Electricity North West Limited

Statement of Loss Adjustment Factor Methodology

Effective from 1 August 2011

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Contents

1. Introduction

1.1 Electricity North West Limited operates under its Electricity Distribution Licence, as issued under the Electricity Act 1989. Words and expressions used in this statement have the definitions given to them in the Act or Licence and shall be construed accordingly.

1.2 This statement, which is not subject to approval by the Authority, describes the methodologies applied by Electricity North West Limited in the calculation of its loss adjustment factors[1] for authorised users of its distribution network, in line with the principles set out in BSC Procedure 128.

1.3 Electricity North West Limited is providing this statement, in order to provide clarity and transparency for users of its distribution network of the methodology that is used for the calculation of its published loss adjustment factors. This methodology is designed to satisfy the requirements of Elexon's BSC Procedure 128 (BSCP 128) "Production, Submission, Audit and Approval of Line Loss Factors". In particular, robust error detection and correction processes have been put in place (BSCP 128 Principle 11) and the methodology and calculations are subject to annual audit by Elexon.

1.4 Electricity North West Limited is obliged under Standard Condition 14 of the Distribution Licence to publish a statement of charges for the use of the distribution system that is in a form approved by the Authority. This statement is required to contain "a schedule of adjustment factors to be made for distribution losses". Electricity North West Ltd's loss adjustment factors are made available to Elexon (and therefore all market participants) through the provision of the dataflow, D0265 for Supplier Volume Allocation (SVA) loss adjustment factors and an Elexon prescribed data format for Central Volume Allocation (CVA) loss adjustment factors.

1.5 Loss adjustment factors are determined through the application of two methodologies. The generic loss adjustment factors are calculated using the methodology developed in a joint project between EA Technology, and the majority of distribution businesses. The site specific loss adjustment factors are calculated using an electricity industry methodology; the recognised network planning tool, IPSA (Interactive Power System Analysis). These methodologies are described in detail in sections 3 and 4 below.

1.6 In accordance with BSCP 128 Principle 1, all LAFs are calculated using the Generic methodology except for:

- Sites that are connected at Extra High Voltage (EHV) or
- Where the customer has requested a site specific LAF, and Electricity North West Limited is in agreement

1.7 If you have any questions about the contents of this statement, please write to or telephone us at:

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1.8 Electronic copies of this statement are available, from the following website: Electricity North West Limited. Alternatively, hard copies can be provided at a cost of £10.00 plus VAT, per copy.

1 Loss Adjustment Factors are sometimes referred to as Line Loss Factors and vice versa.

2. Who we are

2.1 Electricity North West Limited is the licensed electricity distribution business serving the North West part of England, including an area that extends roughly from Buxton to Carlisle and from Blackpool to Settle. We distribute electricity to a range of Customers, comprising domestic, commercial and industrial, through a network of 14,000 km of overhead lines, 45,000 km of underground cabling and substations at various network levels). Our distribution licence is issued under the Electricity Act (1989)[2].

2.2 Electricity North West Limited operates, maintains and repairs assets across its distribution services area, together with managing and delivering its capital investment projects and providing connections and diversions.

[2] As amended by the Utilities Act 2000, the Sustainable Energy Act 2003 and Energy Act 2004.

3. Generic Loss Adjustment Factors

3.1 Generic loss adjustment factors are calculated for the majority of SVA registered authorised users. The allocation model developed by EA Technology is utilised to calculate the generic loss adjustment factors. The generic loss adjustment factors are re-calculated at least every two years (BSCP 128 Principle 12).

3.2 The Generic methodology takes the overall load flows into and out of the Grid Supply Point Group (GSPG) and, after netting off the losses associated with Site Specific customers, allocates the remaining losses (technical and non technical) to the remaining customers (BSCP128 Principles 4 and 5). The methodology utilises Settlement data from a Settlement Run at R3 or greater and from a complete 12-month period. The 12 month period to be used shall be the BSC Year, 3 years prior to the BSC Year for which the LLFs are being calculated (BSCP 128 principle 9). The data is cross-referenced against a set of audited consumption data to ensure its accuracy, prior to being entered into the model (BSCP128 Principle 11).

3.3 The four voltage levels of 132kV, 33kV, 11kV and LV and the three transformation levels of 132/33kV, 33/11kV and 11kV/LV are represented within the model. The model is populated with a set of standing data. For example, the fixed loss constant (in megawatts) and the variable loss constant (per megawatt) for each voltage and transformation level are contained within the standing data. These loss constants are derived from a network equivalent representation of Electricity North West Ltd's distribution network. The fixed loss constant reflects primarily the iron losses in transformers and dielectric losses in cables. The variable loss constant reflects the losses in electrical equipment that vary with the magnitude of the current such as ohmic losses in conductors and transformer windings.

3.4 The model is also populated with the metered volumes of energy per annum at each network voltage, including the energy metered at the connection points with National Grid Electricity Transmission and the contribution from distributed generation within Electricity North West Ltd's distribution network. The populated metered data is transformed into half-hourly data using the settlement profiles (Profile Classes 1 to 8), and user defined profiles.

3.5 The model calculates the power passed through the network into the next voltage level below using the following empirical equation:

$$Pout = Pin - v.Pin^2 - f - L$$

where Pin = Power into voltage level from higher voltage level,
Pout = Power out of voltage level into lower voltage level,
f = Fixed loss constant for voltage level,
v = Variable loss constant for voltage level,
L = Half-hourly metered demand at voltage level.

This is illustrated by the following example:

Power input at 132kV for a particular half hour	2,000MW
Fixed losses on the 132kV network	0.5MW
Variable losses on the 132kV network for 2,000MW	3.5MW
LAF132kV equals 2,000/(2,000 – 3.5 – 0.5)	
LAF132kV calculated as equal to	1.0020

If net sales from the 132kV network inclusive of the site specific

loss calculations carried out for the relevant EHV customers are:	200MW
Then power flowing into the 132/33kV transformation level	1,796MW
Fixed losses at the 132/33kV transformation level	8MW
Variable losses at the 132/33kV transformation level	2MW
$LAF_{132/33kV}$ equals LAF_{132kV} multiplied by 1,796/(1,796 – 8 – 2)	
$LAF_{132/33kV}$ calculated as equal to	1.0076

3.6 This is repeated through the voltage and transformation levels until the LV network is reached. This produces the first estimate of the LV network non half-hourly metered load in every half-hour. As settlement profiles have been used, these estimated values will differ from the annual volume of the non half-hourly metered load. The program therefore undertakes a series of iterative cycles to match the two values.

3.7 The model adjusts the variable losses by amending the variable loss constants. Greater weight is assigned to the 11kV network, 11kV/LV transition and LV network as the greatest losses are incurred on these parts of the distribution network.

3.8 This results in the losses for the whole period and the losses for each half-hour for each voltage and transformation level being calculated and hence the half-hourly loss adjustment factors are calculated. The calculated LAFs are compared with the previously approved values to confirm that they are within an acceptable tolerance level (BSCP128 Principle 11).

3.9 To calculate the loss adjustment factor for a particular tariff class and tariff period, the half-hourly loss adjustment factors are weighted by half-hourly demand of that tariff class and then averaged over all half-hours in that period.

3.10 The output from the EATL model is compliant with the following principles:

- All LAFs are calculated and submitted to 3 decimal places (BSCP 128 Principle 2)
- Generic LLFCs for Import and Export at the same site where the voltage level is the same are ascribed the same values (BSCP 128 Principle 6)
- There are no more than 2 Low Voltage (LV and LVSubstation) and 2 High Voltage (HV and HVS) generic LLFC Groups in the GSPG_(i.e. _G group), and 3 generic EHV LLFC Group - site specific (EHV 132kV, EHV 132kV to 33kV and EHV 33kV) (BSCP 128 Principle 7)
- Four classes of generic LAFs are calculated (BSCP 128 Principle 8) in each case between the start and end times shown below:
    - “winter peak” (1600 – 19.00, Mon – Fri, November – February);
    - “winter daytime” (0700 – 16.00 and 19.00 – 24.00, Mon – Fri, November – February);
    - “night” (midnight – 07.00); and
    - “other” (all other times)
- The calculated LAFs are compared with the previously approved values to check that they fall within the accepted tolerance (BSCP128 Principle 11)

4. Site Specific Loss Adjustment Factors

4.1 LAFs are calculated using a generic method except for sites connected at EHV and where the customer has requested a site specific LAF, and Electricity North West Limited agrees (BSCP128 Principle 1).

4.2 Site specific loss adjustment factors are calculated for all EHV registered authorised users or where the customer has made a request, and Electricity North West Limited is in agreement. The list of customers who have site specific LAFs is reviewed annually to determine whether there has been a relevant change to network data (e.g. for a change to a customer's Maximum Capacity (MC), for the addition of a new customer etc.), or whether a LAF has not been calculated within the last 5 years. If either of these criteria is met, then the customer's LAF is re-calculated, otherwise the previously approved value is used (BSCP 128 Principle 13).

4.3 The site specific loss adjustment factor accounts for technical losses only (BSCP 128 Principle 3) and comprises a fixed loss element and a variable loss element. The variable loss element of the loss adjustment factor is calculated using the IPSA program, whilst the fixed loss element is calculated by a proportionate approach

4.4 Prior to calculation, any changes to a customer's MC or usage in comparison to the previous year are investigated to ensure that the data used in the calculation is accurate (BSCP128 Principle 11).

4.5 The fixed loss element is the energy required to energise the effective network between the user and the National Grid Electricity Transmission interface point without any demand or generation connected. Typical loss values per km are used for the network circuits, while the nameplate data on "iron" losses are used for the transformers. Where an asset is shared between several users, the fixed losses are attributed to individual users based on the user's MC expressed as a percentage of the aggregate MCs.

4.6 The fixed loss element of all the assets supplying the user are then summated to give the total fixed loss element, in kilowatts, for the considered user. This figure is then multiplied by the number of hours in a year (8,760) to give the losses allocated to the user, in kilowatt-hours per annum.

4.7 The variable loss element is calculated using an IPSA network model constructed for each user representing all relevant parts of the distribution network between the user and assigned National Grid Electricity Transmission interface point. IPSA is a standard industry tool and the model used has been built up over a number of years. It is maintained to accurately reflect the network, meaning that it adds a degree of inherent reliability to the calculations (BSCP128 Principle 11). The network model assumes a normal operating configuration and is populated with system loads that are 60% of the maximum demand (i.e. average system demand). The alternating current (ac) load flow capability of the IPSA software is utilised to calculate the variable loss element of the network model.

4.8 The ac load flow program is run against the network model, without the user connected, to calculate the base variable loss element. Then the user is added with its MC and the ac load flow program is run again to calculate the new variable loss element. The difference in the variable loss element of the two results is attributed to the user. This procedure is repeated for each user in turn.

4.9 A user's calculated variable loss element is then multiplied by the number of hours in the year (8,760) and by the user's Loss Load Factor to produce the losses figure, in the kilowatt-hours per annum. A Loss Load Factor is employed to produce an annual variable loss element, as the user will not continuously operate at its MC

and would therefore not be contributing to losses on a continuous basis.

4.10 The user's Loss Load Factor is calculated from the formula:

$$\text{Loss Load Factor} = A.LF + (1-A).LF^2$$

where LF = Load Factor and A normally takes the value 0.2, based on empirical data. The user's Load Factor is calculated from its actual or assumed half-hourly metered data or assumed profiles.

4.11 The user's calculated fixed and variable elements are added together. The loss adjustment factor attributable to a site specific user is calculated from the formula:

Loss Adjustment Factor = 1 + (Total losses / Distributed Units)

where Distributed Units are the user's historic or estimated import/export annual metered values and are positive for demands and negative for generators.

For demand:

- If the losses in kW are positive (increasing network losses), then the LAF is greater than one, LAF>1.
- If the losses in kW are negative (reducing network losses), then the LAF is less than one, LAF<1.

For generation:

- If the losses in kW are positive (increasing network losses), then the LAF is less than one, LAF<1.
- If the losses in kW are negative (reducing network losses), then the LAF is greater than one, LAF>1.

The calculated LAFs are compared with the previously approved values to check that they fall within the accepted tolerance. Prior to submission for approval, this comparison is repeated (BSCP128 Principle 11). All LAFs are calculated and submitted to 3 decimal places (BSCP 128 Principle 2).

5. Approval and Issue of LAFs

5.1 LAFs published through the above process are made available as an annual update and take effect from 1 April each year. The issue of LAFs is also compliant with principles 10, 14, 15 and 16 of BSCP 128, as set out below:

- BSCP 128 Principle 10
  - Adjustments to LAFs, to take into account historic market wide issues noted in the BSC Auditor's latest Report, can only be made if agreed to be appropriate by the Panel.
- BSCP 128 Principle 14
  - No changes shall be made to approved generic LLFCs mid year. Annual updates will have an effective from date of 1 April. Where default LAFs have been applied due to an audit failure, these may be updated to the approved LAFs on a prospective basis as determined from time to time by the Panel.
- BSCP 128 Principle 15
  - No retrospective changes shall be made to approved site specific or generic LAFs other than to correct material manifest errors.
- BSCP 128 Principle 16
  - Changes shall only be made to approved site specific LAFs mid year if:
    - there has been a material change affecting the site; and
    - the revised LAFs have been approved by the BSC Panel.
    - Annual updates will have an effective from date of 1 April. Where default LAFs have been applied, due to an audit failure, these may be updated to the approved LAFs on a prospective basis as determined from time to time by the BSC Panel.

6. Glossary of terms

6.1 The following definitions are included to aid understanding.

Authority	The Gas and Electricity Markets Authority (GEMA) – the regulatory body for the gas and electricity industries established under section 1 of the Utilities Act 2000.
Balancing and Settlement Code or BSC	Balancing and Settlements Code, including all Party Service Lines and BSC Procedures (as therein defined) made under it, established pursuant to the GB System Operator Licence.
Customer	A person to whom a User proposes to supply, or for the time being supplies, electricity through an Exit Point, or from whom a User, or any Relevant Exempt Supplier, is entitled to recover charges, compensation or an account of profits in respect of electricity supplied through an Exit Point.
Central Volume Allocation (CVA)	The determination of quantities of active energy to be taken into account for the purposes of Settlement in respect of Volume Allocation Units (e.g. GSP Group)
Distribution Licence	The Electricity Distribution Licence granted, or treated as granted to Electricity North West Limited, pursuant to section 6(1) of the Act.
Distribution Services Area	Has, in respect of each Company, the meaning given to that term in paragraph 5(b) of Condition 2 of that Company's Distribution Licence.
Extra High Voltage (EHV)	Premises or distribution systems metered at nominal voltages of 22kV or above.
Elexon	The Balancing and Settlements Company.
Exit Point	A Boundary Point at which electricity is imported from a Distribution System to a Connected Installation or to another distribution system not forming part of the Total System (Boundary Point and Total System having the meaning given to those terms in the BSC).
High Voltage (HV)	Premises or distribution systems metered at nominal voltages of less than 22kV, but greater than 1kV excluding any site defined as EHV.
High Voltage Substation (HVS)	Customers connected to the licencee's distribution system at a voltage of at least 1kV and less than 22kV at a substation with a primary voltage (the highest operating voltage present at the substation) of at least 22kVand less than 66kV, where the current transformer used for the customer's settlement metering or for metering used in the calculation of the customer's use of system charges or credits is located at the substation.
Low Voltage (LV)	Premises or distribution systems metered at voltages of less than 1 kilovolt (1kV).
Low Voltage Substation (LVS)	Customers connected to the licencee's distribution system at a voltage of less than 1kV at a substation with a primary voltage (the highest operating voltage present at the substation) of at least 1kV and less than 22kV, where the current transformer used for the customer's settlement metering is located at the substation.
Maximum Capacity	The maximum amount of electricity in kilovoltamperes you are allowed to take from the Distribution Network through your point of connection
National Grid Electricity Transmission	The company that owns and operates the transmission network in England and Wales.

Profile Class	A classification of profile which represents an exclusive category of customers whose consumption can be reasonably approximated to a common profile for the purpose of attributing an EAC or AA to individual half hours for settlement purposes. A Profile Class may be for teleswitched or non-teleswitched Load.
Third Reconciliation Run – R3	As defined by the Settlements Calendar issued by the FAA (Funds Administration Agent) in accordance with section N3 of the BSC.
Supplier Volume Allocation (SVA)	The determination of quantities of active energy to be taken into account for the purposes of Settlement in respect of Supplier BM Units.
User	Is a Supplier, Generator or Distribution Network Operator.

Version Control

Version	Date	Details	Author
1	27 Feb ‘09	Initial Draft	S M Brooke M Attree
2	09 Apr ‘09	Final Draft	S M Brooke M Attree
3	23 Jun ‘09	Updated following Elexon Audit	A Sherry
4	23 Oct ‘09	Amended following the LLF Calculations Audit	A Sherry
5	28 Jan ‘10	Change of address for Electricity North West Limited	A Sherry
6	27 Jul ‘10	Updated to incorporate changes from the Electricity Distribution Charging Methodology	V Tadi
7	27 Jul ‘11	Updated to incorporate the voltage definitions	A Sherry