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Regional differences in network charges

For information

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Overview:

This paper explains why network charges, which make up around 25% of a typical energy bill, differ across regions in Great Britain. These recover the costs incurred by those operating the electricity transmission (high voltage) and distribution (lower voltage) and gas transmission (high pressure) and distribution (lower pressure) networks.

We look at how retail supply companies respond to the regional differences in network costs they face. We consider evidence as to how these regional differences might have an impact on customers in vulnerable situations. We also look at the choices made in other countries to either allow different regional costs to be reflected in bills or to opt for uniform national charges.

We outline the rationale for the current arrangements but also illustrate the potential impacts of moving to Great Britain-wide network charges.

Contents

Executive Summary

Following the network costs inquiry by the 2010-15 House of Commons, Energy and Climate Change Select Committee, this paper explains why households pay different network charges according to the region in which they consume energy.

Background

In Great Britain, separate gas and electricity networks carry energy to homes and businesses. Customers do not pay the network owners directly for their services. The network owners recover their costs from generators and also from suppliers who in turn include a charge as part of the overall bill they issue to their customers. These network charges form approximately 25%[1] of a typical dual fuel customer's total bill excluding VAT.

There are different types of network. Networks are divided into the nationwide high voltage electricity and high pressure gas **transmission** networks which take electricity and gas around the country and which are operated by National Grid Plc[2] and the 14 regional, lower voltage electricity and 8 lower pressure gas **distribution** networks which connect consumers to the national transmission networks. The number and geographical size and location of these distribution networks follow the pre-privatisation electricity and gas boards.

There are regional differences in network charges but these are not a 'surcharge'. Each of the electricity and gas distribution networks (DNOs and GDNs) face different costs that are shared among their own customers supplied in the geographic area in which they operate.

The North Scotland DNO receives a cross subsidy through the Hydro Benefit Replacement Scheme, so its customers face lower network charges than they otherwise would. This component is recovered from suppliers across Great Britain through a charge added to all units of electricity. The cross subsidy is currently around £41 per annum per household in North Scotland.

Between 2014-15 and 2015-16, electricity distribution charges fell in nearly all electricity DNO regions as a result of our RIIO price control. The average reduction across Great Britain was about £11 for a typical household. This is partially offset by an average increase in electricity transmission charges of about £5. Gas distribution charges fell by £4 for a typical household.

[1] The figure is 23% if VAT is included.
[2] In Scotland, the electricity transmission assets are owned by SP Transmission Ltd (a subsidiary of Scottish Power) and SHE Transmission Plc (a subsidiary of Scottish and Southern Energy).

What we did

Our methodology involved the stages set out below:

- We examined the regional differences in network charges for households in 2015-16 for electricity and gas, transmission and distribution.
- We analysed how the largest six suppliers' bills to households responded to these differences.
- We considered the distribution of customers in vulnerable situations across the different distribution regions.
- We looked to understand relevant international practice.
- We illustrated the potential impact of a move to national charges for households both considering the impacts on regulation and the quantitative impact on households in different regions.
- All our focus was on households as the current charging system for large business and other non-domestic customers would make the analysis in this paper impossible.

What we found

1. Electricity distribution charges are higher than average in North Scotland, Merseyside & North Wales and the South West of England and lower in London and Eastern England. In contrast, electricity and gas transmission charges are higher in the south of England and lower in Scotland while gas distribution charges are higher in London and the south of England and lower in Scotland and the north east of England.
2. There are differences in the combined network charges (electricity and gas, transmission and distribution), in different parts of Great Britain. Electricity distribution charges account for the largest proportion of the differences – they vary between £66 and £122 per year for a household (see paragraph 2.11). For typical Great Britain-wide household consumption, the regional differences in combined charges are generally lower than electricity distribution alone, as transmission charges are lower in many of the regions where electricity distribution charges are at their highest.
3. Suppliers generally reflect the fact that there are regional differences in gas or electricity network charges in their corresponding tariffs for households. This is more the case for electricity than gas and sometimes after a delay.
4. Our illustration of the effect of a move to national network charges shows that:
    a) approximately 16 million households would face higher bills, while around 11 million would see reduced bills under such an approach. In most cases the increase or decrease would be small. In Scotland, 1.8 million

households would face higher bills and 0.7 million households would see reductions. It is harder to estimate the numbers for England and Wales separately because the distribution networks which serve Welsh households also operate across the border into England;

b) there are many people who are elderly, disabled and chronically sick, on low incomes or vulnerable in other ways, in both areas which would face bill increases and those which would experience reductions. There does not appear to be any clear justification for national network charges in terms of regional concentration of vulnerability;

c) for a household with typical electricity and gas consumption, there would be an increase or decrease to the network charge element of a bill of less than £20 per year in most distribution network areas (Figure 8); but

d) there would be more significant changes in three electricity distribution regions: South West England (down £38), Merseyside and North Wales (down £26) and East Midlands (up £27) (Figure 8);

e) the potential impact is different if we reflect the fact that households in some areas have higher than average consumption of electricity, particularly where significant numbers of households are off gas grid and/or use electricity as their primary heating source. For example, households in the North of Scotland who use electricity for heating would benefit from reductions of about £60 (paragraph 5.12);

f) where companies exceed service standards or fail to invest adequately in their network, the current arrangements mean their customers see changes in their bills through regulatory rewards and penalties.

5. It is legally possible to introduce national network charges but the change from the current approach would need to be justified against various criteria in European law, particularly on cost reflectivity. There are international (including European Union) examples, both of systems like ours and ones more akin to national network charges.

6. There are potentially significant implications for the regulatory framework and incentives we have implemented or will be implementing to encourage energy efficiency on the networks, if we were to move away from a cost reflective approach.

7. There are regulatory advantages in charges that broadly reflect the costs that different users place on the system. For example, charging generators different costs for using the transmission system in different locations (as they have different impacts on the transmission system as a result) leads to a better outcome for consumers in the long term.[3] From a regulatory perspective, we also found no compelling case to move to a national network charge. Given the

[3] We carried out this assessment as part of Project Transmit, our review of transmission charging for generators. More information can be found on the Project Transmit section of our website, https://www.ofgem.gov.uk/electricity/transmission-networks/charging/project-transmit.

nature of the policy issues raised, the Government would have to play a leading role in a decision to change from the current approach.

8. Instead of introducing a national network charge, targeted help to those off gas grid might be an option to consider further. We identified non-gas households as a priority area for our Vulnerability Strategy.[4] We have been taking and continue to take action to extend gas networks to help the fuel poor and customers in vulnerable situations, and we are focussing on the experience of electric heating customers.

[4] https://www.ofgem.gov.uk/publications-and-updates/consumer-vulnerability-strategy-progress-report

1. This paper and the current position

Introduction

1.1 Following the network costs inquiry by the 2010-15 House of Commons, Energy and Climate Change Select Committee, this paper explains current regional differences in network charges. It will also be of interest to many who have asked about energy bills differing across Great Britain.

1.2 There are regional differences in the charges which suppliers face for use of the electricity and gas distribution and transmission networks across Great Britain. Customers do not pay these charges directly, but suppliers may include them in customers' bills. This cost reflective approach serves specific purposes, which we explain in Section 4, but also contributes to differences in household bills between regions.

1.3 We have compared suppliers' bills against network charges to determine whether or not regional differences in bills are driven by differences in network charges.

1.4 For illustrative purposes we have considered the potential impact of a move to national network charges for households in different areas and of different types. By 'national network charges' we mean a set of unit rates covering the gas and electricity, transmission and distribution networks, which are the same for all households, regardless of where they are located in Great Britain.

1.5 This document includes the following sections:

- **Section 1:** The rest of this section provides an introduction to relevant aspects of the energy system in Great Britain. We describe the different components of the system and associated approaches to charging.
- **Section 2:** This includes a discussion of the different types of household for network charging and billing purposes, a description of existing regional differences in the energy bills households pay and a description of our analysis of the degree to which differences in network charges are the cause.
- **Section 3:** This summarises practice in other countries.
- **Section 4:** For illustrative purposes we consider the potential impact which national network charges would have on how we regulate network companies to protect consumers. We also explain what would be involved in implementing such a process.

- **Section 5:** Finally, we present the potential impact of such a change showing the effect in numbers on different types of households.

Structure of Great Britain's electricity and gas industries

Supply markets

1.6 The majority of Great Britain's electricity comes from large scale generators and from other countries through interconnectors. Electricity also comes from small scale generation, including micro-generation from individual households, eg solar panels. Electricity is sold in a competitive market and the suppliers who buy this then compete to supply it to customers through the retail market. Similarly, gas is sold by competing producers and importers to shippers[5] who sell it on to the retail suppliers who, in turn, sell it to their customers. Shipping (gas only), generation and supply activities are not subject to price control regulation given the competition present, although they are subject to a number of licence conditions which we can enforce if necessary. We referred the retail market to the Competition and Markets Authority (CMA) on 26 June 2014. The CMA published its provisional findings[6] on 7 July 2015 with final findings now due to be published by the end of June 2016.

Regulated networks

1.7 The networks which transport electricity and gas from source to customers (households, businesses and others) are largely monopoly businesses.[7] This is why we subject them to price control regulation to protect customers. We determine 'allowed revenues', enough for them to deliver efficiently required levels of services (through defined output measures) and obtain and retain the necessary investment to do this. Revenues also reward companies who find ways of delivering improved value for customers through required levels of services at lower cost over time or in some cases higher levels of service.

1.8 The majority of networks are regulated under our RIIO[8] price control framework, which is designed to drive real benefits for customers. It gives the companies strong incentives to meet the challenges of delivering a low carbon, sustainable energy sector while providing long-term value for money for existing and future customers. As part of our RIIO process, the network operators are expected

[5] Shippers arrange for the network companies to move gas from producers to consumers. They do so by purchasing rights to flow gas on the networks.
[6] https://assets.digital.cabinet-office.gov.uk/media/559fc933ed915d1592000050/EMI_provisional_findings_report.pdf
[7] Although the networks are largely monopolies, some of their activities are subject to competition, such as connections and the introduction of smaller independent network operators (IDNOs) and independent gas transporters.
[8] RIIO (Revenue = Incentives + Innovation + Outputs) is our new approach to setting network regulatory controls. It was first implemented for transmission and gas distribution from April 2013. Further details on RIIO and reviews carried out under it are available on our website at: https://www.ofgem.gov.uk/network-regulation-riio-model

to talk to stakeholders and customers about the levels of service required and the price that customers in that region are willing to pay for improvements.

1.9 Networks are divided into the high voltage/high pressure **transmission** networks which take electricity and gas around Great Britain and the lower voltage/lower pressure **distribution** networks which connect customers to the national transmission networks. National Grid owns and operates the national gas **transmission** network, and operates the national electricity system (it owns the network in England and Wales and Scottish Power and Scottish and Southern Energy (SSE) own the networks in Scotland). There are 14 electricity **distribution** network operators (DNOs) and eight gas **distribution** networks (GDNs) whose number and geographical position reflect legacies from the pre-privatisation electricity and gas boards (see Figure 1).

Household bills

1.10 Final household bills reflect a number of costs, including the wholesale cost of the energy, the cost of operating and managing the networks and the cost of supplying energy to households. For households, network charges are not separately itemised on the bill. Instead the supplier sets an overall price, which reflects the different costs that it faces (plus a profit element). This price typically varies between regions, in part (though not exclusively) reflecting differences in network costs in different parts of the country.

1.11 Approximately 70%[9] of households in Great Britain receive both electricity and gas from one supplier while a further 17% use different suppliers for gas and electricity. The remaining households are on electricity only. Network costs make up approximately 25% of a typical dual fuel[10] bill (excluding VAT).

1.12 Our analysis is initially based on a set 'typical' rate of consumption. This is chosen at national level as the likely usage for a household. There are different 'typical' consumption rates for electricity and gas and, for electricity, for those on different types of tariff such as Economy 7.[11]

1.13 We also considered the impact of differences in average consumption levels between different regions. This information is available for each of the 14 regions supplied by the different electricity DNOs.

[9] Supplier data provided to Ofgem. All our analysis of supplier bills excludes VAT.
[10] Whenever we refer to dual fuel we mean bills covering electricity and gas but not taking account of any dual fuel discount.
[11] A type of supplier tariff that charges households on the basis of normal and off-peak consumption.

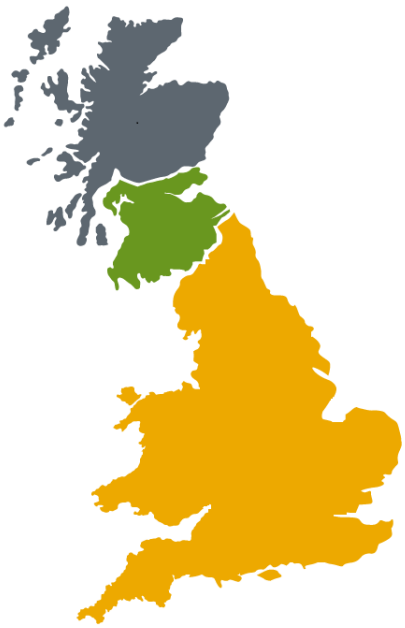
Zonal boundaries

1.14 Figure 1 illustrates the boundary and location of the regional electricity transmission owners (TOs), electricity DNOs and the gas GDNs, which are legacies from the pre-privatisation electricity and gas boards. National Grid Gas Transmission (NGGT) covers the whole of Great Britain. The electricity DNOs match the pre-privatisation regional electricity companies. The local distribution zones that make up the gas eight distribution networks largely match the pre-privatisation gas boards.

1.15 Table 1 lists the electricity DNO areas and their respective household numbers. Table 2 lists the gas GDNs and their respective numbers of customers (households and small non-domestic customers) who consume less than 73,200 kilowatt hours (kWh) per year.[12] This is the lowest category of consumption in gas distribution charges and is therefore the charge that reflects the vast majority of households.

1.16 Throughout this report, the regional data in charts and graphs are split by electricity DNO area, as this is the biggest level of regional disaggregation relevant for charging. The gas and electricity distribution network areas are not identical. For our analysis we have used the electricity DNO areas as the baseline areas for our comparisons and have superimposed the charges from the gas GDN area that most closely aligns with each DNO area. This means, however, that some households may experience gas charges that would be marginally higher or lower than this analysis illustrates if their gas GDN is not the same as assumed here.

[12] Gas GDN customers consuming less than 73,200 kWh/y are assumed to include almost all households but will also include many small non-household customers.



ELECTRICITY TRANSMISSION NETWORKS

- Scottish Hydro Electricity Transmission (SHE)
  SHE Transmission run the high voltage electricity network in the North of Scotland.
- Scottish Power Transmission (SPT)
  SPT run the high voltage electricity network in the South of Scotland.
- National Grid Electricity Transmission (NGET)
  NGET run the high voltage electricity network in England and Wales and is Britain's System Operator.

ELECTRICITY DISTRIBUTION NETWORKS

- Scottish and Southern Energy Power Distribution
  Run the low voltage electricity distribution network in the North of Scotland and South of England.
- SP Energy Networks
  Run the low voltage electricity distribution network in the South of Scotland and North Wales.
- Electricity North West
  Run the low voltage electricity distribution network in the North West.
- Northern Powergrid
  Run the low voltage electricity distribution network in the North East and Yorkshire.
- UK Power Networks
  Run the low voltage electricity distribution network in the East of England, London and South East.
- Western Power Distribution
  Run the low voltage electricity distribution network in the East and West Midlands, South Wales and South West of England.

GAS DISTRIBUTION NETWORKS

- Scotia Gas Networks (SGN)
  SGN run the gas distribution network in Scotland and the south of England, including south London.
- Northern Gas Networks (NGN)
  NGN run the gas distribution network the north of England.
- National Grid Gas (Distribution) (NGGD)
  NGGD run the gas distribution network in north London, central and north west England.
- Wales & West Utilities (WWU)
  WWU run the gas distribution network in Wales and the south west of England.

Figure 1 – Network zonal boundaries
Source: https://www.ofgem.gov.uk/network-regulation-riio-model/energy-network-how-it-works-you

Table 1 – Electricity DNO areas and household numbers[13]

Electricity DNO area	Households (million)	% of total households
North Scotland	0.7	3%
South Scotland	1.8	7%
North East England	1.5	5%
North West	2.2	8%
Yorkshire	2.1	8%
Merseyside and N Wales[14]	1.4	5%
East Midlands	2.4	9%
West Midlands	2.2	8%
Eastern England	3.3	12%
South Wales	1.0	4%
Southern England	2.8	10%
London	2.1	8%
South East England	2.1	8%
South West England	1.4	5%
Total	**27.0**	**100%**

Source: DNOs' CDCM[15] models 2015-16

[13] These include all households excluding those who use an IDNO for the 'last mile' of the network.
[14] Merseyside and North Wales refers to an area that includes Liverpool, Cheshire and North Wales. It is called 'Manweb' by Scottish Power.
[15] Common Distribution Charging Methodology

Table 2 – Gas GDN areas and customer numbers with consumption < 73,200 kWh/y

Gas GDN areas	Households and other customers < 73,200 kWh per year (million)	% of customers < 73,200 kWh per year
Scotland	1.7	8%
Northern England	2.7	12%
North West England	2.8	12%
West Midlands	2.1	9%
Wales and West	2.5	11%
East of England	4.3	19%
London	2.3	10%
Southern England	4.0	18%
Total	**22.4**	**100%**

Source: GDN supplied information (2014)

Network charges

1.17 This section describes, at a high level, how the different types of network charges are calculated and how they can vary across the regions.

Electricity

Transmission charges

1.18 Electricity transmission charges contain a locational element. This recognises that customers in different locations use different amounts of the transmission network, and therefore impose different costs on it. For example, customers located in areas where there is more demand than there is generation, such as in South East England, pay higher transmission charges for the energy they consume than those in areas where there is excess generation capacity, such as Scotland. This is because the electricity has to be transported over longer distances, using more of the transmission system, to reach them. Similarly, generators who only have to transport the electricity they generate over a short distance to reach customers will pay lower charges than those generators who are located a long way from them. This cost reflective approach is designed to promote efficient use of the network by larger users, for example, by providing a signal to generators that locating close to their customers requires less transmission network to be built.

1.19 National Grid Electricity Transmission (NGET) also recovers revenue for its role in balancing the electricity system (making sure that supply of electricity equals demand) through Balancing Services Use of System charges. These charges are paid by all suppliers and transmission-connected generators and do not vary by region.

Distribution charges

1.20 Electricity distribution charges are set at a level which allows electricity DNOs to recover the efficient costs of transporting electricity within each electricity DNO area. All electricity DNOs apply the same methodology to determine distribution charges. Households will have one of the following three types of network charges:

- **Domestic unrestricted**: the majority of households (83%) fall into this category. They are charged a single unit rate (p/kWh) for every unit of electricity consumed. In our analysis, we have assumed that this group of households are also connected to the gas network and use gas as their primary heating fuel.
- **Domestic 2 rate**: a significant proportion of households (16%) fall into this category. These households have meters that are capable of recording electricity consumption at different times of the day (normal consumption periods and off-peak periods). These households pay:
    - a 'rate 1' unit charge for electricity that is used during normal consumption periods and is set at a rate equal to or slightly higher than the 'domestic unrestricted' above; and
    - a 'rate 2' unit charge for electricity that is used during off-peak consumption periods and is set at a rate that is significantly lower than 'rate 1', reflecting the much lower costs off-peak consumption imposes on electricity DNOs.

  In our analysis, we have assumed that households that are not connected to the gas network and use electricity as their primary means of heating are included in this or the following category.
- **Domestic off-peak + related Meter Point Administration Number (MPAN):** a small number of households (less than 2%) have a primary meter and a separate meter for recording off-peak consumption only. For the purposes of our analysis we have assumed that these households' primary meters face unit rate charges similar to 'domestic unrestricted' charges. These households also pay a second unit charge for electricity used during the off-peak period. This unit charge is also significantly lower than the normal consumption unit charge.

  As with 'domestic 2 rate' above, we also assume that households that are not connected to the gas network and use electricity as their primary means of heating are included in this or the previous category of charge types.

1.21 Suppliers' categorisation of households does not necessarily match this electricity DNO categorisation. We have confined our analysis of supplier charges to single rate and Economy 7. For the purposes of our analysis we have assumed that those households charged on a single rate correspond to those with 'domestic

unrestricted' distribution network charges and Economy 7 to those with 'domestic 2 rate' charges.

Hydro Benefit Replacement Scheme[16] for North Scotland

1.22 This scheme involves the electricity DNO in the north of Scotland recovering less revenue from distribution charges from its customers with the gap funded by all suppliers across Great Britain. It is called the Hydro Benefit Replacement Scheme (HBRS). This scheme was introduced by Government in 2005.

1.23 Under the scheme, NGET charges all electricity suppliers a rate per kWh for every unit of electricity they sell throughout their Great Britain business. In 2015-16, the rate is 0.021649p/kWh and is expected to result in a total collection of approximately £57 million from all suppliers across Great Britain. This amount is then passed on to the North Scotland electricity DNO, Scottish Hydro Electric Power Distribution (SHEPD), which is part of SSE, to reduce the money it needs to collect from its customers.

1.24 The charge is imposed on all customers at the same rate, and the benefits are realised by all customers in the SHEPD electricity DNO area. For Great Britain's 27 million households, this charge equates to less than £1 per household per year and reduces distribution network charges for each of SHEPD's 0.7 million households by approximately £41[17] per year.

Gas

Transmission charges

1.25 NGGT's allowed revenue to cover maintenance and development costs is recovered from gas customers across Great Britain. Although there is a regional element, gas transmission charges form a very small part of a customer's bill. Our analysis suggests that suppliers may not be able to identify regional differences in gas transmission charges[18] and, as a result, any differences are probably absorbed by the suppliers and spread equally across their customers.

[16] The current scheme replaced the original Hydro Benefit, which was a provision to allow Scottish Hydro-Electric plc to cross-subsidise its transmission and distribution businesses from its generation business. It was commenced under a power in section 184 of the Energy Act 2004.
[17] The £41 reduction is derived from determining the total revenue expected from domestic network charges from the CDCM model with and without the HBRS subsidy and dividing by the total number of households. The value of the benefit for individual households will vary depending upon their actual consumption. For a typical 'single rate' household using 3100 kWh per year, the HBRS reduces charges by approximately £30 per year and for typical 'two rate' households the reduction is approximately £33 per year.
[18] The Great Britain gas trading market is liquid and allows the energy suppliers to build a portfolio of options to purchase the gas they need to meet the demand of their customers. This means that the gas

Distribution charges

1.26 The gas GDNs charge shippers gas distribution charges to recover their costs. These charges make up approximately 93% of Great Britain's total gas network charges.

1.27 A small number of customers (around 7,500) in Scotland and Wales are not connected to the national gas network but are connected to small gas networks known as Statutory Independent Undertakings (SIUs), which are operated by the gas GDNs. The cost of supplying and transporting gas to SIUs is approximately £12m per year and is spread across all Great Britain gas customers.

reaching a customer's premises does not necessarily come from a single source, but from a combination of sources, each facing a different set of transportation charges.

2. Impact of network charges on existing household bills

Approach to analysis

2.1. We used data from the largest six suppliers for our analysis.[19] This keeps the data manageable and we do not think this inhibits the analysis. Our analysis is based on supplier data for July 2015 unless otherwise stated, while network charge data come from the 2015-16 charging statements[20] and/or supporting models.

2.2. We have used the latest 'Typical domestic Consumption Values' that we developed for other purposes. These values assume that electricity consumption is 3,100 kWh for single rate households and 4,300 kWh for Economy 7 households. For gas the assumed value is 12,500 kWh. These are all Great Britain figures.

2.3. The typical Economy 7 consumption level is based upon the median consumption of all Economy 7 households. We recognise that many of these households do not necessarily use electricity for heating and could be connected to the gas network, use heating oil or some other means. Consequently, those households that do use electricity for heating may consume considerably more electricity than the 4,300 kWh per year that is typical for an Economy 7 household. Information provided to us from the Building Research Establishment, using the Government approved Standard Assessment Procedure (SAP) 2012[21] methodology, suggests that a two bedroom flat that uses electricity for heating would typically consume approximately 10,000 kWh per year for heating and lighting.

2.4. We focused on households in our analysis. Section 4 comments on the issues with extending this analysis to businesses and other non-domestic energy customers.

Regional differences in energy bills

2.5. Electricity and gas bills in Great Britain vary between regions, even for the same type of customer, with the same energy being used. The lowest annual bill[22] for a typical dual fuel (electricity and gas) household is £1,037 (East Midlands) and the highest is £1,090 (Merseyside and North Wales) with a weighted average of

[19] Our analysis has looked at the largest six suppliers often referred to as the 'big six'.
[20] Network companies produce charging statements which provide details of network charges for each year. These can be found on the network company websites.
[21] SAP 2012 is used for building regulation compliance for new dwellings in England (Part L) from 6 April 2014, in Wales (Part L) from 31 July 2014 and in Scotland (Section 6) from 1 October 2015. SAP 2012 is also used for Energy Performance Certificates.

£1,059.[23] These regional differences are not a 'surcharge' but in part reflect the different network costs in the region when shared out between customers consuming energy in in that area.

2.6. Public discussion on regional differences in energy bills has tended to focus on electricity distribution charges. These display the greatest regional differences but, as we explained in the previous section, there are also regional differences in other network charges. The regions with higher or lower charges are **not necessarily** the same for different network types. To an extent, regional differences in one charge type, for example, electricity transmission, can offset regional differences in other network charges, reducing the overall difference.

2.7. We examined the electricity and gas sectors separately and then consider their combined effect. We describe this in detail below. Our analysis reveals that regional variations in household bills are largely (but not exclusively) driven by regional variations in national and local network charges. This is more pronounced for electricity than for gas. Regional differences in energy bills that are not driven by network charges could be caused by a range of issues, including variations in costs that suppliers face in different regions. Market share and customer behaviour (for example, willingness to switch supplier) may also contribute to regional differences in supplier bills.

Impact of electricity network charges on household bills

Our analysis

2.8. We have broken down electricity bills into transmission network, distribution network, and supplier charges. Most households pay for their electricity on the basis of a single unit rate. Other households are on time-of-use (ToU) tariffs such as Economy 7. Figure 2 illustrates the regional breakdown of 'typical' bills for 'single rate' households across the largest six suppliers.

[22] North Scotland details include the impact of the HBRS other than in Section 4 where the HBRS is removed before the move to national network charges, though this has no effect on the overall findings.
[23] Where possible and appropriate we have applied weighted averages, either by consumption or household numbers as required.

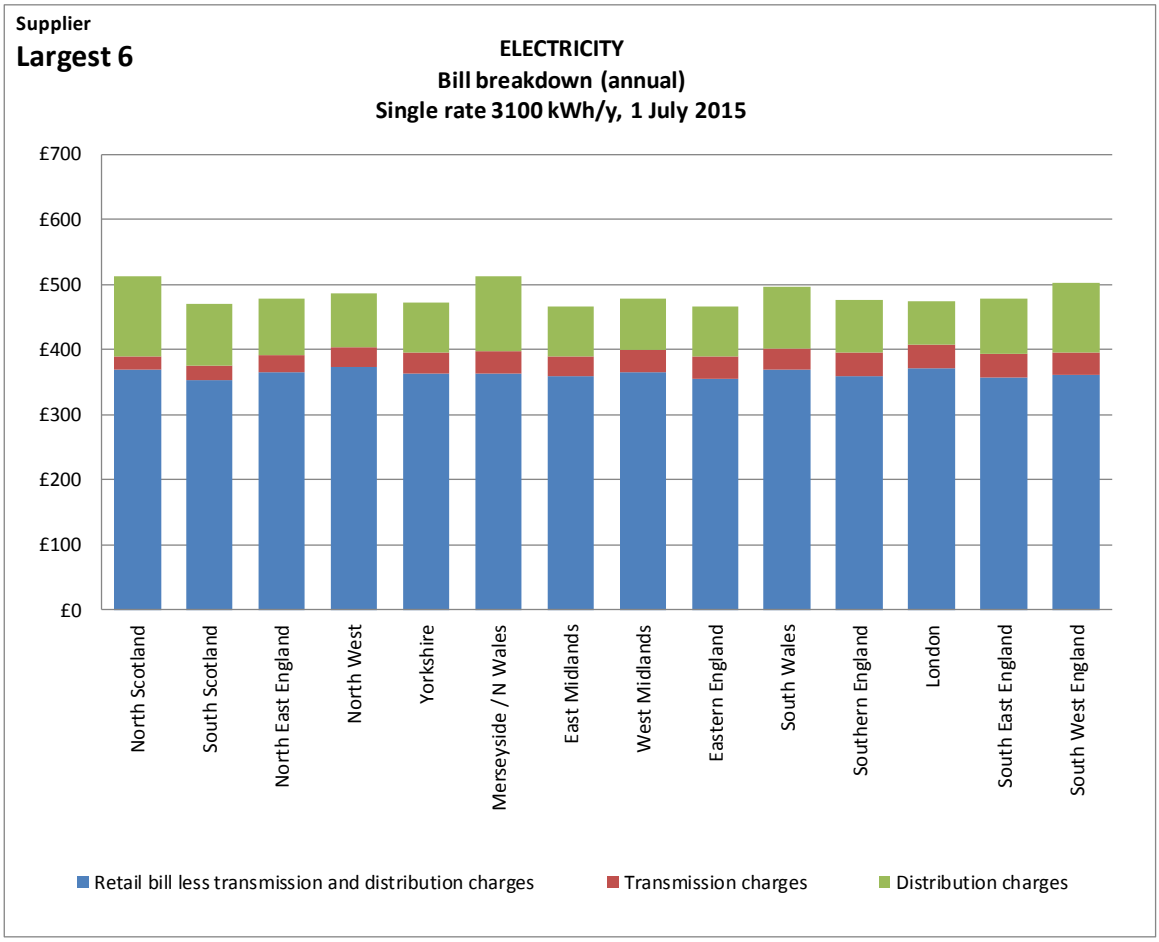


Figure 2 – Single tariff electricity bill breakdown

2.9. For typical Economy 7 households (4,300 kWh per year) the pattern is similar, although bills are marginally (13%) higher to reflect the additional level of consumption. This figure would likely be higher for most customers who use electricity as their primary source of heating.

Electricity transmission charges

2.10. These account for approximately 7% of a typical electricity bill (ex VAT). For 'typical' households on the single rate the electricity transmission component of their bills range from £21 per year in North Scotland to £37 in London and Southern England. The weighted average electricity transmission charge for these households is approximately £32 per year. For Economy 7 households, the electricity transmission charges are higher, with a weighted average of £46, reflecting this type of household's generally greater electricity consumption compared to a single rate household.

Electricity distribution charges

2.11. These account for approximately 18% of bills and, for a typical single rate household, they vary from approximately £66 per year (London) to £122 (North Scotland), with a weighted average of £85. For an Economy 7 household, the range of variation is wider, from £66 per year (London) to £135 (North Scotland). As noted, the range is likely to be higher for those households who use electricity as their primary source of heating.

2.12. The above assumes a Great Britain typical household usage level. We recognise, however, that average consumption in each electricity DNO area is not the same (Figure 3). For North Scotland, in particular, the average consumption levels for both households with single rate and ToU billing are significantly higher than elsewhere in Great Britain. Taking into account differences in average consumption between electricity DNO areas, combined electricity network (both transmission and distribution) charges for single rate households vary from £107 (London) to £169 (North Scotland). For Economy 7 they vary from £134 (East Midlands) to £244 (North Scotland).

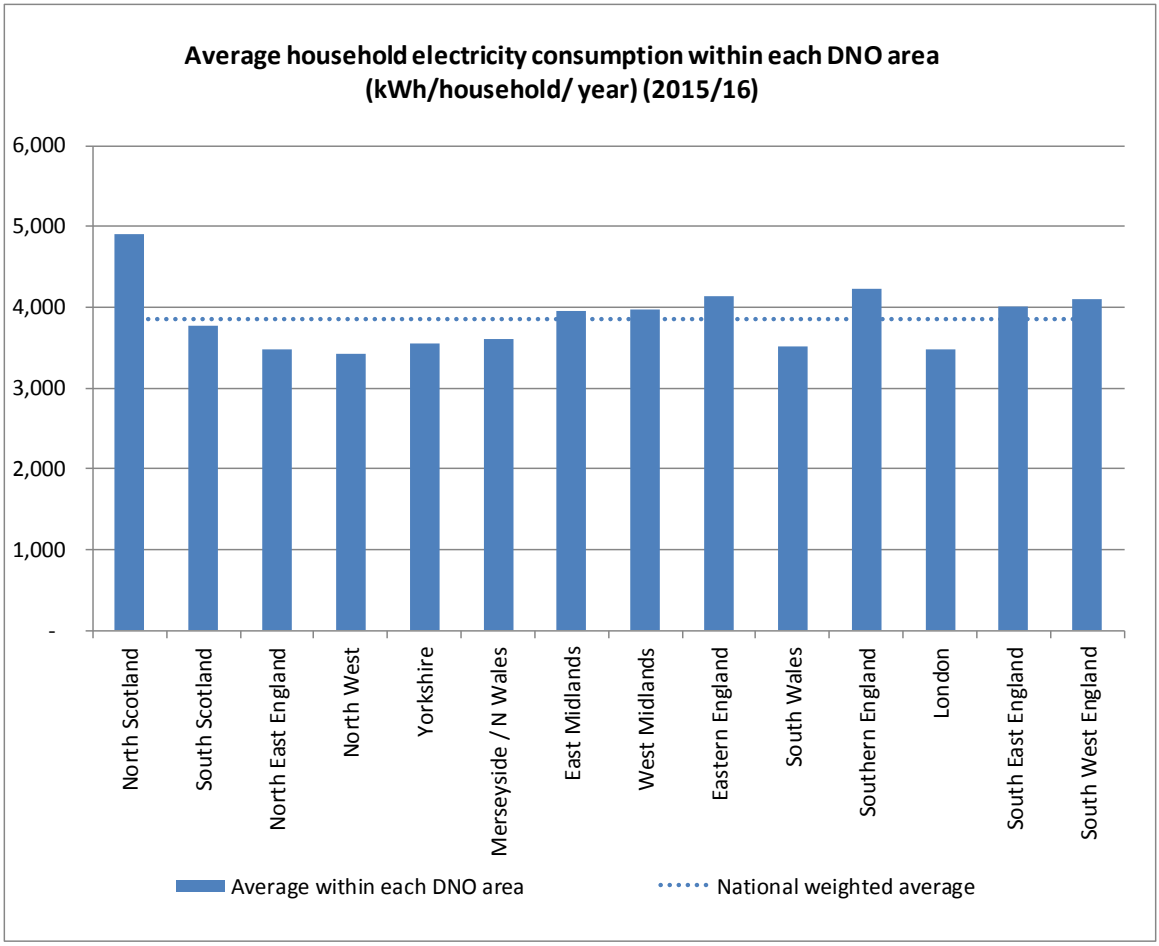


Figure 3 – Average domestic consumption across electricity DNO areas

Combined electricity results

2.13. There is a very strong relationship between bills and network charges by region, suggesting that this is a large component of the variations in bills. Figure 4 illustrates this for typical single rate household consumption for the largest six suppliers. Our analysis also shows that the relationship is approximately pound-for-pound, ie household bills rise or fall by approximately £1 for every £1 rise or fall in network charges.

2.14. Four electricity DNO areas – North Scotland, Merseyside and North Wales, South Wales and South West England – stand out as areas where both network charges and bills are highest.

2.15. When examined individually, five of the largest six suppliers show a similar pattern, with a close relationship between variation in bills and differences in network charges across regions. The average difference between the regional minimum and maximum retail bills for these five is approximately £57.

2.16. For typical Economy 7 households the pattern is similar, although the scale of differences between bills and network charges relative to their averages is greater. This is a result of the greater level of consumption.

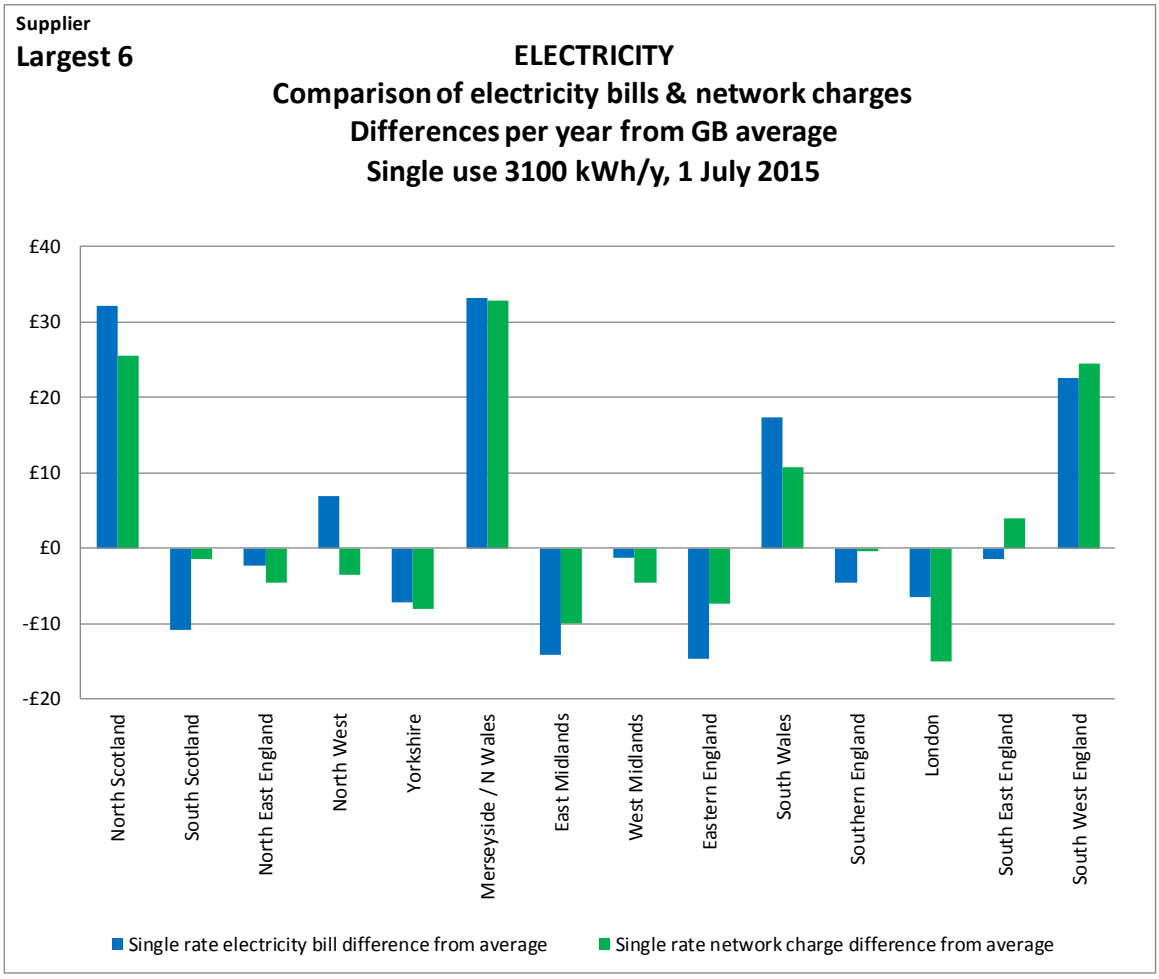


Figure 4 – Comparison of electricity bill and network charge differences from their respective GB averages

2.17. The regional profile of electricity distribution charges is that they are higher in North Scotland, Merseyside and North Wales, and South West England. Electricity transmission charges, on the other hand, tend to follow a pattern of increasing from north to south with the effect that they partially offset some of the regional differences in electricity distribution charges. This is especially so in North Scotland where typical single rate (domestic unrestricted) electricity distribution charges are £47 above the Great Britain average but electricity transmission charges there are £11 lower than average.

2.18. The patterns above can change over time. For example, NGET's estimate of transmission charges for 2016-17 shows an increase in charges for households, businesses and other customers in Scotland. These changes are due to changes in the balance of generation and demand which changes the locational signals for users of the network. This will result in the electricity transmission charges attributable to a typical single rate household in North Scotland increasing from £11 less than the Great Britain average in 2015-16 to approximately £4 less in 2016-17. The locational signals are dynamic and respond to changing patterns of generation and

demand on the network. Therefore, the regional patterns of electricity transmission charges could change in either direction. For example, the completion of the new transmission link between England and Scotland (the 'Western HVDC link') project in 2017-18 may reduce charges for household, businesses and other non-generation customers in Scotland compared to those in other areas.

2.19. **Conclusion:** In summary, our analysis supports the view that regional differences in electricity network charges are a principal driver of regional differences in electricity retail prices.

Impact of gas network charges on household bills

Our analysis

2.20. Gas distribution charges account for approximately 25% of total gas bills. For a 'typical' household, the distribution charge varies from approximately £125 per year (East Midlands) to £156 (London), with a weighted average of £137.

2.21. Figure 5 shows the regional breakdown of the largest six suppliers' gas bills by transmission network, distribution network, and supplier charges. As we note in Section 1, the regional differences gas transmission charge are so small that they are unlikely to be large enough to be reflected by suppliers in their bills.

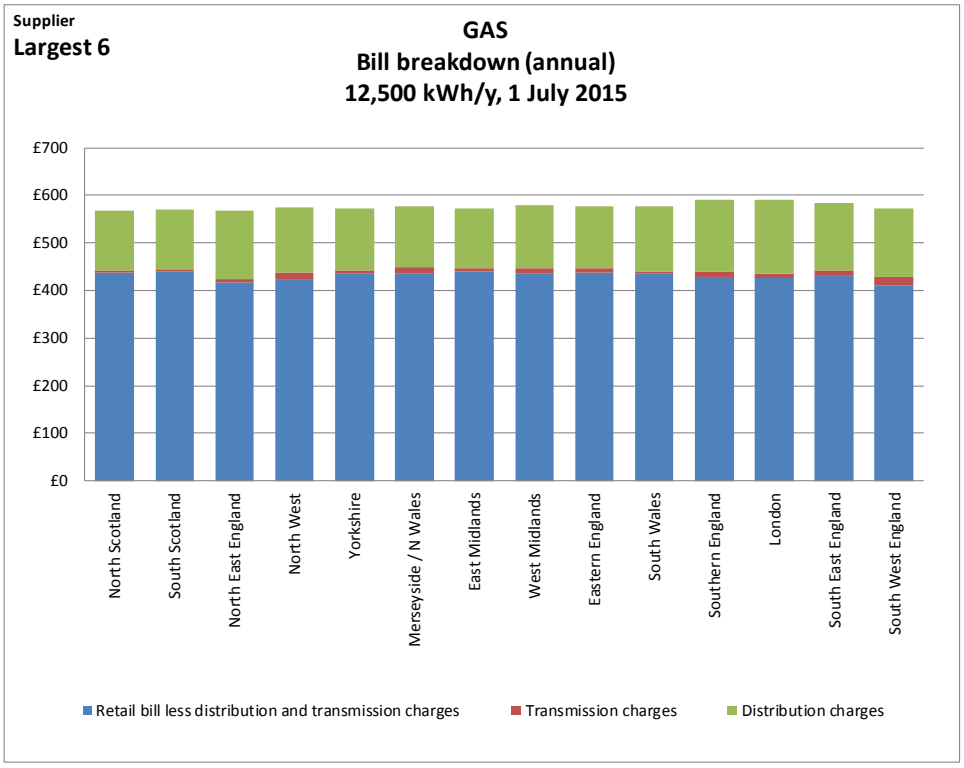


Figure 5 – Breakdown of typical gas bill

Combined gas results

2.22. For two of the largest six suppliers, bills for typical usage were identical regardless of region across Great Britain. We decided to remove them from our analysis and they are not reflected in Figure 6. This is so we could focus only on those whose charges vary and what drives those variations.

2.23. Our analysis reveals that there is a positive relationship between network charges and household bills, although the relationship is not pound-for-pound. Household bills rise or fall by approximately £0.58 for every £1 rise or fall in network charges. The relationship is not as strong as it is for electricity charges but is, nonetheless, statistically significant.[24]

[24] The 95% confidence criteria that there is a positive relationship between network charges and household bills are satisfied.

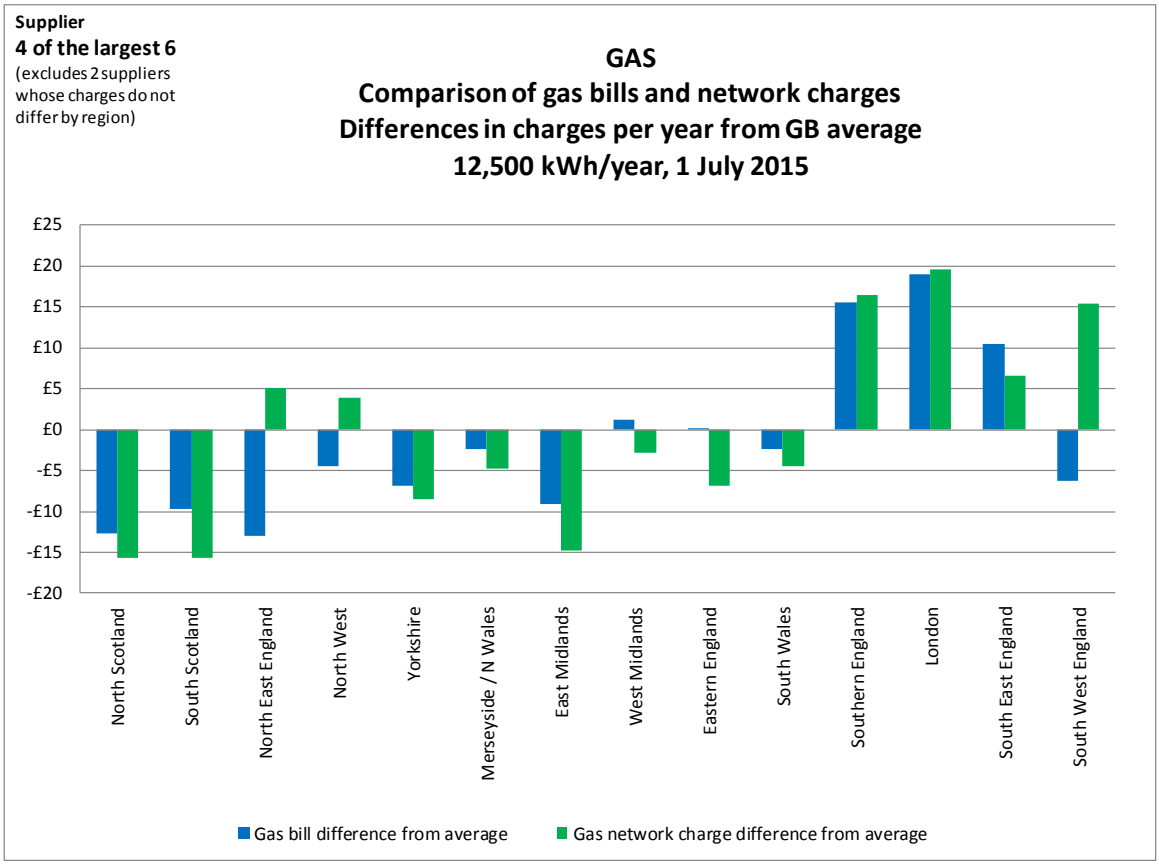


Figure 6 – Comparison of gas bill and network charge differences from their respective GB averages

2.24. Figure 6 shows supporting analysis comparing the regional differences in bills to the regional differences in network costs, by their respective weighted averages for each region. There is some degree of correlation; generally, in those areas where network charges are high, retail bills are also high. Two areas, North East and South West England, stand out as exceptions to this general observation, where network charge differences are significantly greater than retail bill differences.

2.25. **Conclusion:** In summary, our analysis supports the view that regional differences in network charges are a driver of regional differences in gas prices.

Supplier response to recent changes

2.26. The analysis above compared network charges set out in the 2015-16 charging statements to the supplier tariffs in place on 1 July 2015. The biggest change seen was on 1 April 2015 when new network charges for electricity distribution were applied as part of our RIIO price control for electricity distribution. These changes, alongside changes for electricity transmission are set out below in Table 3.

Table 3 – Changes in electricity network charges per typical household per year from 2014-15 to 2015-16

	Change in electricity network charges from 2014/15 to 2015/16 (£/household/y)					
	Single rate (3100 kWh/y)			Two rate (4300 kWh/y)		
Electricity DNO region	**Distribution**	**Transmission**	**Net change**	**Distribution**	**Transmission**	**Net change**
North Scotland	-18	7	-10	-28	10	-18
South Scotland	5	3	9	3	5	7
North East England	-18	4	-14	-20	5	-15
North West	-22	4	-19	-23	5	-18
Yorkshire	-10	7	-3	-16	9	-6
Merseyside / N Wales	-25	8	-17	-29	11	-18
East Midlands	-5	4	-1	-6	5	-1
West Midlands	-7	4	-3	-7	6	-2
Eastern England	-3	5	1	-4	6	2
South Wales	-27	6	-20	-26	9	-17
Southern England	-5	4	-1	-3	5	3
London	-15	5	-10	-18	7	-12
South East England	-10	3	-6	-12	5	-7
South West England	-16	3	-13	-18	4	-14
Weighted average	**-11**	**5**	**-7**	**-9**	**6**	**-3**

Net change may differ from addition of distribution and transmission charges due to rounding
Source: CDCM models and NGET charging statements

2.27. At the same time, **gas distribution** charges fell by approximately £4 per year for a typical household. Suppliers have introduced significant reductions in bills which far outweigh any reductions in gas network charges, reflecting the fact that such changes are primarily driven by other elements of the bill such as wholesale costs.

Distributional impact on different types of household customer

2.28. We wanted to understand whether the regional differences in network charges affect certain types of household customer disproportionately. This is particularly important in light of our statutory duties with regard to customers in vulnerable situations[25] and the aims of our Vulnerability Strategy.[26]

2.29. We commissioned the Centre for Sustainable Energy (CSE) to consider the distribution of household customers across Great Britain. CSE brought their

[25] In carrying out our duties we must have regard to the interests of consumers who are: of pensionable age; disabled; chronically sick; on low incomes; and living in rural areas. We are also able to take into account the needs of other consumer groups. We are further required to meet the general and specific duties placed on public sector bodies in the Equality Act 2010 and must have regard to Government's Social and Environmental Guidance. The latter includes that 'low income and vulnerable consumers are able to benefit from competition and are not unfairly disadvantaged by suppliers' pricing strategies'.
[26] https://www.ofgem.gov.uk/publications-and-updates/consumer-vulnerability-strategy-progress-report

expertise in this area together with public information to generate a rich set of maps and data looking at different measures of household customer. While some of this is included in this paper, we also plan to publish parts of this work on our website separately, as it will also inform future work to understand the distribution of different types of household customer across Great Britain.

2.30. CSE's analysis included the geographical spread of the following types of household or household customer with the following characteristics:

- households with children, including those under 5;
- those with occupants over the age 65; and
- customers with long-term health problems and disability.

2.31. Given the different fuel poverty definitions across Great Britain and the challenges of data availability at the level required, it was not possible to ascertain the impact of any move to national charging on fuel poverty per se. However, CSE's analysis considered:

- indices of deprivation;
- households in receipt of working age benefits; and
- tenure – which has links to trends in housing quality/energy efficiency, payment method, and fuel poverty.

Principal conclusion

2.32. There does not appear to be any clear justification for a national charge in terms of the regional concentration of vulnerability. Distribution regions represent large areas and the socio-demographics of the population in each region tend towards the Great Britain average. However there are some differences evident which are worth noting. Section 5 identifies large numbers of winners and losers from an illustrative move to national network charges. This would include customers in vulnerable situations being affected by bill increases while others see reductions.

2.33. The mean level of electricity use for heating across all areas in Great Britain is 9%. While all regions contain some areas with very high levels of electricity use for heating and some areas with none, there are substantially higher proportions in North Scotland (20%).

2.34. Those reliant on electricity as their primary heating source have typically much higher consumption and hence the impact of a national charge could be substantial. The map in Figure 7 illustrates the number of households using the units known as the 'Middle layer super output areas' (MSOAs)[27], geographic areas

[27] MSOAs are statistical geographic areas developed by the Office for National Statistics (ONS) which are used in England and Wales. The 7,201 SOAs in England and Wales have a minimum population of 5,000 people (or 2,000 households). Scotland uses a similar geographical breakdown as MSOAs, and these

broken down into small population groups, who use electricity for heating. This factor is particularly important because the main differences in network charges across regions (as shown in the analysis above) are driven by differences in electricity network (particularly electricity distribution) charges. This is also significant given the link between electricity for heating and deprivation. Households that use electricity for heating, while not always, tend to be of lower income.

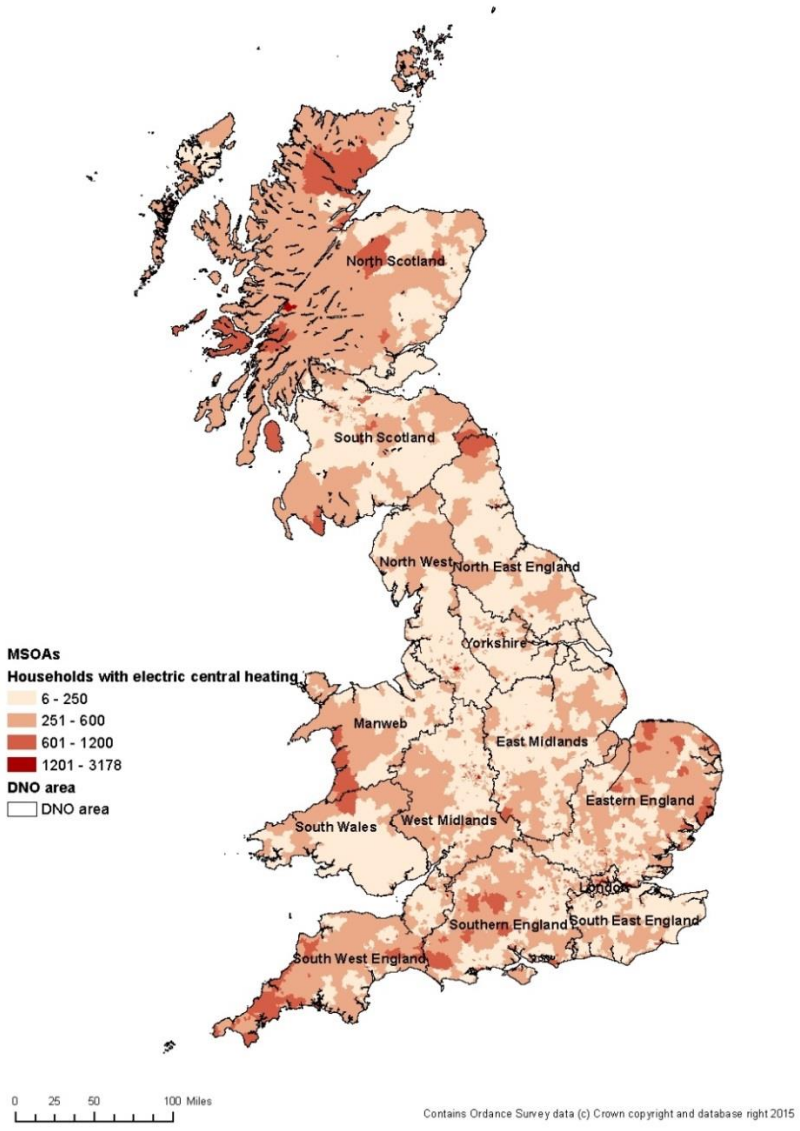


Figure 7 – Distribution of households using electricity or other non-gas materials for heating across GB DNO areas
Source: Centre for Sustainable Energy

Scottish areas are called Intermediate Geography Zones (IGZs). Compared to an MSOA, an IGZ is slightly smaller containing an average of around 4,000 people (with a minimum of 2,500 people).

2.35. The remainder of this section summarises some of the other findings. There is little difference between the regions in terms of overall vulnerability but the following variations are of interest for any future policy interventions:

- **Age** - London has a higher proportion (+6%) of those of working age, and a lower proportion (-7%) of adults aged over 65 compared to the GB average. North and South Scotland regions contain output areas with the highest level of adults over 65. The DNO area with the highest upper quartile of adults 65+ is the South West.
- **Long-term health problems or disability** – South Wales has the highest proportion (23%) of those who are either a little limited or highly limited in carrying out their daily activities due to health problems, compared to a mean level of 18% for GB as a whole. London has the lowest proportion of those who are either limited or highly limited. South Scotland has the highest proportion at a small area level, with some output areas consisting of 65-70% of highly limited residents.
- **Tenure** – London, followed by the Eastern region, has a noticeably higher proportion of both social and private-rented dwellings compared to other areas. This has implications for housing quality/energy efficiency and fuel poverty.
- **Working age benefits** – South Wales, North Wales/Cheshire and South Scotland are above average in terms of recipients of disability benefits, incapacity benefits, job seekers allowance, and the former two also for lone parents and carers' allowance. Areas with the highest proportion of income related benefits are slightly different, with the North East, Yorkshire and London featuring.

Conclusions

2.36. There does not appear to be any clear justification for national network charges in terms of the regional concentration of vulnerability. A move to national charging would result in both winners and losers among customers in vulnerable situations, including those on low incomes.

2.37. As recognised in our wider analysis, even after the reductions in charges as a result of our recent RIIO-ED1 review, North Scotland electricity distribution charges continue to be some of the highest. When combined with gas and electricity transmission charges, this difference narrows. This is also similar in South West England.

3. Arrangements in other countries

International comparison

3.1. This section considers the arrangements in a selection of European countries, including Ireland, France, Germany, Italy, some Scandinavian and Central and Eastern European countries, those from the Iberian Peninsula and the Benelux countries. In general, like us, they must comply with obligations such as those on cost reflectivity set out in European law. We have also looked at New Zealand and parts of Australia.

3.2. In some countries, electricity and gas network costs are recovered through network charges within the energy bill on a regional basis. Local (distribution) network costs in particular are recovered from customers in those areas (and therefore at a different level to equivalent customers in other areas served by alternative local distribution networks). Many countries like us have common rules for charges across different distribution network companies (same structure of charges) but have different level of charges across regions. In addition, like us, many use averaging within a distribution network area but have regional differences between different distribution network areas. A much smaller group of countries have, like us, regional elements in the recovery of electricity transmission charges from end (ie non-generator) customers. Other countries recover all the network costs on a national basis with charges averaged across regions to derive the network cost component of energy bills.

3.3. We consider the approaches by network sector. In doing so we do not consider the issues of definition, ie where different countries define transmission and distribution at different voltage (electricity) or pressure (gas) levels. The question we are asking is whether end customers pay different network charges depending on where they are located.

Electricity transmission

3.4. Transmission networks tend to be provided at a national level by a single company. Similar to those in Great Britain, there are national transmission charges payable by generators and other charges paid by end customers, which vary in level and approach even across Europe.

3.5. In several other countries transmission charges to generators include a regional element. For the network charge payable by end customers though, this is much rarer. Of the EU countries, Romania has a regional element. Also, in

Australia, large business and other non-domestic customers face regional elements to electricity transmission charges within their energy bills.

Electricity distribution

3.6. Some of the countries we looked at have a single company providing the electricity distribution networks, eg Republic of Ireland. In these instances, charges are generally uniform throughout the country. Where comparator countries have only one electricity distribution company (or sometimes one electricity network company), a single national charge is not really equivalent to the national network charges discussed in Sections 4 and 5 of this report, as the latter involves some form of averaging across a number of different network companies.

3.7. Some countries have a number of companies who are the equivalents to our electricity DNOs. For example in Italy, the companies are allowed to earn different revenues reflecting different regional circumstances but the households do not see this regional difference in the network part of their bills. Suppliers face a uniform network charge regardless of location. Final prices from suppliers to customers include this network charge embedded within the bills. Suppliers are allowed to charge different levels of network charge, including regionally, but have to show what degree of the network charge element is in the bill.

3.8. The electricity DNO equivalents in Italy receive different revenues but the uniform network charge is calculated so that in general the sum of the revenues and the amount raised in total by the electricity DNO equivalents is the same. There is a process called 'pereqazione' (broadly translated as equalisation), which provides for any differences between total revenue raised nationally from charges and the total revenue that should be earned by the electricity DNOs in total. This meets any gaps between the two monetary amounts in calculating the final revenues earned by the electricity DNOs.

3.9. Others with multiple electricity DNOs but a single level of charges (across regions for equivalent households) as well as structure of charges, include France.

3.10. Portugal has a common level of network charge but here 99% of the mainland supplies come from the main company.

3.11. Like Great Britain, other countries have a number of different DNOs and different charge components of the bill. For example, the Czech Republic has the same structure whereby the network charge element, ie the charging methodology across the different electricity DNO equivalents is the same, **but** the levels of network charge differ in different regions.

3.12. In Belgium the cost structure facing the particular company and its customer base means that it has different levels of network charges in bills. Norway is similar but has special provisions to harmonise neighbouring levels of the network charge parts of the bill where the same electricity DNO operates in neighbouring areas, eg after merger and acquisition activity.

3.13. In Sweden, electricity DNOs bill customers directly, rather than charging suppliers, although they charge on the basis of a supplier-centric model. At present their 170 electricity DNOs operate as in Great Britain with different levels of charge between the different areas but common terms within those areas. Finland and New Zealand also have similar arrangements.

3.14. Charges in Luxembourg are presently broadly the same as in these examples and in Great Britain. However, they are actively looking at a possible change to a uniform or national network charge for equivalent customer groups.

3.15. The Netherlands should probably be classed as following a hybrid approach. They have a number of electricity DNOs. They generally deal with their revenues together using a yardstick approach to calculate elements of that revenue, eg scope for efficiency. They are able to take into account specific costs that might be argued to be outside the electricity DNO's control. For example, this might include local taxation.

Gas transmission and distribution

3.16. There are many different frameworks for gas distribution charging. Some countries have a single company responsible for the provision and operation of the gas distribution networks (eg Republic of Ireland) and, as a result, distribution charges do not vary by location. At the other extreme there may be many local GDNs, eg Germany has 726, each with its own specific charges.

3.17. Outline descriptions of network structures and charging arrangements for a selection of countries follow:

- Ireland: Single network company is responsible for all gas networks. Uniform charges regardless of location with the only price difference being based upon gas consumption bands.
- Netherlands: Multiple gas GDNs. Charging structure the same across all GDNs but actual charges may vary to allow for regional cost differences.
- Poland: Multiple gas GDNs. Each GDN sets charges to meet its allowable costs although the charging structure and calculation methodology is common to all GDNs.

- Germany: Multiple gas GDNs (726) and each GDN charges different tariffs. There is no prescribed common methodology but the charges are to be determined in accordance with specified criteria, eg cost reflectivity, security of supply, non-discriminatory etc.
- Austria: 20 GDNs. Common structure of charges, different level of charges across gas GDN areas but common level within gas GDN areas for equivalent customers.

3.18. This small sample of international practice reveals that in general charges are set to recover costs by GDN. If a country's distribution networks are operated by a single company then charges will most probably be uniform regardless of location. Where there are multiple companies, charges will more than likely differ according to which company's service area the customer is located.

Conclusion

3.19. Our examination of charging arrangements in other countries has revealed examples of a number of different types of arrangements. Some approaches are the same as or similar to Great Britain's. Others are the same or similar to a national network charge approach, as illustrated in Sections 4 and 5. There are others that are different to both these approaches.

3.20. The review of these international cases does not reveal any justification for us to change from our current approach. Some countries experiences provide a practical guide on alternative approaches that are similar to the national network charges described in Sections 4 and 5 but this is often affected by geography or economic culture of the particular country.

4. Potential effect of national network charges on regulation and incentives

4.1. This section considers how the current regional differences in network charges work with our economic regulation of network companies. It then considers the effect of moving to national network charges. Section 5 illustrates the numerical impact of national network charges when compared to the present situation.

4.2. The existing charging arrangements go back to privatisation and indeed generally before this. Network charges are broadly cost-reflective, which is consistent with EU law. We describe the current approach as broadly cost reflective as purely cost reflective charges would logically reflect the costs imposed by every single entity at particular times. For example, the current approach does not reflect cost differences between urban and rural customers in the same electricity DNO area. Cost reflective charges means they reflect the costs that particular customers are causing or contributing to on the network. In principle, this provides signals to encourage customers to reduce their consumption at peak times in order to reduce their charges. This may also enable the network operators to delay or defer reinforcement, which could reduce future costs.

4.3. We recognise that, while these signals may be effective for industrial customers, for the vast majority of households such price signals do not yet exist and, even for those on ToU charges, their ability to respond to such signals is limited. This may change over time, however, with greater use of smart technology in people's homes.

4.4. In the following sections, we consider the potential effects of national network charges on regulation and incentives.

Incentive regulation

Price control regulation and business plan assessment

4.5. The electricity and gas network companies are essentially monopoly businesses. They are only subject to competition in a minority of their activities though we promote competition as a way of protecting consumers where we can. We therefore regulate the revenues that these companies then earn from customers through their network charges, to make sure they deliver for customers as efficiently as possible. This includes encouraging them to find greater efficiencies than we can identify and avoid anything that would push up costs unnecessarily. We have been

successful in this with the network cost part of the typical energy bill down 17% from 1990 levels.

4.6. Our process involves reviewing, together with customers and stakeholders, the companies' delivery and expenditure plans over a period of time into the future. Following this regulatory control process, we establish the framework for revenues including both the starting revenue and the way that this might change, based on performance that is better or worse than expected. We also set the outputs the companies must deliver for their customers.

4.7. This means that the network companies can achieve rewards for finding further efficiencies during the control period and face corresponding penalties where, instead of finding greater efficiencies, the companies spend more than the base level of revenue allowed. We also specify where revenue may need to be reconsidered because of uncertainty around a number of things. For example, the costs of a big project to be developed during the regulatory control period and other matters of general uncertainty like changes in cost of debt.

Stakeholder engagement and willingness to pay

4.8. For incentive regulation to work, it is important that the companies' customers (as well as its other stakeholders) have a role in influencing what the company is to deliver and other aspects of its business and expenditure plan. During the regulatory control period, customers responding to company performance can help make the financial and reputational incentives acting on the company as effective as possible. For example, this can be through satisfaction surveys or complaints which feed directly into the rewards earned or penalties faced.

4.9. Local costs paid by customers provide the regional network companies (electricity DNOs and gas GDNs) with a realistic assessment of customers' willingness to pay. For example, they can identify how much customers in their own area would be prepared to pay for undergrounding of electricity distribution assets, which has significant associated costs, thereby allowing the company to reflect the preferences in their local area. Without local charges, customers would not have a clear basis for challenging or engaging with their electricity DNO or gas GDN on their performance because they would be paying an equalised charge. The companies would continue to get the different revenues through some form of reallocation mechanism.

4.10. Under national network charges applied to households they would be further removed from the costs of the distribution companies in their area. While adjustments could be made to avoid completely removing this link between company and household, it could weaken the effectiveness of mechanisms encouraging improvements in efficiency and quality.

Quality of service

4.11. Paragraphs 4.18 – 4.22 describe possible mechanisms which would still allow charges to be re-allocated to provide each electricity DNO with the correct revenues. However, where companies fail to meet service standards or fail to invest adequately in their network, the current arrangements mean households in their respective areas see reductions in their bills, while with national network charges they would not. Equally it would be more difficult for households in a particular area to agree through the business plan process to pay higher prices for improved service as happened in our RIIO-ED1 price control. In either case the incentive rewards and penalties would not feed solely to households in that area.

Charging methodologies and key objectives

4.12. We set the network companies' revenues through the regulatory control process. We approve the charging methodologies used to recover these revenues, and we assess proposed changes to them. The network companies 'own' the charging methodologies. This means they have an obligation to review the methodologies and raise any changes to them they think will better meet key objectives specified in the network companies' licences. These licence obligations include whether the change in charges will improve cost reflectivity and/or promote competition. Our role, for all network charges, is to assess the changes recommended by industry against these objectives.

4.13. National network charges for households would be a major move away from some aspects of the current methodologies. It might also raise questions about some previous and potential future changes regarding the reasons for improving cost reflectivity in one element of the methodologies when we have removed a major element of cost reflectivity by introducing national network charges for households.

Competition effects

4.14. Despite network companies being essentially monopolies we have sought to promote competition where possible. Progress has been made for connection to the electricity and gas distribution networks. Independent Distribution Network Operators (IDNOs) and Independent Gas Transporters (IGTs) compete with incumbent electricity DNOs and gas GDNs to provide the 'last mile' of network between customers and the incumbent DNO/GDN. IDNOs and IGTs are prevented from charging households more than the incumbent DNO or GDN. In high network cost areas, where current charges may allow them to offer lower charges than the incumbent company, but still higher than a national network charge, a change to a national network charge could limit the scope for competition (just as it becomes easier for IDNOs and IGTs in areas of lower network cost). This problem could be

addressed through the clearing house mechanism described below in the consideration of mechanics but would add to the overall complexity of the system.

Market transparency

4.15. A single national approach to network charging for households is, by definition, less complicated than having different charges across network types and regions. It would make it much easier for retail suppliers to consider offering single Britain-wide tariffs. There are differing views on the merits of such a change and the contribution that simplifying network charges would have.

Flexibility and energy efficiency

4.16. The roll out of smart meters, smart grid technological developments and other demand side response developments means that customers are starting to gain access to more information about their actual energy usage. New retail tariffs based on the end-to-end costs of the energy system at different times of day are expected to develop.

4.17. As a part of this, there is the opportunity to drive more efficient use of energy networks with the potential for network cost savings by encouraging customers to reduce or move their consumption from times when the networks are constrained. Over time, as network reinforcement is deferred or no longer required, we expect that charges will fall.

Consideration of mechanics

4.18. This section considers how national network charges for households could be implemented for **electricity distribution charges only**. The methods described are not exhaustive, but this section:

- highlights the key processes that would need to be undertaken;
- provides an indicative guide to how they might be achieved; and
- gives an initial estimate of the range of costs that might be incurred.

4.19. A mechanism would need to be established to enable the movement of money between the different owners of the electricity DNO areas. There are two models that could be followed:

1) network companies arrange multilateral arrangements – electricity DNOs and gas GDNs exchanging monies between each other; or

2) a separate party (clearing house) coordinates reallocation of revenues between electricity DNOs.

4.20. Variations of these models are already being used in the way we regulate network companies:

1) the Low Carbon Networks Fund 2015 – electricity DNOs reallocated revenues between themselves; and

2) future Network Innovation Competition – National Grid reallocates revenues between the electricity DNOs and gas GDNs.

4.21. Any such mechanism would include movements of significant monies and the associated costs would need to include the cost of accurate settlement and dispute management as well as potentially compensation for the time value of money.[28]

4.22. The mechanics, including the costs involved, are unlikely to be a reason on their own to drive any decision to consider moving to national network charges. The existing HBRS costs around £100,000[29] to administer. This is a similar process to the clearing house model above but with only one destination for the money flows. NGET's Electricity Market Reform enabling role is much more involved than the role a clearing house would face here but its initial costs are likely to be significantly less than the £10m NGET requested ahead of our decision.[30]

Analysis of the Legal Framework

4.23. The framework of EU energy market legislation, known as the third package, establishes common rules to improve the functioning of the internal energy market. Governments and regulators across the EU, along with energy market participants are all bound by this legislation. The EU's energy policies are driven by three main objectives: security of supply, competitive environment and sustainable energy consumption. For the purposes of this paper, the relevant objective is to ensure energy providers operate in a competitive environment that ensures affordable prices for homes, businesses and industries.

4.24. The Directives which form part of this EU wide legislation require **non-discriminatory, cost reflective prices**. While this does not mean that charges necessarily have to reflect the fact that there are regional cost differences, charges are supposed to move in a cost reflective direction and should not cause distortions to the level of competition in markets that pay the charges.

4.25. Under UK law, we must act in accordance with our principal objective which is to exercise functions in a way which protects the interests of existing and future

[28] Interest earned or paid.
[29] Source: http://www2.nationalgrid.com/UK/Industry-information/System-charges/Electricity-transmission/Assistance-for-areas-with-high-distribution-costs/.
[30] https://www.ofgem.gov.uk/sites/default/files/docs/2015/09/decision_on_revenue_outputs_and_incentives_for_nget_plcs_roles_in_electricity_market_reform_0.pdf

consumers. Ofgem, as National Regulatory Authority for Great Britain, has to include in its consideration the interests of consumers relating to EU legislation. Wherever appropriate we also have to promote competition.

4.26. Equalising regional charges for households as opposed to businesses would have much less of an impact on these requirements. This is because, compared to businesses, they are less likely to react materially to electricity cost signals (although that situation is changing with changes in technology and available information).

4.27. There is an option under European law for member states to introduce a public service obligation (PSO). This may relate to security, including price of supply, and must be limited in time, subject to regular review, transparent, non-discriminatory and applied to a defined group of customers. Member States must also ensure that household customers, and where appropriate, small enterprises, enjoy universal service, i.e. the right to be supplied with electricity and of a specified quality at reasonable, comparable, transparent and non-discriminatory prices. The Directives allow Member States to take appropriate measures to protect final customers and make sure that there are safeguards to protect customers in a vulnerable situation, in particular taking measures to protect such customers in remote areas.

4.28. In summary, the move to national network charges is not prohibited. There is an expectation that any decision to follow this approach must be in a way which promotes competition, and must be non-discriminatory, transparent, and cost-reflective as far as possible. A proposal made to equalise regional network charges might involve justification at EU level. In certain circumstances, a Member State may consider that a public service obligation exists which would justify this action. In this case, it would have to notify the European Commission of the measures it proposed to take. If the Commission did not object, the Government and the regulator might amend legislation or licence obligations to bring about the change.

Wider non-energy implications

4.29. Energy is not the only sector which currently has variations in network costs in different regions operated by separate regional companies. A move to national network charges in energy could lead to the same questions in other regulated sectors. These issues are beyond the scope of this paper, but should be kept in mind when considering changes to energy network charges. Water network charges are different in different regions for example.

5. Illustration of the potential effect of national network charges

Introduction

5.1. In Section 4, we outlined the range of effects which could be expected from a move to national network charges. In this section, we identify the potential quantitative effect of such a change.

5.2. In this document, we are neither supporting nor opposing such an option. The illustration is to inform by providing relevant evidence. We examine the combined effects of national charges for electricity and gas, transmission and distribution. In doing this we remove the impact of the Hydro Benefit Replacement Scheme (HBRS), described in Section 1.22, before equalising the charges.

5.3. Our illustration of national network charges across Great Britain would mean households in some parts of Great Britain would pay more in order to reduce charges for households elsewhere. Given the nature of the policy issues raised, the Government would have to play a leading role in a decision to consider changing the current approach to an approach that introduces national network charges, as illustrated in the paper.

5.4. In this section, we consider typical consumption using a fixed level for all areas of Great Britain. This allows us to show the effect relatively simply. We also examine the impact of using average consumption in each electricity DNO area which can differ from the typical consumption level at a Great Britain-wide level. The average electricity consumption in each region is illustrated in Figure 3.

Rationale and assumptions

5.5. Our analysis is largely confined to an evaluation of the impact of national network charges on **households**.[31]

5.6. Our analysis in Section 2 identified the extent to which network charges are passed through supplier bills using typical household consumption values. We also recognised that average consumption differs across electricity DNO areas.

[31] We have examined the impact of equalising network charges for small non-domestic customers but we recognise that such an approach is significantly more complex than for households.

5.7. For the illustration in this section, we consider the different average consumption levels within each electricity DNO area:

- for electricity we have the data to identify household consumption levels across each electricity DNO area.
- we have not been able to separate household consumption from total consumption of gas for customers using less than 73,200 kWh.

5.8. Moving to national network charges for households means the HBRS in its current form can be removed because there would no longer be any benefit from it. This is because the benefit of the reduction in electricity distribution charges would be fully offset by the cost to fund the HBRS, which is recovered through National Grid. It should be noted that, although we have assumed the HBRS would cease because it would not have an impact on households, it would result in an increase in charges for non-domestic customers in North Scotland (without other changes).

Illustration of impact of combined national network charges

5.9. A decision to move to national network charges does not have to be confined to just electricity or gas but could include both. We have therefore considered the combined effects of equalising both gas and electricity network charges across regions. We assume that the majority of electricity household customers who are also on the gas network do not have electricity ToU tariffs and are single rate electricity customers. We do this because they are able to use gas for heating and therefore are less likely to benefit from the cheaper night time rate under two rate charges.

5.10. Gas charges, like electricity transmission charges, tend to increase from north to south and, when combined with electricity network charges, will reduce the degree of net changes in each electricity DNO area. Scotland and the North East of England face lower gas charges.

5.11. Figure 8 illustrates the change in charges for a typical household with both gas and electricity resulting from a change to national network charges from present arrangements. It is based on the typical domestic consumption values identified in section 2.2. The biggest beneficiaries of such a change would be households in South West England with a potential net annual reduction of £38 in network charges.

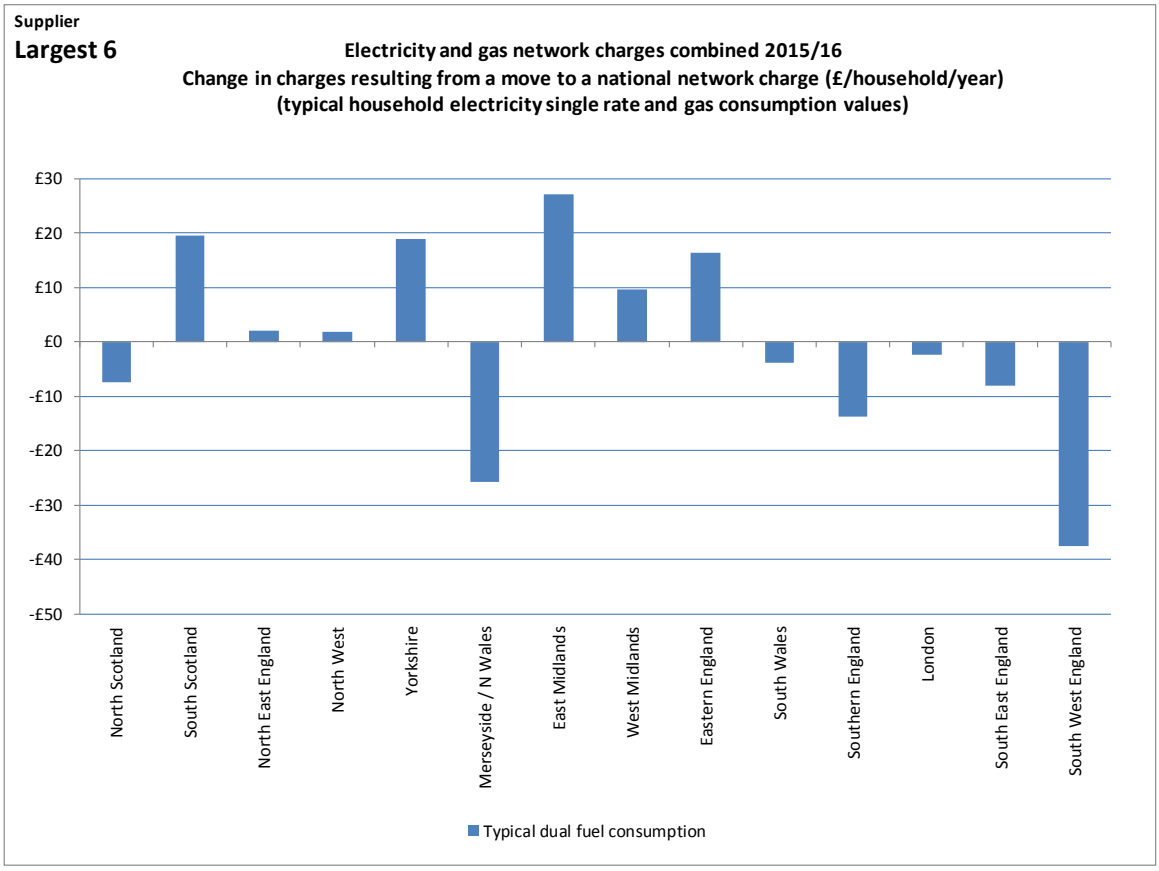


Figure 8 – Combined effects of a move to national network charges for electricity and gas networks

5.12. For a household in North Scotland that uses electricity as their principal means of heating (consuming around 10,000 kWh per year) the saving would be about £60. This is because of the net reduction in electricity network charges and the fact it will exclude the increase in gas network charges that dual fuel households would face.

5.13. The following sections show how the different network charges are derived and used in our combined analysis.

Our approach: electricity charges

5.14. The principal data sources for our analysis of national network charges for electricity are the NGET charging statements for electricity transmission charges and the electricity DNOs' charging models used to determine 2015-16 electricity distribution charges. These models include estimated household numbers and consumption levels for households on each type of charges, including details of ToU households.

5.15. Our analysis is based upon the following approach –

- The Great Britain total revenue recovered through each element of the network charges is fixed. For example, the sum of the revenues recovered from unit charges (single rate) across Great Britain is kept the same before and after any move to national network charges.
- The total revenue is determined from each domestic (household) charging element and divided by household numbers or consumption as appropriate to derive equalised fixed and unit rates.[32]
- These rates are used to examine the impacts on households for both typical Great Britain consumption and average consumption within each electricity DNO area.
- We have ignored any potential price elasticity of demand effects.[33]

Electricity transmission

5.16. Electricity charges are set as p/kWh of peak consumption. For calculating household charges, approximately 18% of demand is considered peak demand. We assume that all domestic demand, regardless of whether the household is on single rate or ToU tariffs, is factored by this amount in order to determine electricity transmission charges for the purpose of this illustration.

5.17. Figure 9 illustrates the impact of equalising electricity transmission charges for a typical single rate household. For most areas the change is small, less than or around £10 per year. Higher or lower consumption levels will result in higher or lower increases or decreases.

[32] For consumption and customer numbers we have used the estimated consumption levels and meter point administration numbers (used as a proxy for number of households) for each customer class as estimated in the electricity DNOs' CDCM models for 2015-16 charges.
[33] Price elasticity of demand is the effect of demand rising or falling in response to changes in price.

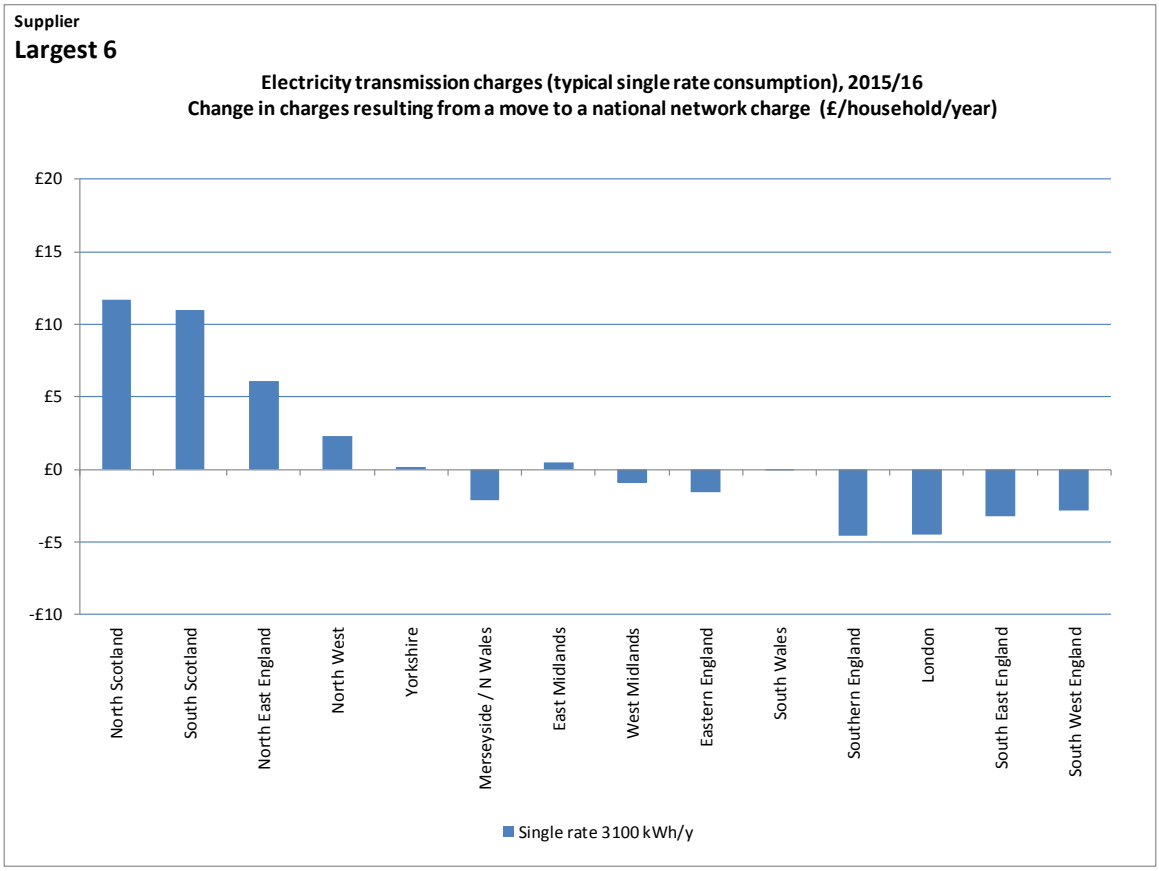


Figure 9 – Impact of a national network charging approach on electricity transmission charges

Electricity distribution

5.18. Electricity distribution charges are set at a level which allows the electricity DNO to recover the allowed revenue in each area. The charges for households comprise fixed charges (p/MPAN/day) and unit charges (p/kWh). The unit charges can be single rate or ToU (two rate charges or unrestricted + off-peak related MPAN). For the purposes of our analysis, we have assumed that the two rate distribution charges correspond to Economy 7 households.

5.19. Our method for analysing equalised charges for electricity distribution was to set each charging component equal to its respective weighted average across regions. The household numbers and projected consumption levels for this analysis are drawn from electricity DNOs' published CDCM models for the 2015-16 charging year. As noted above, we have assumed that, for equalised charges, the current HBRS would become redundant.[34]

[34] We recalculated the 2015-16 distribution charges for North Scotland on the basis of this cross subsidy benefit being removed. The resulting charges for North Scotland, together with the charges for the other 13 electricity DNO areas, are used to determine equalised distribution charges.

Figure 10 illustrates the potential impact of equalising electricity distribution charges for a typical single rate household. A move to a national network charging approach would produce an annual change of less than £20 per year (up or down) in electricity distribution charges in 10 of the electricity DNO areas. For three of the remaining four electricity DNO areas households in North Scotland, Merseyside/North Wales and South West England would experience reductions in charges of £36, £29 and £20 per year respectively. Those in London would experience an increase in charges of £21 per year. Typical Economy 7 households in North Scotland, Merseyside and North Wales, and South West England would face reductions of £52, £36 and £24 respectively with all other areas facing changes of less than £20 per year.

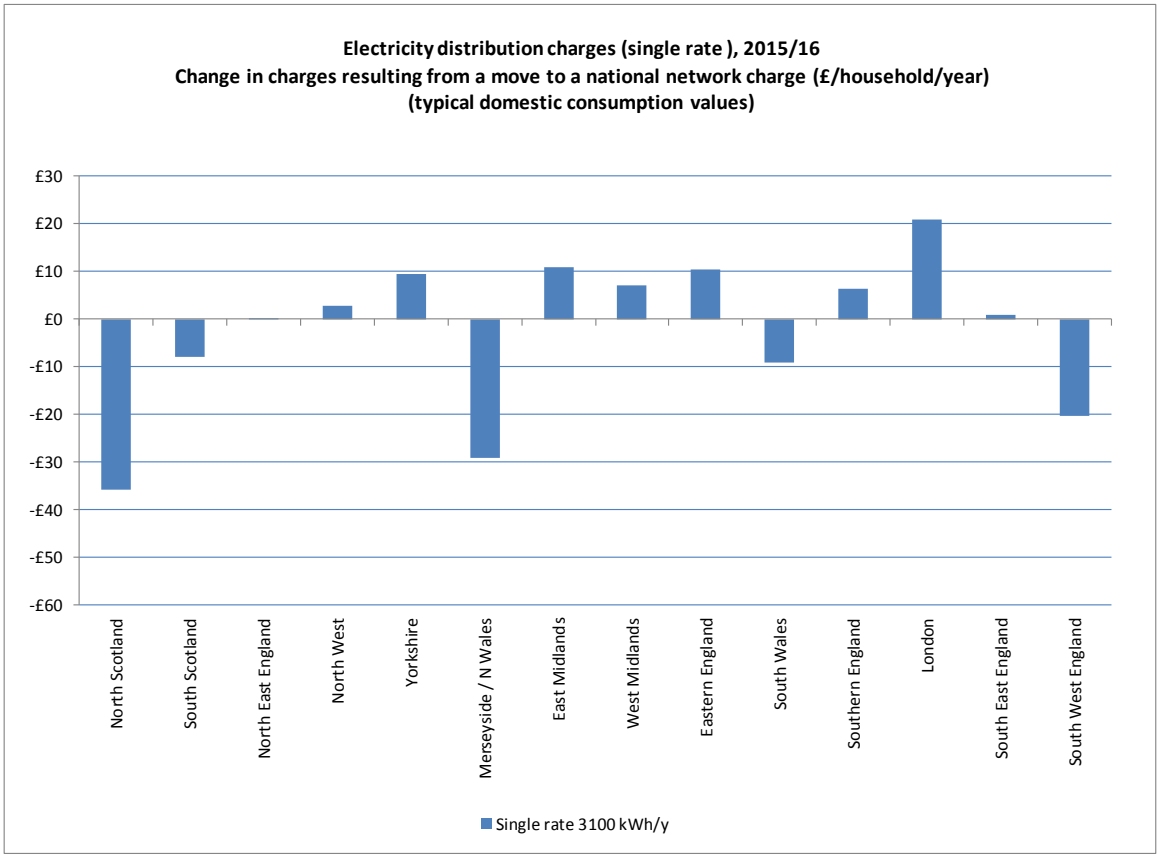


Figure 10 – Impact of a national network charging approach on electricity distribution charges

5.20. We also examined the effect of using the different average consumption levels in the different electricity DNO areas across Great Britain. On this basis, equalising electricity distribution charges would mean:

- households in North Scotland benefit the most with average annual reductions of £41, £81 and £83 per year across the three electricity distribution charge types (single rate, two rate and unrestricted + off-peak related MPAN households) respectively.

- there would be equivalent reductions of £32, £46 and £19 in the Merseyside and North Wales area across the three electricity distribution charge types.
- households in London would be most adversely affected with increases of £22, £20 and £58 across the three charge types.
- households in Eastern England would face increases of £13, £8 and £30 across the three types of charges.

5.21. Of particular note is the high proportion of households in Scotland that fall into the electricity DNO charges category of 'unrestricted + off-peak related MPAN' (48% of the Great Britain total). We assume these households are off gas grid and have this meter arrangement to benefit from significantly lower charges at night. There are 94,000 of these households in North Scotland (14% of North Scotland households) and 121,000 in South Scotland (7% of South Scotland households). Elsewhere, this category of household accounts for less than 2% of households in each electricity DNO region.

5.22. We have analysed the impact of moving to national network charges for these households. The impact is similar to those on the 2 rate distribution charging category. Because of the high concentration of these households in Scotland this change would to be like moving to a national network charge between North and South Scotland. Charges would decrease by £83 on average in the north and increase by £9 in the south. Although such households in London would experience the largest increase in charges, this category accounts for less than 1% (less than 14,000) of households in the London electricity DNO area.

Redistribution of monies

5.23. When considering electricity distribution alone, a redistribution of money would be needed between the 14 electricity DNO licensees, in order to maintain the revenues we set them in the regulatory control. We estimate the net financial transfers for each electricity DNO group to be as scheduled in Table 4. A net inflow means that for the electricity DNO to recover its allowed revenue after moving to a national network charge it would require additional money from the redistribution process. A net outflow means that after a move to a national network charge, a group's revenues would exceed its allowed revenue.

Table 4 – Expected financial transfers between DNO group companies from equalising electricity distribution charges

Company group	Net outflow	Net inflow
Electricity North West Limited		£4 million
Northern Powergrid	£22 million	
Scottish Power		£60 million
Scottish and Southern Energy		£42 million
UK Power Networks	£83 million	
Western Power Distribution	£0 million	

These estimated financial transfers exclude any associated transaction costs and interest earned or incurred.
These numbers are rounded to the nearest million.
WPD's net outflow would be less than £0.5 million.

Electricity transmission and distribution – the combined effect

5.24. The regional profile of electricity transmission charges is that they **generally** increase from north to south, whereas the opposite trend occurs for electricity distribution charges and therefore these charges offset each other to a degree. The combined impact means that overall effect of equalising electricity distribution charges would be less in many, though not all, of the regions.

5.25. Figure 11 illustrates the effects of combining equalised transmission and distribution charges for typical consumption levels for single rate and two rate households. Key findings are –

- For single rate typical households, the net change in charges (increases or decreases) would be less than £20 per year for 11 of the 14 electricity DNOs.
- The greatest reduction (£31 per year) would be in the Merseyside and North Wales area.
- The greatest increase in charges would be London (£17 per year) with East Midlands second highest (£11 per year).

5.26. For typical two rate households the pattern is similar, although the changes are marginally greater.

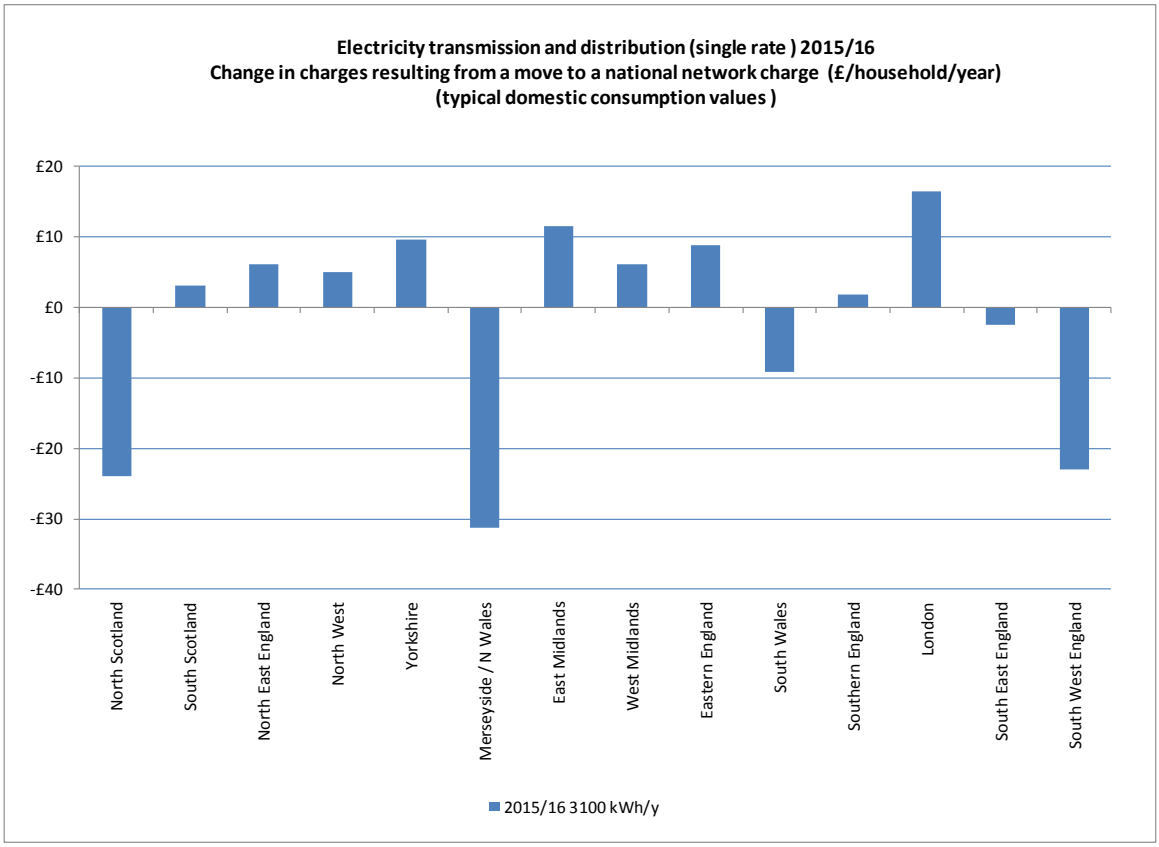


Figure 11 – Impact of a move to a national network charging approach on electricity transmission and distribution charges combined

Our approach: gas charges

Transmission and distribution

5.27. As noted in section 1, regional differences in gas transmission charges are so small that these are unlikely to be large enough to be reflected by suppliers in their bills and are effectively socialised. Therefore, we have just considered the combined effect of gas transmission and distribution.

5.28. We have estimated equalised charges as the weighted average (by household numbers) of network charges (transmission and distribution) incurred by a typical household in each area. This would result in gas network charges of £10 and £137 per year for transmission and distribution respectively. Figure 12 illustrates the change in these charges. Key findings are:

- If these charges were passed through to households, those in Scotland and East Midlands would experience an increase in their gas bills of approximately £16 per year.

- Those in Southern England, London and South West England, on the other hand, would see a reduction in their bills of £15 to £20 per year.
- For the remaining regions, the changes to their annual gas bills would be within £10 either way.

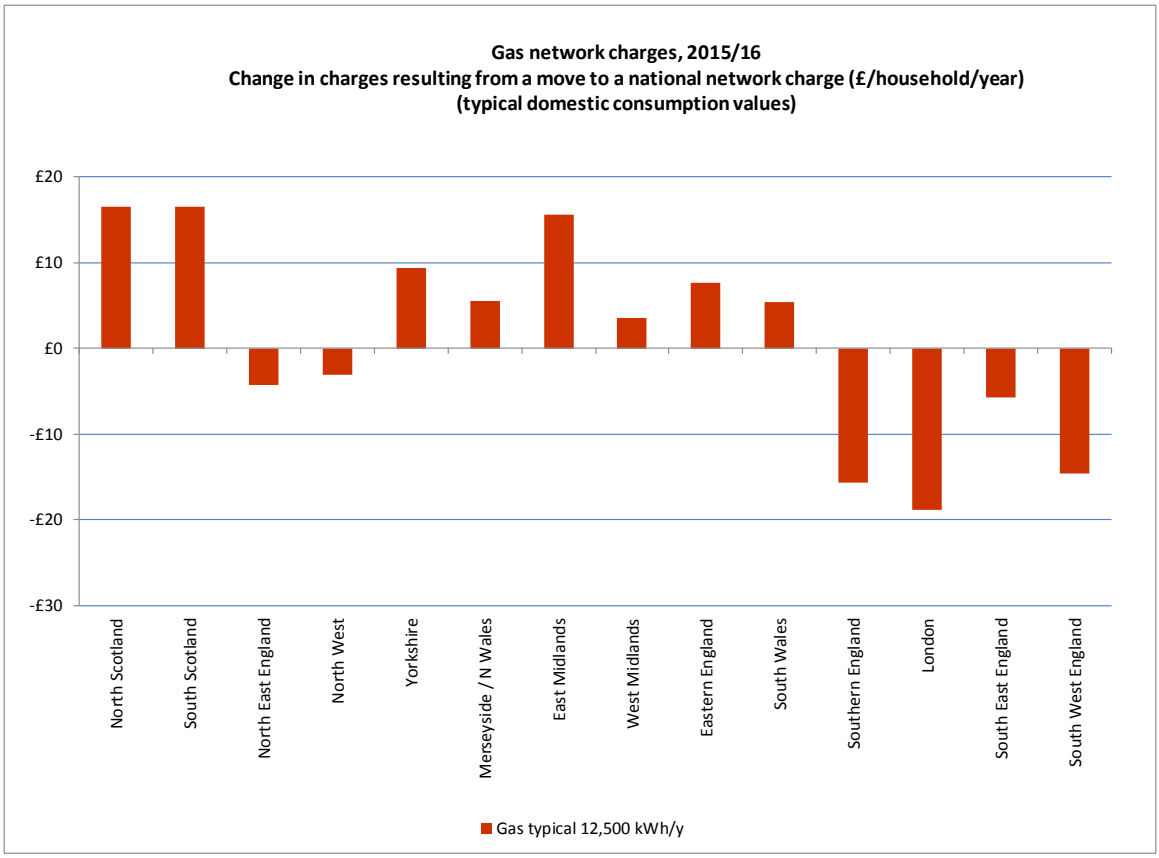


Figure 12 – Impact of a move to a national basis for network charging on gas network charges

Distributional impact

5.29. CSE's work on the distribution of particular types of household customer including customers in a vulnerable situation (described in Section 2) shows that there is no particular pattern to their distribution across the Great Britain electricity DNO regions. In general, we have identified no reason on a distributional basis as similar groups of household customers would face significant bill increases and bill decreases.

5.30. While this finding did not reflect the level of increase or reduction in charges for a given household, overall there would be around 16 million households facing higher bills and 11 million facing lower ones under this illustrative national network charging approach.

5.31. Households off the gas grid are in many cases using much more electricity (eg to provide heating) and are particularly affected by differing regional electricity distribution charges. This is an area that we are working on. On 30 September 2015, we announced more support for fuel poor households and customers in a vulnerable situation with changes to the Fuel Poor Network Extension Scheme. This involves reducing the number of households in fuel poverty by encouraging gas network companies to increase connections of eligible households in fuel poverty, where this is the best solution for them.[35]

Business and other non-domestic customers

5.32. We have examined the practicalities and potential impact of extending the concept of single national network charges to charges for non-domestic customers. The approach that we have applied to domestic charges (ie to equalise each charge component as a weighted average) can only be applied, at least for electricity distribution, to small and medium customers whose electricity charges are confined to fixed charges and unit charges (up to three rates). It would not be possible, without major changes to existing electricity distribution charging policy, to equalise the capacity charges faced by larger non-domestic customers.

5.33. Any changes would need to be thoroughly reviewed by all parties including consideration of the impact on different customers.

Endnote

5.34. This is a technical subject and our analysis has been necessarily based on assumptions in places. Nevertheless we hope that the information in this document will be helpful in understanding regional differences in network charges.

[35] See https://www.ofgem.gov.uk/sites/default/files/docs/2015/09/fpnes_3009_published_2_0.pdf.

Appendix 1 – Supporting data for graphs

	North Scotland	South Scotland	North East England	North West	Yorkshire	Merseyside / N Wales	East Midlands	West Midlands	Eastern England	South Wales	Southern England	London	South East England	South West England
Current bills and charges														
Electricity charges breakdown														
Typical single rate consumption (3100 kWh/y)														
Transmission charges	21	21	26	30	32	34	32	33	34	32	37	37	35	35
Distribution charges	122	95	87	84	77	116	76	80	76	96	80	66	86	107
Retail bill less network charges	369	354	365	373	364	363	359	366	356	370	359	372	358	361
Total	*512*	*469*	*478*	*487*	*473*	*514*	*466*	*479*	*466*	*498*	*476*	*474*	*479*	*503*
Typical Economy 7 consumption (4300 kWh/y)														
Transmission charges	29	30	36	42	45	48	44	46	47	45	51	51	49	49
Distribution charges	134	95	88	75	78	118	79	77	77	92	74	67	91	106
Retail bill less network charges	446	427	426	441	419	416	413	427	413	429	417	418	403	416
Total	*609*	*552*	*550*	*558*	*542*	*582*	*537*	*550*	*536*	*566*	*542*	*537*	*543*	*570*
Gas charges breakdown														
Typical gas consumption level (12,500 kWh/y)														
Transmission charges	5	5	6	14	7	14	7	10	7	6	12	10	11	17
Distribution charges	126	126	145	136	130	127	125	133	132	136	150	156	142	145
Retail bill less network charges	438	440	417	424	435	435	440	435	438	435	429	426	432	411
Total	*568*	*571*	*568*	*575*	*573*	*576*	*571*	*579*	*578*	*577*	*591*	*592*	*585*	*573*

Increase / or decrease in charges resulting from a move to national network charges														
Electricity														
Typical single rate consumption (3100 kWh/y)														
Transmission charges	12	11	6	2	0	-2	0	-1	-2	-0	-5	-4	-3	-3
Distribution charges	-36	-8	0	3	9	-29	11	7	10	-9	6	21	1	-20
Total	-24	3	6	5	10	-31	11	6	9	-9	2	17	-2	-23
Typical Economy 7 consumption (4300 kWh/y)														
Transmission charges	16	15	8	3	0	-3	1	-1	-2	-0	-6	-6	-4	-4
Distribution charges	-52	-19	-5	8	6	-36	10	6	6	-8	9	17	-5	-24
Total	-36	-4	3	11	7	-39	10	5	4	-8	3	10	-10	-28
Gas														
Typical gas consumption level (12,500 kWh/y)														
Distribution and transmission charges	16	16	-4	-3	9	6	16	4	8	5	-16	-19	-6	-15