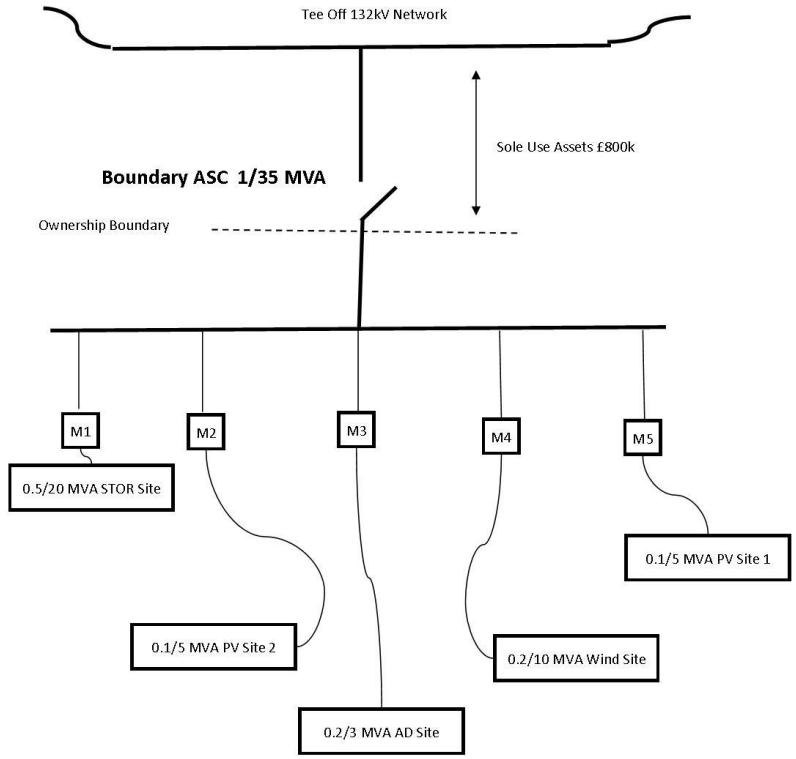
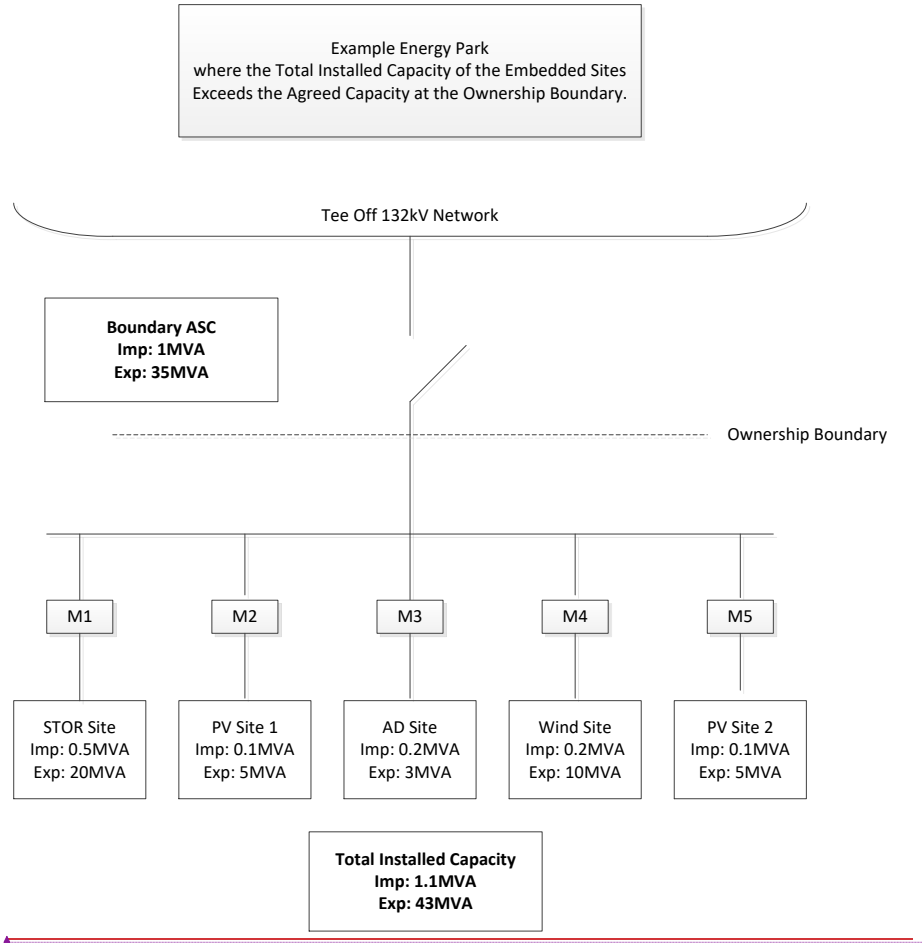
Example Energy Park Where the Total Installed Capacities of the Embedded Sites Exceeds the Agreed Capacity at the Ownership Boundary.



Total Installed Capacity
1.4/43 MVA



Field Code Changed

In the above example of an "Energy Park" the DNO has given the connection agreement holder 5 pairs of import/export MPANs for use with the 5 embedded meters shown[1]. Each of the 10 MPANs has been allocated a site-specific LLFC to enable trading using the "Fully Settled Metering Option" as described in the Elexon Guidance note for Licence Exempt Networks.

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Whilst each MPAN appears in Settlements as a "normal" EHV HH metered site, the above scenario poses problems for DUOS billing under the EDCM pricing model. The first problem is that each MPAN will receive a fixed charge, whereas if the site was not fully settled it would receive a single fixed charge at the boundary. Additional ~~These~~ problems arise because of the mix of technologies sharing the EHV connection, whereby~~. T~~ the non-co-incident nature of these technologies makes it possible to fit ~~more~~ generating units with a higher total installed capacity than the network could ordinarily absorb. ~~These problems might be solved by modifying the methodology in similar ways to~~

[1] The capacities, super-red consumption and tariffs in this example are illustrative only and do not reflect the usage at any specific actual sites.

~~those described below~~In what follows the boundary capacity refers to the agreed capacity in place at the boundary connection point and the installed capacity refers to the capacities of the individual generators.

The proposed solution for this is to introduce new tariffs and charge the embedded Supplier as described below. This is done by calculating a boundary tariff for the licence exempt system, based on the agreed capacity and other factors at the boundary connection point. This is then split, as described below, between the embedded customers in order to ensure that the correct charges are recovered overall.~~.~~

In the example workings below the following boundary tariffs and volumes are used. These are representative of example EDCM tariffs only and are not for a specific site.

Boundary Tariff

Tariff Element	Boundary Import				
	Tariffs		Volumes		Revenue
Import fixed charge	5.000	p/day	1	MPAN	£18.25
Import super-red unit rate	0.020	p/kWh	1,000,000	kWh	£200.00
Import capacity charge	0.500	p/kVA/day	1,000	kVA	£1,825.00
Exceeded import capacity charge	0.500	p/kVA/day	-	kVA	-
Total Import Revenue					**£2,043.25**

Tariff Element	Boundary Export				
	Tariffs		Volumes		Revenue
Export fixed charge	160.000	p/day	1	MPAN	£584.00
Super-red export rate	-0.050	p/kWh	10,000,000	kWh	-£5,000.00
Export capacity charge	0.050	p/kVA/day	35,000	kVA	£6,387.50
Export exceeded capacity rate	0.050	p/kVA/day	-	kVA	-
Total Export Revenue					**£1,971.50**

Total Revenue	**£4,014.75**

Table 1 – Boundary tariffs and revenue calculated using boundary volumes

With no solution in place the charges are levied as follows, with five sets of fixed charges. There is also potential for the capacity charges to be billed incorrectly, although this will depend on how the capacity charge has been allocated between the customers.

Current Charging Arrangements

Tariff Element	Boundary Import				
	Tariffs		Volumes		Revenue
Import fixed charge	5.000	p/day	5	MPAN	£91.25
Import super-red unit rate	0.020	p/kWh	1,000,000	kWh	£200.00
Import capacity charge	0.500	p/kVA/day	1,000	kVA	£1,825.00
Exceeded import capacity charge	0.500	p/kVA/day	-	kVA	-
Total Import Revenue					**£2,116.25**

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Tariff Element	Boundary Export				
	Tariffs		Volumes		Revenue
Export fixed charge	160.000	p/day	5	MPAN	£2,920.00
Super-red export rate	-0.050	p/kWh	10,000,000	kWh	-£5,000.00
Export capacity charge	0.050	p/kVA/day	35,000	kVA	£6,387.50
Export exceeded capacity rate	0.050	p/kVA/day	-	kVA	-
Total Export Revenue					**£4,307.50**

Total Revenue	**£6,423.75**

Table 2 – DUoS revenue from the embedded fully settled MPANs based on the current charging arrangements

The EDCM Fixed Charge

The EDCM fixed charge is currently set as a percentage of the Sole Use Asset Value plus the residual charge. Using the value in the example would result in a Fixed Charge of £800,000 * 0.0125 = £10,000 per annum for the point of connection. This solution proposed is to could be recover this ed by setting the import/export fixed charge applicable to each of the 10 MPANs in proportion to their installed import/export capacities, calculated as follows:.

[embedded customer Import/Export fixed charge in p/day] = [Import/Export fixed charge at the boundary] x [installed capacity of the embedded customer's Import/Export MPAN] / [total installed capacity of all embedded customers' Import/Export MPANs]

For example:;

The Export MPAN for the Anaerobic Digester connected to "M3" has an installed capacity of 3,000kVA. This could be used in proportion to tThe Total total of installed export capacity of the "Energy Park" is ies such that the fixed charge for this MPAN in DUOS would be calculated as;43,000kVA therefore the export fixed charge for M3 will be

£10,000160.00 p/day * (3,000kVA/43,4.4000kVA) / 365 days *100 = 185.11711.163 pence perp/ day.

The EDCM Capacity Charge

The HH profiled readings for all 5 of the embedded meters would be summated together for use in the engineering models to represent the power flows at the boundary point of connection. The resulting engineering factors would are then be entered in the EDCM pricing model, configured for a single generation connection, and this would returns a boundary pence per /kVA/day capacity charges for use in DUOS billing.

Note that in the above example the total of the installed capacities is greater than that quoted in the connection agreement for the boundary point of connection. Equipment is fitted at boundary is programmed to constrain off individual embedded units in the unlikely event that co-incident behaviour by all of the embedded sites would result in the connection agreement values being

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exceeded. In this scenario, if DUOS billing is configured to use the actual installed import/export kVA capacities for each MPAN and also configured to use the boundary capacity charge then it will be overcharging across the 10 MPANs.

~~Suppose that the resulting boundary pence per kVA charges for the above energy park are 5 pence per kVA per day for the imports and 0.05 pence per kVA for the exports.~~The proposed solution is to ~~A suggested addition to the EDCM methodology is to~~ reduce the capacity charge~~s~~e p/kVA/day values applicable at the embedded meter positions by multiplying by the agreed capacity at the boundary and dividing by the total installed capacity of the embedded customers~~as follows;~~:

[embedded customer Import capacity charge in p/kVA/day] = [Import capacity charge at the boundary] x (Import agreed capacity at the boundary] / [total installed Import capacity of all embedded customers]); and

[embedded customer Export capacity charge in p/kVA/day] = [Export capacity charge at the boundary] x (Export agreed capacity at the boundary] / [total installed Export capacity of all embedded customers])

This produces a new p/kVA/day charge which is applicable to all of the embedded customers.

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For example:

At the example Energy Park the import capacity charge is 0.500 p/kVA/day and the agreed capacity at the boundary is 1,000kVA. This gives an expected annual capacity charge of £1,825.00.

The import capacity charge for the embedded customers is calculated as follows:

0.500p/kVA/day * 1,000kVA / 1,100kVA = 0.455p/kVA/day

Applying this to the total embedded capacity of 1,100kVA gives an annual capacity charge of £1,825.00, as expected.

~~The STOR site has an embedded import capacity of 500kVA. If this 500kVA is used with the import MPAN in DUOS billing, then capacity charge could be reduced in the ratio of the Connection Agreement Capacity to the Total Installed Capacity;~~

~~5 pence per kVA per day * 1,000kVA / 1,400 kVA = 3.57 pence per kVA per day.~~

Similarly, for the export capacity charge~~MPAN the STOR site has an installed capacity of 20,000kVA~~, with a boundary agreed capacity of 35,000kVA and a total installed capacity of 43,000kVA the export capacity charge for the embedded customers is calculated as follows:~~;~~

0.05p~~ence per~~ /kVA ~~per~~ /day * 35,000/43,000 = 0.041 p/kVA/day~~pence per kVA per day.~~

Note that reducing the kVA capacities for each individual MPAN in DUOS would not work. This is because it is likely that the meter readings would then routinely exceed these values resulting in

excess capacity charges being applied. Indeed the proposed solution does not fully solve this problem whereby DUOS might apply excess charges at the embedded meter position when no co-incident excess power is observed at the boundary.

The EDCM Super-Red Unit Charge

This element of the EDCM charging is location dependent. The engineering and pricing models do not consider any EHV sites in isolation from their neighbours. Where present, import super-red rates are always positive. Export super-red rates are always negative which represents credits paid from DUOS to the registered supplier of the site. In the proposed solution the super-red rates calculated for the boundary tariffs will be applicable to all of the embedded sites.

In the example intermittent generators (the wind and PV generators) are assigned a zero "F Factor". ~~In the example~~and the non-intermittent generators (~~The~~ the STOR and AD sites) would be assigned a non-zero "F Factor". The size of this factor has a bearing on the size of any super-red credits that might be allocated by the power flow analysis. The intermittent and the non-intermittent "F Factors" combine to result in a non-zero "F Factor" at the boundary, which is an average for all the generators sharing the EHV connection. If the combined power flow analysis then produces non-zero super-red unit charges (generation credits) then these will be applicable to all of the embedded sites, meaning that the~~n~~ the non-intermittent generators may receive less credits than if they were connected directly to the DNO, conversely the intermittent generators would receive more credits.

Example Revenue Calculation

For the "Energy Park" example the charges for each MPAN calculated using the proposed solution would be as follows. The total revenue for each tariff element in these tables is the same as the total revenue calculated using the boundary values in table 1 above.

Embedded Customer	Tariff Element	MPAN Import				
		Tariffs		Volumes		Revenue
M1	Import fixed charge	2.273	p/day	1	MPAN	£8.30
	Import super-red unit rate	0.020	p/kWh	454,545	kWh	£90.91
	Import capacity charge	0.455	p/kVA/day	500	kVA	£829.55
	Exceeded import capacity charge	-	p/kVA/day	-	kVA	-
M2	Import fixed charge	0.455	p/day	1	MPAN	£1.66
	Import super-red unit rate	0.020	p/kWh	90,909	kWh	£18.18
	Import capacity charge	0.455	p/kVA/day	100	kVA	£165.91
	Exceeded import capacity charge	-	p/kVA/day	-	kVA	-
M3	Import fixed charge	0.909	p/day	1	MPAN	£3.32
	Import super-red unit rate	0.020	p/kWh	181,818	kWh	£36.36
	Import capacity charge	0.455	p/kVA/day	200	kVA	£331.82
	Exceeded import capacity	-	p/kVA/day	-	kVA	-

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	charge					
M4	Import fixed charge	0.909	p/day	1	MPAN	£3.32
	Import super-red unit rate	0.020	p/kWh	181,818	kWh	£36.36
	Import capacity charge	0.455	p/kVA/day	200	kVA	£331.82
	Exceeded import capacity charge	-	p/kVA/day	-	kVA	-
M5	Import fixed charge	0.455	p/day	1	MPAN	£1.66
	Import super-red unit rate	0.020	p/kWh	90,909	kWh	£18.18
	Import capacity charge	0.455	p/kVA/day	100	kVA	£165.91
	Exceeded import capacity charge	-	p/kVA/day	-	kVA	-
Total	**Total Import fixed charge**			**5**	**MPAN**	**£18.25**
	Total Import super-red unit rate			**1,000,000**	**kWh**	**£200.00**
	Total Import capacity charge			**1,100**	**kVA**	**£1,825.00**
	Total Exceeded import capacity charge			**-**	**kVA**	**-**
Total Import Revenue						**£2,043.25**

Embedded Customer	Tariff Element	MPAN Export				
		Tariffs		Volumes		Revenue
M1	Export fixed charge	74.419	p/day	1	MPAN	£271.63
	Export super-red unit rate	-0.050	p/kWh	4,651,163	kWh	-£2,325.58
	Export capacity charge	0.041	p/kVA/day	20,000	kVA	£2,970.93
	Exceeded Export capacity charge	-	p/kVA/day	-	kVA	-
M2	Export fixed charge	18.605	p/day	1	MPAN	£67.91
	Export super-red unit rate	-0.050	p/kWh	1,162,791	kWh	-£581.40
	Export capacity charge	0.041	p/kVA/day	5,000	kVA	£742.73
	Exceeded Export capacity charge	-	p/kVA/day	-	kVA	-
M3	Export fixed charge	11.163	p/day	1	MPAN	£40.74
	Export super-red unit rate	-0.050	p/kWh	697,674	kWh	-£348.84
	Export capacity charge	0.041	p/kVA/day	3,000	kVA	£445.64
	Exceeded Export capacity charge	-	p/kVA/day	-	kVA	-
M4	Export fixed charge	37.209	p/day	1	MPAN	£135.81
	Export super-red unit rate	-0.050	p/kWh	2,325,581	kWh	-£1,162.79
	Export capacity charge	0.041	p/kVA/day	10,000	kVA	£1,485.47
	Exceeded Export capacity charge	-	p/kVA/day	-	kVA	-
M5	Export fixed charge	18.605	p/day	1	MPAN	£67.91
	Export super-red unit rate	-0.050	p/kWh	1,162,791	kWh	-£581.40
	Export capacity charge	0.041	p/kVA/day	5,000	kVA	£742.73
	Exceeded Export capacity charge	-	p/kVA/day	-	kVA	-

Total	Total Export fixed charge		5	MPAN	£584.00
	Total Export super-red unit rate		10,000,000	kWh	-£5,000.00
	Total Export capacity charge		43,000	kVA	£6,387.50
	Total Exceeded Export capacity charge		-	kVA	-
Total Export Revenue					£1,971.50

Total Revenue	£4,014.75

Table ~~33~~ - Import and export tariffs and revenue for each embedded MPAN based on the proposed solution

It has been confirmed that the revised EDCM models replicate the splitting of fixed and capacity charges as described above and that this has no impact on any of the boundary tariffs calculated in the EDCM.

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