DISTRIBUTIONAL IMPACT OF REFORMS TO RESIDUAL CHARGES

Ofgem's Targeted Charging Review

13 December 2019[1]

[1] This document was updated on 18 December 2019. This impacted some parts of figures 1, 7 and 9

CONTENTS

1 INTRODUCTION

In 2017 Ofgem launched the Targeted Charging Review (TCR), which is a Significant Code Review (SCR) with the objective to review and reform the network charging arrangements related to the recovery of fixed costs of the electricity transmission and distribution networks. In November 2018 Ofgem published a 'minded to' decision stating its preference to introduce an approach based on fixed charges. It also noted that it was also still considering charges based on users' capacity.

To support that decision Ofgem engaged Frontier to provide an independent assessment of the distributional impacts of the options it was considering. In particular we carried out a 'static bill impact analysis' i.e. an assessment of the change in customer bills holding physical behaviour constant. This provided Ofgem with an understanding of the potential distributional impacts of the proposed changes. In other words, we identified the types of users and types of consumption patterns that were likely to pay less as a result of the changes and those that were likely to pay more. We illustrated these impacts by modelling the effects of the different charges on a range of different representative domestic, commercial and industrial profiles, informed by public source data and information from stakeholders. Our report was published alongside Ofgem's minded to decision.[2]

Following consultation on its minded to decision, Ofgem asked Frontier to update the static bill impact analysis based on two refined options.

Hybrid fixed-agreed capacity charge ('Hybrid option')

- The residual recovery is allocated to LLFCs according their share of total volume.
- Domestic and small non-domestic (up to LV NHH) charges remained as per a fixed by volume charge.
- Larger users face a capacity based charge specific to each LLFC.

Banded fixed charge ('Banded charge')

- The residual is recovered equally from each connection in a particular customer band.
- There is a single domestic band for all users, such that they face a single transmission residual charge and a single distribution residual charge within each licensed area.
- For smaller non-Domestic users (LV NHH) each band is defined on the basis of volume, and for larger non-domestic customers bands are defined based on capacity. This is in contrast to the previous fixed charge approach based on LLFCs.

[2] https://www.ofgem.gov.uk/system/files/docs/2018/11/distributional_and_wider_system_impacts_of_reform_to_residual_charges.pdf

- The residual is recovered from each band on the basis of the share of total consumption by customers in each band i.e. in the same way as the fixed by volume charges in our previous report.

In this report we set out the estimated charges for each option, and estimate the static bill impacts for the same set of representative profiles from our previous report. The results of this analysis are compared to updated estimates for the fixed by volume and deemed capacity charges which we analysed in our previous report.

The static bill impact analysis has been developed based on data from publicly available sources and requests from network owners. The data available to us does not allow the estimation of the exact charges that could be expected if the options are implemented. We have had to make numerous simplifications and assumptions. The user groups are designed to represent a reasonable spread of different levels and shapes of consumption, but they are not representative of all consumers. As a result, the charges and bill impacts estimated should only be considered illustrative to provide the broad direction of the expected impacts.

This report is structured as follows:

- In **Section 2**, we set out in more detail how we have estimated the charges for both of the new options that Ofgem has asked us to consider.
- In **Section 3**, we set out the updated static bill impacts for different types of users.

2 DETAILED METHODOLOGY FOR ESTIMATING CHARGES

In this section we describe in detail how we have estimated the charges for the two new options:

- Hybrid fixed-agreed capacity charge; and
- Banded fixed charge.

The general methodology used to calculate the static bill impacts of network charging reform options is described in section 3 of our previous report to support the minded to decision. This note therefore relies on those explanations and only provides additional explanation where the methodology is not the same i.e. where there are additional calculation steps that were not described in the previous report.

In the previous analysis we also identified that it was not possible to separately identify sites which are specifically generation sites from those that are load with BTMG. Therefore, the previous estimates of the charges were calculated on the basis of all sites, including generation specific sites, which can have a significant impact on estimates of fixed charges in particular. As noted at the time this does not reflect Ofgem's stated policy position to only charge residuals on final demand.

This is a particular problem in the EHV site level dataset provided to us by the DNOs where it is likely there are a large number of pure generation sites. Therefore, we have adjusted the EHV dataset to remove sites which we considered likely to be pure generators, in order to produce more realistic charges. We set out our approach to this adjustment at the end of this section.

This adjusted EHV dataset is applied to estimate all network charges described in this report, and we have also updated our estimates of the fixed by volume and the deemed capacity charges from the previous report. However, it is important to note that while this should result in more realistic charges, we are still not able to accurately identify pure generation sites and we have not undertaken an exercise to remove possible generation sites from the data at other voltage levels (e.g. HV sites).

2.1 Estimating hybrid fixed-agreed capacity charges

Under the hybrid option the calculation of results for all NHH customers is as described in the section 3.5.1 of the previous report (section refers to the fixed by volume approach). The Hybrid option differs from the fixed by volume charge in its treatment of HH customers.

Defining HH segments

Under the hybrid option larger customers are segmented as per previous options giving rise to five HH segments:

- LV HH Metered
- LV Sub HH Metered
- HV HH metered

- EHV
- T-connected

Calculating charges for the segments

The share of residual charges recovered from each segment is based on the share of net volume accounted for by each segment.

The residual is recovered using a capacity charge which is derived as set out in section 3.3.3 of our previous report. Given the need to estimate a specific capacity charge for T-connected sites, we have updated our assumption for the capacity of those sites. For T-connected sites we only have data on peak demand and total volumes. The physical capacity of individual sites has not been made available to us. Therefore, we assume that the capacity of T-connected sites is based on the connection utilisation of EHV customers (kWh consumed/kVA), which itself will have been updated following the adjustments to remove pure generation sites from the EHV dataset.

The estimated hybrid charges are set out below. The TNUoS charges in Figure 1 apply to all DNOs. The CDCM and EDCM charges in Figure 2 only apply for the North East region. [3]

Figure 1 Hybrid fixed-agreed capacity TNUoS charges – All DNOs

	TNUoS Fixed Charges	TNUoS £/kVA charges
Domestic Unrestricted	£31.71	
Domestic Two Rate	£48.72	
Small Non Domestic Unrestricted	£118.50	
Small Non Domestic Two Rate	£212.08	
LV Medium Non-Domestic	£423.56	
LV Sub Medium Non-Domestic	£882.95	
HV Medium Non-Domestic	£848.57	
LV Network Domestic	£41.25	
LV Network Non-Domestic Non-CT	£635.98	
LV HH Metered		£16.85
LV Sub HH Metered		£20.18
HV HH Metered		£24.53
EDCM customers		£22.36
T-connected customers		£22.36

Source: Frontier Economics

[3] Equivalent CDCM and EDCM charges for other DNO regions are provided in the corresponding data file to this report.

Figure 2 Hybrid CDCM & EDCM charges – Northeast DNO Region

	CDCM Fixed Charges	CDCM & EDCM £/kVA charge
Domestic Unrestricted	£32.10	
Domestic Two Rate	£54.38	
Small Non Domestic Unrestricted	£116.61	
Small Non Domestic Two Rate	£217.47	
LV Medium Non-Domestic	£759.10	
LV Sub Medium Non-Domestic	£1,265.81	
HV Medium Non-Domestic	£2,154.95	
LV Network Domestic	£27.09	
LV Network Non-Domestic Non-CT	£459.66	
LV HH Metered		£13.87
LV Sub HH Metered		£23.70
HV HH Metered		£25.16
EHV		£4.23

Source: Frontier Economics

Ofgem may also consider some alternative variations to the charges which combine elements of this hybrid option and the banded charging option discussed below. Since the allocation of the residual to different voltage levels is the same under each option, different options could in theory be applied to different voltage levels. We discuss this in more detail in section 3.

2.2 Estimating banded fixed charges

The banded charges policy option places a fixed charge on all users within a particular segment. The segments in this option are nested within voltage levels and are broadly based on the following:

- All domestic customers are in a single segment (i.e. domestic unrestricted and economy 7 customers are now in a single segment).
- Smaller non-domestic customers (NHH LV customers) are segmented into a series of bands according to volume.
- Larger non-domestic customers (HH LV, HV, and EHV) are segmented into a series of bands according to capacity.
- Transmission connected customers are in a single segment.

The relevant residual is then allocated to each segment according to its share of total net volume for the relevant charging base (i.e. CDCM, EDCM, or system volume for TNUoS). The fixed charge is calculated by dividing the residual by the number of customers in each segment.

We have utilised national consumption and connection capacity data to define the segments. In addition, to the dataset collated as part of the minded to decision, the bands have been estimated using additional site level data from DNOs, and national customer consumption data from BEIS.

For each of the groups described below, the segments are set on the basis of the 40th, 70th and 85th percentiles, resulting in four bands for each group.

- The *LV NHH* segmentation is based on an actual dataset of 2017 national PC3&4 users (provided by BEIS) and a proxy distribution for other LV NHH users that are not in profile class 3 or 4.[4] These two distributions are merged and the derived segment distribution is then applied to the total NHH LV MPAN and volume numbers for 2019/20 taken from the DNO CDCM models.
- The *HH LV* segmentation is based on HH LV site level data for 2018/19 from all DNOs. The derived segment distribution is then applied to the total MPAN and volume numbers for 2019/20 taken from the DNO CDCM models.
- The *HV and EHV* segmentations are based on national datasets created from HV and EHV site level data provided by the DNOs. The EHV dataset is adjusted to remove pure generation sites as described below. The derived capacity segment distributions are then applied separately to:
  - HV total MPAN and volume numbers for 2019/20 taken from the DNO and CDCM models
  - National EHV site numbers and volumes provided by DNOs

Once the customer numbers and total consumption for each segment had been derived the calculation of charges are as set out in section 3.5.1. of the previous report which describes the fixed by volume option.

The estimated TNUoS charges for all DNO regions and the estimated CDCM and EDCM charges for the Northeast DNO region are set out below in Figure 3 and Figure 4.[5]

[4] For NHH LV users that are not in profile class 3 or 4 we only have data on total MPANs and total consumption. However, we do not have site level consumption data and hence we do not know the distribution of these users by volume levels. To calculate the percentiles that set the band thresholds we must assume a volume distribution for these users. We assume these users have the same distribution over volumes as HH LV users but scaled down for the lower average consumption of this group of NHH LV users, subject to a maximum volume cap based on the maximum consumption of PC3&4 users.

[5] Equivalent CDCM and EDCM charges for other DNO regions are provided in the corresponding data file to this report.

Figure 3 TNUoS charges for the banded charges option – All DNOs

Segment	Subsegment	Lower volume threshold (kWh)	Upper volume threshold (kWh)	Lower capacity threshold (kVA)	Upper capacity threshold (kVA)	Charge (£)
Domestic	Single Segment					£34
LV NHH	1st Band	-	5,403			£18
	2nd Band	5,403	17,538			£89
	3rd Band	17,538	33,559			£207
	4th Band	33,559	-			£589
LV HH	1st Band			-	80	£1,088
	2nd Band			80	150	£1,953
	3rd Band			150	225	£3,125
	4th Band			225	-	£7,215
HV	1st Band			-	400	£4,456
	2nd Band			400	900	£16,164
	3rd Band			900	1,600	£29,492
	4th Band			1,600	-	£85,091
EHV	1st Band			-	2,200	£12,292
	2nd Band			2,200	10,000	£127,331
	3rd Band			10,000	19,090	£342,165
	4th Band			19,090	-	£894,404

Source: Frontier Economics

Figure 4 CDCM & EDCM charges for the banded charges option – Northeast DNO region

Segment	Subsegment	Lower volume threshold (kWh)	Upper volume threshold (kWh)	Lower capacity threshold (kVA)	Upper capacity threshold (kVA)	Charge (£)
Domestic	Single Segment					£33
LV NHH	1st Band	-	5,403			£19
	2nd Band	5,403	17,538			£96
	3rd Band	17,538	33,559			£222
	4th Band	33,559	-			£631
LV HH	1st Band			-	80	£905
	2nd Band			80	150	£2,097
	3rd Band			150	225	£3,142
	4th Band			225	-	£8,222
HV	1st Band			-	400	£5,034
	2nd Band			400	900	£16,508
	3rd Band			900	1,600	£29,222
	4th Band			1,600	-	£80,765
EHV	1st Band			-	2,200	£3,572
	2nd Band			2,200	10,000	£17,106
	3rd Band			10,000	19,090	£35,838
	4th Band			19,090	-	£170,934

Source: Frontier Economics

2.3 Removing pure generators from EHV dataset

To support our analysis for the minded to decision the DNOs provided us with EHV site level data related to site capacities and volumes. As noted above, it is not possible to identify with certainty which sites in this dataset are pure generator sites, as opposed to sites with significant amounts of behind the meter generation (BTMG) e.g. some load sites could in theory still have significant exports relative to their imports due to the presence of BTMG.

To produce more realistic charges, we have attempted to identify those sites which are most likely to be pure generation sites and remove them from the dataset for calculating charges. We would expect any generation site to have export volumes and capacity significantly in excess of its import volumes and capacity. However, it is not possible to identify exactly what the ratio of exports to imports should be to ensure that we only remove pure generation sites, and ultimately any assumption that we choose could also remove some load sites with substantial BTMG.

On examination of the dataset, the number of sites that we would remove as 'pure generators' is not particularly sensitive to the choice of the ratio.

- For example, if we were to assume that sites with a ratio of annual exports to annual imports of 25, we would identify 1,295 out of 2,518 as pure generation sites. These sites represent 86.5% of the annual actual exports in the data, and 0.75% of the annual imports.
- However, if we were to switch to using a ratio of 10, the number of generation sites identified would only increase by 49 sites, while if were to use a ratio of 50 actual exports to imports the number of sites identified would only decrease by 49.

As a result, in this analysis we have adopted a ratio of export to import volumes of 25. We consider that this ratio should provide a reasonable indication of the number of pure generation sites, and hence allow us to estimate a set of illustrative charges.

It is important to note that the dataset provided by the DNOs is not complete for every site, and in some cases the import and export volumes are missing. In these cases, we have first applied similar rules to the ratio of super red export and import volumes. Where those volumes are missing we have identified generation sites on the basis of the ratio of export to import capacity. For sites without import and export volumes we apply a ratio of super red export to import volumes of 25, and if necessary, export to import capacity of 50. Similarly, the identified number of pure generation sites from adjustments is not particularly sensitive to alternative assumptions.

3 STATIC BILL IMPACTS

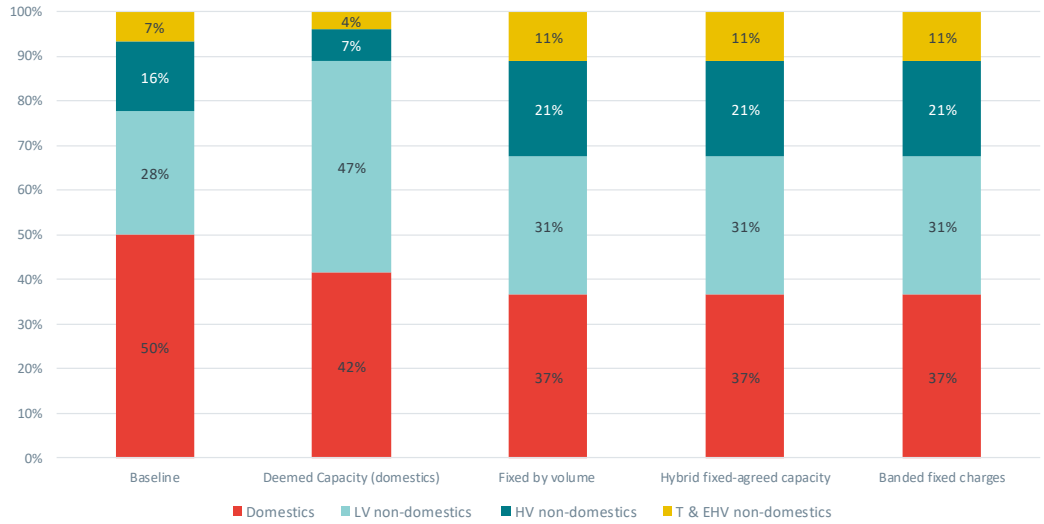
In this section we provide an update to our analysis of potential static bill impacts of tariff changes i.e. the impacts on the bill when the behaviour of individual users is held constant. This analysis is focused only on the impact of changes to the residual component of network user's bills, and hence all impacts are presented on the basis of this part of the bill before (i.e. the 'baseline') and after the change in charging arrangements.

It is important to note that the bill impacts illustrated in this section are based on an assumption that residual charges under the baseline and under the options are fully passed through to all consumers. As it currently stands, this may not be the case since suppliers are free to determine how they pass on charges to customers.

The figures presented are in general based on charging data relevant to the single year of 2019, though as described in the previous section some sources of data provided to us relates to earlier years. We have not attempted to make a projection of bill impacts over multiple future years given the significant uncertainty related to future assumptions, in particular the nature of customer profiles, and the future size of the residual.[6] While the specific magnitudes of the estimated bill impacts are likely to vary depending on the level of the residual, the broad direction of the impacts identified should still be applicable.

Our results in Figure 5 and Figure 6 below show that the Hybrid option and the Banded fixed charge option retain the same allocation of residual recovery between domestics and non-domestics and by voltage level as in the fixed by volume charging option as presented in Ofgem's minded to decision.

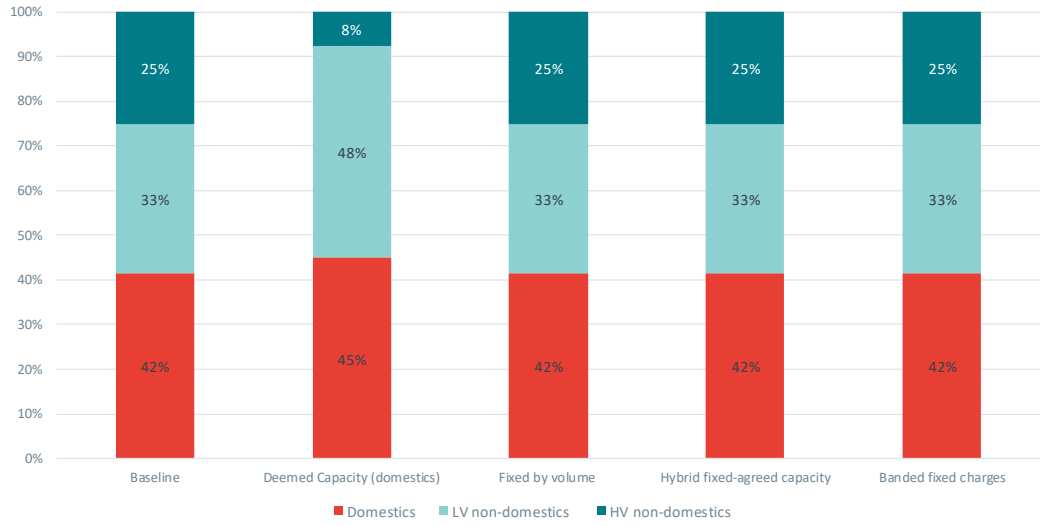
Figure 5 TNUoS inter-group effects relative to the baseline



Source: Frontier Economics analysis

[6] The future size of the residual is a function of the quantum of network charges and regulatory policy related to the share of those costs recovered through cost reflective charges.

Figure 6 CDCM inter-group effects relative to the baseline (National Average)



Source: Frontier Economics analysis

The high level allocation of residual recovery is the same for the hybrid, banded and fixed by volume charges. This is because the hybrid and banded charges options both initially allocate the residual to voltage levels using the fixed by volume methodology. The allocation of the residual within the group to different individual customers is different.

The resulting bills for each user group are presented below in Figure 7 for TNUoS, and Figure 8 for EDCM. In Figure 9 we present the CDCM results for the Northeast DNO region. Equivalent CDCM bills for other DNO regions are provided in the corresponding data file to this report.

Ofgem may also consider some alternative variations to the charges which combine elements of the hybrid and banded charging options, the effect of which can also be observed from the following data.

An alternative variant of the hybrid model could involve fixed charges based on banded segments set according to volume or capacity rather than LLFCs, as was the case in the minded to decision. Provided that the allocation of the residual between voltage levels is not significantly affected, then it is possible to mix some banded fixed charges with the hybrid charges.[7]

For example, volume banded charges could be applied to NHH LV users and the £/kVA charges for HH users would not be affected by this change (from fixed by volume at the LLFC level). This means that the charges for such an altered hybrid can be seen by reading the LV NHH volume banded charges for the relevant users and the Hybrid £/kVA charges for the HH users.

[7] The DNO data includes a small number of HV users that are NHH. In the Hybrid methodology presented these have a separate charge calculated. If these users were included in the HV HH category (and therefore face £/kVA charges) they would marginally affect the £/kVA charge at this level. Any impact is likely to be very small given the limited number of NHH HV users so the HV HH £/kVA charge is still likely to be a good illustration of the possible charges under the Hybrid option with volume banded charges for NHH LV users.

Finally, Ofgem may also consider a further alternative of the hybrid model where capacity charges are applied to banded segments for larger users at LV, rather than LLFC. This option cannot be directly observed from the data presented here.

Figure 7 All DNOs - TNUoS Annual residual bill for each charging option

User group	Baseline	Ex-ante capacity	Fixed by volume	Hybrid	Banded Charges
Domestic - Low consumption	£24	£68	£32	£32	£34
Domestic - Medium consumption	£39	£68	£32	£32	£34
Domestic - High consumption	£59	£68	£32	£32	£34
Domestic - Economy 7 high	£88	£68	£49	£49	£34
Domestic - Solar PV	£24	£68	£32	£32	£34
Domestic - Solar PV with storage	£5	£68	£32	£32	£34
Domestic - Electric vehicles	£45	£68	£32	£32	£34
Domestic - Heat pumps	£46	£68	£32	£32	£34
SME - Low consumption	£73	£208	£118	£118	£89
SME - High with onsite generation/storage (1)	£40	£208	£118	£118	£89
SME - High without onsite generation/storage (1)	£225	£208	£118	£118	£207
SME - High with onsite generation/storage (2)	£40		£636	£636	£89
SME - High without onsite generation/storage (2)	£225		£636	£636	£207
SME - Light industrial HV-connected	£29,757	£7,573	£23,538	£49,063	£85,091
Industrial - EHV-connected without onsite generation/demand management	£297,581	£37,867	£224,338	£223,580	£127,331
Industrial - EHV-connected with peak generation/demand management	£0	£37,867	£224,338	£223,580	£127,331
Industrial - T-connected with peak generation/demand management	£0	£75,734	£549,123	£447,161	£549,123
Industrial - T-connected without onsite generation/demand management	£595,161	£75,734	£549,123	£447,161	£549,123

Source: Frontier Economics

Figure 8 EDCM baseline and option charges for all DNOs

DNO	Baseline - 25th percentile	Baseline - 50th percentile	Baseline - 75th percentile	Ex-ante capacity	Fixed by volume	Hybrid	Banded Charges
Electricity Northwest	£20,989	£76,878	£185,987	£118,679	£133,233	£118,679	£47,502
Northeast	£23,174	£49,447	£95,072	£42,277	£69,053	£42,277	£17,106
Yorkshire	£6,451	£29,150	£67,929	£53,806	£57,182	£53,806	£27,857
Southern Scotland	£4,353	£16,067	£37,272	£50,955	£42,282	£50,955	£29,252
North Wales & Mersey	£21,087	£53,760	£121,023	£134,072	£97,987	£134,072	£70,451
Southern	£718	£10,011	£22,686	£15,139	£21,021	£15,139	£10,244
Scottish Hydro	£1,015	£5,372	£17,694	£32,648	£16,089	£32,648	£31,109
Eastern	£8,162	£24,965	£50,994	£40,079	£48,754	£40,079	£20,317
London	£4,581	£17,221	£33,884	£15,216	£42,603	£15,216	£6,713
South East	£21,140	£47,275	£79,036	£24,275	£63,162	£24,275	£25,654
East Midlands	£321	£10,992	£57,783	£64,611	£44,547	£64,611	£39,864
South Wales	£387	£4,212	£97,198	£106,504	£106,245	£106,504	£52,244
South West	£107	£145	£4,618	£57,968	£10,369	£57,968	£39,955
West Midlands	£287	£5,562	£34,911	£52,558	£41,246	£52,558	£19,986

Source: Frontier Economics

Figure 9 Northeast – CDCM annual residual bill under each charging option

User group	Baseline	Ex-ante capacity	Fixed by volume	Hybrid	Banded Charges
Domestic - Low consumption	£20	£62	£32	£32	£33
Domestic - Medium consumption	£33	£62	£32	£32	£33
Domestic - High consumption	£49	£62	£32	£32	£33
Domestic - Economy 7 high	£75	£62	£54	£54	£33
Domestic - Solar PV	£23	£62	£32	£32	£33
Domestic - Solar PV with storage	£20	£62	£32	£32	£33
Domestic - Electric vehicles	£49	£62	£32	£32	£33
Domestic - Heat pumps	£60	£62	£32	£32	£33
SME - Low consumption	£106	£189	£117	£117	£96
SME - High with onsite generation/storage (1)	£163	£189	£117	£117	£96
SME - High without onsite generation/storage (1)	£264	£189	£117	£117	£222
SME - High with onsite generation/storage (2)	£163		£464	£460	£96
SME - High without onsite generation/storage (2)	£264		£464	£460	£222
SME - Light industrial HV-connected	£52,774	£6,866	£31,467	£50,319	£80,765

Source: Frontier Economics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