

Distribution Loss Factors

2024 – 2025 Financial Year (Public Report)

February 2024

Asset Planning & Performance



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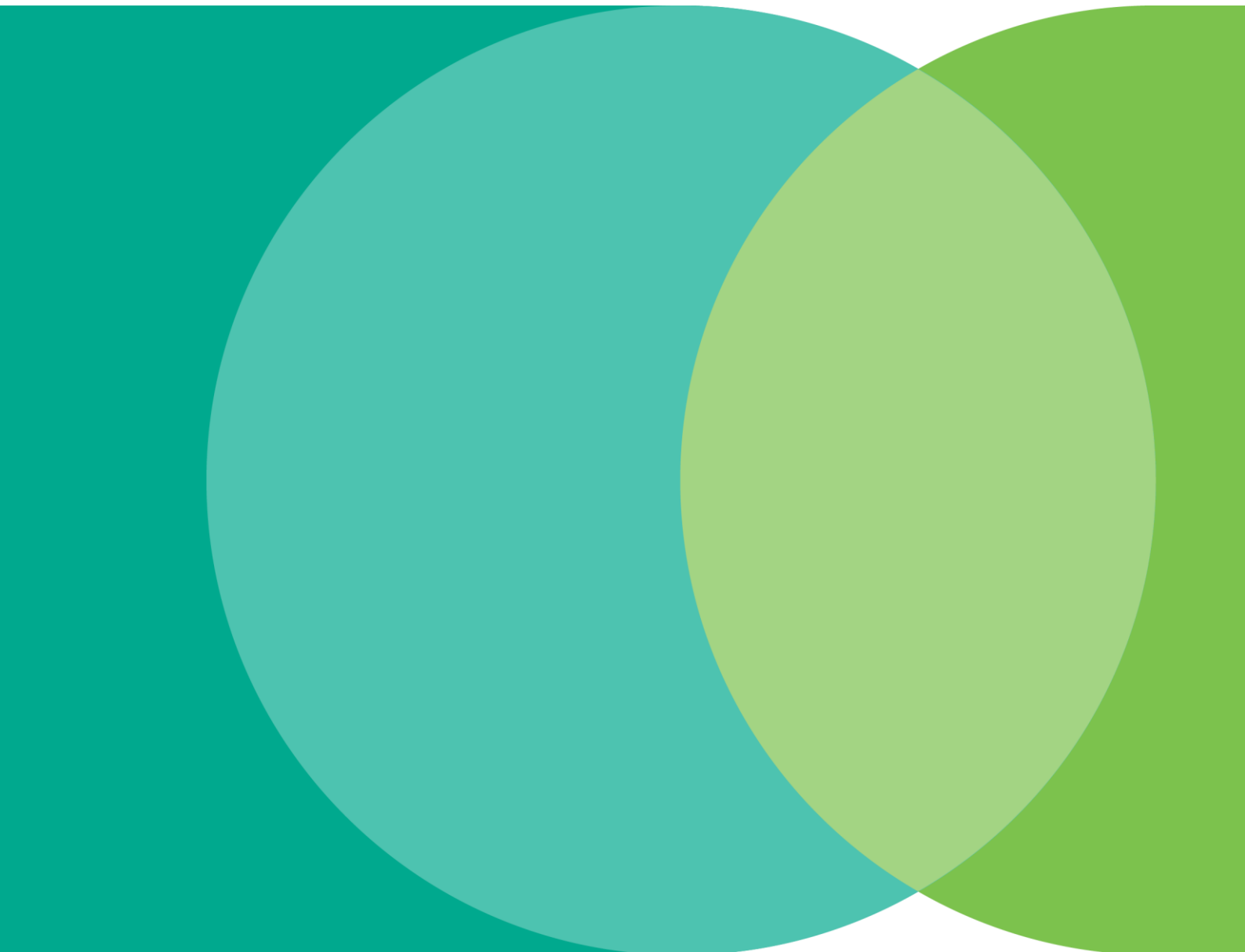
Introduction

The National Electricity Rules require that Distribution Network Service Providers (DNSPs) obtain the approval of the Australian Energy Regulator (AER) as the regulator for distribution loss factors (DLFs) for the Endeavour Energy network. This report nominates the DLFs for Endeavour Energy's electrical distribution network for the 2024/25 financial year.

The methodology used in this calculation are described in Endeavour Energy's publication *Methodology Report Determination of Distribution Loss Factors* dated 3 February 2023 (the Report). The AER requires that distribution loss factors should be calculated for site-specific major customers, while loss factors for each tier of the network should be provided to calculate the losses attributable to the remainder of the customers.

As required by the Report, the proposed DLFs are "forward-looking" and use both demand and energy forecast data as provided by Endeavour Energy's Forecasting & Planning, and Finance sections for the 2024/25 fiscal year. References in this document to 'last financial year' refer to 2022/23 and references to 'next financial year' refer to 2024/25.

Results & Commentary



Tariff customers

Table 1 – Distribution loss factors for tariff customers

Network level ^{1,3}	2023/24		2024/25		Effective section loss factor changes	Cumulative loss factor changes
	Effective section loss factor	Cumulative loss factor ²	Effective section loss factor	Cumulative loss factor ²		
132 kV network	1.0025	1.0025	1.0028	1.0028	0.03%	0.03%
Transmission substation	1.0032	1.0072	1.0030	1.0076	-0.02%	0.03%
Sub-transmission network	1.0048	1.0116	1.0049	1.0121	0.01%	0.05%
Zone substation	1.0048	1.0118	1.0044	1.0114	-0.04%	-0.04%
HV distribution network	1.0043	1.0162	1.0048	1.0164	0.05%	0.01%
Distribution substation	1.0321	1.0502	1.0297	1.0479	-0.22%	-0.22%
LV distribution network	1.0145	1.0691	1.0112	1.0624	-0.33%	-0.63%

Notes

1. All loss factors quoted in the above table are given as 1 + the % loss of energy delivered at that level of the network, whether to customers at that level, or to lower levels.
2. In this study section loss factors do not add numerically to give cumulative loss factors because of compounding and network configuration.
3. An allowance for theft losses of 0.5% of total sales has been made.

An examination of the results indicates that the proposed cumulative 2024/25 DLF differ slightly from results obtained in previous years, with significant changes at the distribution substation and LV distribution network levels. Endeavour provides the following commentary regarding the changes in effective section loss factor changes:

- Increased transmission substation losses could be driven by a decrease in embedded generation in the sub-transmission network, and increased loads without any new transmission substation transformers.
- Increased HV distribution network losses are driven by increased loss load factors due to average loads seen at zone substations decreasing whilst peak loads are increasing.
- Decreased zone substation losses could be attributed to increased residential PV generation causing reverse power flow at zone substations.
- Decreased losses within distribution substation and LV distribution network levels could be attributed to increased residential PV generation combined with decreasing generation at all other network levels. Total cumulative network losses at these levels are reduced as the power is both generated and consumed locally.

The calculation of the above loss factors is set out in Appendix A. The billed energy data used as the basis of the Report is contained in Appendix B.

Site-specific customers

In accordance with the National Electricity Rules, all customers with an average energy consumption of greater than 40 GWh and/or 10 MW demand have had site-specific loss factors calculated. Embedded generators with a peak output of greater than 10 MW have also had loss factors calculated.

██████████ requalifies for a site-specific customer in this years DLF and ██████████ also qualifies due to meeting the consumption threshold.

Due to the large volume of data produced from the load flow calculations, the derivation of these values is not provided in this report. However, the calculations are available for examination, should this be required. The results are summarised in the following tables:

Table 2 – Location specific loss factors for customers with consumption greater than 40 GWh p.a. and/or a maximum demand greater than 10 MW

Site-specific customers	NMI/s	2023/24 loss factor	2024/25 loss factor	Change	Comments on change
██████████	4310857952	1.0167	1.0194	0.27%	██████████
██████████	4310866743	1.0082	1.0087	0.05%	
██████████	4310942441	1.0062	1.0062	0.00%	
██████████	4311028276 4311028297 4311246109 4311246110	1.0137	1.0149	0.12%	██████████
██████████	4311061116 4311061119	1.0062	1.0064	0.02%	
██████████	4311063041 4311063042	1.0098	1.0099	0.01%	
██████████	4311139903	-	1.0186		██████████
██████████	4311159207	1.0055	1.0058	0.04%	
██████████	4311168207	1.0044	1.0043	-0.01%	
██████████	4311204547 4311204594 4311339343 4311339344	1.0086	1.0094	0.08%	

Site-specific customers	NMI/s	2023/24 loss factor	2024/25 loss factor	Change	Comments on change
	4311339345 4311340412				
	4311206443 4311173727	1.0040	1.0051	0.11%	
	4311251697 4311297310	1.0007	1.0022	0.15%	
	4311271253 4311271260	1.0013	1.0015	0.02%	
	4311275493	1.0109	1.0092	-0.17%	
	4311322991 4311322992	1.0068	1.0078	0.10%	
	4311371172 4311371951	1.0000	1.0000	0.00%	
	NEEE000003	1.0102	1.0104	0.01%	
	NEEE000005	1.0130	1.0136	0.07%	
	NEEE000006	1.0364	1.0321	-0.42%	
	NEEE000014	1.0116*	1.0081	N/A	
	NEEE000046	1.0036	1.0040	0.05%	
	NEEE000049	1.0160	1.0152	-0.09%	
	NEEE000066	1.0312	1.0325	0.13%	
	NEEE000506	1.0092	1.0133	0.41%	
	NEEE000758 NEEE000759	1.0148	1.0105	-0.43%	
	NEEE000760 NEEE000762 NEEE000764 NEEE000766 NEEE000768	1.0183	1.0175	-0.08%	
	NEEE000881	1.0076	1.0072	-0.04%	

Site-specific customers	NMI/s	2023/24 loss factor	2024/25 loss factor	Change	Comments on change
[REDACTED]	NEEE001591	1.0110	1.0099	-0.10%	[REDACTED]
[REDACTED]	NEEE001656	1.0036	1.0040	0.04%	
[REDACTED]	NEEE001892	1.0149	1.0147	-0.02%	
[REDACTED]	NEEE004639	1.0108	1.0116	0.08%	
[REDACTED]	NEEE005219	1.0077	1.0078	0.02%	
[REDACTED]	NEEEW00001 NEEEW00002	1.0032	1.0033	0.00%	
[REDACTED]	NEEEW04150 NEEEW04151 NEEEW04152 NEEEW04153 NEEEW04154	1.0076	1.0090	0.14%	[REDACTED]
[REDACTED]	NEEEW04511 NEEEW04512 NEEEW04513 NEEEW04514	1.0044	1.0037	-0.06%	

Note:

* - Customer did not qualify for a site specific DLF and a generic DLF was applied

Site-specific embedded generators

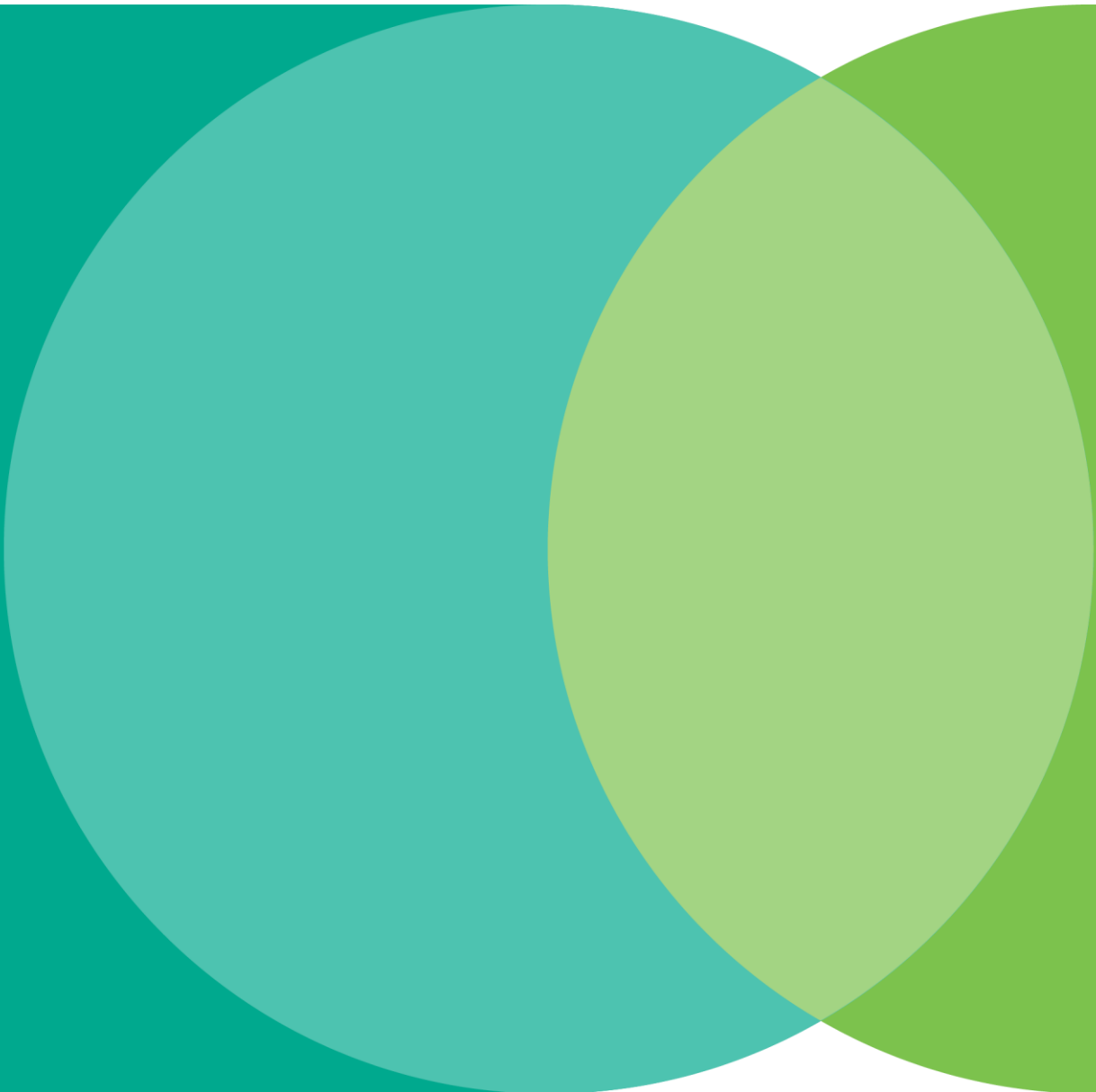
The DLFs for the major embedded generators are as shown below. The methodology for the calculation of these DLFs is based on the difference in losses in the network between the conditions where the generator is operating and not operating over an annual cycle, relative to the energy sent out by the generator over the same period.

The applicable DLFs for embedded generators can have either positive or negative benefits depending on the level of generation and how much of the local generation is consumed locally. When the local generation is consumed locally, overall losses are reduced. However, overall losses incurred in the network increase if the local generation exceeds local load for significant periods during the year. Note that for generators, a DLF less than 1.000 corresponds to an increase in losses when the generators are connected to the network.

Table 3 – Location specific loss factors for embedded generators with peak generation greater than 10 MW

Site-specific embedded generators	NMI/s	2023/24 loss factor	2024/25 loss factor	Change	Comments on change
[REDACTED]	NEEE000748	0.9937	0.9957	0.2%	[REDACTED]
[REDACTED]	NEEE000749	1.0236	1.0217	-0.2%	[REDACTED]
[REDACTED]	NEEE000750	1.0122	1.0145	0.2%	[REDACTED]
[REDACTED]	4310951391	0.9994	0.9996	0.0%	[REDACTED]
[REDACTED]	4311422627	0.9926	0.9980	0.5%	[REDACTED]

Reconciliation of forecast and actual losses



As required by the Rules, a reconciliation of forecast and actual losses has been carried out. This involved taking the complete billing data set for the last financial year and comparing the losses incurred with those estimated by the calculations carried out previously for that year. A summary comparison between the actual losses as calculated from the billing data and the losses predicted by calculation at the macro level is shown in Table 4 below. A reconciliation using the proposed DLFs for the relevant year are shown in Table 5.

Details of this calculation for the 2022/23 financial year are contained in Appendix B.

Table 4 – Reconciliation of forecast to actual losses at macro level

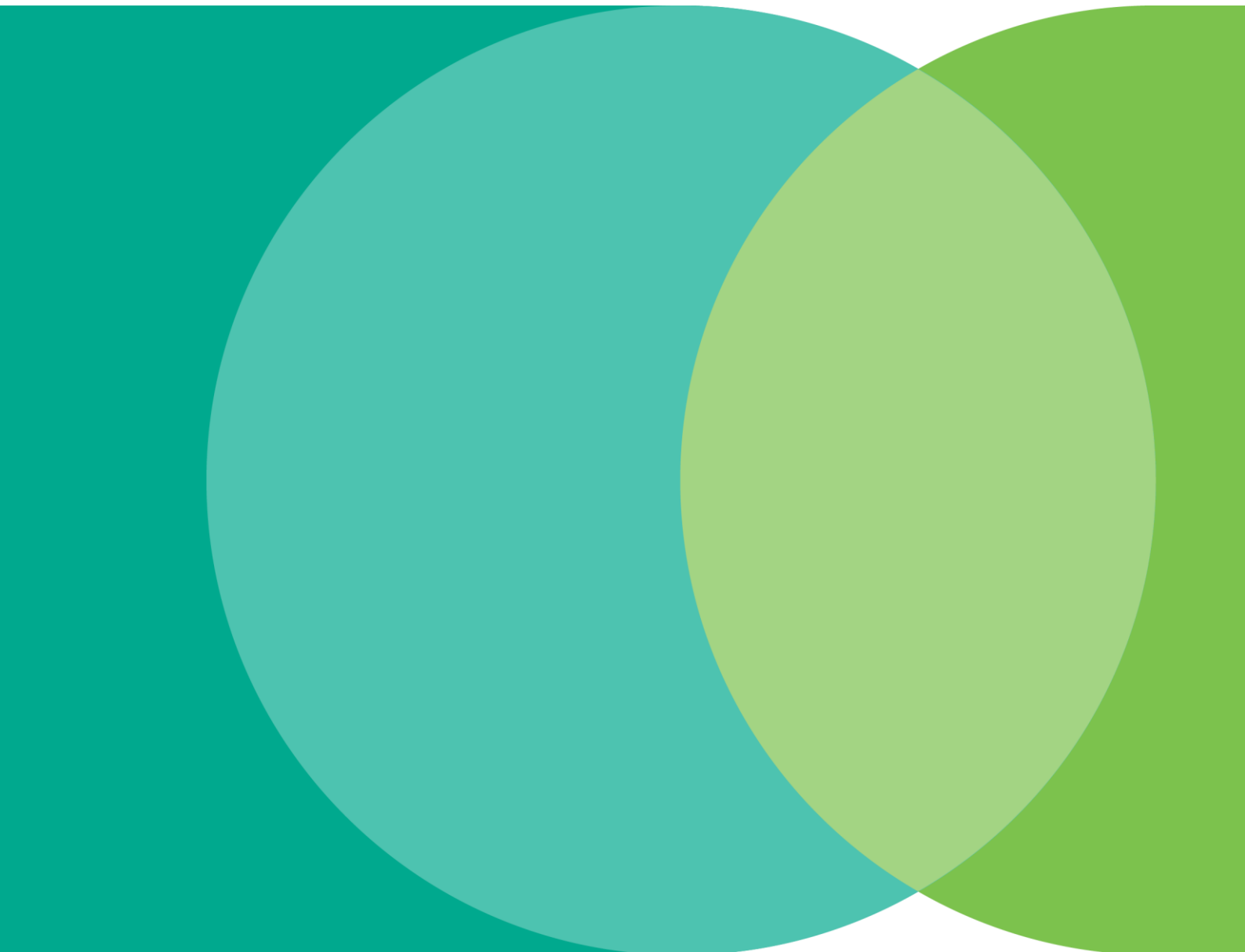
Financial year	Forecast loss (kWh)	Actual loss (kWh)	Difference (kWh)	Energy distributed (kWh)	Forecast error as % of energy distributed
2014/15	620,376,428	672,024,439	-51,648,011	16,127,500,731	-0.32%
2015/16	644,002,105	693,554,014	-49,551,909	16,645,596,945	-0.30%
2016/17	672,024,439	673,002,628	-978,189	16,739,660,930	-0.01%
2017/18	693,554,014	784,053,584	-90,499,570	16,639,359,421	-0.54%
2018/19	673,002,628	783,907,002	-110,904,374	16,758,896,351	-0.66%
2019/20	715,801,176	750,188,080	-34,386,904	16,511,359,434	-0.21%
2020/21	783,907,002	735,934,929	47,972,073	16,716,870,093	0.29%
2021/22	750,188,080	735,905,423	14,282,657	16,711,340,936	0.09%
2022/23	735,934,929	739,782,428	-3,847,500	16,883,000,000	-0.02%

Table 5 – Reconciliation of forecast to actual losses using DLF for that year

Financial year	Forecast loss (kWh)	Actual loss (kWh)	Difference (kWh)	Energy distributed (kWh)	Forecast error as % of energy distributed
2016/17	811,986,066	673,002,628	138,983,438	16,739,660,930	0.83%
2017/18	786,334,666	784,053,584	2,281,082	16,639,359,421	0.01%
2018/19	783,544,563	783,907,002	-362,439	16,758,896,351	0.00%
2019/20	765,491,446	750,188,080	15,303,366	16,511,359,434	0.09%
2020/21	853,091,551	735,934,929	117,156,622	16,716,870,093	0.70%
2021/22	795,245,393	735,905,423	59,339,970	16,711,340,936	0.36%
2022/23	811,613,082	739,782,428	71,830,654	16,883,000,000	0.43%

Note that the 2022/23 financial year is the last complete set of available billing data.

Appendices



Appendix B – Billed energy data for 2022/23 financial year

Energy Imports	
Summary - Energy Imports	kWh
TransGrid - All BSP	15,297,242,532
Embedded Generators	2,325,539,896
Sunpower - included in "Embedded Generators" Total	-
Total Imports kWh	17,622,782,428
Embedded Generators breakdown	kWh
Landfill Gas	54,920,730
Non-Renewable	1,613,807,587
Renewable - PV, Hydro & Wind	656,811,579
Decommissioned	0
Total Embedded Generation	2,325,539,896
Energy Exports	
Consumption Data based on WAPC	kWh
Total Board Report	16,883,000,000
Dom & CLd	5,970,787,155
Domestic	5,051,350,297
Controlled Load	771,466,024
NSW Solar Bonus Scheme	147,970,834
Commercial	1,761,747,138
General Supply Non TOU	1,629,115,751
General Supply TOU	23,348,798
Unmetered -	109,282,589
Industrial	9,150,465,707
Low Voltage TOU Demand	3,549,909,748
High Voltage TOU Demand	1,651,600,014
Subtransmission TOU Demand	2,631,886,179
Bulk & Inter-distributor Transfer	1,317,069,765
Reconciliation (Finance)	
Total Board Report as per TM1 (before corrections for solar and IDT)	18,348,040,599
NSW Solar Bonus Scheme	(147,970,834)
Bulk & Inter-distributor Transfer	(1,317,069,765)
Total Energy Consumption	16,883,000,000

Existing and Potential Site Specific Customers	
High Voltage TOU Demand	1,651,600,014
N29 - HV TOU Demand	1,237,900,215
Sub Transmission TOU Demand	2,631,886,179
N39 - ST TOU Demand	1,323,139,206
Bulk & Inter-distributor Transfer	1,317,069,765
Legend	
	Existing Site Specific DLF Customer current DLF
	No longer Eligible for Site Specific DLF
	New Site Specific DLF Customer
	Former DLF Customer now requalifies

Subtract site specifics from HV TOU Demand (N29) Tariff	
N29 Tariff Consumption without site specifics in year to reconcile	994,939,679
Subtract site specifics from Subtransmission TOU Demand (N39) Tariff	
N39 Tariff Consumption without site specifics in year to reconcile	
	113,989,765
Subtract site specifics from N53 Tariff	
N53 Tariff Consumption without site specifics in current year	
	50,600,802
Total of all LV customers (including all unmetered)	11,282,444,041
Total of all HV customers (excluding site specifics)	995,597,060
Total of all ST Customers (excluding site specifics)	231,236,575
Total energy consumption of all site specifics in current year >40Gwh or >10MW	4,373,722,323
Cross Check Total Consumption	16,883,000,000
Difference	0
Unallocated 132kV customers (energy) kWh	8,482,197
HV Customers Connected Directly to TS	0
Unallocated 33kv and 66kV customers (energy) kWh	222,754,378
HV Customers Connected Directly to Zone Sub HHVT	105,463,498
HV Customers Connected into HV network HHVL	890,133,562
LV Customers connected directly to Distribution Sub HLVT	1,379,467,149
LV Customers connected into the LV network HLVL * excludes unmetered	9,793,694,303
Unmetered LV Supplies	109,282,589
Site Specifics from above	4,373,722,323
Cross Check total Consumption	16,883,000,000
	0
Total Energy in	17,622,782,428
Total Billed Energy	16,883,000,000
Actual Losses (last Financial Year)	739,782,428
Overall losses as a function of Energy Imports	4.20%
Overall losses as a function of Energy Sales	4.38%
Allowance for Theft (0.5% of total sales)	84,415,000
Theft as a % of low voltage sales (s4.3 of report)	0.75%
General Customers Billed (Total Billed less Site Specific Customers)	12,509,277,677
Energy in incl Generation	17,622,782,428
Site Specifics	4,373,722,323
Overall Losses Energy In less General Customers Billed + CRP	739,782,428
Overall Loss factor as a function of Billed Energy	4.38%
Forecast Losses for 2022/23 (From that year's DLF report)	735,934,929
Loss Difference	-3,847,500
Error as % of Energy Distributed	-0.02%

DLF HISTORICAL RECONCILIATION

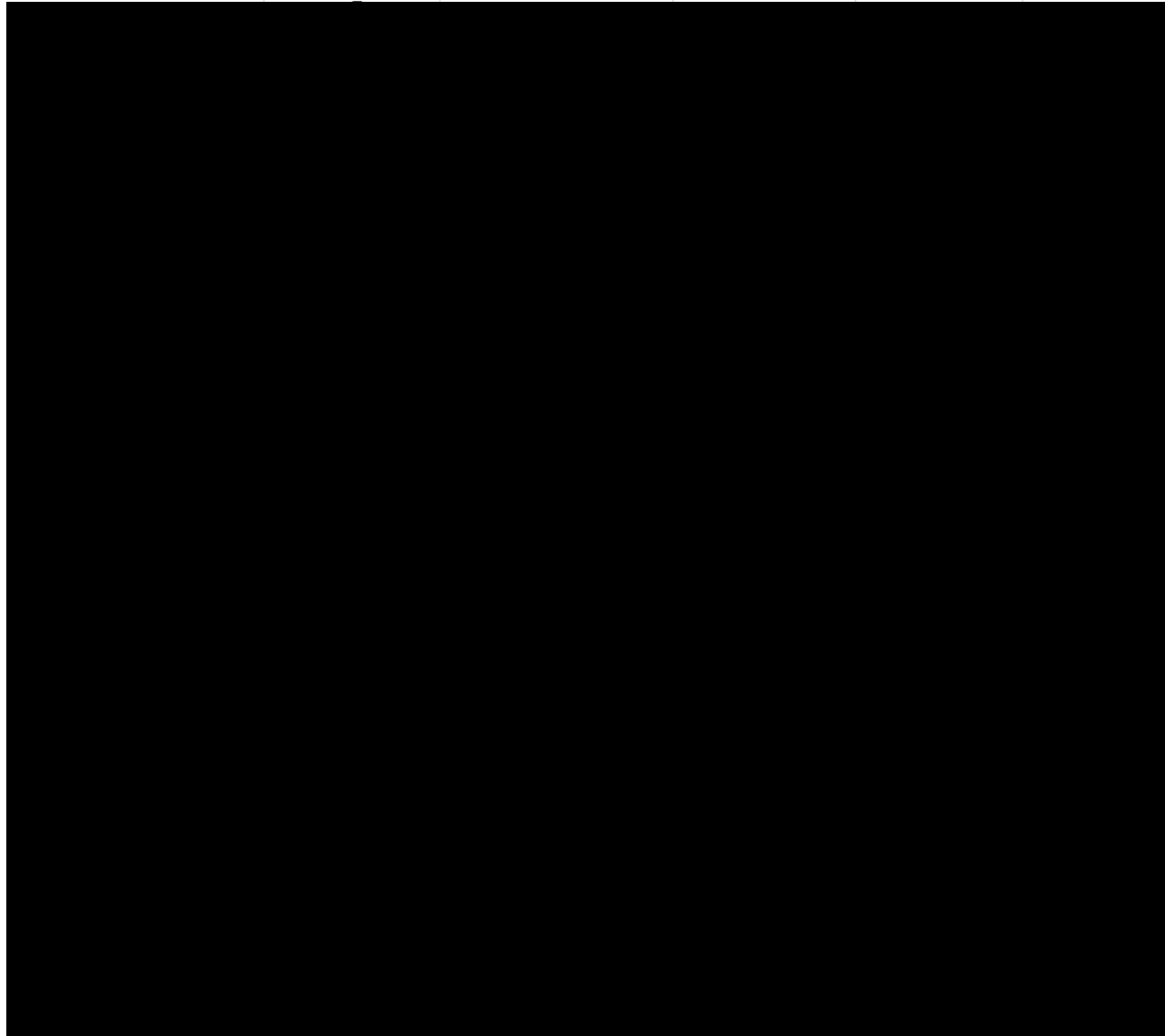
for YEAR 2022/23				
Customers Type		Actual Sales Gwh	DLF applied in 2022/23	DLF x Sales Gwh
1	Site specific customers	4310857952	1.0170	
2		4310866743	1.0086	
3		4310942441	1.0040	
4		4311159207	1.0055	
5		4311168207	1.0040	
6		4311275493	1.0096	
7		4311028276, 4311028297, 4311246109, 4311246110	1.0146	
8		4311061116, 4311061119	1.0064	
9		4311340412, 4311204547, 4311204594, 4311339343, 4311339344, 4311339345	1.0082	
10		4311206443, 4311173727	1.0040	
11		4311251697, 4311297310	1.0011	
12		4311265997, 4311265950	1.0055	
13		4311271253, 4311271260	1.0010	
14		4311322991, 4311322992	1.0062	
15		4311371172, 4311371951	1.0000	
16		NEEE000003	1.0107	
17		NEEE000005	1.0135	
18		NEEE000006	1.0390	
19		NEEE000014	1.0079	
20		NEEE000046	1.0036	
21		NEEE000049	1.0155	
22		NEEE000066	1.0279	
23		NEEE000506	1.0144	
24		NEEE000758, NEEE000759	1.0134	
25		NEEE000760, NEEE000762, NEEE000764, NEEE000766, NEEE000768	1.0181	
26		NEEE000881	1.0040	
27		NEEE001591	1.0071	
28		NEEE001656	1.0036	
29		NEEE001892	1.0130	
30		NEEE004639	1.0107	
31		NEEE005219	1.0072	
32		NEEEW00001, NEEEW00002	1.0029	
33		NEEEW04150, NEEEW04151, NEEEW04152, NEEEW04153, NEEEW04154	1.0072	
34		NEEEW04511, NEEEW04512, NEEEW04513, NEEEW04514	1.0042	
TOTALS Site specific customers		4,318.986		4,370.185
NON Site Specific Customers	132 kV Network	8.482	1.0025	8.504
	Transmission Substation	0.000	1.0069	0.000
	Subtransmission Network	237.044	1.0114	239.743
	Zone Substation	105.463	1.0116	106.688
	High Voltage Distribution Network	930.403	1.0162	945.479
	Distribution Substation	1379.467	1.0493	1447.454
	Low Voltage Distribution Network	9793.694	1.0680	10459.817
	Unmetered	109.283	1.0680	116.716
TOTALS NON Site specific customers		12,563.837		13,324.401
		GWh		
	Actual Purchases	17,622.782		
	Billed Sales	16,883.000		
	Actual Losses	739.782		
	Reconciled Purchases	17,694.586		
	Reconciled Losses	811.586		
	Loss Error	71.804		
	Error as a % of Actual Purchases	0.41%		
	Error as a % of Actual Sales	0.43%		
	Error as a % of Losses	9.71%		
	Error as a % of Actual Sales (correcting sales)	0.43%		

Appendix C – Calculation of losses for HV distribution network

Load	Bus No. (within the	Transmission Substation	LLF (loss load facto	Series Losses at Peak Load (kW)	Distribution Losses (MW)
Abbotsbury ZS	2ABBO11A_LD	Liverpool BSP	0.074129235	230.8801365	0.017115
Albion Park ZS	2ALBI11*_LD	Mount Terry TS	0.09545545	434.6266784	0.041487
Ambarvale ZS	2AMBA11A_LD	Macarthur 66 TS (BSP)	0.116200705	217.5272128	0.025277
Anzac Village ZS	2ANZA11A_LD	Liverpool TS	0.108404286	249.4246253	0.027039
Appin ZS	2APPI11A_LD	Macarthur 66 TS (BSP)	0.144961334	172.6692819	0.025030
Arndell Park ZS	2ARND11*_LD	Sydney West TS (BSP)	0.294485787	86.56021786	0.025491
Baulkham Hills 11kV	2BAUL11A_LD	Sydney West TS (BSP)	0.187116337	352.7583348	0.066007
Berrima Junction ZS	2BERJ11A_LD	Fairfax Lane TS	0.047056213	27.80043753	0.001308
Berry ZS	2BERR11A_LD	Shoalhaven TS	0.167446261	197.7075733	0.033105
Blackmans Flat ZS	2BFLA11A_LD	Mount Piper TS (BSP)	0.207893455	146.7851744	0.030516
Blackheath ZS	2BHEA11A_LD	Katoomba North TS	0.198463998	92.10666745	0.018280
Blaxland ZS	2BLAX11A_LD	Warrimoo TS	0.122998326	254.522038	0.031306
Bolong ZS	2BOLO11A_LD	Shoalhaven TS	0.151158654	65.7279496	0.009935
Bomaderry ZS	2BOMA11A_LD	Shoalhaven TS	0.187052397	180.4511797	0.033754
Bonnyrigg ZS	2BONN11A_LD	West Liverpool TS	0.153804736	152.5506014	0.023463
Bossley Park ZS	2BOSS11A_LD	Blacktown TS	0.140635809	154.8857491	0.021782
Bow Bowling ZS	2BOWB11*_LD	Ingleburn BSP	0.415066557	140.6029556	0.058360
Bowral ZS	2BOWR11A_LD	Fairfax Lane TS	0.19310741	465.3783661	0.089868
Bringelly ZS	2BRIN11A_LD	Macarthur TS (BSP)	0.246004728	315.4058713	0.077591
Bulli ZS	2BULL11A_LD	Bellambi TS	0.150378119	158.142415	0.023781
Bella Vista ZS	2BVIS11A_LD	Vineyard TS (BSP)	0.172897248	262.4115226	0.045370
Bylong ZS	2BYLO22A_LD	Ilford TS	0.145172455	1.426741624	0.000207
Cabramatta ZS	2CABR11A_LD	Guildford TS	0.251180115	55.1833286	0.013861
Cambridge Park ZS	2CAMB11A_LD	Penrith TS	0.10716475	198.4002512	0.021262
Campbelltown ZS	2CAMP11*_LD	Macarthur 66 TS (BSP)	0.1905761	412.2691389	0.078569
Canley Vale ZS	2CANL11A_LD	Liverpool TS	0.229923297	252.7600542	0.058115
Carramar ZS	2CARR11A_LD	Guildford TS	0.252251053	37.61848994	0.009489
Castle Hill ZS	2CAST11A_LD	Carlingford TS	0.152736756	123.861703	0.018918
Casula ZS	2CASU11A_LD	Liverpool TS	0.123146522	150.9688719	0.018591
Cattai ZS	2CATT11A_LD	Hawkesbury TS	0.136359378	689.420987	0.094009
Cawdor ZS	2CAWD11A_LD	Nepean 33 TS	0.135221345	560.1542402	0.075745
Cheriton Avenue ZS	2CHER11*_LD	Vineyard TS (BSP)	0.204901289	111.4064253	0.022827
Chipping Norton ZS	2CHIP11A_LD	Liverpool TS	0.16190577	54.68800173	0.008854
Claremont Meadows ZS	2CMEA11A_LD	Mount Druitt TS	0.13350463	518.369422	0.069205
Corrimal ZS	2CORR11A_LD	Bellambi TS	0.156464833	179.2865434	0.028052
Cranebrook ZS	2CRAN11*_LD	Penrith TS	0.090854369	334.4566232	0.030387
Culburra ZS	2CULB11*_LD	West Tomerong TS	0.173693168	491.3011869	0.085336
Dapto ZS	2DAPZ11*_LD	Springhill TS	0.101973578	377.5455433	0.038500
Darkes Forest ZS	2DARK11A_LD	Bellambi TS	0.004547571	6.897751918	0.000031
Doonside ZS	2DOON11A_LD	Sydney West TS (BSP)	0.11061847	520.2227825	0.057546
Dundas ZS	2DUND11*_LD	Carlingford TS	0.139944078	280.0214841	0.039187
Eastern Creek ZS	2ECCR11A_LD	Sydney West TS (BSP)	0.384501103	157.242405	0.060460
Edmondson Park ZS	2EDMO11*_LD	Denham Court TS	0.122627925	647.6753635	0.079423
Emu Plains ZS	2EMUP11A_LD	Penrith TS	0.128083509	326.8905063	0.041869
East Richmond ZS	2ERIC11A_LD	Hawkesbury TS	0.188572056	307.4032993	0.057968
Fairfield ZS	2FFIE11A_LD	Guildford TS	0.262582976	164.5163197	0.043199
Figtree ZS	2FIGT11A_LD	Springhill TS	0.139246128	238.4459098	0.033203
Gerrington ZS	2GERR11A_LD	Mount Terry TS	0.172299538	34.04724578	0.005866
Glenmore Park ZS	2GLEN11A_LD	Regentville BSP	0.064705215	331.4048332	0.021444
Glenorie ZS	2GLEO11A_LD	Hawkesbury TS	0.16184828	90.55077979	0.014655
Glossodia ZS	2GLOS11B_LD	Hawkesbury TS	0.116781277	470.8332784	0.054985
Granville ZS	2GRAN11A_LD	Holroyd TS (BSP)	0.266713796	95.52110404	0.025477
Greystanes ZS	2GREY11A_LD	Blacktown TS	0.141481608	135.1804308	0.019126
Hartley Vale ZS	2HART11A_LD	Mount Piper TS (BSP)	0.140880246	6.583415831	0.000927
Hazelbrook ZS	2HAZE11A_LD	Lawson TS	0.150294733	73.32867142	0.011021
Helensburgh ZS	2HELE11A_LD	Bellambi TS	0.22505066	98.20402494	0.022101
Hinchinbrook ZS	2HINC11A_LD	West Liverpool TS	0.071505072	616.3341802	0.044071
Holroyd ZS	2HOLR11A_LD	Blacktown TS	0.14347526	299.1368944	0.042919
Homepride ZS	2HOME11*_LD	West Liverpool TS	0.317312648	100.6924341	0.031951
Horsley Park ZS	2HORS11A_LD	Mount Druitt TS	0.159882483	207.4093989	0.033161
Huntingwood ZS	2HUNT11A_LD	Sydney West TS (BSP)	0.210906338	361.0247639	0.076142
Huskisson ZS	2HUSK11A_LD	West Tomerong TS	0.180179035	286.6612339	0.051650
Ilford Hall ZS	2ILFH11A_LD	Ilford TS	0.202565869	12.90618945	0.002614
Inner Harbour ZS	2INNE11A_LD	Springhill TS	0.159251604	3.566665232	0.000568
Jamberoo ZS	2JAMB11A_LD	Mount Terry TS	0.1736424	30.02368366	0.005213
Jasper Rd ZS	2JASP11A_LD	Baulkham Hills TS	0.130310426	220.6431187	0.028752
Jordan Springs ZS	2JORD11A_LD	Penrith TS	0.09366902	277.5010782	0.025993

Kandos ZS	2KAND22A_LD	Ilford TS	0.272922275	120.0066405	0.032752
Kangaroo Valley ZS	2KANG11A_LD	Shoalhaven TS	0.170546719	58.56232853	0.009988
Katoomba ZS	2KATO11A_LD	Katoomba North TS	0.281324804	169.9984968	0.047825
Kellyville ZS	2KELL11A_LD	Sydney North TS (BSP)	0.069544451	179.8417419	0.012507
Kembla Grange ZS	2KEMB11A_LD	Springhill TS	0.104669474	283.0641837	0.029628
Kemps Creek ZS	2KEMP11A_LD	West Liverpool TS	0.254969381	1724.620228	0.439725
Kenny Street ZS	2KENN11A_LD	Springhill TS	0.234214767	25.42574424	0.005955
Kenthurst ZS	2KHUR11A_LD	Sydney North TS (BSP)	0.0792891	447.4720902	0.035480
Kiama ZS	2KIAM11C_LD	Mount Terry TS	0.142079195	143.6171368	0.020405
Kingswood ZS	2KING11*_LD	Penrith TS	0.181198681	557.3345176	0.100988
Kentlyn ZS	2KLYN11A_LD	Macarthur 66 TS (BSP)	0.175277476	231.5971356	0.040594
Kurrajong ZS	2KURR11A_LD	Hawkesbury TS	0.155715279	384.8812124	0.059932
Leabons Lane ZS	2LEAB11A_LD	Blacktown TS	0.250546495	92.97078946	0.023294
Lennox ZS	2LENN11A_LD	Camellia TS	0.27336106	78.60341836	0.021487
Lithgow ZS	2LITH11A_LD	Wallerawang TS (BSP)	0.267408416	553.13159	0.147912
Liverpool 11kV	2LIV211A_LD	Liverpool TS	0.291385977	225.5190135	0.065713
Luddenham ZS	2LUDD11A_LD	Regentville BSP	0.147183699	530.9780474	0.078151
Macquarie Fields ZS	2MACQ11A_LD	Ingleburn BSP	0.194825231	214.9091743	0.041870
Maldon ZS	2MALD11A_LD	Nepean 66 TS	0.151265403	585.2439493	0.088527
Mamre ZS	2MAMR11*_LD	Sydney West TS (BSP)	0.273412793	809.5617366	0.221345
Marayong ZS	2MARA11*_LD	Blacktown TS	0.271877359	245.3804504	0.066713
Meadow Flat ZS	2MFLA11A_LD	Wallerawang TS (BSP)	0.263725327	21.00571019	0.005540
Minto ZS	2MINT11*_LD	Ingleburn BSP	0.235618643	477.7057938	0.112556
Mittagong ZS	2MITT11A_LD	Fairfax Lane TS	0.147271356	749.0472387	0.110313
Moorebank ZS	2MOOR11A_LD	Liverpool TS	0.283589116	57.02332582	0.016171
Moss Vale ZS	2MOSS11A_LD	Fairfax Lane TS	0.223625881	333.9421158	0.074678
Mount Ousley ZS	2MTOU11A_LD	Bellambi TS	0.201842856	96.33276455	0.019444
Mungerie Park ZS	2MUNG22A_LD	Vineyard TS (BSP)	0.07353129	479.6973077	0.035273
Narellan ZS	2NARE11*_LD	Nepean 66 TS	0.104475993	702.4302485	0.073387
North Eastern Creek ZS	2NECK11A_LD	Sydney West TS (BSP)	0.260277458	55.60544863	0.014473
Nepean 11kV	2NEPZ11A_LD	Nepean 66 TS	0.065466065	453.8421027	0.029711
Newton ZS	2NEWT11A_LD	Blacktown TS	0.219327457	124.2088096	0.027242
Northmead ZS	2NMEA11A_LD	Baulkham Hills TS	0.209950613	169.275116	0.035539
Nowra ZS	2NOWR11A_LD	Shoalhaven TS	0.208316058	270.8223128	0.056417
North Parramatta ZS	2NPAR11A_LD	Holroyd TS (BSP)	0.230141219	164.6617104	0.037895
North Richmond ZS	2NRIC11A_LD	Hawkesbury TS	0.134965088	333.2762252	0.044981
North Rocks ZS	2NROC11A_LD	Baulkham Hills TS	0.186150074	118.5768397	0.022073
North Warragamba ZS	2NWAR11A_LD	Regentville BSP	0.131641545	488.6087806	0.064321
North Wollongong ZS	2NWOL11A_LD	Springhill TS	0.222238464	55.40198283	0.012312
Oakdale ZS	2OAKD11A_LD	Nepean 33 TS	0.092688761	66.67331346	0.006180
The Oaks ZS	2OAKS11A_LD	Nepean 33 TS	0.120085716	246.1520018	0.029559
Oran Park ZS	2ORPK11A_LD	Macarthur TS (BSP)	0.059574363	1442.213192	0.085919
Parklea ZS	2PARK22A_LD	Vineyard TS (BSP)	0.080661403	484.7158056	0.039098
Port Central ZS	2PCEN11A_LD	Outer Harbour TS	0.230153432	72.24436025	0.016627
Penrith 11kV	2PENZ11A_LD	Regentville BSP	0.271497248	180.7254281	0.049066
Port Kembla ZS	2PKEM11A_LD	Springhill TS	0.21587157	215.2124803	0.046458
Portland ZS	2PLAN11A_LD	Wallerawang TS (BSP)	0.147360805	16.68406346	0.002459
Plumpton ZS	2PLUM11A_LD	Mount Druitt TS	0.148485161	280.8051548	0.041695
Prestons ZS	2PRES11A_LD	West Liverpool TS	0.067684848	297.1794917	0.020115
Prospect ZS	2PROS11A_LD	Blacktown TS	0.220446727	176.8971571	0.038996
Quakers Hill ZS	2QUAK11*_LD	Sydney West TS (BSP)	0.124512487	286.7221987	0.035700
Quarries ZS	2QUAR11A_LD	Blacktown TS	0.141793203	132.4053683	0.018774
Ringwood ZS	2RING11A_LD	Fairfax Lane TS	0.198987271	383.2150163	0.076255
Riverstone ZS	2RIVE11*_LD	Hawkesbury TS	0.160287584	141.2156751	0.022635
Robertson ZS	2ROBE11A_LD	Fairfax Lane TS	0.233134467	138.1783449	0.032214
Rooty Hill ZS	2ROOT11*_LD	Sydney West TS (BSP)	0.162898158	292.2547972	0.047608
Rosehill ZS	2ROSE11A_LD	Camellia TS	0.399493394	459.5293489	0.183579
Russell Vale ZS	2RUSS11*_LD	Bellambi TS	0.150738002	162.4153053	0.024482
Rydalmere ZS	2RYDA11*_LD	Carlingford TS	0.219113662	232.1246168	0.050862
Schofields ZS	2SCHO11*_LD	Vineyard TS (BSP)	0.079880185	891.3533371	0.071201
Seven Hills ZS	2SEVE11*_LD	Baulkham Hills TS	0.175800332	65.46090848	0.011508
South Granville ZS	2SGRA11A_LD	Guildford TS	0.16185998	125.9094059	0.020380
Shellharbour ZS	2SHEL11A_LD	Mount Terry TS	0.147485862	453.2940331	0.066854
Sherwood ZS	2SHER11A_LD	Guildford TS	0.13145821	112.735588	0.014820
South Erskine Park ZS	2SERS22A_LD	Sydney West TS (BSP)	0.864308472	72.33293048	0.062518
South Leppington ZS	2SLEP11A_LD	Macarthur TS (BSP)	0.070740521	345.1903667	0.024419
South Marsden Park ZS	2SMAR11*_LD	Vineyard TS (BSP)	0.190476622	315.4564325	0.060087
Smithfield ZS	2SMIT11*_LD	Guildford TS	0.153882507	193.7436841	0.029814
South Nowra ZS	2SNOW11A_LD	West Tomerong TS	0.199430245	212.5175716	0.042382
Springwood ZS	2SPRW11*_LD	Warrimoo TS	0.176204003	335.3259021	0.059086
St Marys ZS	2STMA11A_LD	Mount Druitt TS	0.122776296	306.3192069	0.037609
Sussex Inlet ZS	2SUSS11*_LD	West Tomerong TS	0.178387087	112.9139358	0.020142
South Windsor ZS	2SWIN11A_LD	Hawkesbury TS	0.210077283	577.9649033	0.121417
South Wollongong ZS	2SWOL11A_LD	Springhill TS	0.266408625	65.08959103	0.017340

Tahmoor ZS	2TAHM11A_LD	Nepean 66 TS	0.165575506	579.8781857	0.096014
Tomerong ZS	2TOME11A_LD	West Tomerong TS	0.126891013	596.349905	0.075671
Ulladulla ZS	2ULLA11C_LD	Dapto BSP	0.163070246	817.8511715	0.133367
Unanderra ZS	2UNAN11*_LD	Springhill TS	0.322915216	42.65576153	0.013774
Warilla ZS	2WARI11A_LD	Mount Terry TS	0.125955265	131.0303859	0.016504
West Castle Hill ZS	2WCAS11*_LD	Vineyard TS (BSP)	0.14031213	254.7632761	0.035746
Wentworth Falls ZS	2WENT11A_LD	Katoomba North TS	0.218715	84.48538776	0.018478
Werrington ZS	2WERR11A_LD	Mount Druitt TS	0.294956219	281.0834731	0.082907
Westmead ZS	2WESM11A_LD	Baulkham Hills TS	0.352262973	130.9093406	0.046115
Wetherill Park ZS	2WETH11*_LD	Sydney West TS (BSP)	0.387931307	77.82174395	0.030189
Whalan ZS	2WHAL11A_LD	Mount Druitt TS	0.203041536	160.0270313	0.032492
Wilton ZS	2WILT11A_LD	Nepean 66 TS	0.081249216	77.24310273	0.006276
Windsor ZS	2WIND11A_LD	Hawkesbury TS	0.120466578	348.6181106	0.041997
Wisemans ZS	2WISE11A_LD	Hawkesbury TS	0.20765652	266.5452102	0.055350
West Liverpool 11kV	2WLIZ11A_LD	West Liverpool TS	0.152462815	229.2060263	0.034945
Wombarra ZS	2WOMB11A_LD	Bellambi TS	0.152500996	152.5846687	0.023269
Woodpark ZS	2WOOD11A_LD	Guildford TS	0.332558608	58.33703393	0.019400
West Parramatta ZS	2WPAM11A_LD	Holroyd TS (BSP)	0.230581646	93.23985423	0.021499
West Pennant Hills ZS	2WPEN11A_LD	Carlingford TS	0.0939077	113.364538	0.010646
West Wetherill Park 11kV	2WWET11A_LD	Sydney West TS (BSP)	0.266556385	132.7076025	0.035374
West Wollongong ZS	2WWOL11*_LD	Springhill TS	0.163139337	109.3924343	0.017846
Yatte Yattah ZS	2YATT11A_LD	West Tomerong TS	0.122755111	164.8086016	0.020231
Yennora ZS	2YENN11A_LD	Guildford TS	0.263063362	99.72349017	0.026234



Marsden Park ZS	2MARS11A_LD	Vineyard TS (BSP)	0.089003104	336.1838391	0.029921
North Leppington ZS	2NLEP11A_LD	Macarthur TS (BSP)	0.167634477	177.3025515	0.029722
Menangle Park ZS	2MENA11A_LD	Macarthur 66 TS (BSP)	0.048113451	3.551338187	0.000171
Box Hill ZS	2BOXH11A_LD	Vineyard TS (BSP)	0.204901289	0	0.000000
Calderwood ZS	2CALD11_LD	Mount Terry TS	0.101886443	14.81018043	0.001509

Appendix D – Calculation of losses for distribution substations

Rating (kVA)	No. in service	Total Losses (MW)	Assumed LLF	Avg full load series loss %	Avg full load series loss kW	Utilisation Factor	Series losses per tfr (kW)	Total Series Loss (MW)	No load Loss %	No load loss per tfr (kW)	Total No Load Losses (MW)
0	4	-	0.21	1.50%	0	50.00%	-	-	0.50%	0	0.0000
3	0	-	0.21	1.50%	0.045	50.00%	0.00	-	0.50%	0.015	0.0000
5	76	0.0022	0.21	1.50%	0.075	50.00%	0.00	0.00030	0.50%	0.025	0.0019
6	0	-	0.21	1.50%	0.09	50.00%	0.00	-	0.50%	0.03	0.0000
8	0	-	0.21	1.50%	0.1125	11.00%	0.00	-	0.50%	0.0375	0.0000
10	558	0.0342	0.21	1.50%	0.15	60.00%	0.01	0.00633	0.50%	0.05	0.0279
12	1	0.0001	0.21	1.50%	0.18	60.00%	0.01	0.00001	0.50%	0.06	0.0001
15	357	0.0320	0.21	1.50%	0.225	60.00%	0.02	0.00607	0.50%	0.075	0.0268
16	416	0.0400	0.21	1.50%	0.24	60.00%	0.02	0.00755	0.50%	0.08	0.0333
20	10	0.0012	0.21	1.20%	0.24	65.00%	0.02	0.00021	0.50%	0.1	0.0010
23	7	0.0011	0.21	1.20%	0.276	81.00%	0.04	0.00027	0.50%	0.115	0.0008
25	3558	0.5577	0.21	1.20%	0.3	71.00%	0.03	0.11300	0.50%	0.125	0.4448
30	1	0.0002	0.21	1.20%	0.36	60.00%	0.03	0.00003	0.50%	0.15	0.0002
50	1143	0.3325	0.21	1.20%	0.6	57.00%	0.04	0.04679	0.50%	0.25	0.2858
55	0	-	0.21	1.20%	0.66	54.50%	0.04	-	0.40%	0.22	0.0000
58	6	0.0017	0.21	1.20%	0.696	60.00%	0.05	0.00032	0.40%	0.232	0.0014
63	1720	0.5442	0.21	1.20%	0.756	63.70%	0.06	0.11080	0.40%	0.252	0.4334
75	5	0.0019	0.23	1.20%	0.9	60.00%	0.07	0.00037	0.40%	0.3	0.0015
100	2731	1.3585	0.23	1.20%	1.2	59.20%	0.10	0.26416	0.40%	0.4	1.0924
110	1	0.0004	0.23	1.10%	1.21	64.70%	0.08	0.00008	0.30%	0.33	0.0003
150	381	0.2377	0.23	1.10%	1.65	67.70%	0.17	0.06627	0.30%	0.45	0.1715
160	135	0.0845	0.23	1.10%	1.76	60.00%	0.15	0.01967	0.30%	0.48	0.0648
200	2695	2.1244	0.23	1.10%	2.2	61.00%	0.19	0.50742	0.30%	0.6	1.6170
220	0	-	0.23	1.00%	2.2	61.00%	0.19	-	0.30%	0.66	0.0000
250	749	0.7931	0.23	1.00%	2.5	73.30%	0.31	0.23140	0.30%	0.75	0.5618
260	1	0.0009	0.23	1.00%	2.6	63.10%	0.24	0.00024	0.25%	0.65	0.0007
300	3461	3.6423	0.23	1.00%	3	66.20%	0.30	1.04657	0.25%	0.75	2.5958
315	3242	3.4219	0.23	0.95%	2.9925	62.40%	0.27	0.86885	0.25%	0.7875	2.5531
400	1502	1.8113	0.23	0.95%	3.8	48.54%	0.21	0.30930	0.25%	1	1.5020
500	7167	11.4041	0.23	0.90%	4.5	57.42%	0.34	2.44536	0.25%	1.25	8.9588
600	46	0.0807	0.23	0.90%	5.4	45.35%	0.26	0.01175	0.25%	1.5	0.0690
750	242	0.5383	0.23	0.90%	6.75	47.44%	0.35	0.08456	0.25%	1.875	0.4538
800	26	0.0651	0.23	0.90%	7.2	57.13%	0.54	0.01405	0.25%	2	0.0520
910	0	-	0.23	0.90%	8.19	52.19%	0.51	-	0.25%	2.275	0.0000
1000	2732	10.2092	0.23	0.90%	9	77.30%	1.24	3.37917	0.25%	2.5	6.8300
1500	607	2.6559	0.23	0.90%	13.5	44.88%	0.63	0.37963	0.25%	3.75	2.2763
2000	3	0.0180	0.23	0.90%	18	55.00%	1.25	0.00376	0.25%	5	0.0150
2500	0	-	0.23	0.90%	22.5	52.36%	1.42	-	0.25%	6.25	0.0000
3000	0	-	0.23	0.90%	27	55.00%	1.88	-	0.25%	7.5	0.0000
5000	0	-	0.23	0.90%	45	56.21%	3.27	-	0.25%	12.5	0.0000
10000	0	-	0.23	0.90%	90	38.93%	3.14	-	0.25%	25	0.0000
Total	33583	39.9969						9.9243			30.07

