt^2$$

Where:

Qd = Queensland demand

Vd = Victorian demand

Nd = NSW demand

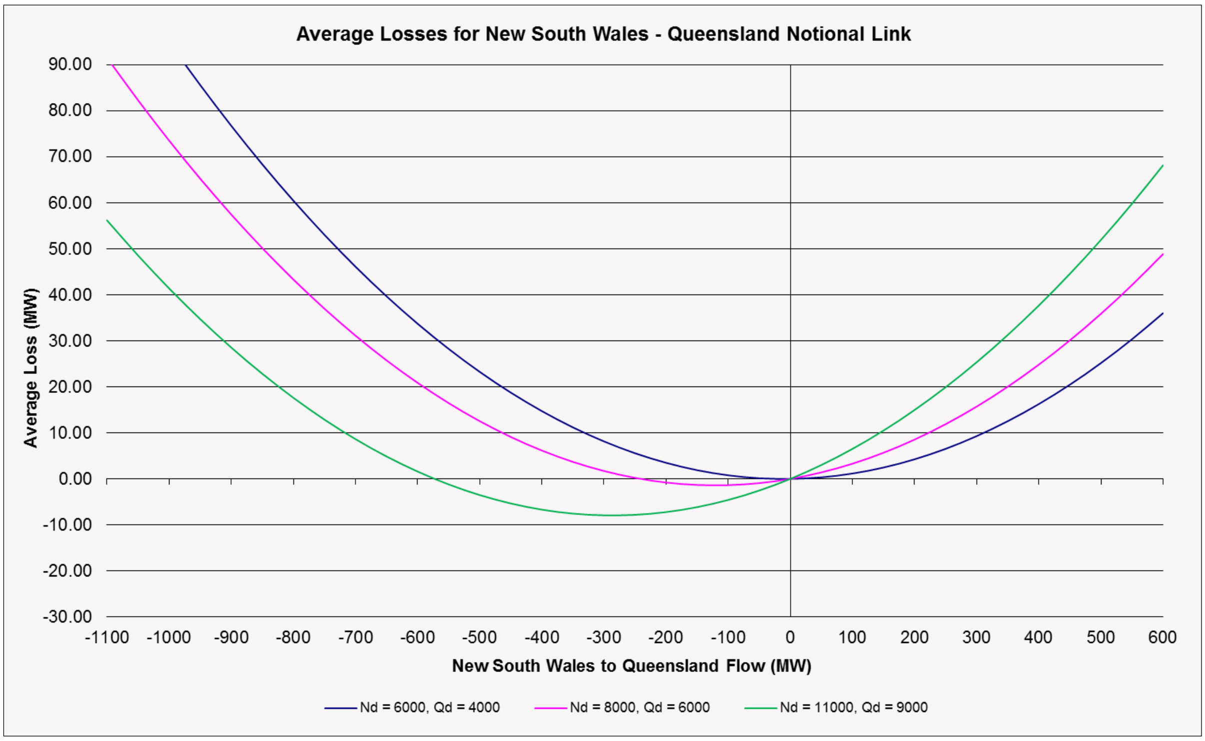
Sd = South Australia demand

NQt = transfer from NSW to Queensland

VNt = transfer from Victoria to NSW

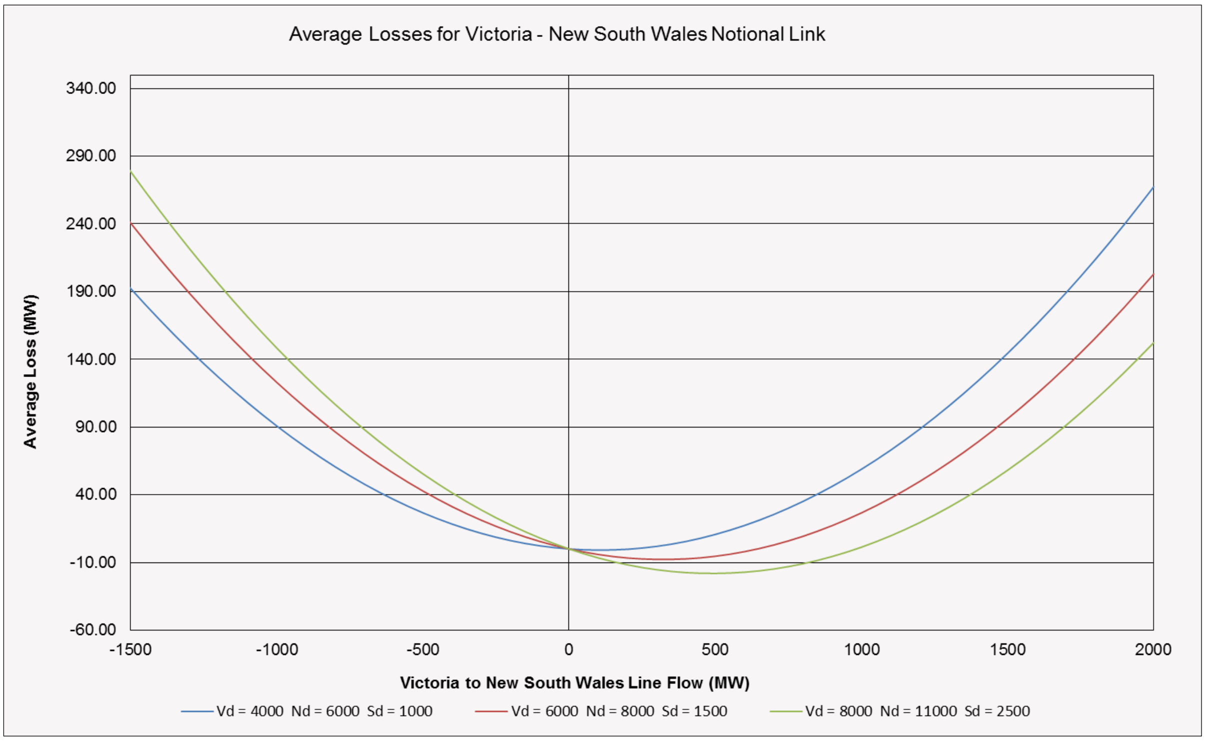
VSAt = transfer from Victoria to South Australia

Figure 9 Average Losses for New South Wales - Queensland Notional Link



NSW to Queensland notional link losses versus NSW to Queensland notional link flow

Figure 10 Average Losses for Victoria - New South Wales Notional Link



Victoria to NSW notional link losses versus Victoria to NSW notional link flow

Figure 11 Average Losses for Victoria – SA National Link

Victoria to South Australia notional link losses versus Victoria to South Australia notional link flow

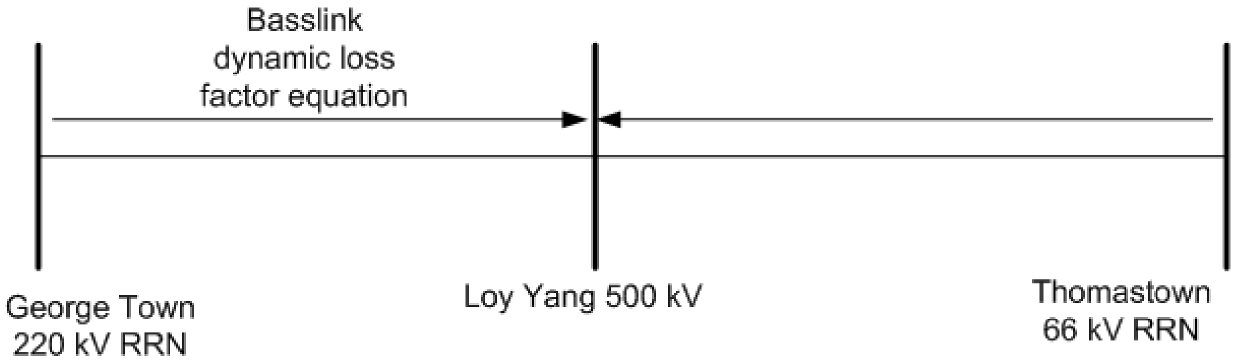
5. BASSLINK, TERRANORA, MURRAYLINK LOSS EQUATIONS

This section describes the loss equations for the DC interconnectors.

5.1 Basslink

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

- George Town 220 kV MLF referred to Tasmania RRN = 1.0000
- Basslink (Loy Yang PS Switchyard) 500 kV MLF referred to Victorian RRN = 0.9874.
- 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.



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.

The model is limited from 40MW to 630MW. When the model falls below 40MW, this is within the ±50 MW 'no-go zone' requirement for Basslink operation.

5.2 Murraylink

Murraylink is a regulated interconnector. In accordance with clause 3.6.1(a) of the Rules, the Murraylink loss model consists of a single dynamic MLF from the Victorian RRN to the South Australian RRN.

The measurement point is the 132 kV connection to the Monash converter, which effectively forms part of the boundary between the Victorian and South Australian regions.

The losses between the Red Cliffs 220 kV and Monash 132 kV connection points is given by the following equation:

$$Losses = (0.0039 * Flow_t + 2.8177 * 10^{-4} * Flow_t^2)$$

AEMO determined the following Murraylink MLF model using regression analysis:

$$\text{Murraylink MLF (Torrens Island 66 referred to Thomastown 66)} = 1.0312 + 2.5951E\text{-}03*Flow_t$$

This model, consisting of a constant and a Murraylink flow coefficient, is suitable because most of the loss is due to variations in the Murraylink flow, and other potential variables do not improve the model.

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

Table 21 Regression statistics for Murraylink

Coefficient	$Flow_t$	CONSTANT
Coefficient Value	2.5951E-03	1.0312
Standard error values for the coefficient	3.7691E-06	3.9769E-04
Coefficient of determination (R2)	0.9643	
Standard error of the y estimate	0.0354	

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

$$\text{Murraylink loss} = 0.0312*Flow_t + 1.2975E\text{-}03*Flow_t^2$$

Figure 12 Murraylink MLF (Torrens Island 66 referred to Thomastown 66)

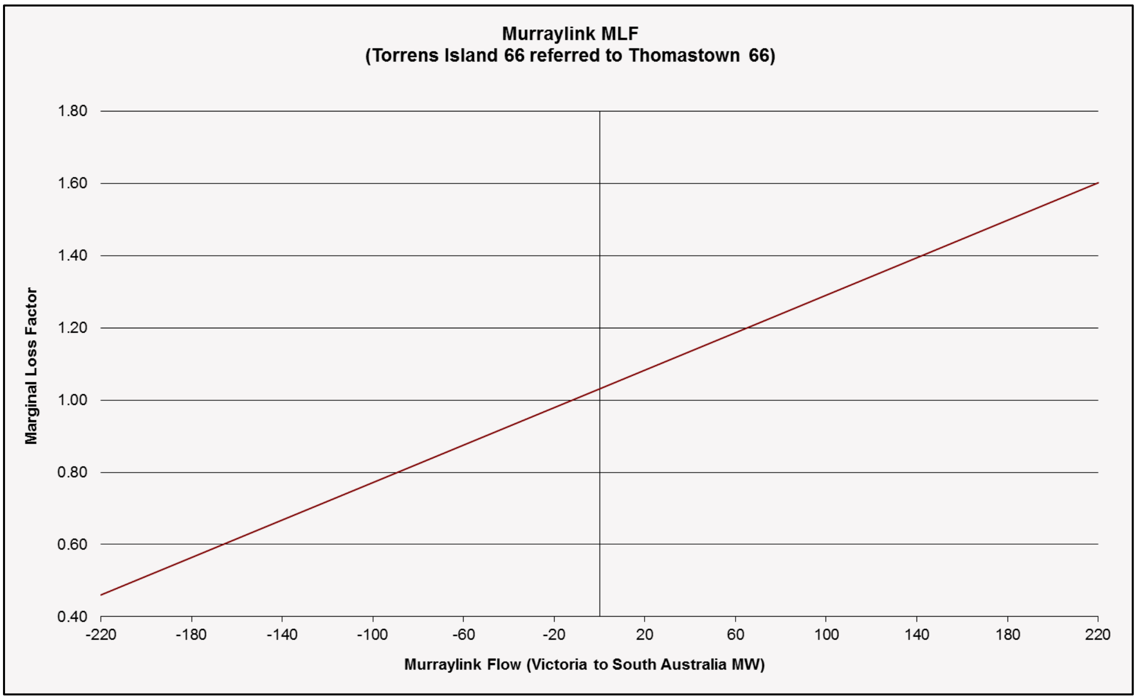
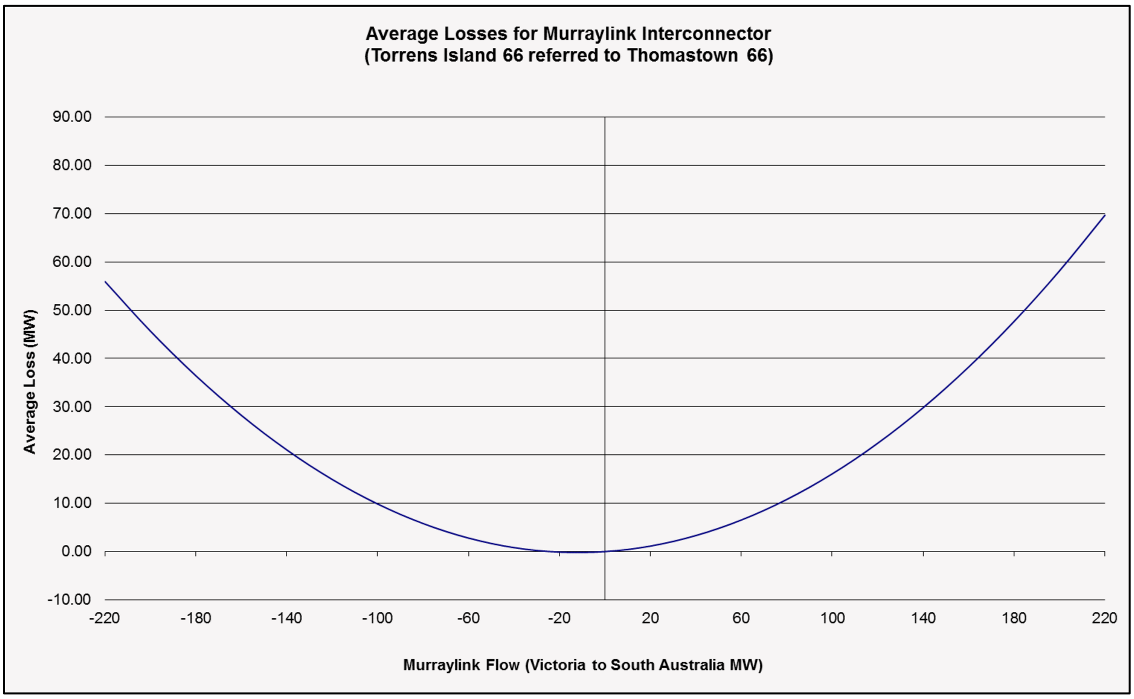


Figure 13 Average Losses for Murraylink Interconnector (Torrens Island 66 referred to Thomastown 66)



Murraylink notional link losses versus Murraylink flow (Victoria to South Australia)

5.3 Terranora

Terranora is a regulated interconnector. In accordance with clause 3.6.1(a) of the Rules, the Terranora loss model consists of a single dynamic MLF from the NSW RRN to the Queensland RRN.

The measurement point is 10.8 km north from Terranora on the two 110 kV lines between Terranora and Mudgeeraba, which effectively forms part of the boundary between the NSW and Queensland regions.

The losses between the Mullumbimby 132 kV and Terranora 110 kV connection points are given by the following equation:

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

AEMO determined the following Terranora MLF model using regression analysis:

Terranora interconnector MLF (South Pine 275 referred to Sydney West 330) = 1.0613 + 1.9227E-03*$Flow^t$.

This model consisting of a constant and a Terranora flow coefficient is suitable because most of the loss is due to variations in the Terranora flow and other potential variables do not improve the model.

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

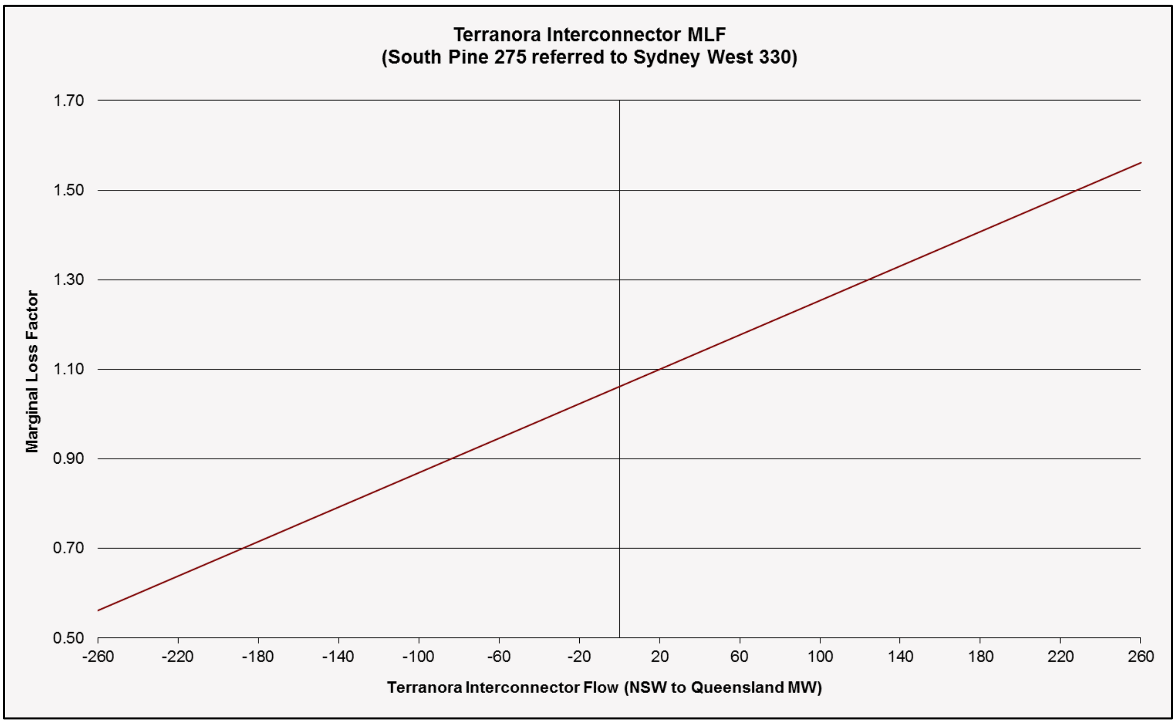
Table 22 Regression statistics for Terranora

Coefficient	$Flow_t$	CONSTANT
Coefficient Value	1.9227E-03	1.0613
Standard error values for the coefficient	4.1573E-06	6.6127E-04
Coefficient of determination (R2)	0.9241	
Standard error of the y estimate	0.0286	

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

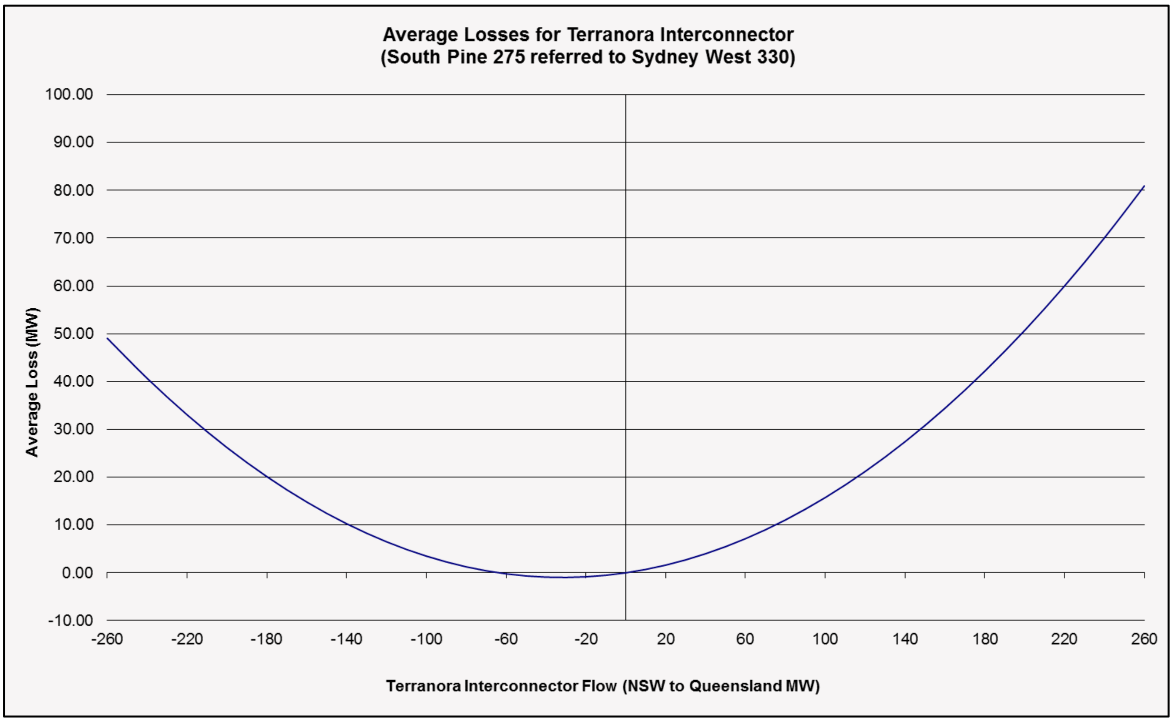
$$Terranora\ loss = 0.0613*Flow_t + 9.6134E\text{-}04*Flow_t^2$$

Figure 14 Terranora Interconnector MLF (South Pine 275 referred to Sydney West 330)



South Pine 275 referred to Sydney West 330 MLF versus Terranora interconnector flow (NSW to Queensland)

Figure 15 Average Losses for Terranora Interconnector (South Pine 275 referred to Sydney West 330)



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

6. PROPORTIONING OF INTER-REGIONAL LOSSES TO REGIONS

This section details how the inter-regional losses are proportioned by the National Electricity Market Dispatch Engine (NEMDE).

NEMDE implements inter-regional loss factors by allocating the inter-regional losses to the two regions associated with a notional interconnector.

The proportioning factors are used to portion the inter-regional losses to two regions by an increment of load at one RRN from the second RRN. The incremental changes to the inter-regional losses in each region are found from changes to interconnector flow and additional generation at the second RRN.

The average proportion of inter-regional losses in each region constitutes a single static loss factor.

The following table provides the factors used to portion inter-regional losses to the associated regions for the 2017–18 financial year:

Table 23 Factors for inter-regional losses

Notional interconnector	Proportioning factor	Applied to
Queensland – NSW (QNI)	0.62	NSW
Queensland – NSW (Terranora Interconnector)	0.61	NSW
Victoria – NSW	0.20	Victoria
Victoria – South Australia (Heywood)	0.44	Victoria
Victoria – South Australia (Murraylink)	0.65	Victoria

7. REGIONS AND REGIONAL REFERENCE NODES

This section describes the NEM regions, the RRN for each region and regional boundaries.

7.1 Regions and Regional Reference Nodes

Table 24 Regions and Regional Reference Nodes

Region	Regional Reference Node
Queensland	South Pine 275kV node
NSW	Sydney West 330kV node
Victoria	Thomastown 66kV node
South Australia	Torrens Island PS 66kV node
Tasmania	George Town 220 kV node

7.2 Region boundaries

Physical metering points defining the region boundaries are at the following locations.

7.2.1 Between the Queensland and NSW regions

- At Dumaresq Substation on the 8L and 8M Dumaresq to Bulli Creek 330kV lines;7
- 10.8km north of Terranora on the two 110kV lines between Terranora and Mudgeeraba (lines 757 & 758). Metering at Mudgeeraba adjusted for that point.

7.2.2 Between the NSW and Victoria 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.

7.2.3 Between the Victoria and South Australia 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.

7.2.4 Between the Victoria and Tasmania regions

Basslink is not a regulated interconnector, it has the following metering points:

- At Loy Yang 500 kV PS.
- At George Town 220 kV Switching Station.

8. VIRTUAL TRANSMISSION NODES

This section shows the configuration of the different virtual transmission nodes (VTNs).

VTNs are aggregations of transmission nodes for which a single MLF is applied. AEMO has considered the following VTNs approved by the Australian Energy Regulator (AER).

8.1 NSW Virtual Transmission Nodes

Table 25 NSW Virtual Transmission Nodes

VTN TNI code	Description	Associated transmission connection points (TCPs)
NEV1	Far North	Muswellbrook 132 and Liddell 33
NEV2	North of Broken Bay	Brandy Hill 11, Kurri 11, Kurri 33, Kurri 132, Newcastle 132, Munmorah 330, Lake Munmorrah 132, Vales Pt. 132, Beresfield 33, Charmhaven 11, Gosford 33, Gosford 66, West Gosford 11, Ourimbah 33, Ourimbah 66, Ourimbah 132, Tomago 132, Tuggerah 132, Somersby 11, BHP Waratah 132 and Wyong 11
NEV3	South of Broken Bay	Sydney North 132 (Ausgrid), Lane Cove 132, Meadowbank 11, Mason Park 132, Homebush Bay 11, Chullora 132 kV, Peakhurst 33, Drummoyne 11, Rozelle 33, Pyrmont 132, Pyrmont 33, Marrickville 11, St Peters 11, Beaconsfield West 132, Canterbury 33, Bunnerong 33, Bunnerong 132, Sydney East 132, Sydney West 132 (Ausgrid) and Sydney South 132, Macquarie Park 11, Rozelle 132, Top Ryde 11, RookWood Road 132, Kurnell 132, Belmore Park 132, Green Square 11, Carlingford 132, Hurstville North 11, Kogorah 11, and Haymarket 132
AAVT[7]	ACT	Angle Crossing 132, Belconnen 132, City East 132, Civic 132, East Lake 132, Gilmore 132, Gold Creek 132, Latham 132, Telopia Park 132, Theodore 132, Wanniassa 132, Woden 132

8.2 South Australia Virtual Transmission Nodes

The SJP1 VTN for South Australia includes all South Australian load transmission connection points, excluding:

- Snuggery Industrial, as nearly its entire capacity services an industrial facility at Millicent.
- Whyalla MLF, as its entire capacity services an industrial plant in Whyalla.

8.3 Tasmania Virtual Transmission Nodes

Table 26 Tasmania Virtual Transmission Nodes

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

[7] The AAVT VTN will become effective once the 12 new TNIs in the ActewAGL network are registered and in commercial operation.

APPENDIX A. BACKGROUND TO MARGINAL LOSS FACTORS

This section summarises the method and interpretation AEMO uses to account for electrical losses in the NEM. It also specifies AEMO's Rules responsibilities related to regions, calculation of MLFs, and calculation of inter-regional loss factor equations.

The NEM uses marginal costs to set electricity prices that need to include pricing of transmission electrical losses.

For electricity transmission, electrical losses are a transport cost that needs to be recovered. A feature of electrical losses is that they also increase with an increase in the electrical power transmitted. That is, the more a transmission line is loaded, the higher the percentage losses. Thus, the price differences between the sending and receiving ends is not determined by the average losses, but by the marginal losses of the last increment of electrical power delivered.

Electrical power in the NEM is traded through the spot market managed by AEMO. The central dispatch process schedules generation to meet demand to maximise the value of trade.

Static MLFs represent intra-regional electrical losses of transporting electricity between a connection point and the RRN. In the dispatch process, generation prices within each region are adjusted by MLFs to determine dispatch of generation.

Dynamic inter-regional loss factor equations calculate losses between regions. Depending on flows between regions, inter-regional losses also adjust the prices in determining generation dispatch to meet demand.

AEMO calculates the Regional Reference Price (RRP) for each region, which is then adjusted by reference to the MLFs between customer connection points and the RRN.

A.1 Rules requirements for the Marginal Loss Factor calculation

Clause 2A.1.3 of the Rules requires AEMO to establish, maintain, review and publish by 1 April each year a list of regions, RRNs, and the market connection points (represented by TNIs) in each region.

Rule 3.6 of the Rules requires AEMO to calculate the inter-regional loss factor equations (clause 3.6.1) and intra-regional loss factors (MLFs) (clause 3.6.2) by 1 April each year that will 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 loss factor equations and MLFs, and the data used in the calculation.

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

A.2 Interpretation of Marginal Loss Factors

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

Consistent with this, the marginal losses are the incremental increase in total losses for each incremental additional unit of electricity. The MLF of a connection point represents the marginal losses to deliver electricity to that connection point from the RRN.

The tables in section 1 show the MLFs for each region. The price of electricity at a TNI is the price at the RRN multiplied by the MLF. Depending on network and loading configurations MLFs vary, ranging from below 1.0 to above 1.0.

A.2.1 Marginal Loss Factors greater than 1.0

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

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

A.2.2 Marginal Loss Factors less than 1.0

Losses increase with distance, so the greater the distance between the RRN and a connection point, the higher the MLF. However additional line flow only raises total losses if it moves in the same direction as existing net flow. At any instant, when additional flow is against net flow, total network losses are reduced. In this case, the MLF is below 1.0. This typically applies to generation but would also apply to loads in areas where the local generation level is greater than local load.

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

A.2.3 Marginal Loss Factors impact on National Electricity Market settlements

For settlement purposes, the value of electricity purchased or sold at a connection point is multiplied by the connection point MLF. For example:

A Market Customer at a connection point with an MLF of 1.05 purchases $1000 of electricity. The MLF of 1.05 multiplies the purchase value to 1.05 x 1000 = $1050. The higher purchase value covers the cost of the electrical losses in transporting electricity to the Market Customer’s connection point from the RRN.

A Market Generator at a connection point with an MLF of 0.95 sells $1000 of electricity. The MLF of 0.95 multiplies the sales value to 0.95 x 1000 = $950. The lower sales value covers the cost of the electrical losses in transporting electricity from the Market Generator’s connection point to the RRN.

Therefore, it follows that in the settlements process:

- Higher MLFs tend to advantage, and lower MLFs tend to disadvantage generation connection points.
- Higher MLFs tend to disadvantage, and lower MLFs tend to advantage load connection points.

APPENDIX B. METHODOLOGY, INPUTS AND ASSUMPTIONS

This section outlines the principles underlying the MLF calculation, load and generation data inputs AEMO obtains and uses for the calculation and how AEMO checks the quality of this data. It also explains how networks and interconnectors are modelled in the MLF calculation.

B.1 Marginal Loss Factors calculation Methodology

AEMO uses a Methodology[8] for calculating MLFs. The Methodology uses the principle of "minimal extrapolation". An overview of the steps in this Methodology is:

- Develop a load flow model of the transmission network that includes committed augmentations for the year that the MLFs will apply.
- Obtain connection point demand forecasts for the year that the MLFs will apply.
- Estimate the dispatch of committed new generating units.
- Adjust the dispatch of new and existing generating units to restore the supply-demand balance in accordance with section 5.5 of the Methodology.
- Calculate the MLFs using the resulting power flows in the transmission network.

B.2 Load data requirements for the Marginal Loss Factors calculation

The annual energy targets used in load forecasting for the 2017-18 MLF calculation are in the table below:

Table 27 Forecast energy for 2017-18

Region	2017–18 forecast sent-out energy[9] (GWh)	2016–17 forecast sent-out energy[10] (GWh)
NSW	68,060	67,755
Victoria	43,747	43,672
Queensland	50,894	54,194
South Australia	12,508	12,922
Tasmania	10,245	10,344

8 Forward Looking Transmission Loss Factors (Version 7) - http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Loss_Factors_and_Regional_Boundaries/2017/Forward-Looking-Loss-Factor-Methodology-v70.pdf

9 Forecast Operational consumption – as sent out. It was sourced from the 2016 National Energy Forecasting Report (NEFR). The Queensland forecast sent-out energy was revised from 52,405 GWh to 50,894 GWh in the Update to 2016 NEFR Report. See link http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Electricity-Forecasting-Report

10 Forecast Operational consumption – as sent out. It was sourced from the 2015 NEFR Report. See link http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Electricity-Forecasting-Report

B.2.1 Historical data accuracy and due diligence of the forecast data

AEMO regularly verifies the accuracy of historical connection point data. AEMO calculates the losses using this historical data, by adding the summated generation values to the interconnector flow and subtracting the summated load values. These transmission losses are used to verify that no large errors occur in the data.

AEMO also performs due diligence checks of connection point load traces to ensure that:

- The demand forecast is consistent with the most recently published National Electricity Forecasting Report (NEFR).
- Load profiles are reasonable, and that the drivers for load profiles that have changed from the historical data are identifiable.
- The forecast for connection points includes any relevant embedded generation.
- Industrial and auxiliary type loads are not scaled with residential drivers.

B.3 Generation data requirements for the Marginal Loss Factors calculation

AEMO obtains historical generation real power (MW) and reactive power (MVAr) data for each trading interval (half-hour) covering every generation connection point in the NEM from 1 July 2015 to 30 June 2016 from its settlements database.

AEMO also obtains the following data:

- Generation capacity data from the 2016 Electricity Statement Of Opportunity (ESOO).
- Historical generation availability, as well as on-line and off-line status data from AEMO's Market Management System (MMS).
- Future generation availability based on most recent MT PASA data, as of 15 January 2017, as a trigger for initiating discussions with participants with the potential to use an adjusted generation profile for the loss factor calculation.

B.3.1 New generating units

For new generating units, AEMO calculates the initial estimate of the output by identifying similar technology and fuel type in accordance with section 5.4.2 of the Methodology.

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

Relevant Network Service Providers (NSPs) are advised of the following new generating units in 2017-18. They are:

- Queensland new generating units
  - Cook Shire Solar Storage is included.
- NSW new generating units
  - White Rock Wind Farm, Williamsdale Solar Farm, Mugga Lane Solar Park, Griffith Solar Farm and Parkes Solar Farm are included.
- Victoria new generating units
  - Mt. Gellibrand Wind Farm, Ararat Wind Farm and Kiata Wind Farm are included.
- South Australia new generating units
  - Hornsdale Wind Farm Stage 2 and Waterloo Wind Farm extension are included.
- Tasmania new generating units

– There are no committed generation projects in Tasmania in 2017–18.

B.3.2 Removed generating units

Relevant NSPs are advised of the following removed generating units in 2017-18:

- Swanbank E GT in Queensland.
- SmithField Energy Facility in NSW.
- Hazelwood Power Station in Victoria.
- Northern Power Station and Playford B Power Station in South Australia.

B.3.3 Abnormal generation patterns

AEMO has adjusted a number of generation profiles for the 2017-18 MLF calculation in accordance with section 5.5.6 of the Methodology. This is due to changes in physical circumstances such as:

- Reduction in fuel availability.
- Outages greater than 30 continuous days.
- Reduction in rainfall and water storage levels.

Following the fault on the Basslink interconnector on 20 December 2015, Hydro Tasmania also asked for an update to forecast generation profiles in accordance with section 5.9 of the Methodology based on new developments.

AEMO has used the adjusted generation profiles to replace historical profiles as an input to the 2017–18 MLF calculation process. AEMO has endeavoured to ensure that the 2017-18 MLF calculation represents expected system conditions, and has made corresponding adjustments to historical Basslink flows in accordance with section 5.3.1 of the Methodology.

The table below shows the historical and adjusted generation values aggregated quarterly and on a regional or sub-regional level.

Table 28 Adjusted generation values for Tasmania

	Historical Generation (GWh)		Adjusted Generation (GWh)	
	Northern Tasmania	Southern Tasmania	Northern Tasmania	Southern Tasmania
Jul – Sep	1933	1183	2142	967
Oct – Dec	962	783	1070	653
Jan – Mar	1346	951	842	590
Apr – Jun	1969	616	1972	768
Total	**6210**	**3533**	**6026**	**2978**

Table 29 Adjusted generation values for Queensland

	Queensland	
	Historical Generation (GWh)	Adjusted Generation (GWh)
Jul – Sep	12849	13280
Oct – Dec	13609	14961
Jan – Mar	13662	14026
Apr – Jun	13395	14318
Total	**53516**	**56586**

Table 30 Adjusted generation values for NSW

	NSW	
	Historical Generation (GWh)	**Adjusted Generation (GWh)**
Jul – Sep	15623	15608
Oct – Dec	14429	14508
Jan – Mar	15255	16033
Apr – Jun	14370	14762
Total	**59677**	**60912**

Table 31 Adjusted generation values for Victoria

	Victoria	
	Historical Generation (GWh)	**Adjusted Generation (GWh)**
Jul – Sep	12608	12616
Oct – Dec	11909	11572
Jan – Mar	12258	12258
Apr – Jun	12151	12151
Total	**48927**	**48597**

B.4 Network representation in the Marginal Loss Factors calculation

An actual network configuration recorded by AEMO's Energy Management System (EMS) is used to prepare the NEM interconnected power system load flow model for the MLF calculation. This recording is referred to as a 'snapshot'.

AEMO reviews the snapshot and modifies it where necessary to accurately represent all normally connected equipment. AEMO also checks switching arrangements for the Victorian Latrobe Valley's 220 kV and 500 kV networks to ensure they reflect normal operating conditions.

AEMO adds relevant network augmentations that will occur in the 2017–18 financial year. The snapshot is thus representative of the 2017–18 normally-operating power system.

B.4.1 Network augmentation for 2017-18

Relevant Transmission Network Service Providers (TNSPs) are advised of the following network augmentations in 2017-18. They are:

Queensland network augmentations

Powerlink provided the following list of planned network augmentations in 2017–18 in Queensland:

- Replacement of Mudgeeraba 275/110kV No.2 transformer.
- Rebuilding of Moura Substation, and reestablishment of the 132kV bus at Moura.
- Rebuilding of Garbutt to Alan Sherriff 132kV lines.
- Rebuilding of Mackay Substation, and reestablishment of the 132kV bus at Mackay.

NSW network augmentations

NSW NSPs provided the following list of planned network augmentations in 2017–18 in NSW:

- Replacement of the three existing 132/66kV 60MVA transformers at Wagga by two 132/66kV 120MVA units.
- Installation of the White Rock 132/33kV substation.
- Removal of Canberra No. 2 330/132kV transformer, after refurbishment of the No. 3 330/132kV transformer.
- Installation of the new Munmorah 132/33kV substation.
- Installation of the new Olympic Park 132/11kV substation.
- Installation of the new Croydon 132/11kV substation.
- Installation of the new Leichhardt 132/11kV substation.
- Installation of the new Rockdale 132/11kV substation.
- Installation of the new Toronto West 132/11kV substation.
- Installation of the New Alexandria 132/33kV STS.
- Rearrangement of Marrickville 132kV feeders.
- Installation of a 132kV feeder between Beaconsfield and Belmore Park.

Victoria network augmentations

AEMO's Victorian Planning Group provided the following list of planned network augmentations in 2017–18 in Victoria.

- Establishment of a new 66 kV supply point with three 220/66kV transformers at Brunswick.
- Establishment of a new 220kV line between Moorabool and Ballarat.
- Establishment of the Deer Park Substation.

South Australia network augmentations

ElectraNet provided the following list of planned network augmentations in 2017–18 in South Australia:

- Replacement of 132/3.3kV transformers for the Morgan-Whyalla pump station.
- Replacement of 132/3.3kV transformers for the Mannum-Adelaide pump station.
- Installation of the second transformer at Dalrymple.
- Installation of two new transformers at Hornsdale Wind Farm 2.
- Installation of a new 50 MVAR 275 kV reactor at Para.

Tasmania network augmentations

TasNetworks provided the following list of planned network augmentations in 2017–18 in Tasmania:

- Upgrading of Sheffield Substation, and increasing the thermal rating of the Sheffield to George Town 220 kV lines.
- Redevelopment of George Town 110 kV, and increasing the thermal rating of George Town to Comalco.
- Increasing thermal rating of Liapootah to Waddamana to Palmerston 220kV, Liapootah to Cluny to Repulse to Chapel Street 220kV, and Liapootah to Chapel Street 220kV.

B.4.2 Treatment of Basslink interconnector

Basslink consists of a controllable network element that transfers power between Tasmania and Victoria.

In accordance with sections 5.3.1 and 5.3.2 of the Methodology, AEMO calculates the Basslink connection point MLFs using historical data, adjusted to reflect any change in forecast generation in Tasmania.

Section 5 outlines the loss model for Basslink.

B.4.3 Treatment of Terranora interconnector

The Terranora interconnector is a regulated interconnector.

The boundary between Queensland and NSW between Terranora and Mudgeeraba is north of Directlink. The Terranora interconnector is in series with Directlink and, in the MLF calculation, AEMO manages the Terranora interconnector limit by varying the Directlink limit when necessary.

Section 5 outlines the loss model for Terranora.

B.4.4 Treatment of the Murraylink interconnector

The Murraylink interconnector is a regulated interconnector.

In accordance with section 5.3 of the Methodology, AEMO treats the Murraylink interconnector as a controllable network element in parallel with the regulated Heywood interconnector.

Section 5 outlines the loss model for Murraylink.

B.4.5 Treatment of Yallourn unit 1

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

Energy Australia informed AEMO that the switching pattern for 2017–18 will not differ from the historical switching pattern for Yallourn unit 1.

AEMO modelled Yallourn unit 1 at the two connection points (one at 220 kV and the other one at 500 kV) and calculated loss factors for each connection point. AEMO then calculated a single volume-weighted loss factor for Yallourn unit 1 based on the individual loss factors at 220 kV and at 500 kV, and the output of the unit.

B.5 Interconnector capacity

In accordance with section 5.5.4 of the Methodology, AEMO estimates nominal interconnector limits for summer peak, summer off-peak, winter peak and winter off-peak periods. These values are in the table below. AEMO also sought feedback from the relevant TNSPs about any additional factors that might influence these limits.

Table 32 Interconnector capacity

From region	To region	Summer peak (MW)	Summer off-peak (MW)	Winter peak (MW)	Winter off-peak (MW)
Queensland	NSW	1030	1030	1030	1030
NSW	Queensland	400	550	400	550
NSW	Victoria	1700 minus Murray Generation	1700 minus Murray Generation	1700 minus Murray Generation	1700 minus Murray Generation
Victoria	NSW	3200 minus Upper & Lower Tumut Generation	3000 minus Upper & Lower Tumut Generation	3200 minus Upper & Lower Tumut Generation	3000 minus Upper & Lower Tumut Generation
Victoria	South Australia*	650	650	650	650
South Australia	Victoria*	650	650	650	650

From region	To region	Summer peak (MW)	Summer off-peak (MW)	Winter peak (MW)	Winter off-peak (MW)
Victoria (Murraylink)	South Australia (Murraylink)	220	220	220	220
South Australia (Murraylink)	–Victoria (Murraylink)	188 minus Northwest Bend & Berri loads	198 minus Northwest Bend & Berri loads	215 minus Northwest Bend & Berri loads	215 minus Northwest Bend & Berri loads
Queensland (Terranora)	NSW (Terranora)	224	224	224	224
NSW (Terranora)	Queensland (Terranora)	107	107	107	107
Tasmania (Basslink)	Victoria (Basslink)**	594	594	594	594
Victoria (Basslink)	Tasmania (Basslink)**	478	478	478	478

* Victoria to South Australia and South Australia to Victoria limits have changed due to the inclusion of the third transformer at Heywood.
** Limit referring to the receiving end.

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

B.6 Calculation of Marginal Loss Factors

AEMO uses the TPrice[11] software to calculate MLFs using the following method:

- Convert the half-hourly forecast load and historical generation data, generating unit capacity and availability data with interconnector data into a format suitable for input to TPrice.
- Adjust the load flow case to ensure a reasonable voltage profile in each region at times of high demand.
- Convert the load flow case into a format suitable for use in TPrice.
- Feed into TPrice, one trading interval at a time, the half-hourly generation and load data for each connection point, generating unit capacity and availability data, with interconnector data. TPrice allocates load and generation values to the appropriate connection points in the load flow case.
- TPrice iteratively dispatches generation to meet forecast demand and solves each half-hourly load flow case subject to the rules in section 5.5.2 of the Methodology, and calculates the loss factors appropriate to load flow conditions.
- Refer loss factors at each connection point in each region to the Regional Reference Node (RRN).
- Average the loss factors for each trading interval and for each connection point using volume weighting.

Typically, the MLF calculation weights generation loss factors against generation output and load loss factors against load consumption. However, where load and generation are connected at the same connection point and individual metering is not available for the separate components, a single loss factor is calculated for both generation and load.

In accordance with section 5.6.1 of the Methodology, AEMO calculates dual MLF values at connection points where one MLF does not satisfactorily represent active power generation and consumption.

B.6.1 Inter-regional loss lactor equations

The inter-regional loss factor equations applying for the 2017–18 financial year are provided in

[11] TPrice is a 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.

section 3. AEMO derives these equations by applying linear regression to the set of loss factor data for the RRNs. To meet AEMO's dispatch algorithm requirements, the choice of variables and equation formulation is restricted:

- Only linear terms are permitted in the equation.
- Only the notional link flow between the RRNs for which the loss factor difference is being determined is used.
- Region demands are allowed as equation variables.
- Other variables such as generation outputs are not used.

Graphs of variation in inter-regional loss factors with notional link flow are in section 3.

Inter-regional loss equations obtained by integrating the (inter-regional loss factor – 1) function are provided in section 4.

Inter-regional loss equations for Basslink, Terranora and Murraylink are provided in section 5.

The factors used to apportion inter-regional losses to associated regions for 2017–18 are provided in section 6.

B.6.2 Marginal loss factor calculation – quality control

EY was engaged by AEMO to perform parallel calculations of Forward-Looking Transmission Loss Factors ("FLLF") using the Methodology as published by AEMO. EY does not audit or review the MLF outcomes or the internal processes used by AEMO to calculate MLFs. Rather EY's parallel MLF calculations deliver an additional quality control measure to identify instances where there are differences between the results of the two parties.

The parallel calculation of MLFs undertaken by EY uses a two-step process:

- The benchmark study – where MLFs are calculated for generators and major industrial loads using primarily publicly available sources of information. There are some inputs that rely on data provided by AEMO. EY has reviewed and provided comment on these data inputs.
- The verification study – where MLFs are calculated for all generation and load connection points using the complete AEMO dataset. EY processes this information and calculates MLFs for all generation and load connection points using the PowerWorld software.

The objective of EY's analysis is to assist in identifying potential issues and errors in data processing and MLF calculations by comparing the outcomes of both the benchmark and verification studies with the MLFs calculated by AEMO. EY's benchmark and verification studies have not identified any outcomes from AEMO's final MLFs that would indicate that AEMO has inappropriately applied the intent of the FLLF Methodology. Where differences in MLF outcomes were found between the EY and AEMO MLF calculations, EY has commented on the outputs and applied professional scepticism to AEMO's procedures.

EY has undertaken similar reviews for several years. At the end of each review period, EY provided recommendations to AEMO about the calculation process.

EY's work informing the benchmark and verification studies was completed on 14 March 2017. It does not consider any other events or circumstances arising after the studies' completion date. EY understands that after 14 March 2017, AEMO have responded to market developments by implementing reductions in Queensland regional demand. EY has not been engaged after the 14 March 2017 to perform additional benchmark or verification studies.

GLOSSARY

This document uses many terms with specific meanings defined in the Rules. Those terms have the same meanings when used in this document unless otherwise specified.

Additional terms and abbreviations are set out below.

Term	Definition
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ESOO	Electricity Statement Of Opportunities
FLLF	Forward-Looking Transmission Loss Factors
Methodology	Forward Looking Loss Factor Methodology
GWh	Gigawatt-hour
km	Kilometre
kV	Kilovolt
LNG	Liquefied natural gas
MLF	Marginal Loss Factor
MNSP	Market Network Service Provider
MT PASA	Medium Term Projected assessment of system adequacy
MVAr	Megavolt-ampere-reactive
MW	Megawatt
NEFR	National Energy Forecasting Report
NEM	National Electricity Market
NEMDE	National Electricity Market Dispatch Engine
NSP	Network Service Provider
NSW	New South Wales
PS	Power station
RRN	Regional Reference Node
Rules	National Electricity Rules
SF	Solar farm
TNI	Transmission Node Identity
TNSP	Transmission Network Service Provider
VTN	Virtual Transmission Node
WF	Wind farm