ETSA Utilities

Distribution Loss Factor Methodology

March 2010

Shortened forms

Abbreviation	Definition or description
AER	Australian Energy Regulator.
Demand	Energy consumption at a point in time.
DLF	Distribution loss factor, the adjustment for average energy losses used for connection points to the distribution network.
Distribution Network	The assets and service that link energy customers to the transmission network.
Distributor, DNSP	Distribution Network Service Provider.
ESCoSA	Essential Services Commission of South Australia, the South Australian Regulator of energy and other infrastructure.
High Voltage	Equipment or supplies at voltages of 22 or 11 kV.
Low Voltage	Equipment or supply at a voltage of 230 V single phase or 400 V, three phase.
NEM	National Electricity Market.
Rules	National Electricity Rules.
Retailer	An FRC market participant (business) supplying electricity to customers.
Subtransmission	Equipment or supplies at voltage levels of 66 or 33 kV.
ToU	Time of Use, a system of pricing where energy or demand charges are higher in peak periods.
Transmission Network	The assets and service that enable generators to transmit their electrical energy to population centres. Operating voltage of equipment is 500, 275, 132 and some at 66 kV.
TCP	Transmission connection point, a point at which the distribution network is connected to the transmission network.
Unmetered supply	A connection to the distribution system that is not equipped with a meter and has estimated consumption. Connections to public lights, phone boxes, traffic lights and the like are not normally metered.
VTN	Virtual transmission node, a construct used for the market settlement of distribution connection points, which represents the volume weighted average of a number of constituent transmission connection points.

Contents

Shortened forms i

1 Introduction 3

2 Summary of the National Electricity Rules requirements 4

3 ETSA Utilities' distribution loss factor methodology 5

Stage 1: Assignment of distribution connection points 5

Stage 2: Calculation of actual losses in the distribution network 6

Energy inputs to the network 6

Connection points to the transmission network 7

Embedded generators 7

Energy outputs from the network 7

Historical losses in the distribution network 8

Stage 3: Calculation of DLFs for major customers and major embedded generators 9

Connections to Powercor distribution network 9

Major customers and generators 9

Stage 4: Calculation of DLFs for non site-specific customers and embedded generators 11

ETSA Utilities' selection of non site-specific customer classes 11

DLFs for non site-specific customer classes 12

Stage 5: Reconciliation of actual and forecast losses 12

Estimated losses for 2009-10 and 2010-11 13

4 Distribution loss factors for 2010-11 15

Distribution loss factor methodology

1 Introduction

ETSA Utilities is responsible for determining distribution loss factors for the connection points to its distribution network. These loss factors describe the average electrical energy losses for electricity conveyed between the point of connection to the distribution network and the point of connection to the transmission network. The distribution loss factors apply to all loads and embedded generators connected to the distribution network.

Clause 3.6.3 of the National Electricity Rules (the Rules) sets out the requirements for the calculation of distribution loss factors and the processes leading to their approval by the Australian Energy Regulator (AER) and implementation in the market settlements by the Australian Energy Market Operator (AEMO).

Prior to the publication of the 2010-11 distribution loss factors, ETSA Utilities developed a methodology that was reviewed by the Electricity Supply Industry Planning Council (ESIPC). ESIPC were at that time the authorised body for determining loss factors, until a derogation ceased in December 2002. In subsequent years, the Essential Services Commission of South Australia (the Commission) was involved. The Commission annually certified to the Australian Energy Regulator (AER) that ETSA Utilities had followed the methodology in preparing proposed distribution loss factors. In 2003, the Commission required a balance of under/over-recovery of losses through distribution loss factors to be maintained.

In March 2009, following changes to the jurisdictional regulatory responsibilities in South Australia, the Commission advised the AER that it would no longer review ETSA Utilities' distribution loss factors. An independent audit of these distribution loss factors is now carried out by Energeia Pty. Ltd.

The AER has not developed a methodology for the calculation of distribution losses for South Australia and accordingly ETSA Utilities has done so. This document sets out the methodology that has been developed, published and will be maintained by ETSA Utilities, in compliance with clause 3.6.3(g)(2) of the Rules. It is the same approach that has historically been used for the calculation of distribution loss factors by ETSA Utilities and the Commission.

This document is published on ETSA Utilities' website at:

http://www.etsautilities.com.au/centric/our_network.jsp

The document is also made available upon request to interested persons.

2 Summary of the National Electricity Rules requirements

The following is a summary of the relevant sections of clause 3.6.3 of the Rules, concerning the calculation of distribution losses. In ETSA Utilities' case, there are several simplifying factors that act to reduce the number of applicable Rule provisions. These are as follows:

- There are no market network service providers using ETSA Utilities network (clauses 3.6.3(b)(2)(i)(C) and 3.6.3(h)(6));
- ETSA Utilities has a single distribution pricing zone for South Australia (clause 3.6.3(e)(2)); and
- No embedded generator with a capacity of less than 10MW or 40GWh has requested ETSA Utilities to provide a site-specific loss factor (clause 3.6.3(b1)).

Distribution loss factor requirements

Distribution loss factors (DLFs) are required under Clause 3.6.3(b)(2) for each connection to the distribution network. The DLFs are to be determined as follows:

- A site-specific DLF is required for each embedded generator with a capacity of greater than 10MW;
- A site-specific DLF is also required for a customer connection point with a demand of greater than 10MW or energy consumption greater than 40GWh; and
- For smaller customers, DLFs are the volume weighted average of the average losses for customers of different connection voltages and patterns of consumption.

Assignment of distribution connection points

For the purpose of DLF calculations, all connection points to the distribution network must be assigned to a transmission connection point or a virtual transmission node, which represents the volume weighted average of a number of transmission connection points. This is the case for both site-specific and non site-specific connections and is covered by Rules clauses 3.6.3(c) to 3.6.3(f).

General principles applying to the distribution loss calculation

The methodology for determining DLFs must have regard to a number of principles, set out in clause 3.6.3(h). The relevant principles are summarised as follows:

(1) For the financial year in which the DLFs are to apply, the aggregate of the loss-adjusted energy delivered into the distribution network should, as closely as is reasonably practicable, equal the sum of the energy delivered to connection points to the distribution network and the losses taking place on the network.

(2) Provision is required for a reconciliation of the previous year's aggregate of loss-adjusted energy delivered into the distribution network with the sum of the energy delivered to connection points to the distribution network and the losses taking place on the network.

(3) For non-site-specific connection points, the DLF represents the volume weighted average of the average electrical energy loss between the assigned transmission connection point or virtual transmission node and each distribution network connection point in the relevant class of distribution network connection points.

(4) For a site-specific connection point, the DLF represents the average electrical energy loss between the assigned transmission connection point or virtual transmission node and the distribution network connection point.

(5) The most recent 12 months of actual load and generation data is used to determine the average electrical energy losses referred to in (3) and (4), adjusted if necessary to take into account projected load and or generation growth in the financial year in which the DLFs are to apply.

3 ETSA Utilities' distribution loss factor methodology

ETSA Utilities' distribution loss factor methodology has been established in compliance with the provisions of the Rules and having due regard to the above principles. The methodology contains the following main stages:

Stage 1: The assignment of distribution connection points to transmission connection points and the virtual transmission node.

Stage 2: Calculation of the actual system losses historically taking place on the distribution network.

Stage 3: Calculation of the system losses and DLFs for site-specific distribution connection points.

Stage 4: Allocation of the losses and DLFs associated with non site-specific distribution connection points.

Stage 5: Reconciliation of actual system losses, any balance of past over/under recovery of losses and those arising from the application of proposed DLFs.

The stages of this methodology are described in this section.

Stage 1: Assignment of distribution connection points

The AER approved ETSA Utilities' definition of a virtual transmission node for South Australia prior to the commencement in 2003 of Full Retail Contestability in South Australia. The South Australian VTN (identified as SJP1) includes all load transmission connection points, with the exception of the following two transmission connection points:

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

ETSA Utilities assigns its customers to the virtual transmission node or to transmission connection points in accordance with this approved arrangement, as follows:

- All site-specific connection points are assigned to a transmission connection point, taking into account the normal network connections and predominant energy flows:
- Customer and generator connections with an energy consumption or export of exceeding 160 MWh are assigned to a transmission connection point, taking into account the normal network connections and predominant energy flows; and
- Customer and generator connections with an energy consumption or export not exceeding 160 MWh are assigned to the virtual transmission node.

This arrangement is in accordance with clauses 3.6.3(c) to 3.6.3(f) of the Rules and the AER's approval of a virtual transmission node for South Australia.

Stage 2: Calculation of actual losses in the distribution network

The second stage in the process of determining distribution losses is the calculation of the actual distribution losses. This is the difference between the energy inputs to the network and the energy outputs from the network. This equation is represented in Figure 1.

Figure 1 - Loss balance for the distribution network

Energy inputs to the network	-	Energy outputs from the network	=	Distribution network losses

In this calculation, the shaded green quantities are inputs and the derived quantity is pink.

This calculation may only be carried out several months after the completion of each financial year, because of the significant proportion of customer premises that are equipped with accumulation meters and have a three-monthly meter reading and billing cycle. Generally by December each year, the quantum of accrued sales has diminished to a sufficient level to permit this calculation to be performed with acceptable accuracy.

The most recent full year of data for which this calculation can now be performed is therefore 2008-09.

Energy inputs to the network

There are two categories of energy inputs at connections to ETSA Utilities' distribution network, as follows:

- Connection points to the transmission network; and
- Connections to embedded generators at different locations and voltages.

These are described in the following sections.

Connection points to the transmission network

There are currently 46 locations at which ETSA Utilities' distribution network is connected to Electranet's transmission network (transmission connection points). These are at voltages of 33 to 132 kV. Each of these connection points is equipped with interval metering, which is used for market settlements.

The interval data derived from these meters is aggregated to provide a half-hourly record of the total energy input to the ETSA Utilities' network through its transmission connection points.

Embedded generators

There are effectively two classes of embedded generators, from which energy is exported to the distribution network:

- Embedded generators equipped with interval meters at all locations where site-specific loss factors apply, as well as some smaller generators with non site-specific DLFs. For these generators, interval data is available; and
- Smaller embedded generators connected to the low voltage network, such as photo-voltaic (PV), are not necessarily equipped with interval meters and their accumulation meters are generally read on a three-monthly or one-monthly schedule, in similar manner to small customers. The estimate of annual energy generated from these sources requires an accrual adjustment, for consumption taking place between meter reading dates.

The outputs of all embedded generators are adjusted by their respective DLF, to reflect their equivalent input to ETSA Utilities distribution network at the transmission connection point level.

The total energy input to the network is the sum of energy conveyed through the connection points to Electranet's transmission network and the distribution loss-adjusted inputs of the embedded generators.

Energy outputs from the network

As with embedded generators, there are different classes of customers connected to the network. From the perspective of determining the total energy delivered by the network, the following groupings apply:

- Major customers are equipped with interval meters at all those at locations where site-specific DLFs apply. As well, there are an increasing number of smaller interval metered customers at connections with non site-specific DLFs. For these customers, interval data is available;
- The great majority of smaller customers are equipped with accumulation meters, of which the majority are read on a three-monthly basis. A proportion of these accumulation meters are read on a monthly basis. For these customers, estimating the energy consumption which has taken place within a given year requires an apportionment of the consumption recorded at adjacent meter readings.

- There is a diverse range of unmetered connections to the network, such as public lighting, traffic lights, cable TV and GSM repeater installations, bus shelters and advertising signs. The consumption of these connections is estimated from their typical demand profile and the number of installations.

The total energy outputs of the network are the aggregate of the energy delivered to the groupings of customers above.

Historical losses in the distribution network

The historical calculation of the actual losses in ETSA Utilities' distribution network is illustrated in Table 1.

Table 1 - Distribution network losses, GWh

Year	Energy inputs to the network			Energy delivered	Losses	
	Electranet	Embedded generation[1]	Total			% of input
1999-00	10,480	59	10,539	9,910	629	5.97%
2000-01	10,950	61	11,011	10,291	721	6.55%
2001-02	10,656	81	10,737	10,153	584	5.44%
2002-03	10,977	96	11,073	10,431	642	5.80%
2003-04	10,964	213	11,177	10,485	692	6.19%
2004-05	10,887	278	11,165	10,499	666	5.96%
2005-06	11,322	354	11,677	10,958	718	6.15%
2006-07	11,628	350	11,978	11,262	716	5.98%
2007-08	11,728	325	12,053	11,347	706	5.86%
2008-09	11,743	308	12,051	11,265	786	6.52%

There is a noticeable annual variation in the percentage of distribution network losses. This arises in part because of the estimation process associated with three monthly meter reading.

However, the years which recorded high percentage losses are also those that had extended periods of extreme summer weather. The additional demand on the network associated with elevated levels of air conditioning during these periods, coupled with higher electrical resistances due to elevated equipment temperatures, has a disproportionate impact upon electrical losses on the days of extreme weather.

The lowest losses occurred in 2001-02, which had the mildest winter and summer in recent years.

[1] Includes an adjustment for the distribution losses of embedded generators.

Stage 3: Calculation of DLFs for major customers and major embedded generators

This third stage in the DLF calculation process involves calculation of the distribution losses that are attributable to site-specific customer and generator connections. In addition, there are two high voltage connections to the Powercor distribution network, on the eastern boundary of ETSA Utilities' network.

These site-specific calculations are amenable to being directly estimated using the engineering calculations which are routinely employed in the planning and design of the network.

Connections to Powercor distribution network

The two high voltage connections between the ETSA Utilities and Powercor networks are as follows:

- Berri-Paringa-Border; and
- Blanche-Allendale East-Border.

In 2004, in accordance with the approach preferred by NEMMCo (now AEMO), DLFs were determined for these two connections. The distribution loss factors apply between the associated transmission connection points (at Berri and Blanche respectively) and the border metering locations. These arrangements have not since been reviewed.

Major customers and generators

The method of calculation of individual distribution loss factors for major customers and generators is outlined below. These calculations are site-specific, taking into account the electrical characteristics, configuration and loading on the relevant portion of the distribution network.

These major customers and generators are all connected at voltages of 11 kV or higher. Each also has an interval meter for the purpose of market settlements, and the historic interval data for the previous financial year may be used to determine the electrical losses taking place in the network.

ETSA Utilities' approach to establishing site-specific DLFs employs the most recent consecutive 12 months of data wherever it is available. If this data is not available, a projection of data is made, in accordance with the terms of the relevant connection agreement.

A loss load factor (LLF) is determined for each site. This is calculated as the average of the square of every half-hourly load reading, expressed as a percentage of the peak half-hourly demand. This factor represents the ratio of the average loss to the peak loss.

The losses occurring in different portions of the distribution network are then calculated, as follows. The DLF for a customer connected at 11 kV will contain components of loss for each of the relevant upstream higher voltage networks.

Subtransmission system losses (66 kV meshed lines)

- A standard system loadflow model is used to determine the portion of 66 kV network losses attributable to the customer's load or generation at the time of system peak load. This is done by analysing the losses using two studies, with and without the customer connection.
- The load data for the relevant 66 kV system is used to calculate the energy lost in the system.
- The DLF for subtransmission-connected customers is determined as the percentage of lost energy to the total energy at the customer's load or generator connection.

Subtransmission system losses (33 kV radial lines)

- The DLF for 33 kV connected customers includes comprises losses for the 33 kV system to the load connection plus (if necessary) upstream losses for the relevant point of connection to the 66 kV subtransmission network.
- The load data for relevant 33 kV system is used in conjunction with loadflow studies to calculate the energy lost in the 33 kV system.
- As with 66 kV connected customers, the subtransmission DLF is calculated as the percentage of lost energy to total energy supplied at the specified substation.

Substation losses

- Where applicable, load data for each substation Is used to calculate the DLF as the percentage of lost energy to total energy supplied by the substation.
- An adjustment to the customer DLF is made to include transformer no load losses and auxiliary equipment losses within the substation.

HV feeder losses

- The DLF for 11 kV connected customers includes a proportion of the upstream losses from the relevant point of connection to the transmission connection point, and can include losses for the 66 kV and/or 33 kV subtransmission networks, the zone substation and the 11 kV system.
- For customers connected via dedicated HV feeders, load data for each feeder over is used to calculate this DLF component as a percentage of the lost energy to total energy supplied from that feeder.

These individual calculations are reviewed whenever a material change takes place to any of the following:

- The customer's (or generator's) circumstances and load characteristics;
- The background load of other customers on the local network; or
- A change in the configuration or equipment installed on the local network, eg. the addition of new transformers or changes to sub-transmission systems.

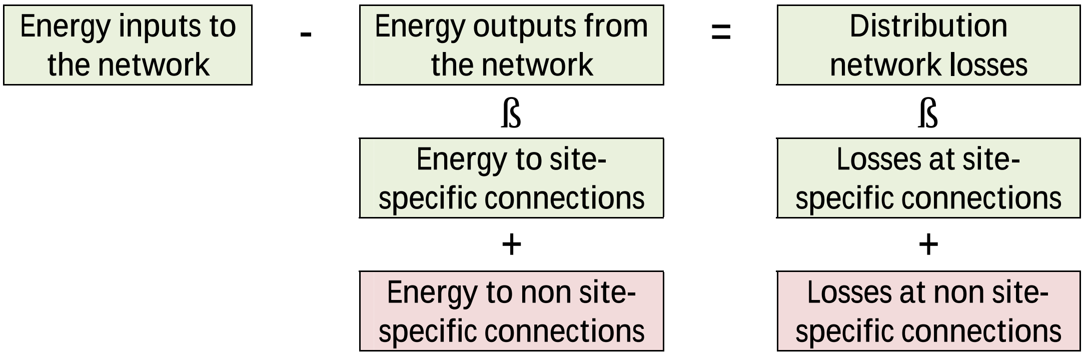
These site-specific calculations were reviewed in 2006-07 and at the time of their preparation used the most recent 12 months of energy data. No material changes requiring the review of any site-specific distribution loss factor has occurred since that time.

Stage 4: Calculation of DLFs for non site-specific customers and embedded generators

The third and final stage in the determination of DLFs is the allocation of the remaining losses, after the determination of the site-specific consumption and loss factors, to the non site-specific classes of customers and embedded generators.

The extension of the equation in Figure 1 above is presented in Figure 2. The quantities determined in the two earlier stages are shaded in green and the quantities derived in this step are shaded pink.

Figure 2 - Distribution losses at non site-specific connections



The aggregate energy delivered to non site-specific connections and the aggregate loss associated with those connections is thereby calculated by subtraction of the site-specific quantities from the totals for the distribution network.

ETSA Utilities’ selection of non site-specific customer classes

Clauses 3.6.3(d)(2) of the Rules requires the non site-specific customer connections to be assigned to classes on the basis of their location, voltage of connection and consumption pattern. ETSA Utilities has met this requirement by assigning non site-specific customer connections to the voltage and consumption classes set out in Table 2.

Table 2 - Non site-specific customer classes

Connection class	Voltage	Type of customer connection
NLV2	Low voltage	Residential, small business, unmetered, controlled load, PV and micro generation
NLV1		Medium business
NHV1	High Voltage	Large business, HV connected embedded generation (eg. landfill gas)
NZS1	High voltage substation connected	Major business below 10 MW or 40 GWh

DLFs for non site-specific customer classes

The allocation of distribution losses to the non site-specific customer classes is covered by Rules clause 3.6.3(b)(2)(ii). Specifically, the volume weighted average of the average energy losses between the virtual transmission node and is assigned to the distribution connections in each customer class.

The relativity between the DLFs at each voltage level has been determined by ETSA Utilities by reference to other Australian utilities with similar network characteristics. This relativity has been reviewed and approved by ESIPC prior to 2002 and subsequently by the Commission to 2009.

Medium scale businesses on demand tariffs are assumed to take supply from (or adjacent to) a distribution transformer. It is assumed that these customers do not incur LV line losses.

Stage 5: Reconciliation of actual and forecast losses

Clause 3.6.3(h)(2) of the Rules requires ETSA Utilities to undertake a reconciliation of the gross energy amounts with actual network losses with the gross energy amounts arising from the application of the DLFs.

Table 3 presents this reconciliation. The two gross energy amounts to be reconciled are in columns labelled (A) and (B). It may be observed that as minor changes have been made to the non site-specific DLFs from time to time, the losses determined from DLFs have been maintained within approximately 10% of the actual loss, notwithstanding the significant annual variation in actual losses that is demonstrated in Table 1 and the adjustments necessary to DLFs to return the closing balance towards zero each year.

Table 3 - Reconciliation of actual and DLF losses

Year	Energy inputs (A)	Energy outputs			Balances		
		Customer loads	DLF Losses	Total (B)	Annual (A-B)	Opening	Closing
Historical							
1999-00	10,539	9,910	670	10,580	-41	-2	-43
2000-01	11,011	10,291	699	10,989	22	-43	-21
2001-02	10,737	10,153	650	10,803	-66	-21	-87
2002-03	11,073	10,431	679	11,110	-37	-87	-124
2003-04	11,177	10,485	637	11,123	55	-124	-69
2004-05	11,165	10,499	641	11,140	25	-69	-44
2005-06	11,677	10,958	706	11,664	13	-44	-31
2006-07	11,978	11,262	727	11,989	-11	-31	-42
2007-08	12,053	11,347	737	12,084	-31	-42	-73
2008-09	12,051	11,265	726	11,991	60	-73	-14

The reconciliation in Table 3 highlights that the annual balance in 2008-09 of 60 GWh resulted in the closing balance at June 2009 reducing to -14 GWh (over-recovered). The high level of losses in 2008/09 has resulted in a quicker reduction of the annual balance than was forecast when the 2009-10 DLFs were set.

Estimated losses for 2009-10 and 2010-11

The estimated losses for 2009-10 have been determined by applying the approved DLFs which have been in place for that year to the actual 2008-09 consumption. It is assumed that the long-term losses of 6.1% of purchases will occur in 2009-10. Given the use of 2008-09 customer loads, the 2009-10 GWh purchases is estimated at 11,997 GWh. The DLF recoveries are determined using the actual 2009-10 DLFs with the 2008-09 customer load. The closing balance for losses is anticipated to increase to 42 GWh (under-recovered) at June 2010.

A further adjustment has been made to the 2010-11 DLFs for non site-specific sites. The 2010/11 DLFs have been increased by 10% from the 2009-10 level. This returns DLFs generally to levels just above that of 2008-09 and earlier years. Such a level of DLFs will enable losses recovered by DLFs to exceed losses incurred by 11 GWh (if actual losses are 6.1% of purchases) and will result in the balance of the losses account closing at 31 GWh (under-recovered). This balance is shown in Table 4.

Table 4 - Reconciliation of estimated actual losses and DLF losses

Year	Energy inputs (A)	Energy outputs			Balances		
		Customer loads	DLF Losses	Total (B)	Annual (A-B)	Opening	Closing
Estimated (using 2008-09 customer load data, average historical losses, actual DLFs for 2009-10 and forecast DLF's 2010-11)							
2009-10	11.997	11,265	676	11,941	56	-14	42
2010-11	11.997	11,265	742	12,008	-11	42	31

It should be possible to maintain DLFs at around this level in the future if actual losses average 6.1% of energy inputs. The balance of the losses account should continue to trend down towards a zero balance.

Note that if the losses account balance was to be eliminated in 2010-11, then the DLFs would need to be increased by 14.6%, with residential DLFs at 8.5%, some 0.35% higher than proposed. DLF's would then have to be lowered in 2011-12, with residential DLFs t around 8.0%. A DLF stability approach has been the practice to date and is proposed for 2010-11.

4 Distribution loss factors for 2010-11

ETSA Utilities' site-specific DLFs for 2010-11 were calculated using the methodology set out in this document and are set out in Table 5 and Table 7. For clarity, a number of site specific locations which will not be used in 2010-11 have been included in Table 6.

The site-specific DLFs are unchanged from 2009-10.

Table 5 - Site-specific distribution loss factors for customers

NMI	MSATS Code	DLF 2009-10	DLF 2010-11
2001000378	NBA1	1.0000	1.0000
2002112609	NKC4	1.0057	1.0057
SAAAAAA018	NPS1	1.0000	1.0000
SAAAAAA084	NOS1	1.0000	1.0000
SAAAAAB557	NOS2	1.0000	1.0000
2001000608	NAC2	1.0135	1.0135
2002133131	NGM2	1.0115	1.0115
SAAAAAA019	NPS2	1.0069	1.0069
SAAAAAA021	NPS3	1.0069	1.0069
SAAAAAA022	NGM1	1.0107	1.0107
SAAAAAA024	NAB1	1.0077	1.0077
SAAAAAA026	NAC1	1.0218	1.0218
SAAAAAA029	NMM1	1.0145	1.0145
SAAAAAA035	NGT1	1.0048	1.0048
SAAAAAA438	NIF1	1.0091	1.0091

Table 6 - Site-specific distribution loss factors no longer applicable for customers

NMI	MSATS Code	DLF 2009-10	DLF 2010-11
SAAAAAA000		0.0000	0.0000
SAAAAAA001		0.0000	0.0000
SAAAAAA002		0.0000	0.0000
SAAAAAA023		0.0000	0.0000
SAAAAAA031		0.0000	0.0000

Table 7 - Site-specific distribution loss factors for embedded generators

NMI	MSATS Code	DLF 2009-10	DLF 2010-11
2002108658	NCDW	0.9721	0.9721
2001000734	NSHW	1.0092	1.0092
2002108660	NAS1	0.9900	0.9900
2002108661	NAS2	0.9900	0.9900
2001000647	NCL1	1.0226	1.0226
SAAAAAA084	NOS1	1.0000	1.0000

The 2010-11 DLFs for non-site specific connections are set out in Table 8. These DLFs have been varied from those in place in 2009-10 and have been increased by 10% from those that applied in 2009-10.

Table 8 - Non site-specific distribution loss factors

Customer tariff	MSATS Code	DLF 2009-10	DLF 2010-11
Unmetered	NLV2	1.0740	1.0814
Residential	NLV2	1.0740	1.0814
Business Single	NLV2	1.0740	1.0814
Business 2 rate	NLV2	1.0740	1.0814
PV cells and other LV connected micro-generation	NLV2	1.0740	1.0814
LV demand (assumed transformer connected)	NLV1	1.0591	1.0650
HV customers and HV connected embedded generators	NHV1	1.0353	1.0388
Substation connected, non-locational	NZS1	1.0164	1.0180