

**STATEMENT OF CHARGING METHODOLOGY FOR USE OF  
SCOTTISH HYDRO-ELECTRIC POWER DISTRIBUTION LTD'S  
DISTRIBUTION SYSTEM: 2006 – 2007**

**Effective from 1 April 2006**

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# **STATEMENT OF CHARGING METHODOLOGY FOR USE OF SCOTTISH HYDRO-ELECTRIC POWER DISTRIBUTION LTD'S DISTRIBUTION SYSTEM.**

## **General Introduction**

### **Who we are**

SSE Power Distribution is a trading name of Southern Electric Power Distribution plc, Scottish Hydro-Electric Power Distribution Ltd and Scottish Hydro-Electric Transmission Ltd, part of the Power Systems division of Scottish and Southern Energy plc. Scottish Hydro-Electric Power Distribution Ltd is the licensed electricity distribution business, which operates networks in the north of Scotland. It also owns and operates small, embedded distribution systems in other parts of Scotland. This statement is produced by Scottish Hydro-Electric Power Distribution Ltd, referred to in this statement as SHEPD, in accordance with the requirements of its electricity distribution licence.

### **Licence Obligations**

This statement describes the Use of System Charging Methodology under which authorised users will be charged for use of SHEPD's electricity distribution system in 2006/7.

SHEPD is obliged, under Condition 4 of its electricity distribution licence, to prepare a statement approved by 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 and to make such modifications to the Use of System Charging Methodology as are necessary for the purpose of better achieving the 'relevant objectives' defined in the same condition of the licence.

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 the 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 reasonably practicable, 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.

Words and expressions used in this statement have (unless specifically defined herein) the definitions given to them in the Act or the licence and shall be construed accordingly. Charges and costs are current at the

time of publication and will not be changed, except as provided for in the relevant agreement for use of system and subject to Condition 4 of the licence.

SHEPD's electricity distribution system is subject to the terms and conditions of the Distribution Code as approved from time to time by the Gas and Electricity Markets Authority (the Authority). In exceptional cases, other parties may be entitled to use of the system under special arrangements to be agreed with SHEPD.

This statement has been approved by the Gas and Electricity Markets Authority. A fee of £5 (excluding VAT) will be payable for each copy of this statement which is provided in accordance with a request.

## **Price Control**

SHEPD's licence contains conditions relating to price control of the revenue that SHEPD is allowed to charge for the provision of regulated services including use of system. In this way, the amount of revenue that SHEPD is allowed to recover from its customer base annually and over the price control period is governed by the detailed terms of its licence. Use of system charges may vary year on year as SHEPD sets its use of system charges to recover its allowed revenue.

## **Use of System**

SHEPD will levy use of system charges for use of its network for the supply of electricity to end-users and for the transportation of electricity across its network from entry points. SHEPD's use of system tariffs are published in our Licence Condition 4A Use of System charging statement.

Users entitled to use SHEPD's electricity distribution system are those who are authorised by licence or by exemption under the Act to supply or generate electricity ("Authorised Electricity Operators"). In order to protect all users of the system, SHEPD will require evidence of authorisation before agreeing terms for use of the system. NOTE: In the rest of this commentary, requirements applying to authorised persons or Authorised Electricity Operators should be taken to mean Licensed Suppliers, Licensed Embedded Electricity Distributor or Licensed Generators only.

## **Connection and Use of System Boundary**

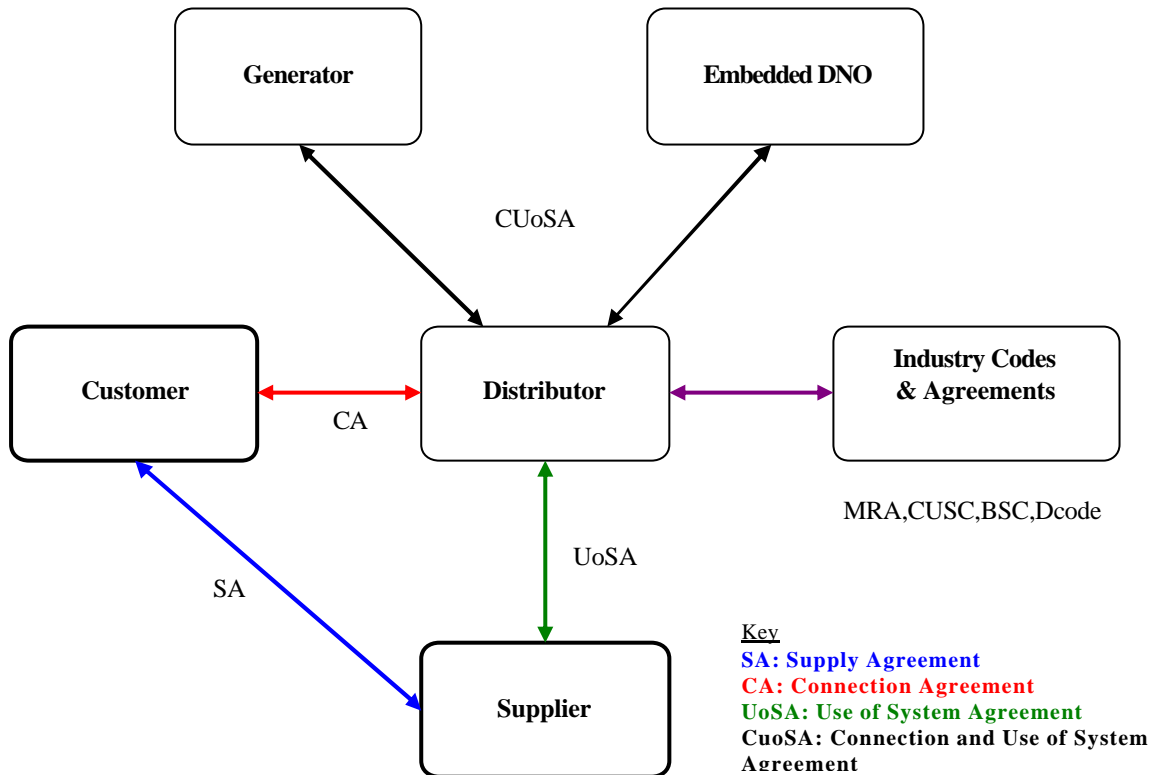
There is a point at which SHEPD splits the recovery of costs between connection to the distribution network and on-going use of system charges for utilisation of the network. The boundary point is common for both demand and generation customers. This statement details the charging methodology that is applied for the calculation of use of system charges. The Licence Condition 4A Statement details the actual use of system charges to be applied, whilst the Licence Condition 4B Statement details the Connection Charging Methodology that is used for calculation of connection charges. These statements can be obtained from our web-site at

[www.scottish-southern.co.uk/ssegroup/contractmanagement.asp](http://www.scottish-southern.co.uk/ssegroup/contractmanagement.asp)

or are available on request at a cost of £5 by following up the contact details on page 6.

## **The Contractual Framework**

The following flowchart shows the contractual framework for a customer trading either Supplier Volume Allocation (SVA) or Central Volume Allocation (CVA) Settlements.



Users seeking to use the system will be required, prior to using the system, to enter into an agreement with SHEPD 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 our Licence Condition 4A statement and the accompanying schedules;
- be a party (where the user is a Licensed Supplier or a Licensed Embedded Electricity Distributor) to the Master Registration Agreement (MRA) for the provision of metering point administration services within SHEPD's authorised area;
- enter into any necessary arrangements with NGC for use of the transmission system to reflect arrangements under BETTA, unless SHEPD is informed by NGC 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 (a copy of which is available at a charge of £30 per serviced copy or £15 per unserviced copy plus packing, postage and VAT from SHEPD on request).

If the applicant and SHEPD fail to agree contractual terms, or any variation of contractual terms proposed by SHEPD, either party may request settlement by the Authority.

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 an agreement for use of SHEPD's 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 SHEPD no less than 28 days' notice. SHEPD will normally respond within 28 days of a notification of change.

Terms and conditions for connection of premises or other electrical systems to SHEPD's electricity distribution system are contained in our Licence Condition 4B document titled "Statement of Charging Methodology for Connection to Scottish Hydro-Electric Power Distribution Ltd's Distribution System" which is available from our web-site at:

[www.scottish-southern.co.uk/ssegroup/contractmanagement.asp](http://www.scottish-southern.co.uk/ssegroup/contractmanagement.asp).

It is also available on request at a cost of £5 by following up the contact details below. Persons seeking use of the system with respect to a new connection point, must apply for connection in accordance with the terms and conditions described in that statement.

## Contact Details

This statement has been prepared in order to discharge SHEPD's obligation under Condition 4 of the licence. If you have any questions about the contents of this statement please contact us at the address shown below. Also given below are contact details for the Office of Gas and Electricity Gas Markets should prospective users wish to enquire separately on matters relating to this statement.

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## Use of System Charging Principles

Pursuant to the requirements of Condition 4 of the licence, the following numbered paragraphs relate to the transport of electricity on SHEPD's system by Authorised Electricity Operators to or from exit points from the system, and to the transport of electricity on the system for supply to Authorised Electricity Operators and to 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 SHEPD's electricity distribution system, a charge for use of the system will be levied either on the Supplier of the electricity or the embedded Distributor. The relevant charges are described in our Licence Condition 4A Statement 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 SHEPD's 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 SHEPD of providing certain services and performing functions for Authorised Electricity Operators, on terms that SHEPD is under a duty to offer under its licence, in order to support the operations of a fully competitive supply market in its authorised area. These services include: Meter provision services; Metering Point Administration Services; Energisation and De-energisation and Re-energisation services; Revenue Protection Services; and Radio Teleswitch Services. SHEPD 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 Licence Condition 4A Statement.

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 price regulation in accordance with the terms of the licence.

4. Charges to Suppliers and Licensed Embedded Electricity Distributors for the use of the system are evaluated as if from SHEPD Bulk Supply Point. 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 10 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 **standing charge** to cover the costs which do not vary with the extent to which the supply is taken up. This consists of a daily or monthly rate per site;

- an **availability charge** per kVA to cover the system capacity at each voltage level which is attributed to the connection;
  - 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 based on 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; and
  - **transactional charges** for certain services provided by SHEPD on an individual basis to Licensed Suppliers. Details are given in our Licence Condition 4A Statement.
6. The standing 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 data processing, maintaining customer records, the costs of the registration service in accordance with the Master Registration Agreement and the cost of use of system billing and collection.

The Availability Charge (available capacity charge) recovers an amount, other than that recovered through the connection charge, towards the costs of providing and maintaining the network. This charge will be based on the agreed available capacity when the connection is first provided, or a modification made to existing connection arrangements. The agreed available capacity will remain unchanged for a minimum period of 5 years for demand and 15 years for generation, and availability charges will be payable on this capacity basis. After this period any agreed reduction to the connection capacity will be limited to once per annum. These constraints are in place to ensure that the assets are sized for optimum utilisation on an enduring basis, thereby enabling the company to meet its statutory duty to "develop and maintain an efficient, co-ordinated and economical system of electricity distribution".

7. The charges for use of system exclude charges for the provision of distributor metering and data services in SHEPD's distribution services area. The terms and conditions for the provision of non half-hourly distributor metering and data services are detailed in a separate statement.

Full details of our metering charges are available in our Licence Condition 36B document titled, 'Statement of Charges for Scottish Hydro-Electric Power Distribution Ltd's Distributor Metering and Data Services. This statement can be obtained from our web-site, [www.scottish-southern.co.uk/ssegroup/contractmanagement.asp](http://www.scottish-southern.co.uk/ssegroup/contractmanagement.asp), or is available on request at a cost of £5 by following up the contact details on page 6.

Authorised persons seeking use of the system shall procure that the Meter Operator, Data Collector and Data Aggregator appointed for each metering point supplied in relation to which the supply of electricity is measured by the metering equipment for the purposes of Settlement, shall provide SHEPD with any data required to be provided to SHEPD, without charge, by the person appointed in that capacity under, as appropriate, the Distributor Metering and Data Services Agreement, Data Collection Services Agreement or Data Aggregation Services Agreement in accordance with the timescales specified in such agreements. Whether SHEPD is appointed to carry out this task or the supplier installs his own energy metering, SHEPD reserves the right to install use of system metering equipment and apply an additional charge for this equipment.

8. Charges for use of system will normally be payable on demand, in accordance with the billing period and payment terms agreed with the party using the system. SHEPD 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 payment may be applied to late payments. Invoices for residential and most business supplies will generally be calculated according to the Supercustomer Methodology for Use of System Billing, a description of which is given in our Licence Condition 4A Statement. However, for supplies with complex pricing structures driven by site-specific components, site-specific invoices will be rendered, listing the supplies to which the invoice refers, the information about the supply on which the charge has been calculated, and the amount due for each supply identified in the invoice.
9. Where a supply is to be provided wholly or partly over SHEPD's electricity distribution system to an exit point from that system, the Supplier or embedded 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 Licence Condition 4A Statement. Relevant metering information or being a party to the Balancing and Settlement Code will be considered to be adequate demonstration. Suppliers should refer to the above statement in order to calculate the amount of electricity that they must provide. The same loss adjustment factors are reflected automatically in the settlement system.
10. Where the supply is to be provided over SHEPD's 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.
11. Where SHEPD, 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 Licence Condition 4A Statement is appropriate, SHEPD will offer appropriate arrangements in these exceptional circumstances and following discussion with the customer. In most cases, SHEPD will make its offer of terms within 28 days of receiving the application, following receipt of the full and final information necessary for the preparation of the terms.
12. Where use of the system is sought at a standard of security different from that referred to in the Distribution Code, SHEPD may consider special arrangements with respect to that supply. In respect of loads with power factors which fall outside the range of 0.8 lagging and unity, any specific conditions related to the power factor will be stated in the Connection Agreement.
13. Use of System Charges for demand only include a contribution to recovery of transmission exit charges. These amounts are calculated to be appropriate to each class of customer. This is on the basis that the total contribution to transmission exit charges paid by any class of customer is in proportion to the demand of that class of customer and is generally recovered through the unit charges.
14. Charges to generators for use of SHEPD's distribution system will be made both 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 paragraphs 1 to 13 above and the detail provided in the following sections. The Loss Adjustment Factors set out in our Licence Condition 4A Statement may also be relevant.

## **Use of System Methodology – Regulated Demand Tariffs**

### **Principles**

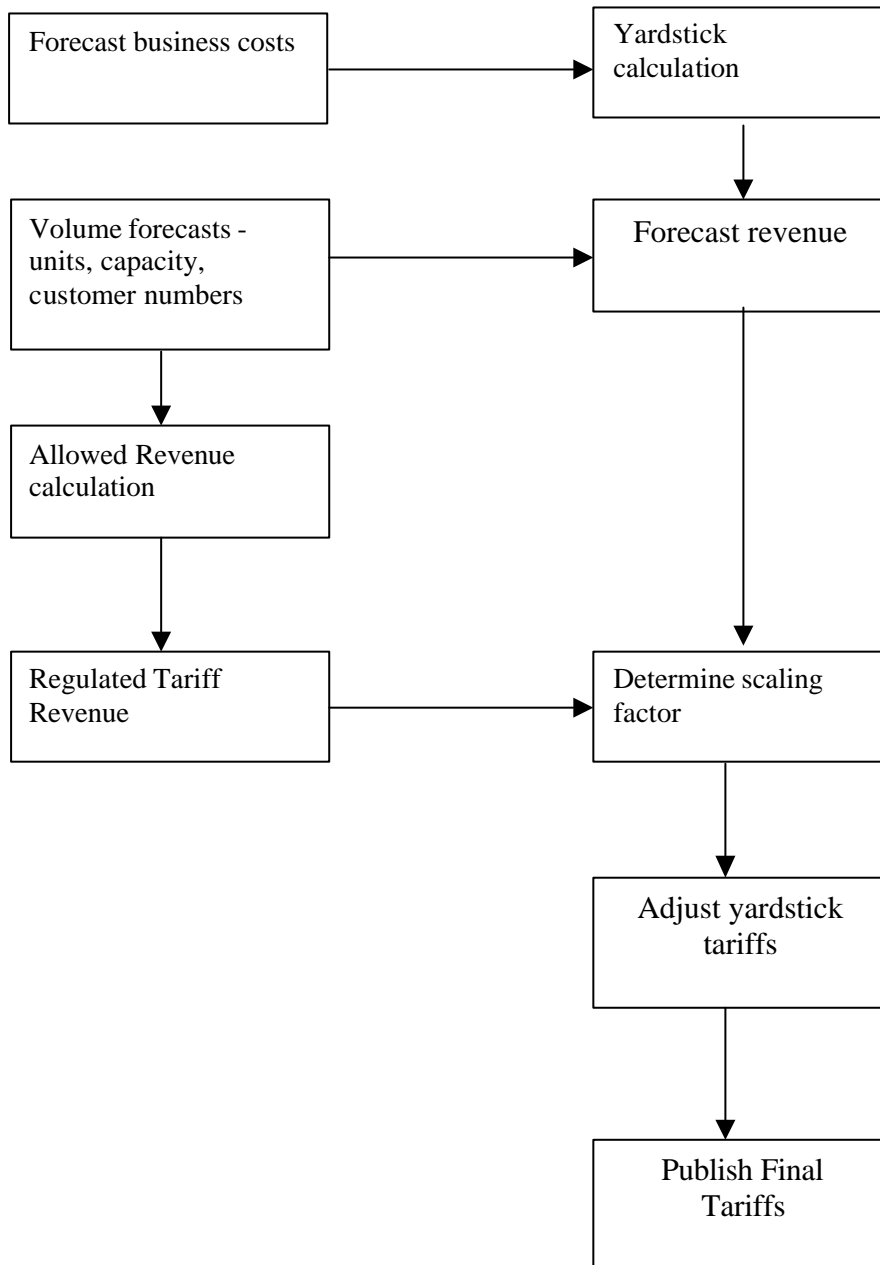
The methodology to calculate use of system charges involves the following process:

- Yardstick Calculation;
- Revenue Calculation;
- Setting Final Tariffs.

The process produces use of system charges that maintain appropriate cost recovery between customer groups, provide price stability, cost reflectivity and ensure that target allowed revenue is achieved.

The stages in the process are described in the following sections, and depicted in Fig 1: High level flowchart of the process, on the following page.

**Fig 1: High Level flowchart of the process**



## **Yardstick Calculation**

The use of system yardstick tariff costs are derived by calculating costs based on a modern replacement value simulation of the distribution network, with the asset value at each distribution voltage being calculated.

### **Costs**

Modern equivalent asset prices and trends were used to produce costs at each voltage level. This cost was then converted into an annual charge by means of an annuity factor, which included a target rate of return and an allowance for obsolescence. The annuitisation factor used was based on the allowed rate of return over the assumed lifetime of the asset. In addition to annuitised capital costs, the yardstick model also builds in annualised operation and maintenance costs.

Each year, the simulation is updated to reflect the addition and removal of assets at each voltage level. Historical capital expenditure and operating cost figures are revised and new forecasts incorporated.

All of the cost inputs to the simulation are gathered into two groups: customer-related costs and asset-related costs. The asset-related costs are those which are driven by demand on the assets. Customer-related costs are driven by the existence of the customer rather than by the customer's demand on the assets. Together the annuitised capital costs and the annual operation and maintenance costs derive the total £/kW over each voltage level of the system.

Other business costs including local authority rates, corporate overheads, minimum supply connection costs, and billing and collection costs are included in the various yardstick components.

A yardstick tariff is developed for each class of customer. It takes into account the costs at each level of the system from 33kV to LV and over each voltage level. Average diversity factors, load factors and assumed coincidence factors are then utilised to turn the £/kW into a cost reflective yardstick unit rate for the customer class. The allocation of the costs to the customer class is based on annual total demand.

SHETL charges are treated as a pass through cost and recovered across each element of a customer class tariff.

The underlying rationale is to attribute costs in the most cost-reflective manner, consistent with the available metering.

## **Revenue Calculation**

The following process explains the revenue calculations that will need to be performed in order to set the final use of system tariffs.

### Allowed Revenue

The Allowed Revenue is derived from the distribution price control formula set out in the licence. The calculation produces the maximum average allowed revenue per unit distributed. Adjusting for the pass-

through of excluded service revenue gives the total use of system revenue that SHEPD is allowed to recover via its tariffs. This is known as the Regulated Tariff Revenue.

### **Setting Final Tariffs**

Once the amount of revenue required from the regulated tariffs has been determined, a uniform scaling process is then undertaken across all yardstick tariffs, to ensure that the forecast revenue recovered matches the regulated tariff revenue.

### **Format of Tariffs – EHV, HV and LV**

Tariff structures relate 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 the tariff a distributor may offer.

Those tariffs relating to customers without Maximum Demand metering consist of the following components:

- Customer related or MPAN charge;
- Unit related charge(s)

Those tariffs relating to customers with Maximum Demand metering consist of the following components:

- Customer related or MPAN charge;
- Unit related charge(s);
- Capacity related charge.

The tariffs applicable to various customer groups (e.g. Domestic, Non-domestic) are identified by unique Line Loss Factor Class (LLFC) codes.

### **Out of Area Networks**

Where SHEPD operates distribution networks outside its distribution services area, it will charge any demand connecting to those networks after 1 April 2006 in a manner which ensures that the overall UoS charges payable do not exceed those which would be payable if the connection had been made to the network of the "host" distribution network operator in whose distribution services area SHEPD's network is situated.

## **Use of System Methodology – Generation Tariffs**

### **Introduction**

Generators who connect to the distribution system based on terms offered in compliance with the methodology set out in SHEPD's connection charging methodology statement for 2006/07 will, where applicable, be required to pay generator distribution use of system (GDUoS) charges, as discussed in this section. These charges apply to the characteristics of the generator's export to the distribution system. Where the generator also imports energy from the distribution system, the appropriate demand tariffs will apply.

### **Rationale**

Ofgem have proposed a mechanism to incentivise SHEPD to connect generators to its distribution network. The mechanism allows SHEPD to recover a percentage of the reinforcement costs associated with the connection of generation, a value per kW of generation connected and an allowance per kW for the operation and maintenance of the assets used to connect generation. The approach involves the development of a distributed generation (DG) allowed revenue income stream.

This methodology statement explains the calculation of SHEPD's GDUoS charges.

### **Transitional Arrangements**

Generators already connected to the distribution system will not be liable for any GDUoS charges unless there are material changes in their required export capacity and/or connection arrangements after 1 April 2005. Similarly, generators who have accepted a connection offer based on the connection charging methodology applicable prior to 1 April 2005 will be connected according to the agreed contractual arrangements and will not be liable for GDUoS charges. Due to the 90-day timescale for providing connection quotations, the last application date for which a connection offer based on the previous methodology can be guaranteed is 31 December 2004.

Generators applying for connection after 1 April 2005 will be liable for GDUoS. Since generators applying for connection on or after 1 January 2005 are likely to be provided with terms for connection on or after 1 April 2005, the new connection charging methodology will be used in providing these terms. These generators will then be liable for GDUoS once connected.

### **Methodology**

The methodology used to establish GDUoS is expected to evolve over time as further experience is gained of the capacities of generators connecting and the costs of reinforcing the distribution system to accommodate them. Initially, two categories of capacity-related charges have been developed (one for EHV and one for HV/LV) by building up the elements of the DG allowed revenue income stream.

Some elements of allowed income are already expressed in £/kW terms. In order to express the allowed pass-through of reinforcement costs for the above two categories in similar terms, forecasts and assumptions are made about the level of reinforcement costs, the contribution to those costs made

by generators through their connection charge and any other factors affecting the DG allowed revenue income stream. The resulting costs are then annuitised to provide an equivalent £/kW figure, referred to as the network charge.

### Tariff Setting Example

The following example illustrates the charge setting process described above.

Expected DG Capacity (MW) (A)	Expected Pass-through costs £m (B)	Cost per kW (B) / (A) £/kW
800	8	10

Annuity Factor	0.1091	Price control assumption, reflecting 6.9% rate of return over 15 years
Network Charge £/kW	1.1	£10/kW x 0.1091
Operation and Maintenance Charge £/kW	1.0	Price control allowance
£/kW Incentive Allowance	2.0	Price control allowance
RPZ Allowance £/kW	0.2	
<b>Total Charge £/kW</b>	<b>4.3</b>	

The total charge derived above is then uplifted to reflect forecast incidence of generation connection during the year such that allowed annual revenue is still achieved.

It is intended to apply this charge setting process to generation connecting at both EHV and HV/LV voltages on a £/kVA basis to the export capacity specified in the generator's connection agreement. At this stage, the methodology does not provide charges for generation connecting at non-half hourly metered sites due to the low materiality of expected costs from this class of generator. The charging methodology may be refined in future to incorporate charges for such generators and/or to set different GDUoS charges in different geographical areas.

### Development of Charges over time

SHEPD will set charges based in the above manner based on the forecasts of generation connecting, the associated costs and the final price control parameters relevant to the calculation of DG allowed

revenue. The charges for subsequent years will be updated to reflect: inflation-linked changes to the price control parameters; updated forecasts of generation connecting together with its associated costs; and any under or over-recovery of allowed revenue in the previous year. In the interests of maintaining a stable path of GDUoS charges, SHEPD will limit any year on year increase in generator charges to 10% in real terms.

## **Other Matters**

- Payment Period for GDUoS Charges. A connection start date will be established with each generator to reflect the date from which access to the distribution system is required to be available. GDUoS charges will be payable for the agreed capacity level from the connection start date. GDUoS charges at the prevailing rate will be payable for 5 years.
- Network Access Rebates.

For generators who:

- i) are connected at HV or EHV; **and**
- ii) have an export capacity greater than 1 MVA,

SHEPD will rebate GDUoS charges by £2/MWh of eligible network unavailability in situations where an agreed baseline level of expected network unavailability is exceeded in any financial year. This baseline level will be established on a site-specific basis and will take into account the specific relevant features of the connection arrangements. Pre-arranged outages will not be subject to this rebate mechanism.

After the end of the financial year, SHEPD will arrange for the appropriate payment to be made to the party liable for the GDUoS payments on the basis of the number of complete hours of network unavailability above the site-specific baseline level that occurred during that financial year.

- Out of Area Networks. Where SHEPD operates distribution networks outside its distribution services area, it will charge any generators connecting to those networks after 1 April 2005 in a manner which ensures that the overall GDUoS charges paid by the generator do not exceed those to which it would be liable if it connected to the network of the “host” distribution network operator in whose distribution services area SHEPD’s network is situated.

## **Where our Use of System charges are published**

SHEPD’s Use of System tariffs are published in our Licence Condition 4A Statement. . This statement can be obtained from our web-site at:

[www.scottish-southern.co.uk/ssegroup/contractmanagement.asp](http://www.scottish-southern.co.uk/ssegroup/contractmanagement.asp)

and is also available on request at a cost of £5 by following up the contact details on page 6.

## Glossary of Terms

Licence	The Electricity Distribution Licence granted to SHEPD under Section 6(1)(c) of the Act.
Act	The Electricity Act 1989 as amended by the Utilities Act 2000 and the Sustainability Energy Act 2003.
Authority	The Gas and Electricity Markets Authority (GEMA) – the regulatory body for the gas and electricity industries established under the Section 1 of the Utilities Act 2000.
Ofgem	The Office of Gas and Electricity Markets.
GEMA	See “the Authority”
SHEPD	Scottish Hydro-Electric Power Distribution plc
Authorised Electricity Operator	Persons entitled to use SHEPD’s distribution system are those who are authorised by licence or by exemption under the Act to supply, distribute or generate electricity.
CVA	Central Volume Allocation – centrally registered metering point with no MPAN allocated and not registered in MPRS.
SVA	Supplier Volume Allocation – relates to units that enter settlements from an MPAN registered in MPRS
MPRS	Meter Point Registration Service
MRA	Master Registration Agreement –The MRA is the multi-party agreement that all Ofgem licensed Suppliers and Distribution Business enter into that governs the essential interactions between them.
CUSC	NGC’s Connection and Use of System Code
BSC	Balancing and Settlements Code governing wholesale electricity trading arrangements introduced in England and Wales in 2001.
Distribution Code, D Code	The Distribution Code of the Licensed Distribution Network Operators (DNOs) of Great Britain; produced in accordance with Condition 9 of the licence and approved by the Authority to define the technical aspects and planning criteria of the working relationship between the DNO and all those connected to its distribution system.
NGC	National Grid Company which owns and operates the high-voltage electricity transmission network in England and Wales.
BETTA	British Electricity Transmission and Trading Arrangements, due to come into force on 1 April 2005

LV	Low voltage – 230 volts plus 10% or minus 6% measured between the neutral conductor and any two-phase conductor.
HV	High voltage – 6,600 volts or 11,000 volts plus or minus 6% measured between any two-phase conductors.
EHV	Extra High Voltage – 22,000 volts or higher voltage up to and including 33,000 volts
MD	Maximum Demand
MPAN	Meter Point Administration Number
LLFCs	Line Loss Factor Classes
kVA	Kilo-volt Ampere – a unit of capacity
GDUoS	Generation Distribution Use of System
DG	Distributed Generation
RPZ	Registered Power Zones

## **Appendix 1**

### **Statement of Loss Adjustment Factor Methodology for Scottish Hydro-Electric Power Distribution Ltd's Electricity Distribution Network**

#### **General Information**

- 1.1 This appendix describes the methodologies applied by Scottish Hydro-Electric Power Distribution Ltd (SHEPD) in the calculation of its loss adjustment factors <sup>1</sup> for authorised users of its distribution network in 2006/7.
- 1.2 SHEPD is providing this statement as an appendix to 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. The statement is in addition to the Use of System Charging Methodology statement and is not subject to approval by the Authority.
- 1.3 SHEPD is obliged under Standard Condition 4A of the Distribution Licence to publish a statement of charges for the use of the distribution system that is in a form approved by the Authority. The statement is required to contain "a schedule of adjustment factors to be made for distribution losses." SHEPD 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 other loss adjustment factors describe the application of the factors to any metered export from embedded generation within the SHEPD's distribution network. These methodologies are described in detail in sections 2 and 3 below.

#### **Generic Loss Adjustment Factors**

- 2.1 Generic loss adjustment factors are calculated for all CVA and 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 The three voltage levels of 33kV, 11kV and LV and the two transformation levels of 33/11kV and 11kV/LV are represented within the model. The model is populated with a set of standing data. For example, the fixed loss constant (in megawatts) and the variable loss constant (per megawatt) for each voltage and transformation level are contained within the standing data. These loss constants are derived from a network equivalent representation of SHEPD's distribution network. The fixed loss constant reflects primarily the iron losses in transformers and dielectric losses in cables. The variable loss

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<sup>1</sup> Loss Adjustment Factors are sometimes referred to as Line Loss Factors and vice versa.

constant reflects the losses in electrical equipment that vary with the magnitude of the current such as ohmic losses in conductors and transformer windings.

- 2.3 The model is also populated with estimated metered volumes of energy per annum for the year in question at each network voltage, including the energy metered at the connection points with National Grid Electricity Transmission (NGET) and the contribution from distributed generation within SHEPD distribution network. The populated data are transformed into half-hourly data using the settlement profiles (Profile Classes 1 to 8), and user defined profiles.
- 2.4 The model calculates the power passed through the network into the next voltage level below using the following empirical equation:

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

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 33kV for a particular half hour	2,000MW
Fixed losses on the 33kV network	0.5MW
Variable losses on the 33kV network for 2,000MW	3.5MW
$LAF_{33kV}$ equals $2,000 / (2,000 - 0.35 - 0.5)$	
$LAF_{33kV}$ calculated as equal to	1.0020
If net sales from the 33kV network	200MW
Then power flowing into the 33/11kV transformation level	1,796MW
Fixed losses at the 33/11kV transformation level	8MW
Variable losses at the 33/11kV transformation level	2MW
$LAF_{33/11kV}$ equals $LAF_{33kV} \times 1,796 / (1,796 - 8 - 2)$	
$LAF_{33/11kV}$ calculated as equal to	1.0076

- 2.5 This is repeated through the voltage and transformation levels until the LV network is reached. This produces the first estimate of the LV network non half-hourly metered load in every half-hour. As settlement profiles have been used, these estimated values will differ from the forecast annual volume of the non half-hourly metered load. The program therefore undertakes a series of iterative cycles to match the two values.
- 2.6 The model adjusts the variable losses by amending the variable loss constants. Greater weight is assigned to the 11kV network, 11kV/LV transition and LV network as the greatest losses are incurred on these parts of the distribution system.
- 2.7 This results in the losses for the whole period and the losses for each half-hour for each voltage and transformation level being calculated and hence the half-hourly loss adjustment factors are calculated.

- 2.8 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.

### **Other Loss Adjustment Factors**

- 3.1 Historically it was agreed to assign unity loss adjustment factors to any metered export from embedded generation within the SHEPD's distribution network and this continues to be the case for 2006/07.

### **Out of Area Networks**

- 4.1 Where SHEPD operates distribution networks outside its distribution services area, the LAFs will reflect the "host" distribution network operator's figures for the GSP Group in which SHEPD's networks is situated.

### **Contact Details**

- 5.1 This statement has been prepared to provide clarity and transparency for users of SHEPD's distribution network. If you have any questions about the contents of this statement, please contact at the address shown below.

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