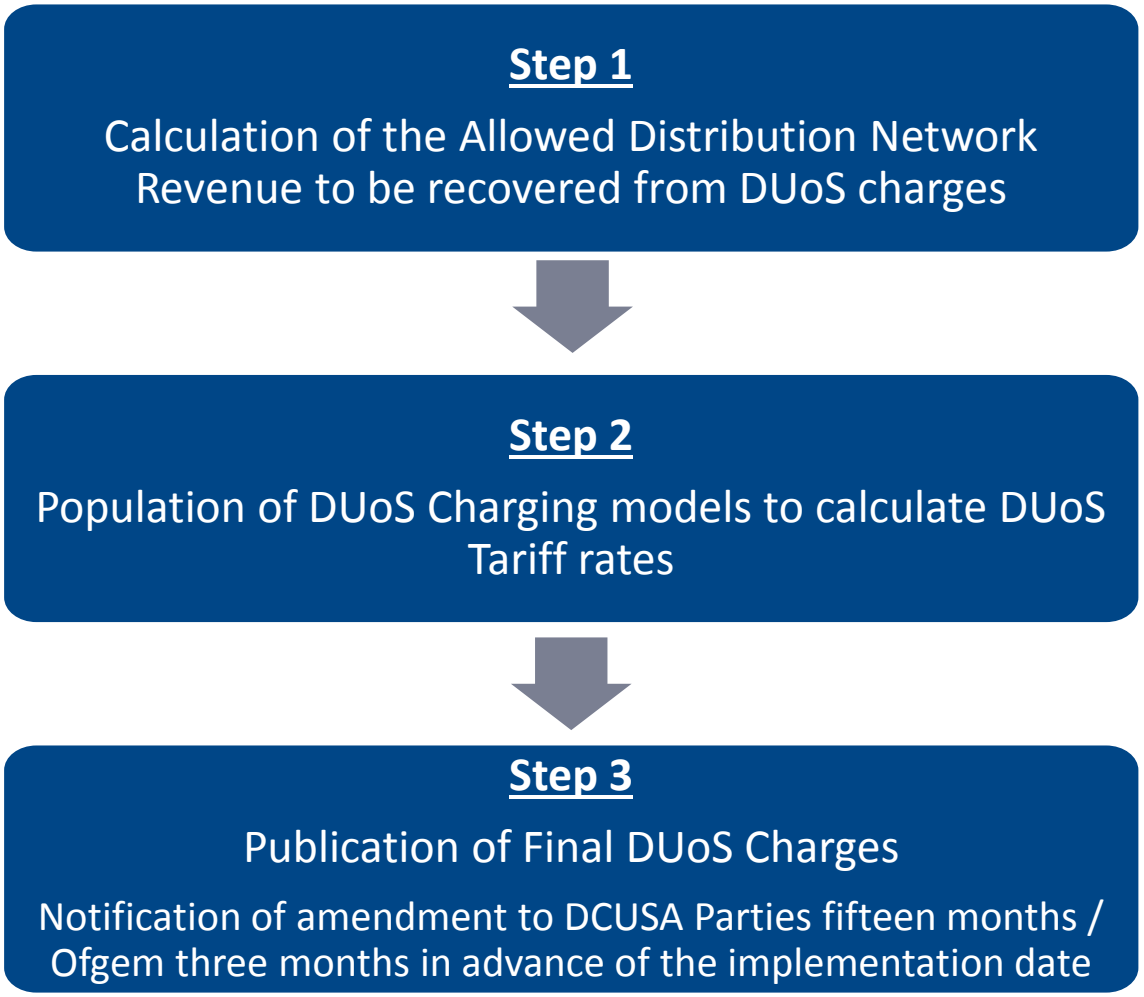
How are DUoS charges calculated? – Overview



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Allowed Distribution Network Revenue (ARt)

- The DNO's ARt is calculated in accordance with the terms of special licence conditions. They are set out in the Charge Restriction Conditions issued by Ofgem at the start of each Distribution Price Control Review (DPCR) period
- DPCR periods covered five consecutive financial years up to 31st March 2015
- The DPCR periods now include eight consecutive financial years from 1st April 2015
- The current DPCR period runs from 1st April 2015 to 31st March 2023 and is known as "RIIO-ED1"
- "RIIO-ED1" reflects a change in the way Ofgem incentivises DNOs to optimise DUoS revenues to maintain, repair, reinforce their networks, and to deliver excellent service for customers
- "RIIO" is the acronym of:-

- "ED1" identifies RIIO as the 1st pertaining to Electricity Distribution

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https://www.ofgem.gov.uk/ofgem-publications/64003/pricecontrolexplainedmarch13web.pdf

Allowed Distribution Network Revenue (ARt) (cont.)

- The components of the "Revenue" are:-
  - Incentives
    - A series of performance targets set by Ofgem that the DNO must achieve to either gain additional revenue allowances, or to minimise poor performance for relief of penalties
  - Innovation
    - Revenues awarded by Ofgem to DNOs developing approved innovative solutions that will improve the network efficiency for the benefit of consumers
  - Outputs
    - Revenues awarded by Ofgem reflecting the DNO's performance in delivering a number of measurable outputs designed to benefit the consumer - eg
      - Network Reliability
      - Providing Network Connections services
      - Customer Service
      - Social Obligations
      - Environmental matters
      - Safety – keeping the networks safe
- DNOs calculate their ARt using a Revenue Reporting model provided by Ofgem
- DNOs recover Allowed Distribution Network Revenue through the application of two common distribution charging methodologies

CDCM / EDCM Overview

➢All DNOs are required to use two common distribution charging methodologies to set their DUoS charges: CDCM and EDCM

➢They are subject to DCUSA Open Governance: processes through which they can be challenged, enhanced or amended on an on-going basis

CDCM **(Common Distribution Charging Methodology)**	**EDCM** **(Extra-High Voltage Distribution Charging Methodology)**
Applicable from 1st April 2010	Demand applicable from 1st April 2012, Generation applicable from 1st April 2013
LV and HV designated properties	Designated EHV properties (EHV and HV Substation)
Methodology calculates standard charges by customer type	Methodology calculates site specific charges
Export credit for intermittent and non-intermittent generation	Export credit for generation supporting the network in demand dominated areas
Subject to DCUSA Schedule 16	Subject to DCUSA Schedules 17, 18

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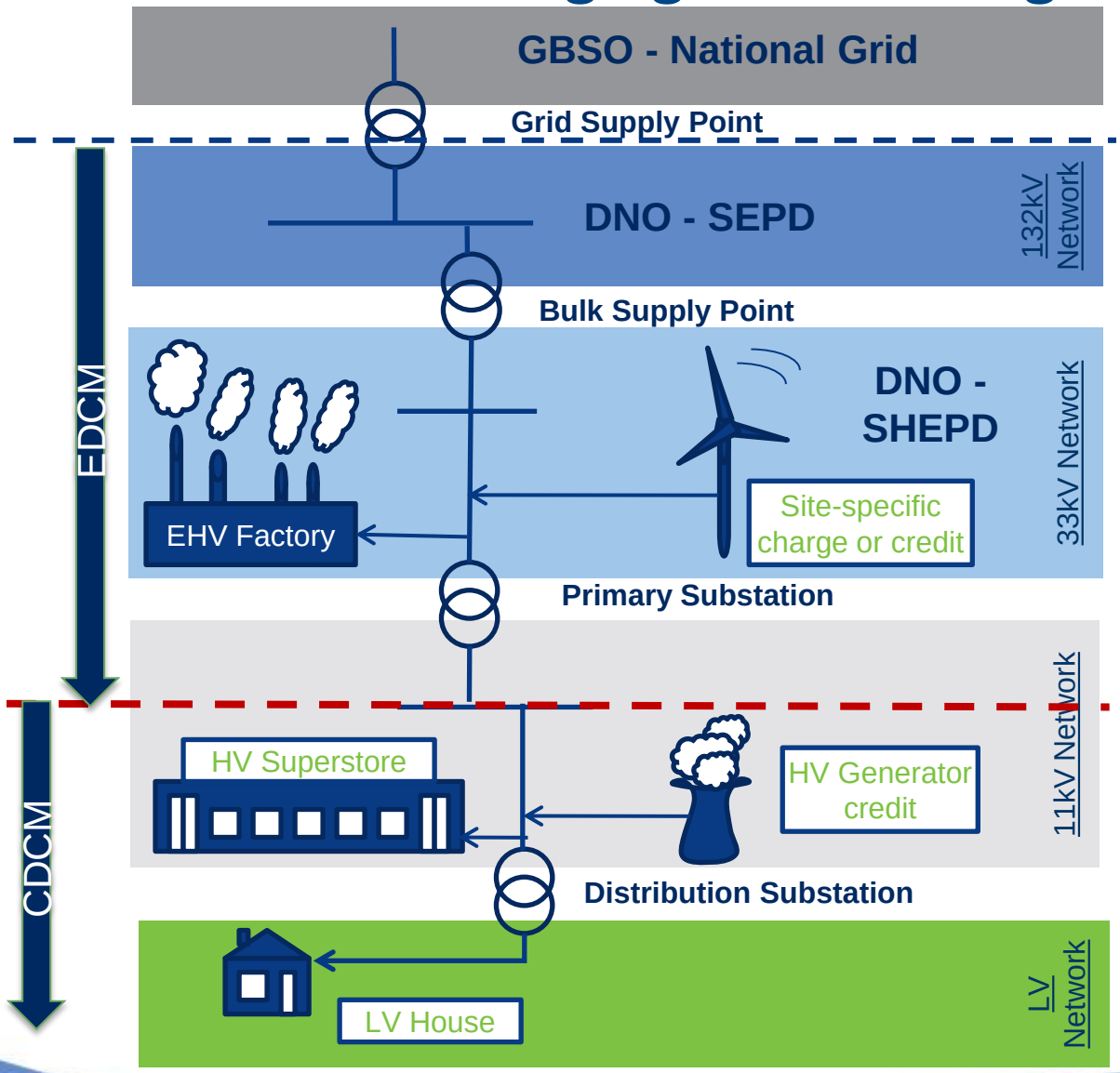
Distribution Charging Methodologies Overview Diagram



EDCM –
Extra High Voltage Charging Methodology
(EHV & HVS customers - includes connection voltages at 22kV or more, as well as premises metered within and connected directly to substation of 22kV or higher. 132kV is transmission in Scotland)

CDCM –
Common Distribution Charging Methodology (HV & LV customers)

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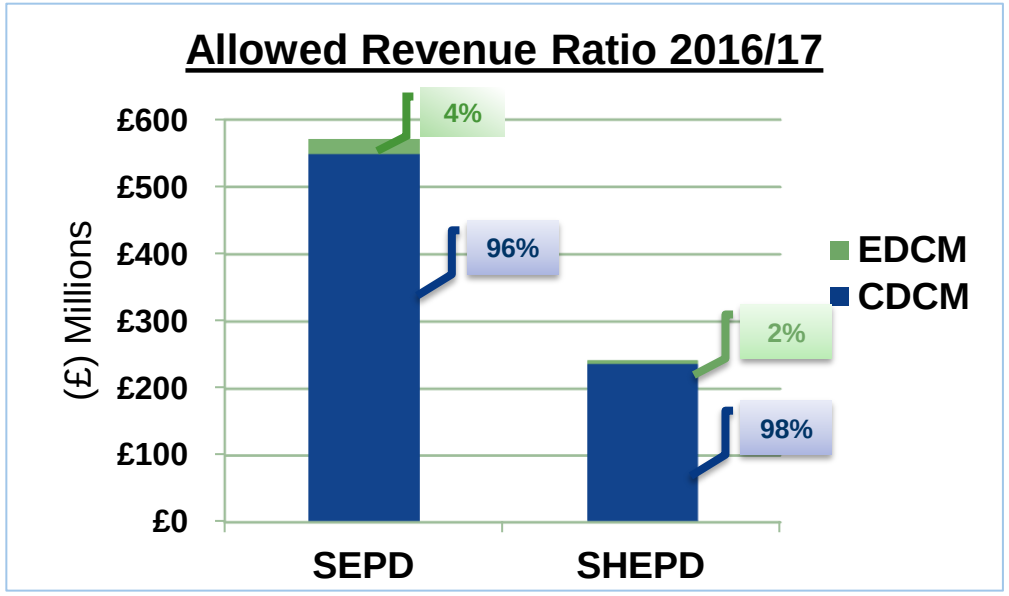
CDCM / EDCM Allowed Revenue Apportionment

The table shows the 2016/17 Allowed Distribution Network Revenue totals for SEPD and SHEPD. These are the totals we were allowed to recover from DUoS Charges in 2016/17. The majority of Revenue is collected from CDCM customers.

Area	Allowed Revenue (£)	Allowed Revenue (£) Ratio	
	2016/17	CDCM	EDCM
SEPD	£571m	£549m	£22m
SHEPD	£243m	£237m	£6m
Total	£814m	£786m	£28m



The "Hydro Benefit" scheme

- This applies only to SHEPD
- It is an additional allowance that is paid to SHEPD by National Grid (NG); and which NG recovers from all GB customers through Transmission Network Use of System (TNUoS) charges
- It reduces the SHEPD DUOS charges
- It is properly known as the "Hydro Benefit Replacement Scheme" and provides an "assistance for high-cost distribution areas"
- The Hydro Benefit paid to SHEPD in 2016/17 was £58m
- SHEPD's total Allowed Revenue in 2016/17 was £301m (i.e. £243m from DUOS Charges + £58m)

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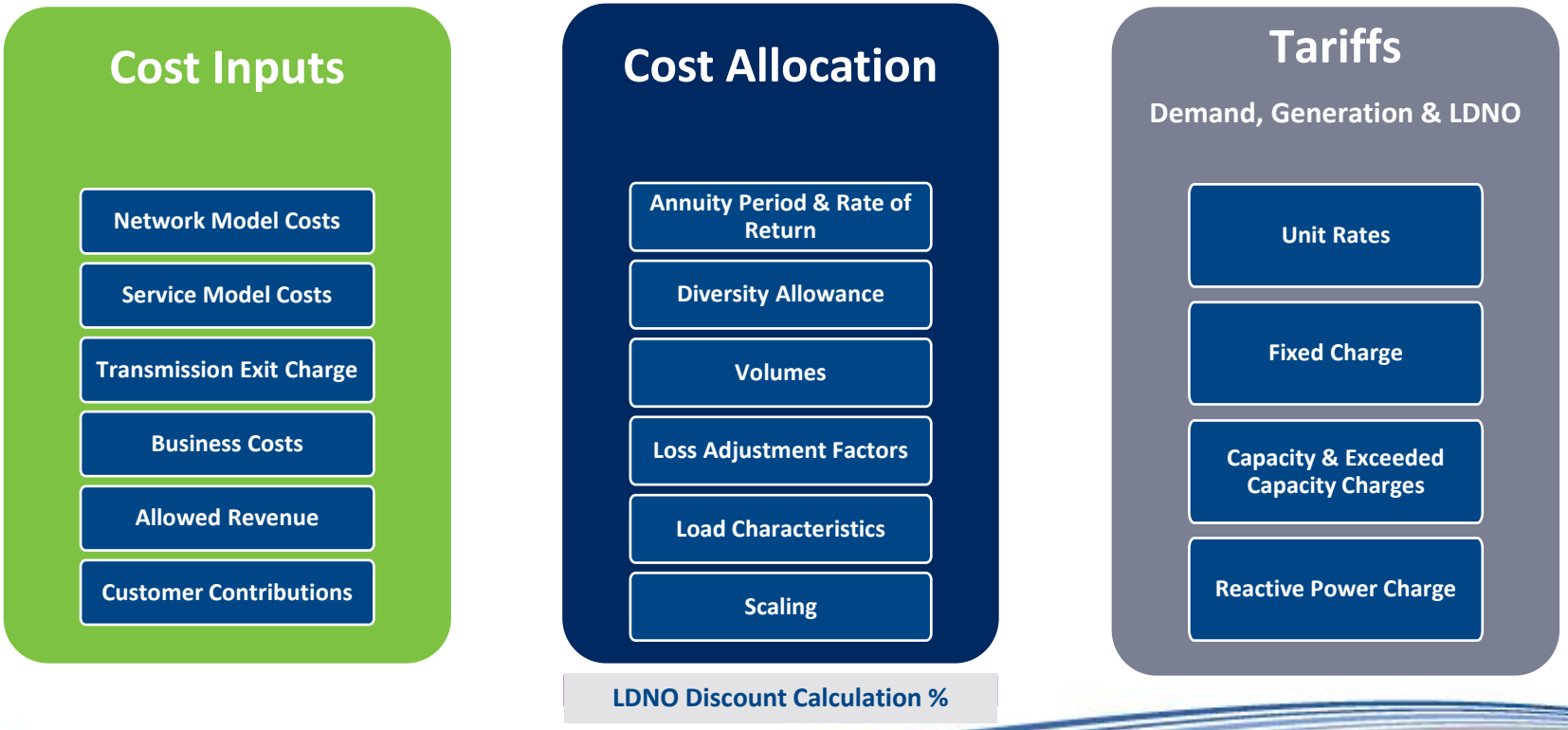
Common Distribution Charging Methodology (CDCM)

- CDCM applies to all HV & LV designated properties – typically, these are domestic and small/medium businesses – metered at:
  - HV: metered at nominal voltages of at least 1kV and less than 22kV
  - LV: metered at nominal voltages below 1kV
- DNOs use the CDCM to set "standard/generic" tariffs for the various customer groups with HV & LV connections
- CDCM tariffs are set for both demand (i.e. importing from the distribution network) and generation (i.e. exporting onto the distribution network) customers
- The CDCM also produces "boundary" charges for Licenced Distribution Network Operators (LDNOs) with networks connected within the SEPD or SHEPD DNO networks
  - Please refer to slide 12 for further details on LDNO tariffs
- Schedule 16 of the DCUSA document details CDCM
- The SEPD & SHEPD CDCM models used to set DUoS charges are published annually on the SSEN website Library section
  - https://www.ssepd.co.uk/Library/ChargingStatements/

How the CDCM Model works

- DNOs populate the model with the prescribed CDCM cost and volume (ie customer numbers and forecast consumption (MWh) data
- The model then allocates these costs over the generic customer groups and produces a set of tariffs for each group
- The Inputs, Allocation and Tariffs are summarised in the diagram below



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CDCM – Demand Tariff Structure

Tariff name	Open LLFCs	PCs	Unit charge 1 (NHH) or red/black charge (HH) p/kWh	Unit charge 2 (NHH) or amber/yellow charge (HH) p/kWh	Green charge(HH) p/kWh	Fixed charge p/MPAN/day	Capacity charge p/kVA/day	Reactive power charge p/kVArh	Exceeded capacity charge p/kVA/day	Closed LLFCs
Domestic Unrestricted	100, 105, 106, 110, 120, 125, 126, 300, 305, 320, 325	1	3.592			7.05				
Domestic Two Rate	101, 111, 121, 127, 128, 301, 321	2	3.871	1.264		7.05				
LV Network Domestic	506	0	7.912	3.147	0.901	7.05				
LV HH Metered	500	0	5.535	2.197	0.641	23.90	4.53	0.464	4.53	
LV Sub HH Metered	505	0	3.956	1.560	0.481	9.41	8.42	0.316	8.42	
HV HH Metered	600	0	2.998	1.176	0.379	229.29	10.98	0.246	10.98	
NHH UMS category A	803, 805	8	2.990							
LV UMS (Pseudo HH Metered)	804	0	13.756	3.110	1.539					

Tariff Component	Key Driver
Unit rate(s)	Volume & Allowed Revenue
Fixed charge	Reflects network operating costs
Capacity charge	MIC specified in Connection Agreement
Reactive power charge	Accounts for the increased inefficiency of operating a power factor less than 0.95
Exceeded capacity charge	Applies to any unauthorised exceeded portion of capacity taken over and above the agreed MIC

Restructured extract from the SHEPD 2016/17 Schedule of Charges and Other Tables spreadsheet

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CDCM – Generation Tariff Structure

Tariff name	Open LLFCs	PCs	Unit charge 1 (NHH) or red/black charge (HH) p/kWh	Unit charge 2 (NHH) or amber/yellow charge (HH) p/kWh	Green charge(HH) p/kWh	Fixed charge p/MPAN/day	Capacity charge p/kVA/day	Reactive power charge p/kVArh	Exceeded capacity charge p/kVA/day	Closed LLFCs
LV Generation NHH or Aggregate HH	951	8&0	-1.081			0.00				
LV Sub Generation NHH	952	8	-0.949			0.00				
LV Generation Intermittent	1, 909	0	-1.081			0.00		0.239		
LV Generation Non-Intermittent	2	0	-3.007	-1.212	-0.307	0.00		0.239		
LV Sub Generation Intermittent	3	0	-0.949			0.00		0.209		
LV Sub Generation Non-Intermittent	4	0	-2.639	-1.063	-0.271	0.00		0.209		
HV Generation Intermittent	5, 910	0	-0.462			283.97		0.188		
HV Generation Non-Intermittent	6	0	-1.278	-0.512	-0.137	283.97		0.188		

Extract from the SHEPD 2016/17 Schedule of Charges and Other Tables spreadsheet

Generation Plant Classification (in accordance to the definitions in Engineering Recommendation P2/6)

Intermittent Generation	Non-Intermittent Generation
A generation plant where the energy source of the prime mover cannot be made available on demand	A generation plant where the energy source of the prime mover can be made available on demand
These include wind, tidal, wave, photovoltaic and small hydro.	These include combined cycle gas turbine (CCGT), gas generators, landfill, sewage, biomass, biogas, energy crop, waste Incineration, combined heat and power (CHP) and Battery Storage*

*Battery Storage classification subject to industry confirmation

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CDCM – Price Signals – SEPD Distribution Time Bands

- CDCM standard charges are non-locational within the DNO Area
- Customer's consumption pattern will impact their annual DUoS charge
- Time Bands apply to unit rates for HH tariffs – these discourage/encourage use of the network at particular times
- 2016/17 Time bands for SEPD DNO Area are shown in the tables below:

Time Bands for Half Hourly Metered Properties			
Time periods	**Red Time Band**	**Amber Time Band**	**Green Time Band**
Monday to Friday (Including Bank Holidays) All Year	16:30 - 19:00		
Monday to Friday (Including Bank Holidays) All Year		09:00 - 16:30 19:00 - 20:30	
Monday to Friday (Including Bank Holidays) All Year			00:00 - 09:00 20:30 - 24:00
Saturday and Sunday All Year			00:00 - 24:00
Notes	All the above times are in UK Clock time		

Time Bands for Half Hourly Unmetered Properties			
Time Periods	**Black Time Band**	**Yellow Time Band**	**Green Time Band**
Monday to Friday (Including Bank Holidays) March to October		09:00 - 20:30	
Monday to Friday (Including Bank Holidays) November to February	16:30 - 19:00	09:00 - 16:30 19:00 - 20:30	
Monday to Friday (Including Bank Holidays) April to March			00:00 - 09:00 20:30 - 24:00
Saturday and Sunday All Year			00:00 - 24:00
Notes	All the above times are in UK Clock time		

- **Time Bands have been revised for 2017/18**

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CDCM – Price Signals – SHEPD Distribution Time Bands

- CDCM standard charges are non-locational within the DNO Area
- Customer's consumption pattern will impact their annual DUoS charge
- Time Bands apply to unit rates for HH tariffs – these discourage/encourage use of the network at particular times
- 2016/17 Time bands for SHEPD DNO Area are shown in the tables below:

Time Bands for Half Hourly Metered Properties			
Time periods	**Red Time Band**	**Amber Time Band**	**Green Time Band**
Monday to Friday (Including Bank Holidays) All Year	12:30 - 14:30 16:30 - 21:00		
Monday to Friday (Including Bank Holidays) All Year		07:00 - 12:30 14:30 - 16:30	
Monday to Friday (Including Bank Holidays) All Year			00:00 - 07:00 21:00 - 24:00
Saturday and Sunday All Year		12:30 - 14:00 17:30 - 20:30	00:00 - 12:30 14:00 - 17:30 20:30 - 24:00
Notes	All the above times are in UK Clock time		

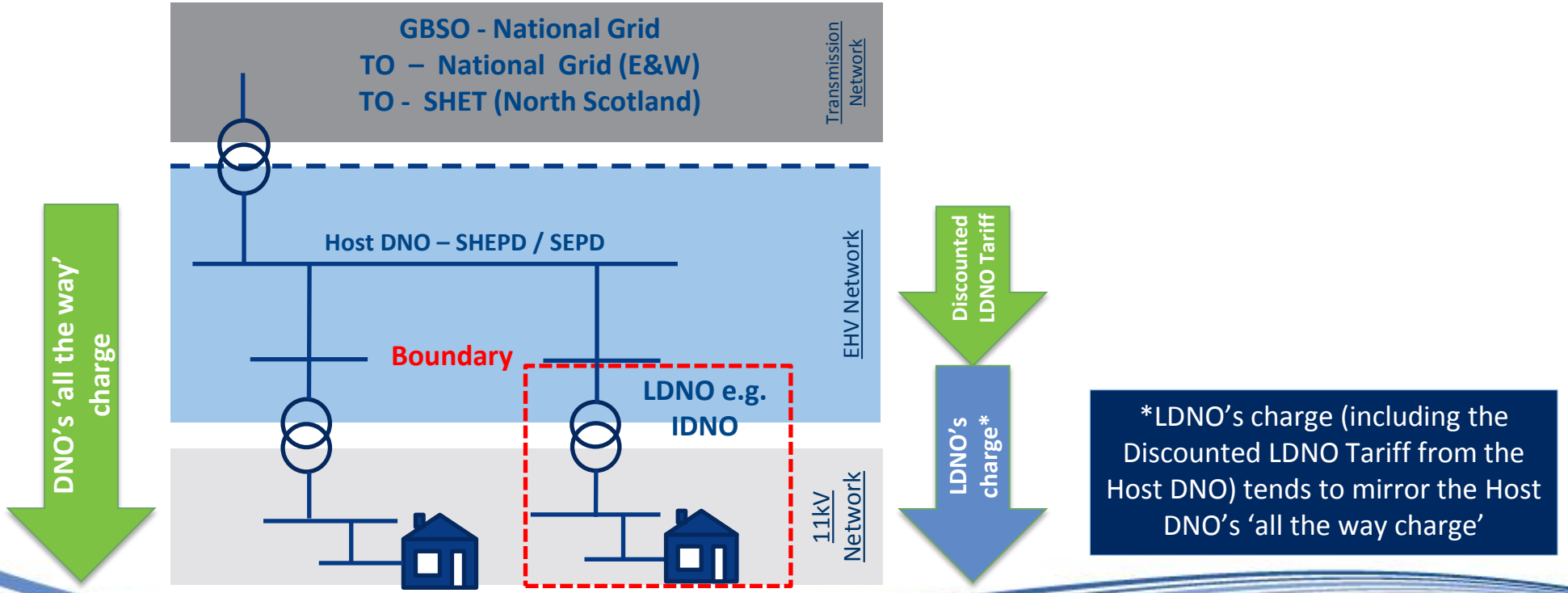
Time Bands for Half Hourly Unmetered Properties			
Time Periods	**Black Time Band**	**Yellow Time Band**	**Green Time Band**
Monday to Friday (Including Bank Holidays) April to September		07:00 - 21:00	00:00 - 07:00 21:00 - 24:00
Monday to Friday (Including Bank Holidays) October to March	16:30 - 21:00	07:00 - 16:30	00:00 - 07:00 21:00 - 24:00
Saturday and Sunday April to September		12:30 - 14:00 17:30 - 20:30	00:00 - 12:30 14:00 - 17:30 20:30 - 24:00
Saturday and Sunday October to March		12:30 - 14:00 17:30 - 20:30	00:00 - 12:30 14:00 - 17:30 20:30 - 24:00
Notes	All the above times are in UK Clock time		

- **Time Bands reviewed and updated for 2017/18**

Scottish & Southern Electricity Networks

LDNO Tariffs

- Licensed Distribution Network Operator (LDNO) includes:
  - IDNO (Licensed Independent Distribution Network Operator)
  - DNO Party operating an electricity distribution system outside of its Distribution Services Area
- The LDNO Tariffs have standard discount percentages applied to the Host DNO's 'all-the-way' charge



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Extra High Voltage Distribution Charging Methodology (EDCM)

- Extra-High Voltage Distribution Charging Methodology (EDCM) is applicable to designated EHV properties (typically large businesses and large generators) which covers:
  - EHV: metered at nominal voltages of 22kV or above
  - HV Substation: metered at nominal voltage of 11kV if the metering is within the boundary of the primary substation e.g. 33/11kV

- The EDCM sets locational site specific charges for import and export customers, charges for EDCM-like customers within an LDNO network and boundary charges for LDNO networks connected at EHV

- SEPD/SHEPD use Forward Cost Pricing (FCP) Methodology as prescribed with DCUSA Schedule 17*

- The latest blank EDCM Model can be found on the DCUSA website**

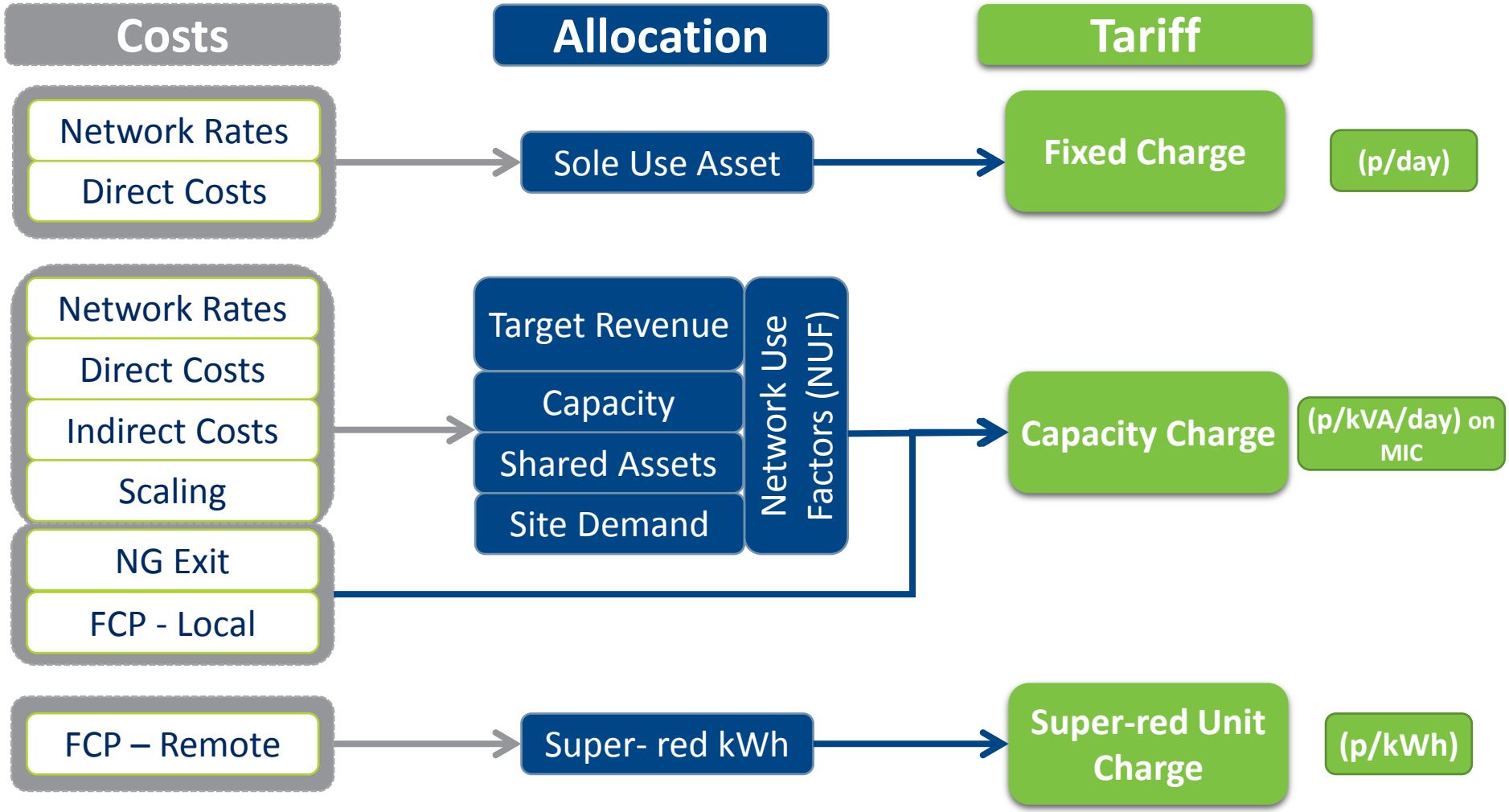
*https://www.dcusa.co.uk/SitePages/Documents/DCUSA-Document.aspx

**https://www.dcusa.co.uk/SitePages/Documents/Publications_EDCM.aspx

How the EDCM (FCP) Model works

- The Forward Cost Pricing (FCP) EDCM and model produce Import and Export DUoS tariffs for relevant customers on a site specific basis
- The EDCM is subject to DCUSA Open Governance processes
- The EDCM FCP model also calculates DUoS charges for EDCM-like customers within LDNO networks; and boundary charges for LDNO networks with an EHV connection to one of our Distribution networks
- The model is updated with technical information for the network and individual customers, as prescribed in DCUSA Schedule 17, and apportioned to an individual customer's connection in accordance with the methodology
- An overview of the EDCM cost allocation for Import tariffs is shown in slide 15
- An overview of the EDCM cost allocation for Export tariffs is shown in slide 16

EDCM - Overview of Import Methodology



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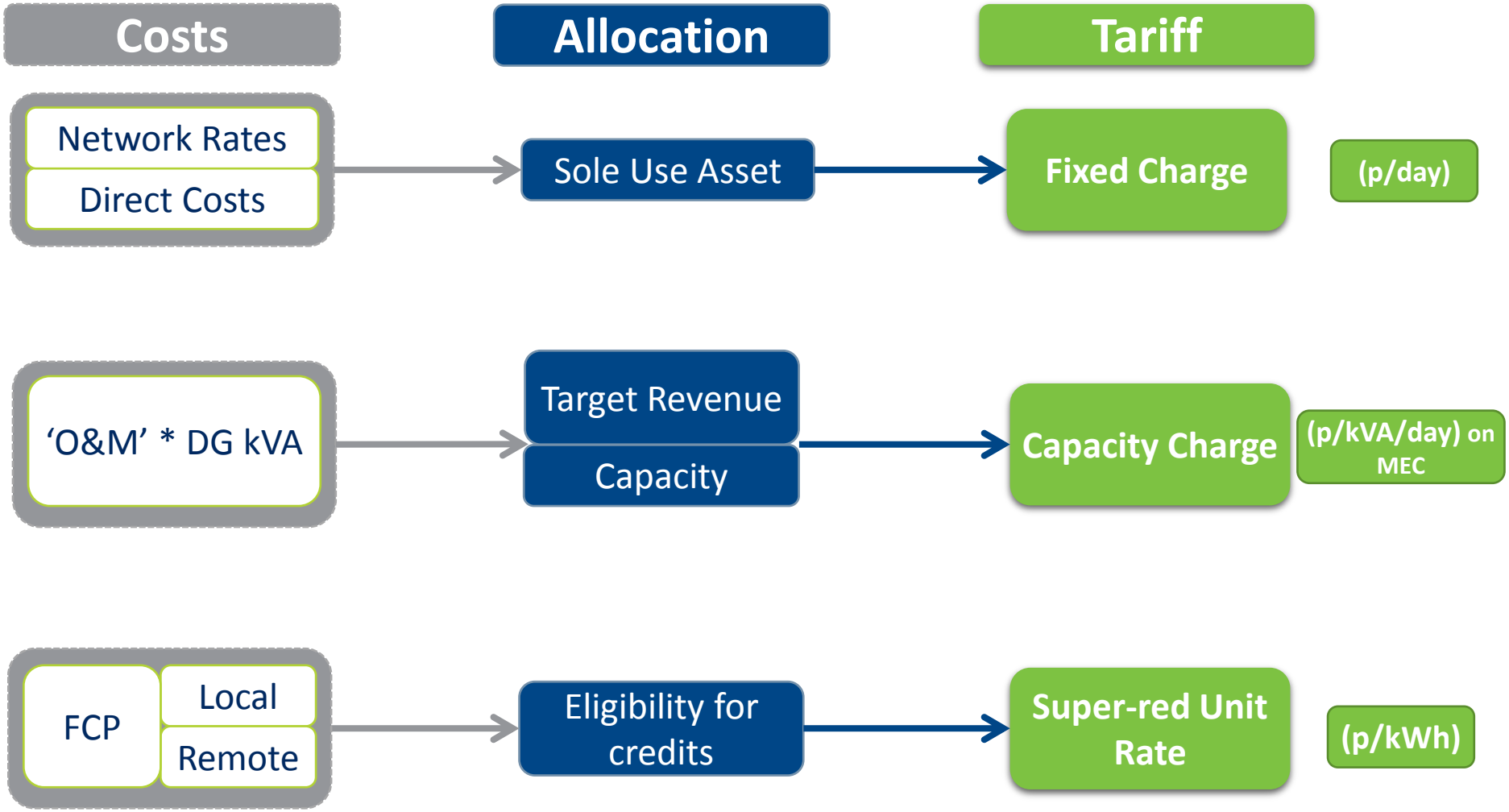
EDCM - Overview of Export Methodology



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FCP Methodology

- Forward Cost Pricing calculates incremental charges for the expected cost of reinforcement over ten years
  - Long Term Development Statement (LTDS) as load data for power flow analysis

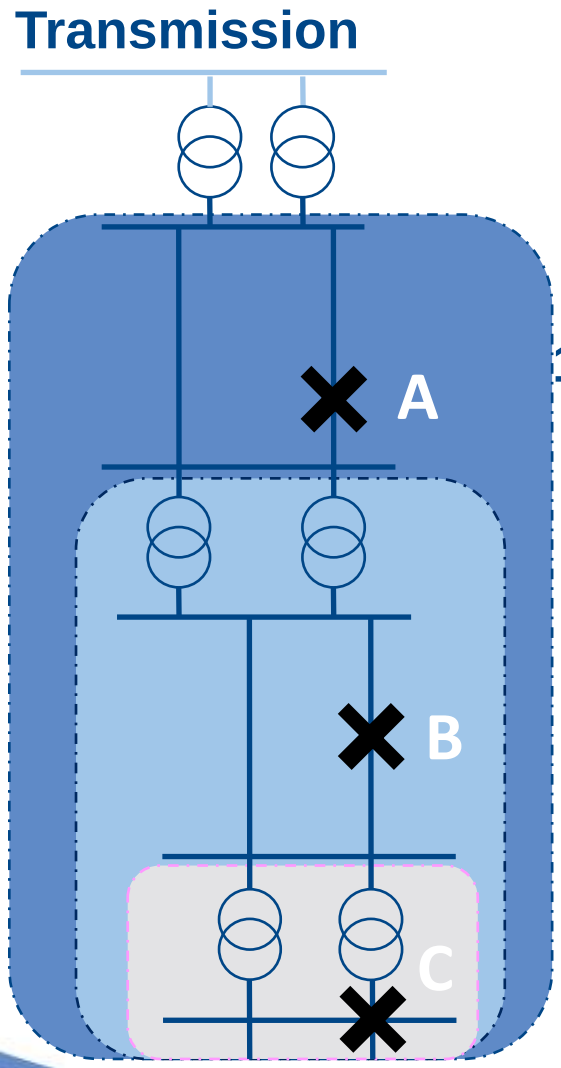
- FCP identifies future demand-led reinforcement costs to be applied within the charging year

- Network Group Levels:

Network Group	SEPD	SHEPD
Level 1	Grid Supply Point (132kV)	
Level 2	Bulk Supply Point (33kV)	Grid Supply Point (33kV)
Level 3	Primary Substation (33/11kV)	Primary Substation (33/11kV)

- The FCP network costs are published on the SSEN website
  - Local and remote FCP charge of each network group

FCP Network Group Levels



132kV – Level 1

33kV – Level 2

33/11kV – Level 3

Customer A	Customer B	Customer C	
Local FCP Network Group is a GSP	Local FCP Network Group is a BSP	Local FCP Network Group is a Primary Substation	
Local - Level 1	Remote - Level 1	Remote - Level 1	Remote - Level 1
	Local - Level 2	Remote - Level 2	
		Local - Level 3	Local - Level 3

e.g. 132/11kV

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Eligibility for EDCM Export Credits

- Eligibility for export credits is prescribed within DCUSA Schedule 17:
  - Eligible for credits if the F Factor assigned is non-zero
  - Not eligible for credits if the F Factor assigned is zero

- The F Factor is determined using ER P2/6 guidance

- Eligibility for battery storage is determined as above

- Credits for generators will apply as below:

	Customer: Zero F Factor	Customer: Non-Zero F Factor
Local FCP Charge	**No credit for export during super-red time period**	**Credit for export during super-red time period**
No Local FCP Charge	**No credit for export during super-red time period**	**No credit for export during super-red time period**
Remote FCP Charge	**No credit for export during super-red time period**	**Credit for export during super-red time period**
No Remote FCP Charge	**No credit for export during super-red time period**	**No credit for export during super-red time period**

Note: See paragraph 6.3 and Annex 1 – 5.3 (Schedule 17)

Super-red time periods – SEPD and SHEPD

Southern Electric Power Distribution plc – effective between 1st April 2016 and 31st March 2017	
Time Periods for Designated EHV Properties	
Time periods	**Super Red Time Band**
Monday to Friday (Including Bank Holidays) November to February	16:30 - 19:00
Notes	All the above times are in UK Clock time

Scottish Hydro Electric Power Distribution plc – effective between 1st April 2016 and 31st March 2017	
Time Periods for Designated EHV Properties	
Time periods	**Super Red Time Band**
Monday to Friday (Including Bank Holidays) October to March	12:30 - 14:30 16:30 – 21:00
Notes	All the above times are in UK Clock time

From 1st April 2017

Southern Electric Power Distribution plc – effective from 1st April 2017	
Time Periods for Designated EHV Properties	
Time periods	**Super Red Time Band**
Monday to Friday (Including Bank Holidays) November to February	16:30 - 19:30
Notes	All the above times are in UK Clock time

Scottish Hydro Electric Power Distribution plc – effective from 1st April 2017	
Time Periods for Designated EHV Properties	
Time periods	**Super Red Time Band**
Monday to Friday (Including Bank Holidays) November to February	16:00 - 19:00
Notes	All the above times are in UK Clock time

- SEPD and SHEPD super-red time periods reviewed and effective from 1st April 2017

Scottish & Southern Electricity Networks

EDCM Data Outputs – Import Tariff Charges

Import LLFC	Import MPANs/MSIDs	Tariff	Import Super-red unit Charge (p/kWh)	Import Fixed Charge (p/day)	Import Capacity Charge (p/kVA/day)	Import Exceeded Capacity Charge (p/kVA/day)
NNN	17 NNNN NNNN NN	1	0.000	10981.33	3.38	3.38
NNN	17 NNNN NNNN NN	2	0.000	6936.35	3.59	3.59
NNN	17 NNNN NNNN NN	3	0.000	4295.93	2.98	2.98
NNN	17 NNNN NNNN NN	4	5.515	1.65	3.46	3.46
NNN	17 NNNN NNNN NN	5	0.545	5.39	2.17	2.17
NNN	17 NNNN NNNN NN	6	0.000	55.65	3.26	3.26
NNN	17 NNNN NNNN NN	7	0.000	5734.50	1.49	1.49
NNN	17 NNNN NNNN NN	8	0.549	463.81	7.37	7.37
NNN	17 NNNN NNNN NN	9	0.000	8857.83	2.95	2.95
NNN	17 NNNN NNNN NN	10	0.000	6234.44	5.40	5.40

Tariff Component	Unit	Comments
Super-red unit Charge	p/kWh	Reflects the remote element of the **FCP network costs (charge 1)**
Import Fixed Charge	p/day	Recovery of direct operating costs and network rates associated with the **sole use assets** of the site
Import Capacity Charge	p/kVA/day	Reflects the local element of the FCP network costs, direct operating costs, indirect costs, network rates, transmission exit costs and scaling
Exceeded Import Capacity Charge	p/kVA/day	Charged at the **same rate as the import capacity charge** (except for sites with demand side management agreements)

EDCM Import Annual Charge – Site Parameters

- Change in MIC will affect the Import Capacity Annual Charge
- Change in Super-red import consumption will affect the Super-red unit Annual Charge

	Import Fixed Annual Charge (£/year)	Import Capacity Annual Charge (£/kVA/year)	Exceeded Import Capacity Annual Charge (£/kVA/year)	Super-red unit Annual Charge (£/kWh)
Increase MIC		↑	↑	
Decrease MIC		↓	↓	
Increase import kWh in super-red time period				↑
Decrease import kWh in super-red time period				↓

- Changes in the MIC and/or Super-red import consumption may affect charging rates in future years
- Demand Side Management agreement would reduce the Import Capacity Charge Rate but may increase the Exceeded Import Capacity Charge Rate if there is an FCP charge

Note the above examples are following the general principles of the methodology

EDCM Data Outputs – Export Tariff Charges

Export LLFC	Export MPANs/MSIDs	Tariff	Export Super-red unit Rate (p/kWh)	Export Fixed Charge (p/day)	Export Capacity Rate (p/kVA/day)	Export Exceeded Capacity Rate (p/kVA/day)
NNN	17 NNNN NNNN NN	1	0.000	0.00	0.00	0.00
NNN	17 NNNN NNNN NN	2	-0.521	827.42	0.05	0.05
NNN	17 NNNN NNNN NN	3	0.000	0.00	0.00	0.00
NNN	17 NNNN NNNN NN	4	0.000	315.07	0.05	0.05
NNN	17 NNNN NNNN NN	5	0.000	186.15	0.05	0.05
NNN	17 NNNN NNNN NN	6	0.000	1,919.05	0.05	0.05
NNN	17 NNNN NNNN NN	7	0.000	235.90	0.05	0.05
NNN	17 NNNN NNNN NN	8	0.000	234.03	0.05	0.05
NNN	17 NNNN NNNN NN	9	0.000	235.43	0.05	0.05
NNN	17 NNNN NNNN NN	10	0.000	468.06	0.05	0.05

Tariff Component	Unit	Comments
Export Super-red unit Rate	p/kWh (negative)	Reflects both local and remote elements of the **FCP network costs (charge 1)**
Export Fixed Charge	p/day	Reflects **Sole use asset** charge for direct operating costs and network rates
Export Capacity Charge	p/kVA/day	Reflects scaling and O&M costs
Exceeded Export Capacity Charge	p/kVA/day	Charged at the **same rate as the export capacity charge** (except for sites with generation side management agreements)

EDCM Export Annual Charge– Site Parameters

- Change in MEC will affect the Export Capacity Annual Charge
- Change in Super-red export consumption will affect the Super-red unit Annual Rate

	Export Fixed Annual Charge (£/year)	Export Capacity Annual Charge (£/kVA/year)	Exceeded Export Capacity Annual Charge (£/kVA/year)	Export Super-red unit Annual Rate (£/kWh)
Increase MEC		↑	↑	
Decrease MEC		↓	↓	
Increase export kWh in super-red time period				↑
Decrease export kWh in super-red time period				↓

- Changes in the MEC may affect charging rates in future years
- Super-red export consumption will not affect the charging rates in future years
- Generation Side Management agreement to export during National Grid supergrid transformer conditions would decrease the Exceeded Export Capacity charging rate

Note the above examples are following the general principles of the methodology

Scottish & Southern Electricity Networks

Calculating DUoS Charges - Summary

- To set our DUoS Charges we do the following:-
  - Calculate our Allowed Distribution Network Revenues for our SEPD & SHEPD Distribution Services Areas
  - Review and update our network and user costs and, along with our forecasts of customer numbers and consumption (annual MWh), populate the charge setting models
  - We, along with all other GB DNOs, use the Common Distribution Charging Methodology (CDCM) to calculate generic charges for the various groups of customers connected to our Distribution Systems at voltages of less than 22kV
  - We also the use Forward Cost Pricing (FCP) Extra-High Voltage Charging Methodology (EDCM) to calculate site specific charges for customers connected to our Distribution Systems at 22kV or more, as well as customers who are connected directly to 22kV or higher substation assets and the Metering Point is located at the same substation (ie premises designated as HVS)
- Our Allowed Distribution Network Revenues consist of a Base Revenue determined by Ofgem, which is adjusted, up or down, as a result of our performance against targets set for us by Ofgem
- We use the CDCM in accordance with Schedule 16 of DCUSA
- We use the EDCM in accordance with Schedule 17 of DCUSA
- We publish our DUoS charges by 31st December each year, giving fifteen months notice before they are implemented on 1st April