Preliminary Marginal Loss Factors: FY 2021-22

December 2020

A report for the National Electricity Market

Important notice

PURPOSE

This document has been prepared by AEMO solely to inform Registered Participants of the preliminary intra-regional loss factors calculated for the 2021-22 financial year. The results are indicative only; the process utilised to obtain these results differs from the process to calculate the final marginal loss factors (MLFs), and the numbers published in this report will almost certainly differ from the MLFs AEMO will publish by 1 April 2021 in accordance with clause 3.6.2(f1) of the National Electricity Rules.

Potential investors should consider seeking advice from appropriately qualified experts on the implications of MLFs, and future MLF changes, for their individual circumstances.

The National Electricity Rules and the National Electricity Law prevail over this document to the extent of any inconsistency.

DISCLAIMER

This document contains indicative information only based on information available to AEMO in August 2020, and final 2021-22 intra-regional loss factors will differ. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the National Electricity Law, the National Electricity Rules, or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

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Introduction

In recent years, variations in marginal loss factors (MLFs) have been primarily driven by changes in generation. With large increases in remote semi-scheduled generation, offsetting traditional scheduled generation, load is increasingly being supplied by generators located long distances from load centres, in electrically weak areas. This increases losses in the transmission network as well as volatility in MLFs in the remote areas of the network.

This document is intended to provide an early indication to stakeholders of both the potential direction and extent of movement in MLFs across the National Electricity Market (NEM) between the 2020-21 financial year (FY) and the 2021-22 financial year. The MLFs published in this document are *indicative* in nature and form part of AEMO's strategy to improve transparency around MLFs.

To produce the preliminary MLFs in this report, AEMO used inputs from the 2020-21 MLF study with generation profiles updated to reflect committed generation[1] for the 2021-22 FY, as at July 2020. In subsequent MLF publications, historical load data will be replaced with 2021-22 forecasts and network augmentations committed in 2021-22 will be included.

Since changes in generation patterns has been the primary driver of MLF variations in recent years, the preliminary MLFs are expected to be reflective of the general movements and outcomes for the 2021-22 FY. Given the timing of this publication, further new generation projects are likely to become committed prior to or within the 2021-22 FY. These will be included in the 2021-22 MLFs.

Additional generation that becomes committed in remote areas of the network will put further downward pressure on MLFs. The magnitude of any reductions will be highly dependent on the location, capacity, and technology of the additional generation projects.

[1] Committed in the July 2020 publication on the Generation Information web page, at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information. Definitions of commitment status are detailed in the Background Information tab.

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As these preliminary results have been prepared well in advance of the publication of the final 2021-22 MLFs (1 April 2021), the inputs to this study will vary from the inputs that will be utilised for the final study. The major variations are shown in Table 1 and discussed in further detail below.

Table 1 Preliminary vs final study variations

Item	Preliminary	Final
Methodology review	The existing methodology (version 7.0) followed for production of preliminary MLFs, with exception of the items listed below.	Changes resulting from 2020 FLLF methodology review to be implemented.
New generation projects	Inclusion based on generator project status in July 2020 Generation Information page[2]. Projects are included where the status is COM or COM*[3].	Inclusion based on generator project status in January 2021 Generation Information page. Projects are included where the status is COM or COM*.
Load profiles	Historical load profiles from 2019-20 FY.	Forecast load profiles for 2021-22 FY.
Network model	2020-21 MLF study network model.	Revised network model incorporating future augmentations.
Intra-regional limit management	Intra-regional limits as identified and incorporated into the 2020-21 MLF study.	Intra-regional limits incorporated in the 2020-21 study will be reviewed and altered where required. Additional intra-regional constraints may also be identified and incorporated into the final study.
Inter-regional limit management	Inter-regional limits as per 2020-21 MLF study.	Inter-regional limits will be revised as required based on limit advice for the 2021-22 FY.

1.1 FLLF methodology review

1.1.1 Summary

AEMO is currently in the process of undertaking a formal review of the FLLF methodology, the final determination is anticipated to be published in December 2020.

As this review is still in progress these preliminary results have been prepared in line with the existing methodology. The final 2021-22 MLFs will be produced in line with the outcomes of this review and as such the methods utilised to prepare the final results is anticipated to differ from those utilised for the preliminary results.

[2] The Generation Information page provides stakeholders with information on the capacity of existing, withdrawn, committed, and proposed generation projects in the NEM. See https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information.

[3] Committed (COM) projects meet all five of AEMO's commitment criteria (relating to site, components, planning, finance, and date). Committed* (COM*) projects are classified as Advanced, have commenced construction or installation, and meet AEMO's site, finance, and date criteria, but are required to meet only one of the components or planning criteria.

1.1.2 Preliminary method

The method used for calculation of these preliminary MLFs is in line with the existing methodology, with the exception of other items listed within this section of this report.

1.1.3 Potential for change

The potential for change resulting from the revised methodology may potentially be material, however is difficult to ascertain given the changes have no yet been implemented.

Under the existing methodology, the flow on DC interconnectors in parallel with AC counterparts is derived from the flows on the AC counterpart and the ratio of the capacity of the two interconnectors. This is proposed to be changed to a ratio that is based on historical flows from the reference year rather than the capacities. This will lead to variations in the flows on these DC interconnectors and impact MLFs in close proximity to both ends.

In additionl there is expected to be a small change to the dual MLF test, where the intention is that the threshold will be expanded. This will result in a minor increase in the number of outcomes where a dual MLF is applied.

1.2 New generation projects

1.2.1 Summary

New generation projects are included in MLF calculations, dependent on their status in AEMO's Generation Information page. Projects listed as committed (COM/COM*) and with a target commercial operation date prior to or within the target year are included. These generators are incorporated into the network model and forecast generation profiles are created.

1.2.2 Preliminary method

The method used for calculating preliminary MLFs does not differ from the method that will be used to calculate the final MLFs.

For new thermal generation, the relevant proponents were requested to provide forecasts. For new storage projects, the relevant proponents were requested to provide forecasts; where forecasts were not provided, the data utilised has been based on historical data. For new solar and wind projects, AEMO created half-hourly profiles based on name plate capacity, and timing (Full Commercial Use Date) detailed in the August 2020 publication of the Generation Information page "NEM" data file, using historical 2019-20 FY weather data.

Where generation profiles have been produced by AEMO, considerations were made for the full commercial operational date, nameplate capacity and the technology type of the project. Where the technology type has been listed as confidential, research was performed on publicly available information to identify the technology type of the project (wind, or fixed or single axis for solar projects).

Additionally, when producing forecast generation profiles internally AEMO seeks feedback from the relevant proponents/generators. Where feedback is provided that is verifiable, the profiles may be revised to incorporate this feedback. AEMO has not yet completed this process, and as such the generation forecasts implemented in this preliminary study may not be reflective of those utilised to calculate the final 2021-22 FY MLFs.

AEMO intends to use the same process for the final 2021-22 MLF study. Developers of generation projects are encouraged to ensure that the data submitted to AEMO through the Generator Survey process is as accurate as possible, and updated as soon as they become aware of any changes that could affect the expected generation profile.

1.2.3 Potential for change

It is likely that there will be changes to the committed status of projects listed in the Generation Information page between now and January 2021. The likely outcome is an increase in the volume of committed projects, and in turn the volume of projects considered for the purposes of MLF calculations. Additional generation in remote areas of the network will put downward pressure on MLFs, however, the magnitude of any reductions will be highly dependent on the location, capacity, and technology of the additional generation projects.

In some cases, the extent of the reductions in MLF can be limited by network congestion. As network loading approaches secure operational limits, the generation is curtailed, which limits flows and therefore losses.

Table 2 provides an overview of the volume and classification of future generation projects as per the 29 July 2020 Generation Information publication. As projects advance, the status will be revised (Publicly Announced → Emerging → Maturing → Committed* → Committed) based on the Generator Survey responses[4].

Table 2 NEM project status[5]

Region	Committed (MW)	Committed* (MW)	Maturing (MW)	Emerging (MW)	Announced (MW)
QLD	237	86	431	0	17,237
NSW	1,671	0	380	82	15,672
VIC	1,753	0	0	258	8,216
SA	86	0	0	150	9,575
TAS	0	0	0	0	4,850
NEM	3,747	86	811	490	55,549

1.3 Load profiles

1.3.1 Summary

To calculate final MLFs, AEMO uses load forecasts for the target year. These forecasts are typically based on historical data and are adjusted on a connection point level to reflect changes to both shape and magnitude for each half hour.

In addition to the utilisation of historical data, forecasts are produced for connection points that have been identified as having either an adjustment to load and/or the inclusion or exclusion of large loads that are forecast to be either operational or no longer present.

1.3.2 Preliminary method

When preparing load forecasts, AEMO must adjust historical loads to obtain the operational demand at connection point level. This work is expected to commence in November 2020 and has not been considered in the preliminary 2021-22 MLF study. In place of forecast load, AEMO has used historical loads from the reference year (2019-20 FY) for the purpose of calculating this set of preliminary MLFs.

Table 3 shows the operation demand for 2019-20 (actual), 2020-21 (forecast as of August 2019) and 2021-22 (forecast as of July 2020), across the NEM.

The operational demand relevant to each study is detailed below:

- The 2020-21 forecast operational demand, was used to produce forecast load profiles at the connection point level for the 2020-21 MLF study.

[4] For the criteria utilised to determine the status of generation projects, see https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information.

[5] The volumes displayed in Table 2 are not limited to 2021-22 FY.

- The 2019-20 actual operational demand was used to produce the 2021-22 preliminary MLF study.
- The 2021-22 forecast operational demand will be used to produce the final 2021-22 MLF study.

Table 3 Regional Operational demand

Region	Actual 2019-20 (GWh)	Forecast 2020-21 (GWh)	Forecast 2021-22 (GWh)
QLD	50,960.89	50,940.25	50,078.44
NSW	66,390.69	65,579.17	65,667.26
VIC	41,687.91	41,491.87	38,724.09
SA	11,889.72	12,260.52	11,264.10
TAS	9,949.51	10234.47	10,333.20

1.3.3 Potential for change

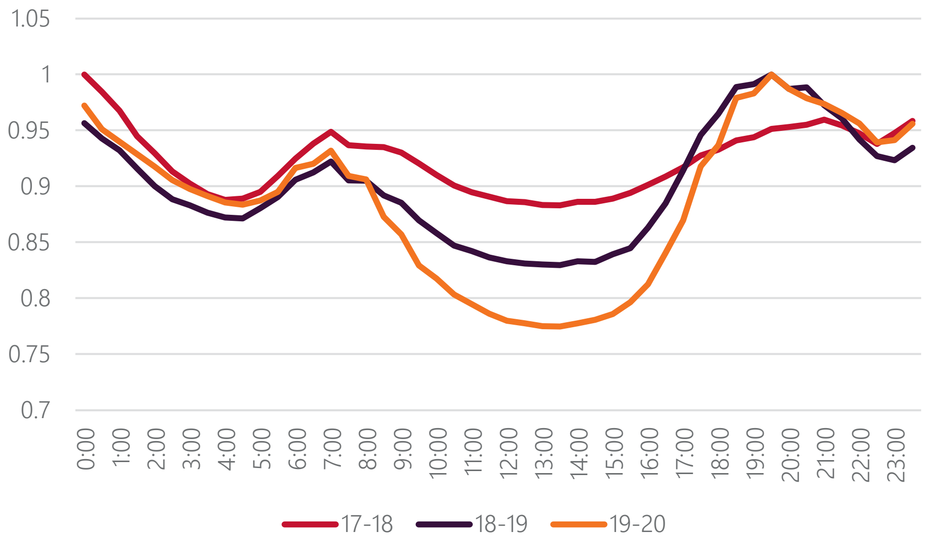
During the reference year (2019-20 FY) COVID-19 and the associated lockdowns have had a material impact on load within certain areas, in particular visible reductions can be observed at connection points in close proximity to central business districts during periods of lockdown. For this preliminary MLF study, as historical demand has been utilised the impact of these lockdowns is reflected in these load profiles. For the final 2021-22 MLF study, adjustments will be implemented as part of the forecasting processes to correct this data.

As the adjustments performed in response to the impact of the lockdowns are anticipated to largely be within central business districts and in close proximity to the relevant RRN the local MLF impact is anticipated to be minimal. However, the adjustments may result in a material change to generator behaviour and this may have a more material impact on MLFs elsewhere.

With continued increase in rooftop photovoltaic (PV) penetration, the diurnal profile of operational demand has become increasingly dynamic, with significant demand reduction between the morning and evening peaks. As MLFs are strongly tied to the patterns of operational demand and the location of the generation serving that demand, MLFs across the day are also increasingly reflecting this variation in their diurnal profile.

Figure 1 shows the variation in the diurnal profile for the historical time of day (ToD) MLF profiles for a generator (normalised), displaying significant annual variation since 2017-18.

Figure 1 MLF ToD Comparison



The MLF methodology incorporates volume weighting (half-hourly MLFs are volume weighted against the magnitude of load/generation to obtain final MLFs). Generators and loads that operate at high levels between the morning and evening peaks will increasingly see MLFs that are typically lower than those in surrounding areas.

When AEMO incorporates the forecast load profiles for the 2021-22 MLF study, it is likely that an expected increase in rooftop PV will lead to increased variability in MLFs across the day. For generators operating at high output between the morning and evening peaks, this will likely result in a lower MLF than those published in this report. This is also true for loads, however, to a lesser extent given few loads operate in this manner.

1.4 Network model

1.4.1 Summary

Each year, AEMO prepares a network model specifically for calculating MLFs. The network model is adjusted to:

- Move both load and generation to the shared transmission level.
- Reflect system normal conditions.
- Incorporate any future transmission augmentations that have been identified for the target year.

1.4.2 Preliminary method

To produce the preliminary MLFs, the network model used to calculate the 2020-21 MLFs has been implemented with the inclusion of additional generation projects as discussed above.

1.4.3 Potential for change

For the final study, all committed network augmentations for the remainder of 2020-21 and the entirety of the 2021-22 FY will be incorporated into the network model.

Augmentations that involve the re-stringing of existing lines or the construction of additional lines are likely to increase capacity and reduce resistance. However net losses may increase further as a result of the increased capacity, and in turn put additional downward pressure on nearby MLFs.

1.5 Intra-regional limit management

1.5.1 Summary

When performing MLF calculations, AEMO seeks to identify high impact system normal intra-regional limits that are likely to have a material impact on MLFs. To minimise deviations between the MLF calculations and actual market outcomes, AEMO incorporates these limits by reducing local generation levels to ensure the limits are not exceeded.

1.5.2 Preliminary method

To calculate the preliminary MLFs in this document, the intra-regional limits used were the same as those used in the 2020-21 MLF study. These limits are to be reviewed for the 2021-22 MLF study, and as such additional intra-regional limits may be included and the currently incorporated limits may be revised or excluded.

1.5.3 Potential for change

The high impact intra-regional limits identified are often in remote areas with a large generation capacity. Because the limits are managed by a reduction in generation, MLFs within these regions will increase when intra-regional capping is applied. If additional limits are identified, or existing limits are lowered, then MLFs in the affected areas would be expected to increase. If existing intra-regional limits are increased, then MLFs within these areas would be expected to increase.

Notably, a new voltage collapse limit[6] (N^^N_NIL_3) ascociated with the 220kV X5 line between Balranald and Darlington Point has recently been implemented and is anticipated to bind during periods of high generation in south-west NSW. Given the remote nature of this area, after this limit is incorporated into future 2021-2022 studies it is anticipated this will put upward pressure on MLFs within south-west NSW and north-west Victoria.

1.6 Inter-regional limit management

1.6.1 Summary

When performing MLF calculations, AEMO implements inter-regional limits which manage flows between regions. These inter-regional limits are reviewed and revised on an annual basis as changes are identified.

1.6.2 Preliminary method

To calculate the preliminary MLFs in this document, the inter-regional limits used were the same as those used in the 2020-21 MLF study. These limits are to be reviewed for the 2021-22 MLF study, and as such may be revised.

1.6.3 Potential for change

Revisions to existing inter-regional limits will likely lead to variations in inter-regional flows, and in turn variation in MLFs with the variatons more significant for MLFs in close proximity to interconnectors.

The System Integrity Protection Scheme[7] (SIPS) within Victoria is expected to increase the sourtherly transfer capacity on the Victoria to New South Wales interconnector, however the revised capacity has not been incorporated when preparing these results. As flows are predominately in the northern direction, an increase in the southerly capacity is not anticipated to have a material impact on the MLFs.

The Queensland-NSW interconnector (QNI) upgrade has not been incorporated when preparing these results, however commissioning is anticipated to occur within the 2021-22 FY and as such a revised capacity may be implemented into the final 2021-22 FY MLFs.

[6] As per AEMO market notice 80103 - New system normal constraint equation in NSW for voltage collapse at Balranald which may be found at https://aemo.com.au/Market-Notices

[7] Further information on the System Integrity Protection Scheme can be found at https://aemo.com.au/newsroom/media-release/aemo-completes-system-integrity-protection-scheme-procurement-process

2. Preliminary marginal loss factors by region

This section shows the preliminary intra-regional loss factors, commonly known as MLFs, for the 2021-22 FY, for every load or generation transmission node (TNI) in each NEM region. These preliminary factors are published for information only and do not constitute final MLFs. AEMO will publish final MLFs by 1 April 2021 in accordance with clause 3.6.2(f1) of the National Electricity Rules.

2.1 Queensland marginal loss factors

Table 4 Queensland loads

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Abermain	33	QABM	1.0006	1.0019
Abermain	110	QABR	1.0017	1.0027
Alan Sherriff	132	QASF	0.9934	0.9676
Algester	33	QALG	1.0141	1.0161
Alligator Creek	132	QALH	0.9807	0.9649
Alligator Creek	33	QALC	0.9878	0.9710
Ashgrove West	33	QAGW	1.0155	1.0166
Ashgrove West	110	QCBW	1.0134	1.0142
Belmont	110	QBMH	1.0091	1.0115
Belmont Wecker Road	33	QBBS	1.0107	1.0131
Belmont Wecker Road	11	QMOB	1.0102	1.0125
Biloela	66/11	QBIL	0.9289	0.9141
Blackstone	110	QBKS	0.9980	0.9995
Blackwater	66/11	QBWL	0.9751	0.9618
Blackwater	132	QBWH	0.9689	0.9546
Bluff	132	QBLF	0.9703	0.9570
Bolingbroke	132	QBNB	0.9680	0.9509
Bowen North	66	QBNN	0.9713	0.9492
Boyne Island	275	QBOH	0.9625	0.9490
Boyne Island	132	QBOL	0.9602	0.9463
Braemar – Kumbarilla Park	275	QBRE	0.9737	0.9758
Bulli Creek (Essential Energy)	132	QBK2	0.9726	0.9746
Bulli Creek (Waggamba)	132	QBLK	0.9726	0.9746
Bundamba	110	QBDA	1.0000	1.0016
Burton Downs	132	QBUR	0.9722	0.9618
Cairns	22	QCRN	1.0011	0.9661
Cairns City	132	QCNS	0.9917	0.9581
Callemondah (Rail)	132	QCMD	0.9510	0.9375

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Calliope River	132	QCAR	0.9491	0.9351
Cardwell	22	QCDW	0.9976	0.9731
Chinchilla	132	QCHA	0.9715	0.9715
Clare	66	QCLR	1.0031	0.9633
Collinsville Load	33	QCOL	0.9621	0.9433
Columboola	132	QCBL	0.9862	0.9917
Columboola 132 (Bellevue LNG load)	132	QCBB	0.9870	0.9928
Coppabella (Rail)	132	QCOP	0.9789	0.9721
Dan Gleeson	66	QDGL	0.9953	0.9724
Dingo (Rail)	132	QDNG	0.9486	0.9344
Duaringa	132	QDRG	0.9516	0.9376
Dysart	66/22	QDYS	0.9770	0.9728
Eagle Downs Mine	132	QEGD	0.9727	0.9671
Edmonton	22	QEMT	1.0116	0.9791
Egans Hill	66	QEGN	0.9382	0.9228
El Arish	22	QELA	1.0075	0.9833
Garbutt	66	QGAR	0.9994	0.9740
Gin Gin	132	QGNG	0.9740	0.9637
Gladstone South	66/11	QGST	0.9542	0.9426
Goodna	33	QGDA	1.0035	1.0055
Goonyella Riverside Mine	132	QGYR	0.9900	0.9808
Grantleigh (Rail)	132	QGRN	0.9502	0.9358
Gregory (Rail)	132	QGRE	0.9523	0.9353
Ingham	66	QING	1.0527	0.9853
Innisfail	22	QINF	1.0110	0.9788
Invicta Load	132	QINV	0.9280	0.9274
Kamerunga	22	QKAM	1.0132	0.9775
Kemmis	66	QEMS	0.9722	0.9602
King Creek	132	QKCK	0.9713	0.9484
Lilyvale	66	QLIL	0.9551	0.9414
Lilyvale (Barcaldine)	132	QLCM	0.9538	0.9478
Loganlea	33	QLGL	1.0125	1.0148
Loganlea	110	QLGH	1.0089	1.0111
Mackay	33	QMKA	0.9779	0.9603
Middle Ridge (Energex)	110	QMRX	0.9795	0.9821
Middle Ridge (Ergon)	110	QMRG	0.9795	0.9821
Mindi (Rail)	132	QMND	0.9606	0.9448
Molendinar	110	QMAR	1.0097	1.0120
Molendinar	33	QMAL	1.0092	1.0115
Moranbah (Mine)	66	QMRN	0.9850	0.9842
Moranbah (Town)	11	QMRL	0.9937	0.9624
Moranbah South (Rail)	132	QMBS	0.9774	0.9702
Moranbah Substation	132	QMRH	0.9782	0.9721
Moura	66/11	QMRA	0.9489	0.9349

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Mt McLaren (Rail)	132	QMTM	0.9695	0.9688
Mudgeeraba	33	QMGL	1.0097	1.0106
Mudgeeraba	110	QMGB	1.0088	1.0102
Murarrie (Belmont)	110	QMRE	1.0099	1.0124
Nebo	11	QNEB	0.9598	0.9430
Newlands	66	QNLD	0.9980	0.9837
North Goonyella	132	QNGY	0.9863	0.9836
Norwich Park (Rail)	132	QNOR	0.9684	0.9599
Oakey	110	QOKT	0.9760	0.9809
Oonooie (Rail)	132	QOON	0.9817	0.9658
Orana LNG	275	QORH	0.9768	0.9795
Palmwoods	132	QPWD	1.0074	1.0046
Pandoin	132	QPAN	0.9411	0.9251
Pandoin	66	QPAL	0.9415	0.9257
Peak Downs (Rail)	132	QPKD	0.9851	0.9794
Pioneer Valley	66	QPIV	0.9901	0.9676
Proserpine	66	QPRO	1.0001	0.9766
Queensland Alumina Ltd (Gladstone South)	132	QQAH	0.9581	0.9455
Queensland Nickel (Yabulu)	132	QQNH	0.9812	0.9593
Raglan	275	QRGL	0.9427	0.9280
Redbank Plains	11	QRPN	1.0042	1.0057
Richlands	33	QRLD	1.0133	1.0152
Rockhampton	66	QROC	0.9440	0.9291
Rocklands (Rail)	132	QRCK	0.9335	0.9182
Rocklea (Archerfield)	110	QRLE	1.0047	1.0058
Ross	132	QROS	0.9957	0.9650
Runcorn	33	QRBS	1.0148	1.0171
South Pine	110	QSPN	1.0049	1.0048
Stony Creek	132	QSYC	0.9775	0.9594
Sumner	110	QSUM	1.0056	1.0068
Tangkam (Dalby) - Dual MLF Generation	110	QTKM	0.9771	0.9798
Tangkam (Dalby) - Dual MLF Load	110	QTKM	0.9771	0.9843
Tarong	66	QTRL	0.9732	0.9731
Teebar Creek	132	QTBC	0.9883	0.9843
Tennyson	33	QTNS	1.0086	1.0093
Tennyson (Rail)	110	QTNN	1.0069	1.0079
Townsville East	66	QTVE	0.9864	0.9591
Townsville South	66	QTVS	0.9901	0.9625
Townsville South (KZ)	132	QTZS	1.0061	0.9899
Tully	22	QTLL	1.0405	0.9710
Turkinje	66	QTUL	1.0220	0.9942
Turkinje (Craiglie)	132	QTUH	1.0335	1.0028
Wandoan South	132	QWSH	0.9966	1.0035
Wandoan South (NW Surat)	275	QWST	0.9956	1.0026

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Wandoo (Rail)	132	QWAN	0.9657	0.9506
Wivenhoe Pump	275	QWIP	0.9975	0.9969
Woolooga (Energex)	132	QWLG	0.9895	0.9841
Woolooga (Ergon)	132	QWLN	0.9895	0.9841
Woree	132	QWRE	0.9999	0.9677
Wotonga (Rail)	132	QWOT	0.9779	0.9699
Wycarbah	132	QWCB	0.9413	0.9260
Yarwun – Boat Creek (Ergon)	132	QYAE	0.9506	0.9380
Yarwun – Rio Tinto	132	QYAR	0.9473	0.9333

Table 5 Queensland generation

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Baking Board Solar Farm (Chinchilla Solar Farm)	132	BAKING1	QCHS1C	QCHS	0.9743	0.9743
Barcaldine PS – Lilyvale	132	BARCALDN	QBCG	QBCG	0.9025	0.9025
Barcaldine Solar at Lilyvale (132)	132	BARCSF1	QLLV1B	QLLV	0.9064	0.8889
Barron Gorge Power Station (PS) Unit 1	132	BARRON-1	QBGH1	QBGH	0.9765	0.9356
Barron Gorge PS Unit 2	132	BARRON-2	QBGH2	QBGH	0.9765	0.9356
Braemar PS Unit 1	275	BRAEMAR1	QBRA1	QBRA	0.9634	0.9609
Braemar PS Unit 2	275	BRAEMAR2	QBRA2	QBRA	0.9634	0.9609
Braemar PS Unit 3	275	BRAEMAR3	QBRA3	QBRA	0.9634	0.9609
Braemar Stage 2 PS Unit 5	275	BRAEMAR5	QBRA5B	QBRA	0.9634	0.9609
Braemar Stage 2 PS Unit 6	275	BRAEMAR6	QBRA6B	QBRA	0.9634	0.9609
Braemar Stage 2 PS Unit 7	275	BRAEMAR7	QBRA7B	QBRA	0.9634	0.9609
Browns Plains Landfill Gas PS	110	BPLANDF1	QLGH3B	QLGH	1.0089	1.0111
Callide A PS Unit 4	132	CALL_A_4	QCAA4	QCAA	0.9210	0.9066
Callide A PS Unit 4 Load	132	CALLNL4	QCAA2	QCAA	0.9210	0.9066
Callide B PS Unit 1	275	CALL_B_1	QCAB1	QCAB	0.9203	0.9086
Callide B PS Unit 2	275	CALL_B_2	QCAB2	QCAB	0.9203	0.9086
Callide C PS Unit 3	275	CPP_3	QCAC3	QCAC	0.9227	0.9076
Callide C PS Unit 4	275	CPP_4	QCAC4	QCAC	0.9227	0.9076
Callide PS Load	132	CALLNL1	QCAX	QCAX	0.9199	0.9048
Childers Solar Farm	132	CHILDSF1	QTBS1C	QTBS	0.9746	0.9608
Clare Solar Farm	132	CLARESF1	QCLA1C	QCLA	0.8967	0.8647
Clermont Solar Farm	132	CLERMSF1	QLLV3C	QLLV	0.9064	0.8889
Collinsville Solar Farm	33	CSPVPS1	QCOS1C	QCOS	0.9057	0.8738
Columboola – Condamine PS	132	CPSA	QCND1C	QCND	0.9830	0.9884
Coopers Gap Wind Farm	275	COOPGWF1	QCPG1C	QCPG	0.9683	0.9681
Daandine PS - Dual MLF (Generation)	110	DAANDINE	QTKM1	QTKM	0.9771	0.9798
Daandine PS - Dual MLF (Load)	110	DAANDINE	QTKM1	QTKM	0.9771	0.9843
Darling Downs PS	275	DDPS1	QBRA8D	QBRA	0.9634	0.9609
Darling Downs Solar Farm	275	DDSF1	QBRS1D	QBRS	0.9760	0.9825
Daydream Solar Farm	33	DAYDSF1	QCCK1D	QCCK	0.9081	0.8825

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Emerald Solar Farm	66	EMERASF1	QLIS1E	QLIS	0.9051	0.8864
German Creek Generator	66	GERMCRK	QLIL2	QLIL	0.9551	0.9414
Gladstone PS (132 kV) Unit 3	132	GSTONE3	QGLD3	QGLL	0.9432	0.9288
Gladstone PS (132 kV) Unit 4	132	GSTONE4	QGLD4	QGLL	0.9432	0.9288
Gladstone PS (132kV) Load	132	GLADNL1	QGLL	QGLL	0.9432	0.9288
Gladstone PS (275 kV) Unit 1	275	GSTONE1	QGLD1	QGLH	0.9460	0.9285
Gladstone PS (275 kV) Unit 2	275	GSTONE2	QGLD2	QGLH	0.9460	0.9285
Gladstone PS (275 kV) Unit 5	275	GSTONE5	QGLD5	QGLH	0.9460	0.9285
Gladstone PS (275 kV) Unit 6	275	GSTONE6	QGLD6	QGLH	0.9460	0.9285
Grosvenor PS At Moranbah 66 No 1	66	GROSV1	QMRN2G	QMRV	0.9758	0.9696
Grosvenor PS At Moranbah 66 No 2	66	GROSV2	QMRV1G	QMRV	0.9758	0.9696
Hamilton Solar Farm	33	HAMISF1	QSLD1H	QSLD	0.9033	0.8743
Haughton Solar Farm	275	HAUGHT11	QHAR1H	QHAR	0.9142	0.8765
Hayman Solar Farm	33	HAYMSF1	QCCK2H	QCCK	0.9081	0.8825
Hughenden Solar Farm	132	HUGSF1	QROG2H	QROG	0.9196	0.8907
Invicta Sugar Mill	132	INVICTA	QINV1I	QINV	0.9280	0.9274
Isis CSM	132	ICSM	QGNG1I	QTBC	0.9883	0.9843
Kareeya PS Unit 1	132	KAREEYA1	QKAH1	QKYH	0.9595	0.9465
Kareeya PS Unit 2	132	KAREEYA2	QKAH2	QKYH	0.9595	0.9465
Kareeya PS Unit 3	132	KAREEYA3	QKAH3	QKYH	0.9595	0.9465
Kareeya PS Unit 4	132	KAREEYA4	QKAH4	QKYH	0.9595	0.9465
Kidston Solar Farm	132	KSP1	QROG1K	QROG	0.9196	0.8907
Kogan Creek PS	275	KPP_1	QBRA4K	QWDN	0.9693	0.9735
Koombooloomba	132	KAREEYA5	QKYH5	QKYH	0.9595	0.9465
Lilyvale Solar Farm	33	LILYSF1	QBDR1L	QBDR	0.9084	0.8904
Longreach Solar Farm	132	LRSF1	QLLV2L	QLLV	0.9064	0.8889
Mackay GT	33	MACKAYGT	QMKG	QMKG	0.8922	0.8893
Maryorough Solar Farm (Brigalow Solar Farm)	110	MARYRSF1	QMRY2M	QMRY	0.9788	0.9851
Millmerran PS Unit 1	330	MPP_1	QBCK1	QMLN	0.9729	0.9763
Millmerran PS Unit 2	330	MPP_2	QBCK2	QMLN	0.9729	0.9763
Moranbah Generation	11	MORANBAH	QMRL1M	QMRL	0.9937	0.9624
Moranbah North PS	66	MBAHNTH	QMRN1P	QMRN	0.9850	0.9842
Mount Emerald Wind farm	275	MEWF1	QWKM1M	QWKM	0.9775	0.9550
Mt Stuart PS Unit 1	132	MSTUART1	QMSP1	QMSP	0.9121	0.9229
Mt Stuart PS Unit 2	132	MSTUART2	QMSP2	QMSP	0.9121	0.9229
Mt Stuart PS Unit 3	132	MSTUART3	QMSP3M	QMSP	0.9121	0.9229
Oakey 1 Solar Farm	110	OAKEY1SF	QTKS1O	QTKS	0.9703	0.9783
Oakey 2 Solar Farm	110	OAKEY2SF	QTKS2O	QTKS	0.9703	0.9783
Oakey PS Unit 1	110	OAKEY1	QOKY1	QOKY	0.9520	0.9591
Oakey PS Unit 2	110	OAKEY2	QOKY2	QOKY	0.9520	0.9591
Oaky Creek 2	66	OAKY2	QLIL3O	QLIL	0.9551	0.9414
Oaky Creek Generator	66	OAKYCREK	QLIL1	QLIL	0.9551	0.9414
Racecourse Mill PS 1 – 3	66	RACOMIL1	QMKA1R	QPIV	0.9901	0.9676

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Rochedale Renewable Energy Plant	110	ROCHEDAL	QBMH2	QBMH	1.0091	1.0115
Rocky Point Gen (Loganlea 110kV)	110	RPCG	QLGH2	QLGH	1.0089	1.0111
Roma PS Unit 7 – Columboola	132	ROMA_7	QRMA7	QRMA	0.9669	0.9761
Roma PS Unit 8 – Columboola	132	ROMA_8	QRMA8	QRMA	0.9669	0.9761
Ross River Solar Farm	132	RRSF1	QROG3R	QROG	0.9196	0.8907
Rugby Run Solar Farm	132	RUGBYR1	QMPL1R	QMPL	0.8976	0.8886
Stanwell PS Load	132	STANNL1	QSTX	QSTX	0.9401	0.9216
Stanwell PS Unit 1	275	STAN-1	QSTN1	QSTN	0.9280	0.9120
Stanwell PS Unit 2	275	STAN-2	QSTN2	QSTN	0.9280	0.9120
Stanwell PS Unit 3	275	STAN-3	QSTN3	QSTN	0.9280	0.9120
Stanwell PS Unit 4	275	STAN-4	QSTN4	QSTN	0.9280	0.9120
Stapylton	110	STAPYLTON1	QLGH4S	QLGH	1.0089	1.0111
Sun Metals Solar Farm	132	SMCSF1	QTZS1S	QTZS	1.0061	0.9899
Sunshine Coast Solar Farm	132	VALDORA1	QPWD1S	QPWD	1.0074	1.0046
Susan River Solar Farm	132	SRSF1	QTBS2S	QTBS	0.9746	0.9608
Swanbank E GT	275	SWAN_E	QSWE	QSWE	0.9978	0.9997
Tarong North PS	275	TNPS1	QTNT	QTNT	0.9727	0.9720
Tarong PS Unit 1	275	TARONG#1	QTRN1	QTRN	0.9727	0.9721
Tarong PS Unit 2	275	TARONG#2	QTRN2	QTRN	0.9727	0.9721
Tarong PS Unit 3	275	TARONG#3	QTRN3	QTRN	0.9727	0.9721
Tarong PS Unit 4	275	TARONG#4	QTRN4	QTRN	0.9727	0.9721
Ti Tree BioReactor	33	TITREE	QABM1T	QABM	1.0006	1.0019
Warwick Solar Farm 1	110	WARWSF1	QMRY3W	QMRY	0.9788	0.9851
Warwick Solar Farm 2	110	WARWSF2	QMRY4W	QMRY	0.9788	0.9851
Whitsunday Solar Farm	33	WHITSF1	QSLS1W	QSLS	0.9034	0.8743
Whitwood Rd Renewable Energy Plant	110	WHIT1	QSBK1	QBKS	0.9980	0.9995
Windy Hill Wind Farm	66	WHILL1	QTUL	QTUL	1.0220	0.9942
Wivenhoe Generation Unit 1	275	W/HOE#1	QWIV1	QWIV	0.9910	0.9919
Wivenhoe Generation Unit 2	275	W/HOE#2	QWIV2	QWIV	0.9910	0.9919
Wivenhoe Pump 1	275	PUMP1	QWIP1	QWIP	0.9975	0.9969
Wivenhoe Pump 2	275	PUMP2	QWIP2	QWIP	0.9975	0.9969
Wivenhoe Small Hydro	110	WIVENSH	QABR1	QABR	1.0017	1.0027
Yabulu PS	132	YABULU	QTYP	QTYP	0.9615	0.9268
Yabulu Steam Turbine (Garbutt 66kV)	66	YABULU2	QGAR1	QYST	0.9400	0.9196
Yarranlea Solar Farm	110	YARANSF1	QMRY1Y	QMRY	0.9788	0.9851
Yarwun PS	132	YARWUN_1	QYAG1R	QYAG	0.9464	0.9324

2.2 New South Wales marginal loss factors[8]

Table 6 New South Wales loads

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Alexandria	33	NALX	1.0028	1.0031
Albury	132	NALB	0.9590	0.9702
Armidale	66	NAR1	0.9531	0.9671
Australian Newsprint Mill	132	NANM	0.9697	0.9828
Balranald	22	NBAL	0.8746	0.9014
Beaconsfield North	132	NBFN	1.0027	1.0029
Beaconsfield South	132	NBFS	1.0027	1.0030
Belmore Park	132	NBM1	1.0028	1.0031
Beresfield	33	NBRF	0.9952	0.9912
Beryl	66	NBER	0.9692	0.9794
BHP (Waratah)	132	NWR1	0.9926	0.9908
Boambee South	132	NWST	0.9872	0.9946
Boggabri East	132	NBGE	0.9963	1.0117
Boggabri North	132	NBGN	0.9997	1.0109
Brandy Hill	11	NBHL	0.9969	0.9943
Broken Hill	22	NBKG	0.8434	0.8734
Broken Hill	220	NBKH	0.8255	0.8644
Bunnerong	132	NBG1	1.0042	1.0041
Bunnerong	33	NBG3	1.0050	1.0055
Buronga	220	NBRG	0.8461	0.8127
Burrinjuck	132	NBU2	0.9717	0.9825
Canterbury	33	NCTB	1.0207	1.0170
Carlingford	132	NCAR	1.0010	1.0010
Casino	132	NCSN	0.9963	1.0107
Charmhaven	11	NCHM	0.9953	0.9935
Chullora	132	NCHU	1.0017	1.0014
Coffs Harbour	66	NCH1	0.9826	0.9886
Coleambally	132	NCLY	0.9280	0.9561
Cooma	66	NCMA	0.9672	0.9809
Cooma (AusNet Services)	66	NCM2	0.9672	0.9809
Croydon	11	NCRD	1.0169	1.0168
Cowra	66	NCW8	0.9792	1.0009
Dapto (Endeavour Energy)	132	NDT1	0.9922	0.9967
Dapto (Essential Energy)	132	NDT2	0.9922	0.9967
Darlington Point	132	NDNT	0.9402	0.9575
Deniliquin	66	NDN7	0.9667	0.9843
Dorrigo	132	NDOR	0.9732	0.9846
Drummoyne	11	NDRM	1.0185	1.0187
Dunoon	132	NDUN	0.9889	1.0059

[8] The New South Wales region includes the Australian Capital Territory (ACT). ACT generation and load are detailed separately for ease of reference.

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Far North VTN		NEV1	0.9776	0.9775
Finley	66	NFNY	0.9677	0.9537
Forbes	66	NFB2	1.0049	1.0148
Gadara	132	NGAD	0.9815	0.9951
Glen Innes	66	NGLN	0.9381	0.9579
Gosford	66	NGF3	1.0035	1.0019
Gosford	33	NGSF	1.0041	1.0026
Grafton East 132	132	NGFT	1.0033	0.9925
Green Square	11	NGSQ	1.0055	1.0054
Griffith	33	NGRF	0.9648	0.9888
Gunnedah	66	NGN2	0.9968	1.0064
Haymarket	132	NHYM	1.0029	1.0031
Heron's Creek	132	NHNC	1.0391	1.0419
Holroyd	132	NHLD	1.0024	1.0024
Holroyd (Ausgrid)	132	NHLX	1.0024	1.0024
Hurstville North	11	NHVN	1.0042	1.0045
Homebush Bay	11	NHBB	1.0163	1.0168
Ilford	132	NLFD	0.9562	0.9754
Ingleburn	66	NING	0.9976	0.9983
Inverell	66	NNVL	0.9451	0.9603
Kemps Creek	330	NKCK	0.9949	0.9949
Kempsey	66	NKS2	1.0132	1.0155
Kempsey	33	NKS3	1.0173	1.0223
Koolkhan	66	NKL6	1.0002	1.0061
Kurnell	132	NKN1	1.0014	1.0017
Kogarah	11	NKOG	1.0061	1.0065
Kurri	33	NKU3	0.9974	0.9912
Kurri	11	NKU1	0.9956	0.9912
Kurri	132	NKUR	0.9951	0.9912
Lake Munmorah	132	NMUN	0.9830	0.9787
Lane Cove	132	NLCV	1.0133	1.0138
Leichhardt	11	NLDT	1.0174	1.0169
Liddell	33	NLD3	0.9678	0.9673
Lismore	132	NLS2	1.0045	1.0432
Liverpool	132	NLP1	1.0009	1.0012
Macarthur	132	NMC1	0.9945	0.9955
Macarthur	66	NMC2	0.9966	0.9975
Macksville	132	NMCV	1.0006	1.0090
Macquarie Park	11	NMQP	1.0184	1.0184
Manildra	132	NMLD	1.0030	1.0099
Marrickville	11	NMKV	1.0075	1.0078
Marulan (Endeavour Energy)	132	NMR1	1.0173	1.0103
Marulan (Essential Energy)	132	NMR2	1.0173	1.0103
Mason Park	132	NMPK	1.0137	1.0140

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Meadowbank	11	NMBK	1.0171	1.0175
Molong	132	NMOL	1.0165	1.0216
Moree	66	NMRE	0.9810	0.9913
Morven	132	NMVN	0.9538	0.9731
Mt Piper	66	NMP6	0.9754	0.9774
Mudgee	132	NMDG	0.9637	0.9817
Mullumbimby	11	NML1	0.9900	1.0073
Mullumbimby	132	NMLB	0.9753	0.9898
Munmorah STS 33	33	NMU3	0.9919	0.9899
Munyang	11	NMY1	0.9745	0.9865
Munyang	33	NMYG	0.9745	0.9865
Murrumbateman	132	NMBM	0.9688	0.9791
Murrumburrah	66	NMRU	0.9736	0.9894
Muswellbrook	132	NMRK	0.9784	0.9784
Nambucca Heads	132	NNAM	0.9954	1.0059
Narrabri	66	NNB2	1.0027	1.0212
Newcastle	132	NNEW	0.9924	0.9907
North of Broken Bay VTN		NEV2	0.9956	0.9932
Orange	66	NRGE	1.0371	1.0376
Orange North	132	NONO	1.0356	1.0364
Ourimbah	33	NORB	1.0008	0.9986
Ourimbah	132	NOR1	0.9993	0.9976
Ourimbah	66	NOR6	0.99991	0.9982
Panorama	66	NPMA	1.0245	1.0229
Parkes	66	NPK6	1.0018	1.0095
Parkes	132	NPKS	0.9948	1.0040
Peakhurst	33	NPHT	1.0032	1.0035
Potts Hill 11	11	NPHL	1.0036	1.0033
Potts Hill 132	132	NPO1	1.0005	1.0004
Pt Macquarie	33	NPMQ	1.0341	1.0382
Pyrmont	33	NPT3	1.0061	1.0063
Pyrmont	132	NPT1	1.0032	1.0035
Queanbeyan 132	132	NQBY	0.9926	0.9976
Raleigh	132	NRAL	0.9888	0.9982
Regentville	132	NRGV	0.9983	0.9983
Rockdale (Ausgrid)	11	NRKD	1.0054	1.0056
Rookwood Road	132	NRWR	1.0015	1.0002
Rozelle	132	NRZH	1.0163	1.0151
Rozelle	33	NRZL	1.0153	1.0154
Snowy Adit	132	NSAD	0.9613	0.9721
Somersby	11	NSMB	1.0046	1.0031
South of Broken Bay VTN		NEV3	1.0051	1.0052
St Peters	11	NSPT	1.0060	1.0063
Strathfield South	11	NSFS	TBA	1.0090

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Stroud	132	NSRD	1.0106	1.0084
Sydney East	132	NSE2	1.0064	1.0058
Sydney North (Ausgrid)	132	NSN1	1.0039	1.0035
Sydney North (Endeavour Energy)	132	NSN2	1.0039	1.0035
Sydney South	132	NSYS	1.0005	1.0009
Sydney West (Ausgrid)	132	NSW1	1.0010	1.0010
Sydney West (Endeavour Energy)	132	NSW2	1.0010	1.0010
Tamworth	66	NTA2	0.9720	0.9760
Taree (Essential Energy)	132	NTR2	1.0432	1.0438
Tenterfield	132	NTTF	0.9618	0.9763
Terranora	110	NTNR	0.9985	1.0056
Tomago	330	NTMG	0.9930	0.9908
Tomago (Ausgrid)	132	NTME	0.9958	0.9926
Tomago (Essential Energy)	132	NTMC	0.9958	0.9926
Top Ryde	11	NTPR	1.0160	1.0163
Tuggerah	132	NTG3	0.9956	0.9940
Tumut	66	NTU2	0.9849	0.9913
Tumut 66 (AusNet DNSP)	66	NTUX	0.9849	0.9913
Vales Pt.	132	NVP1	0.9897	0.9884
Vineyard	132	NVYD	1.0000	0.9997
Wagga	66	NWG2	0.9490	0.9686
Wagga North	132	NWGN	0.9497	0.9754
Wagga North	66	NWG6	0.9478	0.9729
Wallerawang (Endeavour Energy)	132	NWW6	0.9764	0.9776
Wallerawang (Essential Energy)	132	NWW5	0.9764	0.9776
Wallerawang 66 (Essential Energy)	66	NWW4	0.9771	0.9779
Wallerawang 66	66	NWW7	0.9771	0.9779
Wallerawang 330 PS Load	330	NWWP	0.9755	0.9770
Wellington	132	NWL8	0.9867	0.9887
West Gosford	11	NGWF	1.0051	1.0035
Williamsdale (Essential Energy) (Bogong)	132	NWD1	0.9350	0.9795
Wyong	11	NWYG	0.9978	0.9961
Yanco	33	NYA3	0.9468	0.9683
Yass	66	NYS6	0.9689	0.9799
Yass	132	NYS1	0.9110	0.9392

Table 7 New South Wales generation

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
AGL Sita Landfill 1	132	AGLSITA1	NLP13K	NLP1	1.0009	1.0012
Appin Power Station	66	APPIN	NAPP1A	NAPP	0.9968	0.9978
Bayswater PS Unit 1	330	BW01	NBAY1	NBAY	0.9625	0.9625
Bayswater PS Unit 2	330	BW02	NBAY2	NBAY	0.9625	0.9625

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Bayswater PS Unit 3	500	BW03	NBAY3	NBYW	0.9619	0.9633
Bayswater PS Unit 4	500	BW04	NBAY4	NBYW	0.9619	0.9633
Beryl Solar Farm	66	BERYLSF1	NBES1B	NBES	0.9162	0.9348
Blowering	132	BLOWERNG	NBLW8	NBLW	0.9477	0.9580
Boco Rock Wind Farm	132	BOCORWF1	NCMA3B	NBCO	0.9357	0.9536
Bodangora Wind Farm	132	BODWF1	NBOD1B	NBOD	0.9552	0.9659
Bomen Solar Farm	132	BOMENSF1	NWGS1B	NWGS	0.8944	0.9417
Broadwater PS	132	BWTR1	NLS21B	NLS2	1.0045	1.0432
Broken Hill GT 1	22	GB01	NBKG1	NBKG	0.8435	0.8734
Broken Hill Solar Farm	22	BROKENH1	NBK11B	NBK1	0.7324	0.7844
Brown Mountain	66	BROWNMT	NCMA1	NCMA	0.9672	0.9809
Burrendong Hydro PS	132	BDONGHYD	NWL81B	NWL8	0.9867	0.9887
Burrinjuck PS	132	BURRIN	NBUK	NBUK	0.9668	0.9848
Campbelltown WSLC	66	WESTCBT1	NING1C	NING	0.9976	0.9983
Capital Wind Farm	330	CAPTL_WF	NCWF1R	NCWF	0.9568	0.9674
Coleambally Solar Farm	132	COLEASF1	NCLS1C	NCLS	0.8736	0.9002
Collector Wind Farm	330	COLWF01	NCLW1C	NCLW	0.9594	0.9786
Colongra PS Unit 1	330	CG1	NCLG1D	NCLG	0.9846	0.9819
Colongra PS Unit 2	330	CG2	NCLG2D	NCLG	0.9846	0.9819
Colongra PS Unit 3	330	CG3	NCLG3D	NCLG	0.9846	0.9819
Colongra PS Unit 4	330	CG4	NCLG4D	NCLG	0.9846	0.9819
Condong PS	110	CONDONG1	NTNR1C	NTNR	0.9985	1.0056
Copeton Hydro PS	66	COPTNHYD	NNVL1C	NNVL	0.9451	0.9603
Crookwell 2 Wind Farm	330	CROOKWF2	NCKW1C	NCKW	0.9617	0.9716
Crudine Ridge Wind Farm	132	CRURWF1	NCDS1C	NCDS	0.9184	0.9184
Cullerin Range Wind Farm	132	CULLRGWF	NYS11C	NYS1	0.9110	0.9392
Darlington Point Solar Farm	132	DARLSF1	NDNS1D	NDNS	0.8819	0.9160
Eastern Creek	132	EASTCRK	NSW21	NSW2	1.0010	1.0010
Eastern Creek 2	132	EASTCRK2	NSW23L	NSW2	1.0010	1.0010
Eraring 330 BS UN (GT)	330	ERGT01	NEP35B	NEP3	0.9853	0.9835
Eraring 330 PS Unit 1	330	ER01	NEPS1	NEP3	0.9853	0.9835
Eraring 330 PS Unit 2	330	ER02	NEPS2	NEP3	0.9853	0.9835
Eraring 500 PS Unit 3	500	ER03	NEPS3	NEPS	0.9861	0.9845
Eraring 500 PS Unit 4	500	ER04	NEPS4	NEPS	0.9861	0.9845
Eraring PS Load	500	ERNL1	NEPSL	NNEW	0.9924	0.9907
Finley Solar Farm	132	FINLYSF1	NFNS1F	NFNS	0.8477	0.8800
Glenbawn Hydro PS	132	GLBWNHYD	NMRK2G	NMRK	0.9784	0.9784
Glenn Innes (Pindari PS)	66	PINDARI	NGLN1	NGLN	0.9381	0.9579
Glennies Creek PS	132	GLENNCRK	NMRK3T	NMRK	0.9784	0.9784
Grange Avenue	132	GRANGEAV	NVYD1	NVYD	1.0000	0.9997
Griffith Solar Farm	33	GRIFSF1	NGG11G	NGG1	0.8643	0.9001
Goonumbla Solar Farm	66	GOONSF1	NPG12G	NPG1	0.9098	0.9259
Gullen Range Solar Farm	330	GULLRSF1	NGUR2G	NGUR	0.9593	0.9708

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Gullen Range 1 Wind Farm	330	GULLRWF1	NGUR1G	NGUR	0.9593	0.9708
Gullen Range 2 Wind Farm	330	GULLRWF2	NGUR3G	NGUR	0.9593	0.9708
Gunning Wind Farm	132	GUNNING1	NYS12A	NYS1	0.9110	0.9392
Guthega	132	GUTHEGA	NGUT8	NGUT	0.9013	0.9125
Guthega Auxiliary Supply	11	GUTHNL1	NMY11	NMY1	0.9745	0.9865
Hume (New South Wales Share)	132	HUMENSW	NHUM	NHUM	0.8996	0.9471
Jemalong Solar Farm	66	JEMALNG1	NFBS1J	NFBS	TBA	0.9920
Jindabyne Generator	66	JNDABNE1	NCMA2	NCMA	0.9672	0.9809
Jounama PS	66	JOUNAMA1	NTU21J	NTU2	0.9849	0.9913
Kangaroo Valley – Bendeela (Shoalhaven) Generation – Dual MLF	330	SHGEN	NSHL	NSHN	0.9761	0.9809
Kangaroo Valley (Shoalhaven) Pumps – Dual MLF	330	SHPUMP	NSHP1	NSHN	0.9863	1.0007
Keepit	66	KEEPIT	NKPT	NKPT	0.9968	1.0064
Kincumber Landfill	66	KINCUM1	NGF31K	NGF3	1.0035	1.0019
Liddell 33 – Hunter Valley GTs	33	HVGTS	NLD31	NLD3	0.9678	0.9673
Liddell 330 PS Load	330	LIDDNL1	NLDPL	NLDP	0.9630	0.9631
Liddell 330 PS Unit 1	330	LD01	NLDP1	NLDP	0.9630	0.9631
Liddell 330 PS Unit 2	330	LD02	NLDP2	NLDP	0.9630	0.9631
Liddell 330 PS Unit 3	330	LD03	NLDP3	NLDP	0.9630	0.9631
Liddell 330 PS Unit 4	330	LD04	NLDP4	NLDP	0.9630	0.9631
Limondale Solar Farm 1	220	LIMOSF11	NBSF1L	NBSF	0.7473	0.7907
Limondale Solar Farm2	22	LIMOSF21	NBL21L	NBL2	0.7461	0.7926
Liverpool 132 (Jacks Gully)	132	JACKSGUL	NLP11	NSW2	1.0010	1.0010
Lower Tumut Generation – dual MLF	330	TUMUT3	NLTS8	NLTS	0.9237	0.9246
Lower Tumut Pipeline Auxiliary	66	TUMT3NL3	NTU2L3	NTU2	0.9849	0.9913
Lower Tumut Pumps – dual MLF	330	SNOWYP	NLTS3	NLTS	0.9525	0.9942
Lower Tumut T2 Auxiliary	66	TUMT3NL1	NTU2L1	NTU2	0.9849	0.9913
Lower Tumut T4 Auxiliary	66	TUMT3NL2	NTU2L2	NTU2	0.9849	0.9913
Lucas Heights II Power Plant	132	LUCASHGT	NSYS2G	NSYS	1.0005	1.0009
Lucas Heights Stage 2 Power Station	132	LUCAS2S2	NSYS1	NSYS	1.0005	1.0009
Manildra Solar Farm	132	MANSLR1	NMLS1M	NMLS	0.9356	0.9542
Molong Solar Farm	66	MOLNGSF1	NMOS1M	NMOS	0.9475	0.9634
Moree Solar Farm	66	MOREESF1	NMR41M	NMR4	0.8919	0.8950
Mt Piper PS Load	330	MPNL1	NMPPL	NMTP	0.9724	0.9745
Mt Piper PS Unit 1	330	MP1	NMTP1	NMTP	0.9724	0.9745
Mt Piper PS Unit 2	330	MP2	NMTP2	NMTP	0.9724	0.9745
Narromine Solar Farm	132	NASF1	NWLS1N	NWLS	0.9406	0.9471
Nevertire Solar Farm	132	NEVERSF1	NWLS3N	NWLS	0.9406	0.9471
Nine Willoughby	132	NINEWIL1	NSE21R	NSE2	1.0064	1.0058
Nyngan Solar Farm	132	NYNGAN1	NWL82N	NWL8	0.9867	0.9887
Parkes Solar Farm	66	PARSF1	NPG11P	NPG1	0.9098	0.9259
Sapphire Wind Farm	330	SAPHWF1	NSAP1S	NSAP	0.9505	0.9553
Silverton Wind Farm	220	STWF1	NBKW1S	NBKW	0.7978	0.8496

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Sithe (Holroyd Generation)	132	SITHE01	NSYW1	NHD2	1.0008	1.0025
South Keswick Solar Farm	132	SKSF1	NWLS2S	NWLS	0.9406	0.9471
St George Leagues Club	33	STGEORG1	NPHT1E	NPHT	1.0032	1.0035
Sunraysia Solar Farm	220	SUNRSF1	NBSF2S	NBSF	0.7473	0.7907
Tahmoor PS	132	TAHMOOR1	NLP12T	NLP1	1.0009	1.0012
Tallawarra PS	132	TALWA1	NDT13T	NTWA	0.9906	0.9913
Taralga Wind Farm	132	TARALGA1	NMR22T	NMR2	1.0173	1.0103
Teralba Power Station	132	TERALBA	NNEW1	NNEW	0.9924	0.9907
The Drop Power Station	66	THEDROP1	NFNY1D	NFNY	0.8670	0.9537
Tower Power Plant	132	TOWER	NLP11T	NLP1	1.0009	1.0012
Upper Tumut	330	UPPTUMUT	NUTS8	NUTS	0.9369	0.9468
Uranquinty PS Unit 11	132	URANQ11	NURQ1U	NURQ	0.8674	0.8570
Uranquinty PS Unit 12	132	URANQ12	NURQ2U	NURQ	0.8674	0.8570
Uranquinty PS Unit 13	132	URANQ13	NURQ3U	NURQ	0.8674	0.8570
Uranquinty PS Unit 14	132	URANQ14	NURQ4U	NURQ	0.8674	0.8570
Vales Point 330 PS Load	330	VPNL1	NVPPL	NVPP	0.9874	0.9857
Vales Point 330 PS Unit 5	330	VP5	NVPP5	NVPP	0.9874	0.9857
Vales Point 330 PS Unit 6	330	VP6	NVPP6	NVPP	0.9874	0.9857
Wellington Solar Farm	132	WELLSF1	NWLS4W	NWLS	0.9406	0.9471
West Nowra	132	AGLNOW1	NDT12	NDT1	0.9922	0.9967
Wests Illawara Leagues Club	132	WESTILL1	NDT14E	NDT1	0.9922	0.9967
White Rock Solar Farm	132	WRSF1	NWRK2W	NWRK	0.8728	0.8801
White Rock Wind Farm	132	WRWF1	NWRK1W	NWRK	0.8728	0.8801
Wilga Park A	66	WILGAPK	NNB21W	NNB2	1.0027	1.0212
Wilga Park B	66	WILGB01	NNB22W	NNB2	1.0027	1.0212
Woodlawn Bioreactor	132	WDLNGN01	NMR21W	NMR2	1.0173	1.0103
Woodlawn Wind Farm	330	WOODLWN1	NCWF2W	NCWF	0.9568	0.9674
Woy Woy Landfill	66	WOYWOY1	NGF32W	NGF3	1.0035	1.0019
Wyangala A PS	66	WYANGALA	NCW81A	NCW8	0.9792	1.0009
Wyangala B PS	66	WYANGALB	NCW82B	NCW8	0.9792	1.0009

Table 8 ACT loads

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Angle Crossing	132	AAXG	0.9463	0.9722
Belconnen	132	ABCN	0.9684	0.9804
City East	132	ACTE	0.9701	0.9839
Civic	132	ACVC	0.9679	0.9823
East lake	132	AELK	0.9687	0.9836
Gilmore	132	AGLM	0.9691	0.9839
Gold Creek	132	AGCK	0.9705	0.9804
Latham	132	ALTM	0.9699	0.9795
Telopea Park	132	ATLP	0.9700	0.9839

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Theodore	132	ATDR	0.9717	0.9803
Wanniassa	132	AWSA	0.9703	0.9810
Woden	132	AWDN	0.9690	0.9815
ACT VTN	132	AAVT	0.9694	0.9819
Queanbeyan (ACTEW)	66	AQB1	0.9873	0.9982
Queanbeyan (Essential Energy)	66	AQB2	0.9873	0.9982

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

Table 9 ACT generation

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Capital East Solar Farm	66	CESF1	AQB21C	AQB2	0.9873	0.9982
Mugga Lane Solar Farm	132	MLSP1	ACA12M	AMS1	0.9502	0.9731
Royalla Solar Farm	132	ROYALLA1	ACA11R	ARS1	0.9499	0.9725

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

2.3 Victoria marginal loss factors

Table 10 Victoria loads

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Altona	66	VATS	1.0085	1.0065
Altona	220	VAT2	0.9925	0.9910
Ballarat	66	VBAT	0.9681	0.9711
Bendigo	66	VBE6	0.9981	1.0022
Bendigo	22	VBE2	0.9979	1.0090
BHP Western Port	220	VJLA	0.9912	0.9907
Brooklyn (Jemena)	22	VBL2	0.9991	0.9989
Brooklyn (Jemena)	66	VBL6	1.0048	1.0037
Brooklyn (POWERCOR)	22	VBL3	0.9991	0.9989
Brooklyn (POWERCOR)	66	VBL7	1.0048	1.0037
Brunswick (CitiPower)	22	VBT2	0.9978	0.9976
Brunswick (Jemena)	22	VBTS	0.9978	0.9976
Brunswick 66 (CitiPower)	66	VBT6	0.9964	0.9969
Cranbourne	220	VCB2	0.9903	0.9899
Cranbourne (AusNet Services)	66	VCBT	0.9921	0.9918
Cranbourne (United Energy)	66	VCB5	0.9921	0.9918
Deer Park	66	VDPT	0.9968	0.9982
East Rowville (AusNet Services)	66	VER2	0.9951	0.9948
East Rowville (United Energy)	66	VERT	0.9951	0.9948
Fishermens Bend (CITIPOWER)	66	VFBT	0.9986	0.9993
Fishermens Bend (POWERCOR)	66	VFB2	0.9986	0.9993
Fosterville	220	VFVT	0.9980	1.0041
Geelong	66	VGT6	0.9905	0.9914
Glenrowan	66	VGNT	1.0201	1.0274

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Heatherton	66	VHTS	0.9973	0.9967
Heywood	22	VHY2	0.9877	0.9865
Horsham	66	VHOT	0.9278	0.9269
Keilor (Jemena)	66	VKT2	0.9969	0.9969
Keilor (POWERCOR)	66	VKTS	0.9969	0.9969
Kerang	22	VKG2	0.9858	1.0104
Kerang	66	VKG6	1.0029	1.0096
Khancoban	330	NKHN	1.0351	1.0318
Loy Yang Substation	66	VLY6	0.9760	0.9763
Malvern	22	VMT2	0.9952	0.9946
Malvern	66	VMT6	0.9942	0.9935
Morwell Power Station Units 1 to 3	66	VMWG	0.9721	0.9726
Morwell PS (G4&5)	11	VMWP	0.9777	0.9777
Morwell TS	66	VMWT	0.9973	0.9955
Mt Beauty	66	VMBT	1.0245	1.0235
Portland	500	VAPD	0.9920	0.9913
Red Cliffs	22	VRC2	0.9364	0.9516
Red Cliffs	66	VRC6	0.9343	0.9406
Red Cliffs (Essential Energy)	66	VRCA	0.9343	0.9406
Richmond	22	VRT2	0.9966	0.9969
Richmond (CITIPOWER)	66	VRT7	0.9975	0.9980
Richmond (United Energy)	66	VRT6	0.9975	0.9980
Ringwood (AusNet Services)	22	VRW3	0.9975	0.9978
Ringwood (AusNet Services)	66	VRW7	0.9998	1.0011
Ringwood (United Energy)	22	VRW2	0.9975	0.9978
Ringwood (United Energy)	66	VRW6	0.9998	1.0011
Shepparton	66	VSHT	1.0360	1.0289
South Morang (Jemena)	66	VSM6	0.9956	0.9954
South Morang (AusNet Services)	66	VSMT	0.9956	0.9954
Springvale (CITIPOWER)	66	VSVT	0.9987	0.9984
Springvale (United Energy)	66	VSV2	0.9987	0.9984
Templestowe (CITIPOWER)	66	VTS2	0.9994	0.9991
Templestowe (Jemena)	66	VTST	0.9994	0.9991
Templestowe (AusNet Services)	66	VTS3	0.9994	0.9991
Templestowe (United Energy)	66	VTS4	0.9994	0.9991
Terang	66	VTGT	0.9990	1.0079
Thomastown (Jemena)	66	VTTS	1.0000	1.0000
Thomastown (AusNet Services)	66	VTT2	1.0000	1.0000
Tyabb	66	VTBT	0.9926	0.9921
Wemen 66 (Essential Energy)	66	VWEA	0.9064	0.9345
Wemen TS	66	VWET	0.9064	0.9345
West Melbourne	22	VWM2	0.9986	0.9995
West Melbourne (CITIPOWER)	66	VWM7	0.9974	0.9978
West Melbourne (Jemena)	66	VWM6	0.9974	0.9978

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Wodonga	22	VWO2	1.0324	1.0303
Wodonga	66	VWO6	1.0302	1.0263
Yallourn	11	VYP1	0.9629	0.9581

Table 11 Victoria generation

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Ararat Wind Farm	220	ARWF1	VART1A	VART	0.8900	0.8983
Bairnsdale Power Station	66	BDL01	VMWT2	VBDL	0.9927	0.9899
Bairnsdale Power Station Generator Unit 2	66	BDL02	VMWT3	VBDL	0.9927	0.9899
Bald Hills Wind Farm	66	BALDHWF1	VMWT9B	VMWT	0.9973	0.9955
Ballarat BESS - Generation	22	BALBG1	VBA21B	VBA2	0.9564	0.9643
Ballarat BESS - Load	22	BALBL1	VBA22B	VBA2	0.9568	0.9630
Ballarat Health Services	66	BBASEHOS	VBAT1H	VBAT	0.9681	0.9711
Banimboola	220	BAPS	VDPS2	VDPS	0.9790	0.9854
Bannerton Solar Farm	66	BANN1	VWES1B	VWES	0.8001	0.8096
Basslink (Loy Yang Power Station Switchyard)	500	BLNKVIC	VLYP13	VTBL	0.9624	0.9620
Broadmeadows Power Plant	66	BROADMDW	VTTS2B	VTTS	1.0000	1.0000
Brooklyn Landfill & Recycling Facility	66	BROOKLYN	VBL61	VBL6	1.0048	1.0037
Bulgana Green Power Hub	220	BULGANA1	VBGT1B	VBGT	0.8792	0.8988
Challicum Hills Wind Farm	66	CHALLHWF	VHOT1	VBAT	0.9681	0.9711
Chepstowe Wind Farm	66	CHPSTWF1	VBAT3C	VBAT	0.9681	0.9711
Cherry Tree Wind Farm	66	CHYTWF1	VSM71C	VSM7	0.9960	0.9958
Clayton Landfill Gas Power Station	66	CLAYTON	VSV21B	VSV2	0.9987	0.9984
Clover PS	66	CLOVER	VMBT1	VMBT	1.0245	1.0235
Codrington Wind Farm	66	CODRNGTON	VTGT2C	VTGT	0.9990	1.0079
Coonooer Bridge Wind Farm	66	CBWF1	VBE61C	VBE6	0.9981	1.0022
Corio LFG PS	66	CORIO1	VGT61C	VGT6	0.9905	0.9914
Crowlands Wind Farm	220	CROWLWF1	VCWL1C	VCWL	0.8852	0.9026
Dartmouth PS	220	DARTM1	VDPS	VDPS	0.9790	0.9854
Dundonnell Wind Farm 1	500	DUNDWF1	VM051D	VM05	0.9790	0.9790
Dundonnell Wind Farm 2	500	DUNDWF2	VM052D	VM05	0.9790	0.9790
Dundonnell Wind Farm 3	500	DUNDWF3	VM053D	VM05	0.9790	0.9790
Eildon Hydro PS	66	EILDON3	VTT22E	VSMT	0.9956	0.9954
Eildon PS Unit 1	220	EILDON1	VEPS1	VEPS	0.9958	0.9903
Eildon PS Unit 2	220	EILDON2	VEPS2	VEPS	0.9958	0.9903
Elaine Wind Farm	220	ELAINWF1	VELT3E	VELT	0.9457	0.9501
Ferguson North Wind Farm	66	FNWF1	VTGT6F	VTGT	0.9762	1.0079
Gannawarra BESS (Generation)	66	GANNBG1	VKGB1G	VKGB	0.9673	0.9793
Gannawarra BESS (Load)	66	GANNBL1	VKGB2G	VKGL	0.9753	0.9823
Gannawarra Solar Farm	66	GANNSF1	VKGS1G	VKGS	0.8735	0.8863
Glenmaggie Hydro PS	66	GLENMAG1	VMWT8G	VMWT	0.9973	0.9955

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Hallam Mini Hydro	66	HLMSEW01	VER21H	VER2	0.9951	0.9948
Hallam Road Renewable Energy Facility	66	HALAMRD1	VER22L	VER2	0.9951	0.9948
Hepburn Community Wind Farm	66	HEPWIND1	VBAT2L	VBAT	0.9681	0.9711
Hume (Victorian Share)	66	HUMEV	VHUM	VHUM	0.9829	0.9833
Jeeralang A PS Unit 1	220	JLA01	VJLGA1	VJLG	0.9760	0.9734
Jeeralang A PS Unit 2	220	JLA02	VJLGA2	VJLG	0.9760	0.9734
Jeeralang A PS Unit 3	220	JLA03	VJLGA3	VJLG	0.9760	0.9734
Jeeralang A PS Unit 4	220	JLA04	VJLGA4	VJLG	0.9760	0.9734
Jeeralang B PS Unit 1	220	JLB01	VJLGB1	VJLG	0.9760	0.9734
Jeeralang B PS Unit 2	220	JLB02	VJLGB2	VJLG	0.9760	0.9734
Jeeralang B PS Unit 3	220	JLB03	VJLGB3	VJLG	0.9760	0.9734
Jindabyne pump at Guthega	132	SNOWYGJP	NGJP	NGJP	1.1219	1.1231
Karadoc Solar Farm	66	KARSF1	VRCS1K	VRCS	0.7939	0.8045
Kiamal Solar Farm	220	KIAMSF1	VKMT1K	VKMT	0.7955	0.8043
Kiata Wind Farm	66	KIATAWF1	VHOG1K	VHOG	0.8763	0.8974
Laverton PS (LNGS1)	220	LNGS1	VAT21L	VAT2	0.9925	0.9910
Laverton PS (LNGS2)	220	LNGS2	VAT22L	VAT2	0.9925	0.9910
Longford	66	LONGFORD	VMWT6	VMWT	0.9973	0.9955
Loy Yang A PS Load	500	LYNL1	VLYPL	VLYP	0.9760	0.9760
Loy Yang A PS Unit 1	500	LYA1	VLYP1	VLYP	0.9760	0.9760
Loy Yang A PS Unit 2	500	LYA2	VLYP2	VLYP	0.9760	0.9760
Loy Yang A PS Unit 3	500	LYA3	VLYP3	VLYP	0.9760	0.9760
Loy Yang A PS Unit 4	500	LYA4	VLYP4	VLYP	0.9760	0.9760
Loy Yang B PS Unit 1	500	LOYYB1	VLYP5	VLYP	0.9760	0.9760
Loy Yang B PS Unit 2	500	LOYYB2	VLYP6	VLYP	0.9760	0.9760
MacArthur Wind Farm	500	MACARTH1	VTRT1M	VTRT	0.9768	0.9757
Maroona Wind Farm	66	MAROOWF1	VBAT5M	VBAT	0.9681	0.9711
McKay Creek / Bogong PS	220	MCKAY1	VMKP1	VT14	0.9660	0.9650
Moorabool Wind Farm	220	MOORAWF1	VELT2M	VELT	0.9457	0.9501
Mortlake Unit 1	500	MORTLK11	VM0P1O	VM0P	0.9866	0.9845
Mortlake Unit 2	500	MORTLK12	VM0P2O	VM0P	0.9866	0.9845
Mortons Lane Wind Farm	66	MLWF1	VTGT4M	VTGT	0.9990	1.0079
Mt Gellibrand Windfarm	66	MTGELWF1	VGTW1M	VGTW	0.9840	0.9850
Mt Mercer Windfarm	220	MERCER01	VELT1M	VELT	0.9457	0.9501
Murra Warra Wind Farm	220	MUWAWF1	VMRT1M	VMRT	0.8590	0.8885
Murray	330	MURRAY	NMUR8	NMUR	0.9855	0.9674
Murray (Geehi Tee off Auxiliary)	330	MURAYNL3	NMURL3	NMUR	0.9855	0.9674
Murray Power Station M1 Auxiliary	330	MURAYNL1	NMURL1	NMUR	0.9855	0.9674
Murray Power Station M2 Auxiliary	330	MURAYNL2	NMURL2	NMUR	0.9855	0.9674
Newport PS	220	NPS	VNPS	VNPS	0.9920	0.9914
Numurkah Solar Farm	66	NUMURSF1	VSHS1N	VSHS	0.9786	0.9945
Oaklands Hill Wind Farm	66	OAKLAND1	VTGT3A	VTGT	0.9990	1.0079
Rubicon Mountain Streams Station	66	RUBICON	VTT21R	VSMT	0.9956	0.9954

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Salt Creek Wind Farm	66	SALTCRK1	VTG61S	VTG6	0.9488	0.9588
Shepparton Waste Gas	66	SHEP1	VSHT2S	VSHT	1.0360	1.0289
Somerton Power Station	66	AGLSOM	VTTS1	VSOM	0.9932	0.9924
Springvale Power Plant	66	SVALE1	VSV22S	VSV2	0.9987	0.9984
Tatura	66	TATURA01	VSHT1	VSHT	1.0360	1.0289
Timboon West Wind Farm	66	TIMWEST	VTGT5T	VTGT	0.9990	1.0079
Toora Wind Farm	66	TOORAWF	VMWT5	VMWT	0.9973	0.9955
Traralgon NSS	66	TGNSS1	VMWT1T	VMWT	0.9973	0.9955
Valley Power Unit 1	500	VPGS1	VLYP07	VLYP	0.9760	0.9760
Valley Power Unit 2	500	VPGS2	VLYP08	VLYP	0.9760	0.9760
Valley Power Unit 3	500	VPGS3	VLYP09	VLYP	0.9760	0.9760
Valley Power Unit 4	500	VPGS4	VLYP010	VLYP	0.9760	0.9760
Valley Power Unit 5	500	VPGS5	VLYP011	VLYP	0.9760	0.9760
Valley Power Unit 6	500	VPGS6	VLYP012	VLYP	0.9760	0.9760
Waubra Wind Farm	220	WAUBRAWF	VWBT1A	VWBT	0.9165	0.9228
Wemen Solar Farm	66	WEMENSF1	VWES2W	VWES	0.8001	0.8096
West Kiewa PS Unit 1	220	WKIEWA1	VWKP1	VWKP	1.0035	1.0024
West Kiewa PS Unit 2	220	WKIEWA2	VWKP2	VWKP	1.0035	1.0024
William Hovell Hydro PS	66	WILLHOV1	VW061W	VGNT	1.0201	1.0274
Wollert Renewable Energy Facility	66	WOLLERT1	VSMT1W	VSMT	0.9956	0.9954
Wonthaggi Wind Farm	66	WONWP	VMWT7	VMWT	0.9973	0.9955
Yallourn W PS 220 Load	220	YWNL1	VYP2L	VYP2	0.9586	0.9549
Yallourn W PS 220 Unit 1	220	YWPS1	VYP21	VYP3	0.9660	0.9660
Yallourn W PS 220 Unit 2	220	YWPS2	VYP22	VYP2	0.9586	0.9549
Yallourn W PS 220 Unit 3	220	YWPS3	VYP23	VYP2	0.9586	0.9549
Yallourn W PS 220 Unit 4	220	YWPS4	VYP24	VYP2	0.9586	0.9549
Yaloak South Wind Farm	66	YSWF1	VBAT4Y	VBAT	0.9681	0.9711
Yambuk Wind Farm	66	YAMBUKWF	VTGT1	VTGT	0.9990	1.0079
Yarrawonga Hydro PS	66	YWNGAHYD	VSHT3Y	VSHT	1.0360	1.0289
Yatpool Solar Farm	66	YATSF1	VRCS2Y	VRCS	0.7939	0.8045
Yawong Wind Farm	66	YAWWF1	VBE62Y	VBE6	0.9981	1.0022
Yendon Wind Farm	66	YENDWF1	VBAW1Y	VBAW	0.9410	0.9474

2.4 South Australia marginal loss factors

Table 12 South Australia loads

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Angas Creek	33	SANC	1.0087	1.0119
Ardrossan West	33	SARW	0.9484	0.9493
Back Callington	11	SBAC	1.0106	1.0139
Baroota	33	SBAR	1.0001	1.0018
Berri	66	SBER	1.0932	1.0932

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Berri (POWERCOR)	66	SBE1	1.0932	1.0932
Blanche	33	SBLA	1.0015	1.0107
Blanche (POWERCOR)	33	SBL1	1.0015	1.0107
Brinkworth	33	SBRK	0.9923	0.9951
Bungama Industrial	33	SBUN	0.9883	0.9908
Bungama Rural	33	SBUR	0.9969	1.0013
City West	66	SACR	1.0065	1.0075
Clare North	33	SCLN	0.9889	0.9922
Dalrymple	33	SDAL	0.9117	0.9141
Davenport	275	SDAV	0.9892	0.9939
Davenport	33	SDAW	0.9903	0.9960
Dorrien	33	SDRN	1.0039	1.0068
East Terrace	66	SETC	1.0016	1.0022
Happy Valley	66	SHVA	1.0045	1.0046
Hummocks	33	SHUM	0.9655	0.9663
Kadina East	33	SKAD	0.9728	0.9738
Kanmantoo	11	SKAN	1.0109	1.0141
Keith	33	SKET	1.0101	1.0165
Kilburn	66	SKLB	1.0006	1.0008
Kincraig	33	SKNC	1.0027	1.0093
Lefevre	66	SLFE	1.0003	1.0003
Leigh Creek South	33	SLCS	1.0310	1.0200
Magill	66	SMAG	1.0037	1.0041
Mannum	33	SMAN	1.0138	1.0162
Mannum – Adelaide Pipeline 1	3.3	SMA1	1.0147	1.0209
Mannum – Adelaide Pipeline 2 – Dual MLF (Generation)	3.3	SMA2	0.9943	1.0185
Mannum – Adelaide Pipeline 2 – Dual MLF (Load)	3.3	SMA2	1.0156	1.0185
Mannum – Adelaide Pipeline 3 – Dual MLF (Generation)	3.3	SMA3	0.9942	1.0183
Mannum – Adelaide Pipeline 3 – Dual MLF (Load)	3.3	SMA3	1.0154	1.0183
Middleback	33	SMDL	1.0024	1.0116
Middleback	132	SMBK	1.0044	1.0106
Millbrook	132	SMLB	1.0024	1.0041
Mobilong	33	SMBL	1.0098	1.0137
Morgan – Whyalla Pipeline 1	3.3	SMW1	1.0105	1.0360
Morgan – Whyalla Pipeline 2	3.3	SMW2	0.9986	1.0191
Morgan – Whyalla Pipeline 3 – Dual MLF (Generation)	3.3	SMW3	0.9940	1.0005
Morgan – Whyalla Pipeline 3– Dual MLF (Load)	3.3	SMW3	0.9968	1.0005
Morgan – Whyalla Pipeline 4	3.3	SMW4	0.9934	0.9944
Morphett Vale East	66	SMVE	1.0044	1.0050
Mount Barker South	66	SMBS	1.0050	1.0061

Location	Voltage [kV]	TNI code	2021/22 MLF	2020/21 MLF
Mt Barker	66	SMBA	1.0039	1.0053
Mt Gambier	33	SMGA	1.0042	1.0134
Mt Gunson South	132	SMGS	0.9999	1.1561
Mt Gunson	33	SMGU	0.9977	1.0121
Munno Para	66	SMUP	0.9995	1.0000
Murray Bridge – Hahndorf Pipeline 1	11	SMH1	1.0136	1.0158
Murray Bridge – Hahndorf Pipeline 2	11	SMH2	1.0252	1.0172
Murray Bridge – Hahndorf Pipeline 3	11	SMH3	1.0133	1.0150
Neuroodla	33	SNEU	1.0103	1.0102
New Osborne	66	SNBN	1.0003	1.0005
North West Bend	66	SNWB	1.0249	1.0402
Northfield	66	SNFD	1.0023	1.0027
Para	66	SPAR	1.0003	1.0016
Parafield Gardens West	66	SPGW	1.0011	1.0012
Penola West 33	33	SPEN	0.9949	1.0016
Pimba	132	SPMB	1.0043	1.0176
Playford	132	SPAA	0.9877	0.9923
Port Lincoln	33	SPLN	0.9895	0.9851
Port Pirie	33	SPPR	0.9933	0.9983
Roseworthy	11	SRSW	1.0075	1.0109
Snuggery Industrial - (Generation)	33	SSNN	0.9923	0.9723
Snuggery Industrial – (Load)	33	SSNN	0.9923	0.9723
Snuggery Rural	33	SSNR	0.9789	0.9859
South Australian VTN		SJP1	1.0016	1.0045
Stony Point	11	SSPN	0.9950	0.9997
Tailem Bend	33	STAL	1.0108	1.0127
Templers	33	STEM	1.0020	1.0048
Torrens Island	66	STSY	1.0000	1.0000
Waterloo	33	SWAT	0.9824	0.9864
Whyalla Central Substation	33	SWYC	0.9951	0.9994
Whyalla Terminal BHP	33	SBHP	0.9948	1.0004
Woomera	132	SWMA	1.0008	1.0169
Wudina	66	SWUD	1.0029	1.0055
Yadnarie	66	SYAD	0.9896	0.9913

Table 13 South Australia generation

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Angaston Power Station	33	ANGAST1	SDRN1	SANG	1.0079	1.0079
Barker Inlet PS	275	BARKIPS1	SBPS1B	SBPS	0.9995	0.9998
Bolivar WWT Plant	66	BOLIVAR1	SPGW1B	SPGW	1.0011	1.0012
Bungala One Solar Farm	132	BNGSF1	SBEM1B	SBEM	0.9685	0.9744
Bungala Two Solar Farm	132	BNGSF2	SBEM2B	SBEM	0.9685	0.9744

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Canunda Wind Farm	33	CNUNDAWF	SSNN1	SCND	0.9599	0.9702
Cathedral Rocks Wind Farm	132	CATHROCK	SCRK	SCRK	0.9324	0.9324
Clements Gap Wind Farm	132	CLEMGPWF	SCGW1P	SCGW	0.9578	0.9597
Cummins Lonsdale PS	66	LONSDALE	SMVE1	SMVE	1.0044	1.0050
Dalrymple North BESS (Generation)	33	DALNTH01	SDAN1D	SDAM	0.9006	0.9193
Dalrymple North BESS (Load)	33	DALNTHL1	SDAN2D	SDAN	0.9474	0.9249
Dry Creek PS Unit 1	66	DRYCGT1	SDCA1	SDPS	0.9989	1.0011
Dry Creek PS Unit 2	66	DRYCGT2	SDCA2	SDPS	0.9989	1.0011
Dry Creek PS Unit 3	66	DRYCGT3	SDCA3	SDPS	0.9989	1.0011
Hallet 2 Wind Farm	275	HALLWF2	SMOK1H	SMOK	0.9706	0.9710
Hallett 1 Wind Farm	275	HALLWF1	SHPS2W	SHPS	0.9689	0.9666
Hallett PS	275	AGLHAL	SHPS1	SHPS	0.9689	0.9666
Hornsdale Battery (Generation)	275	HPRG1	SMTL1H	SMTL	0.9633	0.9838
Hornsdale Battery (Load)	275	HPRL1	SMTL2H	SMTL	0.9780	0.9790
Hornsdale Wind Farm Stage 1	275	HDWF1	SHDW1H	SHDW	0.9612	0.9595
Hornsdale Wind Farm Stage 2	275	HDWF2	SHDW2H	SHDW	0.9612	0.9595
Hornsdale Wind Farm Stage 3	275	HDWF3	SHDW3H	SHDW	0.9612	0.9595
Ladbroke Grove PS Unit 1	132	LADBROK1	SPEW1	SPEW	0.9718	0.9685
Ladbroke Grove PS Unit 2	132	LADBROK2	SPEW2	SPEW	0.9718	0.9685
Lake Bonney BESS - Generation	33	LBBG1	SLBB1L	SLBB	0.9741	0.9741
Lake Bonney BESS - Load	33	LBBL1	SLBB2L	SLBB	0.9925	0.9925
Lake Bonney Wind Farm	33	LKBONNY1	SMAY1	SMAY	0.9472	0.9587
Lake Bonney Wind Farm Stage 2	33	LKBONNY2	SMAY2	SMAY	0.9472	0.9587
Lake Bonney Wind Farm Stage 3	33	LKBONNY3	SMAY3W	SMAY	0.9472	0.9587
Lincoln Gap Wind Farm	275	LGAPWF1	SLGW1L	SLGW	0.9734	0.9779
Mintaro PS	132	MINTARO	SMPS	SMPS	0.9837	0.9907
Morgan – Whyalla Solar Farm 3 – Dual MLF (Generation)	3.3	MWPS3PV1	SMW31M	SMW3	0.9940	1.0005
Morgan – Whyalla Solar Farm 3 – Dual MLF (Load)	3.3	MWPS3PV1	SMW31M	SMW3	0.9968	1.0005
Morphett Vale East 66	66	SATGS1	SMVG1L	SMVG	1.0039	0.9972
Mt Millar Wind Farm	33	MTMILLAR	SMTM1	SMTM	0.9351	0.9355
North Brown Hill Wind Farm	275	NBHWF1	SBEL1A	SBEL	0.9653	0.9661
O.C.P.L. Unit 1	66	OSB-AG	SNBN1	SOCP	0.9998	0.9998
Para 66	66	SATGN1	SPAG1E	SPAG	0.9990	0.9963
Pelican Point PS	275	PPCCGT	SPPT	SPPT	0.9987	0.9987
Port Lincoln 3	33	POR03	SPL31P	SPL3	0.9789	0.9916
Port Lincoln PS	132	POR01	SPLN1	SPTL	0.9784	0.9886
Pt Stanvac PS	66	PTSTAN1	SMVE3P	SMVE	1.0044	1.0050
Quarantine PS Unit 1	66	QPS1	SQPS1	SQPS	0.9858	0.9854
Quarantine PS Unit 2	66	QPS2	SQPS2	SQPS	0.9858	0.9854
Quarantine PS Unit 3	66	QPS3	SQPS3	SQPS	0.9858	0.9854
Quarantine PS Unit 4	66	QPS4	SQPS4	SQPS	0.9858	0.9854
Quarantine PS Unit 5	66	QPS5	SQPS5Q	SQPS	0.9858	0.9854

Generator	Voltage [kV]	DUID	Connection Point ID	TNI code	2021/22 MLF	2020/21 MLF
Snowtown Wind Farm	33	SNOWTWN1	SNWF1T	SNWF	0.9171	0.9165
Snowtown Wind Farm Stage 2 – North	275	SNOWNTH1	SBLWS1	SBLW	0.9704	0.9717
Snowtown Wind Farm Stage 2 – South	275	SNOWSTH1	SBLWS2	SBLW	0.9704	0.9717
Snuggery PS Units 1 to 3	132	SNUG1	SSGA1	SSPS	0.9727	0.9518
Starfish Hill Wind Farm	66	STARHLWF	SMVE2	SMVE	1.0044	1.0050
Tailem Bend Solar Farm	132	TBSF1	STBS1T	STBS	0.9988	1.0013
Tatiara Meat Co	33	TATIARA1	SKET1E	SKET	1.0101	1.0165
The Bluff wind Farm	275	BLUFF1	SBEL2P	SBEL	0.9653	0.9661
Torrens Island PS A Unit 1	275	TORRA1	STSA1	STPS	0.9997	0.9998
Torrens Island PS A Unit 2	275	TORRA2	STSA2	STPS	0.9997	0.9998
Torrens Island PS A Unit 3	275	TORRA3	STSA3	STPS	0.9997	0.9998
Torrens Island PS A Unit 4	275	TORRA4	STSA4	STPS	0.9997	0.9998
Torrens Island PS B Unit 1	275	TORRB1	STSB1	STPS	0.9997	0.9998
Torrens Island PS B Unit 2	275	TORRB2	STSB2	STPS	0.9997	0.9998
Torrens Island PS B Unit 3	275	TORRB3	STSB3	STPS	0.9997	0.9998
Torrens Island PS B Unit 4	275	TORRB4	STSB4	STPS	0.9997	0.9998
Torrens Island PS Load	66	TORNL1	STSYL	STSY	1.0000	1.0000
Waterloo Wind Farm	132	WATERLWF	SWLE1R	SWLE	0.9638	0.9665
Wattle Point Wind Farm	132	WPWF	SSYP1	SSYP	0.8146	0.8200
Willogoleche Wind Farm	275	WGWF1	SWGL1W	SWGL	0.9675	0.9693
Wingfield 1 LFG PS	66	WINGF1_1	SKLB1W	SKLB	1.0006	1.0008
Wingfield 2 LFG PS	66	WINGF2_1	SNBN2W	SNBN	1.0003	1.0005

2.5 Tasmania marginal loss factors

Table 14 Tasmania loads

Location	Voltage (kV)	TNI code	2021-22 MLF	2020-21 MLF
Arthurs Lake	6.6	TAL2	0.9786	0.9703
Avoca	22	TAV2	1.0025	0.9982
Boyer SWA	6.6	TBYA	0.9962	1.0081
Boyer SWB	6.6	TBYB	1.0050	1.0174
Bridgewater	11	TBW2	1.0087	1.0219
Burnie	22	TBU3	0.9754	0.9786
Chapel St.	11	TCS3	0.9941	1.0085
Comalco	220	TCO1	1.0006	1.0006
Creek Road	33	TCR2	0.9948	1.0092
Derby	22	TDE2	0.9455	0.9527
Derwent Bridge	22	TDB2	0.9109	0.9155
Devonport	22	TDP2	0.9773	0.9824
Electrona	11	TEL2	1.0086	1.0239
Emu Bay	11	TEB2	0.9720	0.9761
Fisher (Rowallan)	220	TFI1	0.9558	0.9587

Location	Voltage (kV)	TNI code	2021-22 MLF	2020-21 MLF
George Town	22	TGT3	1.0022	1.0018
George Town (Basslink)	220	TGT1	1.0000	1.0000
Gordon	22	TGO2	0.9668	0.9859
Greater Hobart Area VTN		TVN1	0.9965	1.0106
Hadspen	22	THA3	0.9875	0.9893
Hampshire	110	THM2	0.9715	0.9750
Huon River	11	THR2	1.0108	1.0256
Kermandie	11	TKE2	1.0117	1.0310
Kingston	33	TK13	1.0001	1.0145
Kingston	11	TKI2	1.0042	1.0198
Knights Road	11	TKR2	1.0111	1.0265
Lindisfarne	33	TLF2	0.9979	1.0110
Meadowbank	22	TMB2	0.9793	0.9913
Mornington	33	TMT2	0.9988	1.0125
Mowbray	22	TMY2	0.9870	0.9885
New Norfolk	22	TNN2	0.9910	1.0043
Newton	22	TNT2	0.9509	0.9633
Newton	11	TNT3	0.9249	0.9454
North Hobart	11	TNH2	0.9938	1.0077
Norwood	22	TNW2	0.9859	0.9873
Palmerston	22	TPM3	0.9717	0.9714
Port Latta	22	TPL2	0.9452	0.9479
Que	22	TQU2	0.9605	0.9746
Queenstown	11	TQT3	0.9431	0.9484
Queenstown	22	TQT2	0.9425	0.9517
Railton	22	TRA2	0.9771	0.9829
Risdon	33	TRI4	0.9980	1.0120
Risdon	11	TRI3	0.9992	1.0142
Rokeby	11	TRK2	1.0026	1.0163
Rosebery	44	TRB2	0.9496	0.9611
Savage River	22	TSR2	0.9848	0.9942
Scottsdale	22	TSD2	0.9612	0.9649
Smithton	22	TST2	0.9301	0.9326
Sorell	22	TSO2	1.0177	1.0306
St Leonard	22	TSL2	0.9858	0.9878
St. Marys	22	TSM2	1.0163	1.0175
Starwood	110	TSW1	1.0010	1.0007
Tamar Region VTN		TVN2	0.9884	0.9899
Temco	110	TTE1	1.0032	0.9998
Trevallyn	22	TTR2	0.9878	0.9891
Triabunna	22	TTB2	1.0241	1.0387
Tungatinah	22	TTU2	0.9135	0.9191
Ulverstone	22	TUL2	0.9749	0.9779
Waddamana	22	TWA2	0.9351	0.9354

Location	Voltage (kV)	TNI code	2021-22 MLF	2020-21 MLF
Wayatinah	11	TWY2	0.9768	0.9865
Wesley Vale	22	TWV2	0.9740	0.9794

Table 15 Tasmania generation

Generator description	Voltage [kV]	DUID	Connection Point ID	TNI code	2021-22 MLF	2020-21 MLF
Basslink (George Town)	220	BLNKTAS	TGT11	TGT1	1.0000	1.0000
Bastyan	220	BASTYAN	TFA11	TFA1	0.9283	0.9301
Bell Bay No.3	110	BBTHREE1	TBB11	TBB1	0.9987	0.9975
Bell Bay No.3	110	BBTHREE2	TBB12	TBB1	0.9987	0.9975
Bell Bay No.3	110	BBTHREE3	TBB13	TBB1	0.9987	0.9975
Bluff Point and Studland Bay Wind Farms	110	WOOLNTH1	TST11	TST1	0.8776	0.8777
Butlers Gorge	110	BUTLERSG	TBG11	TBG1	0.9046	0.9101
Catagunya	220	LI_WY_CA	TLI11	TLI1	0.9750	0.9817
Cethana	220	CETHANA	TCE11	TCE1	0.9499	0.9545
Cluny	220	CLUNY	TCL11	TCL1	0.9759	0.9855
Devils gate	110	DEVILS_G	TDG11	TDG1	0.9566	0.9618
Fisher	220	FISHER	TFI11	TFI1	0.9558	0.9587
Gordon	220	GORDON	TGO11	TGO1	0.9236	0.9491
Granville Harbour Wind Farm	220	GRANWF1	TGH11G	TGH1	0.9298	0.9408
John Butters	220	JBUTTERS	TJB11	TJB1	0.9258	0.9230
Lake Echo	110	LK_ECHO	TLE11	TLE1	0.9208	0.9173
Lemonthyme	220	LEM_WIL	TSH11	TSH1	0.9601	0.9626
Liapootah	220	LI_WY_CA	TLI11	TLI1	0.9750	0.9817
Mackintosh	110	MACKNTSH	TMA11	TMA1	0.9159	0.9178
Meadowbank	110	MEADOWBK	TMB11	TMB1	0.9781	0.9773
Midlands PS	22	MIDLDPS1	TAV21M	TAV2	1.0025	0.9982
Musselroe	110	MUSSELR1	TDE11M	TDE1	0.8981	0.9024
Paloona	110	PALOONA	TPA11	TPA1	0.9581	0.9604
Poatina	220	POAT220	TPM11	TPM1	0.9661	0.9715
Poatina	110	POAT110	TPM21	TPM2	0.9491	0.9561
Reece No.1	220	REECE1	TRCA1	TRCA	0.9189	0.9202
Reece No.2	220	REECE2	TRCB1	TRCB	0.9142	0.9183
Remount	22	REMOUNT	TMY21	TVN2	0.9884	0.9899
Repulse	220	REPULSE	TCL12	TCL1	0.9759	0.9855
Rowallan	220	ROWALLAN	TFI12	TFI1	0.9558	0.9587
Tamar Valley CCGT	220	TVCC201	TTV11A	TTV1	1.0000	1.0000
Tamar Valley OCGT	110	TVPP104	TBB14A	TBB1	0.9987	0.9975
Tarraleah	110	TARRALEA	TTA11	TTA1	0.9102	0.9167
Trevallyn	110	TREVALLN	TTR11	TTR1	0.9824	0.9805
Tribute	220	TRIBUTE	TTI11	TTI1	0.9127	0.9183
Tungatinah	110	TUNGATIN	TTU11	TTU1	0.8850	0.8920
Wayatinah	220	LI_WY_CA	TLI11	TLI1	0.9750	0.9817

Generator description	Voltage [kV]	DUID	Connection Point ID	TNI code	2021-22 MLF	2020-21 MLF
Wild Cattle Hill Wind Farm	220	CTHLWF1	TWC11C	TWC1	0.9769	0.9850
Wilmot	220	LEM_WIL	TSH11	TSH1	0.9601	0.9626

3. Changes in marginal loss factors

Year-on-year changes in MLFs are driven by projected changes in the NEM. These changes fall into two main categories:

1. Changes to projected power flows over the transmission network that are caused by projected changes to power system demand and generation, including power stations being built or retired, and revised electricity consumption forecasts.

   If the projected power flow from a connection point to the regional reference node (RRN) increases, then the MLF for that connection point will decrease. If the projected power flow from a connection point to the RRN decreases, then the MLF for that connection point will increase.

2. Changes to the impedance of the transmission network caused by augmentation of the transmission network, such as building new transmission lines.

   If augmentations decrease the impedance of the transmission network between a connection point and the RRN, then the MLF for the connection point will move closer to 1.0.

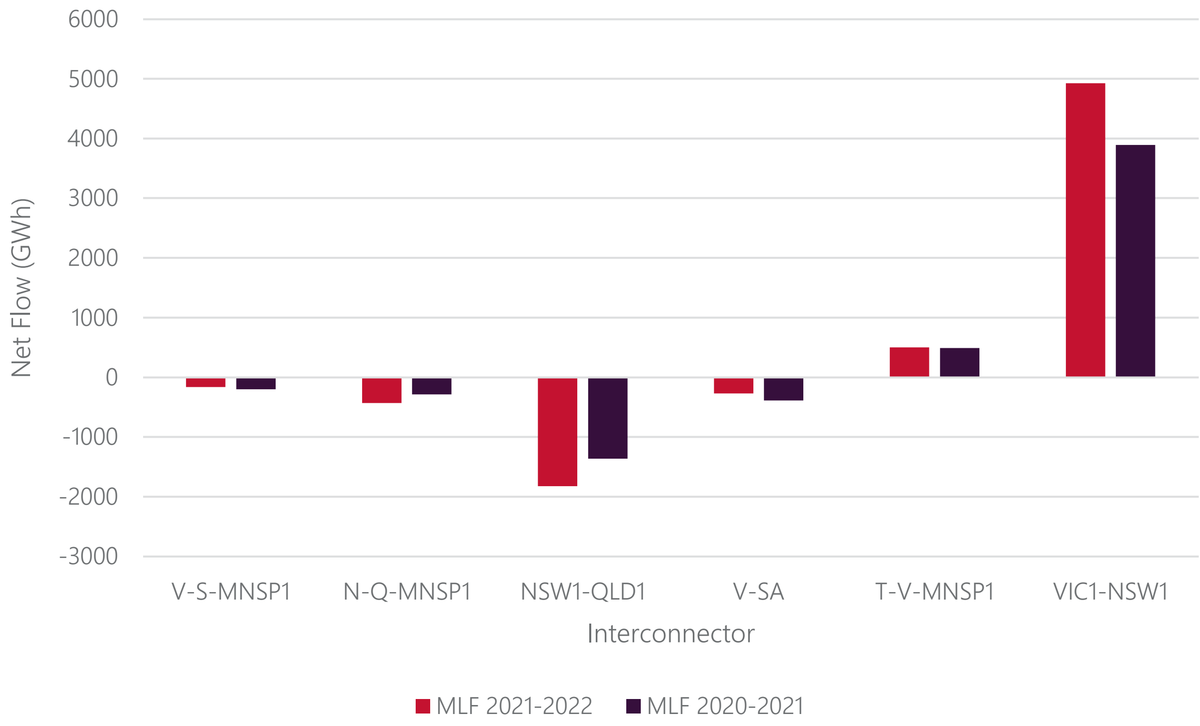
Changes between the 2020-21 MLF study and the 2021-22 preliminary MLF study are primarily driven by changes in projected power flow over the transmission network. Currently, there are 18 new committed generation projects expected in the 2021-22 FY that were not modelled in the 2020-21 MLF study. These projects have a combined capacity of 1204 megawatts (MW), compared to 21 new projects with a capacity of 2,694 MW modelled in the 2020-21 MLF study.

The number of committed projects in the 2021-22 FY may increase in future updates to the Generation Information page (refer to Table 2 for further detail). If these projects are of large volumes and located in remote areas, MLFs can be expected to drop further.

The following sections discuss MLF changes from 2020-21 to the preliminary results for 2021-22 for each NEM region. Each section includes a table for individual NEM regions detailing volume weighted MLF movements for generation and load, as well as a map with connection points as circles with colour coding to indicate the MLF changes.

Figure 2 shows the interconnector flows for the 2020-21 MLF study and the preliminary 2021-22 MLF study. The material movements in flows between the two studies are largely driven by variations in generation patterns.

Figure 2 2020-21/2021-22 MLF Interconnector Net Flow



3.1 Changes in Queensland

3.1.1 Summary

Figure 3 shows a visualisation of the changes in MLFs from the 2020-21 MLF study to the preliminary 2021-22 MLF study within the Queensland region.

Despite a material increase in southerly flows from Queensland to New South Wales, the primary driver of MLF variations within Queensland has been local generation within the south-west and the impact on intra-regional flows. This has resulted in MLF variations that are largely the opposite of what would be expected given the inter-regional flows alone.

Table 16 shows that MLFs through central and north Queensland have generally increased since 2020-21. North Queensland has seen average increases of 2.51% for load and 7.39% for generation. Central Queensland has seen average increases of 1.42% for load and 1.63% for generation.

The increases in MLFs are largely being driven by a reduction in output of large scheduled generators within central Queensland and a large increase in the level of semi-scheduled generation in south-west Queensland, Victoria and New South Wales. This has led to a reduction of southerly flows between central Queensland and the RRN and in turn an increase in MLFs within central and north Queensland.

Despite a material increase in exports to New South Wales, MLFs in south-west and south-east Queensland have decreased.These reductions have been driven by increased generation in south-west Queensland, which has more than offset the local impact of the increased exports to New South Wales.

3.1.2 Export/import changes

Exports to New South Wales are higher than those in the 2020-21 MLF study, with a net increase of 602 GWh for the preliminary 2021-22 MLF study.

Figure 3 Queensland preliminary 2021-22 MLF heat map

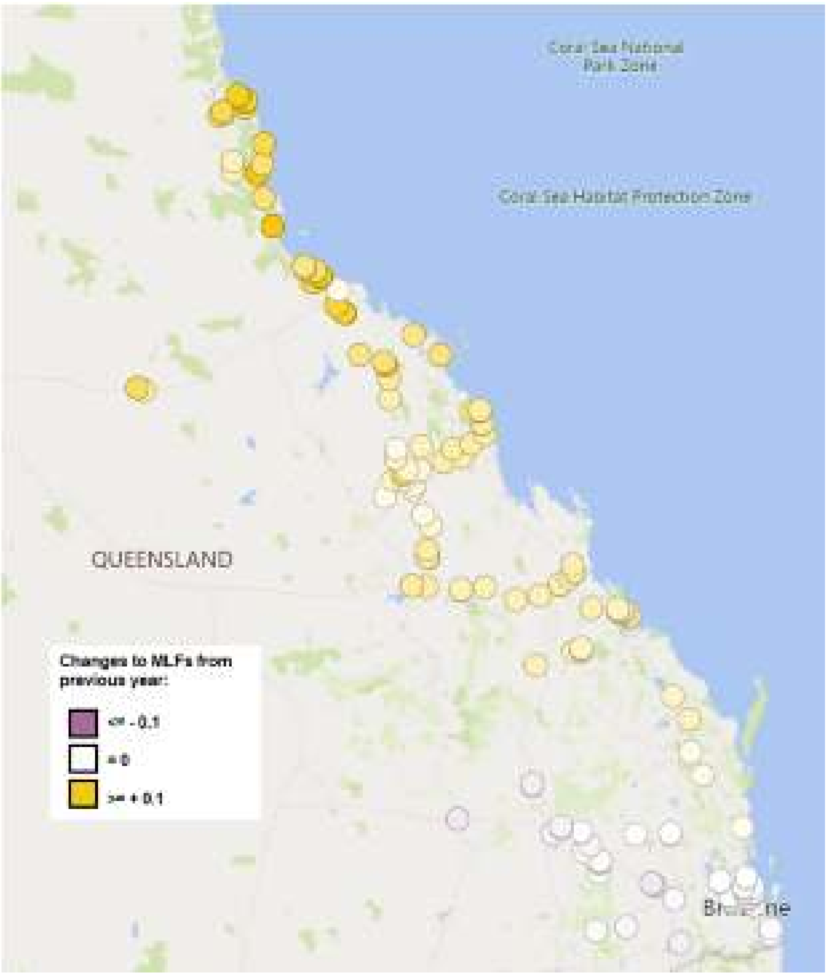


Table 16 Queensland preliminary 2021-22 MLF changes

Area	MLF Average Difference (%) 20-21 versus 21-22	
	Gen	**Load**
North Queensland	7.39%	2.51%
Central Queensland	1.63%	1.42%
South-east Queensland	-0.08%	-0.12%
South-west Queensland	-0.31%	-0.35%

3.2 Changes in New South Wales

3.2.1 Summary

The primary drivers of change are variations in imports from both Victoria and Queensland as well as an increase in remote generation.

Figure 4 shows a visualisation of the MLFs changes between the 2020-21 MLF study and the preliminary 2021-22 MLF study within the New South Wales region.

Table 17 shows that on average MLFs across almost all of NSW with the exception of Hunter have decreased. These reductions are by and large the combined results of increased imports from both Victoria and Queensland as well as a material increase in generation in west and south-west New South Wales.

The increase within the Hunter region are the result of a material reduction of scheduled generation within these areas, the reduction is partially the result of the commencement of the partial closure of Lidell power station. The reductions in scheduled generation have more than offset the impact of the increased flows from Queensland leading to minor increased in MLF outcomes.

South-west New South Wales has again seen the largest reductions in the region, compounded by both an increase in imports from Victoria and an increase in generation capacity within the area and in particular west New South Wales. The average reductions in south-west New South Wales is 2.76% for load and 3.66% for generation.

It is expected that if further generation (except for storage) were to connect in south-west and/or west New South Wales, the MLFs in these areas would see further declines. Given the historical sensitivity of the areas, it is expected that any reductions resulting from increased generation capacity would be more severe than if located in other locations in the NEM.

3.2.2 Export/import changes

For the 2021-22 preliminary MLF study imports from Queensland have increased, with a net increase of 602 GWh when compared with the 2020-21 MLF study. Imports from Victoria have increased by 1,033 GWh when compared with the 2020-21 MLF study.

Figure 4 New South Wales preliminary 2021-22 MLF heat map

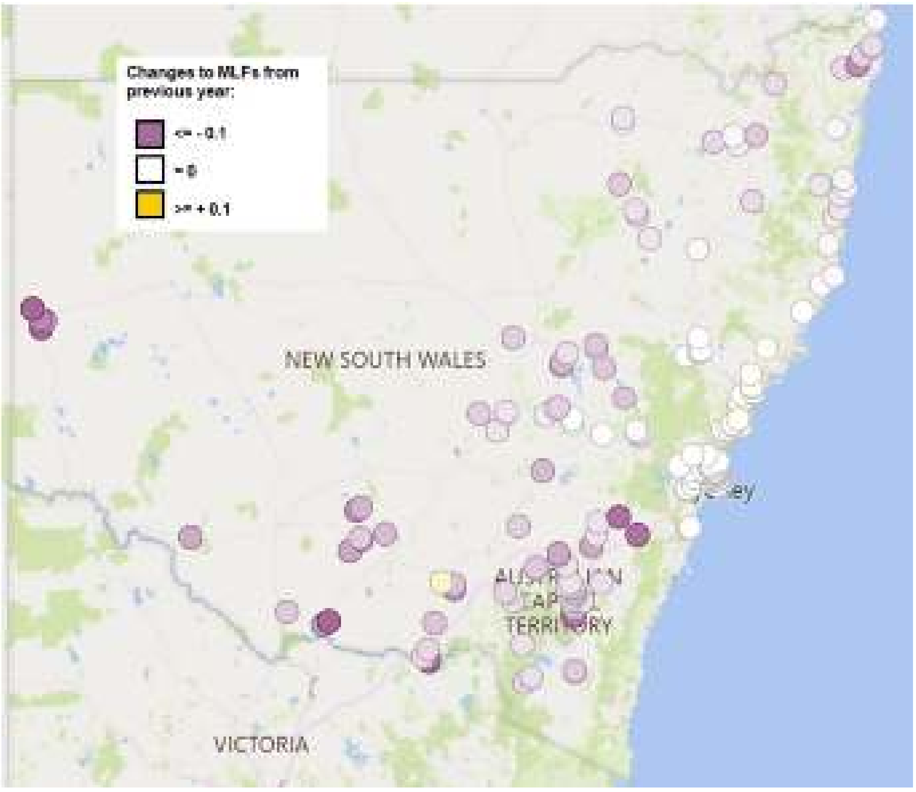


Table 17 New South Wales preliminary 2021-22 MLF changes

Area	MLF Average Difference (%) 20-21 versus 21-22	
	Gen	Load
North New South Wales	-0.41%	-0.99%
Hunter Valley	0.09%	0.20%
Sydney	-1.23%	-0.07%
West New South Wales	-1.85%	-0.80%
Australian Capital Territory	-1.82%	-1.59%
Snowy	-2.04%	-1.22%
South-west New South Wales	-3.66%	-2.76%

3.3 Changes in Victoria

3.3.1 Summary

The primary drivers of change in Victoria are an increase in exports to New South Wales and an increase in remote generation.

Figure 5 shows a visualisation of the changes in MLFs between the results of the 2020-21 MLF study and the preliminary 2021-22 MLF study within the Victoria region.

Table 18 shows that despite a strong increase in flows from Victoria to New South Wales, and a reduction in flows from South Australia to Victoria. MLFs in north-west Victoria have continued to decline, with an average reduction of 1.29% for load and 1.91 for generation%.

While the generators in the north-west Victoria were included for the 2020-21 MLF study, a large portion were only partially operational. For the preliminary 2021-22 MLF study, these generators are forecast to be commercially operational for the entire financial year, resulting in significantly increased generation levels in the area.

North Victoria has seen marginal increases to MLFs of 0.26% for load and 0.11% for generation. Despite there being a forecast increase in generation within north Victoria, the increase in exports to New South Wales has offset the impact of the increased generation.

3.3.2 Export/import changes

For the 2021-22 preliminary MLF study imports from South Australia have decreased, with a net reduction of 157 GWh when compared with the 2020-21 MLF study. Imports from Tasmania have increased by 8 GWh when compared to the 2020-21 MLF study. Exports to New South Wales have increased by 1,033 GWh when compared to the 2020-21 MLF study.

Figure 5 Victoria preliminary 2021-22 MLF heat map

Table 18 Victoria preliminary 2021-22 MLF changes

Area	MLF Average Difference (%) 20-20 versus 21-22	
	Gen	Load
North Victoria	0.11%	0.26%
North-west Victoria	-1.91%	-1.29%
Central Victoria	-1.34%	-0.64%
Melbourne	0.08%	0.00%
West Victoria	-0.25%	-0.32%
Latrobe Valley	0.10%	0.06%

3.4 Changes in South Australia

3.4.1 Summary

Figure 6 shows a visualisation of the changes in MLFs between the results of the 2020-21 MLF study and the preliminary 2021-22 MLF study within the South Australian region.

Table 19 shows that the Riverland area has seen a material decrease in MLFs and that south-east South Australia has seen a material increase for generation. These reductions are due to both decreased exports to Victoria and an increase in local behind the meter generation.

The increase in generation MLFs in south-east South Australia is related to a single TNI with a low net energy balance (NEB) which is leading to a distorted outcome. As per the FLLF methodology review, the threshold for application of a dual MLF is anticipated to change and this MLF is likely to have a sperate MLFs applied for imports and exports.

3.4.2 Export/import changes

For the preliminary 2021-22 MLF study exports to Victoria have decreased, with a net reduction of 157 GWh when compared to the 2020-21 MLF study.

Figure 6 South Australia preliminary 2021-22 MLF heat map

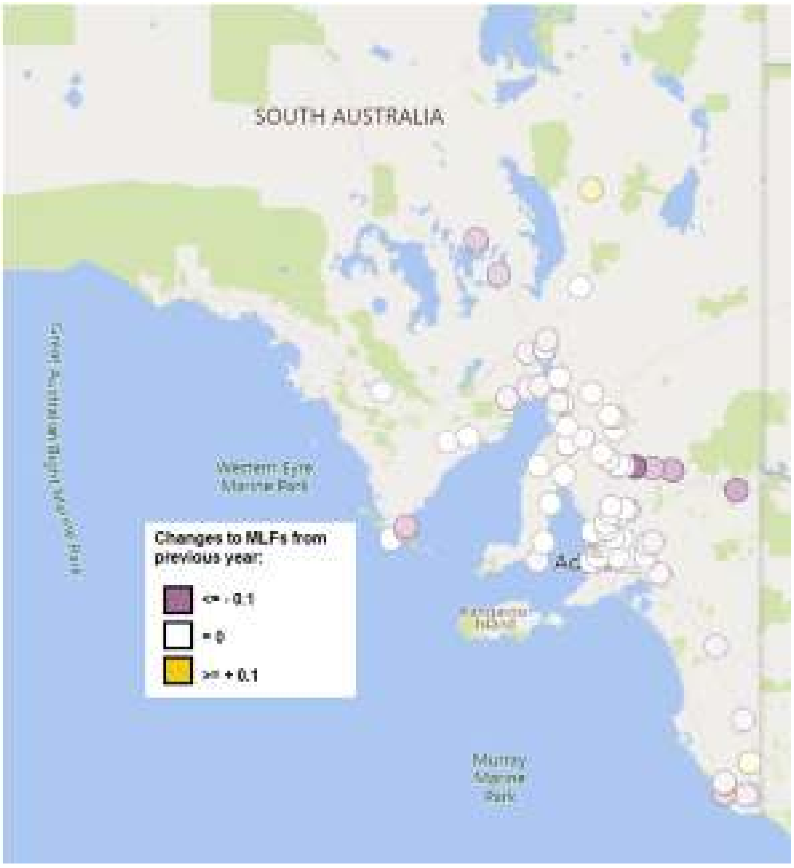


Table 19 South Australia preliminary 2021-22 MLF changes

Area	MLF Average Difference (%) 19-20 versus 20-21	
	Gen	**Load**
North South Australia	-0.46%	-0.33%
Riverland	N/A	-2.38%
Adelaide	-0.06%	-0.07%
South-east South Australia	2.94%	-0.56%

3.5 Changes in Tasmania

3.5.1 Summary

Tasmania has seen reductions in MLFs across almost all TNIs.

Figure 7 shows a visualisation of the changes in MLFs between the results of the 2020-21 MLF study and the preliminary 2021-22 MLF study within the Tasmanian region.

Table 20 shows MLF reductions across the majority of Tasmania, as exports have largely remained unchanged these reductions are largely due to an increase in remote generation and a reduction of generation in close proximity to the RRN.

3.5.2 Import/export change

For the preliminary 2021-22 MLF study exports to Victoria have increased by 8 GWh when compared to the 2020-21 MLF study.

Figure 7 Tasmania preliminary 2021-22 MLF heat map

Table 20 Tasmania preliminary 2021-22 MLF changes

Area	MLF Average Difference (%) 19-20 versus 20-21	
	Gen	Load
Georgetown	0.12%	0.10%
North-west Tasmania	-0.31%	-0.40%
North Tasmania	-0.39%	-0.07%
West coast Tasmania	-0.35%	-1.22%
South Tasmania	-0.76%	-1.28%

A1. Methodology, inputs, and assumptions

This section outlines the principles underlying the MLF calculation, the 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.

A1.1 Marginal loss factors calculation methodology

AEMO uses a forward-looking loss factor (FLLF) methodology (Methodology)[9] 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.

A1.2 Generation data requirements for the preliminary marginal loss factors calculation

AEMO obtains historical 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 2019 to 30 June 2020 from its settlement/metering databases.

AEMO also obtains the following data:

- Generation capacity data from the Generation Information page publication in July 2020.
- Historical generation output and 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 input data, as a trigger for review of forecast outages and where significant incorporating them into the relevant generator profiles.

A1.2.1 New generating units

To calculate the preliminary 2021-22 MLFs, AEMO included the following new projects (not yet registered):

- Queensland – Gangarri Solar Farm, Kennedy Energy Park (solar, wind and storage), and Middlemount Sun Farm.

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[9] Forward Looking Transmission Loss Factors (Version 7), at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Loss_Factors_and_Regional_Boundaries/2017/Forward-Looking-Loss-Factor-Methodology-v70.pdf.

- New South Wales – Jemalong Solar Project, Biala Wind Farm, Corowa Solar Farm, Junee Solar Farm, Wagga North Solar Farm and Bango 973 Wind Farm.
- Victoria – Berrybank Wind Farm, Murra Warra Wind Farm – stage 2, Cohuna Solar Farm, Glenrowan West Sun Farm, Stockyard Hill, and Winton Solar Farm.
- South Australia – Adelaide Desalination Plant – stage 1 and stage 2 PV, Murray Bridge – Onkaparinga Pipeline Pump 2 PV, Happy Valley Reservoir Reserve PV, Bolivar Wastewater Treatment Plant Reserve PV, Morgan – Whyalla Pipeline 1, 2 and 4 PV, Christies Beach Wastewater Treatment Reserve PV, and Mannum Adelaide Pumping Station No 2 and 3 PV.

A1.3 Network representation in the preliminary 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 kilovolt (kV) and 500 kV networks to ensure they reflect normal operating conditions.

For the 2021-22 preliminary MLF calculation, AEMO used the same network model that was used to calculate the 2020-21 MLFs. For the final MLFs to be published by 1 April 2021, a revised network model will be used incorporating the committed network augmentations for the target financial year.

A1.3.1 Network augmentation for 2020-21

Relevant Transmission Network Service Providers (TNSPs) advised of the following network augmentations in 2020-21.

Queensland network augmentations

Powerlink provided the following list of planned network augmentations in 2020-21 in Queensland:

- Decommissioning of Loganlea 110/33 kV transformer (T2).
- Retirement of Cairns 132/22 transformer (T4) including its 132 kV series reactor and line.
- CP02371 H010 Bouldercombe – 275/132/19.1 Transformer 1 and 2 replacement.

New South Wales network augmentations

New South Wales NSPs provided the following list of planned network augmentations in 2020-21 in New South Wales:

- Decommissioning of Upper Tumut – Canberra 330 kV line.
- Installation of Upper Tumut – Stockdill 330 kV.
- Installation of new Stockdill – Canberra 330 kV line.
- Decommissioning of Canberra – Williamsdale 330 kV line.
- Installation of new Stockdill – Williamsdale 330 kV line.
- Decommissioning of Canberra – Woden 132 kV line.
- Installation of new Canberra – Stockdill 132 kV line.
- Installation of new Stockdill – West Belconnen 132 kV line.
- Installation of new West Belconnen – Woden 132 kV line.

- Installation of new Stockdill 330/132 kV transformer.
- New Greenacre 132/11 kV zone substation and decommission 132 kV feeders 291/1 and 292.
- New Strathfield South 132/11 kV zone substation (Looping into feeder 911).
- Replace 132 kV feeders 282/1 and 283/1 between Sydney South and Revesby.
- 132 kV Feeder 957/3 Uprate (Vales Point to Tee).
- New Morisset Annex 132/33 kV STS.

Victoria network augmentations

AEMO's Victorian Planning Group provided the following list of planned network augmentations in 2020-21 in Victoria:

- FBTS Redevelopment B4 – Replacing the B4 transformer.
- ERTS Redevelopment B3 – Replacing B3 220/66kV transformer.

South Australia network augmentations

ElectraNet provided the following list of planned network augmentations in 2020-21 in South Australia:

- Para – Robertstown 275 kV Line – Re-insulation.
- Para – Munno Para 275 kV Line – Re-insulation.
- TIPS – New Osborne No. 3 and No. 4, 66 kV Line – Re-insulation.
- Waterloo – Mintaro 132 kV line – Re-insulation.
- Davenport – Leigh Creek 132 kV Line – Re-insulation.
- Eyre Peninsula Transmission Supply – Replace placement of existing 132 kV line from Cultuna to Port Lincoln with a new double circuit 132 kV line.
- Davenport Main Grid System Strength Support – two new synchronous condensers.
- Construction of a new 275 kV line from Davenport to Mount Gunson South and a 132 kV line from Mount Gunson South to Prominent Hill (configuration to be confirmed).
- Robertstown Main Grid System Strength Support – two new synchronous condensers.
- Decommissioning of Cherry Garden – Tailem Bend 275kV.
- Installation of Cherry Garden – Tungkillo 275 kV.
- Installation of Tungkillo – Tailem Bend 275 kV.

Tasmania network augmentations

TasNetworks provided the following list of planned network augmentations in 2020-21 in Tasmania:

- Upgrading of Port Latta Substation.
- Upgrading of Sheffield Substation.

A1.3.2 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.

The inter-regional loss factor equation for the Basslink will be published by 1 April 2021.

A1.3.3 Treatment of Terranora interconnector

The Terranora interconnector is a regulated interconnector.

The boundary between Queensland and New South Wales 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.

The inter-regional loss factor equation for the Terranora will be published by 1 April 2021.

A1.3.4 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.

The inter-regional loss factor equation for the Murraylink will be published by 1 April 2021.

A1.3.5 Treatment of Yallourn unit 1

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

A1.4 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 as to whether there were any additional factors that might influence these limits.

To calculate the preliminary 2021-22 MLFs, AEMO has used the interconnector limits used for the 2020-21 MLF study, shown in Table 19. The limits will be reviewed and adjusted if necessary, prior to the final calculation of the 2021-22 MLFs.

Table 21 Nominal interconnector limits

From region	To region	Summer peak (MW)	Summer off-peak (MW)	Winter peak (MW)	Winter off-peak (MW)
Queensland	NSW	1,078	1,078	1,078	1,078
New South Wales	Queensland	400	550	400	550
New South Wales	Victoria	1,700 minus Murray Generation	1,700 minus Murray Generation	1,700 minus Murray Generation	1,700 minus Murray Generation
Victoria	NSW	3,200 minus Upper & Lower Tumut Generation	3,000 minus Upper & Lower Tumut Generation	3,200 minus Upper & Lower Tumut Generation	3,000 minus Upper & Lower Tumut Generation
Victoria	South Australia*	650	650	650	650
South Australia	Victoria	550	550	550	550
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

* Limit referring to the receiving end.

The peak interconnector capability does not necessarily correspond to the network capability at the time of the maximum regional demand; it refers to average capability during the peak periods, which corresponds to 7.00 am to 10.00 pm on weekdays.

A1.5 Calculation of preliminary marginal loss factors

AEMO uses the TPRICE[10] software to calculate preliminary MLFs using the following method:

- Convert the half-hourly historical (historical data was utilised for the preliminary calculation – this data will be forecast in the final calculation) load and generation data, generating unit capacity, and availability data together 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 the 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 the load flow conditions.
- Refer the loss factors at each connection point in each region are referred to the RRN.
- Average the loss factors for each trading interval and for each connection point using volume weighting.

[10] 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.

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, the same loss factor is calculated for both generation and load.

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

A1.5.1 Marginal Loss Factor calculation quality control

As these results are indicative only, AEMO has not yet engaged consultants to ensure the quality and the accuracy of the preliminary MLF calculation. When the final MLFs for the 2021-22 FY are being prepared, a consultant will be engaged to review inputs and assumptions and perform parallel studies to support the integrity and quality of the results.

Glossary

Term	Definition
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
FLLF	Forward Looking Loss Factor
GWh	Gigawatt hour
km	Kilometre
kV	Kilovolt
LNG	Liquefied natural gas
MLF	Marginal loss factor
Methodology	Forward-looking Loss Factor Methodology
MVAr	Megavolt ampere reactive
MW	Megawatt
NEM	National Electricity Market
NSP	Network Service Provider
NSW	New South Wales
PS	Power station
RRN	Regional Reference Node
SIPS	System Integrity Protection Scheme
TNI	Transmission Node Identity
TNSP	Transmission Network Service Provider
TPRICE	MLF calculation engine used by AEMO
VTN	Virtual Transmission Node