Statement of the Use of System Charging Methodology for EDF Energy Network's Electricity Distribution Systems ~~in its London, South East and East of~~

South East Region

Contents

General Introduction

Who we are

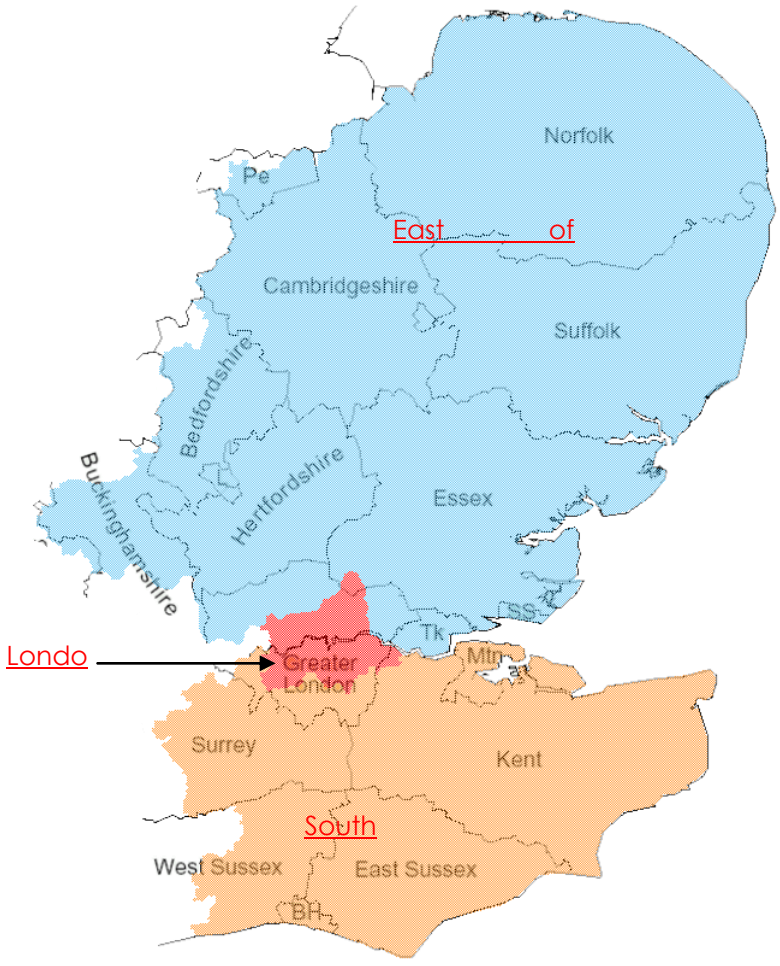
EDF Energy Networks Ltd ("EDF Energy Networks") is responsible for the three licensed electricity distribution businesses serving the whole of London, the South East and the East of England. Our Electricity Distribution Licences ("Licences") are issued under the Electricity Act 1989 as amended by the Utilities Act (2000), the Sustainable Energy Act (2003) and the Energy Act 2004 ("the Act").

This statement is produced by EDF Energy Networks, although certain responsibilities may be undertaken by associated companies or agents. Reference to EDF Energy Networks throughout this document is with regard to EDF Energy Networks (SPN) plc ONLY~~all of the three licensed businesses, namely EDF Energy Networks (EPN) plc, EDF Energy Networks (LPN) plc and EDF Energy Networks (SPN) plc~~.

Important Note

The Use of System Charging Methodology described in this statement is only applicable to the London and East of England Distribution Systems operated by EDF Energy Networks, indicated in blue and red respectively on the map below.

The Use of System Charging Methodology applicable to the South Eastern Distribution System operated by EDF Energy Networks (indicated by 'South East' on the map below) is described in a separate Statement[1]



[1] Statement of the Use of System Charging Methodology for EDF Energy Network's Electricity Distribution System | London and East of England Regions.

Licence Obligations

This statement describes the Use of System Charging Methodology under which authorised persons will be charged for use of EDF Energy Networks' electricity distribution system.

Notwithstanding our obligation to set Use of System charges in line with the special conditions of our Licences (as amended from time to time), EDF Energy Networks is obliged, under Licence Condition 4[2], paragraph 1(a), of its Licences, to prepare a statement approved by the Gas and Electricity Markets Authority ("the Authority") setting out the methodology upon which charges will be made for the provision of Use of System. We are also obliged to review our Use of System Charging Methodology statement annually.

Words and expressions used in this statement have (unless specifically defined herein) the definitions given to them in the Act or the Licences and shall be construed accordingly. Charges are current at the time of publication and will not be changed, except as provided for in the relevant agreement for use of system (see below) and subject to Condition 4 of the Licences.

Additional copies of this statement can be obtained from our web-site at www.edfenergy.com, or alternatively are available on request, at a cost of £10, via the contact details on page 7~~5~~4. To locate this (and other) Statements on the website; on the home page select "Networks" from the orange menu bar that runs across the screen below the logo; then select the "Go to Public Networks" link from the centre of the webpage; then select "Publicly Available Information" from the menu down the left hand side of the screen; then select "Click here for our complete statutory documents" in the yellow bar approximately a third of the way down the screen; finally select Connection, Use of System and Metering Services Documents from the list in the centre of the page.

Price Control

EDF Energy Networks is a licensed distribution business regulated by the Authority. The regulation is applied via the Licences and their price control mechanism. The price control period is five years and Ofgem prescribe the amount of revenue that EDF Energy Networks is allowed to recover from its customer base annually over the price control period. Use of system charges may vary year on year as EDF Energy Networks sets its charges to recover its allowed revenue.

Use of System

EDF Energy Networks will levy use of system charges for utilisation of its network for the supply of electricity to end users and/or the transportation of electricity across its network from entry points. EDF Energy Networks' Use of System tariffs are published in our Use of System Charging Statements~~s~~[3] issued under Licence Condition 4A. These can be obtained from our web-site at www.edfenergy.com, or alternatively are available on request, at a cost of £10, via the contact details on page 7~~5~~4.

[2] A copy of Licence Condition 4 is provided in Appendix 1.

[3] ~~Published separately for each EDF Energy region:~~

~~•Charges for Use of the EDF Energy Networks (EPN) Electricity Distribution System~~

~~•Charges for Use of the EDF Energy Networks (LPN) Electricity Distribution System~~

~~•~~Charges for Use of the Electricity Distribution System | EDF Energy Networks (SPN) ~~Electricity Distribution System~~

Connection and Use of System Boundary

EDF Energy Networks splits the recovery of costs between those associated with connection to the distribution network and those associated with on-going use of system for utilisation of the network. This boundary point is common for both demand and generation customers. This statement details the charging methodology that is applied for the calculation of on-going use of system charges. In addition the Use of System Charging Statements detail the use of system charges that are applied.

The Basis and Methodology of Charges for Connection statement~~s~~[4] issued under Licence Condition 4B details the Connection Charging Methodology that is used as the basis for calculation of connection charges. This statement also contains indicative charges and examples to aid understanding of Connection charges.

Thi~~es~~e statements can be obtained from our web-site at www.edfenergy.com, or alternatively are available on request, at a cost of £10, via the contact details on page 7~~5~~4.

Terms and conditions for connection of premises or other electrical systems to EDF Energy Networks' electricity distribution system are contained in our Basis and Methodology of Charges for Connection statement~~s~~. Persons seeking use of the system with respect to a new supply must apply for connection in accordance with the terms and conditions described in thatose statement~~s~~.

Where a person requires a connection to EDF Energy Networks' electricity distribution system pursuant to Section 16 of the Act, the provisions of this statement are without prejudice to the provisions of sections 16 to 21 & 23 of the Act (those sections which deal with the rights, powers and duties of EDF Energy Networks, as an electricity distributor) in respect of the distribution of electricity to owners or occupiers of premises.

The Contractual Framework

Persons entitled to use EDF Energy Networks' electricity distribution system are those who are authorised by Licence or by exemption under the Act to supply, distribute or generate electricity ("Authorised Electricity Operators"). In order to protect all users of the system, EDF Energy Networks will require evidence of authorisation before agreeing terms for use of the system.

NOTE: In the rest of this commentary, requirements applying to authorised users or Authorised Electricity Operators should be taken to mean Licensed Suppliers, Licensed Electricity Distributors or Licensed Generators only.

Persons seeking to use the system will be required, prior to using the system, to enter into an agreement with EDF Energy Networks setting out the obligations of both parties. The party seeking use of the system will be required to:

- pay all charges due in respect of use of the system as described in this statement and the accompanying schedules;
- be a party (where the user is a Licensed Supplier or a Licensed Distributor) to the Master Registration Agreement (MRA) for the provision of metering point administration services within EDF Energy Networks' authorised area;

[4] Published in a single document covering all three ~~separately for each~~ EDF Energy Networks regions:

- Statement of Basis and Methodology of Charges for Connection to the Electricity Distribution System | EDF Energy Networks (EPN) plc, ~~Basis and Methodology of Charges for Connection to its Distribution System~~
- EDF Energy Networks (LPN) plc, ~~Basis and Methodology of Charges for Connection to its Distribution System~~
- EDF Energy Networks (SPN) plc ~~Basis and Methodology of Charges for Connection to its Distribution System~~

- enter into the National Grid Electricity Transmission (NGET) Connection and Use of System Code and any necessary Bilateral Agreement, governing connections to and use of NGET's transmission system, unless EDF Energy Networks is informed by NGET that this is not required in any particular case;
- be a party to the Balancing and Settlements Code; and
- comply with the provisions of the Distribution Code.

If the applicant and EDF Energy Networks fail to agree contractual terms, or any variation of contractual terms proposed by EDF Energy Networks, either party may request settlement by Ofgem.

While the terms and conditions in the agreements will be consistent with those in this statement, the agreement will take precedence. Where an Authorised Electricity Operator, having entered into an agreement for use of EDF Energy Networks' electricity distribution system, ceases for whatever reason to be an Authorised Electricity Operator with respect to that use of the system, then the entitlement to use of the system will cease forthwith, but the operator will continue to be liable under the agreement unless and until the agreement is terminated. In order to avoid any liability in this regard, an Authorised Electricity Operator wishing to terminate his agreement or wishing to notify a change should give EDF Energy Networks no less than 28 days' notice. EDF Energy will normally respond within 28 days of a notification of change.

Contact Details

This statement has been prepared in order to discharge EDF Energy Networks' obligation under the Licences. If you have any questions about the contents of this statement please contact us at the address shown below. Also provided below are contact details for Ofgem, should prospective users wish to enquire separately on matters relating to this statement.

EDF Energy

Oliver Day,
Distribution Pricing Manager,
EDF Energy Networks, Energy House,
Hazelwick Avenue, Crawley,
West Sussex, RH10 1EX.

01293 657920

~~oliver.day@edfenergy.com~~DistributionPricing@edfenergy.com

www.edfenergy.com

Office of the Gas and Electricity Markets

9 Millbank,
London,
SW1P 3GE.

020 7901 7000

www.ofgem.gov.uk

Networks Use of System General Principles

Pursuant to the requirements of Condition 4 of the Electricity Distribution Licence, the following numbered paragraphs relate to the transport of electricity on EDF Energy Networks' system by Authorised Electricity Operators to exit points from the system, and to the transport of electricity on the system for supply to Authorised Electricity Operators and to/from generators including customers with on-site generation.

1. Where a supply of electricity is provided over electric lines or electrical plant comprising a part of EDF Energy Networks' electricity distribution system, a charge for use of the system will be levied either on the Supplier of the electricity or the Distributor. The relevant charges are described in our Use of System Charging Statements and are payable by reference to the characteristics of the supply, in accordance with the categories of supply described in the section headed 'Notes on Use of System Tariffs'.

2. The charges for each category of supply depend upon the criteria that determine eligibility for that category, including the voltage of connection to the system, the characteristics of the load, and installation of the appropriate use of system metering.

3. The charges for use of the system reflect:

   - the costs of providing, operating and maintaining the electricity distribution system to the standards prescribed by the Act other than those costs which are recovered through charges paid to EDF Energy Networks in respect of connection to the system, such that electricity can be transported efficiently through the system to exit points or from entry points; and
   - the costs to EDF Energy Networks of providing certain services and performing functions for Authorised Electricity Operators, on terms which EDF Energy Networks is under a duty to offer under its Electricity Distribution Licence, in order to support the operations of a fully competitive supply market in its authorised area. These services include: Metering Point Administration Services; Energisation, De-energisation and Re-energisation services; Revenue Protection Services; and Radio Teleswitch Services. EDF Energy Networks is either wholly or partly remunerated through use of system charges or through transaction charges for these services. The cost for provision of these services is detailed in our Use of System Charging Statements.

   All charges for use of the system include a reasonable return on the relevant assets, and the revenues arising from the charges are subject to regulation in accordance with the terms of the Licence.

4. Demand use of system charges to Suppliers and Licensed Embedded Electricity Distributors are evaluated as if from EDF Energy Networks' Grid Supply Points. These charges reflect real electrical flows on the system and the need to provide adequate capacity at all voltage levels to protect the security of the system. Paragraph 11 may also be relevant. Charges are applied to the electricity as measured at the exit or entry points, as indicated in paragraph 5 below.

5. The charges for use of the system may include some or all of the following elements:

   - a Network Charge to cover the costs which do not vary with the extent to which the supply is taken up. This consists of a daily charge per MPAN or monthly charge per site;
   - an Availability Charge per kVA to cover the system capacity at each voltage level which is attributed to the sites import capacity. Availability Charges shall be calculated using the declared Maximum Power Requirement (MPR) or, if it is higher,

the highest demand (measured in kVA) made in any of the preceding 12 months commencing from the date of using EDF Energy Networks' distribution system;

- an **Export Charge** per kVA, for half-hourly metered customers or a pence-per-day for non-half hourly metered customers, covering the contribution to system reinforcement due to Distributed Generation and ongoing operation and maintenance. This charge will be applied to the Export MPAN and charged on that capacity over and above the import capacity level.
- a Unit Charge per kWh unit delivered to the exit point from the system, designed to reflect utilisation of the system at all relevant voltage levels. Units for metered supplies are based on actual meter readings or profiled consumption derived from actual meter readings and/or estimated annual advances. Units for unmetered supplies are based on the certified estimated annual consumption of an inventory of unmetered equipment or pseudo half hourly readings;
- an Export Unit Charge per kWh unit accepted onto the system at the 'exit' point. Units for metered supplies are based on actual meter readings or profiled consumption derived from actual meter readings and/or estimated annual advances;
- an Excess Reactive Unit Charge per kVArh unit delivered to the exit point from the system (see paragraph 15 below). The excess reactive power charge, applied in bands according to the level, provides a behavioural pricing signal to customers to improve their power factor; and
- Transactional Charges for certain services provided by EDF Energy Networks on an individual basis to Licensed Suppliers or Licensed Distributors. Details are given in our Licence Condition 4A Statement.

Which tariff element applies to each customer is determined by the supplier's choice of metering. Further details of tariff structures are provided on page 282~~411~~ and in detail within the Charging Statement. Any modification to the elements of tariff structures would form part of a methodology change.

6. The network charge for use of system noted in paragraph 5 above may include, (dependant on tariff), an amount to reflect the cost of the service cable to the premises and its termination, a contribution to the cost of the local network except as recovered within the connection charge, the costs of the registration service in accordance with the Master Registration Agreement, the cost of use of system billing and an element of system capacity which is attributable to the supply.

7. The availability charge recovers an amount, other than that recovered through the connection charge, towards the costs of providing and maintaining the network. During the first five years, following the commencement of a new supply or the provision of increased capacity, the capacity upon which the charge is calculated will not be less than the original agreed capacity. The basis for the minimum capacity arrangement is to ensure that any upstream reinforcement expenditure or network extension is supported equally by a commitment to utilise that extra provision and to encourage efficient and accurate connection sizing.

8. Unit charges and export unit charges may be positive or negative. Positive charges are applied where after scaling the modelling suggest users will bring forward the need to reinforce the network. Negative charges are applied where after scaling the modelling suggest users will defer the need to reinforce the network. In addition ~~The~~ unit charges recover~~s~~ the costs of elements such as ~~providing incremental use of the upstream network at all voltages levels, including~~ operational rates and NGET GSP exit charges, where these costs have not been recovered elsewhere.

~~8.~~9. Details of metering provision are not included as part of this statement. The details of EDF Energy Networks' metering provision can be found in our Statement of Charges for the Use of EDF Energy Networks' Metering Services[5], issued under Licence Condition 36B. These can be obtained from our web-site at www.edfenergy.com, or alternatively are available on request, at a cost of £10, via the contact details on page 6. Where an Authorised Electricity Operator wishes to use meter providers other than EDF Energy, their agents must ensure that the data provided by the metering meets EDF Energy Networks' requirements for use of system billing purposes. Whether EDF Energy Networks is appointed to carry out this task or the supplier installs his own energy metering, EDF Energy Networks reserves the right to install use of system metering equipment and apply an additional charge for this equipment.

~~9.~~10. Charges for use of system will be payable in accordance with the billing period and payment terms agreed with the party using the system. EDF Energy Networks reserves the right to require appropriate security in respect of the charges estimated to arise, depending on the circumstances of the supply and on the basis of the agreed payment terms. Interest may be applied to late payments. Invoices for residential and non half hourly metered business supplies will generally be calculated according to the Supercustomer Methodology for Use of System Billing, a description of which is given in our Use of System Charging Statement~~s~~.

~~10.~~11. Where a supply is to be provided wholly or partly over EDF Energy Networks' electricity distribution system to an exit point from that system, the Supplier or Distributor must demonstrate that at all times the quantity of electricity entering the system for the purpose of providing that supply equals the metered quantity delivered from that exit point plus the amount of electrical losses appropriate to the voltage at which the supply is delivered and to the source of the supply, as shown in the schedule of loss adjustment factors in our Use of System Charging Statement~~s~~. Relevant metering information or being a party to the Balancing and Settlement Code will be considered to be adequate demonstration. Suppliers should apply the loss adjustment factors to calculate the amount of electricity that they must provide. The same loss adjustment factors are reflected automatically in the settlement system.

~~11.~~12. Where the supply is to be provided over EDF Energy Networks' electricity distribution system on either an intermittent or continuing basis to any premises with own generation, charges for use of the system will be levied with respect to the system capacity provided to meet the maximum power required as requested by the party seeking use of the system and the extent to which that supply is taken up.

~~12.~~13. Where EDF Energy, after evaluation of the characteristics of the requested use of the system, accepts that none of the categories of charges in the schedules of our Use of System Charging Statement are appropriate or where supplies are to be provided at Extra High Voltage (EHV), as defined in the section headed 'Statement of Charges for the Use of EDF Energy Networks' Distribution System' in that statement, EDF Energy Networks may offer special arrangements. Such charges will be calculated according to the Site Specific Charging Section on page 33~~2~~415~~ of this methodology. In most cases, EDF Energy Networks will make its offer of terms within 28 days of receipt of the application, including the full and final information necessary for the preparation of the terms.

[5] ~~Published separately for each EDF Energy region:~~
- ~~Charges for the Use of EDF the Energy Networks (EPN) Metering Services~~
- ~~Charges for the Use of EDF the Energy Networks (LPN) Metering Services~~

Charges for Legacy Basic Meter Asset Provision | ~~the Use of~~ EDF ~~the~~ Energy Networks (SPN) ~~Metering Services~~

~~13.~~14. Where use of the system is sought at a standard of security different from that referred to in the Distribution Code, EDF Energy Networks may consider special arrangements with respect to that supply.

~~14.~~15. Where the power factor of the supply is less that 0.95, it will normally be possible for EDF Energy Networks to offer use of system, subject to paying appropriate charges. In such cases, specially assessed loss adjustment factors may apply at EDF Energy Networks' discretion.

~~15.~~16. For all classes of demand customer the charges for use of the system include a contribution to recovery of NGET's exit charges. These amounts are calculated to be appropriate to each class of customer. This is on the basis that the total contribution to NGET exit charges paid by any class of customers is in proportion to the demand of that class of customer.

~~16.~~17. On occasion applicants will wish to reserve capacity on the Distribution System ahead of their planned usage. Where such situations arise the applicant will be required to pay a reservation fee. The reservation fee will be payable in advance of the period to which it pertains as either a capitalised sum or an annual payment. Failure on the part of the Applicant to pay the reservation fee will release us from an obligation to reserve the capacity and it may be allocated to other parties.

Reservation fees will reflect the value of the assets reserved. In most circumstances this will be represented by a proportion of the availability charge, HV or LV as appropriate. Where the reservation takes place at EHV or there are special circumstances then project specific charges will be developed.

~~17.~~18. For the avoidance of doubt, charges to generators for use of EDF Energy Networks' distribution system will be made for use of the system in respect of electricity that the generator imports from and exports to the system. The generator will be charged for use of the system in respect of such imports or exports in accordance with the preceding paragraphs.

~~18.~~19. EDF Energy Networks makes compensation payments to customers for network outages under two schemes.

The majority of customers are compensated under the Guaranteed Standards[6] arrangements. Customers who are off supply for greater then defined periods of time are entitled to a payment. This scheme applies to all demand customers and to all generators not included in the scheme described below.

For customers with generators connected at more than 1,000 volts and commissioned after 1 April 2005 (and who will, therefore, pay Generator Use of System Charges as defined in this Statement) the following scheme will apply. This scheme is known as Distributed Generation Network Unavailability (DGNU) and payments will be calculated for each generator on the following basis:

$$Payment = A \times B \times (C - D)$$

Where:

A = the network unavailability price of £2 per MW per hour (in 2005/06 subject to RPI indexation in future years), or some other value agreed between the customer and EDF Energy Networks and recorded within the connection agreement.

[6] Statutory Instrument 2005 No. 1019 The Electricity (Standards of Performance) Regulations 2005 as amended or replaced from time to time.

B= incentivised generator capacity; the highest active electrical power that can be generated (or the relevant incremental change of this amount in cases of the expansion of existing generation plant) by the generator for the year, according to the connection and/or use of system agreement(s).

C = network interruption duration; the total duration of all occurrences (in minutes) on the distribution system each of which involves a physical break in the circuit between itself and the rest of the system or due to any other open circuit condition, which prevents the generator from exporting power. It excludes:

- 50 per cent of the total duration of cases where EDF Energy Networks takes pre-arranged outages of its equipment for which the statutory notification has been issued to the generator;
- the cases where the generator has specific exemption agreements with EDF Energy Networks in the connection and/or use of system agreement(s); and
- the cases which are part of exempted events in the quality of service incentive or the Guaranteed Standard Statutory Instrument (such exemptions include interruptions of less than three minutes duration and industrial action).

D = the baseline network interruption duration for the relevant year which either has a default value of zero or some other value agreed between the customer and EDF Energy Networks and recorded within the connection agreement and/or use of system agreement(s).

DGNU scheme payments will be calculated by EDF Energy Networks on an annual basis (1st April - 31st March) and payments made shortly after the end of each year. Payments may also be made on an interim basis during the year on each occasion that the payment due to a generator exceeds £250. This payment is automatic and does not need to be claimed by the generation Customer.

~~19.~~20. The introduction of Generation Use of System charges into a developing market creates the potential for volatility in prices. In order to provide some stability and predictability of generation charges it is proposed to minimise the upwards disturbance of generation charges by capping the change in nominal generation charges in any year up to March 2010 (other than by agreement with the individual generator). The cap will be plus ten percent per annum, except where the current charge is zero, in which case the cap will be plus £1.00 per export MPAN per annum.

Use of System Methodology

Rationale

Demand and Generation

The methodology for deriving Use of System charges functions by apportioning the target allowed revenue to typical groups of customers depending on their connection capability and use of the network. Essentially we calculate a theoretical cost using our models and then scale the result to meet the target allowed revenue.

This methodology applies an LRIC approach, using power flow modelling, to provide the basis for calculating the economic cost of using the EHV network (including EHV/HV transformation). In addition to this approach for the use of the EHV network, estimated marginal reinforcement costs are used for the deriving the remaining cost for those users who connect to the HV and LV network.

The LRIC approach on the EHV network allows generation and demand charges to be determined using the same basis. Our LRIC approach utilises AC power flow modelling which we believe provides an improved reflection of the costs of the network taking into account real and reactive power flows.

The methodology will, in principle, allow for demand or generation charges to be negative (i.e. a demand/generation user might be paid if their use of the network defers overall reinforcement expenditure).

The charges for users connected to the EHV network will be calculated solely using network costs modelled using the LRIC approach and charges for users connected to the HV & LV networks calculated using network costs from a combination of the LRIC approach and our existing DRM based approach. The nodal cost outputs from the EHV approach will be averaged and used as marginal cost inputs to the DRM approach when calculating the HV & LV tariffs.

Format of tariffs

Demand and generation

Charges are applied to customers through the application of tariffs. Tariffs are designed to send cost reflective price signals to users in order to encourage efficient use and development of the network. The basis for our tariff structures is to recover our costs in a manner appropriate to that cost. Costs which do not vary with how much electricity is used will be recovered through 'fixed' Network Charges and, for half hourly metered customers, Availability Charges. Costs which do vary as electricity is used will be recovered through Unit Charges.

Specific tariff structures are then formulated in relation to the metering installed at the point of connection. This is driven by the settlements data requirements and can result in restriction of the format of tariff that may be offered.

Those tariffs relating to connections without half hourly metering consist of the following components:

- Connection related in an MPAN charge – Network Charge;
- Consumption related within a Unit charge - the maximum number of unit rates being determined by the number of registers (time pattern regimes) on the metering system – Unit Charge.

Those tariffs relating to connections with half hourly metering consist of the following components:

- Connection related in an MPAN or site charge – Network Charge;
- Connection capacity related charge – Availability Charge;
- Consumption related within a Unit charge - according to times set by EDF Energy Networks – Unit Charge;
- Reactive power charge - applied in multiple blocks depending on the level of the power factor – Excess reactive unit charge.

These components are described on page 5.

Charges are calculated to recover costs on an annual basis and except for seasonal unit rates the same rate is used to average the charge over the year. Availability charges are set to recover an amount appropriate to the highest required annual capacity. In choosing to vary their agreed capacity, a customer's application for a decrease will only be accepted on an annual basis and generally to a level no lower than the preceding year's maximum demand. This option to reduce agreed connection capacity is not applicable to new or enhanced connections in the first three years.

Unit related charges are based on Active Power measured in watts (kW's or kWh's). Where sites have a poor power factor the kWh charge does not recover the extra costs of providing higher rated equipment needed to meet the larger Apparent Power, measured in volt-amperes (kVA's or kVAh's). Reactance (inductive or capacitive) in load causes poor power factors and the more this reactance increases compared to resistive load the further the current will lag or lead the voltage, further increasing the Apparent Power. To recover the extra costs associated with poor power factors a charge related to reactance or Reactive Power, measured in kVAr or kVArh, is applied. Reactive Power charges are applied when the level exceeds an efficiency boundary. This boundary is an appropriate balance point between the costs of an efficient network and the cost of corrective equipment. The Reactive Power consumption can be avoided with management of inductive or capacitive power flow through the use of corrective equipment.

The Reactive Power charge (p/kVArh) is based on the calculation of extra volt-ampere units required to deliver the Apparent Power. The calculation is conducted in Power Factor Bands using a midpoint power factor for each band. At this power factor the number of kVAh's exceeding the kWh's (extra units) is calculated against the average modelled pence per unit charge for the tariff group to derive an extra cost. This extra cost is then divided by the number of Excess Reactive Units at this power factor, to derive a reactive power charge (p/kVArh).

Reactive power charges are only applied to half hourly metered customers.

The Charging Model

General Structure

The charging model comprises three main processing elements. These are:

- Power-flow model utilising proprietary electricity network simulation
- EHV marginal cost – processing data relating to EHV power flow and reinforcement solution costs producing nodal £/kVA marginal values.
- Tariff Yardstick Calculations taking marginal costs and attributing usage characteristics to provide site specific charges and HV/LV tariffs

Data relating to the network assets, the use of our networks and the costs is input at various stages of the model. This data is provided from a number of sources largely falling into categories relating to:

- Network infrastructure – The collective assets used to distribute electricity over a given geographical area. This data reflects the data published in the Long Term Development Statement (LTDS).
- Network usage – Data relating to Customer connections and their consumptions; EHV connected customers, nodal load, GSP growth and HV/LV connected tariff groups.
- Capital and operational expenditure – Including costs of network reinforcement solutions and other costs to be attributed into charges.

Underpinning our modelling process is the use of five network time bands, these time bands are common throughout and are also used in our tariff modelling and to define the Half Hourly tariff charges.

Final scaling of charges to the allowed revenue involves aligning the revenue calculated from the yardstick charges to recover the allowed revenue for the network. A fixed adder is applied to the marginal costs to scale the modelled yardstick revenue to match the allowed revenue.

A simplified schematic of the charging model is provided in Figure 1 below.

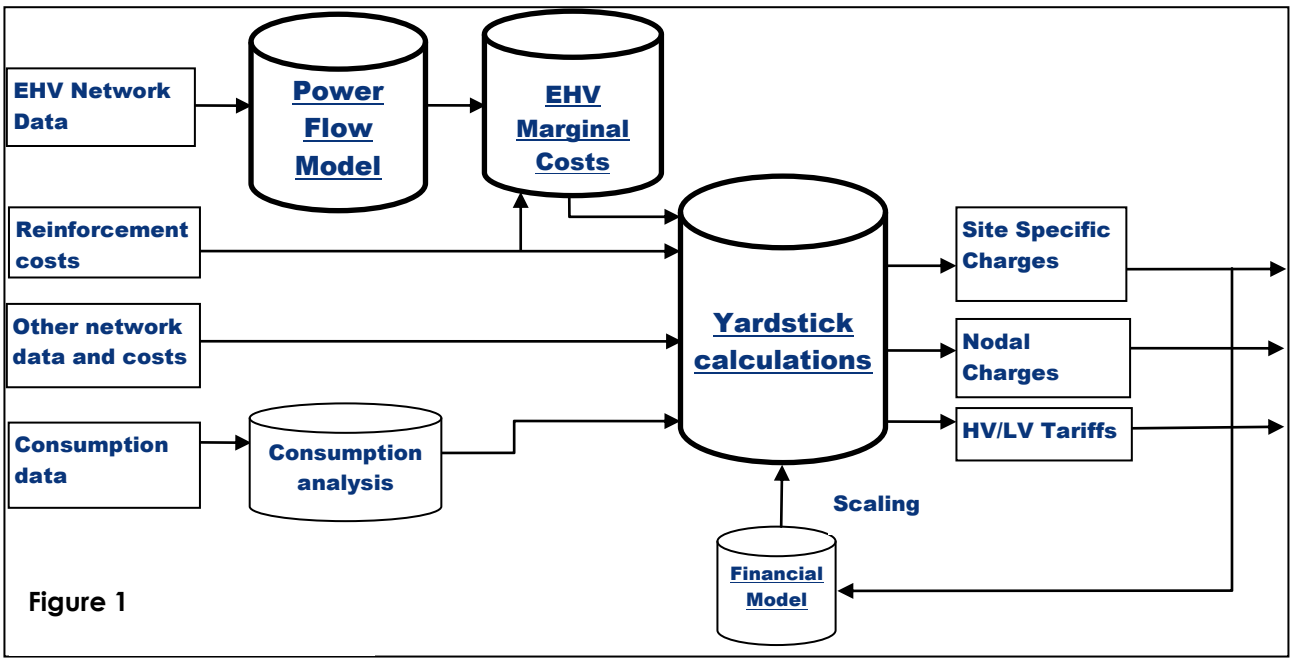


Figure 1

Model Inputs

The network is split for modelling purposes to derive costs for the Extra High Voltage (EHV) and cost for the High Voltage / Low Voltage (HV/LV) network.

Network data

The EHV power flow model is populated with network data which mirrors the data published in the Long Term Development Statement (LTDS) produced in accordance with distribution licence condition 25. It needs to be noted that the LTDS and power flow model are snapshots of the network produced at different points in time and may therefore differ slightly.

An EHV network contingency data file is established containing details of any events that take place during an outage. This could include load transfers and the switching in or out of additional circuits.

Network usage data

Cost modelling and half hourly tariff charges are conducted using time bands covering daily and seasonal demand times. There are five time bands that are used in the modelling for both half hourly, and non half hourly metered tariff charges. The five time bands that are used are:

1. Between midnight and 07:00 hours all year – Night
2. Between 16:00 and 20:00, Monday to Friday, November to February – Winter Peak
3. Between 07:00 and 16:00, Monday to Friday, November to February and between 07:00 and 20:00, Monday to Friday in March – Winter shoulder
4. Between 07:00 and 20:00 Monday to Friday, June to August – Summer Peak
5. All other times

These time bands have been identified as being representative of times to signal avoidance of network use through a higher than average charge or encourage network use through a lower than average charge for demand users. Similarly they are used to provide the reverse signal for generation users.

The EHV power flow model is populated with nodal demands for each time band with data extracted from EDF Energy Networks' SCADA[7] information database. The data is extracted for three maximum periods and three minimum periods for each of our 5 time bands. The dates and times that the data is extracted is determined from the three highest demands and the three lowest demands, separated by 10 complete days, for each of our 5 time bands using the annual GSP group take as the reference data. For each node the load data is extracted and then averaged to generate the value used at each node in the power flow model. The result of these extracts is to populate each node and each time band, where energy either enters or exits the EHV network, with a maximum (peak) power flow value used for the calculation of demand charges and a minimum power flow value used for the calculation of generation charges.

The growth rates that are used in the net present value calculations are derived from the forecast consumer requirements on the network. A zonal growth rate based on the allocation of a node to its connected grid supply point is calculated based on the forecast growth in demand published in the LTDS.

[7] SCADA is the acronym for Supervisory Control And Data Acquisition. The SCADA system gathers data from the monitored asset and transfers the data to a central data store.

Customer consumption data is collected and analysed individually for EHV connected customers and at tariff group level for all HV/LV connected customers using either actual half hourly data for half hourly metered sites or profiled half hourly data for non half hourly metered sites.

Customers are allocated to tariff groups according to the nature of metering and voltage of connection to the network.

Network loss adjustment to uplift customer demand requirements to account for energy losses when using upstream network assets are applied either through the power flow modelling or using loss factors derived form our published losses.

Capital and operational expenditure

The capital costs for reinforcement scenarios at each level of the electricity distribution system from 132kV to LV are calculated, using current modern equivalent asset costs, from EDF Energy Networks' asset management information. The reinforcement costs used in the marginal cost calculations at EHV will be a weighted representation of the solution costs that are used to reinforce the generic asset type expressed as the capital cost to reinforce the asset. While at the HV network, HV/LV transformation and LV network the reinforcement costs will be based on the cost of delivering new load including an appropriate mix of underground and overhead cables and other assets at each voltage level, this is to reflect the broad spectrum of network variations encountered. The cost at HV/LV level are derived from our asset management information and are expressed as a marginal £/kVA capital cost.

An annuitisation factor to convert capital cost to annual cost based on the regulated allowed rate of return is used over the assumed lifetime of the asset.

NGET grid supply point exit charge cost are established for the charge year based on NGET illustrative charges and our own forecast of additional cost which will materialise during the year.

Calculations and Processing

Power flow modelling

The power flow modelling is conducted using PSS™E software (a Siemens proprietary product), although any suitable power flow modelling software could have been utilised. We have automated use of this software using two custom built modules.

- The security module which conducts the security factor analysis and base case power flows.
- The sensitivity module which provides the sensitivity coefficients.

The output from the modules provides the base case power flow, sensitivity coefficients and the security factors for each asset on the network. All power flow output data is presented in the form of a comma separated file, which is then used to calculated the nodal £/kVA values prior to being loaded into the charging model.

The base power flow is calculated then the power flows are calculated for each contingency case. During the contingency process the highest power flow on each remaining branch is stored. At the end of the contingency process the final highest power flow in each branch is divided by the base case power in each branch to provide the security factor. It is this security factor which is then used to de-rate the branch's actual capacity to an approximate Engineering Recommendation P2/6[8] compliant capacity.

The contingency data file holds outage instructions for each branch and is processed sequentially during the contingency analysis. For each branch the statement will instruct the tripping of that branch and then the other actions which would be performed during that branch outage. These additional actions may include closing circuits or bus bars and transferring load to other nodes. These other actions are typical of how the network is managed on an operational basis.

The modules can be described as operating in steps following which the outputs are then used in the charging model. The steps of operation are described below:

Step 1 – Calculation of base case power flow and security factors for 1st analysis timeband

A – Base case power flow calculated for each branch on an intact network.

B – Highest power flow calculated for each branch during the process of 'removing' (under simulated ER P2/6 conditions) other branches in the otherwise intact network.

$$\text{Branch security factor} = \frac{\text{Highest power flow under N-1 conditions}}{\text{Normal power flow}}$$

The branch security factor is used to determine the usable headroom capacity from the maximum capacity to allow for N-1.

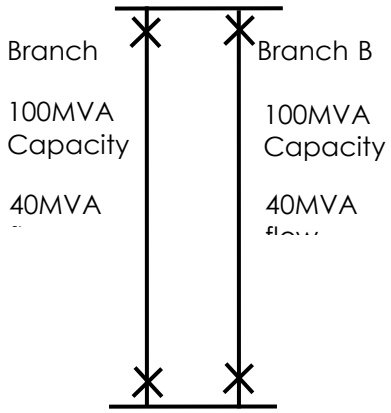
[8] Engineering Recommendation P2/6 (ER P2/6) is the current distribution network planning standard. The Distribution Network Operators (DNOs) have a licence obligation to plan and develop their systems in accordance with ER P2/6.

In a simple two circuit network the branch security would be as follows. The highest power flow in Branch A will be when Branch B is isolated.

Therefore highest power flow in Branch A = 80MVA. Normal power flow in Branch A = 40MVA.

Branch security factor = 80/40 = 2.

The usable head room capacity would then be calculated as follows. This calculation is conducted in the charging model.



$$\text{Usable headroom capacity} = \frac{\text{maximum capacity}}{\text{branch security factor}} - \text{current power flow}$$

Step 2 – Calculation of sensitivity coefficients for 1st analysis time band

Step 3 – to final step – Repeat steps 1 and 2 for remaining analysis time bands

The output from the sensitivity module provides a set of coefficients that enable the calculation of the effect to a power flow in a branch caused by an increment or decrement applied to a node. The resultant coefficient is used to calculate the new power flow by multiplying it with the increment or decrement and adding it to the original branch power flow. For a particular operating point of interest and the full intact network topology model the power flow will be calculated. The approach uses the standard output from the load flow, i.e. for each node *i* the following values: P_i, Q_i, V_i and θ_i (active power node injection, reactive power node injection, node voltage magnitude, and node voltage angle).

Due to the nature of whole network power flow modelling, branches which are normally electrically isolated from the node under study within the distribution system but which are connected through the transmission system will have sensitivity coefficients which indicate a power flow change. This movement is unlikely to be realised in the real network. One of the causes is the use of a slack node[9] in the power flow study, whereas in reality power flow variations would be balanced across a range of nodes.

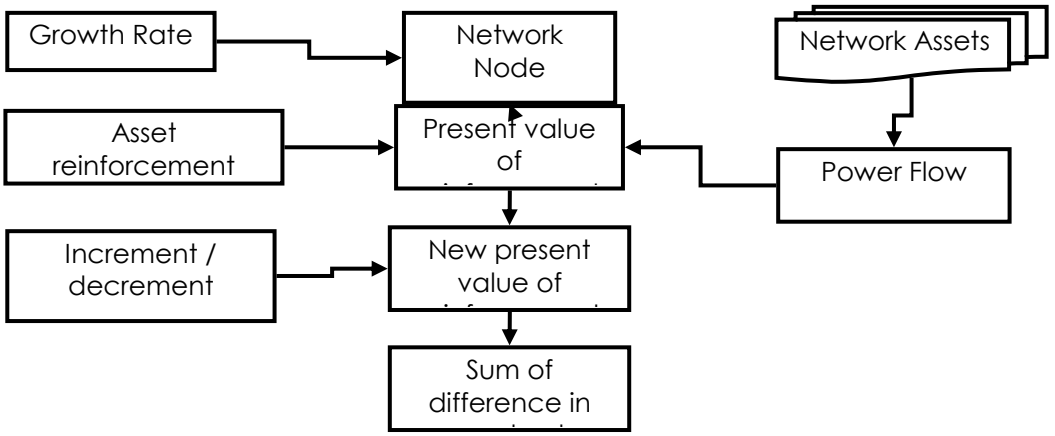
To reduce the amount of computed data and avoid the calculation of insignificant charges on branches which are to all practical purposes electrically isolated from the node under study we will filter sensitivities smaller than 0.005.

Marginal cost calculation

Costs are calculated for each node which have exit points to customer connections. These exit points can either be for EHV connected customers or at the boundary between the EHV network and the HV/LV network. The latter costs are used as input costs to the HV/LV tariffs.

[9] The slack node is a defined point in the network model which adjusts to balance the difference between demand and generation. In reality the balancing of demand and generation is a complex operation across many participants.

The charge calculated is based on a predicted future timescale of reinforcement requirement and how this future timescale will change following the application of a marginal increment or decrement to the node under study. The charge for an asset is based on the demand growth of the node under study and is the difference between the net present value of the future cost of reinforcement and the net present value of the future cost of



reinforcement after allowing for the application of the marginal increment or decrement in power flow has been placed. The charges for each asset for a node under study are then summed to achieve a nodal charge.

A scaling factor is applied to the power flows adjusting utilisation values. The same power flow scaling factor will be applied consistently to all power flows and all time bands. This is conducted to avoid the erroneous charge values which can be calculated at low growth rates where utilisation is high and where capacities are exceeded within a short term time frame.

The calculations for the marginal costs are conducted for each node. These nodal costs are then either used as the 'shared asset' component of an EHV site specific charge or, if the node is an HV/LV exit point, aggregated with other relevant 'tariff' nodes to calculate a weighted average cost to be taken forward into the tariff yardstick calculation.

The marginal cost for a node is the sum of the change in brought forward reinforcement costs at each branch which has been triggered by the change in power flow at the node and is represented by the following formula.

$$\text{Marginal cost at Node } n = \sum_{i=1}^{B} \Delta Ci$$

Where:

n = the node under study

B = number of branches in the network

ΔCi = Change in reinforcement costs of the asset in branch i due to marginal increment /decrement at the node

The change in reinforcement costs due to the application of the increment/decrement of demand is derived from the following formula.

$$\Delta Ci = \text{Net present Value (Inc)} - \text{Net Present Value (base)}$$

Where:

Net present Value (Inc) = the brought forward cost of reinforcement after the increment /decrement has been applied and derived from the following formula

$$\text{Net present value (Inc)} = \frac{\text{Cost of reinforcem ent solution}}{(1+\text{Discount Rate})^{\text{Number of years until reinforcem ent (Inc)}}}$$

and,

Net present Value (base) = the current brought forward cost of reinforcement for the base case

$$\text{Net present value (Base)} = \frac{\text{Cost of reinforcem ent solution}}{(1+\text{Discount Rate})^{\text{Number of years until reinforcem ent (base)}}}$$

Both of the net present Value calculations use the same cost of reinforcement solution which is dependant on the generic asset type. The discount rate is also the same for both present Value calculations. The regulatory rate of return for the price control period will be used for the discount rate as this is a proxy for the DNOs cost of borrowing.

The number of years until reinforcement is the time it will take, assuming the forecast growth rates, to 'use up' any spare capacity in the asset and therefore when the asset should be reinforced. The number of years until reinforcement is calculated using the following formula.

$$\text{Number of years until reinforcement} = \frac{\log(\text{rated capacity}) - \log(\text{power flow})}{\log(1+\text{growth of utilisatio n})}$$

Where:

Rated capacity = the ER P2/6 capacity. This is the network asset capacity de-rated by the security factor,

Growth of utilisation = the forecast growth rate of the load at the supporting GSP,

and power flow, for the base case power flow, calculated from the following formula

$$\text{power flow (MVA)} = \sqrt{P(MW)^2 + Q(MVAr)^2}$$

Where the values for P and Q are the branch outputs

To establish the 'new' number of years until reinforcement the power flow is adjusted to take account of the effect of the increment or decrement at the node where the charge is being calculated.

The new power flow taking the increment or decrement into account is calculated using the following formula.

$$\text{new power flow (MVA)} = \sqrt{(P(MW) + \Delta P * X_p)^2 + (Q(MVAr) + \Delta Q * X_q)^2}$$

Where ΔP = -1MW for demand increments and 1 MW for generation decrements and ΔQ = -0.33MVAr for demand increments and 0 MVAr for generation decrements and Xp and Xq are the sensitivity coefficients

ΔQ assumes a power factor of 0.95 for demand connection and unity for generation connections. These power factors are typical of those expected of new connections.

On completion of the calculations a matrix of charges are held for each node. These comprise the five time band charges used to compile charges to demand connections and the five time band charges used to compile charges to generation connections.

Nodal Cost Aggregation for tariffs

One set of nodal costs are used in the tariff yardstick process. This set of costs is presented as the weighted average of all the nodes where there is an entry to the HV/LV network. The weighting of the costs is conducted by multiplying the nodal cost by the nodal demand and then summating the result and dividing by the sum of nodal demands. This calculation is as shown in the following formula.

$$\text{Timeband cost for Tariff} = \frac{\sum_{i=1}^{Nt} Ci.Di}{\sum_{i-1}^{N} Di}$$

Where:

C_i = Nodal cost for time band at a HV/LV entry/exit point

D_i = Nodal demand for time band at a HV/LV entry/exit point

N_t = Number of nodes where there is an entry to the HV/LV network from the EHV network

On completion there are five demand costs, one for each time band and five generation costs, one for each time band. These costs feed in to the tariff yardstick model for application in to the tariff setting and revenue scaling process. These costs could be either positive or negative.

Nodal Costs for Site Specific EHV charges

The nodal cost used in the calculation of site specific EHV charges is from the nodal cost at the boundary between the shared network assets and the sole use EHV connection assets. The costs of the remaining sole use assets are calculated separately and depend on the connection charge contribution.

At each shared use connection node there will also be five demand costs, one for each time band and five generation costs, one for each time band. These costs will then feed into the charge calculation process for the site specific charge. These costs could be either positive or negative.

Tariff Yardstick Calculations

The marginal costs derived from the EHV power flow modelling and those derived from HV/LV asset management information are applied to the yardstick model. With regard to HV/LV tariffs the yardstick is supplied with 5 time band demand costs for the EHV network and five time band generation costs for the EHV network. There are separate HV/LV costs for the different layers of the HV/LV network namely; HV network, HV/LV transformation and LV network. These costs are allocated to the five demand time bands in the same proportion as that calculated for the EHV time bands. These costs are applied as negative costs (benefit) to the HV/LV generation time bands. With regard to site specific charges the yardstick for each EHV connection is supplied with the costs specific to the node of common (shared) connection. Any connection spur (sole use) assets are treated separately until the point of common connection changes.

Scaling adders are applied to the marginal costs which are initially set to zero prior to the final matching of forecast revenue to allowed revenue.

The marginal costs are annuitised at the regulatory rate of return over an average expected asset life of 40 years. Operation and maintenance costs are applied expressed as a percentage of the marginal cost. The percentage used is published in our connection charging statement.

The £/kVA charges are converted to £/kW using a power factor average of 0.95p.f. Additional reactive charges are applied where customer's power factor deviates from this average.

NGET costs are applied as a £/kW cost to the time band when system peak occurs as a function of total NGET cost (less any site specific NGET charges) divided by the system peak demand. This cost is also allocated to generation charges as a benefit in the equivalent generation time band.

The yardstick charges are calculated, based on the marginal costs, for each tariff group and EHV connected user. For each time band the charges calculated take into consideration the network coincidence of the tariff group's demand to the network demand. For EHV connections actual half hourly data specific to the site is used. The HV/LV level costs are adjusted for network losses for each tariff group to account for the higher demand requirement required to adjust for losses.

HV/LV tariff yardstick

The yardstick for HV/LV tariffs then apportions these marginal charges between fixed and variable costs.

The fixed charge (availability for half hourly metered) comprises of 100% of the costs at the point of connection and for LV connections 50% of the cost of the assets above, while HV connections 20% of the EHV marginal costs. The marginal costs for unmetered supplies tariff groups are attributed solely to variable costs.

The fixed charges for non half hourly metered connections are based on the average demand for the tariff group multiplied by the sum of the apportioned marginal cost and include a cost for operation and maintenance on the service connection. The fixed charges for non half hourly unmetered supplies include the cost of running the unmetered supplies office and include the cost of operation and maintenance on the service connections. The

fixed charge for half hourly connections recovers the cost of operation and maintenance on the service connection assets.

The remaining costs are allocated to unit charges based on the tariff group's average unit consumption and the ratio of kW/kWhs for each time band. Additionally, for non half hourly connections the percentage use that the tariffs (market domain data) time band makes of the cost allocated to each of the 5 modelling time bands is allocated. For example the varieties of two rate 'off peak' time bands means that a small proportion of winter shoulder costs have to be allocated to the two rates 'off peak' unit rate. The half hourly tariff time bands match the modelled time bands and therefore the cost allocation is directly applied.

The HV/LV network marginal costs are based on average network provision. Where charges are calculated for half hourly metered sites the cost are allocated based on a smaller proportion of the network being used.

EHV charges yardstick

The fixed charges for EHV sites are based on the connection spur (sole use) costs. The default charge is based on the current connection charging policy. This includes for the operation and maintenance of the connection assets to be recovered through the use of system charge. Variations to this default are only made where there is evidence that different connection charges were made.

The availability and unit charges are based on a total charge which is calculated from the product of the demand values and the marginal costs, and include the allocation of NGET charges. A capacity charge equivalent to the product of the agreed capacity and the peak marginal cost is allocated on a £/kVA/month basis. The remaining charge is then allocated to the 5 time bands based on the time bands remaining marginal cost and their kW/kWh ratio.

Generator charge yardstick

The charges allocated to generators are applied using the same principles as those that have been used for demand tariff groups. Where HV/LV demand marginal costs are offset or deferred the charge will be seen as a credit. Appropriate coincidence factors and kW/kWh ratios are applied each generation tariff group.

Allowed Revenue

Forecasts of our expected allowed revenue and expected user consumptions and productions for the year that prices are set are made. The yardstick charges are then calculated against the expected user volumes to determine the revenue that would be recovered from the yardstick charges. The scaling adders are then adjusted on an iterative basis until the forecast charged revenue matches the allowed revenue. It is at this point that the prices are set.

Scaling to allowed revenue

The methodology calculates yardstick charges for the EHV network using an LRIC approach and yardstick charges for the HV and LV network using a combination of LRIC and our existing DRM based approach.

The alignment of the yardstick charges with allowed revenue will take part in three stages. The first stage would involve splitting the allowed revenue into that recovered from demand

and generation customers. However, allowed revenue for Demand and Generation is currently separate in the distribution price control. Therefore, we do not propose to have any transfer of revenue between these two allowances.

Demand Charges

For demand customers the second stage is to split the allowed revenue between EHV network modelled yardsticks and HV & LV network modelled yardsticks. This is done in the same proportion as the MEA values of the EHV networks and the HV & LV networks.

The third stage involves aligning the yardstick charges with the allowed revenue in each relevant network. A fixed adder approach is used to scale the modelled revenue to match the allowed revenues for the different networks.

Generation Charges

For generation customers the second stage is to split the allowed revenue between EHV and HV & LV network users. This is done by splitting the allowed generation revenue in the same proportion as the effective metered generation demand on the network.

The third stage involves aligning the yardstick charges with the allowed revenue in each relevant network. A fixed adder approach is being proposed to scale the modelled revenue to match the allowed revenues for the different networks.

Use of System Charges – Further Information

Where our Use of System Charges are published

EDF Energy Networks' Use of System tariffs for general demand and generation sites are published in our Use of System Charging Statements. These can be obtained from our web-site at www.edfenergy.com, or alternatively are available on request, at a cost of £10, via the contact details on page ~~75~~. To locate these statements on the website; on the home page select "Networks" from the orange menu bar that runs across the screen below the logo; then select "Publicly Available Information" from the menu down the left hand side of the screen; then select "Click here for our complete statutory documents" in the yellow bar approximately a third of the way down the screen; finally select Connection, Use of System and Metering Services Documents from the list in the centre of the page.

Site-specific charge schedules are issued to the customer and current supplier only. Copies of the schedules are provided, on request, to Licensed Suppliers subject to any agreement with the customer. Schedules will only be released to other parties with the customer's approval.

~~Use of System Methodology – General Demand Tariffs~~

~~Rational~~

~~The methodology for deriving Use of System charges for general demand tariffs functions by apportioning the target revenue to typical groups of customers depending on their connection capability and use of the network at peak usage time. Essentially we calculate a theoretical cost using our models and then scale the result to meet the target revenue.~~

~~Model Inputs~~

- ~~Modern equivalent asset values for typical components at different voltage levels across the network. Scenarios representing different sets of equipment and construction environments have been created. These scenarios are designed to represent the type of equipment used within the appropriate network. Estimates of the average costs involved of providing and installing the equipment are calculated. These costs are based on current prices of conducting the work;~~

- ~~Operational and maintenance costs, expressed as a percentage of gross asset values. The percentage used is published in the Basis and Methodology of Charges for Connection statements, details of how to obtain these statements are given on page 3;~~

- ~~Billing and administration costs, representing the administration of billing and data services;~~

- ~~NGET Grid Supply Point exit charges, representing the charges made to EDF Energy Networks for connection to the transmission system;~~

- ~~Operational Rates, representing the charges made to EDF Energy Networks as assessed against transformer rating; and~~

•Research concerning typical customer consumption patterns and data about the network. This data includes: network density factors designed to indicate the amount of equipment per sq/km; diversity factors indicate the relationship between connected load (potential maximum demand) and actual maximum demand; load factors indicating the relationship between consumption (units used) and maximum demand; and coincidence factors which show the relationship between customer demand and system peak demand.

The Model

It is a theoretical model designed to provide a £/kW yardstick cost for common customer groupings at each voltage level. It is driven by network reinforcement scenarios which encapture both the immediate connection of new load and the provision of additional capacity upstream in the network to meet that new load and the load growth of existing customers. The model estimates the cost of delivering typical new load to the distribution network at every voltage level. This model is colloquially known as the 500MW model.

There is a separate model for each licensed network. They consist of an appropriate mix of underground and overhead cables and, where necessary, network density scenarios, at each voltage level. This is to reflect the network variations encountered.

Costs

The capital costs for the scenarios at each level of the electricity distribution system from 132kV to LV are calculated, using current modern equivalent asset costs, from EDF Energy Networks' asset management information. These capital costs are then divided by the scenario capacity to derive their proportion of £/kVA yardstick value and further divided by the power factor to convert to £/kW. These costs are then annuitised and an operation and maintenance factor applied to arrive at an annual £/kW value over each voltage and transformation level. The annuitisation factor is based on the regulated allowed rate of return, 6.9%, over the assumed lifetime of the asset.

Yardstick Calculation

Load research data for each of the main tariff groups is collected and analysed. This contains profiles of consumption. A demand estimation coefficient (DEC) is attributed to each half hour to represent the proportion of annual consumption.

For each tariff group the average DEC for demand periods on the system is calculated. Weighted combinations of these are then utilised to formulate specific DECs for each voltage level of the network. These specific DECs are expressed as a proportion of the maximum annual DEC to generate a coincidence factor. A coincidence factor provides a measure of the extent to which customers in that tariff group are contributing to stress on the network at times of peak network demand for each voltage level.

Coincidence factors are combined with the £/kW figures and the calculated losses at each network voltage level to generate a cost figure for the tariff group. At this stage the figures across all tariff groups are scaled by a common factor to ensure that the resultant charges

deliver the target revenue. Following scaling, billing and administration, NGET exit charges and operational rates are apportioned and added to derive the final tariff figure.

Format of Tariffs

Charges are applied to customers through the application of tariffs. Tariffs are designed to send cost reflective price signals to users in order to encourage efficient use and development of the network. The basis for our tariff structures is to recover our costs in a manner appropriate to that cost. Costs which do not vary with how much electricity is used will be recovered through 'fixed' Network Charges. Costs which do vary as electricity is used will be recovered through Unit Charges and, for half hourly metered customers, Availability Charges.

Specific tariff structures are then formulated in relation to the metering installed in the customer's premises, which is driven by the settlements data requirements and can result in restriction of the format of tariff a Distributor may offer.

Those tariffs relating to customers without half hourly metering consist of the following components:

•Customer related in an MPAN charge – Network Charge;

•Consumption related within a Unit charge – the maximum number of unit rates being determined by the number of registers (time pattern regimes) on the metering system – Unit Charge.

Those tariffs relating to customers with half hourly metering consist of the following components:

•Customer related in an MPAN or site charge – Network Charge;

•Connection capacity related charge – Availability Charge;

•Consumption related within a Unit charge - according to times set by EDF Energy Networks – Unit Charge;

•Reactive power charge – applied in multiple blocks depending on the level of the power factor – Excess reactive unit charge.

These components are described on page 5.

Charges are calculated to recover costs on an annual basis and except for seasonal unit rates the same rate is used to average the charge over the year. Availability charges are set to recover an amount appropriate to the highest required annual capacity. In choosing to vary their agreed capacity, a customer's application for a decrease will only be accepted

on an annual basis and generally to a level no lower than the preceding year's maximum demand. This option to reduce agreed connection capacity is not applicable to new or enhanced connections in the first five years.

Unit related charges are based on Active Power measured in watts (kW's or kWh's). Where sites have a poor power factor the kWh charge does not recover the extra costs of providing higher rated equipment needed to meet the larger Apparent Power, measured in volt-amperes (kVA's or kVAh's). Reactance (inductive or capacitive) in load causes poor power factors and the more this reactance increases compared to resistive load the further the current will lag or lead the voltage, further increasing the Apparent Power. To recover the extra costs associated with poor power factors a charge related to reactance or Reactive Power, measured in kVAr or kVArh, is applied. Reactive Power charges are applied when the level exceeds an efficiency boundary. This boundary is an appropriate balance point between the costs of an efficient network and the cost of corrective equipment. The Reactive Power consumption can be avoided with management of inductive or capacitive power flow through the use of corrective equipment.

The Reactive Power charge (p/kVArh) is based on the calculation of extra volt-ampere units required to deliver the Apparent Power. The calculation is conducted in Power Factor Bands using a midpoint power factor for each band. At this power factor the number of kVAh's exceeding the kWh's (extra units) is calculated against the average modelled pence per unit charge for the tariff group to derive an extra cost. This extra cost is then divided by the number of Excess Reactive Units at this power factor, to derive a reactive power charge (p/kVArh).

Reactive power charges are only applied to half hourly metered customers.

~~Use of System Methodology – General Generation Tariffs~~

~~This methodology is applicable for generators energising connections to EDF Energy Networks' distribution system after 1st April 2005. In line with Ofgem guidance the charging methodology applied to generators connected before April 2005[10] will remain unchanged until at least 2010.~~

~~Rational~~

~~Ofgem have proposed a mechanism to allow EDF Energy Networks to connect distributed generators to its electrical network through a form of shallowish connection charges. The mechanism allows EDF Energy Networks to recover a percentage of the reinforcement costs associated with connection of generation, a value per kW of generation connected and the O&M on the sole use and reinforcement assets either from the individual generator or the population of generators. This approach involves the creation of a generation regulatory asset base and the development of a distributed generation (DG) allowed revenue income stream. This methodology explains the calculation of use of system charges for distributed generation. These charges will be calculated separately, using the same methodology, for each of our three network areas using data specific to that network.~~

~~Normal general demand tariffs will apply for the import requirements of the site as described on page 10. This general generation tariff methodology describes the charges that will be applied to recover costs associated with the provision of network assets, network maintenance and network control to meet export requirements.~~

~~Model Inputs~~

~~The model inputs will be a mix of forecast and actual generation associated network data.~~

- ~~Joint use asset investment - Forecast and actual network investment on shared use assets directly attributable as assets installed for the purpose of network use by export sites~~

- ~~Sole use asset investment - Forecast and actual connection costs of export sites. Sole use assets form part of the connection charges. Within this methodology they are only used for the purpose of identifying the cost incurred in operating and maintaining the relevant assets.~~

- ~~Generation capacity - Forecast and actual installed generation (rating plate size)~~

- ~~Operation and Maintenance – collected to assist with future requirements~~

- ~~Regulatory incentive parameters~~

- ~~Customer groups~~

[10] Generators connected prior to April 2005 will have paid 'deeper' connection charges and due to this will generally only pay use of system charges for their demand requirements.

~~The Model~~

~~The model is designed to apply the incentive appropriately to groupings of export sites. The groupings will be, domestic, non-domestic non half-hourly metered, half-hourly metered, and have been chosen so that they represent large enough populations of customers to enable stable tariffs to be offered. The incentive will be applied individually to site-specific users.~~

~~EDF Energy Networks will set an Export Charge, which will be reviewed annually, based on projected reinforcement costs associated with connecting a certain level of distribution generation to the EDF Energy Networks licensed distribution network. The Export Charge for each group will be set for the whole of each DNO area, with a p/day charge depending on the settlement profile for non half hourly metered sites and a £/kVA charge for half hourly metered sites. The charge for EHV connected sites will be calculated on a site specific basis, see page 15.~~

~~The settlement profile, for non-half hourly metered sites, will be used as an indicator of the average size of installed generation output for that profile and therefore be reflected in the p/day charge. The charge for half hourly sites will vary dependant on the export capacity.~~

~~The model calculates the target income for each customer group. The target income has the following components:~~

~~•EDF Energy Networks investment pass through – this is the element based on 80% of the shared asset investment annuitised over 15 years at 6.9%;~~

~~•Generation incentive – based on £1.50 per kW of installed generation;~~

~~•Operation and maintenance – expressed as a percentage of sole use asset and joint use assets values.~~

~~Format of Tariffs~~

~~The use of system charges to distributed generators shall comprise the following components:~~

~~Use of System Charges – as previously defined in the section 'Use of System Methodology – General Demand Tariffs', to be applied to the import MPAN.~~

~~An Export Charge covering the contribution to system reinforcement due to Distributed Generation (DG) and ongoing O&M. This will be a £/kVA excess export capacity charge for half hourly metered customers or a pence-per-day for non half hourly metered customers. The receipts from this charge will count towards the DG Price Control. This charge will be applied to the Export MPAN and charged on that capacity over and above the import capacity level.~~

~~Exceptions~~

~~Individual export sites connecting which have reinforcement costs exceeding £200/kW of installed capacity will be required to pay the costs in excess of £200/kW through the connection charge.~~

~~Matching Tariffs to Allowed Revenue~~

~~The Export Charge will be based on a forecast of network investment and installed capacity attributable to Distributed Generation for the period 2005 2010. Actual activity will be used to update the allowed income against the charged income and the over or under recovery, when material, will lead to an adjustment in charges. The Export Charge will be reviewed on an annual basis.~~

~~Setting the initial charges on a 5 year forecast is expected to have the effect of smoothing the annual charge and reducing excessive volatility in charges.~~

~~Use of System Methodology – Site-Specific Charges for Demand and Generation~~

~~Rational~~

~~The network utilisation of premises connected at Extra High Voltage (EHV) can be individually apportioned to that customer. Therefore, the use of system charges for each of these premises will be considered on a site-specific basis. This methodology explains the calculation of site specific use of system charges for EHV premises.~~

~~Note: An EHV premise is defined in the Licence as a site connected to the distribution system at a voltage of 22kV and above or at a substation with a primary voltage of 66kV and above. In practice, this generally means sites with exit points at 132kV, 33kV, or at a dedicated 132/11kV substation.~~

~~Where a site has export generation capability the methodology used for the export component will depend on the date of connection:~~

~~•For new sites where the connection is on or after 1 April 2005 any costs attributable to generation will be recovered using the same methodology described in the section 'Use of System Methodology – General Generation Tariffs', except that the methodology will be applied specifically to the site.~~

~~•For existing sites connected prior to the 1 April 2005, the charges will be calculated on the basis of the Connection Agreement agreed at the time of connection. In line with Ofgem guidance these arrangements will remain unchanged until at least 2010.~~

~~Model Inputs~~

~~Site-specific use of system charges are set to recover all relevant costs associated with the provision of, and the Operation and Maintenance (O&M) of, all network and connection assets plus the cost of billing and administration, in so far as this is not recovered as part of the initial charge for the connection. The main components of a site-specific use of system charge are:~~

~~•Sole Use Assets - The capital cost of any assets and their ongoing O&M provided for the sole use of the site may have been recovered from the customer prior to energisation. This will have been in the form of an upfront capital contribution. The values of the sole use assets are reviewed annually to take account of inflation and any network modifications. Where the full capital contribution was not made at connection, an annual charge towards the provision of the assets and the O&M of these sole use assets will be applied;~~

~~•Share of Joint Use Assets - A contribution towards the capital cost of existing joint user assets, used to provide supply from the grid supply point to the customer's exit point, are charged.~~

~~This contribution is based on a proportion of the annuitised cost of the assets provided. This proportion is based on the ratio of the agreed capacity of the exit point to the network capacity of the Joint User Assets under consideration. The annuitised cost reflects the~~

allowed rate of return. The asset valuation (taking into account any capital contribution made by the customer at the time of connection) and network capacity are provided by EDF Energy Networks and are reviewed from time to time to take account of inflation, any modifications to that part of our distribution system, the route of access to the NGET network or changes to the customers agreed capacity.

An annual contribution towards the costs of on-going O&M of these joint use assets is calculated by multiplying the asset valuation share of the joint use assets by the O&M rate;

•NGET Grid Supply Point exit charges - A contribution towards the cost of the NGET exit point(s) supplying the site is recovered via the site specific use of system charge. This contribution is based on the ratio of the agreed capacity to the firm capacity of the supplying GSP, applied to the forecast annual cost of the GSP;

•Operational Rates - A contribution towards the cost of operational rates is recovered via the EHV use of system charge. This contribution is based on the ratio of the site's agreed capacity and number of voltage transformations to the operational rates valuation.

•Billing and Administration - this comprises those costs which can be attributed to the administration of the site. These include, Use of System billing, a contribution towards the cost of the annual review of the site-specific use of system charge and may also include an amount to cover additional network control centre operational liaison.

•Details of any network assets provided for export capacity and the generation output for the site if energised after 1 April 2005.

NGET GSP exit charges and Operational Rates will based on import capacity, except where the export capacity triggers incremental or sole use asset cost to be incurred by EDF Energy.

The Model

The model contains all of the major network assets that are used by the site. it details the length and capacity of circuits, whether they are overhead or underground, transformers, circuit breakers and related plant. The modern equivalent asset values for each part, along with the percentage share are used to determine the attributed costs to the site.

An annuity factor based on the regulated rate of return and a 40 year depreciation period is then applied along with the O&M rate to the attributed asset cost. This then provides an annual income requirement for network use.

The proportion of GSP exit charge and operational rates is applied along with the customer service charge to provide a final income requirement for the site.

If the site was energised after 1st April 2005 an additional charge to recover the generation incentive will be applied if applicable.

The following assumptions are applied in the calculation of an EHV use of system charge:

•The allowed rate of return is as determined for the price control period;

•The O&M rate is applied as a percentage of the modern equivalent asset value of the distribution assets;

•The site capacity is loss adjusted when apportioning the various costs;

•The Loss Adjustment Factors are considered on an individual basis. The Loss Adjustment Factor to be applied to each site is reviewed to take into account of any material changes to site demand, site load factor and network configuration. A list of sites charged on site-specific terms is contained within our Use of System Charging Statements.

Format of Tariffs

The site-specific use of system charge is generally structured in the following manner:

•A Network Charge per month – to recover the income required for those costs that don't vary with site capacity. These include sole use assets and billing and administration;

•An Availability Charge per month – to recover the costs which do vary with site capacity. These include shared assets, exit charges and operational rates. The minimum chargeable capacity of a site will be fixed for a period of 5 years from the date of energisation for a new or enhanced supply where additional asset investment has been provided;

•An Export Charge – where applicable, to recover costs associated with provision of network assets specific to export capacity. This charge will be applied to the Export MPAN and charged on that capacity over and above the import capacity level;

•Excess Reactive Unit Charges.

EDF Energy Networks is prepared to consider offering differing formats of tariff structures (such as the inclusion of unit charges or entirely fixed price charges) for site-specific tariffs at the request of customers. These would be within the constraints of the structural elements listed in paragraph 5 on page 5 and would still be designed to recover the actual costs incurred as calculated by this methodology.

Prospective Site Specific Charges

Developers of schemes likely to be connected at EHV and have charges which are site-specific are encouraged to contact us for indicative prices. Please follow the contact details provided on page 4.

~~Use of System Charges~~

~~Where our Use of System Charges are published~~

~~EDF Energy Networks' Use of System tariffs for general demand and generation sites are published in our Use of System Charging Statements. These can be obtained from our web-site at www.edfenergy.com, or alternatively are available on request, at a cost of £10, via the contact details on page 4. To locate these statements on the website; on the home page select "Networks" from the orange menu bar that runs across the screen below the logo; then select "Publicly Available Information" from the menu down the left hand side of the screen; then select "Click here for our complete statutory documents" in the yellow bar approximately a third of the way down the screen; finally select Connection, Use of System and Metering Services Documents from the list in the centre of the page.~~

~~Site specific charge schedules are issued to the customer and current supplier only. Copies of the schedules are provided, on request, to Licensed Suppliers subject to any agreement with the customer. Schedules will only be released to other parties with the customer's approval.~~

Appendix 1. Licence Condition 4 – Use of System Charging Methodology

1. The licensee shall, by 1 April 2005:

   (a) determine and prepare a statement of a use of system charging methodology, approved by the Authority, that achieves the relevant objectives; and

   (b) comply with the use of system charging methodology at that date and as modified from time to time thereafter in accordance with the provisions of this condition.

2. The licensee shall, for the purpose of ensuring that the use of system charging methodology continues to achieve the relevant objectives:

   (a) review the use of system charging methodology at least once in every year; and

   (b) subject to paragraph 4, make such modifications (if any) of the use of system charging methodology as are necessary for the purpose of better achieving the relevant objectives.

3. For the purposes of this condition, the relevant objectives are:

   (a) that compliance with the use of system charging methodology facilitates the discharge by the licensee of the obligations imposed on it under the Act and by this licence;

   (b) that compliance with the use of system charging methodology facilitates competition in the generation and supply of electricity, and does not restrict, distort, or prevent competition in the transmission or distribution of electricity;

   (c) that compliance with the use of system charging methodology results in charges which reflect, as far as is reasonably practicable (taking account of implementation costs), the costs incurred by the licensee in its distribution business; and

   (d) that, so far as is consistent with sub-paragraphs (a), (b) and (c), the use of system charging methodology, as far as is reasonably practicable, properly takes account of developments in the licensee's distribution business.

4. Except with the consent of the Authority, before making a modification of the use of system charging methodology the licensee shall:

   (a) give the Authority a report which sets out:

      (i) the terms proposed for the modification;

      (ii) how the modification would better achieve the relevant objectives; and

      (iii) a timetable for implementing the modification and the date with effect from which the modification (if made) is to take effect, being not earlier than the date on which the period referred to in paragraph 6 will expire; and

   (b) where the Authority has directed that sub-paragraph (a) should not apply, comply with such other requirements (if any) as the Authority may specify in its direction.

5. Subject to paragraph 6, where the licensee has complied with the requirements of paragraph 4, it shall, before making the modification:

(a) revise the statement (or the most recent revision thereof) issued under paragraph 1(a) of this condition so that the statement sets out the changed use of system charging methodology and specifies the date from which it is to have effect; and

(b) give the Authority a copy of the revised statement.

6. The licensee shall make the modification to the use of system charging methodology unless, within 28 days of receiving the licensee's report under paragraph 4, the Authority, having particular regard to the relevant objectives, has either:

(a) directed the licensee not to make the modification; or

(b) notified the licensee that it intends to consult and then within three months of giving that notification has directed the licensee not to make the modification.

7. The licensee shall give or send a copy of any statement under paragraph 1(a) or report under paragraph 4 to any person who requests it.

8. The licensee may make a charge for any statement or report given or sent pursuant to paragraph 7 of an amount which does not exceed the amount specified in directions issued by the Authority for the purposes of this condition based on the Authority's estimate of the licensee's reasonable costs of providing the document.

9. Subject to paragraph 10, an approval by the Authority pursuant to paragraph 1(a) may be granted subject to such conditions as the Authority considers appropriate, having regard, in particular, to:

(a) the need for any further action to be undertaken by the licensee to ensure that the use of system charging methodology would facilitate the achievement of the relevant objectives; and

(b) the time by which such action must be completed.

10. An approval granted under paragraph 9 will only be effective if the Authority has informed the licensee of its intention to impose such conditions in a notice which:

(a) sets out the nature and contents of the conditions; and

(b) specifies the period (not being less than 28 days from the date of the notice) within which representations with respect to the conditions may be made, and has considered any representations or objections which have been duly made by the licensee and have not been withdrawn.

11. The provisions of this condition are wholly without prejudice to:

(a) the application of any charge restriction conditions (within the meaning given in paragraph 3 of special condition A (Definitions and Interpretation) (England and Wales) or paragraph 2 of special condition B (Definitions) (Scotland) of distribution licences as at 1 April 2004); or

(b) the application of any charging arrangements condition (within the meaning of standard condition BA1 (Charging Arrangements) of the distribution licence as modified from time to time).

12. The Authority may (following consultation with the licensee and, where appropriate, with any other authorised electricity operator likely to be materially affected thereby) issue directions relieving the licensee of its obligations under paragraph 1 to such extent as may be specified in the directions.

Appendix 2. Glossary

Authority The Gas and Electricity Markets Authority – the regulatory body for the gas and electricity industries established under the Utilities Act 2000.

Active Power - The product of voltage and the in-phase component of alternating current measured in units of watts, W, kW, MW, etc.

Apparent Power - The product of voltage and of alternating current measured in units of volt-amperes, VA, kVA, MVA etc. Apparent power is that which is actually utilised, as a function of volts multiplied by amps, rather than the metered active power.

Authorised Electricity Operator means Persons entitled to use EDF Energy Networks' electricity distribution system by Licence or by exemption from the Electricity Act 1989.

Balancing and Settlement Code (BSC) means the agreement containing the rules and procedures under the new electricity trading arrangements (NETA).

CT means current transformer.

Data Aggregator (DA) means an organisation that aggregates consumption data supplied by the Data Collector or Data Processor. The DA may be half hourly or non-half hourly.

Data Collector (DC) means an organisation carrying out the roles of Data Retrieval and Data Processing.

Data Processing (DP) means the processing, validation and (if necessary) estimation of meter reading data and the creation, processing and validation of data in respect of consumption at premises with an unmetered supply, together with delivery of such data to the Data Aggregator.

Data Retrieval (DR) means the retrieval and validation of meter reading data from electricity meters and the delivery of such data to the relevant person for the purpose of data processing.

De-energisation means the removal of supply for a Metering System such that the Metering System is considered to be temporarily "inactive" for the purposes of settlement. This definition applies irrespective of the method used to effect the de-energisation - e.g. removal of fuse at the connection point or other method.

Distribution Code means the Distribution Code of Licensed Distribution Network Operators of England and Wales prepared pursuant to standard condition 9 (Distribution Code) and approved by the Authority as revised from time to time with approval of the Authority.

Distribution Licence The Electricity Distribution Licence~~s~~ granted to ~~EDF Energy Networks (EPN) plc, EDF Energy Networks (LPN) plc and~~ EDF Energy Networks (SPN) plc under Section 6(1)(c) of the Act.

Distribution System The whole of our interconnected distribution equipment, including cables, overhead lines and substations, which we operate in accordance with our Distribution Licence.

DNO means Distribution Network Operator

Elexon The Balancing and Settlements Code Company

Energisation means the commencement of supply to a Metering System, such that the Metering System is considered to be "active" for the purposes of settlement. This definition applies irrespective of the actual method used - e.g. insertion of fuse at the connection point or other method.

Excess Reactive Units – for each power factor band, the number of reactive units (kVArh) delivered in excess of: the number of kVArh at the start of the power factor band divided by the kWh's, then multiplied by the kWh's.

Exit Point means the point of connection at which electricity may flow between EDF Energy Networks' electricity distribution system and a customer's installation.

Exit Point Type is a generic description of similar exit points used by EDF Energy.

Extra High Voltage means equal to or more than 22,000 volts.

Grid Supply Point means a metered connection between the National Grid Company's transmission system and EDF Energy Networks' distribution system at which electricity flows on to the distribution system.

GSP Group means Grid Supply Point Group; a distinct electrical system, consisting of all or part of a distribution system, that is supplied from one or more Grid Supply Points for which total supply into the GSP Group can be determined for each half hour.

High Voltage means more than 1,000 volts and less than 22,000 volts.

kVA means kilovolt-amperes.

kVArh means kilovolt-ampere reactive hour.

kW means kilowatt.

kWh means kilowatt hour (equivalent to one "unit" of electricity).

LLFC (Line Loss Factor Class) identifies the loss adjustment factors and Use of System prices for a metering point.

Loss Adjustment Factor means the factor by which supplies of electricity taken from a Grid Supply Point must exceed the take at the exit point from EDF Energy Networks' electricity distribution system, varying according to the voltage of connection, month, day and time of day.

Low Voltage Interconnection means an electrical connection by a Low Voltage electric line to EDF Energy Networks' distribution system.

Low Voltage means 1,000 volts or less.

Low Voltage Substation Supply means a Low Voltage supply to premises from an on-site ground mounted substation through an electric line, both of which are situated wholly within the boundary of those premises, including the site of the substation, where there is no Low Voltage Interconnection.

Maximum Power Requirement or *MPR* means the maximum power in kVA which for the time being the customer has required and EDF Energy Networks has accepted as the maximum rate of consumption that may be reasonably anticipated.

Metering Point means the point at which a supply of electricity to (export) or from (import) EDF Energy Networks' distribution system is measured, is deemed to be measured, or is intended to be measured. (For the purposes of this statement Grid Supply Points are not 'metering points').

MPAS (Meter Point Administration Service) is EDF Energy Networks' service for meter point registration, established pursuant to its Licence and the MRA.

MRA (Master Registration Agreement) means the national agreement prepared in accordance with condition 37 of the Licence.

MTC (Meter Timeswitch Code) means a code that uniquely identifies meter characteristics.

NGET means National Grid Electricity Transmission plc (formerly National Grid Company or NGC) .

Ofgem The Office of Gas and Electricity Markets.

Power Factor Bands – The grouping of power factor by impact on network. For example; Band 1, unity to 0.95; Band 2, 0.95 to 0.75; Band 3, 0.75 to … and so on.

Profile means a pattern of consumption of electricity, by half hour, across a year.

Reactive Power - The product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive, VAr, kVAr, MVAr etc.

Re-energisation means the resumption of supply to a Metering System following a period of de-energisation, such that the Metering System is considered to be "active" for the purposes of settlement. This definition applies irrespective of the actual method used - e.g. insertion of fuse at the connection point or other method.

Revenue Protection Service is the service provided by EDF Energy Networks for the investigation and follow up of cases of suspected meter faults or interference.

Settlement Class means the combination which defines the level at which non half hourly Data Aggregators must supply aggregated consumption values, that is for Profile, Line Loss Factor Class, Time Pattern Regime and Standard Settlement Configuration, by supplier within a GSP Group.

Settlement Day means the period from midnight to midnight to which consumption in a settlement run relates.

Settlement Run means a full run of the Settlement System Administrator Settlement system and the Initial Settlement and Reconciliation Settlement system for all GSP Groups within the settlement timescale.

SSC (Standard Settlement Configuration) means a standard metering configuration supported by SVAA relating to a specific combination of TPRs.

Standby Supply means the provision of electricity on a periodic or intermittent basis, to replace a primary source of supply which is temporarily unavailable.

Statement (Supercustomer) means the daily summary of unit and Network charges to be invoiced for Use of System through the Supercustomer process, for each settlement class, sent electronically to each supplier as appropriate.

Supercustomer means the method of billing suppliers for Use of System on an aggregated basis, grouping consumption and Network charges for all similar customers together.

Supplier means an organisation with a Supply Licence which can register itself as supplying electricity to any metering point.

SVAA (Supplier Volume Allocation Agency) means the agency which uses aggregated consumption data from the Data Aggregator to calculate supplier purchases by settlement class for each settlement day, and then pass this information to the relevant distributors and suppliers across the national data transfer network.

TPR (Time Pattern Regime) means the pattern of switching behaviour through time that one or more registers follow.

UoSA (Use of System Agreement) or *Agreement* means the contract between the supplier and EDF Energy Networks agreeing the terms and conditions under which the supplier may use EDF Energy Networks' distribution system to supply electricity to customers.

Appendix 3. Statement of Loss Adjustment Factor Methodology for EDF Energy Networks' Electricity Distribution Networks

1. General Information

1.1 This appendix describes the methodologies applied by EDF Energy Networks in the calculation of its loss adjustment factors (LAF's)[11] for authorised users of its distribution network.

1.2 EDF Energy Networks is providing this statement as an appendix to the Statement of the Use of System Charging Methodology. It details the methodology that is used for the calculation of its published loss adjustment factors and is made available in order to provide clarity and transparency for users of its distribution network. This statement does not form part of EDF Energy Networks' Statement of the Use of System Charging Methodology and is not subject to approval by the Authority.

1.3 EDF Energy Networks is obliged under Standard Condition 4A of its Distribution Licence to publish a statement of charges for the use of the distribution system that is in a form approved by the Authority. The statement is required to contain "a schedule of adjustment factors to be made for distribution losses". EDF Energy Networks' loss adjustment factors are made available to Elexon (and therefore all market participants) through the provision of the dataflow, D0265 for SVA loss adjustment factors and an Elexon prescribed data format for CVA loss adjustment factors.

1.4 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 a substitution method. These methodologies are described in detail in sections 2 and 3 below.

2. Generic Loss Adjustment Factors

2.1 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 reviewed annually but only changed periodically to reflect a confirmed trend.

2.2 In principle the model takes into account the units entering EDF Energy Networks' distribution system from Grid Supply Points (GSPs), distribution system connection points and distributed generators, etc known as the system entry volume and the units leaving the system, known as units distributed. The total system losses are then given by the following expression.

Total system losses = system entry volume - units distributed

2.3 The total system losses are, therefore, fixed by the recorded metered data and the model seeks to allocate these losses across the whole network equitably using estimates of the likely loss at each voltage level.

[11] Loss Adjustment Factors (LAF's) are sometimes referred to as Line Loss Factors (LLF's) and vice versa.

2.4 The voltage levels at EHV, HV and LV and the transformation levels of EHV/EHV, EHV/HV and HV/LV are represented within the model. The model is populated with a set of standing data. For example, the fixed loss constant and the variable loss constant for each voltage and transformation level are contained within the standing data. These loss constants are derived from a network model, based on a network equivalent representation of the EDF Energy Networks distribution system. The fixed loss constant reflects primarily the iron losses in transformers and dielectric losses in cables. The variable loss constant reflects the losses in plant that vary with the magnitude of the current such as ohmic losses in conductors and transformer windings.

2.5 The model is also populated with the estimated metered volumes of energy imported or exported per annum for the year in question at each of the various voltage level, including the energy entering at the connection points with National Grid Electricity Transmission (NGET), other distributors and the contribution from distributed generation within EDF Energy Networks' distribution network. The populated metered data is transformed into half-hourly data using the settlement profiles (Profile Classes 1 to 8), user defined profiles and profiles for generation based on recent historical data.

2.6 A 'Top-Down' approach is used for estimating network losses starting from the bus-bar at GSPs. The energy delivered from the higher voltage level is used to deduce the losses on the assets and thus the energy passed through to the lower voltage level.

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

$$P_{out} = P_{in} - v.P_{in}^2 - f - L$$

where P_{in} = Power into voltage level from higher voltage level,
P_{out} = 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
LAF_{132kV} equals 2,000/(2,000 – 3.5– 0.5)	
LAF_{132kV} calculated as equal to	1.0020
If net sales from the 132kV network	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} x 1,796/(1,796 – 8 – 2)	
$LAF_{132/33kV}$ calculated as equal to	1.0076

2.8 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 we have used the settlement profiles, these values will differ from the forecast annual volume of the non half-hourly metered load. The program, therefore, undertakes a series of iterative cycles to match the two values.

2.9 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 generated at these networks and there is greatest uncertainty in estimating the loss constants.

2.10 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 therefore the half-hourly loss adjustment factors are calculated.

2.11 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.

2.12 Note that the overall loss is not derived from the model but based upon an extrapolation from the historic recorded losses.

3. Site Specific Loss Adjustment Factors

3.1 Site specific loss adjustment factors are calculated when necessary for EHV users. These loss adjustment factors are reviewed annually and re-calculated following a material change to network data (for example a change to a customer's maximum capacity, for the addition of a new customer etc.)

3.2 The site specific loss adjustment factor comprises a fixed loss element and a variable loss element. The variable loss element of the loss adjustment factor is calculated using the substitution method, whilst the fixed loss element is calculated by a proportionate approach.

3.3 The fixed loss element is the energy required to energise the effective network between the user and the NGET 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 maximum capacity expressed as a percentage of the aggregate maximum capacities.

3.4 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 to give the losses allocated to the user per annum.

3.5 The variable loss element is calculated using a network model constructed for each user representing all relevant parts of the distribution network between the user and assigned NGET interface point. 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). An alternating current (AC) load flow program is utilised to calculate the variable loss element of the network model.

3.6 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 ASC 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.

3.7 A user's calculated variable loss element is then multiplied by the number of hours in the year and by the user's loss load factor to produce the losses figure, per annum. A loss

load factor is employed to produce an annual variable loss element, as the user will not continuously operate at its ASC and would therefore not be contributing to losses on a continuous basis.

3.8 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.

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

$$\text{Loss Adjustment Factor} = 1 + (\text{Total losses} / \text{Units Distributed})$$

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

4. Contact Details

4.1 This statement has been prepared to provide clarity and transparency for users of EDF Energy Networks' distribution network. If you have any questions about the contents of this statement, please contact us at the address shown below.

Oliver Day
Distribution Pricing Manager
EDF Energy Networks Ltd
Energy House
Carrier Business Park
Hazelwick Avenue
Crawley
West Sussex
RH10 1EX

Tel: 01293 657920
Email : DistributionPricing~~oliver.day~~@edfenergy.com