REGIONS AND MARGINAL LOSS FACTORS: FY 2018-19

NATIONAL ELECTRICITY MARKET

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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 2018-19 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 National Electricity Law (Law) and the Rules prevail over this document to the extent of any inconsistency.

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VERSION RELEASE HISTORY

Version No.	Release date	Description
2.0	13 July 2018	Updated document as at 11 July 2018
1.0	29 March 2018	Final version

EXECUTIVE SUMMARY

This document details the 2018-19 inter-regional loss factor equations and the intra-regional loss factors, or marginal loss factors (MLFs). 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) in 2017, and the changes to the Methodology have been reflected in the 2018-19 MLFs calculation.

Major changes in load and generation patterns leading to differences between the 2018-19 and 2017-18 MLFs are as follows:

- Increased renewable generation, particularly in north Queensland, central Queensland, north-west Victoria, and northern South Australia.
- Decrease in projected generation from coal and gas fired power stations across the NEM.
- Increased consumption forecast in southern Queensland, in particular forecast increased liquefied natural gas (LNG) processing load.
- Decreased regional consumption forecast in Queensland, New South Wales, Victoria, and South Australia.
- Increased regional consumption forecast in southern Tasmania and increased generation on the west coast.
- Forecast increased Basslink power transfers from Victoria to Tasmania.

These flow changes have an impact on electrical losses, and have driven significant changes in MLFs in 2018-19 compared to 2017-18. The major changes in regional loss factors are, in summary:

- A large reduction in MLFs at connection points in central and northern Queensland, and an increase in MLFs at connection points in south-east and south-west Queensland.
- A reduction in MLFs at connection points in northern and southern New South Wales.
- A reduction in MLFs at connection points in central Victoria, western Victoria and north-west Victoria, and an increase in MLFs at connection points in northern Victoria.
- An increase in MLFs at connection points in south-east and the Riverland area in South Australia, and a reduction in MLFs at connection points in northern South Australia.
- A general increase in MLFs at connection points in Tasmania.

As well as the MLFs, this document includes other information related to marginal losses for 2018-19, 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.

AEMO applies a number of quality assurance steps when calculating MLFs. This includes engaging an independent consultant to perform a two-step parallel MLF calculation to identify and resolve outcomes apparently 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 2018-19, for every load or generation transmission node identifier (TNI) in each NEM region.

1.1 Queensland Marginal Loss Factors

Table 1 Queensland Loads

Location	Voltage in kilovolts (kV)	TNI	2018-19 MLF	2017-18 MLF
Abermain	33	QABM	1.0015	1.0016
Abermain	110	QABR	0.9968	1.0018
Alan Sherriff	132	QASF	0.9656	1.0383
Algester	33	QALG	1.0161	1.0153
Alligator Creek	132	QALH	0.9640	1.0050
Alligator Creek	33	QALC	0.9654	1.0060
Ashgrove West	33	QAGW	1.0139	1.0149
Ashgrove West	110	QCBW	1.0122	1.0129
Belmont	110	QBMH	1.0123	1.0114
Belmont Wecker Road	33	QBBS	1.0104	1.0089
Belmont Wecker Road	11	QMOB	1.0353	1.0340
Biloela	66/11	QBIL	0.9141	0.9235
Blackstone	110	QBKS	1.0001	0.9999
Blackwater	66/11	QBWL	0.9624	1.0001
Blackwater	132	QBWH	0.9621	0.9988
Bluff	132	QBLF	0.9608	0.9985
Bolingbroke	132	QBNB	0.9486	0.9931
Bowen North	66	QBNN	0.9469	1.0090
Boyne Island	275	QBOH	0.9411	0.9593
Boyne Island	132	QBOL	0.9383	0.9574
Braemar – Kumbarilla Park	275	QBRE	0.9764	0.9654
Bulli Creek (Essential Energy)	132	QBK2	0.9840	0.9752
Bulli Creek (Waggamba)	132	QBLK	0.9840	0.9752
Bundamba	110	QBDA	1.0013	1.0011
Burton Downs	132	QBUR	0.9596	1.0116
Cairns	22	QCRN	0.9713	1.0550
Cairns City	132	QCNS	0.9682	1.0547
Callemondah (Rail)	132	QCMD	0.9314	0.9494
Calliope River	132	QCAR	0.9258	0.9472
Cardwell	22	QCDW	0.9777	1.0482
Chinchilla	132	QCHA	0.9830	0.9750
Clare	66	QCLR	0.9615	1.0457
Collinsville Load	33	QCOL	0.9494	1.0126
Columboola	132	QCBL	0.9891	0.9715
Columboola 132 (Bellevue LNG load)	132	QCBB	0.9899	0.9724

Location	Voltage in kilovolts (kV)	TNI	2018-19 MLF	2017-18 MLF
Coppabella (Rail)	132	QCOP	0.9690	1.0294
Dan Gleeson	66	QDGL	0.9713	1.0391
Dingo (Rail)	132	QDNG	0.9538	0.9838
Duaringa	132	QDRG	0.9684	0.9754
Dysart	66/22	QDYS	0.9629	1.0156
Eagle Downs Mine	132	QEGD	0.9630	1.0269
Edmonton	22	QEMT	0.9847	1.0603
Egans Hill	66	QEGN	0.9159	0.9428
El Arish	22	QELA	0.9846	1.0533
Garbutt	66	QGAR	0.9664	1.0420
Gin Gin	132	QGNG	0.9541	0.9693
Gladstone South	66/11	QGST	0.9384	0.9534
Goodna	33	QGDA	1.0052	1.0050
Goonyella Riverside Mine	132	QGYR	0.9836	1.0483
Grantleigh (Rail)	132	QGRN	0.9150	0.9426
Gregory (Rail)	132	QGRE	0.9423	0.9791
Ingham	66	QING	0.9597	1.0660
Innisfail	22	QINF	0.9747	1.0600
Kamerunga	22	QKAM	0.9844	1.0612
Kemmis	66	QEMS	0.9643	1.0084
King Creek	132	QKCK	0.9563	1.0175
Lilyvale	66	QLIL	0.9451	0.9808
Lilyvale (Barcaldine)	132	QLCM	0.9378	0.9775
Loganlea	33	QLGL	1.0151	1.0148
Loganlea	110	QLGH	1.0116	1.0112
Mackay	33	QMKA	0.9556	1.0021
Middle Ridge (Energex)	110	QMRX	0.9878	0.9833
Middle Ridge (Ergon)	110	QMRG	0.9878	0.9833
Mindi (Rail)	132	QMND	0.9425	0.9846
Molendinar	110	QMAR	1.0143	1.0147
Molendinar	33	QMAL	1.0136	1.0142
Moranbah (Mine)	66	QMRN	0.9819	1.0364
Moranbah (Town) (DUAL MLF – GEN)	11	QMRL	0.9803	1.0441
Moranbah (Town) (DUAL MLF – LOAD)	11	QMRL	0.9538	
Moranbah South (Rail)	132	QMBS	0.9745	1.0342
Moranbah Substation	132	QMRH	0.9709	1.0333
Moura	66/11	QMRA	0.9480	0.9609
Mt McLaren (Rail)	132	QMTM	0.9786	1.0478
Mudgeeraba	33	QMGL	1.0169	1.0169
Mudgeeraba	110	QMGB	1.0174	1.0165
Murarrie (Belmont)	110	QMRE	1.0130	1.0121
Nebo	11	QNEB	0.9394	0.9846
Newlands	66	QNLD	0.9831	1.0715
North Goonyella	132	QNGY	0.9789	1.0499

Location	Voltage in kilovolts (kV)	TNI	2018-19 MLF	2017-18 MLF
Norwich Park (Rail)	132	QNOR	0.9528	1.0007
Oakey	110	QOKT	0.9818	0.9779
Oonooie (Rail)	132	QOON	0.9651	1.0103
Orana LNG	275	QORH	0.9805	0.9678
Palmwoods	132	QPWD	1.0025	1.0056
Pandoin	132	QPAN	0.9198	0.9461
Pandoin	66	QPAL	0.9199	0.9457
Peak Downs (Rail)	132	QPKD	0.9710	1.0280
Pioneer Valley	66	QPIV	0.9623	1.0060
Proserpine	66	QPRO	0.9723	1.0439
Queensland Alumina Ltd (Gladstone South)	132	QQAH	0.9381	0.9565
Queensland Nickel (Yabulu)	132	QQNH	0.9616	1.0344
Raglan	275	QRGL	0.9217	0.9427
Redbank Plains	11	QRPN	1.0031	1.0030
Richlands	33	QRLD	1.0149	1.0136
Rockhampton	66	QROC	0.9134	0.9481
Rocklands (Rail)	132	QRCK	0.9164	0.9399
Rocklea (Archerfield)	110	QRLE	1.0061	1.0059
Ross	132	QROS	0.9625	1.0292
Runcorn	33	QRBS	1.0174	1.0161
South Pine	110	QSPN	1.0042	1.0044
Stony Creek	132	QSYC	0.9723	1.0289
Sumner	110	QSUM	1.0071	1.0068
Tangkam (Dalby)	110	QTKM	0.9867	0.9816
Tarong	66	QTRL	0.9756	0.9715
Teebar Creek	132	QTBC	0.9764	0.9870
Tennyson	33	QTNS	1.0098	1.0100
Tennyson (Rail)	110	QTNN	1.0087	1.0085
Townsville East	66	QTVE	0.9669	1.0367
Townsville South	66	QTVS	0.9698	1.0373
Tully	22	QTLL	0.9516	1.0779
Turkinje	66	QTUL	0.9966	1.0877
Turkinje (Craiglie)	132	QTUH	0.9915	1.0762
Wandoan South	132	QWSH	1.0036	0.9854
Wandoan South (NW Surat)	275	QWST	1.0030	0.9846
Wandoo (Rail)	132	QWAN	0.9471	0.9897
Wivenhoe Pump	275	QWIP	0.9974	0.9975
Woolooga (Energex)	132	QWLG	0.9756	0.9850
Woolooga (Ergon)	132	QWLN	0.9756	0.9850
Woree	132	QWRE	0.9754	1.0541
Wotonga (Rail)	132	QWOT	0.9685	1.0290
Wycarbah	132	QWCB	0.9061	0.9351
Yarwun – Boat Creek (Ergon)	132	QYAE	0.9282	0.9478

Location	Voltage in kilovolts (kV)	TNI	2018-19 MLF	2017-18 MLF
Yarwun – Rio Tinto	132	QYAR	0.9266	0.9461

Table 2 Queensland Generation

Location	Voltage (kV)	DUID	Connection point ID	TNI	2018-19 MLF	2017-18 MLF
Barcaldine Solar at Lilyvale (132)	132	BARCSF1	QLLV1B	QLLV	0.8934	0.9689
Barron Gorge Power Station (PS) Unit 1	132	BARRON-1	QBGH1	QBGH	0.9346	1.0238
Barron Gorge PS Unit 2	132	BARRON-2	QBGH2	QBGH	0.9346	1.0238
Braemar PS Unit 1	275	BRAEMAR1	QBRA1	QBRA	0.9709	0.9607
Braemar PS Unit 2	275	BRAEMAR2	QBRA2	QBRA	0.9709	0.9607
Braemar PS Unit 3	275	BRAEMAR3	QBRA3	QBRA	0.9709	0.9607
Braemar Stage 2 PS Unit 5	275	BRAEMAR5	QBRA5B	QBRA	0.9709	0.9607
Braemar Stage 2 PS Unit 6	275	BRAEMAR6	QBRA6B	QBRA	0.9709	0.9607
Braemar Stage 2 PS Unit 7	275	BRAEMAR7	QBRA7B	QBRA	0.9709	0.9607
Callide PS Load	132	CALLNL1	QCAX	QCAX	0.9048	0.9146
Callide A PS Unit 4	132	CALL_A_4	QCAA4	QCAA	0.9074	0.9161
Callide A PS Unit 4 Load	132	CALLNL4	QCAA2	QCAA	0.9074	0.9161
Callide B PS Unit 1	275	CALL_B_1	QCAB1	QCAB	0.9069	0.9235
Callide B PS Unit 2	275	CALL_B_2	QCAB2	QCAB	0.9069	0.9235
Callide C PS Unit 3	275	CPP_3	QCAC3	QCAC	0.9080	0.9211
Callide C PS Unit 4	275	CPP_4	QCAC4	QCAC	0.9080	0.9211
Clare Solar Farm	132	CLARESF1	QCLA1C	QCLA	0.8727	0.9823
Columboola – Condamine PS	132	CPSA	QCND1C	QCND	0.9882	0.9688
Darling Downs PS	275	DDPS1	QBRA8D	QBRA	0.9709	0.9607
Darling Downs Solar Farm	275	DDSF1	QBRS1D	QBRS	0.9812	0.9711
Gladstone PS (132 kV) Unit 3	132	GSTONE3	QGLD3	QGLL	0.9206	0.9402
Gladstone PS (132 kV) Unit 4	132	GSTONE4	QGLD4	QGLL	0.9206	0.9402
Gladstone PS (132kV) Load	132	GLADNL1	QGLL	QGLL	0.9206	0.9402
Gladstone PS (275 kV) Unit 1	275	GSTONE1	QGLD1	QGLH	0.9240	0.9431
Gladstone PS (275 kV) Unit 2	275	GSTONE2	QGLD2	QGLH	0.9240	0.9431
Gladstone PS (275 kV) Unit 5	275	GSTONE5	QGLD5	QGLH	0.9240	0.9431
Gladstone PS (275 kV) Unit 6	275	GSTONE6	QGLD6	QGLH	0.9240	0.9431
Hamilton Solar Farm	33	HAMISF1	QSLD1H	QSLD	0.8741	0.9638
Hughenden SF	132	HUGSF1	QROG2H	QROG	0.8842	1.0114
Kareeya PS Unit 1	132	KAREEYA1	QKAH1	QKYH	0.9523	1.0181
Kareeya PS Unit 2	132	KAREEYA2	QKAH2	QKYH	0.9523	1.0181
Kareeya PS Unit 3	132	KAREEYA3	QKAH3	QKYH	0.9523	1.0181
Kareeya PS Unit 4	132	KAREEYA4	QKAH4	QKYH	0.9523	1.0181
Kidston Solar Farm	132	KSP1	QROG1K	QROG	0.8842	1.0114
Kogan Creek PS	275	KPP_1	QBRA4K	QWDN	0.9743	0.9635
Koombooloomba	132	KAREEYA5	QKYH5	QKYH	0.9523	1.0181
Millmerran PS Unit 1	330	MPP_1	QBCK1	QMLN	0.9812	0.9737

Location	Voltage (kV)	DUID	Connection point ID	TNI	2018-19 MLF	2017-18 MLF
Millmerran PS Unit 2	330	MPP_2	QBCK2	QMLN	0.9812	0.9737
Mt Stuart PS Unit 1	132	MSTUART1	QMSP1	QMSP	0.8842	0.9964
Mt Stuart PS Unit 2	132	MSTUART2	QMSP2	QMSP	0.8842	0.9964
Mt Stuart PS Unit 3	132	MSTUART3	QMSP3M	QMSP	0.8842	0.9964
Oakey PS Unit 1	110	OAKEY1	QOKY1	QOKY	0.9562	0.9667
Oakey PS Unit 2	110	OAKEY2	QOKY2	QOKY	0.9562	0.9667
Ross River Solar Farm	132	RRSF1	QROG3R	QROG	0.8842	1.0114
Stanwell PS Load	132	STANNL1	QSTX	QSTX	0.9104	0.9366
Stanwell PS Unit 1	275	STAN-1	QSTN1	QSTN	0.9075	0.9329
Stanwell PS Unit 2	275	STAN-2	QSTN2	QSTN	0.9075	0.9329
Stanwell PS Unit 3	275	STAN-3	QSTN3	QSTN	0.9075	0.9329
Stanwell PS Unit 4	275	STAN-4	QSTN4	QSTN	0.9075	0.9329
Staplyton	110	STAPLYTON1	QLGH4S	QLGH	1.0116	1.0112
Sun Metals Solar Farm	132	SMCSF1	QTZS1S	QTZS	1.0092	1.0424
Swanbank E GT	275	SWAN_E	QSWE	QSWE	1.0009	1.0019
Tarong North PS	275	TNPS1	QTNT	QTNT	0.9755	0.9713
Tarong PS Unit 1	275	TARONG#1	QTRN1	QTRN	0.9752	0.9712
Tarong PS Unit 2	275	TARONG#2	QTRN2	QTRN	0.9752	0.9712
Tarong PS Unit 3	275	TARONG#3	QTRN3	QTRN	0.9752	0.9712
Tarong PS Unit 4	275	TARONG#4	QTRN4	QTRN	0.9752	0.9712
Whitsunday Solar Farm	33	WHITSF1	QSLS1W	QSLS	0.8741	0.9569
Wivenhoe Generation Unit 1	275	W/HOE#1	QWIV1	QWIV	0.9939	0.9935
Wivenhoe Generation Unit 2	275	W/HOE#2	QWIV2	QWIV	0.9939	0.9935
Wivenhoe Pump 1	275	PUMP1	QWIP1	QWIP	0.9974	0.9975
Wivenhoe Pump 2	275	PUMP2	QWIP2	QWIP	0.9974	0.9975
Yabulu PS	132	YABULU	QTYP	QTYP	0.9346	1.0035
Yarwun PS	132	YARWUN_1	QYAG1R	QYAG	0.9245	0.9435

Table 3 Queensland Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Barcaldine PS – Lilyvale	132	BARCALDN	QBCG	QBCG	0.9029	0.9507
Browns Plains Landfill Gas PS	110	BPLANDF1	QLGH3B	QLGH	1.0116	1.0112
Daandine PS	110	DAANDINE	QTKM1	QTKM	0.9867	0.9816
German Creek Generator	66	GERMCRK	QLIL2	QLIL	0.9451	0.9808
Grosvenor PS At Moranbah 66 No 2	66	GROSV2	QMRV1G	QMRV	0.9683	1.0252
Grosvenor PS At Moranbah 66 No 1	66	GROSV1	QMRN2G	QMRV	0.9683	1.0252
Invicta Sugar Mill	132	INVICTA	QINV1I	QINV	0.9660	0.9787
Isis CSM	132	ICSM	QGNG1I	QTBC	0.9764	0.9870
Longreach Solar Farm	132	LRSF1	QLLV2L	QLLV	0.8934	0.9689
Mackay GT	33	MACKAYGT	QMKG	QMKG	0.8863	0.9577
Moranbah Gen	11	MORANBAH	QMRL1M	QMRL	0.9803	1.0441

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Moranbah North PS	66	MBAHNTH	QMRN1P	QMRN	0.9819	1.0364
Oaky Creek Generator	66	OAKYCREK	QLIL1	QLIL	0.9451	0.9808
Oaky Creek 2	66	OAKY2	QLIL3O	QLIL	0.9451	0.9808
Racecourse Mill PS 1 – 3	66	RACOMIL1	QMKA1R	QPIV	0.9623	1.0060
Rochedale Renewable Energy Plant	110	ROCHEDAL	QBMH2	QBMH	1.0123	1.0114
Rocky Point Gen (Loganlea 110kV)	110	RPCG	QLGH2	QLGH	1.0116	1.0112
Roghan Road Generator	110	EDLRGNRD	QSPN2	QSPN	1.0042	1.0044
Roma PS Unit 7 – Columboola	132	ROMA_7	QRMA7	QRMA	0.9729	0.9623
Roma PS Unit 8 – Columboola	132	ROMA_8	QRMA8	QRMA	0.9729	0.9623
Southbank Institute Of Technology	110	STHBKTEC	QCBD1S	QCBW	1.0122	1.0129
Sunshine Coast Solar Farm	132	VALDORA1	QPWD1S	QPWD	1.0025	1.0056
Ti Tree BioReactor	33	TITREE	QABM1T	QABM	1.0015	1.0016
Whitwood Rd Renewable Energy Plant	110	WHIT1	QSBK1	QBKS	1.0001	0.9999
Windy Hill Wind Farm	66	WHILL1	QTUL	QTUL	0.9966	1.0877
Wivenhoe Small Hydro	110	WIVENSH	QABR1	QABR	0.9968	0.9990
Yabulu Steam Turbine (Garbutt 66kV)	66	YABULU2	QGAR1	QYST	0.9495	0.9778

1.2 NSW Marginal Loss Factors[1]

Table 4 NSW Loads

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Alexandria	33	NALX	1.0093	1.0084
Albury	132	NALB	1.0792	1.1080
Alcan	132	NALC	0.9932	0.9920
Armidale	66	NAR1	0.8957	0.9020
Australian Newsprint Mill	132	NANM	1.0810	1.1110
Balranald	22	NBAL	1.1047	1.2097
Beaconsfield North	132	NBFN	1.0084	1.0081
Beaconsfield South	132	NBFS	1.0084	1.0081
Beaconsfield West	132	NBFW	1.0084	1.0081
Belmore Park	132	NBM1	1.0085	1.0082
Beresfield	33	NBRF	0.9957	0.9947
Beryl	66	NBER	1.0062	1.0067
BHP (Waratah)	132	NWR1	0.9893	0.9886
Boambee South	132	NWST	0.9125	0.9190
Boggabri East	132	NBGE	0.9692	0.9677
Boggabri North	132	NBGN	0.9692	0.9694

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

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Brandy Hill	11	NBHL	0.9935	0.9924
Broken Hill	22	NBKG	1.0603	1.2841
Broken Hill	220	NBKH	1.0486	1.2757
Bunnerong	132	NBG1	1.0081	1.0080
Bunnerong	33	NBG3	1.0103	1.0099
Burrinjuck	132	NBU2	1.0155	1.0324
Canterbury	33	NCTB	1.0136	1.0135
Carlingford	132	NCAR	1.0033	1.0041
Casino	132	NCSN	0.8960	0.9021
Charmhaven	11	NCHM	0.9930	0.9925
Chullora	132	NCHU	1.0076	1.0076
Coffs Harbour	66	NCH1	0.9072	0.9139
Coleambally	132	NCLY	1.0783	1.1222
Cooma	66	NCMA	1.0307	1.0387
Cooma (AusNet Services)	66	NCM2	1.0307	1.0387
Croydon	11	NCRD	1.0089	1.0113
Cowra	66	NCW8	1.0411	1.0435
Dapto (Endeavour Energy)	132	NDT1	1.0037	1.0023
Dapto (Essential Energy)	132	NDT2	1.0037	1.0023
Darlington Point	132	NDNT	1.0764	1.1114
Deniliquin	66	NDN7	1.1081	1.1400
Dorrigo	132	NDOR	0.9070	0.9116
Drummoyne	11	NDRM	1.0087	1.0090
Dunoon	132	NDUN	0.8822	0.8881
Far North VTN		NEV1	0.9654	0.9632
Finley	66	NFNY	1.1441	1.1256
Forbes	66	NFB2	1.0429	1.0551
Gadara	132	NGAD	1.0504	1.0756
Glen Innes	66	NGLN	0.8920	0.9000
Gosford	66	NGF3	1.0011	1.0008
Gosford	33	NGSF	1.0021	1.0014
Green Square	11	NGSQ	1.0098	1.0094
Griffith	33	NGRF	1.0929	1.1321
Gunnedah	66	NGN2	0.9579	0.9592
Haymarket	132	NHYM	1.0084	1.0082
Heron's Creek	132	NHNC	0.9885	0.9921
Holroyd	132	NHLD	1.0000	0.9998
Hurstville North	11	NHVN	1.0068	1.0068
Homebush Bay	11	NHBB	1.0110	1.0112
Ilford	132	NLFD	0.9901	0.9868
Ingleburn	66	NING	1.0006	1.0001
Inverell	66	NNVL	0.9063	0.9127
Kemps Creek	330	NKCK	0.9972	0.9965
Kempsey	66	NKS2	0.9510	0.9572

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Kempsey	33	NKS3	0.9542	0.9600
Koolkhan	66	NKL6	0.9174	0.9255
Kurnell	132	NKN1	1.0054	1.0055
Kogarah	11	NKOG	1.0090	1.0120
Kurri	33	NKU3	0.9961	0.9951
Kurri	11	NKU1	0.9940	0.9932
Kurri (DUAL MLF - GEN)	132	NKUR	0.9913	0.9930
Kurri (DUAL MLF - LOAD)	132	NKUR	0.9934	
Lake Munmorah	132	NMUN	0.9835	0.9810
Lane Cove	132	NLCV	1.0083	1.0088
Lichhardt	11	NLDT	1.0103	1.0106
Liddell	33	NLD3	0.9596	0.9582
Lismore	132	NLS2	0.8965	0.9051
Liverpool	132	NLP1	1.0024	1.0022
Macarthur	132	NMC1	0.9987	0.9972
Macarthur	66	NMC2	1.0008	0.9998
Macksville	132	NMCV	0.9305	0.9362
Macquarie Park	11	NMQP	1.0122	1.0123
Manildra	132	NMLD	1.0223	1.0346
Marrickville	11	NMKV	1.0138	1.0136
Marulan (Endeavour Energy)	132	NMR1	0.9977	0.9998
Marulan (Essential Energy)	132	NMR2	0.9977	0.9998
Mason Park	132	NMPK	1.0084	1.0086
Meadowbank	11	NMBK	1.0116	1.0120
Molong	132	NMOL	1.0236	1.0303
Moree	66	NMRE	0.9612	0.9479
Morven	132	NMVN	1.0752	1.1004
Mt Piper	66	NMP6	0.9734	0.9713
Mudgee	132	NMDG	1.0039	1.0026
Mullumbimby	11	NML1	0.8642	0.8710
Mullumbimby	132	NMLB	0.8591	0.8644
Munmorah STS 33	33	NMU3	1.0058	0.9969
Munyang	11	NMY1	1.0256	1.0426
Munyang	33	NMYG	1.0256	1.0426
Murrumbateman	132	NMBM	1.0129	1.0179
Murrumburrah	66	NMRU	1.0448	1.0596
Muswellbrook	132	NMRK	0.9659	0.9637
Nambucca Heads	132	NNAM	0.9243	0.9307
Narrabri	66	NNB2	0.9789	0.9746
Newcastle	132	NNEW	0.9901	0.9892
North of Broken Bay VTN		NEV2	0.9933	0.9926
Orange	66	NRGE	1.0343	1.0363
Orange	132	NRG1	1.0348	1.0374
Orange North	132	NONO	1.0322	1.0343

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Ourimbah	33	NORB	0.9986	0.9977
Ourimbah	132	NOR1	0.9972	0.9968
Ourimbah	66	NOR6	0.9972	0.9967
Panorama	66	NPMA	1.0225	1.0251
Parkes	66	NPK6	1.0372	1.0497
Parkes	132	NPKS	1.0336	1.0476
Peakhurst	33	NPHT	1.0063	1.0069
Pt Macquarie	33	NPMQ	0.9783	0.9833
Pyrmont	33	NPT3	1.0092	1.0089
Pyrmont	132	NPT1	1.0086	1.0084
Queanbeyan 132	132	NQBY	1.0457	1.0555
Raleigh	132	NRAL	0.9166	0.9223
Regentville	132	NRGV	0.9993	0.9993
Rockdale (Ausgrid)	11	NRKD	1.0081	1.0078
Rookwood Road	132	NRWR	1.0027	1.0019
Rozelle	132	NRZH	1.0092	1.0089
Rozelle	33	NRZL	1.0098	1.0100
Snowy Adit	132	NSAD	1.0132	1.0263
Somersby	11	NSMB	1.0020	1.0018
South of Broken Bay VTN		NEV3	1.0062	1.0064
St Peters	11	NSPT	1.0115	1.0113
Stroud	132	NSRD	1.0022	1.0010
Sydney East	132	NSE2	1.0049	1.0048
Sydney North (Ausgrid)	132	NSN1	1.0015	1.0015
Sydney North (Endeavour Energy)	132	NSN2	1.0015	1.0015
Sydney South	132	NSYS	1.0036	1.0033
Sydney West (Ausgrid)	132	NSW1	1.0033	1.0041
Sydney West (Endeavour Energy)	132	NSW2	1.0033	1.0041
Tamworth	66	NTA2	0.9348	0.9372
Taree (Essential Energy)	132	NTR2	1.0105	1.0111
Tenterfield	132	NTTF	0.8945	0.9028
Terranora	110	NTNR	0.9223	0.9406
Tomago	330	NTMG	0.9898	0.9888
Tomago (Ausgrid)	132	NTME	0.9925	0.9915
Tomago (Essential Energy)	132	NTMC	0.9925	0.9915
Top Ryde	11	NTPR	1.0091	1.0095
Tuggerah	132	NTG3	0.9935	0.9930
Tumut	66	NTU2	1.0438	1.0748
Vales Pt.	132	NVP1	0.9883	0.9878
Vineyard	132	NVYD	0.9991	0.9989
Wagga	66	NWG2	1.0616	1.0888
Wagga North	132	NWGN	1.0642	1.0889
Wagga North	66	NWG6	1.0673	1.0941
Wallerawang (Endeavour Energy)	132	NWW6	0.9737	0.9714

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Wallerawang (Essential Energy)	132	NWW5	0.9737	0.9714
Wallerawang 66 (Essential Energy)	66	NWW4	0.9747	0.9718
Wallerawang 66	66	NWW7	0.9747	0.9718
Wallerawang 330 PS Load	330	NWWP	0.9766	0.9754
Wellington	132	NWL8	0.9824	0.9831
West Gosford	11	NGWF	1.0026	1.0024
Williamsdale[2]	132	NWDL	1.0258	1.0356
Williamsdale (Essential Energy)(Bogong)	132	NWD1	1.0272	1.0382
Wyong	11	NWYG	0.9958	0.9953
Yanco	33	NYA3	1.0833	1.1197
Yass	66	NYS6	1.0136	1.0191
Yass	132	NYS1	1.0054	1.0135

Table 5 NSW Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Bayswater PS Unit 1	330	BW01	NBAY1	NBAY	0.9538	0.9520
Bayswater PS Unit 2	330	BW02	NBAY2	NBAY	0.9538	0.9520
Bayswater PS Unit 3	500	BW03	NBAY3	NBYW	0.9555	0.9532
Bayswater PS Unit 4	500	BW04	NBAY4	NBYW	0.9555	0.9532
Blowering	132	BLOWERNG	NBLW8	NBLW	0.9900	1.0506
Bodangora Wind Farm	132	BODWF1	NBOD1B	NBOD	0.9819	0.9847
Broken Hill GT 1	22	GB01	NBKG1	NBKG	1.0603	1.2841
Burrinjuck	132	BURRIN	NBUK	NBUK	1.0124	1.0275
Capital Wind Farm	330	CAPTL_WF	NCWF1R	NCWF	1.0100	1.0163
Colongra PS Unit 1	330	CG1	NCLG1D	NCLG	0.9827	0.9831
Colongra PS Unit 2	330	CG2	NCLG2D	NCLG	0.9827	0.9831
Colongra PS Unit 3	330	CG3	NCLG3D	NCLG	0.9827	0.9831
Colongra PS Unit 4	330	CG4	NCLG4D	NCLG	0.9827	0.9831
Eraring 330 PS Unit 1	330	ER01	NEPS1	NEP3	0.9828	0.9820
Eraring 330 PS Unit 2	330	ER02	NEPS2	NEP3	0.9828	0.9820
Eraring 500 PS Unit 3	500	ER03	NEPS3	NEPS	0.9853	0.9846
Eraring 500 PS Unit 4	500	ER04	NEPS4	NEPS	0.9853	0.9846
Eraring PS Load	500	ERNL1	NEPSL	NEPS	0.9853	0.9846
Griffith Solar Farm	33	GRIFSF1	NGG11G	NGG1	1.0603	1.1162
Gullen Range Solar Farm	330	GULLRSF1	NGUR2G	NGUR	0.9959	1.0010
Gullen Range Wind Farm	330	GULLRWF1	NGUR1G	NGUR	0.9959	1.0010
Guthega	132	GUTHEGA	NGUT8	NGUT	0.9537	0.9658
Guthega Auxiliary Supply	11	GUTHNL1	NMY11	NMY1	1.0256	1.0426
Hume (New South Wales Share)	132	HUMENSW	NHUM	NHUM	1.0675	1.1055

[2] There is a currently a registration process in place to replace ACA1 and NWDL TNIs with 12 new TNIs in the ActewAGL network. Royalla and Mugga Lane Solar Farms will also have separate TNIs ARS1 and AMS1 respectively as part of this process. The 2018-19 MLF for NWDL listed in the table above will apply from 1 July 2018 until the time when the 12 new TNIs are registered and in commercial operation.

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Kangaroo Valley – Bendeela (Shoalhaven) Generation – dual MLF	330	SHGEN	NSHL	NSHN	0.9981	0.9931
Kangaroo Valley (Shoalhaven) Pumps – dual MLF	330	SHPUMP	NSHP1	NSHLPUMP	1.0137	1.0141
Liddell 330 PS Load	330	LIDDNL1	NLDPL	NLDP	0.9537	0.9509
Liddell 330 PS Unit 1	330	LD01	NLDP1	NLDP	0.9537	0.9509
Liddell 330 PS Unit 2	330	LD02	NLDP2	NLDP	0.9537	0.9509
Liddell 330 PS Unit 3	330	LD03	NLDP3	NLDP	0.9537	0.9509
Liddell 330 PS Unit 4	330	LD04	NLDP4	NLDP	0.9537	0.9509
Lower Tumut Generation – dual MLF	330	TUMUT3	NLTS8	NLTS	0.9954	1.0155
Lower Tumut Pipeline Auxiliary	66	TUMT3NL3	NTU2L3	NTU2	1.0438	1.0748
Lower Tumut Pumps – dual MLF	330	SNOWYP	NLTS3	NLTS	1.0545	1.0533
Lower Tumut T2 Auxiliary	66	TUMT3NL1	NTU2L1	NTU2	1.0438	1.0748
Lower Tumut T4 Auxiliary	66	TUMT3NL2	NTU2L2	NTU2	1.0438	1.0748
Mt Piper PS Load	330	MPNL1	NMPPL	NMTP	0.9738	0.9725
Mt Piper PS Unit 1	330	MP1	NMTP1	NMTP	0.9738	0.9725
Mt Piper PS Unit 2	330	MP2	NMTP2	NMTP	0.9738	0.9725
Murray (Geehi Tee off Auxiliary)	330	MURAYNL3	NMURL3	NMUR	0.9069	0.8964
Murray Power Station M1 Auxiliary	330	MURAYNL1	NMURL1	NMUR	0.9069	0.8964
Murray Power Station M2 Auxiliary	330	MURAYNL2	NMURL2	NMUR	0.9069	0.8964
Parkes Solar Farm	66	PARSF1	NPG11P	NPG1	0.9964	1.0135
Sapphire Wind Farm	330	SAPHWF1	NSAP1S	NSAP	0.8821	0.8780
Silverton Wind Farm	220	STWF1	NBKW1S	NBKW	1.0062	1.0665
Upper Tumut	330	UPPTUMUT	NUTS8	NUTS	1.0112	1.0356
Uranquinty PS Unit 11	132	URANQ11	NURQ1U	NURQ	0.9609	1.0087
Uranquinty PS Unit 12	132	URANQ12	NURQ2U	NURQ	0.9609	1.0087
Uranquinty PS Unit 13	132	URANQ13	NURQ3U	NURQ	0.9609	1.0087
Uranquinty PS Unit 14	132	URANQ14	NURQ4U	NURQ	0.9609	1.0087
Vales Point 330 PS Load	330	VPNL1	NVPPL	NVPP	0.9851	0.9845
Vales Point 330 PS Unit 5	330	VP5	NVPP5	NVPP	0.9851	0.9845
Vales Point 330 PS Unit 6	330	VP6	NVPP6	NVPP	0.9851	0.9845
Woodlawn Wind Farm	330	WOODLWN1	NCWF2W	NCWF	1.0100	1.0163
White Rock Wind Farm	132	WRWF1	NWRK1W	NWRK	0.8413	0.8468

Table 6 NSW Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Appin PS	66	APPIN	NAPP1A	NAPP	1.0010	1.0000

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Awaba Renewable Energy Facility	132	AWABAREF	NNEW2	NNEW	0.9901	0.9892
Bankstown Sport Club	132	BANKSPT1	NSYS3R	NSYS	1.0036	1.0033
Boco Rock Wind Farm	132	BOCORWF1	NCMA3B	NBCO	1.0068	1.0167
Broadwater PS	132	BWTR1	NLS21B	NLS2	0.8965	0.9051
Broken Hill Solar Farm	22	BROKENH1	NBK11B	NBK1	0.9789	1.2456
Brown Mountain	66	BROWNMT	NCMA1	NCMA	1.0307	1.0387
Burrendong Hydro PS	132	BDONGHYD	NWL81B	NWL8	0.9824	0.9831
Campbelltown WSLC	66	WESTCBT1	NING1C	NING	1.0006	1.0001
Condong PS	110	CONDONG1	NTNR1C	NTNR	0.9223	0.9406
Copeton Hydro PS	66	COPTNHYD	NNVL1C	NNVL	0.9063	0.9127
Cullerin Range Wind Farm	132	CULLRGWF	NYS11C	NYS1	1.0054	1.0135
Eastern Creek	132	EASTCRK	NSW21	NSW2	1.0033	1.0041
Eraring 330 BS UN (GT)	330	ERGT01	NEP35B	NEP3	0.9828	0.9820
Glenbawn Hydro PS	132	GLBWNHYD	NMRK2G	NMRK	0.9659	0.9637
Glenn Innes (Pindari PS)	66	PINDARI	NGLN1	NGLN	0.8920	0.9000
Glennies Creek PS	132	GLENNCRK	NMRK3T	NMRK	0.9659	0.9637
Grange Avenue	132	GRANGEAV	NVYD1	NVYD	0.9991	0.9989
Gunning Wind Farm	132	GUNNING1	NYS12A	NYS1	1.0054	1.0135
Jindabyne Generator	66	JNDABNE1	NCMA2	NCMA	1.0307	1.0387
Jounama PS	66	JOUNAMA1	NTU21J	NTU2	1.0438	1.0748
Keepit	66	KEEPIT	NKPT	NKPT	0.9579	0.9592
Kincumber Landfill	66	KINCUM1	NGF31K	NGF3	1.0011	1.0008
Liddell 33 – Hunter Valley GTs	33	HVGTS	NLD31	NLD3	0.9596	0.9582
Liverpool 132 (Jacks Gully)	132	JACKSGUL	NLP11	NSW2	1.0033	1.0041
Lucas Heights II Power Plant	132	LUCASHGT	NSYS2G	NSYS	1.0036	1.0033
Lucas Heights Stage 2 Power Station	132	LUCAS2S2	NSYS1	NSYS	1.0036	1.0033
Manildra Solar Farm	132	MANSLR1	NMLS1M	NMLS	0.9905	0.9923
Moree Solar Farm	66	MOREESF1	NMR41M	NMR4	0.8988	0.8911
Narromine Solar Farm	132	NASF1	NWLS1N	NWLS	0.9708	0.9714
Nine Willoughby	132	NINEWIL1	NSE21R	NSE2	1.0049	1.0048
Nyngan Solar Farm	132	NYNGAN1	NWL82N	NWL8	0.9824	0.9831
Sithe (Holroyd Generation)	132	SITHE01	NSYW1	NHD2	1.0000	0.9979
South Keswick Solar Farm	132	SKSF1	NWLS2S	NWLS	0.9708	0.9714
St George Leagues Club	33	STGEORG1	NPHT1E	NPHT	1.0063	1.0068
Tahmoor PS	132	TAHMOOR1	NLP12T	NLP1	1.0024	1.0022
Tallawarra PS	132	TALWA1	NDT13T	NTWA	1.0001	1.0013
Taralga Wind Farm	132	TARALGA1	NMR22T	NMR2	0.9977	0.9998
Teralba Power Station	132	TERALBA	NNEW1	NNEW	0.9901	0.9892
The Drop Power Station	66	THEDROP1	NFNY1D	NFNY	1.1441	1.1256
Tower Power Plant	132	TOWER	NLP11T	NLP1	1.0024	1.0022
West Nowra	132	AGLNOW1	NDT12	NDT1	1.0037	1.0023
Wests Illawara Leagues Club	132	WESTILL1	NDT14E	NDT1	1.0037	1.0023

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Wilga Park A	66	WILGAPK	NNB21W	NNB2	0.9789	0.9746
Wilga Park B	66	WILGB01	NNB22W	NNB2	0.9789	0.9746
Woodlawn Bioreactor	132	WDLNGN01	NMR21W	NMR2	0.9977	0.9998
Woy Woy Landfill	66	WOYWOY1	NGF32W	NGF3	1.0011	1.0008
Wyangala A PS	66	WYANGALA	NCW81A	NCW8	1.0411	1.0435
Wyangala B PS	66	WYANGALB	NCW82B	NCW8	1.0411	1.0435

Table 7 ACT Loads

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Canberra[3]	132	ACA1	1.0266	1.0362
Angle Crossing[4]	132	AAXG	1.0327	1.0371
Belconnen[4]	132	ABCN	1.0288	1.0388
City East[4]	132	ACTE	1.0322	1.0419
Civic[4]	132	ACVC	1.0295	1.0394
East lake[4]	132	AELK	1.0309	1.0406
Gilmore[4]	132	AGLM	1.0303	1.0397
Gold Creek[4]	132	AGCK	1.0283	1.0383
Latham[4]	132	ALTM	1.0276	1.0377
Telopea Park[4]	132	ATLP	1.0320	1.0415
Theodore[4]	132	ATDR	1.0293	1.0389
Wanniassa[4]	132	AWSA	1.0304	1.0400
Woden[4]	132	AWDN	1.0296	1.0394
ACT VTN	132	AAVT	1.0300	1.0396
Queanbeyan (ACTEW)	66	AQB1	1.0438	1.0563
Queanbeyan (Essential Energy)	66	AQB2	1.0438	1.0563

Table 8 ACT Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Capital East Solar Farm	66	CESF1	AQB21C	AQB2	1.0438	1.0563
Mugga Lane Solar Farm[3]	132	MLSP1	ACA12M	ACA1	1.0266	1.0362
Royalla Solar Farm[3]	132	ROYALLA1	ACA11R	ACA1	1.0266	1.0362
Mugga Lane SF @ Gilmore[4]	132			AMS1	1.0200	1.0395
Royalla Solar Farm @ Theodore[4]	132			ARS1	1.0178	1.0386

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

[3] There is a currently a registration process in place to replace ACA1 and NWDL TNIs with 12 new TNIs in the ActewAGL network. Royalla and Mugga Lane Solar Farms will also have separate TNIs ARS1 and AMS1 respectively as part of this process. The 2018-19 MLF for ACA1 listed in the table above will apply from 1 July 2018 until the time when the 12 new TNIs are registered and in commercial operation.

[4] The 2018-19 MLF value will apply once the TNI registration process is complete and in commercial operation (see note above).

1.3 Victoria Marginal Loss Factors

Table 9 Victorian Loads

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Altona	66	VATS	1.0054	1.0084
Altona	220	VAT2	1.0018	1.0081
Ballarat	66	VBAT	1.0016	1.0160
Bendigo	66	VBE6	1.0139	1.0398
Bendigo	22	VBE2	1.0163	1.0405
BHP Western Port	220	VJLA	0.9944	0.9948
Brooklyn (Jemena)	22	VBL2	1.0051	1.0081
Brooklyn (Jemena)	66	VBL6	1.0042	1.0069
Brooklyn (Powercor)	22	VBL3	1.0051	1.0081
Brooklyn (Powercor)	66	VBL7	1.0042	1.0069
Brunswick (CITIPOWER)	22	VBT2	1.0008	1.0008
Brunswick (Jemena)	22	VBTS	1.0008	1.0008
Brunswick 66 (CitiPower)	66	VBT6	0.9992	0.9993
Cranbourne	220	VCB2	0.9935	0.9933
Cranbourne (AusNet Services)	66	VCBT	0.9957	0.9962
Cranbourne (United Energy)	66	VCB5	0.9957	0.9962
Deer Park	66	VDPT	1.0038	1.0069
East Rowville (AusNet Services)	66	VER2	0.9956	0.9962
East Rowville (United Energy)	66	VERT	0.9956	0.9962
Fishermens Bend (CitiPower)	66	VFBT	1.0034	1.0046
Fishermens Bend (Powercor)	66	VFB2	1.0034	1.0046
Fosterville	220	VFVT	1.0096	1.0305
Geelong	66	VGT6	1.0002	1.0055
Glenrowan	66	VGNT	0.9903	0.9884
Heatherton	66	VHTS	1.0001	1.0007
Heywood	22	VHY2	1.0028	1.0096
Horsham	66	VHOT	0.9957	1.0473
Keilor (Jemena)	66	VKT2	1.0024	1.0048
Keilor (Powercor)	66	VKTS	1.0024	1.0048
Kerang	22	VKG2	1.0292	1.0779
Kerang	66	VKG6	1.0192	1.0755
Khancoban	330	NKHN	0.9459	0.9369
Loy Yang Substation	66	VLY6	0.9822	0.9826
Malvern	22	VMT2	0.9983	0.9982
Malvern	66	VMT6	0.9971	0.9971
Morwell Power Station Units 1 to 3	66	VMWG	0.9816	0.9820
Morwell PS (G4&5)	11	VMWP	0.9817	0.9821
Morwell TS	66	VMWT	0.9879	0.9886
Mt Beauty	66	VMBT	0.9882	0.9743
Portland	500	VAPD	1.0058	1.0121
Pt Henry	220	VPTH	0.9980	1.0030
Red Cliffs	22	VRC2	1.0129	1.1108

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Red Cliffs	66	VRC6	1.0062	1.1068
Red Cliffs (Essential Energy)	66	VRCA	1.0062	1.1068
Richmond	22	VRT2	0.9996	0.9997
Richmond (CitiPower)	66	VRT7	1.0011	1.0015
Richmond (United Energy)	66	VRT6	1.0011	1.0015
Ringwood (AusNet Services)	22	VRW3	1.0007	1.0005
Ringwood (AusNet Services)	66	VRW7	1.0012	1.0005
Ringwood (United Energy)	22	VRW2	1.0007	1.0005
Ringwood (United Energy)	66	VRW6	1.0012	1.0005
Shepparton	66	VSHT	1.0002	1.0037
South Morang (Jemena)	66	VSM6	0.9979	0.9980
South Morang (AusNet Services)	66	VSMT	0.9979	0.9980
Springvale (CitiPower)	66	VSVT	0.9986	0.9989
Springvale (United Energy)	66	VSV2	0.9986	0.9989
Templestowe (CitiPower)	66	VTS2	1.0006	1.0005
Templestowe (Jemena)	66	VTST	1.0006	1.0005
Templestowe (AusNet Services)	66	VTS3	1.0006	1.0005
Templestowe (United Energy)	66	VTS4	1.0006	1.0005
Terang	66	VTGT	1.0149	1.0322
Thomastown (Jemena)	66	VTTS	1.0000	1.0000
Thomastown (AusNet Services)	66	VTT2	1.0000	1.0000
Tyabb	66	VTBT	0.9958	0.9963
Wemen 66 (Essential Energy)	66	VWEA	1.0066	1.1038
Wemen TS	66	VWET	1.0066	1.1038
West Melbourne	22	VWM2	1.0019	1.0027
West Melbourne (CitiPower)	66	VWM7	1.0029	1.0041
West Melbourne (Jemena)	66	VWM6	1.0029	1.0041
Wodonga	22	VWO2	0.9735	0.9654
Wodonga	66	VWO6	0.9712	0.9621
Yallourn	11	VYP1	0.9584	0.9582

Table 10 Victoria Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Ararat WF	220	ARWF1	VART1A	VART	0.9691	1.0019
Banimboola	220	BAPS	VDPS2	VDPS	0.9249	0.9372
Bannerton Solar Farm	66	BANN1	VWES1B	VRC6	1.0062	1.1068
Basslink (Loy Yang Power Station Switchyard) Tasmania to Victoria	500	BLNKVIC	VLYP13	VTBL	0.9839	0.9874
Dartmouth PS	220	DARTM1	VDPS	VDPS	0.9249	0.9372
Eildon PS Unit 1	220	EILDON1	VEPS1	VEPS	0.9782	0.9696
Eildon PS Unit 2	220	EILDON2	VEPS2	VEPS	0.9782	0.9696
Hazelwood PS Load	220	HWPNL1	VHWPL	VHWP	0.9813	0.9820
Jeeralang A PS Unit 1	220	JLA01	VJLGA1	VJLG	0.9783	0.9830

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Jeeralang A PS Unit 2	220	JLA02	VJLGA2	VJLG	0.9783	0.9830
Jeeralang A PS Unit 3	220	JLA03	VJLGA3	VJLG	0.9783	0.9830
Jeeralang A PS Unit 4	220	JLA04	VJLGA4	VJLG	0.9783	0.9830
Jeeralang B PS Unit 1	220	JLB01	VJLGB1	VJLG	0.9783	0.9830
Jeeralang B PS Unit 2	220	JLB02	VJLGB2	VJLG	0.9783	0.9830
Jeeralang B PS Unit 3	220	JLB03	VJLGB3	VJLG	0.9783	0.9830
Jindabyne pump at Guthega	132	SNOWYGJP	NGJP	NGJP	1.0124	1.0474
Kiata Wind Farm	66	KIATAWF1	VHOG1K	VHOG	0.9911	1.0357
Laverton PS (LNGS1)	220	LNGS1	VAT21L	VAT2	1.0018	1.0081
Laverton PS (LNGS2)	220	LNGS2	VAT22L	VAT2	1.0018	1.0081
Loy Yang A PS Load	500	LYNL1	VLYPL	VLYP	0.9798	0.9801
Loy Yang A PS Unit 1	500	LYA1	VLYP1	VLYP	0.9798	0.9801
Loy Yang A PS Unit 2	500	LYA2	VLYP2	VLYP	0.9798	0.9801
Loy Yang A PS Unit 3	500	LYA3	VLYP3	VLYP	0.9798	0.9801
Loy Yang A PS Unit 4	500	LYA4	VLYP4	VLYP	0.9798	0.9801
Loy Yang B PS Unit 1	500	LOYYB1	VLYP5	VLYP	0.9798	0.9801
Loy Yang B PS Unit 2	500	LOYYB2	VLYP6	VLYP	0.9798	0.9801
MacArthur Wind Farm	500	MACARTH1	VTRT1M	VTRT	0.9971	1.0017
McKay Creek / Bogong PS	220	MCKAY1	VMKP1	VT14	0.9265	0.9213
Mortlake Unit 1	500	MORTLK11	VM0P1O	VM0P	0.9961	1.0050
Mortlake Unit 2	500	MORTLK12	VM0P2O	VM0P	0.9961	1.0050
Mt Mercer Windfarm	220	MERCER01	VELT1M	VELT	0.9909	1.0010
Murray	330	MURRAY	NMUR8	NMUR	0.9069	0.8964
Newport PS	220	NPS	VNPS	VNPS	0.9962	0.9990
Salt Creek Wind Farm	66	SALTCRK1	VTG61S	VTG6	1.0076	1.0193
Valley Power Unit 1	500	VPGS1	VLYP07	VLYP	0.9798	0.9801
Valley Power Unit 2	500	VPGS2	VLYP08	VLYP	0.9798	0.9801
Valley Power Unit 3	500	VPGS3	VLYP09	VLYP	0.9798	0.9801
Valley Power Unit 4	500	VPGS4	VLYP010	VLYP	0.9798	0.9801
Valley Power Unit 5	500	VPGS5	VLYP011	VLYP	0.9798	0.9801
Valley Power Unit 6	500	VPGS6	VLYP012	VLYP	0.9798	0.9801
Waubra Wind Farm	220	WAUBRAWF	VWBT1A	VWBT	0.9784	0.9997
West Kiewa PS Unit 1	220	WKIEWA1	VWKP1	VWKP	0.9607	0.9540
West Kiewa PS Unit 2	220	WKIEWA2	VWKP2	VWKP	0.9607	0.9540
Yallourn W PS 220 Load	220	YWNL1	VYP2L	VYP2	0.9573	0.9558
Yallourn W PS 220 Unit 1	220	YWPS1	VYP21	VYP3	0.9696	0.9702
Yallourn W PS 220 Unit 2	220	YWPS2	VYP22	VYP2	0.9573	0.9558
Yallourn W PS 220 Unit 3	220	YWPS3	VYP23	VYP2	0.9573	0.9558
Yallourn W PS 220 Unit 4	220	YWPS4	VYP24	VYP2	0.9573	0.9558
Yaloak South WF	66	YSWF1	VBAT4Y	VBAT	1.0016	1.0160

Table 11 Victoria Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Bairnsdale Power Station	66	BDL01	VMWT2	VBDL	0.9866	0.9863
Bairnsdale Power Station Generator Unit 2	66	BDL02	VMWT3	VBDL	0.9866	0.9863
Bald Hills WF	66	BALDHWF1	VMWT9B	VMWT	0.9879	0.9886
Ballarat Health Services	66	BBASEHOS	VBAT1H	VBAT	1.0016	1.0160
Broadmeadows Power Plant	66	BROADMDW	VTTS2B	VTTS	1.0000	1.0000
Brooklyn Landfill & Recycling Facility	66	BROOKLYN	VBL61	VBL6	1.0042	1.0069
Chepstowe Wind Farm	66	CHPSTWF1	VBAT3C	VBAT	1.0016	1.0160
Clayton Landfill Gas Power Station	66	CLAYTON	VSV21B	VSV2	0.9986	0.9989
Clover PS	66	CLOVER	VMBT1	VMBT	0.9882	0.9743
Codrington Wind Farm	66	CODRNGTON	VTGT2C	VTGT	1.0149	1.0322
Coonooer Bridge WF	66	CBWF1	VBE61C	VBE6	1.0139	1.0398
Corio LFG PS	66	CORIO1	VGT61C	VGT6	1.0002	1.0055
Eildon Hydro PS	66	EILDON3	VTT22E	VSMT	0.9979	0.9980
Gannawarra Solar Farm	66	GANNSF1	VKGS1G	VKGS	0.9729	1.044
Glenmaggie Hydro PS	66	GLENMAG1	VMWT8G	VMWT	0.9879	0.9886
Hallam Mini Hydro	66	HLMSEW01	VER21H	VER2	0.9956	0.9962
Hallam Road Renewable Energy Facility	66	HALAMRD1	VER22L	VER2	0.9956	0.9962
Hepburn Community WF	66	HEPWIND1	VBAT2L	VBAT	1.0016	1.0160
Hume (Victorian Share)	66	HUMEV	VHUM	VHUM	0.9498	0.8911
Longford	66	LONGFORD	VMWT6	VMWT	0.9879	0.9886
Maroona Wind Farm	66	MAROOWF1	VBAT5M	VBAT	1.0016	1.0160
Mornington Landfill Site Generator	66	MORNW	VTBT1	VTBT	0.9958	0.9963
Mortons Lane Wind Farm	66	MLWF1	VTGT4M	VTGT	1.0149	1.0322
Oaklands Hill Wind Farm	66	OAKLAND1	VTGT3A	VTGT	1.0149	1.0322
Rubicon Mountain Streams Station	66	RUBICON	VTT21R	VSMT	0.9979	0.9978
Shepparton Waste Gas	66	SHEP1	VSHT2S	VSHT	1.0002	1.0037
Somerton Power Station	66	AGLSOM	VTTS1	VSOM	0.9963	0.9968
Springvale Power Plant	66	SVALE1	VSV22S	VSV2	0.9986	0.9989
Tatura	66	TATURA01	VSHT1	VSHT	1.0002	1.0037
Toora Wind Farm	66	TOORAWF	VMWT5	VMWT	0.9879	0.9886
Traralgon NSS	66	TGNSS1	VMWT1T	VMWT	0.9879	0.9886
William Hovell Hydro PS	66	WILLHOV1	VW061W	VWO6	0.9712	0.9621
Wollert Renewable Energy Facility	66	WOLLERT1	VSMT1W	VSMT	0.9979	0.9980
Wonthaggi Wind Farm	66	WONWP	VMWT7	VMWT	0.9879	0.9886
Wyndham Landfill Site Generator	66	WYNDW	VATS1	VATS	1.0054	1.0084
Yambuk Wind Farm	66	YAMBUKWF	VTGT1	VTGT	1.0149	1.0322
Yarrawonga Hydro PS	66	YWNGAHYD	VSHT3Y	VSHT	1.0002	1.0037

1.4 South Australia Marginal Loss Factors

Table 12 South Australia Loads

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Angas Creek	33	SANC	1.0080	1.0096
Ardrossan West	33	SARW	0.9582	0.9541
Back Callington	11	SBAC	1.0094	1.0092
Baroota	33	SBAR	0.9997	1.0066
Berri	66	SBER	1.0072	0.9485
Berri (Powercor)	66	SBE1	1.0072	0.9485
Blanche	33	SBLA	0.9693	0.9371
Blanche (Powercor)	33	SBL1	0.9693	0.9371
Brinkworth	33	SBRK	0.9967	1.0011
Bungama Industrial	33	SBUN	0.9939	1.0016
Bungama Rural	33	SBUR	1.0026	1.0114
City West	66	SACR	1.0044	1.0045
Clare North	33	SCLN	0.9924	0.9972
Dalrymple	33	SDAL	0.9258	0.9193
Davenport	275	SDAV	0.9928	1.0048
Davenport	33	SDAW	0.9941	1.0066
Dorrien	33	SDRN	1.0064	1.0083
East Terrace	66	SETC	1.0036	1.0047
Happy Valley	66	SHVA	1.0054	1.0051
Hummocks	33	SHUM	0.9724	0.9751
Kadina East	33	SKAD	0.9791	0.9804
Kanmantoo	11	SKAN	1.0087	1.0089
Keith	33	SKET	0.9952	0.9780
Kilburn	66	SKLB	1.0019	1.0035
Kincraig	33	SKNC	0.9799	0.9571
Lefevre	66	SLFE	0.9999	0.9995
Leigh Creek	33	SLCC	1.0506	1.0575
Leigh Creek South	33	SLCS	1.0549	1.0589
Magill	66	SMAG	1.0039	1.0044
Mannum	33	SMAN	1.0090	1.0098
Mannum – Adelaide Pipeline 1	3.3	SMA1	1.0135	1.0143
Mannum – Adelaide Pipeline 2	3.3	SMA2	1.0122	1.0134
Mannum – Adelaide Pipeline 3	3.3	SMA3	1.0121	1.0136
Middleback	33	SMDL	0.9996	1.0085
Middleback	132	SMBK	1.0014	1.0102
Millbrook	132	SMLB	1.0040	1.0055
Mobilong	33	SMBL	1.0079	1.0065
Morgan – Whyalla Pipeline 1	3.3	SMW1	1.0023	0.9797
Morgan – Whyalla Pipeline 2	3.3	SMW2	0.9991	0.9872
Morgan – Whyalla Pipeline 3	3.3	SMW3	0.9947	0.9921
Morgan – Whyalla Pipeline 4	3.3	SMW4	0.9919	0.9926
Morphett Vale East	66	SMVE	1.0068	1.0047

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Mount Barker South	66	SMBS	1.0050	1.0041
Mt Barker	66	SMBA	1.0043	1.0041
Mt Gambier	33	SMGA	0.9708	0.9390
Mt Gunson	33	SMGU	1.0257	1.0373
Munno Para	66	SMUP	1.0002	1.0035
Murray Bridge – Hahndorf Pipeline 1	11	SMH1	1.0129	1.0088
Murray Bridge – Hahndorf Pipeline 2	11	SMH2	1.0157	1.0105
Murray Bridge – Hahndorf Pipeline 3	11	SMH3	1.0140	1.0102
Neuroodla	33	SNEU	1.0226	1.0308
New Osborne	66	SNBN	0.9997	0.9990
North West Bend	66	SNWB	1.0013	0.9778
Northfield	66	SNFD	1.0031	1.0034
Para	66	SPAR	1.0026	1.0041
Parafield Gardens West	66	SPGW	1.0030	1.0039
Penola West 33	33	SPEN	0.9664	0.9376
Pimba	132	SPMB	1.0731	1.0429
Playford	132	SPAA	0.9918	1.0038
Port Lincoln	33	SPLN	0.9850	0.9900
Port Pirie	33	SPPR	0.9990	1.0110
Roseworthy	11	SRSW	1.0090	1.0103
Snuggery Industrial (Dual MLF Generation)	33	SSNN	0.9430	0.9174
Snuggery Industrial (Dual MLF Load)	33	SSNN	0.9482	0.9102
Snuggery Rural	33	SSNR	0.9457	0.9181
South Australian VTN		SJP1	0.9998	0.9994
Stony Point	11	SSPN	0.9990	1.0109
Tailem Bend	33	STAL	1.0017	0.9936
Templers	33	STEM	1.0046	1.0061
Torrens Island	66	STSY	1.0000	1.0000
Waterloo	33	SWAT	0.9886	0.9897
Whyalla Central Substation	33	SWYC	0.9996	1.0112
Whyalla Terminal BHP	33	SBHP	0.9988	1.0107
Woomera	132	SWMA	1.0320	1.0432
Wudina	66	SWUD	1.0049	1.0118
Yadnarie	66	SYAD	0.9927	0.9986

Table 13 South Australia Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Bungala one Solar Farm	132	BNGSF1	SBEM1B	SBEM	0.9700	0.9946
Cathedral Rocks Wind Farm	132	CATHROCK	SCRK	SCRK	0.8860	0.8965
Clements Gap Wind Farm	132	CLEMGPWF	SCGW1P	SCGW	0.9683	0.9787
Dry Creek PS Unit 1	66	DRYCGT1	SDCA1	SDPS	1.0030	1.0019
Dry Creek PS Unit 2	66	DRYCGT2	SDCA2	SDPS	1.0030	1.0019
Dry Creek PS Unit 3	66	DRYCGT3	SDCA3	SDPS	1.0030	1.0019

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Dalrymple North BESS - Gen	33	DALNTH01	SDAN1D	SDAN	0.8880	0.8848
Dalrymple North BESS - Load	33	DALNTHL1	SDAN2D	SDAN	0.9326	0.9099
Hallett 2 Wind Farm	275	HALLWF2	SMOK1H	SMOK	0.9715	0.9818
Hallett PS	275	AGLHAL	SHPS1	SHPS	0.9715	0.9820
Hallett Wind Farm	275	HALLWF1	SHPS2W	SHPS	0.9715	0.9820
Hornsdale Wind Farm Stage 1	275	HDWF1	SHDW1H	SHDW	0.9744	0.9799
Hornsdale Wind Farm Stage 2	275	HDWF2	SHDW2H	SHDW	0.9744	0.9799
Hornsdale Wind Farm Stage 3	275	HDWF3	SHDW3H	SHDW	0.9744	0.9799
Hornsdale Battery – generation	275	HPRG1	SMTL1H	SMTL	0.9771	0.9886
Hornsdale Battery – load	275	HPRL1	SMTL2H	SMTL	0.9853	0.9886
Ladbroke Grove PS Unit 1	132	LADBROK1	SPEW1	SPEW	0.9474	0.9170
Ladbroke Grove PS Unit 2	132	LADBROK2	SPEW2	SPEW	0.9474	0.9170
Lake Bonney Wind Farm	33	LKBONNY1	SMAY1	SMAY	0.9144	0.8906
Lake Bonney Wind Farm Stage 2	33	LKBONNY2	SMAY2	SMAY	0.9144	0.8906
Lake Bonney Wind Farm Stage 3	33	LKBONNY3	SMAY3W	SMAY	0.9144	0.8906
Mintaro PS	132	MINTARO	SMPS	SMPS	0.9942	0.9941
Mt Millar Wind Farm	33	MTMILLAR	SMTM1	SMTM	0.9055	0.9172
North Brown Hill Wind Farm	275	NBHWF1	SBEL1A	SBEL	0.9674	0.9798
O.C.P.L. Unit 1	66	OSB-AG	SNBN1	SOCP	0.9992	0.9988
Pelican Point PS	275	PPCCGT	SPPT	SPPT	1.0005	1.0012
Port Lincoln 3	33	POR03	SPL31P	SPL3	1.0383	1.0510
Port Lincoln PS	132	POR01	SPLN1	SPTL	0.9691	1.0158
Quarantine PS Unit 1	66	QPS1	SQPS1	SQPS	0.9854	0.9856
Quarantine PS Unit 2	66	QPS2	SQPS2	SQPS	0.9854	0.9856
Quarantine PS Unit 3	66	QPS3	SQPS3	SQPS	0.9854	0.9856
Quarantine PS Unit 4	66	QPS4	SQPS4	SQPS	0.9854	0.9856
Quarantine PS Unit 5	66	QPS5	SQPS5Q	SQPS	0.9854	0.9856
Snowtown WF Stage 2 – North	275	SNOWNTH1	SBLWS1	SBLW	0.9813	0.9869
Snowtown WF Stage 2 – South	275	SNOWSTH1	SBLWS2	SBLW	0.9813	0.9869
Snowtown Wind Farm	33	SNOWTWN1	SNWF1T	SNWF	0.9203	0.9296
Snuggery PS Units 1 to 3	132	SNUG1	SSGA1	SSPS	0.9325	0.9318
The Bluff wind Farm	275	BLUFF1	SBEL2P	SBEL	0.9674	0.9798
Torrens Island PS A Unit 1	275	TORRA1	STSA1	STPS	1.0009	1.0016
Torrens Island PS A Unit 2	275	TORRA2	STSA2	STPS	1.0009	1.0016
Torrens Island PS A Unit 3	275	TORRA3	STSA3	STPS	1.0009	1.0016
Torrens Island PS A Unit 4	275	TORRA4	STSA4	STPS	1.0009	1.0016
Torrens Island PS B Unit 1	275	TORRB1	STSB1	STPS	1.0009	1.0016
Torrens Island PS B Unit 2	275	TORRB2	STSB2	STPS	1.0009	1.0016
Torrens Island PS B Unit 3	275	TORRB3	STSB3	STPS	1.0009	1.0016

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Torrens Island PS B Unit 4	275	TORRB4	STSB4	STPS	1.0009	1.0016
Torrens Island PS Load	66	TORNL1	STSYL	STSY	1.0000	1.0000
Waterloo Wind Farm	132	WATERLWF	SWLE1R	SWLE	0.9712	0.9751
Wattle Point Wind Farm	132	WPWF	SSYP1	SSYP	0.8279	0.8330

Table 14 South Australia Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Amcor Glass UN 1	11	AMCORGR	SRSW1E	SRSW	1.0090	1.0103
Angaston Power Station	33	ANGAST1	SDRN1	SANG	1.0087	1.0121
Blue Lake Milling	33	BLULAKE1	SKET2B	SKET	0.9952	0.9780
Bolivar WWT Plant (NEW)	66	BOLIVAR1	SPGW1B	SPGW	1.0030	1.0039
Canunda Wind Farm	33	CNUNDAWF	SSNN1	SCND	0.9237	0.8967
Cummins Lonsdale PS	66	LONSDALE	SMVE1	SMVE	1.0068	1.0047
Morphett Vale East 66 (Generation)	66	SATGS1	SMVG1L	SMVG	1.0061	1.0007
Para 66 (Generation)	66	SATGN1	SPAG1E	SPAG	0.9971	1.0022
Pt Stanvac PS	66	PTSTAN1	SMVE3P	SMVE	1.0068	1.0047
Starfish Hill Wind Farm	66	STARHLWF	SMVE2	SMVE	1.0068	1.0047
Tatiara Meat Co	33	TATIARA1	SKET1E	SKET	0.9952	0.9780
Wingfield 1 LFG PS	66	WINGF1_1	SKLB1W	SKLB	1.0019	1.0035
Wingfield 2 LFG PS	66	WINGF2_1	SNBN2W	SNBN	0.9997	0.9990

1.5 Tasmania Marginal Loss Factors

Table 15 Tasmania Loads

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
Arthurs Lake	6.6	TAL2	0.9943	0.9937
Avoca	22	TAV2	1.0140	1.0017
Boyer SWA	6.6	TBYA	1.0227	1.0199
Boyer SWB	6.6	TBYB	1.0239	1.0197
Bridgewater	11	TBW2	1.0233	1.0141
Burnie	22	TBU3	0.9857	0.9855
Chapel St.	11	TCS3	1.0231	1.0127
Comalco	220	TCO1	1.0006	1.0006
Creek Road	33	TCR2	1.0232	1.0140
Derby	22	TDE2	0.9647	0.9672
Derwent Bridge	22	TDB2	0.9386	0.9368
Devonport	22	TDP2	0.9885	0.9884
Electrona	11	TEL2	1.0360	1.0255
Emu Bay	11	TEB2	0.9832	0.9829
Fisher (Rowallan)	220	TFI1	0.9660	0.9671
George Town	22	TGT3	1.0025	1.0023

Location	Voltage (kV)	TNI	2018-19 MLF	2017-18 MLF
George Town (Basslink)	220	TGT1	1.0000	1.0000
Gordon	22	TGO2	1.0024	1.0012
Greater Hobart Area VTN		TVN1	1.0236	1.0155
Hadspen	22	THA3	0.9967	0.9941
Hampshire	110	THM2	0.9819	0.9834
Huon River	11	THR2	1.0380	1.0316
Kermandie	11	TKE2	1.0399	1.0312
Kingston	33	TK13	1.0290	1.0188
Kingston	11	TKI2	1.0306	1.0196
Knights Road	11	TKR2	1.0433	1.0353
Lindisfarne	33	TLF2	1.0237	1.0159
Meadowbank	22	TMB2	0.9938	0.9919
Mornington	33	TMT2	1.0239	1.0162
Mowbray	22	TMY2	0.9955	0.9927
New Norfolk	22	TNN2	1.0179	1.0128
Newton	22	TNT2	0.9773	0.9712
Newton	11	TNT3	0.9552	0.9607
North Hobart	11	TNH2	1.0224	1.0150
Norwood	22	TNW2	0.9951	0.9926
Palmerston	22	TPM3	0.9847	0.9870
Port Latta	22	TPL2	0.9604	0.9664
Que	22	TQU2	0.9743	0.9708
Queenstown	11	TQT3	0.9635	0.9546
Queenstown	22	TQT2	0.9629	0.9629
Railton	22	TRA2	0.9900	0.9899
Risdon	33	TRI4	1.0245	1.0180
Risdon	11	TRI3	1.0257	1.0228
Rokeby	11	TRK2	1.0259	1.0163
Rosebery	44	TRB2	0.9750	0.9727
Savage River	22	TSR2	0.9938	1.0013
Scottsdale	22	TSD2	0.9731	0.9735
Smithton	22	TST2	0.9482	0.9493
Sorell	22	TSO2	1.0317	1.0239
St Leonard	22	TSL2	0.9947	0.9915
St. Marys	22	TSM2	1.0284	1.0165
Starwood	110	TSW1	1.0011	1.0009
Tamar Region VTN		TVN2	0.9965	0.9938
Temco	110	TTE1	1.0043	1.0039
Trevallyn	22	TTR2	0.9961	0.9931
Triabunna	22	TTB2	1.0454	1.0382
Tungatinah	22	TTU2	0.9396	0.9367
Ulverstone	22	TUL2	0.9879	0.9868
Waddamana	22	TWA2	0.9617	0.9537
Wayatinah	11	TWY2	1.0006	0.9979
Wesley Vale	22	TWV2	0.9867	0.9863

Table 16 Tasmania Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Basslink (George Town)	220	BLNKTAS	TGT11	TGT1	1.0000	1.0000
Bastyan	220	BASTYAN	TFA11	TFA1	0.9410	0.9486
Bell Bay No.3	110	BBTHREE1	TBB11	TBB1	1.0003	1.0001
Bell Bay No.3	110	BBTHREE2	TBB12	TBB1	1.0003	1.0001
Bell Bay No.3	110	BBTHREE3	TBB13	TBB1	1.0003	1.0001
Bluff Point and Studland Bay Wind Farms	110	WOOLNTH1	TST11	TST1	0.8952	0.9025
Butlers Gorge	110	BUTLERSG	TBG11	TBG1	0.9350	0.9216
Catagunya	220	LI_WY_CA	TLI11	TLI1	0.9977	0.9919
Cethana	220	CETHANA	TCE11	TCE1	0.9628	0.9630
Cluny	220	CLUNY	TCL11	TCL1	1.0019	0.9908
Devils gate	110	DEVILS_G	TDG11	TDG1	0.9692	0.9703
Fisher	220	FISHER	TFI11	TFI1	0.9660	0.9671
Gordon	220	GORDON	TGO11	TGO1	0.9868	0.9594
John Butters	220	JBUTTERS	TJB11	TJB1	0.9365	0.9445
Lake Echo	110	LK_ECHO	TLE11	TLE1	0.9385	0.9487
Lemonthyme	220	LEM_WIL	TSH11	TSH1	0.9701	0.9711
Liapootah	220	LI_WY_CA	TLI11	TLI1	0.9977	0.9919
Mackintosh	110	MACKNTSH	TMA11	TMA1	0.9282	0.9402
Meadowbank	110	MEADOWBK	TMB11	TMB1	0.9773	0.9770
Musselroe	110	MUSSELR1	TDE11M	TDE1	0.9105	0.9133
Paloona	110	PALOONA	TPA11	TPA1	0.9771	0.9668
Poatina	220	POAT220	TPM11	TPM1	0.9912	0.9813
Poatina	110	POAT110	TPM21	TPM2	0.9799	0.9677
Reece No.1	220	REECE1	TRCA1	TRCA	0.9350	0.9399
Reece No.2	220	REECE2	TRCB1	TRCB	0.9264	0.9402
Repulse	220	REPULSE	TCL12	TCL1	1.0019	0.9908
Rowallan	220	ROWALLAN	TFI12	TFI1	0.9660	0.9671
Tamar Valley CCGT	220	TVCC201	TTV11A	TTV1	0.9999	1.0000
Tamar Valley OCGT	110	TVPP104	TBB14A	TBB1	1.0003	1.0001
Tarraleah	110	TARRALEA	TTA11	TTA1	0.9405	0.9338
Trevallyn	110	TREVALLN	TTR11	TTR1	0.9909	0.9898
Tribute	220	TRIBUTE	TTI11	TTI1	0.9377	0.9466
Tungatinah	110	TUNGATIN	TTU11	TTU1	0.9184	0.9233
Wayatinah	220	LI_WY_CA	TLI11	TLI1	0.9977	0.9919
Wilmot	220	LEM_WIL	TSH11	TSH1	0.9701	0.9711

Table 17 Tasmania Embedded Generation

Location	Voltage (kV)	DUID	Connection Point ID	TNI	2018-19 MLF	2017-18 MLF
Midlands PS	22	MIDLDPS1	TAV21M	TAV2	1.0140	1.0017
Remount	22	REMOUNT	TMY21	TVN2	0.9965	0.9938

2. CHANGES IN MARGINAL LOSS FACTORS

2.1 MLFs in the NEM

The MLF for a connection point represents the marginal electrical transmission losses in electrical power flow between that connection point and the regional reference node (RRN) for the region in which the connection point is located.

A MLF below one indicates that an incremental increase in power flow from the connection point to the RRN would increase total losses in the network between the connection point and the RRN. A MLF above one indicates the opposite.

The difference between the cost of electricity at a connection point remote from the RRN and the cost of electricity at the RRN is directly proportional to the MLF for the connection point. If the MLF for a connection point is 0.9 then the effective values of electricity purchased or sold at that connection point will be 90% of the regional reference price. Consequently, a year-on-year fall of a MLF at a connection point is likely to have a positive impact on customers and a negative impact on generators at that connection point.

For more information on the role of MLFs in the NEM refer to Appendix A.

2.2 Reasons why MLFs change

There are two main reasons why the MLF for a connection point changes from year to year:

1. The impedance between the Regional Reference Node (RRN) and the connection point changes.

If the network between the RRN and a connection point is augmented in such a way that the impedance of the network decreases, for example if a new transmission line is commissioned, then the losses in the network will decrease. This will cause the MLF for that connection point to move closer to one.

Connection points electrically closer to the RRN have an MLF nearer one for this reason.

2. The power flow between the RRN and connection point is projected to change.

If the power flow from a connection point to the RRN increases, then the losses associated with an incremental increase of power flow from the connection point to the RRN will increase. This will result in a lower MLF. Conversely, if the power flow between a connection point and the RRN decreases then the MLF will increase.

If additional generation is connected at a connection point, and the load associated with that connection point stays the same, then it is likely that the MLF at the connection point will decrease.

2.3 Change between 2017-18 MLF and 2018-19 MLF

This section summarises the changes in MLFs for 2018-19 from the 2017-18 MLFs at a zone level, and the trends driving the changes.

2.3.1 Changes to Marginal Loss Factors in Queensland

Electricity generated by new solar and wind generators connecting in north and central Queensland will increase power flow from the north of the state toward the RRN located in Brisbane.

Further contributing to the increased power flow from the north to the south of the state is a forecast decline in central Queensland demand. Central Queensland coal generation projections are lower in the 2018-19 MLF calculation study than the 2017-18 study, but the impact of this decline on north-south power flow is less than the combined impact of increased renewable generation and decreased central Queensland generation.

The increase in projected power flow from north and central Queensland toward the RRN has led to decreases in MLFs for connection points in northern Queensland of between 1.5% and 12.7%, and decreases for connection points in central Queensland between 0.7% and 7.8%.

The MLFs for connection points in north Queensland have decreased more than those in central Queensland due to the combination of two issues. First that the network impedance between northern Queensland and the RRN is higher than it is for central Queensland, and second that much of the new renewable generation is located north of central Queensland. Combined, these issues mean that the increase in projected losses between north Queensland and the RRN is higher than that between the central Queensland and the RRN.

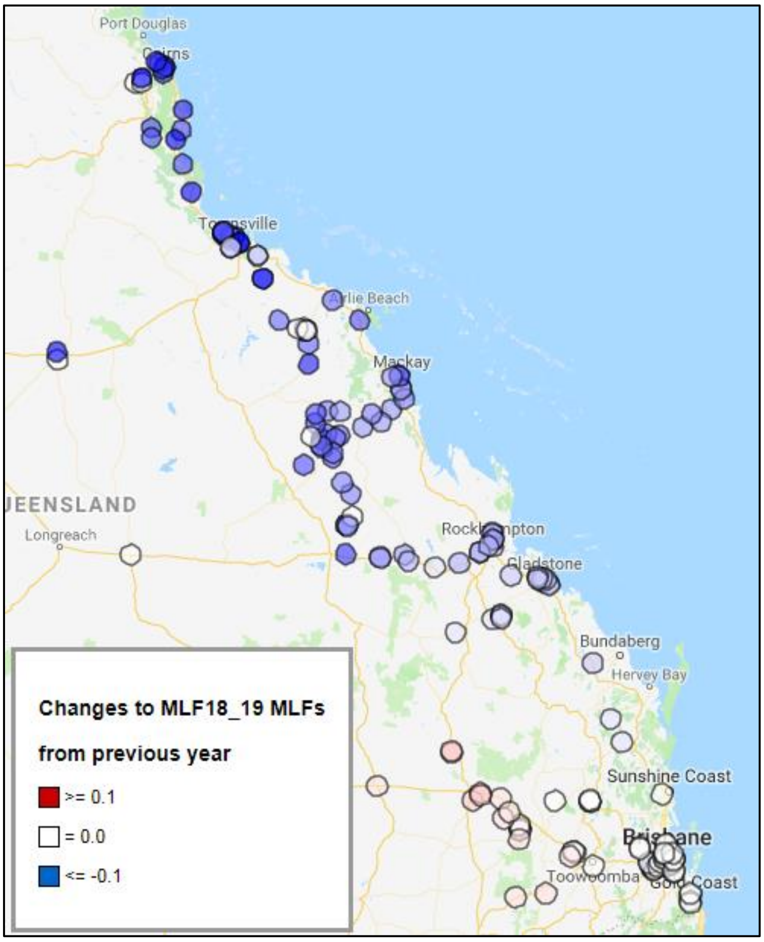
A decrease in projected generation from coal and gas fired generation south west Queensland, as compared to the 2017-18 MLF calculation, combined with a forecast increase in south west Queensland demand, mostly due to the projected increase in LNG load, has led to decreased projected electricity flow toward the RRN.

The decrease in projected flow from south west Queensland to the RRN led to an increase in MLFs of 0.4% and 1.9%, excluding the decrease in the MLF at one connection point caused by the expected connection of new solar farms close to the connection point.

MLFs for connection points in south east Queensland zone have not changes substantially from 2018-19. This is because most connection points in the area are electrically close to the RRN.

Figure 1 shows the changes to MLFs at Queensland connection points in the 2018-19 study compared to the previous year.

Figure 1 Queensland changes to 2018-19 MLFs



2.3.2 Changes to Marginal Loss Factors in NSW

MLFs for connection points in the south of NSW and the ACT, including the Canberra, Snowy and south west NSW zones, have decreased by between 0.3% and 10.5%. New renewable generation connections in the area, combined with a reduction in projected interconnector flow from NSW to Victoria, have resulted in an effective projected increase power flow toward the RRN in western Sydney.

MLFs for connection points in Broken Hill have decreased by up to 22.7%. New generation projects connected near Broken Hill have resulted in projected generation in the area increasing by over 85%, increasing the projected power flow toward the RRN substantially.

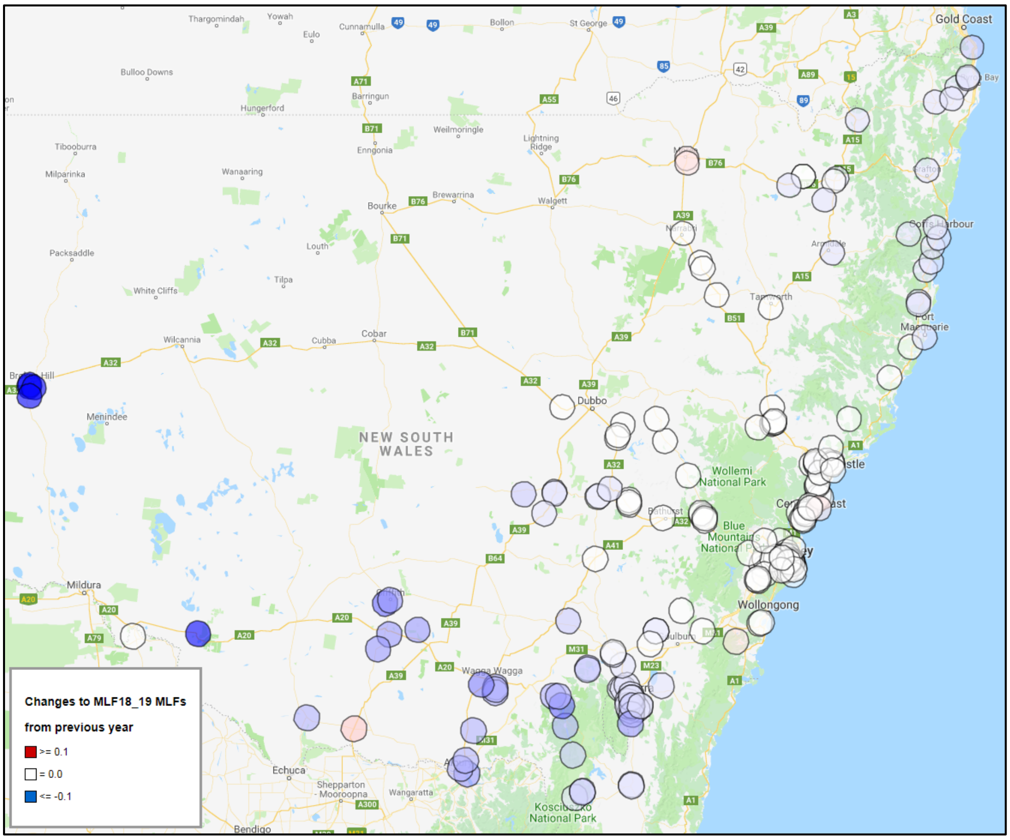
MLFs for most connection points in the west NSW zone have changed less than 0.3% from 2017-18 to 2018-19. This is due to their being little change in the projected supply/demand balance in this zone. The exceptions are the connection points close to Parkes, Forbes, and Griffiths where MLFs have declined by up to 5.6%. These connection points lie on a transmission flow path linking south NSW and the RRN. Due to increased flow toward the RRN, as discussed above, MLFs in this area have decreased.

MLFs for connection points in the Sydney zone have not changed substantially from 2018-19. This is because most connection points in the area are electrically close to the RRN.

MLFs for most connection points in the northern part of the state, including the north NSW and Hunter Valley zones, have changed less than 1.0% from 2017-18 to 2018-19. This is due to there being virtually no change in projected interconnector import from QLD, and only a relatively small change in the projected supply/demand balance in these zones.

Figure 2 shows the changes to MLFs at NSW connection points in the 2018-19 study compared to the previous year.

Figure 2 NSW changes to 2018-19 MLFs



2.3.3 Changes to Marginal Loss Factors in Victoria

MLFs for connection points in the central and north west Victoria zones have decreased between 0.4% and 10.1%. This is due to the increase in projected generation in the region from new wind and solar farms, together with a forecast decline in demand in these zones, causing an increase in projected power from these regions to the RRN located in Melbourne.

Connection points in the north Victoria zone lie on the transmission flow path connecting the main components of the Victoria-NSW interconnection with the RRN. All but one MLF in the north Victoria zone has increased between 0.2% and 5.9%, due to a decrease in projected interconnector import from NSW leading to decreased projected power flow from this zone to RRN. The one MLF decrease of 1.2% in this zone was due to a projected decrease in generation from Banimboola and Dartmouth power stations.

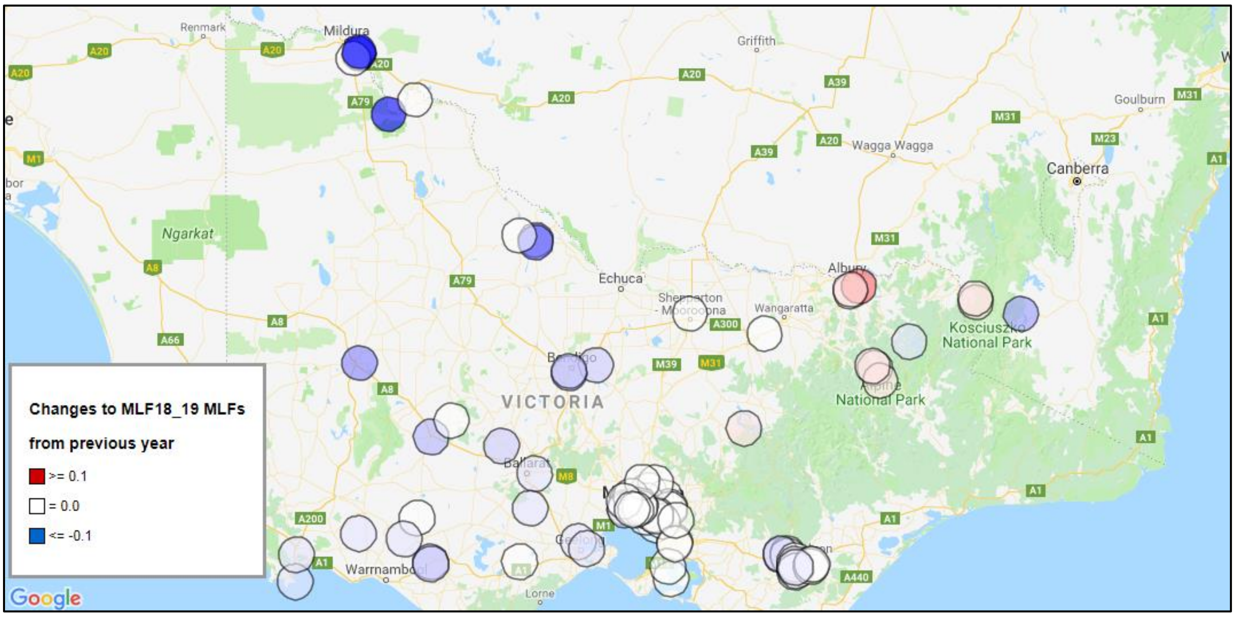
MLFs for connection points in western Victoria have decreased between 0.5% and 0.9% largely due to a projected decrease in interconnector export to South Australia. Connection points in this zone lie on the transmission flow path connecting the Victorian RRN with the Heywood interconnector. A decrease in projected interconnector export effectively increases power flow from these connection points to the RRN.

Changes to the MLFs for connection points in the Latrobe Valley zone are 0.5% or smaller, due to the relatively small changes in the projected supply/demand balance in the zone.

MLFs for connection points in the Melbourne zone have changed less than 0.6% from 2017-18 to 2018-19. This is because the connection points in this zone are electrically close to the RRN.

Figure 3 shows the changes to MLFs at Victorian connection points in the 2018-19 study compared to the previous year.

Figure 3 Victoria changes to 2018-19 MLFs



2.3.4 Changes to Marginal Loss Factors in South Australia

New wind and solar generation developments in the north South Australia zone have led to an increase in projected power flow from this zone to the RRN located in Adelaide. The increase in projected power flow has caused the MLFs for connection points in the region to decrease by up to 4.7%.

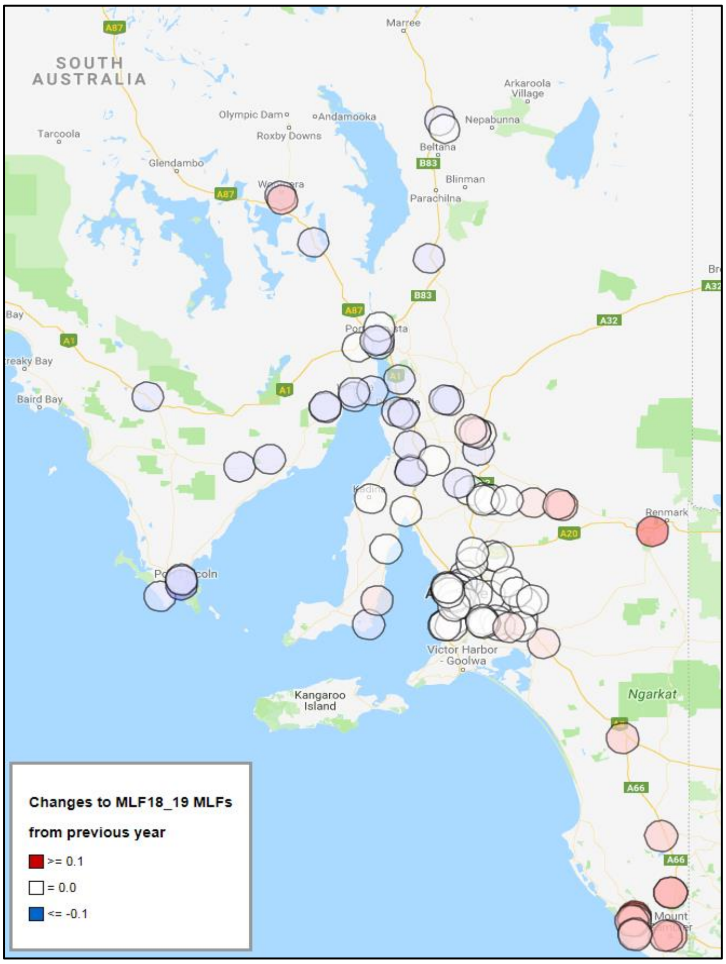
Loss factors in the Riverland and south east South Australia zones have increased by up to 11.0%. Connection points for these zones lie on the transmission corridors between the Heywood and

Murraylink interconnectors and the RRN. Reduced projected interconnector import from Victoria has effectively decreased the projected power flow from these zones to the RRN.

MLFs for connection points in the Adelaide zone have changed less than 1.2% from 2017-18 to 2018-19. This is because the connection points in this zone are generally electrically closer to the RRN.

Figure 4 shows the changes to MLFs at South Australian connection points in the 2018-19 study compared to previous year.

Figure 4 South Australia changes to 2018-19 MLFs



2.3.5 Changes to Marginal Loss Factors in Tasmania

A projected increase in demand in the south Tasmania zone has led to an effective decrease in projected power flow toward the RRN located in Georgetown. The projected decrease in power flow is exacerbated by a projected decrease in generation in the north Tasmania zone which lies on the interconnector flow path between the RRN and the south Tasmania zone. The impact of these changes is an increased MLFs of up to 2.7% for connection points in the south Tasmania zone and 1.2% for connection points in the north Tasmania zone.

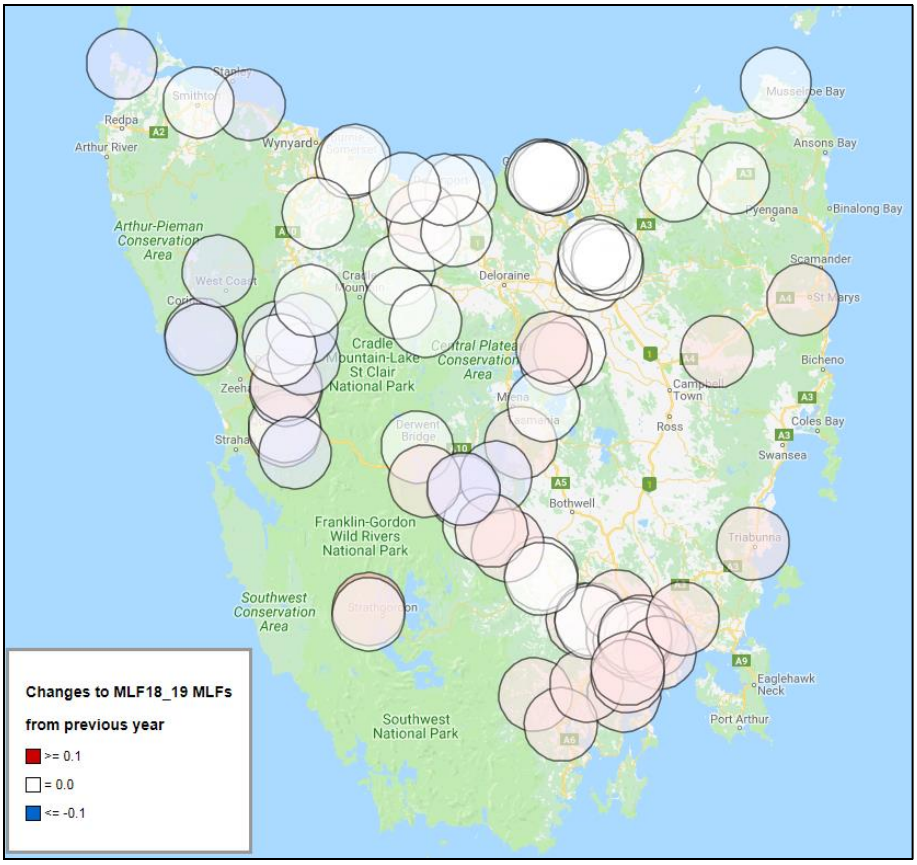
The MLFs for connection points in the west coast zone have decreased by up to 1.4% due a projected increase in generation in the zone.

MLFs for connection points in the north-west Tasmania zone are less than 1%. This is due to the projected supply/demand balance in the region remaining similar to the projected supply/demand balance used in the 2017-18 MLF study.

MLFs for connection points in the Georgetown zone have changed less than 0.1% from 2017-18 to 2018-19. This is because the connection points in this zone are electrically close to the RRN.

Figure 5 shows the changes to MLFs at Tasmanian connection points in the 2018-19 study compared to the previous year.

Figure 5 Tasmania changes to 2018-19 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)

= 0.9532 + 1.9172E-04*NQt + 3.5206E-06*Nd + 5.3555E-06*Qd

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

= 1.0555 + 1.4043E-04*VNt + -3.0036E-05*Vd + 7.8643E-06*Nd + -5.4411E-06*Sd

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

= 1.0291 + 3.6949E-04*VSAt + 7.8218E-07*Vd + -2.5868E-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 1 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	5.3555E-06	3.5206E-06	1.9172E-04	0.9532
Standard error values for the coefficients	1.5168E-07	1.0172E-07	3.4212E-07	6.3839E-04
Coefficient of determination (R^2)	0.9628			
Standard error of the y estimate	0.0113			

Figure 2 MLF (Sydney West 330 referred to Thomastown 66)

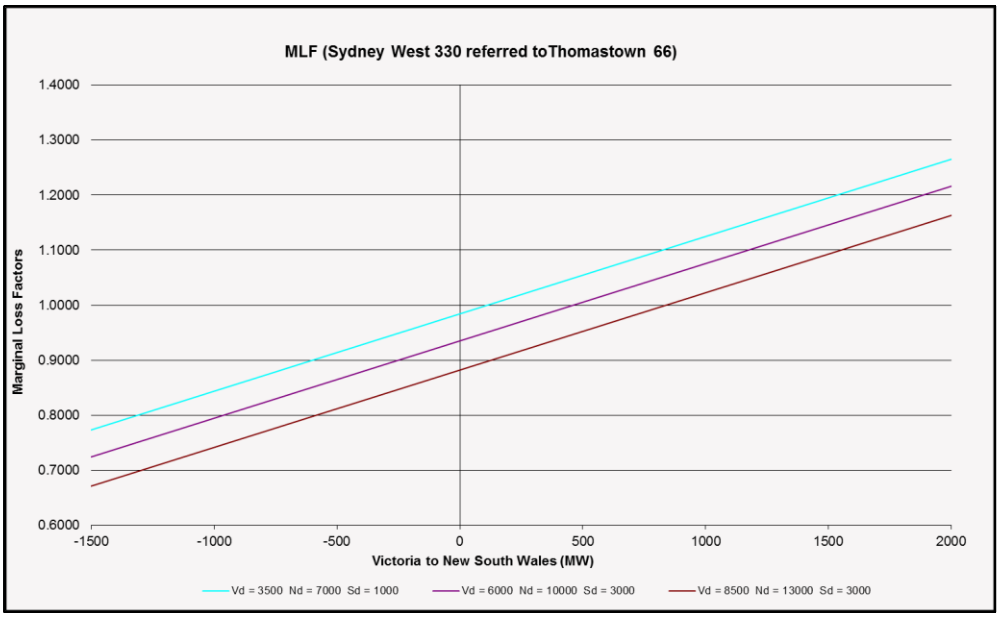


Table 19 Sydney West 330 referred to Thomastown 66 MLF versus Victoria to NSW flow Coefficient statistics

Coefficient	S_d	N_d	V_d	VN_t	CONSTANT
Coefficient value	-5.4411E-06	7.8643E-06	-3.0036E-05	1.4043E-04	1.0555
Standard error values for the coefficients	6.2464E-07	2.7554E-07	4.6511E-07	5.9202E-07	1.4411E-03
Coefficient of determination (R^2)	0.8748				
Standard error of the y estimate	0.0297				

Figure 3 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	-2.5868E-05	7.8218E-07	3.6949E-04	1.0291
Standard error values for the coefficients	6.2475E-07	2.4167E-07	1.0551E-06	8.4252E-04
Coefficient of determination (R2)	0.9493			
Standard error of the y estimate	0.0176			

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

= (-0.0468 + 3.5206E-06*Nd + 5.3555E-06*Qd)*NQt + 9.5859E-05*NQt^2

Sydney West 330 referred to Thomastown 66 notional link average losses

= (0.0555 + -3.0036E-05*Vd + 7.8643E-06*Nd + -5.4411E-06*Sd)*VNt + 7.0213E-05*VNt^2

Torrens Island 66 referred to Thomastown 66 notional link average losses

= (0.0291 + 7.8218E-07*Vd + -2.5868E-05*Sd)*VSAt + 1.8474E-04*$VSAt^2$

Where:

Qd = Queensland demand

Vd = Victorian demand

Nd = NSW demand

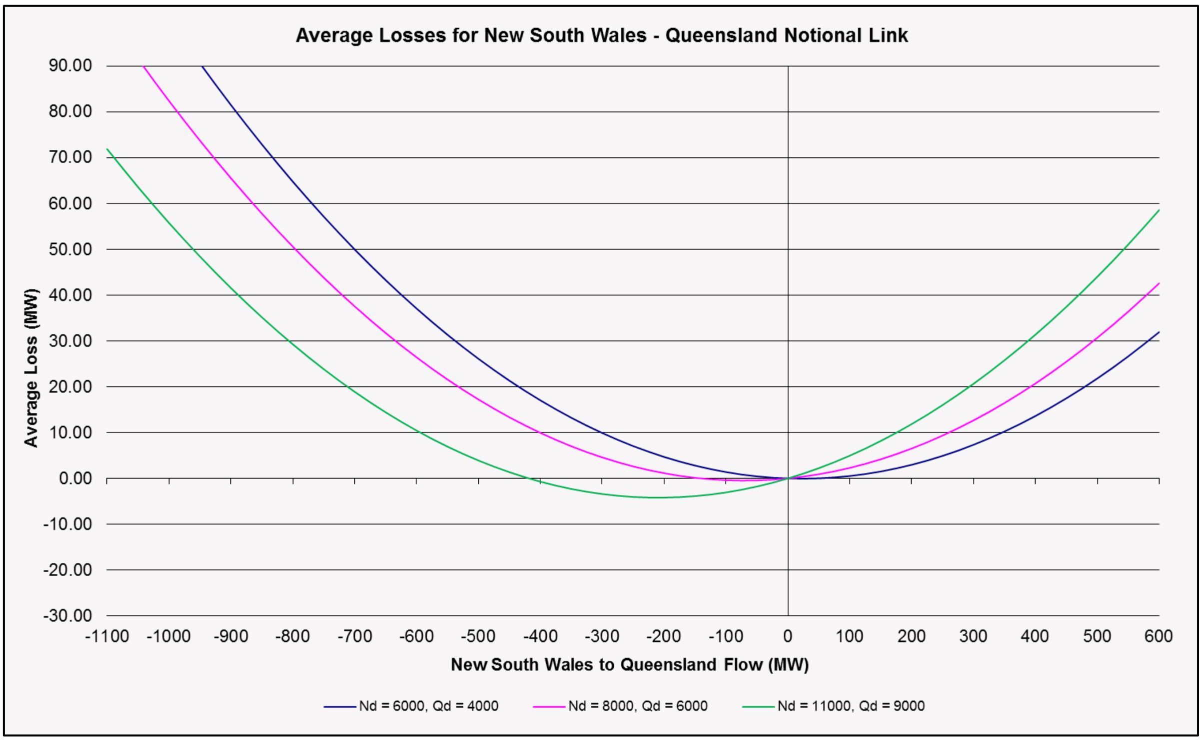
Sd = South Australia demand

NQt = transfer from NSW to Queensland

VNt = transfer from Victoria to NSW

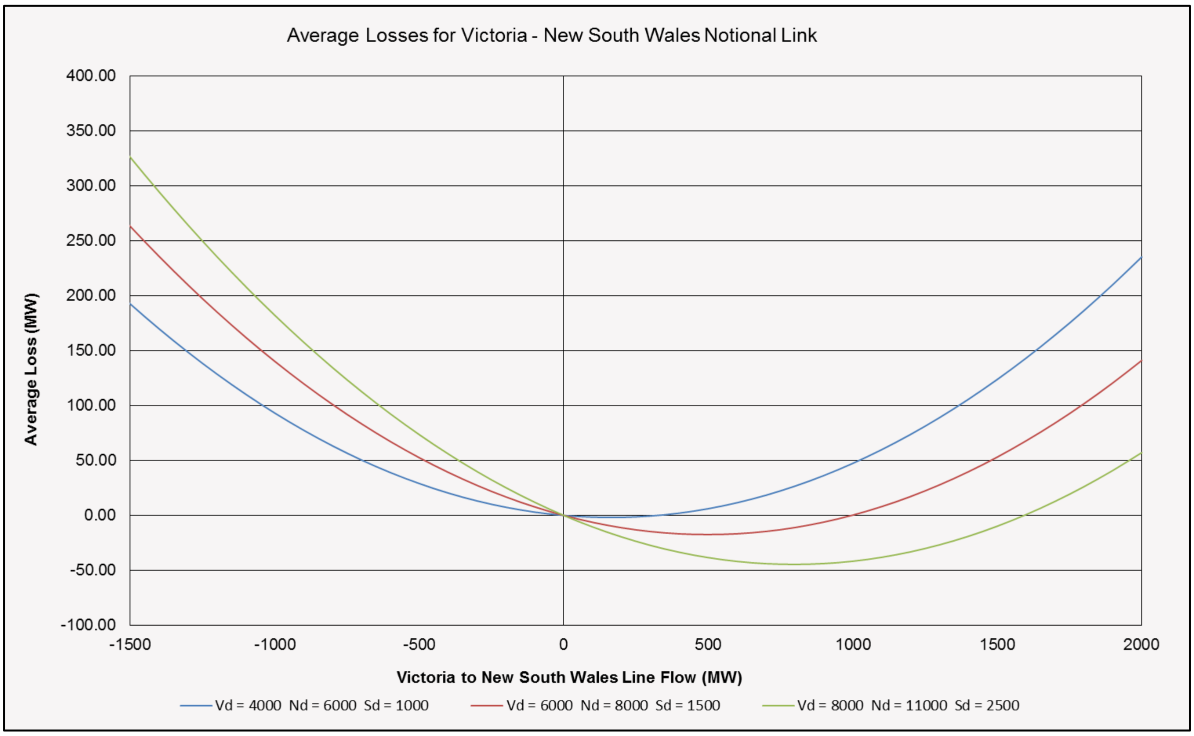
VSAt = transfer from Victoria to South Australia

Figure 4 Average Losses for New South Wales - Queensland Notional Link



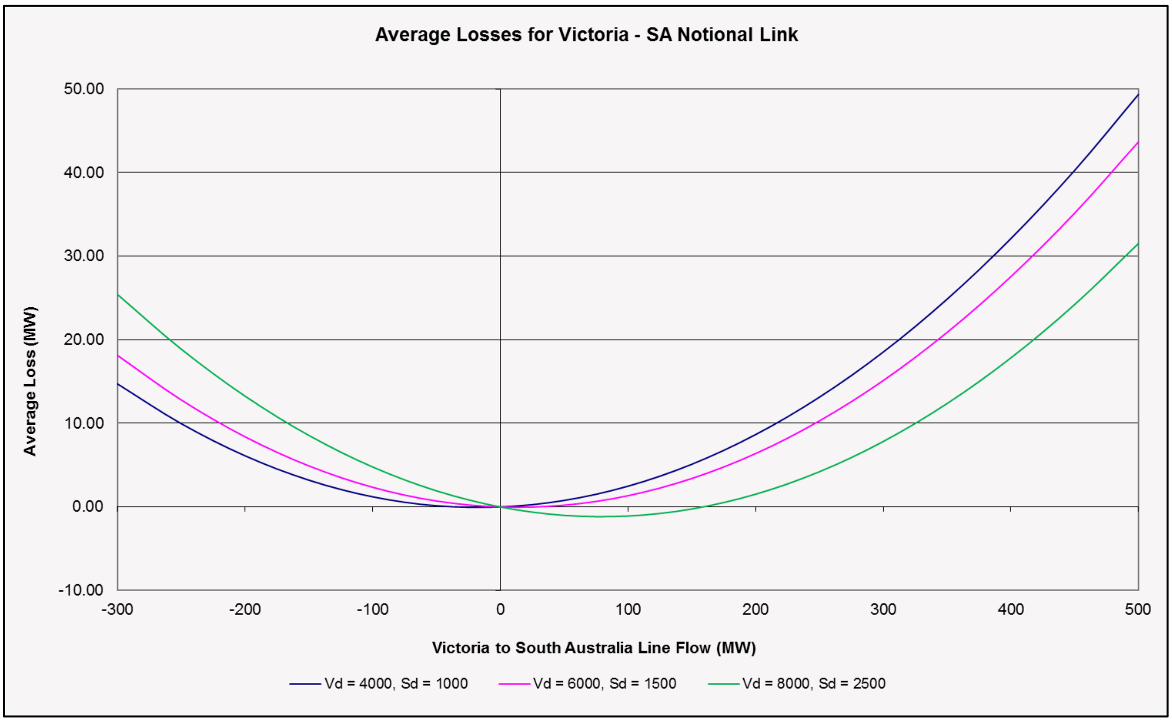
NSW to Queensland notional link losses versus NSW to Queensland notional link flow

Figure 5 Average Losses for Victoria - New South Wales Notional Link



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

Figure 6 Average Losses for Victoria – SA National Link



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

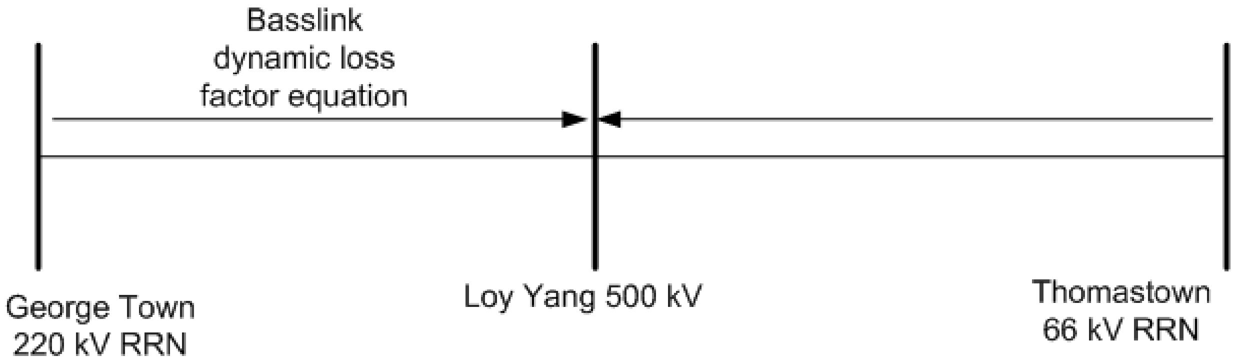
5. BASSLINK, TERRANORA, MURRAYLINK LOSS EQUATIONS

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 = 0.9839.
- 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:

$$P(send) = P(receive) + [\ (-3.92\times10^{-3}) * P(receive) + (1.0393\times10^{-4}) * P(receive)^2 + 4]$$

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:

$$\text{Losses} = (0.0039 * \text{Flow}_t + 2.8177 * 10^{-4} * \text{Flow}_t^2)$$

AEMO determined the following Murraylink MLF model using regression analysis:

$$\text{Murraylink MLF (Torrens Island 66 referred to Thomastown 66)} = 0.9702 + 2.2869\text{E-03}*\text{Flow}_t$$

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	2.2869E-03	0.9702
Standard error values for the coefficient	4.8139E-06	4.0094E-04
Coefficient of determination (R2)	0.9280	
Standard error of the y estimate	0.0499	

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

$$\text{Murraylink loss} = -0.0298*\text{Flowt} + 1.1435\text{E-03}*\text{Flow}_t^2$$

Figure 7 Murraylink MLF (Torrens Island 66 referred to Thomastown 66)

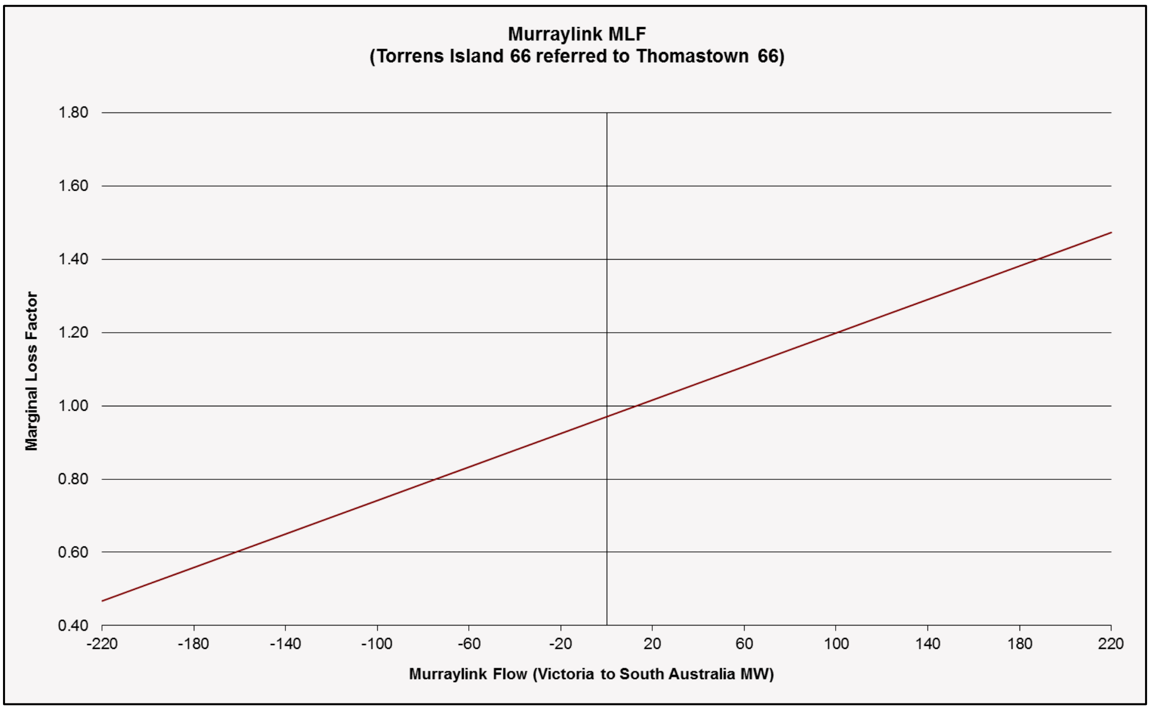
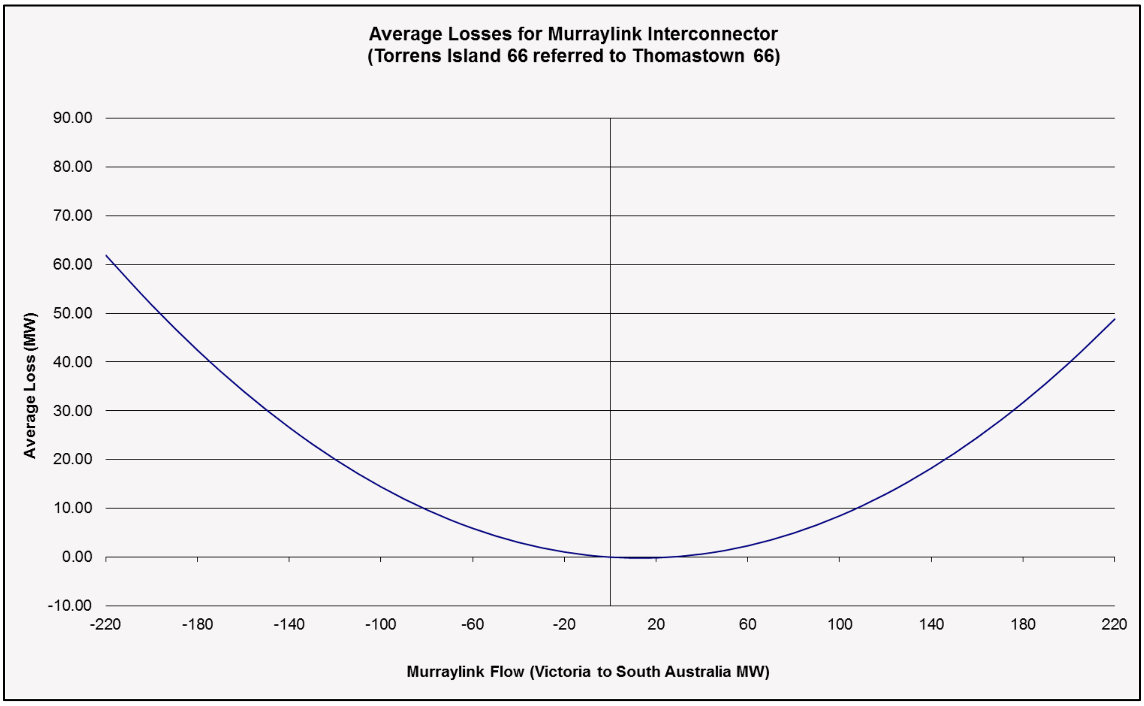


Figure 8 Average Losses for Murraylink Interconnector (Torrens Island 66 referred to Thomastown 66)



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)

= $1.0289 + 1.7924E\text{-}03*Flow_t$

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:

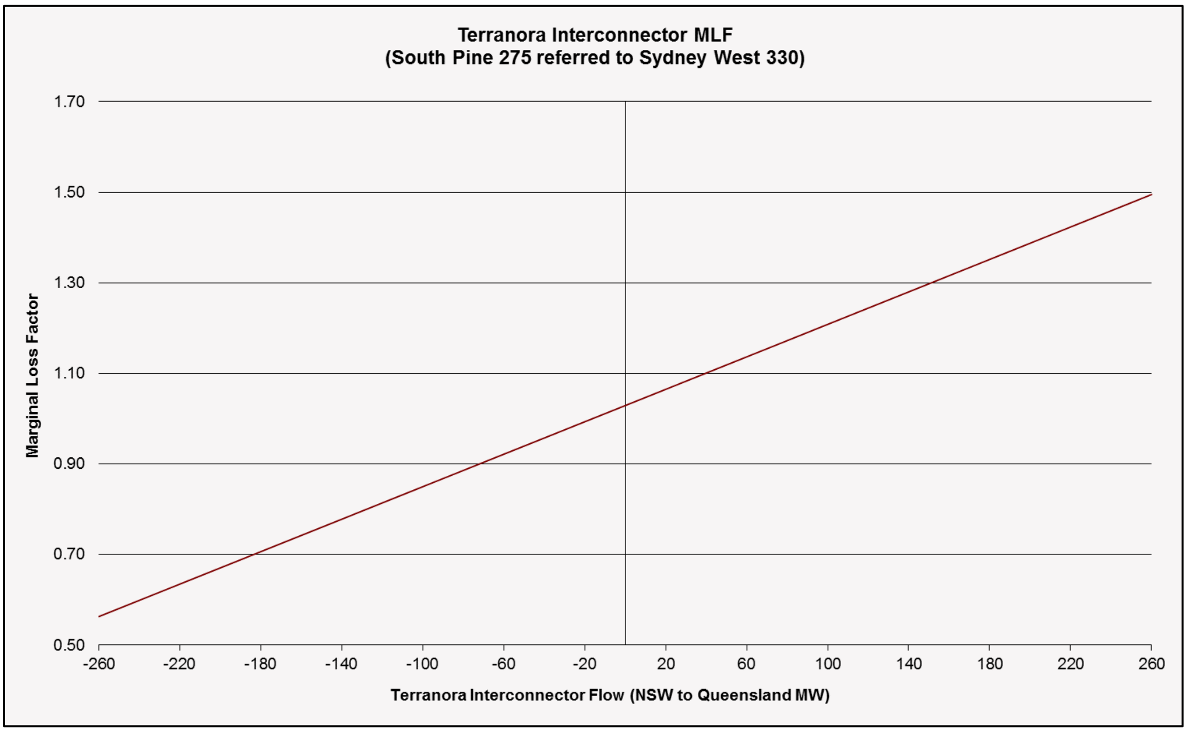
Table 22 Regression statistics for Terranora

Coefficient	$Flow_t$	CONSTANT
Coefficient Value	1.7924E-03	1.0289
Standard error values for the coefficient	4.3745E-06	6.8084E-04
Coefficient of determination (R2)	0.9055	
Standard error of the y estimate	0.0306	

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

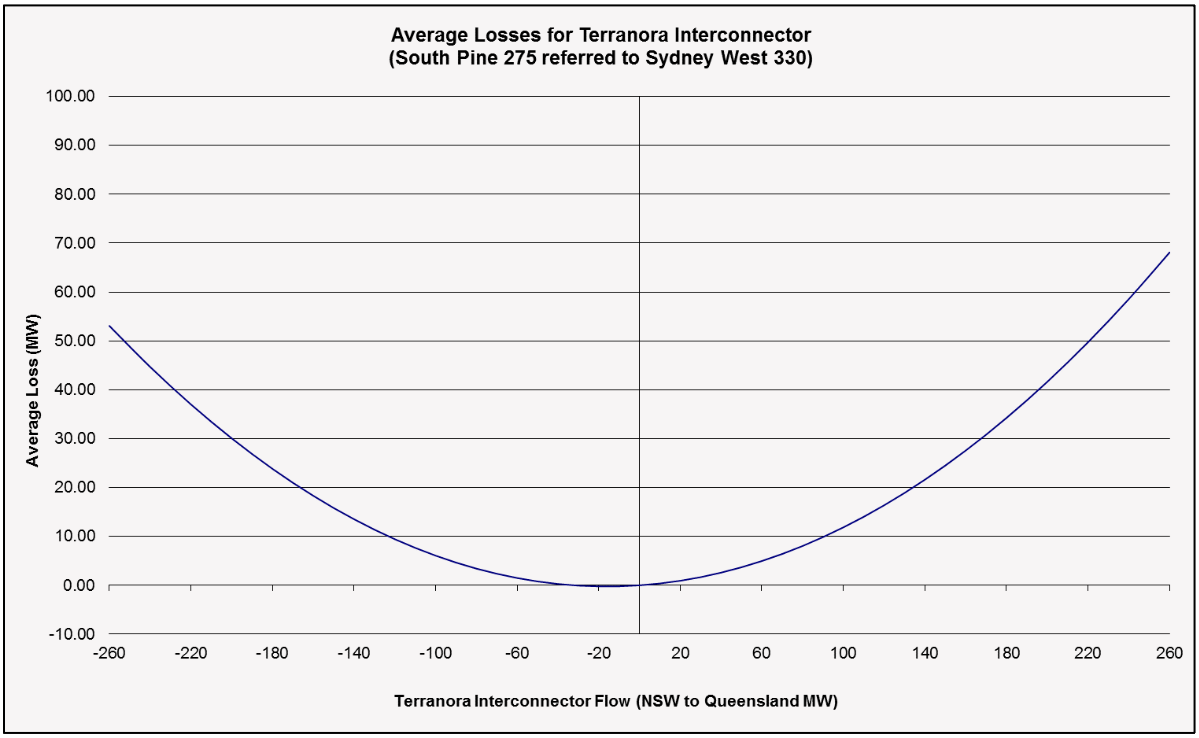
Terranora loss = $0.0289*Flow_t + 8.9620E\text{-}04*Flow_t^2$

Figure 9 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 10 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 2018-19 financial year:

Table 23 Factors for inter-regional losses

Notional interconnector	Proportioning factor	Applied to
Queensland – NSW (QNI)	0.68	NSW
Queensland – NSW (Terranora Interconnector)	0.66	NSW
Victoria – NSW	0.32	Victoria
Victoria – South Australia (Heywood)	0.78	Victoria
Victoria – South Australia (Murraylink)	0.67	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.[5]
- 10.8 km 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.

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

8. VIRTUAL TRANSMISSION NODES

This section describes 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 which have been 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, Hydro Aluminium 132
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, Croydon 11
AAVT[6]	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

[6] 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[7] 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 2018-19 MLF calculation are in the table below:

Table 27 Forecast energy for 2018-19

Region	2018-19 forecast sent-out energy in gigawatthours[8] (GWh)	2017-18 forecast sent-out energy[9] (GWh)
NSW	66,727	68,060
Victoria	42,828	43,747
Queensland	50,742	50,894
South Australia	11,949	12,508
Tasmania	10,421	10,245

[7] 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

[8] 2017 Electricity Statement of Opportunities, published in September 2017, available at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/NEM-Electricity-Statement-of-Opportunities. The Queensland annual operational consumption (forecast sent-out energy) for 2018-19 was revised from 51,890 GWh to 50,742 GWh in February 2018, which will be published in the following update.

[9] Annual operational consumption (forecast sent-out energy) was sourced from the *2016 NEFR Report*, available at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Electricity-Forecasting-Report and data from Forecasting data portal with selection of Publication NEFR, Version 19/07/2016 00:00 and Category Operational, available at http://forecasting.aemo.com.au/Electricity/AnnualConsumption/Operational

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 Electricity Statement of Opportunities (ESOO) published in September 2017.[8]
- 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 2016 to 30 June 2017 from its settlements database.

AEMO also obtains the following data:

- Generation capacity data from AEMO's Generation Information Page published on 16 March 2018.[10]
- 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 2018, as a trigger for initiating any necessary 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 2018-19. They are:

- Queensland new generating units
  - Collinsville Solar Farm.
  - Coopers Gap Wind Farm.
  - Darling Downs Solar Farm.
  - Daydream Solar Farm.
  - Dunblane Solar Farm.
  - Hamilton Solar Farm.

[10] Information by region, published on 16 March 2018, available at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information.

- Hayman Solar Farm.
- Kennedy Energy Park.
- Lilyvale Solar Farm.
- Mount Emerald Wind Farm.
- Oakey 1 Solar Farm.
- Oakey 2 Solar Farm.
- Ross River Solar Farm.
- Rugby Run Solar Farm.
- Sun Metals Solar Farm.
- Tableland Sugar Mill Green Power Station.
- Whitsunday Solar Farm.

* New South Wales and Australian Capital Territory new generating units
  - Bodangora Wind Farm.
  - Crookwell 2 Wind Farm.
  - Hunter Economic Zone Diesel (reconnection).
  - Manildra Solar Farm.
  - Mugga Lane Solar Farm.
  - Narromine Solar Farm.
  - South Keswick Solar Farm.
  - White Rock Solar Farm.
  - Williamsdale Solar Farm.
* Victoria new generating units
  - Bannerton Solar Farm.
  - Crowlands Wind Farm.
  - Mount Gellibrand Wind Farm.
  - Salt Creek Wind Farm.
  - Yaloak South Wind Farm.
  - Yatpool Solar Farm.
* South Australia new generating units
  - Bungala Solar Farm.
  - Dalrymple Battery storage.
  - Lincoln Gap Solar Farm.
  - Willogoleche Wind Farm.

B.3.2 Removed generating units

Relevant NSPs are advised of the following removed generating units in 2018-19:

* Tamar Valley Combined Cycle.

B.3.3 Abnormal generation patterns

AEMO has adjusted a number of generation profiles for the 2018-19 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.

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 2018-19 MLF calculation process. AEMO has endeavoured to ensure that the 2018-19 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	2,327	815	2,239	763
Oct – Dec	1,876	804	1,690	748
Jan – Mar	1,293	510	873	525
Apr – Jun	1,761	655	1,375	679
Total	**7,256**	**2,784**	**6,177**	**2,715**

Table 29 Adjusted generation values for Queensland

	Queensland	
	Historical Generation (GWh)	Adjusted Generation (GWh)
Jul – Sep	13,107	13,387
Oct – Dec	13,381	14,127
Jan – Mar	14,897	15,036
Apr – Jun	13,232	12,935
Total	**54,618**	**55,484**

Table 30 Adjusted generation values for NSW

	NSW	
	Historical Generation (GWh)	Adjusted Generation (GWh)
Jul – Sep	14,833	14,325
Oct – Dec	13,002	15,343
Jan – Mar	15,003	14,839
Apr – Jun	14,910	14,186
Total	**57,749**	**58,693**

Table 31 Adjusted generation values for Victoria

	Victoria	
	Historical Generation (GWh)	**Adjusted Generation (GWh)**
Jul – Sep	9,473	9,201
Oct – Dec	9,060	8,463
Jan – Mar	8,813	8,813
Apr – Jun	10,377	9,845
Total	**37,723**	**36,323**

Table 32 Adjusted generation values for South Australia

	South Australia	
	Historical Generation (GWh)	**Adjusted Generation (GWh)**
Jul – Sep	1,360	1,248
Oct – Dec	912	837
Jan – Mar	1,350	1,297
Apr – Jun	1,753	1,679
Total	**5,376**	**5,061**

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 2018-19 financial year. The snapshot is thus representative of the 2018-19 normally-operating power system.

B.4.1 Network augmentation for 2018-19

Relevant Transmission Network Service Providers (TNSPs) advised of the following network augmentations in 2018-19. They are:

Queensland network augmentations

Powerlink provided the following list of planned network augmentations in 2018-19 in Queensland:

- Replacement of Garbutt 132/66/11 kV transformers 1 & 2.
- Decommissioned Baralaba – Duaringa 132 kV line.
- Decommissioned Callide A – Gladstone South 132 kV lines
- Installation of a new Calvale 275/132 kV transformer.
- Rebuild of Mackay substation.

NSW network augmentations

NSW NSPs provided the following list of planned network augmentations in 2018-19 in NSW:

- Installation of the new Googong load at Williamsdale 330/132 kV substation.
- Installation of the new Rockdale 132/11 kV substation.
- Retirement of two 132 kV Lane Cove – Dally Street feeders.
- Replacement of Mason Park – Top Ryde 132 kV line.
- Replacement of Mason Park – Meadowbank 132 kV line.
- Replacement of Lane Cove – Top Ryde 132 kV line.
- Replacement of Lane Cove – Meadowbank 132 kV line.

Victoria network augmentations

There is no planned network augmentation in 2018-19 in Victoria.

South Australia network augmentations

ElectraNet provided the following list of planned network augmentations in 2018-19 in South Australia:

- Increasing thermal ratings of Para – Brinkworth – Davenport 275 kV line.
- Increasing thermal ratings of Brinkworth – Mintaro 132 kV line.
- Rebuild of the SA Water Mannum – Adelaide Pumping Stations #1 and #3 132/3.3 kV transformers.
- Rebuild of the SA Water Millbrook Pumping Station 132/3.3 kV transformers.
- Upgrading of Robertstown – North West Bend No. 2 132 kV line.
- Upgrading of the Waterloo East – Robertstown 132 kV.

Tasmania network augmentations

TasNetworks provided the following list of planned network augmentations in 2018-19 in Tasmania:

- Replacement of T1 110/6.6 kV supply transformer at Boyer A.
- Replacement of 110/33 kV supply transformers at Linfarne.
- Rearrangement of Queenstown – Newton 132 kV line and addition of Tee – Newton connection.
- Converted 110/11 kV transformers at Wesley Vale to 110/22 kV transformers.

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 has informed AEMO that the switching pattern for 2018-19 will differ from the historical switching pattern for Yallourn unit 1 in 2016-17. AEMO, in consultation with AusNet Services, accepted the proposed switching profile provided by EnergyAustralia, and has used it as an input to the 2018-19 MLF calculation.

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 33 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
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 the Rules and 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 factor equations

The inter-regional loss factor equations applying for the 2018-19 financial year are provided in 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.

[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.

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 2018-19 are provided in Section 6.

B.6.2 Marginal loss factor calculation – quality control

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

The parallel calculation of MLFs undertaken by the consultant 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. The consultant 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. The consultant processes this information and calculates MLFs for all generation and load connection points using the PowerWorld software.

The objective of the consultant'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. The consultant'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.

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
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
TNI	Transmission Node Identifier
TNSP	Transmission Network Service Provider
VTN	Virtual Transmission Node