State of the energy market

2018
REPORT

ofgem

Making a positive difference
for energy consumers

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Executive Summary

Energy is an essential service and the lifeblood of our economy. Questions about how energy is produced and supplied, and how affordable it is, are at the forefront of public debate. This report aims to contribute to the debate, by providing rigorous analysis of the current state of energy markets, and the outcomes they achieve.

Ofgem regulates Great Britain's gas and electricity markets, to protect the interests of current and future consumers. Through our regulation, we aim to deliver five outcomes for consumers:

Lower bills than would otherwise have been the case

Reduced environmental damage both now and in the future

Improved reliability and safety

Better quality of service, appropriate for an essential service

Benefits for society as a whole, including support for those struggling to pay their bills.

In this report, we assess how well energy markets are working for consumers in achieving these outcomes.

It is our second annual assessment of the state of energy markets in Great Britain. It focuses on developments in the energy markets over the past year.

British households and businesses spend around £50 billion on energy each year and their experience of the energy market is mainly via the retail side of the market. This is where trends elsewhere in the market will have their most immediate effects on consumers. For example, disruptive business models and innovative technologies, combined with environmental policies, are shaping the energy sector and feeding into consumers' energy bills.

There have been many positive developments in retail markets since we began implementing the remedies set out in 2016 by the Competition and Markets Authority (CMA). Consumers now have more suppliers and innovative deals to choose from than ever before, and it is becoming easier for consumers to switch tariffs and suppliers. However, the retail market is still not delivering the desired outcomes for all consumers.

This is why we extended the price protection, originally introduced for customers on prepayment meters, to a further one million vulnerable customers receiving the Warm Home Discount. In July 2018, Parliament mandated us to take further action by introducing a temporary price cap on all standard variable and default fixed-term tariffs. We are working to have the cap in place by the end of 2018.

Improving retail energy markets is only part of our focus. Britain's energy system is undergoing a profound transformation to meet our need for clean, secure and affordable energy. We aim to facilitate this transformation, and to ensure that all consumers benefit from it.

Retail markets – where homes and businesses buy energy

Consumers who shop around have more choice of suppliers than ever before but new suppliers are typically small in scale.
Active consumers can choose from 73 active licensed suppliers, 13 more than in 2017. Consumers can usually get a good deal by switching suppliers or tariffs. In June 2018, rolling annual household switching rates reached 18.4% for electricity and 19% for gas. However, only the traditional six largest energy suppliers have market shares above 5%, and 60 suppliers have market shares below 1%.

More than half of consumers are still on poor-value default tariffs.
Similar to last year, more than 60% of customers reported changing supplier only once or that they have never switched, and over half of customer accounts that do not currently qualify for price protection are still on expensive default tariffs. Around 54% were on default tariffs for more than three years. These customers are typically paying more than they need to for their energy. The difference between the average standard variable tariff (SVT) price of the six large suppliers and the cheapest market tariff was on average £320 between June 2017 and June 2018.

The safeguard tariff is protecting some of the most vulnerable customers from unjustified price increases, but there are still opportunities to switch to cheaper tariffs.
We have put in place a safeguard tariff that currently protects around 5 million customers from paying too much for their energy. Over 90% of prepayment meter (PPM) customers are on tariffs priced close to the cap, but there are still opportunities to switch to cheaper tariffs. As of 17 September 2018, the cheapest PPM tariff for a typical consumer was £984, which is £105 less than the safeguard tariff, and suppliers continue to offer smart pay-as-you-go tariffs, with easier access to top-up and emergency credit. However, PPM customers' engagement with the energy market remains below average.

The quality of customer service is variable across suppliers.
Customer service performance varies across suppliers, with variation in key quality indicators being especially high among small suppliers. While some small suppliers tend to outperform larger suppliers, others have not invested in customer service resources as they grow, leading to a decline in standards. There are some signs of overall improvement. For instance, customer satisfaction with complaint handling has increased significantly, from 27% in 2016 to 32% in 2018. However, customers rarely take unresolved complaints to the Energy Ombudsman.

Competition is working better in non-domestic markets, but small and micro businesses continue to pay much more on average for their energy than larger businesses.
Historically, non-domestic markets have had higher entry and exit rates than domestic markets, resulting in more rival suppliers of comparable size, and higher levels of engagement including switching. Large industrial customers can often negotiate deals directly with suppliers, and some can earn revenue by selling flexibility services into the balancing and capacity markets. On the other hand, a significant minority of microbusinesses (24% in gas and 27% in electricity) are on poor-value default and deemed contracts. In Q1 2018, microbusinesses on deemed contracts paid around twice as much for each unit of gas consumed and 70% more for each unit of electricity consumed, compared to microbusinesses on negotiated contracts.

Wholesale markets – where gas and electricity are bought and sold

Competition in the gas and electricity wholesale markets is working reasonably well.
The GB wholesale gas market has many different sources of gas supply. In addition to the production from the UK Continental Shelf, there are a large number of gas importers. This means that no single firm has significant power to dictate market prices. With a high degree of market liquidity, buyers and sellers can trade easily and with confidence that prices, which are around the European average, reflect underlying supply and demand.

Competition in the wholesale electricity market continues to improve as market concentration (the extent to which the market is dominated by a small number of firms) has fallen further. Liquidity in GB is greater than or in line with that of other European power markets except for Germany, and the generation mix is diverse, with cost-efficient deployment of sources. GB wholesale electricity prices are broadly cost-reflective – although they are higher than in most other European countries, mainly due to different policy choices around decarbonisation.

Affordability and vulnerability – managing price and consumption

Households, on average, spent less of their budget on energy bills in 2016-17 than in previous years.
Across 2016-17, energy bills accounted for 4.0% of total expenditure for the average household, compared to 4.4% the previous year. For the lowest-income households, the proportion spent on energy is twice as much, but fell by 1.3 percentage points since 2015-16. This improvement was primarily driven by lower energy consumption. However, recent energy price rises are likely to increase bills.

Private renters in England are consistently more likely to be in fuel poverty than other types of households.
19.4% of private renters in England are in fuel poverty, compared to an overall average of 11.1%. The higher rate of fuel poverty in the private rented sector compared to the social sector is partly driven by the relative energy performance of homes in each market. In 2016, 7% of privately rented homes were rated F or G (i.e. of lowest energy efficiency), compared to just 1% in the social sector. In Scotland, social renters are more likely to be in fuel poverty than private renters, although this may be because of a different definition of fuel poverty.

Consumers in vulnerable circumstances are less likely to engage in the market for a better deal.
Although there have been improvements in affordability, many vulnerable consumers are still paying more than they need to for their energy. In 2018, 41% of respondents to our annual Consumer Engagement Survey said they had engaged in the market to some degree. The proportion was lower for some groups of consumers who are at greater risk of being vulnerable. For instance, only 32% of social renters had engaged with the market, as had 32% of households using prepayment meters.

Suppliers are doing better in supporting consumers who are in vulnerable situations, but there is room for further improvement.

Suppliers provided over 1.5 million Priority Services Register services to vulnerable consumers in 2017, up around 25% since 2016. Disconnections are now extremely unusual. In 2017, there were only 17 disconnections across both fuels, down 92% from the previous year, with 13 in England and 4 in Wales. Suppliers have been less proactive in re-engaging with customers that are in arrears with their bills. Although the number of customers in debt in 2017 to their electricity and gas supplier has remained stable at 1.2 million and 1 million respectively, the proportion with a repayment plan agreed has fallen from 60% to 53%.

Decarbonisation of energy – moving to a low carbon economy

Government policies have been the main driver of the UK's progress towards meeting its legislated decarbonisation targets.
Between 2018 and 2022, the UK is committed to emitting no more than 2,544 million tonnes of carbon dioxide across all sectors of the economy, and has made progress towards this target. Between 2010 and 2017, the majority of the reductions in carbon emissions came from the power sector, particularly due to the falling carbon intensity of electricity generation. There has been limited or no progress in other sectors. Between 2010 and 2017, without key decarbonisation policies we estimate the GB electricity sector would have emitted an additional 520 million tonnes of carbon dioxide, about 65 million tonnes per year.

The carbon price has proved particularly effective in reducing emissions and delivering value for money.
The majority of the estimated £39 billion that households spent on decarbonisation policies between 2010 and 2017 was targeted at the electricity sector. The single biggest contributor to emission reductions was the carbon price, accounting for around half of the reductions. We estimate that the net cost to consumers of the carbon price was around £27 for each tonne of carbon dioxide emissions it saved. Other policies were significantly more expensive. For instance, subsidies to large-scale renewables cost about £101 per tonne of carbon dioxide, while subsidies to small-scale renewables cost about £315.

Gaps remain in the government's plans to meet decarbonisation commitments.
The Committee on Climate Change's assessment suggests that the UK is not on course to meet its legally binding carbon budgets from 2023, even if the current set of policies and those that are part of the new Clean Growth Strategy are fully implemented. Meeting the challenge of future carbon targets is likely to require additional policy interventions, including to stimulate further decarbonisation of heat and electricity.

Security of supply – keeping the lights and heating on

The GB gas market responded well to the record high demand during the 'Beast from the East' extreme weather event.
The GB gas market was significantly tested for the first time since 2010 during the cold weather period that was named the 'Beast from the East'. The low temperatures led to gas demand that was above 400 million cubic meters per day, for the first time since 2012. On 1 March 2018, National Grid issued a Gas Deficit Warning, the first gas market warning since the six Gas Balancing Alerts in 2010, and made several purchases to signal shippers to increase flows. After a sluggish start, supplies responded and balanced

the market by the end of the day. The market response came from liquefied natural gas, interconnectors and reduced demand from gas-fired power stations. Despite the closure of Rough, the country's largest gas storage facility, GB still retains a diverse mix of supplies facilitating both flexibility and security of supply.

The GB electricity market is changing but remains resilient.
2017/18 was the Capacity Market's first full year of operation. There were higher daily margins between demand and supply this winter than in 2016/17, suggesting that the Capacity Market has been effective so far in stimulating capacity investment. Cash-out prices, the charges incurred by market participants if they generate or consume more or less electricity than contracted, were also lower and more stable than in the previous year. At just under £980 million, National Grid's 2017-18 system balancing costs were higher than in most previous years, but were significantly below the 2016-17 record of around £1.1 billion.

Key facts on Competition

Competition has brought more choice than ever before to active consumers, while the less engaged are still on more expensive default tariffs.

73 The number of active licensed suppliers in June 2018 (last year: 60)

£320 The approximate amount consumers on a Standard Variable Tariff could save by switching to the cheapest tariff in the market (last year: £300)

54% The proportion of consumers on a default tariff, not including prepayments meter tariffs (last year: 57%)

19% The proportion of consumers switching supplier between July 2017 and June 2018 (last year: 17%)

61% The proportion of consumers who reported they have never switched, or have only switched once (last year: 58%)

Key facts on Affordability and vulnerable consumers

Low-income households spend less on energy bills, but consumers in vulnerable circumstances remain less engaged on average.

£1,117 The average dual fuel bill for a customer of the six largest suppliers in 2017: a fall in real terms of £52 from 2016

8% The proportion of total expenditure that low-income households spent on energy in 2016-17 (last year: 10%)

19% The proportion of households in England living in privately rented homes that are identified as being fuel poor, compared with just 11% of all English households

2% The proportion of customers repaying a debt for both fuels in England, Scotland and Wales

17 The number of disconnections in Great Britain in 2017 (last year: 210)

17% The reduction in household energy consumption over the last 15 years, after adjusting for changes in temperature

6 million The number of electricity customers on the Priority Services Register, a 36% increase from last year (4.4 million). The equivalent figure for gas is 4.8 million, up by 30% since last year (3.7 million)

Key facts on Decarbonisation of energy

The UK is on track to meet current carbon reduction targets but more work is needed to decarbonise key sectors such as heat and transport.

61% The percentage of carbon emissions reduction between 2010 and 2017 attributed to the power sector

0% The percentage of carbon emissions reduction between 2010 and 2017 attributed to the transport sector

£62 An estimate of the value that the Government places on reducing carbon dioxide emissions by 1 tonne

£27 The estimated consumer cost of the carbon price policy, per tonne of carbon dioxide emissions saved

£315 The estimated consumer cost of subsidies to small scale renewables, per tonne of carbon dioxide emissions saved

520 million tonnes The estimated amount of carbon dioxide saved by selected decarbonisation policies between 2010 and 2017

Key facts on Security of supply

GB electricity and gas systems have proven to be resilient, with sufficient capacity to meet demand.

0 The number of times gas deficit emergency measures have been deployed this century

1 The number of Gas Deficit Warnings issued in 2018, the first gas warning since 2010

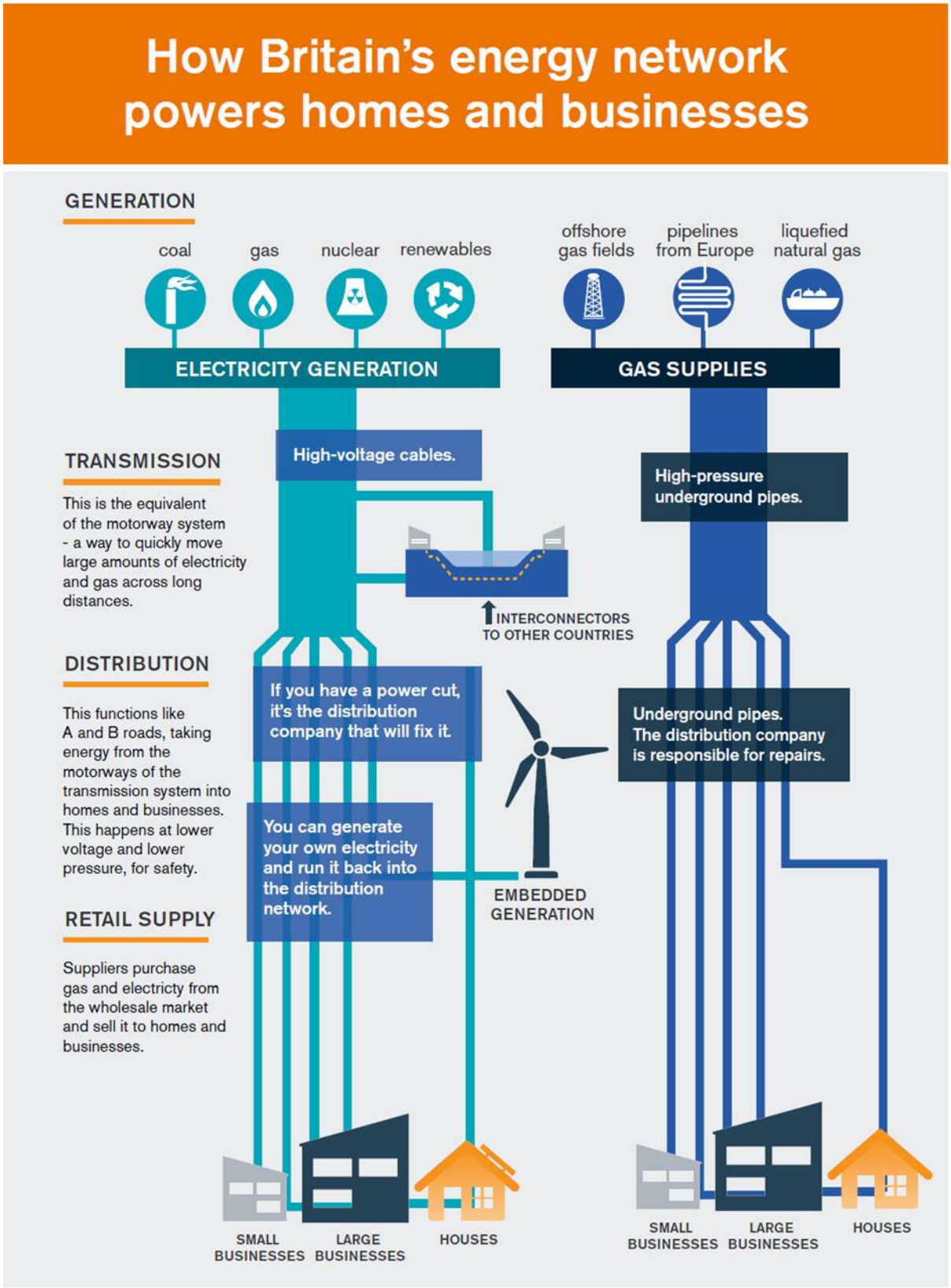
418 million cubic meters The highest level of daily gas demand in 2017/18, the highest since the record of 474 million cubic meters reached in 2010

1.5GW National Grid's average over-estimate of winter peak demand on the transmission system since 2010-11

£980 million National Grid system balancing costs in 2017/18, down from around £1.1 billion in 2016/17

Chapter 1: Introduction

Figure 1.1: Britain's energy network



How the energy system works

The energy system is critical to the UK economy. It supplies electricity and gas to the vast majority of households and commercial premises in the country. There are three elements to supplying energy to homes and businesses in GB (see Figure 1.1):

- generating electricity and producing gas (wholesale markets);
- transporting them through the 272,000 km of gas pipelines and 1 million km of electricity cabling (networks); and
- selling them to homes and businesses (retail markets).

Ofgem regulates each of these elements. Energy companies can operate in any of these areas and some have a presence across all three. The six largest firms in the GB energy markets are Centrica, EDF, E.ON, npower, ScottishPower and SSE.[1] They are the former monopoly suppliers of gas and electricity to GB consumers. Each of them generates electricity and retails both electricity and gas. Centrica is also involved in gas production.

The regulatory and policy framework

Ofgem's principal objective is to protect the interests of existing and future consumers. Ofgem must also have regard to the interests of individuals who are disabled or chronically sick, of pensionable age, with low incomes or residing in rural areas.

Ofgem protects the interests of consumers in a variety of ways, including:

- promoting value for money;
- promoting security of supply and sustainability, for present and future generations of consumers, domestic and industrial users;
- supervising and developing markets and competition; and
- regulating the delivery of government schemes.

Ofgem is independent of government and carries out its duties within the policy framework established by the UK Parliament and the European Union (EU).[2] The Department for Business, Energy and Industrial Strategy (BEIS) is responsible for setting and developing energy policy. Energy policy as a whole is reserved to the UK government, but the Welsh and Scottish governments play important roles in several areas, such as energy efficiency and fuel poverty. EU law also has a significant impact on the UK energy sector.

In the Climate Change Act 2008, the UK committed to reducing its greenhouse gas emissions to 20% of 1990 levels by 2050. The independent Committee on Climate Change monitors progress in reducing emissions and reports annually to Parliament. The Energy Act 2013 established the two main mechanisms through which the government aims to ensure secure, affordable and clean electricity supplies:

- Contracts for Difference incentivise investment in low-carbon electricity generation; and

[1] This excludes firms whose main business is in transmission or distribution networks, such as National Grid.
[2] Ofgem regulates the energy sector in GB. The Northern Ireland Utility Regulator regulates the energy sector in Northern Ireland.

- the Capacity Market aims to encourage the availability of sufficient reliable electricity generating capacity.

The cost of energy is a concern for many consumers

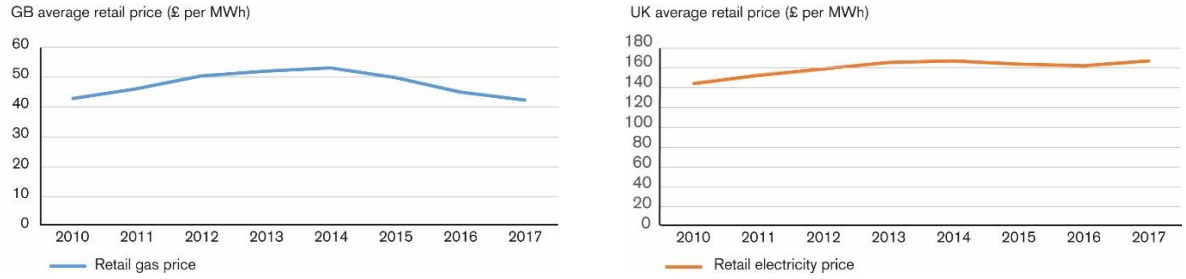
Energy accounts for a greater proportion of household expenditure than it did a decade ago. In 2016-17, it accounted for 4.0% of UK households' total expenditure, up from 3.5% in 2006, although the level has fallen from the peak of 5.1% in 2013.[3] Although most consumers do not report being worried about meeting the cost of their energy, about 30% say they are very or fairly worried about paying for their bills.[4]

Energy bills for gas and electricity are made up of two components – prices and consumption. For a given level of consumption, rising prices will result in an increase in a household's energy bills. Similarly, if prices are fixed, higher consumption will lead to an increase in bills.

Overall the trend in prices is mixed, but there has been a noticeable decline in energy consumption

Retail gas prices have been fairly stable in real terms since 2010, but fell by 5.1% from £44.25 to £42.00 per MWh between 2016 and 2017 (see Figure 1.2). However, retail electricity prices steadily increased in real terms between 2010 and 2017.

Figure 1.2: Domestic retail energy prices (real terms): 2010 to 2017



Source: BEIS (2018). Annual domestic energy bills data.

Note: Prices deflated to 2017 terms using the GDP (market prices) deflator. Data for standard single-rate electricity tariffs has been used to calculate the average electricity price.

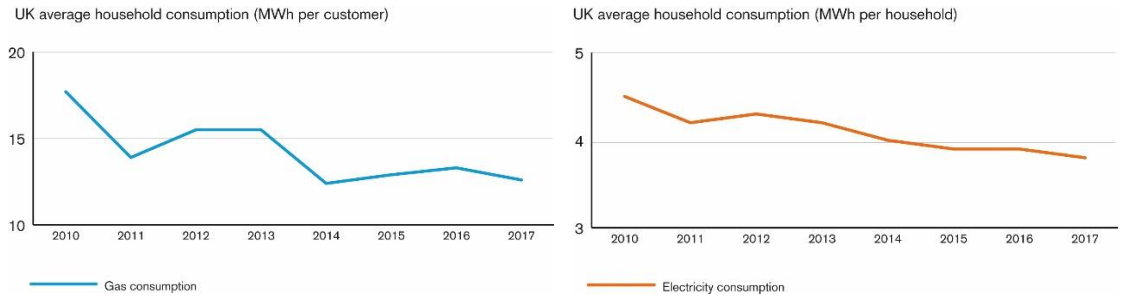
Many domestic retail energy tariffs have risen during 2018, meaning that prices are likely to be higher. To protect consumers from unjustified price increases, we are currently working on the design and implementation of a temporary cap on all standard variable tariffs (SVTs) and fixed-term default tariffs.

Since 2010, there has been a downward trend in domestic energy consumption (see Figure 1.3). Average gas consumption was down 6% from 13.3 MWh per household in 2016 to 12.6 MWh in 2017, while consumption of electricity fell 3% from 3.9 to 3.8 MWh

[3] Source: https://www.ofgem.gov.uk/data-portal/energy-spend-percentage-total-household-expenditure-uk
[4] BEIS (2018). Energy and Climate Change Public Attitude Tracker: Wave 25.

per household over the same period. The decline in consumption helped to offset the impact of rising electricity prices.

Figure 1.3: Domestic energy consumption (unadjusted): 2010 to 2017



Source: BEIS (2018). Energy Consumption statistics in the UK.

Note: The denominator in the gas calculation is based on an estimate of the number of domestic gas customers as not every property is connected to the gas network.

The 1% fall in energy bills between 2016 and 2017 was driven by many factors

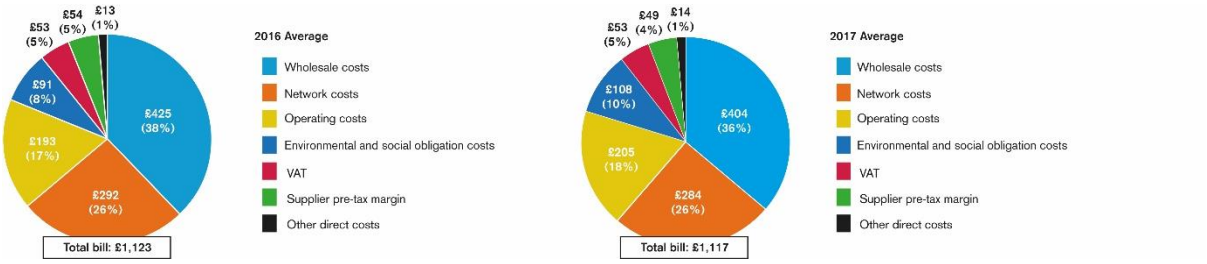
To measure changes in the costs that determine consumer bills, we normally focus on the six largest energy suppliers who manage around 75% of the customer accounts in the market.[5] In 2017, the average dual fuel bill (in nominal terms) for customers of the six largest energy suppliers declined from £1,123 in 2016 to £1,117 (see Figure 1.4).[6]

This decline was driven by many factors and relates to the main cost components of a household's energy bill:

- **Wholesale costs** – the amounts suppliers pay to buy gas and electricity;
- **Network costs** – the costs of building, maintaining and operating the transmission and distribution networks that transport energy to consumers;
- **Operating costs** – the expenditures associated with running a retail energy business such as sales, metering and billing. This category also includes depreciation and amortisation;
- **Environmental and social costs** – the costs of government policies that aim to deliver environmental and social objectives;
- **VAT** – the 5% rate of value added tax that applies to the domestic consumption of energy;
- **Supplier pre-tax margin** – the earnings (before interest and tax) that accrue to suppliers and are calculated by subtracting total operating costs, depreciation and amortisation from total revenue; and
- **Other direct costs** – the costs relating to general participation in the market, such as administration and brokers' costs.

[5] In June 2018, the six large suppliers served 75% and 76% of the gas and electricity market respectively.
[6] In 2017 prices, the average 2016 dual fuel bill was around £1,169, meaning that real-terms average bills fell by £52 year on year.

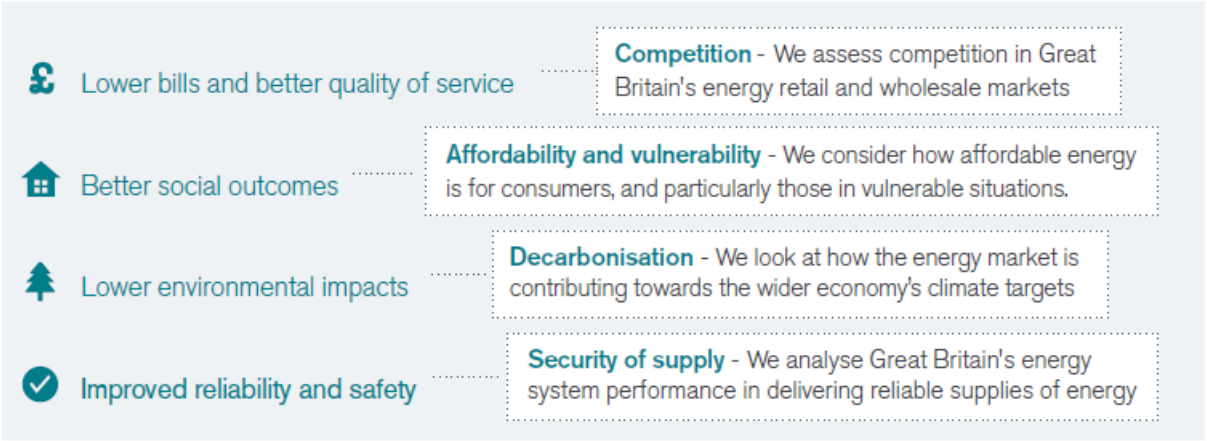
Figure 1.4: Costs that make up an average domestic dual fuel bill



Source: Ofgem analysis based on the Consolidated Segmental Statements (CSS) for the six largest energy suppliers. Data cover the period January to December 2017 with the exception of SSE, which relates to April 2017 to March 2018.

Note: The profits made by companies operating in wholesale markets and networks are not shown separately. They are incorporated into wholesale costs and network costs. Note that the values may not sum to the total due to rounding.

This report focuses on energy markets and does not assess the state of energy networks.[7] It has four chapters in which we examine how key trends in the market have affected household energy bills, while also covering the wider outcomes that Ofgem expects the market to deliver:



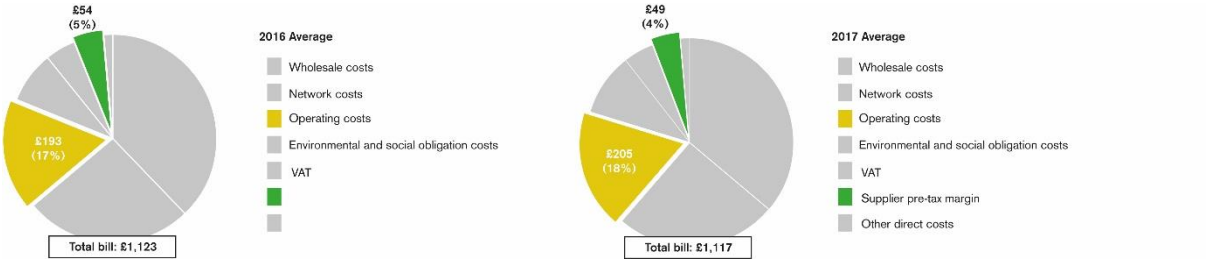
Retail markets account for the third largest share of household bills

The share of bills that related to retail (i.e. operating costs and suppliers' pre-tax margin) was unchanged at 22% in 2017 (see Figure 1.5). However, there was a swing towards higher operating costs and lower margins as suppliers incurred additional costs – related to, for example, the rollout of smart metering – and customers became increasingly ready to switch away from the six largest energy suppliers.

We explore the effects of changes in competition and consumer engagement on price differences in Chapter 2.

[7] We examine networks in our annual reports on distribution and transmission networks. See, for instance: https://www.ofgem.gov.uk/publications-and-updates/riio-electricity-distribution-annual-report-2016-17

Figure 1.5: Retail costs that contribute to an average domestic dual fuel bill

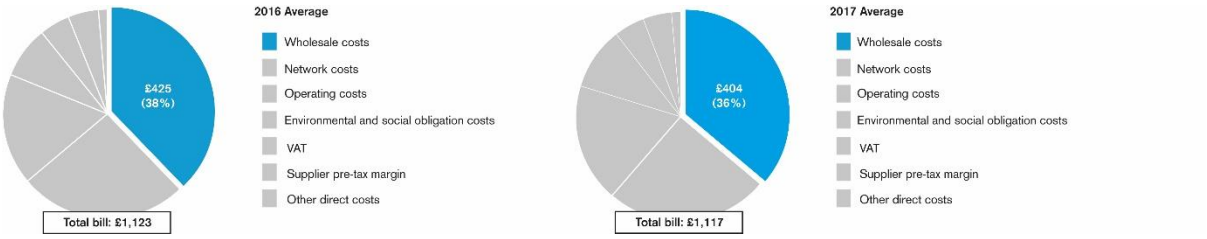


Wholesale costs are still the largest component of a household's bill

Wholesale costs accounted for the single largest share of an average domestic dual fuel bill in 2017 at 36%, but this was down from 38% in 2016 (see Figure 1.6). In wholesale markets we have found that electricity prices are relatively high, but are cost-reflective, i.e. changes in the price of inputs (including gas) are largely passed on to consumers, while gas prices themselves are around the European average.

We explore the implications of the changing trends in wholesale markets in the second part of Chapter 2.

Figure 1.6: Wholesale costs that contribute to an average domestic dual fuel bill



Meeting the cost of energy is still a challenge for consumers in vulnerable circumstances

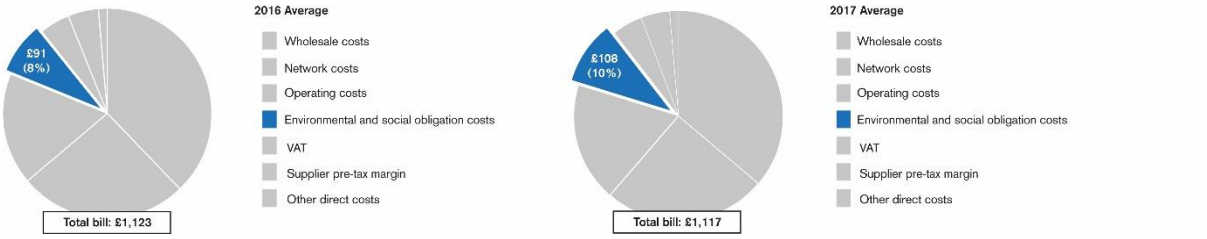
Households in the lowest income decile continue to spend relatively more on energy, with 8.4% of their budget being taken up by gas and electricity consumption.[8] We find that the market could work better for vulnerable groups of consumers who are less likely to switch supplier or change tariff, and often pay more for their energy than they ought to. We examine the implications for affordability and vulnerability in Chapter 3.

Decarbonising the energy system adds to the cost of energy

Decarbonisation policies made up about 10% of an average domestic dual fuel bill in 2017, up from 8% in 2016 (see Figure 1.7). Our analysis reveals, however, that the net cost to the customer is less once the positive impacts of the downward pressure on wholesale prices and increased tax receipts are taken into account. We explore the costs and benefits of decarbonisation policies in Chapter 4.

[8] Source: https://www.ofgem.gov.uk/data-portal/energy-spend-percentage-total-household-expenditure-uk

Figure 1.7: Decarbonisation costs that contribute to an average domestic dual fuel bill

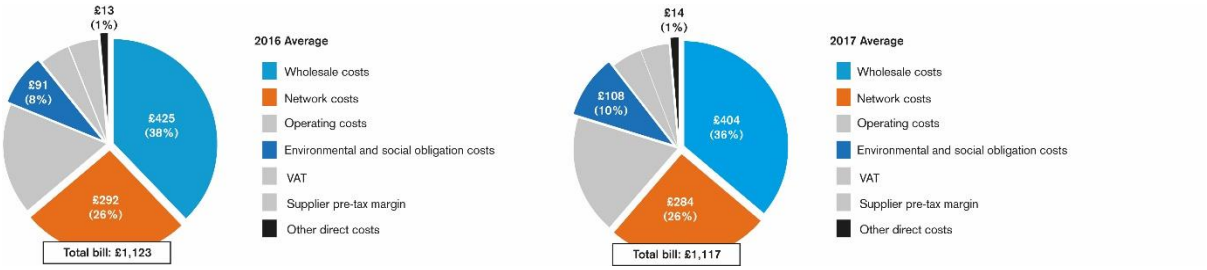


Ensuring secure energy supplies is relevant to the bulk of a household's bill

The share of bills that related to security of supply was unchanged at 73% in 2017, but it fell by 1% in absolute terms (see Figure 1.8). While the direct costs that relate to security of supply (i.e. balancing costs and the capacity market) are relatively small, indirect costs cut across the various cost components of a typical household bill.

We examine the impact of security of supply on the cost of energy in Chapter 5.

Figure 1.8: Security of supply costs that contribute to an average domestic dual fuel bill



Aim of this report

We want this report to help anyone with an interest in gas and electricity markets to understand how well they are currently working. We provide an evidence-based assessment of the issues affecting the GB energy system, helping to inform those who make decisions and contribute to regulatory debates.

Last year we provided a baseline for future analysis, setting the context of energy market developments over the last decade. In this report, we focus more on current market issues and debates, including examining the impacts of interventions on the functioning of energy markets.

We continue to expect the focus of this report to evolve over time.

Chapter 2: Competition in energy markets

Retail markets - summary of findings

- Competition has brought more choice than ever to active consumers, but some suppliers have not been able to expand and some do not meet high quality standards.
- The structure of the domestic retail market is evolving, and potentially significant changes, such as the proposed merger between SSE and Npower, may make it more concentrated.
- More than half of currently non-price protected energy customer accounts are still on expensive default tariffs.
- We have put in place a safeguard tariff that currently protects around 5 million customers. Most prepayment (PPM) customers are now on tariffs priced close to the cap, but there are still opportunities to switch to cheap and innovative PPM tariffs.
- Competition continues to work better in non-domestic markets, but a significant minority of microbusinesses are on more expensive default contracts and pay much more on average than other businesses.

Wholesale markets – summary of findings

- Competition in the gas wholesale markets is working reasonably well, given the large number and diversity of gas producers and the high degree of liquidity.
- Competition in the wholesale electricity market continues to improve. Liquidity in GB is greater than or in line with that of most other European power markets, and the GB generation mix is diverse, with cost-efficient deployment of sources.

Retail energy markets

Domestic retail energy markets

As of June 2018, there were 23 million gas meter points and 28 million electricity meter points in the domestic market, accounting for 60% (297 TWh) and 35% (105 TWh) of total (domestic and non-domestic) gas and electricity demand respectively and spending around £28 billion per year.[9]

Although gas and electricity are fairly uniform goods, suppliers tend to differentiate their prices and products to respond to consumers' different engagement attitudes and

[9] We source gas and electricity meter points directly from network operators, while the sources for gas and electricity demand data are: BEIS - Natural gas supply and consumption and BEIS - Supply and consumption of electricity. Spending data is sourced from DUKES 1.7.

behaviours. As in last year's State of the Energy Market Report, we continue to find that competition has worked well to date for the most engaged domestic consumers, who are willing and able to shop around. For the least engaged, prices and quality outcomes are a source of concern.

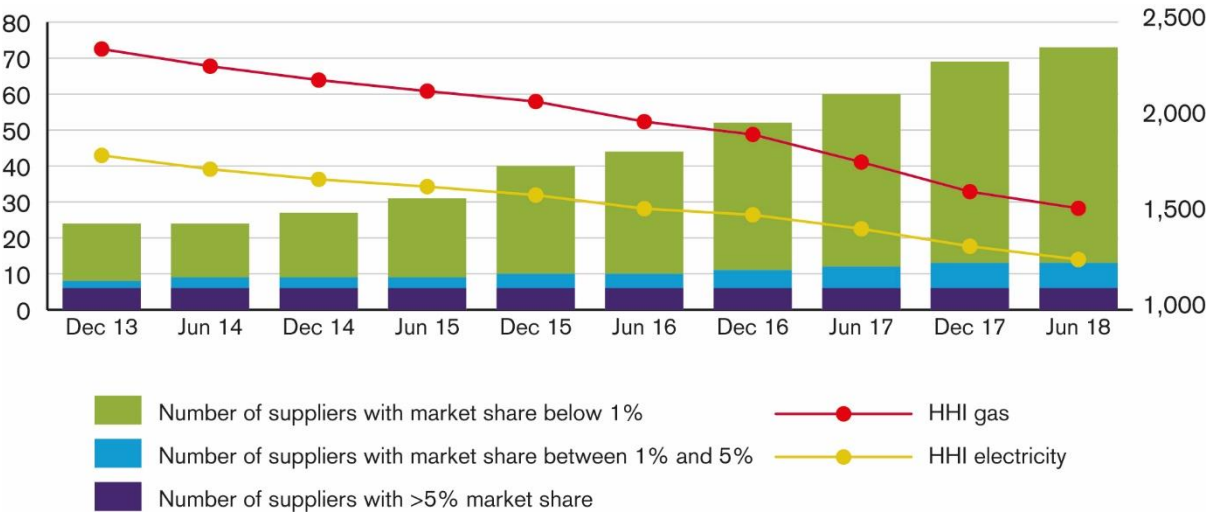
Domestic retail energy market structure

Domestic retail markets are changing

The number of firms in the market and the significance of their operations are key drivers of competitive dynamics in the retail markets. Monitoring the level of concentration and entry helps us to understand the competitive constraints that existing suppliers face.

Retail markets are still concentrated, but concentration is declining due to new entry at a sustained pace (see Figure 2.1). In June 2018, there were 73 active licensed suppliers in the domestic retail market, of which 64 were dual fuel, seven gas-only and two electricity-only. These suppliers form a heterogeneous group with a wide variety of business models. In addition, there were 24 white label providers,[10] often with a regional focus. Since June 2017, there has been a net increase of 13 licensed suppliers and 11 white label providers.

Figure 2.1: Evolution of concentration and number of active licensed suppliers



Source: Ofgem's analysis of Distribution Network Operators and Xoserve data

Note: The Herfindahl–Hirschman Index (HHI) measures market concentration by summing the squares of the market share of each firm. It provides insights into how competitive a market is. The closer a market is to being a monopoly, the higher will be the measure of concentration (see CMA market investigation guidelines, p.87). The CMA typically regards markets with HHI below

10 White label suppliers are organisations without supply licences that partner with an active licensed supplier to offer gas and electricity using their own brand (for example, Sainsbury's Energy is a British Gas' white label).

1000 as unconcentrated, markets with HHI between 1000 and 2000 as concentrated, and markets with HHI above 2000 as highly concentrated.

The high level of entry into the retail market indicates that barriers to entry are low. In particular, we have seen an increase in entry via simplified routes, such as the creation of white label providers and the acquisition of off-the-shelf pre-accredited licensed companies.

As a result, the erosion of the six large suppliers' share of the market has continued. Between June 2017 and June 2018, they had a net loss as a group of around 1.4 million customers[11] and their combined market share fell by around five percentage points in both gas and electricity, compared to four percentage points on average during the previous four years. In June 2018, the six large suppliers served 75% and 76% of the gas and electricity market respectively, while medium and small suppliers held the remaining 25% and 24%.

British Gas is the largest supplier, serving 30% and 20% of the GB gas and electricity markets respectively.[12] The former incumbent electricity suppliers exhibit disproportionately high market shares in their historic legacy regions, down from 29% in June 2017 to 27% on average in June 2018. This varies between SSE's 59% share in Northern Scotland and npower's 18% share in Yorkshire.

The structure of the domestic retail market is changing, as mergers and acquisitions are announced. For instance, Shell announced the acquisition of First Utility in December 2017 and SSE and Npower announced a merger with the declared rationale to create a new independent retail supplier in GB. If the latter were to go ahead, the current market structure would change to one where there are two large suppliers of similar size, controlling almost 50% of the market, followed at some distance by three large suppliers and a fringe of many smaller suppliers. The CMA is currently investigating the merger and is due to make a decision by 22 October 2018.

Small and medium suppliers are struggling to expand

Between 2013 and mid-2016, low volatility and falling prices in wholesale markets attracted new suppliers. Since late 2016, greater wholesale price volatility and increasing supply costs have prevailed, but market entry continues.[13] Against this background, several small suppliers have found themselves in financial difficulties, often triggered by wholesale price spikes and lack of hedging for energy procurement. Some suppliers have exited, either through the application of the Supplier of Last Resort (SOLR) process or through corporate decisions (see Figure 2.2).

[11] Here we use electricity meter points as a proxy measure for the number of customers.
[12] See https://www.ofgem.gov.uk/data-portal/electricity-supply-market-shares-company-domestic-gb and https://www.ofgem.gov.uk/data-portal/electricity-supply-market-shares-company-domestic-gb
[13] See https://www.ofgem.gov.uk/data-portal/supplier-cost-index-fuel-type-gb

Figure 2.2: Exits in the domestic retail market since 2016

Exit type	Exiting supplier	Acquiring supplier	Exit date
Corporate decision	Tempus	-	Gradual exit during 2016
Ofgem's SOLR process	GB Energy	Co-operative Energy	Nov-16
Corporate decision	The Energy Deal (White Label)	Robin Hood (White label parent)	Jun-17
Corporate decision	Brighter World (White Label)	Robin Hood (White label parent)	Dec-17
Ofgem's SOLR process	Future Energy	Green Star Energy	Jan-18
Corporate decision	Flow Energy	Co-operative Energy	Jun-18
Ofgem's SOLR process	Iresa	Octopus Energy	Jul-18

Source: Ofgem and Cornwall Insight's Energy Spectrum

Exits form part of competitive market dynamics, which are acceptable as long as continuity of supply and consumers' credit balances are protected. All the exits that have occurred since 2016 have happened smoothly. We successfully operated the SOLR arrangements for GB Energy, Future Energy and Iresa in November 2016, January 2018 and July 2018 respectively. In all cases, there were costs associated with customers' outstanding credit balances, which will be partly borne by the appointed SOLR supplier and partly funded through future network charges shared among all electricity and gas customers in GB.[14]

Although a number of new suppliers that entered the market over the last five years have managed to expand significantly (for instance Utilita, OVO Energy and Bulb Energy), there are no suppliers, besides the large six, that have yet reached an individual 5% market share. As of June 2018, seven suppliers had a market share between 1% and 5% and 60 suppliers had market shares below 1% (see Figure 2.1).

We see some barriers to expansion for medium and small suppliers. For instance, there is currently a 250,000-customer account threshold, above which suppliers have to bear the costs of contributing to the Energy Company Obligation (ECO) and the Warm Home Discount (WHD).[15] Increased cash flow requirements related to meeting ongoing checks of suppliers' financial position may also limit expansion. These constraints have so far not prevented the continued erosion of the six large suppliers' market share.

[14] See: https://www.ofgem.gov.uk/system/files/docs/2018/01/last_resort_supply_payment_claim_from_co-operative_energy_final_decision.pdf

[15] The Government has recently announced plans to maintain the participation threshold for WHD to 250,000 accounts for the 2018/19 winter, but this will be lowered to 200,000 accounts in 2019/20 and 150,000 accounts in 2020/21. On 19 July the Government also announced a similar gradual reduction path for the ECO participation threshold.

We are reviewing existing arrangements for supply market entry, exit and monitoring.[16] We recognise that low entry barriers make companies more likely to enter the market without meeting our expectations for customer service and make it more likely that they will fail. With this review, we hope to strike a balance between maintaining competition that works for consumers and attracting new entrants who are able to withstand the financial pressures and operate under high quality of service standards. We are also reviewing the SoLR and the safety net arrangements.

Switching is increasing for the fourth consecutive year

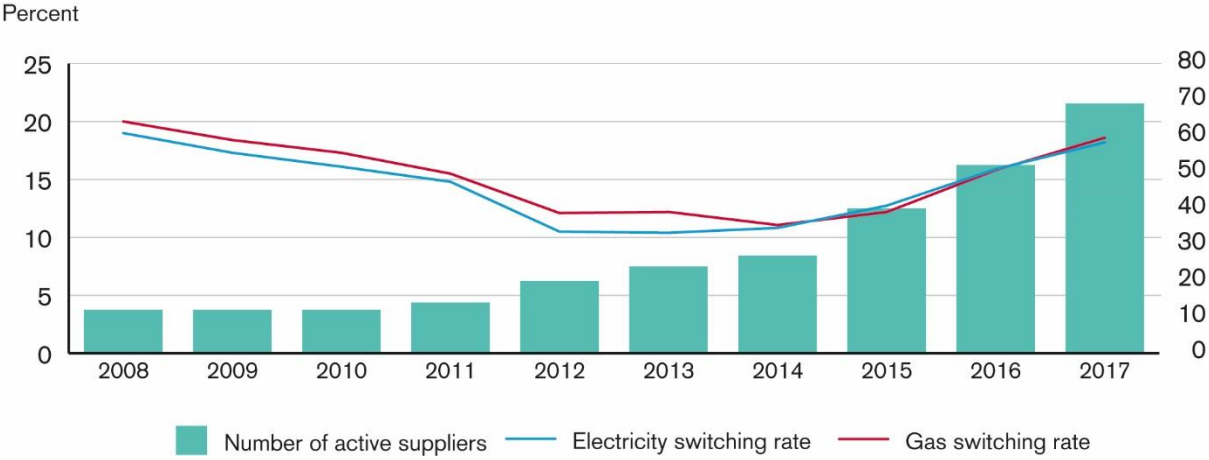
Consumer engagement can help achieve good outcomes in the retail market as a whole. Engaged consumers who actively assess and choose their tariff and / or supplier can strengthen price and quality of competition through the threat of switching. The CMA[17] found that a lack of consumer engagement gives suppliers a position of unilateral market power over their inactive customer base.[18]

After a period of decline between 2008 and 2013, which coincided, among other things, with a drop in suppliers' door-to-door sales, the rate of switching between suppliers has increased during four consecutive years. In 2017, 18% of gas and electricity meter points changed supplier, amounting to over 4 million and 5 million switches for gas and electricity respectively (see Figure 2.3). As of June 2018, the rolling annual switching rates continued to increase and reached up to 18.4% in electricity and 19% in gas. These are relatively high switching rates, compared with other utility sectors and retail energy markets around the world.[19]

This long-term trend is consistent with the rapid increase in the number of active suppliers since 2014, which has led to greater variety of products and sustained price differentials in the market. Over the same period, the internet has become the main tool for consumers to compare tariffs and switch.[20] [21] More recently we have also witnessed a resurgence in direct sales activity, especially from small and medium suppliers.

[16] See https://www.ofgem.gov.uk/publications-and-updates/review-ofgem-s-approach-licensing-suppliers
[17] See https://www.gov.uk/cma-cases/energy-market-investigation
[18] Market power exists where an individual firm has the ability to raise prices profitably above competitive levels (or reduce the value of its offer to consumers in other ways) independently of the behaviour of rival firms.
[19] See BEIS Consumer Green Paper and CEER Retail Market Monitoring Report 2017
[20] See for instance https://www.ofgem.gov.uk/publications-and-updates/more-consumers-are-shopping-around-over-six-million-energy-switches-2015-says-ofgem
[21] https://www.ofgem.gov.uk/publications-and-updates/consumer-engagement-survey-2018

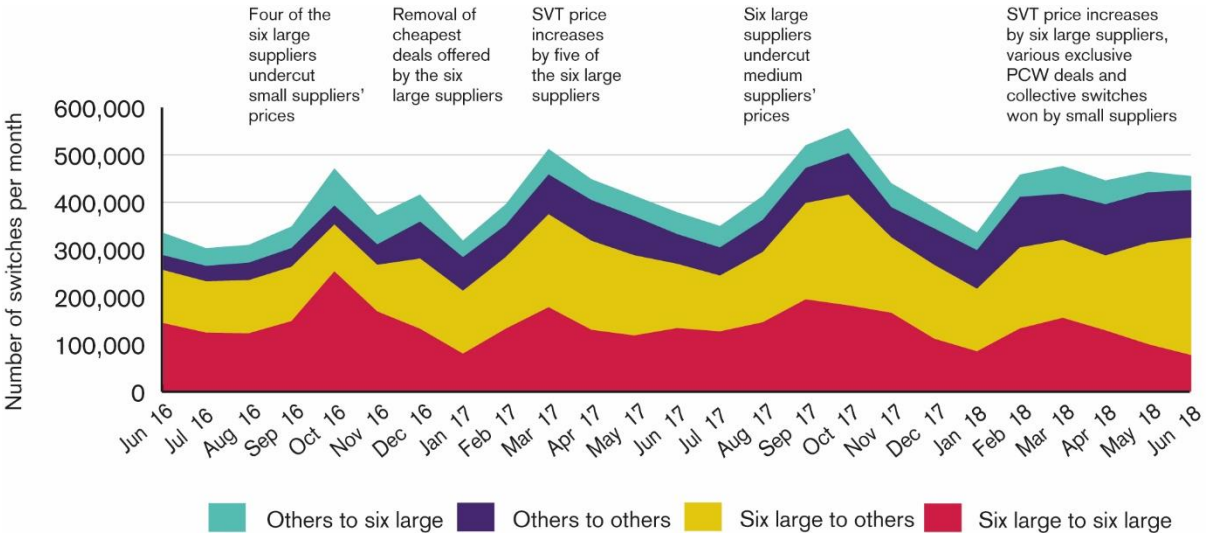
Figure 2.3: Long-term trend in annual switching rates and number of active suppliers



Source: Ofgem's analysis of Distribution Network operator data and Xoserve data.

Short-term fluctuations in switching tend to respond mainly to price change announcements by the six large suppliers. The majority of switches are to suppliers outside the six large suppliers, with customers moving away from those companies accounting for nearly 40% of total switching between June 2017 and June 2018, and customers moving between smaller suppliers accounting for a further 20%. On the other hand, over the same period, 40% of switches happened among and to the six large suppliers, even though they generally offered higher prices compared to other suppliers. Branding and customer loyalty can help explain this behaviour, while peaks in switches towards the six large suppliers also coincided with their relatively low prices in autumn 2016 and 2017 (see Figure 2.4).

Figure 2.4: Short-term fluctuations in the number and type of switching movements



Source: Ofgem's analysis of Distribution Network operator data and Xoserve data.

Consumer engagement is broadly unchanged, but new models of switching intermediaries are emerging

Our latest domestic engagement survey data suggests that overall engagement has remained at the levels seen in 2017. Around 41% of customers either switched supplier, changed tariff, or compared tariffs in 2018. This is unchanged compared to 2017. The proportion of customers that reported switching supplier or tariff remained relatively stable compared to 2017, at 18% and 14% respectively. Also, similar to 2017, of the 18% who switched suppliers, 7% were first time switchers and the remaining 11% had switched before. Both customer types indicated that the main prompts for switching were: receiving a bill / statement; receiving a price increase notice; and moving home.

As in previous years, saving money is by far the main reason for switching, with 87% of consumers who switched mentioning it as a motive in our consumer survey. Consistently, the risks that switching may result in higher bills or not lead to the expected level of saving, represent the most common concerns in 2018, both for customers who switched and those who did not switch over the past 12 months.

Price comparison websites and other online channels are an important facilitator for switching and engagement in the energy market: 54% of those who switched or compared tariffs or suppliers used a price comparison site to find deals, up from 49% in 2017. On the other hand, the proportion of switchers using third party services to switch has fallen, from 50% to 42% in 2017, though it remains the most frequent method. This is due to 38% of customers approaching suppliers themselves, up from 33% in 2017.

Over the last two years we have also witnessed the launch of more intermediaries that differ from traditional price comparison websites (PCWs). Several companies now offer an automated switching service that does not require any direct customer engagement with the market, unless they want to cancel an upcoming transfer. This puts additional competitive pressure on existing suppliers and on the traditional supplier-customer arrangements.[22]

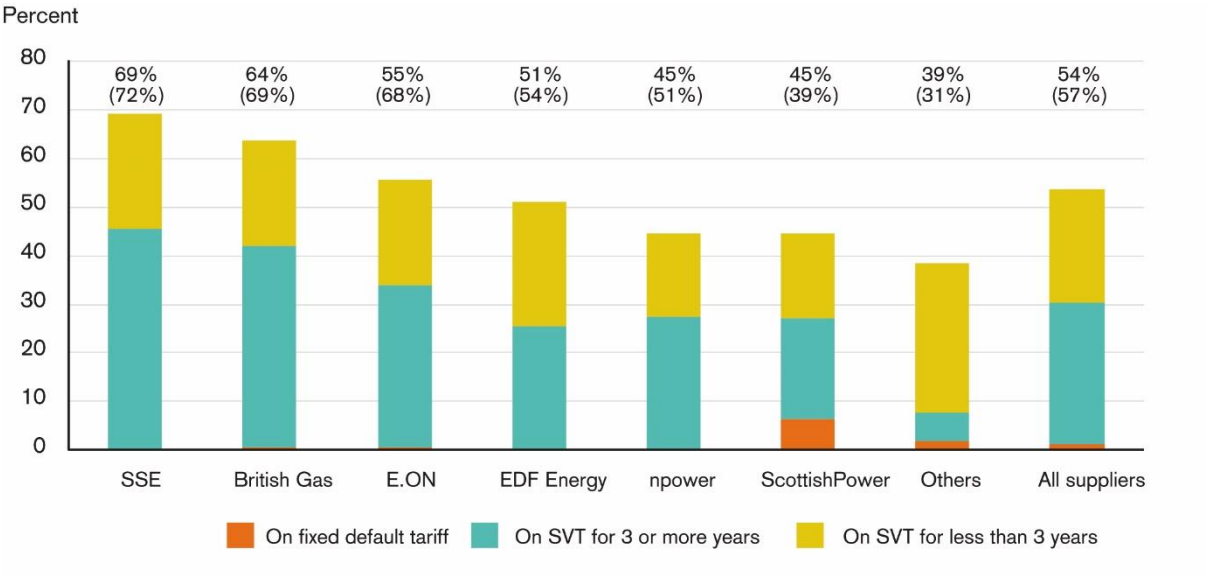
A large proportion of consumers remain unengaged and on expensive default tariffs

Despite the increasing engagement and switching in recent years, the proportion of unengaged consumers remains high. Our 2018 consumer survey found that 34% of consumers recalled they had never switched and 27% said they had switched only once. This is a small and not statistically significant increase from a total of 58% of consumers who recalled switching at most once in our 2017 survey.

Less engaged consumers tend to be on expensive default tariffs. Despite a 3% reduction compared to April 2017, 54% of non-price protected energy customer accounts were still on default tariffs in April 2018. This includes 29% on standard variable tariffs (SVTs) for more than three years, 23% on SVTs for fewer than three years and 1% on fixed default tariffs.[23] The proportion of customers on default tariffs varies across suppliers, suggesting significant differences in engagement with consumers (see Figure 2.5).

[22] See Future supply market arrangements-response to our call for evidence.
[23] We issued a derogation allowing suppliers to use fixed-term tariffs as default tariffs in October 2017 (see https://www.ofgem.gov.uk/publications-and-updates/decision-default-tariffs-domestic-customers-end-fixed-term-contracts). To date, only a few suppliers have introduced these tariffs, including British Gas, ScottishPower, E.ON, First Utility, Coop and Flow Energy, while others are carrying out trials.

Figure 2.5: Proportion of customer accounts on default tariffs



Source: Ofgem's analysis of gas and electricity customer account data by 28 suppliers

Note: The chart includes all suppliers with over 100,000 customer accounts for either gas or electricity. They supplied around 98% of customer accounts in April 2018; the 2017 proportion is shown in brackets. The chart excludes price protected customers, i.e. customers covered by the prepayment and Warm Home Discount safeguard tariff. It also excludes customers on mixed tariffs (a different tariff for each fuel type). In April 2018 around 340,000 customer accounts had mixed tariffs (1.3% of the non-price protected segment).

SVTs are generally more expensive than fixed tariffs, with the average differential between the average SVT offered by the six large suppliers and the market cheapest tariff at £320 between June 2017 and June 2018. Prices of fixed default tariffs are not generally advertised on PCWs or suppliers' websites. Since January 2018, most suppliers have priced their fixed default tariffs around £20-30 below their SVTs, with the exception of Co-op Energy, which priced it around £70-100 below.

Our analysis of price sensitivity suggests that consumers on SVTs are less likely to respond to opportunities to save money than consumers who are already on cheaper fixed tariffs. Some consumers' lack of price sensitivity may indicate explicit customer loyalty. Recent survey evidence suggests that branding is an especially important choice factor for the least engaged customers. The supplier brand makes up 23% of the driving force behind tariff choice among customers who have been on an SVT for more than three years, compared to 18% among other customers.[24]

The quality of switching remains poor and requires major reforms

More reliable and faster switching can benefit market outcomes in two main ways. Firstly, a switch that is executed in a fast and reliable manner saves time, money and hassle for switchers. Secondly, it means that there is less perceived risk that a switch may go wrong and thus reduces a key barrier to engagement.

Our 2018 survey found that the possibility of something going wrong with the switching process is a concern for 12% of consumers who had not switched supplier and for 7% of

[24] See https://www.ofgem.gov.uk/publications-and-updates/consumer-engagement-survey-2018

those who had switched supplier in the previous 12 months, unchanged compared to 2017. New survey questions in 2018 suggest that over four-fifths of switchers say they found the process easy. However, switchers were less likely to feel in control over their switching date, and a fifth disagreed that they had sufficient control.

Supply licences require licensees to take all reasonable steps to complete a transfer 21 calendar days after the end of the 14-day cooling-off period (or after an earlier date during the cooling-off period if agreed with the customer). Over the past three years, the system average switching time[25] has fluctuated around 15-16 days for electricity and 15-19 days for gas.[26] Even when the switching process works well, it is slow compared to other sectors. For instance, in banking switching is possible within seven working days. In mobile telephony switching currently takes one or two days and, following a recent decision from Ofcom, will be within one working day from mid-2019.

Reliability remains an area of primary concern, due to a significant number of erroneous, delayed and unsuccessful switches. The proportion of erroneous transfers, where consumers are switched to suppliers against their wishes, has stayed broadly stable since 2014, fluctuating around 1%, despite our introduction in that year of a new licence obligations to prevent erroneous transfers.[27] The wrong meter point being switched has typically been the main cause, explaining around 90% of cases. Inaccurate customer address data held across the industry remains the single largest reason for erroneous transfers.

Domestic retail energy market outcomes

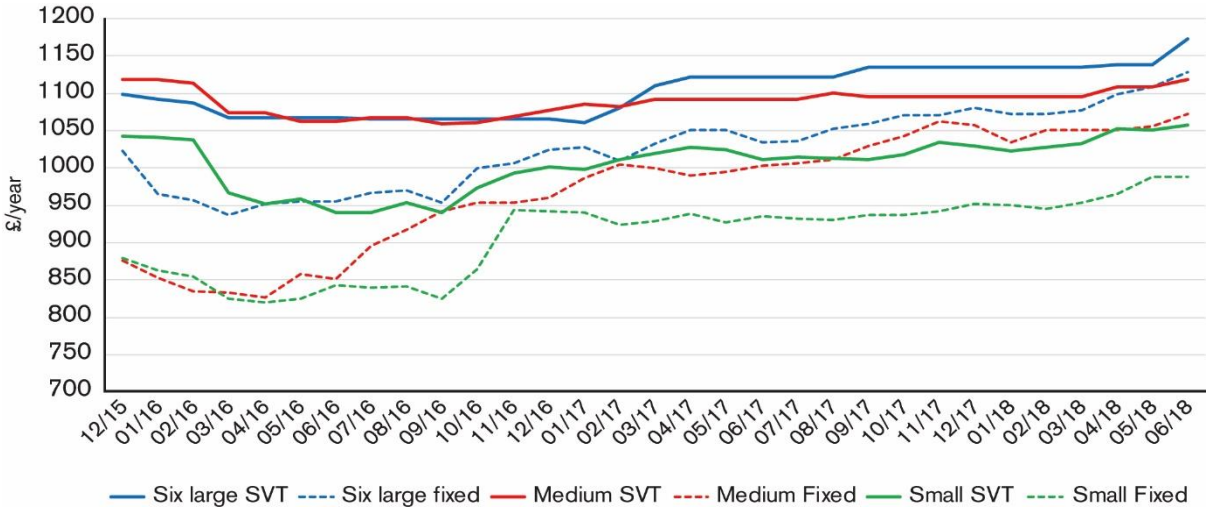
A two-tier market continues to exist, but there is lower price dispersion among tariffs offered by the same supplier

In a well-functioning competitive market, there should be downward pressure on prices as suppliers compete to attract customers. Downward pressure does not necessarily mean lower prices, since prices could rise because of increases in costs such as the global price of gas, or to cover service quality improvements which consumers value.

Since mid-2016, wholesale energy markets have shown much higher levels of volatility than in previous years,[28] with alternating periods of increasing and decreasing prices.[29] Average retail prices offered by suppliers have been on the rise since early 2017, by different degrees across the different tariff types and suppliers. Small suppliers continued to offer, on average, the cheapest deals in the market, both for fixed and variable tariffs (see Figure 2.6). By contrast, the six large suppliers showed the most expensive prices.

[25] System switching time is measured by the number of calendar days it takes from when a supplier submits a switching request to the transfer taking place. We source our data from distribution network operators, so this statistic does not reflect the time taken by the supplier to submit a switching request, which may happen at the end or during the cooling-off period, nor the additional time to process the contract with the customer.
[26] See https://www.ofgem.gov.uk/data-portal/average-switching-time-domestic-customers-gb
[27] Ofgem, Statutory consultation on enforcing three week switching, 2014.
[28] See https://www.ofgem.gov.uk/data-portal/supplier-cost-index-fuel-type-gb
[29] Wholesale prices fell during the first half of 2017, but have risen since then. The dual fuel Supplier Cost Index went up by 14% between May 2017 and May 2018, mainly driven by electricity and gas wholesale price increases.

Figure 2.6: Average tariff prices over time split by supplier size



Note: The chart depicts average prices for Direct Debit variable and fixed tariffs in nominal terms. The Typical Domestic Consumption Value for electricity was 3100 kWh throughout the period, while that for gas was 12,500 kWh up to January 2017 and then 12,000 kWh thereafter.

Source: Ofgem analysis of Energylinx data (up to January 2017) and Energyhelpline data (from February 2017)

The potential saving from switching supplier for customers on the most expensive tariffs has fluctuated but has remained relatively high throughout the analysed period, about £250 between similar types of tariffs (i.e. SVT or fixed). By contrast, saving opportunities from switching tariff within the same supplier seem to have reduced (see Figure 2.6).

The six large suppliers' profit margins fell in 2017

A principal way of assessing whether price competition is intense enough is to consider company profit margins and costs.[30] With intense competition, and in the absence of innovation in services, we would expect profit margins and costs to be pushed towards their efficient level.

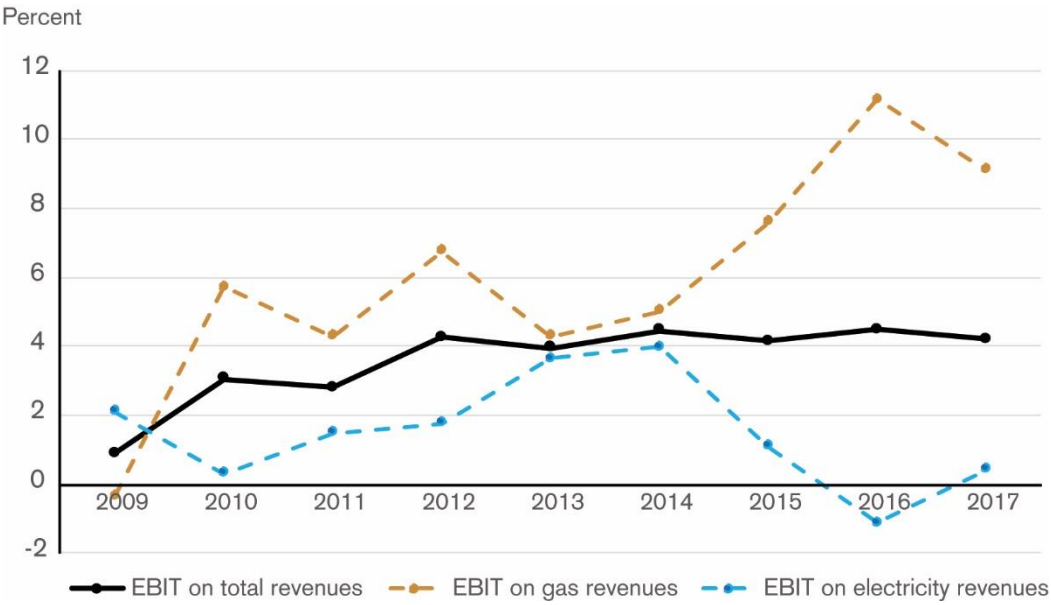
In 2017, competitive pressure from medium and small suppliers continued. As a result, the six large suppliers lost customers and experienced a loss in their aggregated domestic supply revenues, from £23 billion in 2016 to £22 billion in 2017. Total domestic supply profits aggregated across the six companies, measured as earnings before interest and tax (EBIT), fell for the first time since 2014, from £1 billion in 2016 to £0.9 billion in 2017.

Figure 2.7 shows that the overall average profit margin, measured by EBIT as a percentage of revenue, has been relatively stable since 2012, with a notable contrast between gas and electricity. In 2017, the six large suppliers continued to make most of their profits on gas sales, but to a lesser extent than in previous years. Despite the decline in gas wholesale and direct costs, higher operating costs and lower revenues for

[30] See, for instance, the CMA's latest market investigation guidelines. The Office of Fair Trading had previously commissioned a paper on Assessing profitability in competition policy analysis.

all suppliers meant that the overall gas EBIT was down from £1.1 billion to £0.87 billion. By contrast, electricity revenues were relatively stable on average, against lower wholesale costs and higher operating and direct costs. As a result, the overall electricity EBIT was up to £52 million, from a loss of £142 million in the previous year.

Figure 2.7: Profits of the six large suppliers before interest and tax as a percentage of sales, 2009-2017



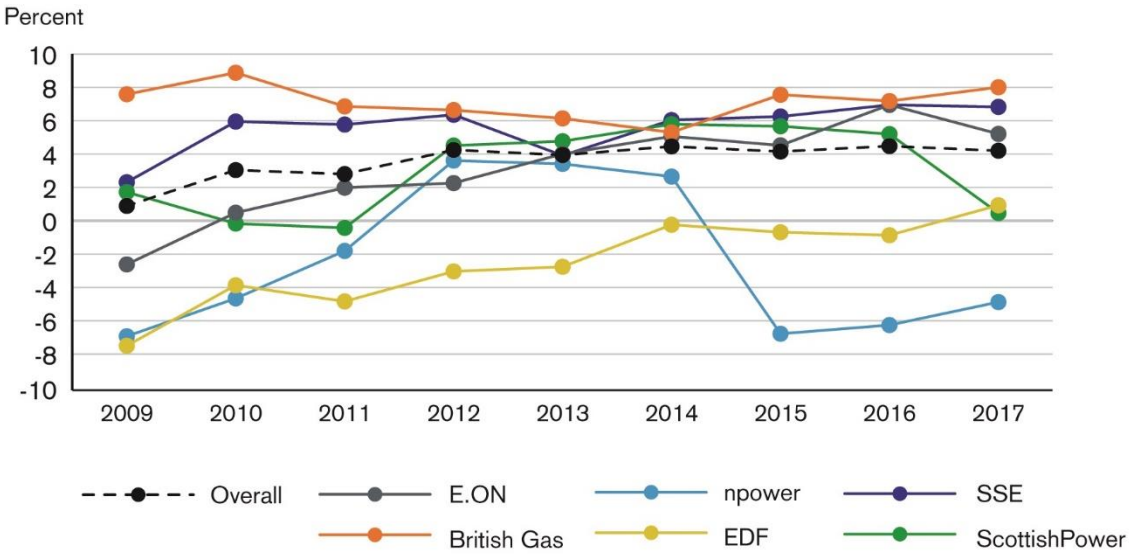
Source: Ofgem analysis of Consolidated Segmental Statements

Profit margins continue to vary across the six large suppliers, with some notable changes in individual trends from 2016 to 2017, as both E.ON and ScottishPower saw a significant reduction in their margins, down to 5% and 0.5% respectively. EDF recorded a positive margin of 0.9% for the first time since 2009 and npower reduced its losses to -5% (see Figure 2.8). British Gas and SSE made similar and significant margins, 8% and 7% respectively, essentially stable compared to 2016.

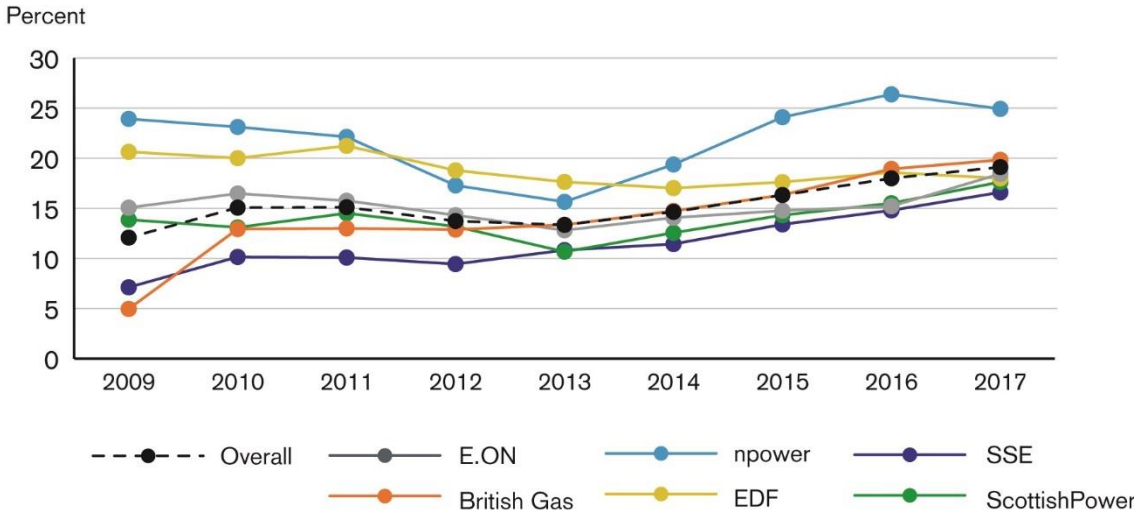
One reason for the difference in profit margins is the variance in suppliers' operating costs and the extent to which these are passed onto consumers. Figure 2.8 shows that the two suppliers with the highest operating costs, npower and EDF, have consistently made the least profits, suggesting some constraint on suppliers' ability or willingness to pass on high costs to consumers. Both companies have shown a reduction in operating costs in 2017, and, at the same time, higher profit margins or lower losses compared to 2016.

Figure 2.8: EBIT and operating costs as % of sales

Earnings before tax and interest as % of revenue



Operating costs as % of revenue



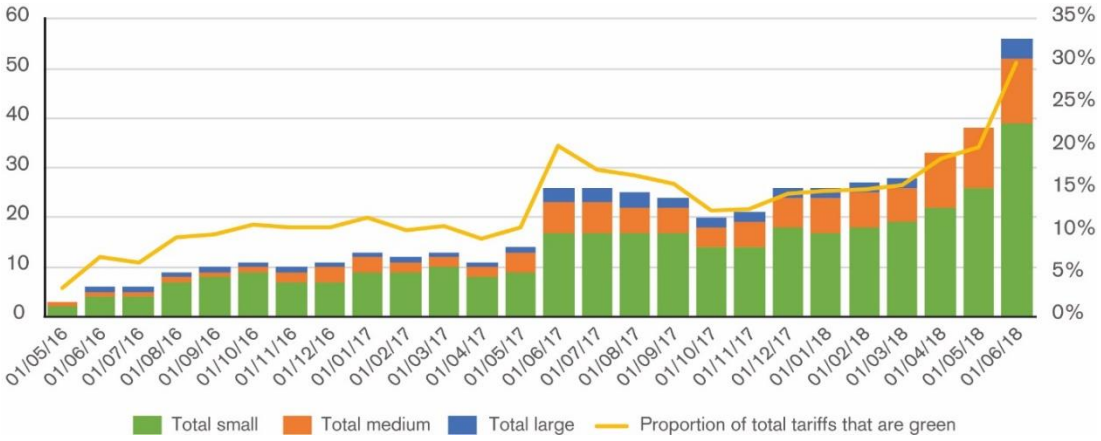
Source: Ofgem analysis of Consolidated Segmental Statements

More innovative tariffs and service offerings are emerging

Greater choice of suppliers has brought more tariff offerings and so more opportunities for consumers to get the deal that best suits them. As of June 2018, there were 226 dual fuel direct debit tariffs, around 100 more than in June 2017. The increase is only partly explained by the entry of new suppliers. After the CMA's recommendation in 2016 to remove restrictions on the number and structure of tariffs suppliers can offer, we have seen an increase in the number of tariffs offered by each supplier, especially evident for the largest suppliers. In particular, there are more longer-term tariffs, generally more expensive, possibly reflecting a greater appetite for protection against increasing price volatility.

We have also seen an increase in the number of (mostly fixed) tariff offers labelled by suppliers as 'green', negligible in May 2016 up to 56 in June 2018 (see Figure 2.9).

Figure 2.9: Recent trends in green tariff offers by supplier size groups

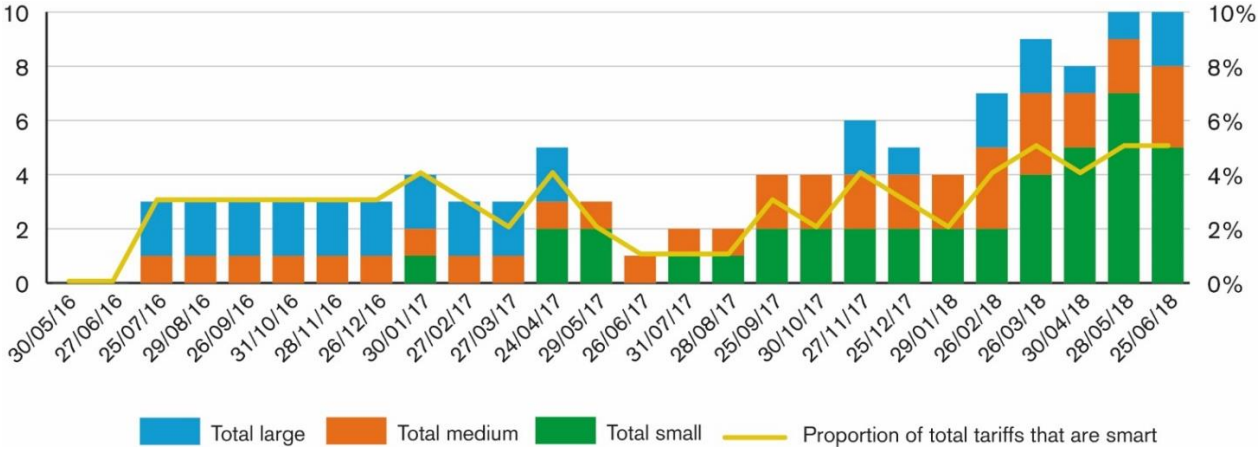


Source: Ofgem's analysis of Energyhelpline data

Note: Green tariffs are defined as those tariffs with at least 100% renewable electricity (some tariffs will have 100% electricity as well as renewable gas / carbon offsetting).

By contrast, the increase in the number of available smart tariffs[31] has been modest (see Figure 2.10), with smart tariffs representing just above 5% of total dual fuel tariff offers in June 2018. Moreover, most smart tariffs on offer are static, typically involving cheaper tariff rates during pre-determined periods of time. The current main barriers for suppliers in offering smart tariffs, with dynamic pricing, relate to the ongoing rollout of smart meters, very few of which are fully interoperable, and to the current settlement rules. In the absence of half-hourly settlement, suppliers tend to have limited incentives to offer time-variable prices as they cannot capture the commercial value of shifting usage away from peak demand periods.[32]

Figure 2.10: Recent trends in smart tariff offers by supplier size groups



Source: Ofgem analysis of Energyhelpline data

[31] Throughout this document we refer to smart tariffs as tariffs for which suppliers require the installation of a smart meter.
[32] See https://www.ofgem.gov.uk/publications-and-updates/settlement-reform-update

Another developing trend is the emergence of specific Electric Vehicle (EV) tariffs. All EV tariffs are also 100% renewable energy, tend to provide facilities with charging points or lower unit rates for customers with a registered EV and in some cases they are time-of-use or smart tariffs. In parallel, the number of suppliers diversifying into non-energy services has grown significantly over the past year, possibly reflecting an attempt to capture higher margins and reduce customer churn.

The appearance of new tariffs and services does not seem to have significantly affected consumer perceptions about the choice of energy tariffs, which remained stable between 2016 and-2018. The latest survey data finds that only 47% of consumers feel they have the right amount of choice of energy tariffs and 34% think there is too much choice (only around 7% of consumers believe they have too little choice). This may help explain the recent growing popularity of new switching intermediaries that offer apps, chatbots and digital platforms that enable a hassle-free automated switching service.

Customer satisfaction with complaint handling has increased, but poor customer service remains a concern

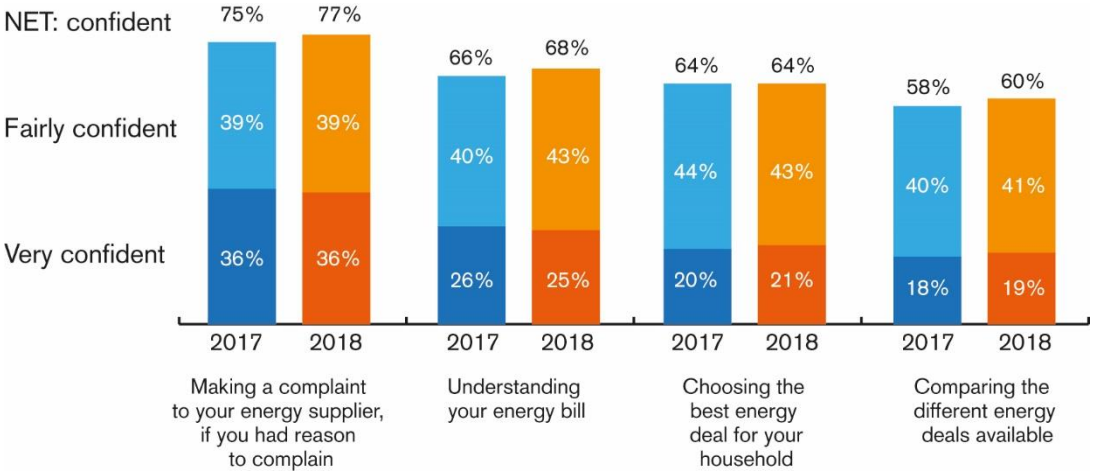
In a well-functioning competitive market, we would expect suppliers to compete by offering high service quality and not just put pressure on prices. In a smarter digital market, we would also expect greater opportunities for companies to distinguish themselves and their brand in their customer service. As a result, consumers should become increasingly confident engaging in the market and choosing suppliers they trust.

Our survey shows that overall satisfaction with the service received from suppliers has remained at the levels observed in 2016 and 2017 (around 76% of customers in 2018 declared they were satisfied or very satisfied compared to 77% in 2016 and 2017).[33] Our latest biannual complaint handling survey[34] indicates that overall customer satisfaction with complaint handling increased, from 27% in 2016 to 32% in 2018. On the other hand, the energy industry tends to score lower for complaint handling than other industries such as banking and mobile telephony.[35] Ofcom's 2018 report stated that 56% of telecoms customers surveyed who had made a complaint were satisfied with how it was handled, compared to 51% of energy customers.

Customers' confidence is especially high when it comes to raising a complaint with suppliers and has increased over time (see Figure 2.11), while the level of engagement with alternative resolution routes remains quite low according to our complaint handling survey. In 2018, only 9% of customers with complaints they identified as 'not resolved' by suppliers, took their case further to the Energy Ombudsman, compared to 14% in 2016. Figure 2.12 shows complaints performance and cases accepted by the Energy Ombudsman between Q1 2015 and Q1 2018. Citizens Advice examined complaints performance in more detail in its star rating reports.[36]

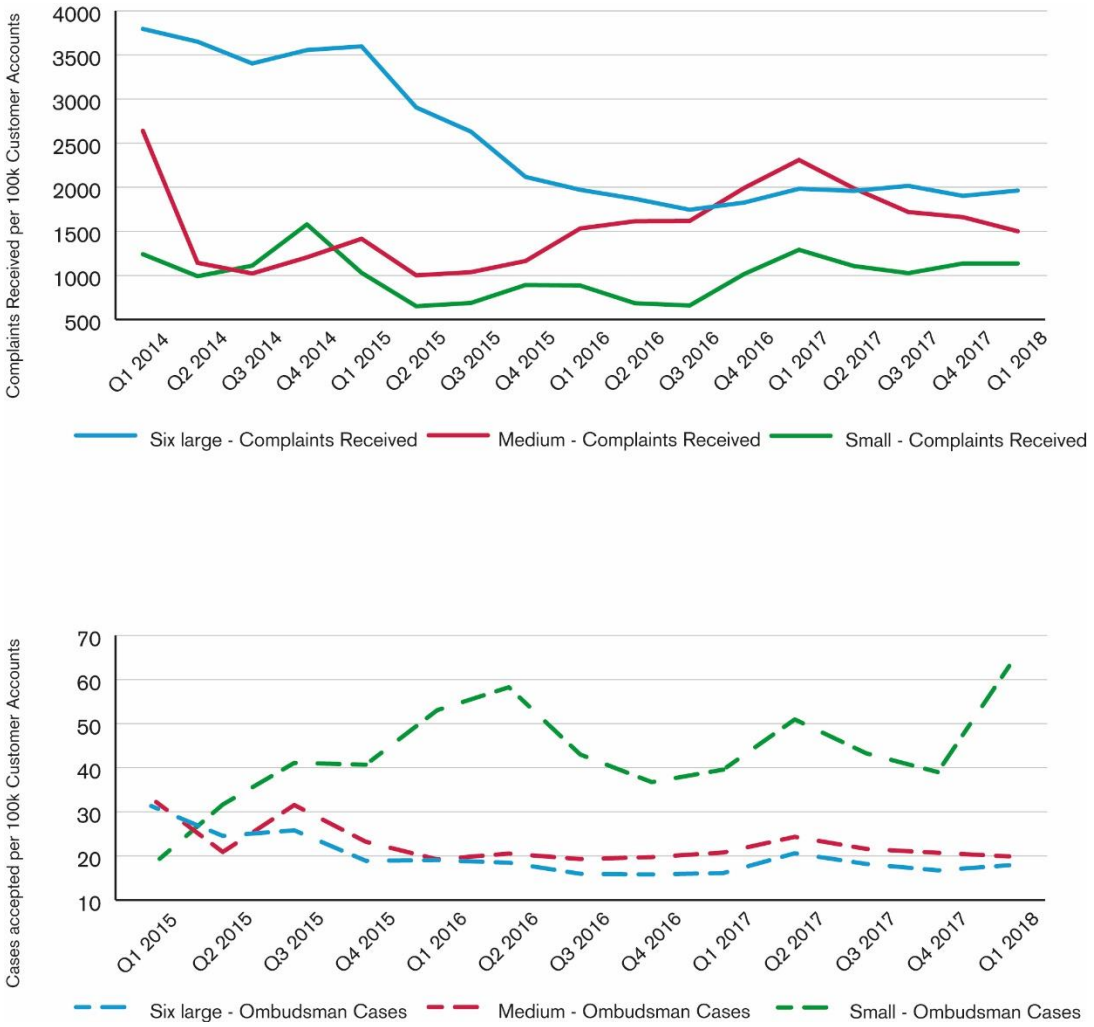
[33] See https://www.ofgem.gov.uk/publications-and-updates/consumer-engagement-survey-2018
[34] See https://www.ofgem.gov.uk/system/files/docs/2018/09/quadrangle_ofgemchs2018_researchreport.pdf
[35] Ofcom's Comparing Service Quality report 2018, and the Institute of Customer Service report 2018, each showed both Gas and Electricity overall score lower than other industries for service.
[36] See https://www.citizensadvice.org.uk/about-us/how-citizens-advice-works/citizens-advice-consumer-work/supplier-performance/energy-supplier-performance/compare-domestic-energy-suppliers-customer-service/

Figure 2.11: Customers' confidence engaging with the market



Source: Ofgem**,** *Consumer engagement survey 2018***.**

Figure 2.12: Complaints received by suppliers and cases accepted by the Ombudsman by supplier size groups



Source: Ofgem's analysis of data from suppliers and the Energy Ombudsman

Note: The group of small suppliers considered in Ofgem's complaints data only refer to six small suppliers, as shown in https://www.ofgem.gov.uk/data-portal/complaints-received-small-sized-suppliers-10000-customer-accounts.

Performance tends to vary across suppliers and quality of service indicators, with variation being especially high among small suppliers (see Figure 2.13). While some, including innovative newer entrants, tend to outperform larger suppliers, others have not increased customer service resources as they grow, leading to a decline in standards. Billing accuracy and timeliness seem to be lower for smaller suppliers. By contrast, small suppliers seem to perform better in quickly addressing customer calls, keeping appointment times and executing the switching process.

Figure 2.13: Key quality of service indicators by supplier size groups

Key quality of service indicators		Suppliers		
		Average values and range		
		Large	Medium	Small
Assess	Billing accuracy (% of customers)	94% (88.7% - 96.6%)	88% (69.8% - 95.9%)	84% (55.0% - 99.7%)
	Billing timeliness (% of customers)	97% (94.0% - 99.0%)	95% (84.2% - 99.8%)	89% (45.3% - 100%)
Assess	Missed appointments (% out of total)	6% (2.5% - 10.2%)	5% (1.1% - 8.0%)	3% (0% - 22.8%)
	Call waiting time (seconds)	163.8 (68-251)	152 (87-209)	143.4 (17-558)
Act	Switches (% executed within 21 days)	95% (84.7%-99.1%)	91% (66.7%-100%)	98% (95.6%-100%)

Source: Citizens Advice Supplier Star Rating Q1 2018 and suppliers' data submissions to Ofgem for Guaranteed Standards of Performance

Note: Average values for each group are calculated as simple arithmetic means

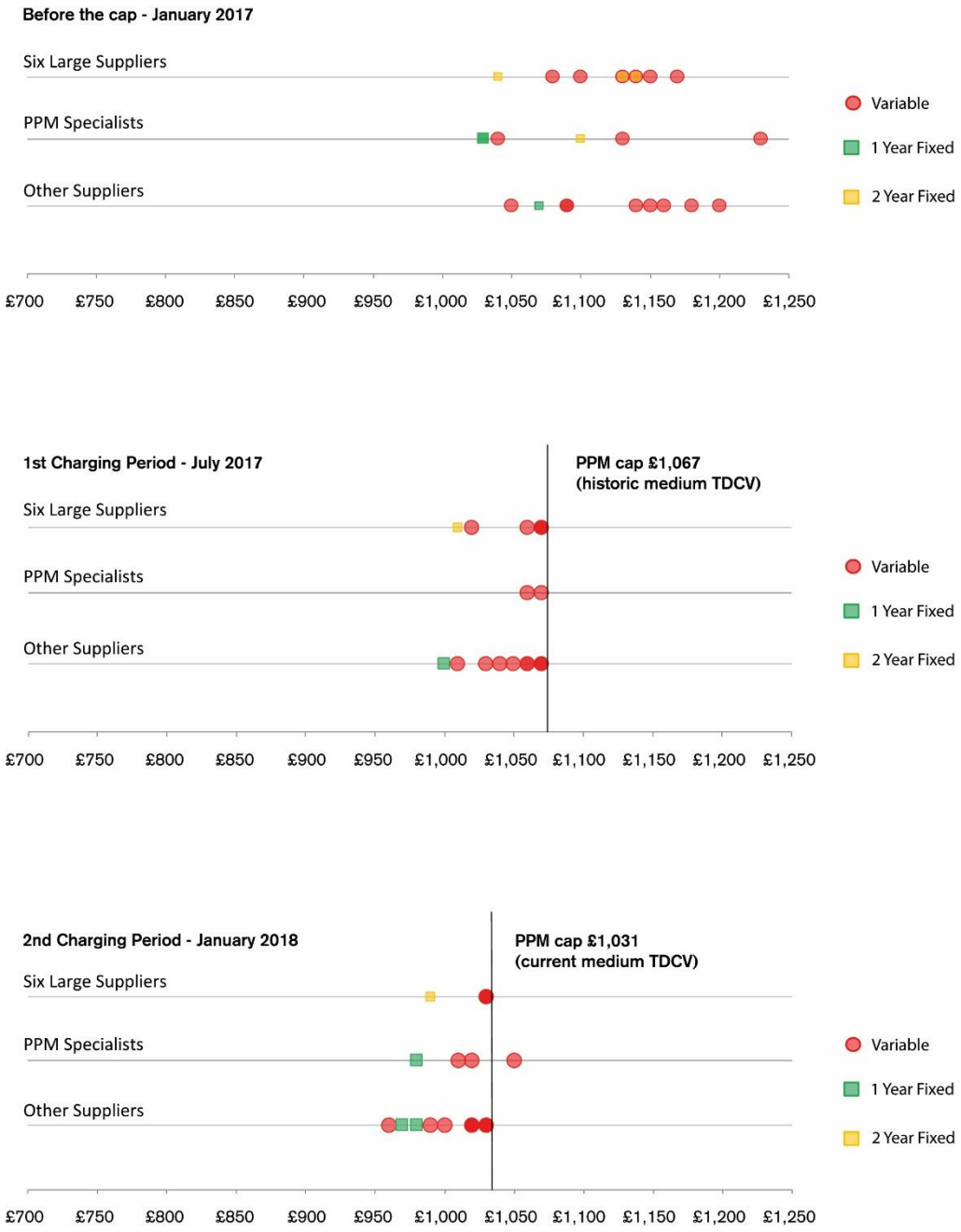
The impact of the PPM safeguard tariff

There are currently around 4 million customers on prepayment meters (PPMs), representing around 16% of total customers in GB. Competition has worked less well for these customers, who have traditionally had less choice in the market, due to technical restrictions, compared to consumers on credit payment methods. This was a key finding of the CMA's energy market investigation and led the CMA to issue an order in 2016 requiring suppliers to ensure that the annual bills paid by PPM customers do not exceed a specified cap, for a period until the end of 2020. We implemented the order by introducing a safeguard tariff on PPM tariffs from April 2017.

Price dispersion has narrowed under the safeguard tariff, but cheaper deals are still available

Overall, price dispersion narrowed during the first two periods[37] of the safeguard tariff implementation. This was mainly due to suppliers reducing higher prices to comply with the cap, while the market cheapest tariffs remained roughly at the same level and were offered in most cases by the smaller suppliers (see Figure 2.14).

Figure 2.14: Price dispersion for PPM dual fuel tariffs before and after the introduction of the PPM safeguard tariff



Source: Ofgem analysis of Energyhelpline data

[37] The first period run from 1 April 2017 to 30 September 2017 and the second from 1 October 2017 to 31 March 2018.

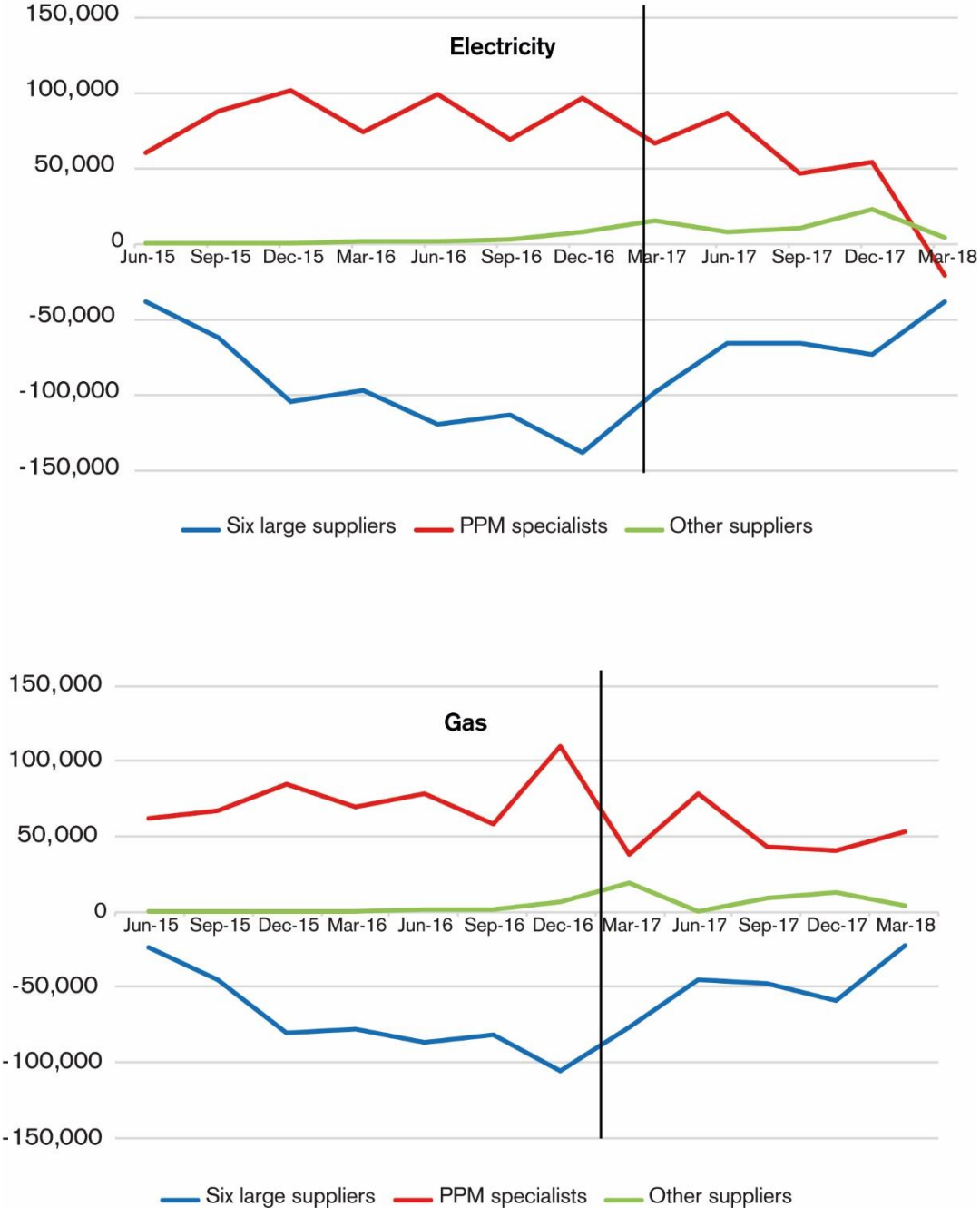
Note: PPM specialists covered here include: Utilita, OVO, E, Economy Energy, Eversmart Energy, Our Power, Spark and Toto. The last graph includes a non-compliant tariff at £1,050 for Economy Energy in January 2018. We issued a temporary direction for Economy Energy to continue to use this tariff, because it was a zero-standing charge tariff that would benefit low consumption users.

The above evidence suggests competition dynamics comparable to that observed in the non-PPM market, where small suppliers set the cheapest prices, large suppliers generally price higher but undercut the lower prices occasionally and medium suppliers tend to follow a more cautious pricing approach.

Switching away from the largest suppliers has slowed down and the vast majority of PPM customers are on tariffs priced close to the cap

Levels of overall engagement among PPM customers have traditionally been lower than those observed for customers on other payment methods. 2018 survey data indicates that the proportion of PPM customers who have switched supplier, tariff or just compared deals is broadly stable at 32% (it was 29% in 2017) and remains below the average for all customers (41%). On the other hand, there is indirect evidence that PPM external switching has slowed down. Between March 2017 and March 2018 (see Figure 2.15) the net PPM customer account losses for the six large suppliers have declined and the net gains for PPM specialist suppliers have reduced. This is consistent with information directly provided by the six large suppliers that suggests lower churn rates following the implementation of the safeguard tariff.

Figure 2.15. Net PPM customer account gains by supplier group



Source: Ofgem analysis of social obligations reporting data provided by suppliers

Note: PPM specialists covered here include: Utilita, OVO, E, Economy Energy, Eversmart Energy, Our Power, Spark and Toto

Possibly as a result of the narrower price dispersion and the continued relatively low levels of engagement, the vast majority of PPM customers (above 90%) were on tariffs priced at or close to the PPM cap in both charging periods.

Product choice has increased and quality of service is stable for PPM customers

Before the introduction of the safeguard tariff, the number of PPM offers available on the market to dual fuel customers was 29, compared to 123 for direct debit. Most suppliers offered mainly SVTs to prepayment customers and fixed tariffs represented 31% of the total number of tariffs. Under the PPM cap, the number of PPM dual fuel tariffs has risen in line with the number of suppliers and there were 34 dual fuel PPM tariffs for single rate meters as of March 2018. On the other hand, the proportion of fixed tariffs on offer has decreased further to 15%. Faced with increasing uncertainty about wholesale costs, medium and small suppliers have reduced the number of PPM fixed tariffs on offer and tend to have only one PPM SVT.

Under a price cap, suppliers may compete more through product differentiation. In the PPM segment a key differentiator is the offer of online manageable, smart 'pay-as-you-go' tariffs, with easier access to top-up and emergency credit. Our data suggests that in 2017 the number of electricity and gas smart PPM meters increased by 59% and 55% respectively, compared to 2016. The number of suppliers offering smart 'pay-as-you-go' tariffs and other smart features, such as low credit, high consumption alerts, as well as multiple ways to top up, also increased or was stable (see Figure 2.16).

Figure 2.16. PPM tariffs with innovative features

Number of suppliers in the PPM segment offering:	2016	2017
Smart pay-as-you-go tariffs	15	18
Low credit and/or high consumption alerts	14	17
Multiple top-up channels including cash/online/ phone/mobile/text	(14/13/8/12/6)	(17/15/8/14/6)

Source: Social Obligation Reporting data and safeguard tariff compliance data

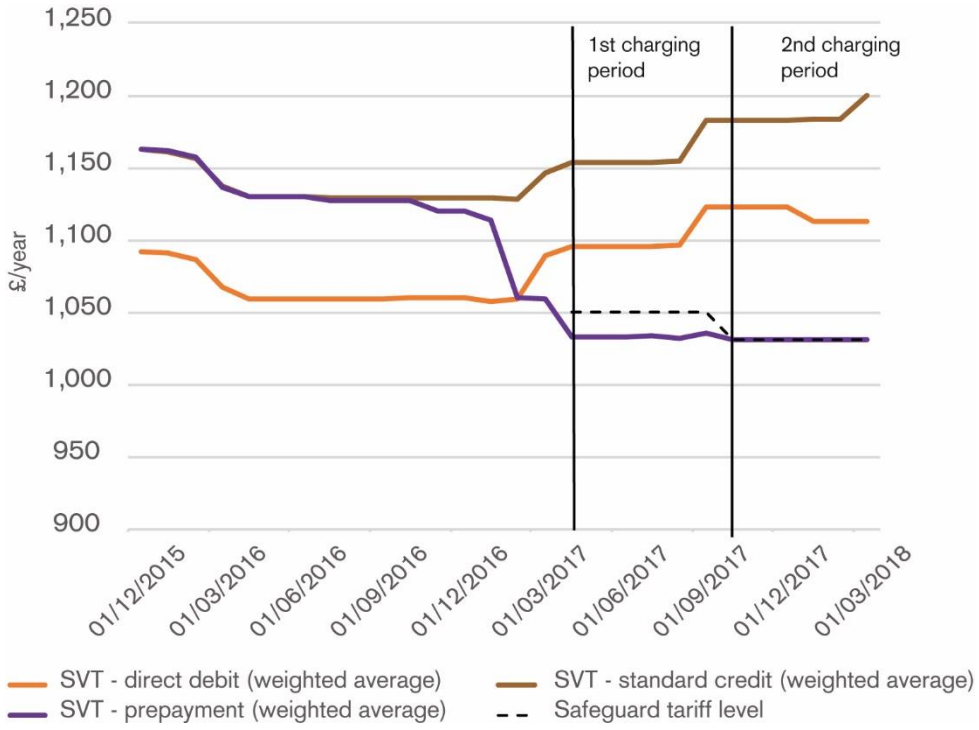
Quality of service levels seem to have remained stable for PPM customers to date. Complaints information from the Energy Ombudsman and Citizens Advice have not revealed any specific PPM issues after the introduction of the safeguard tariff. Survey data also indicates that the level of complaints from PPM customers is stable. Around 12% of PPM customers declared they raised a complaint in the past 12 months, compared to 11% in 2017, while the corresponding proportion across all payment methods was 10%.

Prepayment SVT tariffs are now the cheapest payment method

Since market liberalisation, customers paying by direct debit have received a discount compared to those paying by prepayment and standard credit. The introduction of the safeguard tariff has reversed this pattern for SVT tariffs.

Immediately after the safeguard tariff level was announced in February 2017, while PPM tariffs started to fall to comply with the cap, average SVT prices for customers on direct debit and standard credit increased above the average SVT PPM price (see Figure 2.17). The average differential across GB was £67 and £125 respectively for direct debit SVT and standard credit SVT during the first charging period and widened to £88 and £155 during the second charging period (see Figure 2.17).

Figure 2.17. SVT prices across payment methods before and after the introduction of the safeguard tariff



Source: Ofgem analysis of Energylinx and Energyhelpline data

Non-domestic retail energy markets

As of June 2018, there were 1.5 million gas meter points and 2.5 million electricity meter points in the non-domestic markets, accounting for 40% (198 TWh) and 65% (195 TWh) of total (domestic and non-domestic) gas and electricity demand respectively. Overall non-domestic electricity and gas spending was around £23 billion in 2017.[38]

Consumers in the non-domestic sector are diverse, covering a range of different sectors and energy needs. Businesses can be broadly categorised as Industrial and Commercial (I&C), small and medium enterprises and microbusinesses.[39] As in last year's State of the Energy Market Report, our main finding is that non-domestic retail markets typically work well for larger businesses. Small and microbusinesses continue to pay much higher prices and their engagement remains limited, but there are signs of improvement.

Non-domestic retail energy markets structure

Entry and expansion of new suppliers continue

As of June 2018, there were 90 active licensed suppliers in non-domestic markets, implying a net entry of 10 compared to June 2017, continuing the increase observed in the previous year. Of the active suppliers, 43 supplied both gas and electricity, 26 only

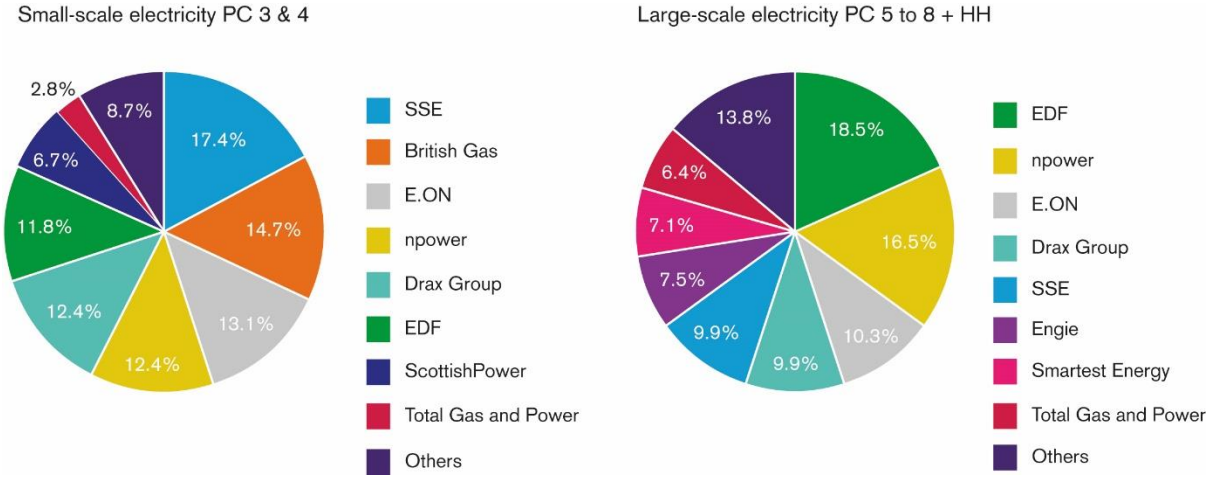
[38] We source gas and electricity meter points directly from network operators, while the sources for gas and electricity demand data are: BEIS - Natural gas supply and consumption and BEIS - Supply and consumption of electricity. Spending data is sourced from DUKES 1.7.

[39] A non-domestic customer is defined as a microbusiness if they meet one of the following criteria: employs fewer than 10 employees (or their full time equivalent) and has an annual turnover or balance sheet no greater than €2 million; or uses no more than 100,000 kWh of electricity per year; or uses no more than 293,000 kWh of gas per year.

gas and 21 only electricity. Most business customers tend to negotiate separate contracts for gas and electricity and many do not have a gas supply (for example, only 42% of micro- and small businesses report using both electricity and mains gas).

Non-domestic markets liberalised earlier than domestic markets and have seen higher rates of entry and exit, resulting in lower concentration and greater presence of suppliers besides the six large domestic suppliers (see Figures 2.18 and 2.19). Over the last year, the latter have generally continued to lose ground across all non-domestic customer types, and other suppliers have reinforced their positions, especially in the segment of larger businesses. Concentration levels have continued to fall. In both gas and electricity large business segments, the HHI was at or just below 1,000.[40] For the small gas and electricity segments, the HHI was, respectively, at 1,196 and 1,195, indicating a moderate level of concentration according to the CMA's definition and close to that in the domestic market.

Figure 2.18. Non-domestic market shares for electricity in June 2018

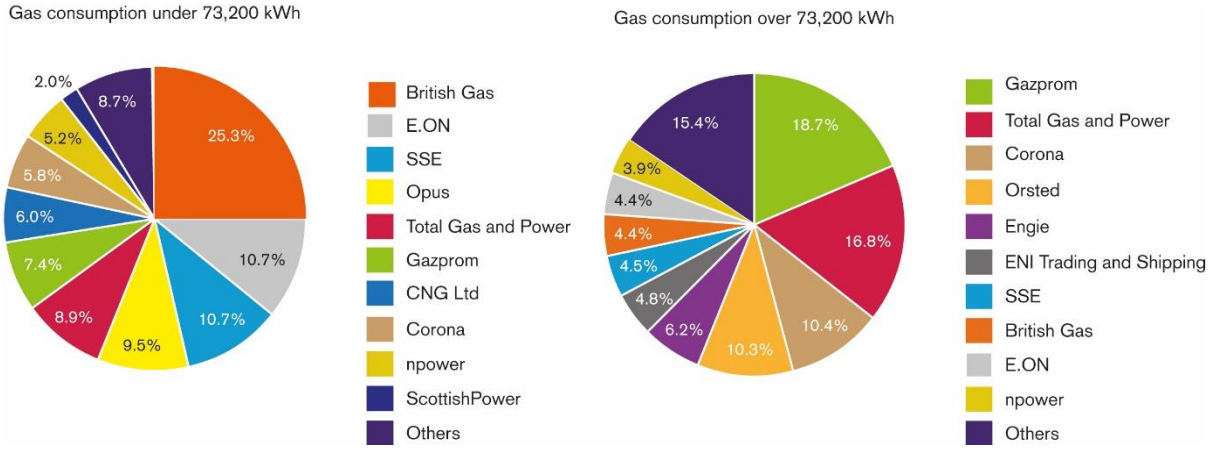


Source: Ofgem's analysis of Elexon data

Note: Electricity profile classes' definitions refer to Elexon Guidance. Profile classes 3 & 4 are typically small businesses and market shares are measured in terms of meter points; profile classes 5 to 8 and half-hourly (HH) customers are typically larger and market shares are measured in terms of volume. The Drax group includes Haven Power and Opus Energy.

[40] The Herfindahl-Hirschman Index (HHI) measures market concentration by summing the squares of the market share of each player. See Figure 2.1 for a more detailed explanation.

Figure 2.19. Non-domestic market shares for gas in June 2018



Source: Ofgem's analysis of Xoserve data

Note: In Q1 2018, SSE reclassified as non-domestic some meter points that had been classified as domestic. This contributed to their market share increase from 6% in June 2017 to 11% in June 2018 in the segment of customers with gas consumption under 73,200 kWh. For electricity the Drax Group includes Haven Power and Opus.

There are signs of increased engagement for small and microbusinesses

In its energy market investigation the CMA found barriers to engagement for microbusiness customers,[41] especially related to lack of price transparency and contract lock-in. To improve this situation, on 26 June 2017 the CMA issued an order to suppliers to stop locking firms into automatic rollover contracts. This means that suppliers are no longer able to charge exit fees or to include no-exit clauses in automatic rollovers. Customers can now give termination notice at any time. The CMA also ordered suppliers to help microbusinesses search for the cheapest available deals, by making information clearly available on their websites or via a link to a price comparison website.

Our 2018 non-domestic engagement survey shows some signs of improvement in the level of engagement for small and microbusinesses. The proportion of small and microbusinesses that have had some engagement with the energy market, either through switching supplier, tariff or comparing deals, has increased from around 66% in 2016 to 68% in 2017. This year, reported switching between suppliers increased from 21% to 24%, while switching tariff fell from 26% to 23%. A higher proportion of consumers compared prices across suppliers year on year, rising from 45% in 2016 to 48% in 2017, with the incidence of comparing tariffs with an existing supplier rising from 33% to 40%.

Our survey also shows an increase of contract renegotiation and a reduction in the proportion of rollover contracts. While the incidence of small and microbusinesses on a first contract with a supplier is broadly flat, there has been an increase in renegotiated contracts, from 39% in 2016 to 45% in 2017 and a larger fall in the incidence of those on rollover contracts, from 26% in 2016 to 17% in 2017. The latter may have been directly affected by the CMA's order of June 2017 that banned automatic rollover contracts.

However, contract lock-in continues to represent the single most important perceived barrier to engagement for small and microbusinesses. In 2017, among those who did not

[41] See https://www.gov.uk/cma-cases/energy-market-investigation

switch supplier or tariff during the last 12 months, 52% stated that this was because they were tied into an existing contract, compared to 53% in 2016. But the importance of exit fees diminished: 26% reported staying with their current supplier to avoid exit fees in 2017, compared to 32% in 2016. Other significant reasons in 2017 were the preference to stay with the existing supplier (44%) and the perception that switching was too time-consuming (38%).

The proportion of microbusinesses on negotiated contracts is increasing

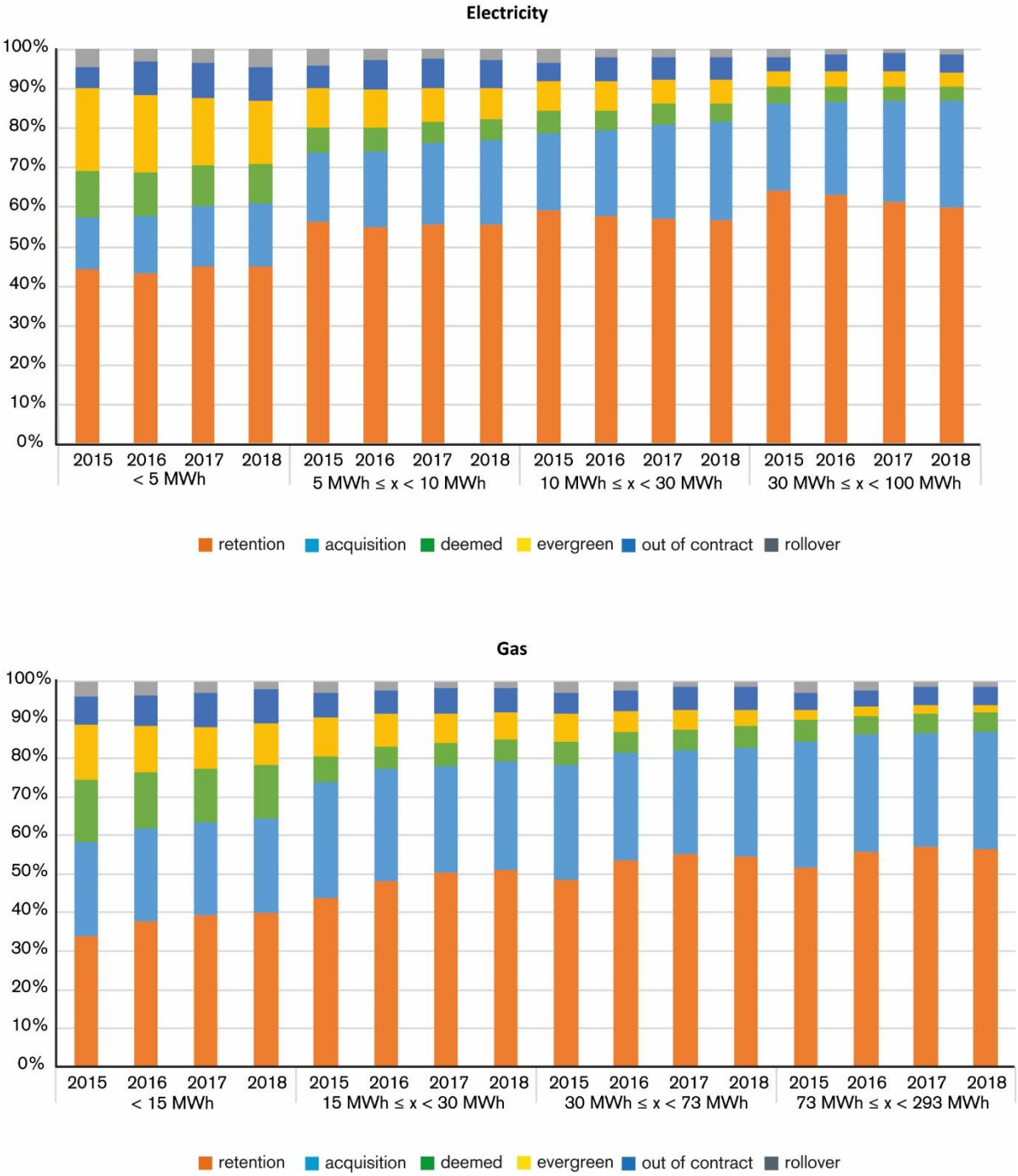
We have analysed recent evidence on the number of microbusiness meter points on different contract types, based on information provided by the 11 largest suppliers to the small business segments.[42]

Our data indicates that the majority of microbusinesses are on negotiated acquisition and retention contracts and that this proportion has increased over time across the different consumption categories (see Figure 2.20). Between Q1 2015 and Q1 2018 it went up from 70% to 76% in gas, and from 70% to 73% in electricity. In both fuels there was a similar reduction in the proportion of microbusinesses on default tariffs, while the proportion on deemed contracts remained relatively stable.[43]

Within the microbusiness segment, contract types vary across the different consumption categories. The main distinction is between the smallest microbusinesses categories (with consumption below 15 MWh in gas and 5 MWh in electricity) and the remaining categories. The former show the greatest improvement over time, but continue to exhibit the lowest proportion of customers on negotiated contracts as of Q1 2018 (64% in gas and 61% in electricity).

[42] These include British Gas, CNG Ltd, Corona, E.ON, EDF, Gazprom, npower, Opus, SSE, ScottishPower and Total Gas and Power, jointly accounting for just above 90% of electricity and gas supply to the small business segments.
[43] A default contract refers to any contractual arrangement (evergreen, rollover or out of contract) that applies in cases where the customer does not make any choice at the end of a fixed contract. A deemed contract is normally in place when a customer moves into new premises and starts to consume gas, electricity, or both, without agreeing a contract with a supplier.

Figure 2.20. Proportion of microbusiness meter points in varying consumption brackets and contract types



Source: Ofgem's analysis of suppliers' data

Note: For 2015, 2016 and 2017 the data shown in the charts refers to the proportion of meter points on the different types of contracts at the end of the year. For 2018 it refers to the end of the first quarter.

Non-domestic retail energy market outcomes

Microbusiness customers continue to pay significantly higher prices than other business customers

Energy contracts for business customers are mostly bespoke and there is generally limited public information available on them. Small and microbusinesses are typically on fixed-term, fixed price contracts, with standard terms and conditions. Larger industrial customers have a distinct advantage in being able to negotiate better deals than smaller businesses given their higher bargaining power. In addition, they are metered half-hourly and some have flexibility to 'load shift' from periods of high price to periods of low price.[44]

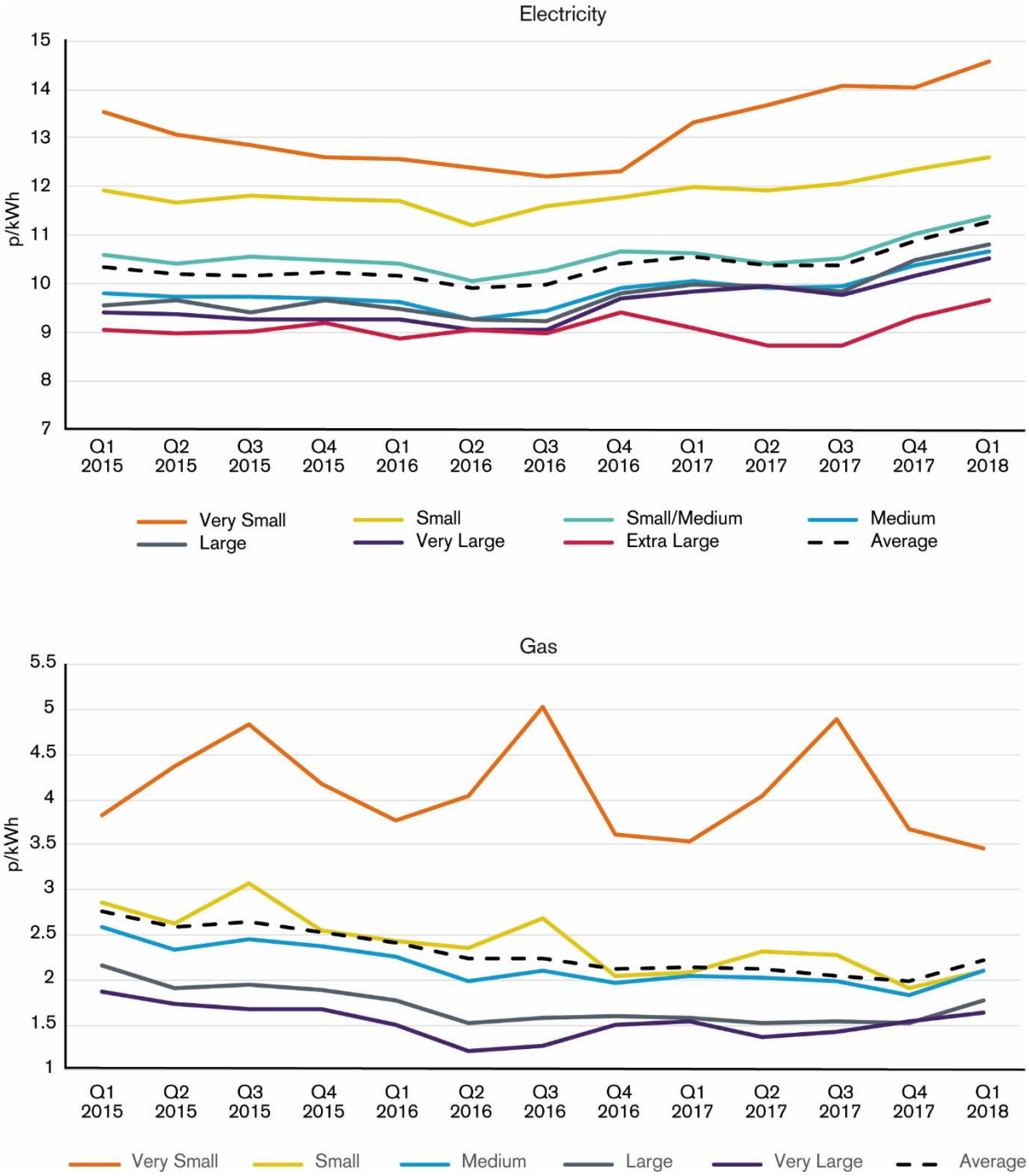
Average prices for microbusinesses have typically been above those for large businesses (see Figure 2.21). In Q1 2018, microbusinesses paid on average a gas price nearly twice as high and an electricity price 35% higher than large businesses.[45]

The different trends observed for gas and electricity prices between Q1 2015 and Q1 2018 were mainly due to dissimilarities in wholesale price trends, with much larger and prolonged reductions for gas than electricity and to the fact that the costs of social and environmental programmes are almost entirely recovered through electricity prices.

[44] See: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633442/upgrading-our-energy-system-july-2017.pdf

[45] The annual consumption threshold (20 MWh/year) identifying very small electricity business customers in BEIS industrial price statistics differs from our definition of electricity microbusinesses (100 MWh/year).

Figure 2.21. Average gas and electricity non-domestic prices



Source: BEIS, *Gas and electricity prices in the non-domestic sector*.

Note: Prices are in nominal terms and exclude VAT and the Climate Change Levy. In electricity very small, small, small/medium, medium, large, very large and extra-large customers are defined by BEIS as having consumption of 0-20MWh, 20-499MWh, 500-1,999MWh, 2,000-19,999MWh, 20,000-69,999MWh, 70,000-150,000MWh and >150,000MWh respectively. For gas the relevant thresholds are <278MWh, 278-2,777MWh, 2,778 - 27,777MWh, 27,778-277,777MWh and 277,778-1,111,112MWh. Gas price spikes are related to a standing charge effect in those months (Q3) where consumption, driven by space heating, is lowest.

The higher prices seen for the smallest categories of business customers can be partly explained by a significant minority of microbusinesses being on more expensive default and deemed contracts, as shown in Figure 2.20. Our findings indicate that there are still considerable variations across microbusiness contract prices, in both gas and electricity. In Q1 2018, the lowest average prices were 3.6 pence/kWh and 13.1 pence/kWh, respectively for negotiated gas and electricity contracts (i.e. acquisition and retention contracts), while the most expensive ones were 7.4 pence/kWh and 22.8 pence/kWh for deemed contracts. Customers on rollover and evergreen contracts on average pay more per unit of energy than customers on negotiated contracts but less than deemed contracts (4.9 pence/kWh for gas and 19 pence/kWh for electricity).

Most small and microbusinesses continue to be broadly satisfied with service quality

Consumer satisfaction in the non-domestic segment has remained broadly unchanged. Survey data shows that around two-thirds of small and microbusinesses reported they were satisfied with their current supplier's overall service in 2017, the same proportion as in 2015.[46] However, only 17% of smaller businesses in the 2017 survey would recommend their energy supplier to others.

For small and microbusinesses, brokers are an important way of helping consumers shop around and switch. In 2017, 67% of those who switched tariff or supplier used a broker and 42% of those who switched tariff or supplier said the broker was their main influence. This represents an increase compared to previous surveys in 2014, 2015 and 2016, where the proportion of consumers who used brokers to switch fluctuated between 50% and 64%, and the proportion of those who said it had a main influence fell in the range between 26% and 28%.

Those who used brokers appeared satisfied with the service, with 63% of users satisfied compared to 15% dissatisfied, with high intentions for repeat use. Broker use is associated with more efficient purchasing and more regular switching. Survey data also suggests that, although used by companies across the size spectrum, brokers appear to be most effectively used by high spend and larger firms.

Wholesale energy markets

Gas and electricity wholesale markets have a significant impact on consumer outcomes as wholesale costs are the largest single component of consumer bills. The level of competition in these markets is an important determinant of wholesale energy market prices and hence wholesale costs incurred by retail energy market suppliers.

We consider the structure of wholesale energy markets, including the market participants, ease of entry and exit, degree of market concentration and vertical integration, and market power of producers. We then look at the outcomes they achieve, including the prices and their determinants, the sources of supply and market liquidity.

We focus on the gas market first, followed by electricity.

[46] This is supported by other measures of satisfaction such as Value for Money (54% in 2016 vs 53% in 2015) and information provided about satisfaction with available tariffs (46% in 2016 vs 51% in 2015).

Wholesale gas market structure

The wholesale gas market is supplied by a diverse range of sources

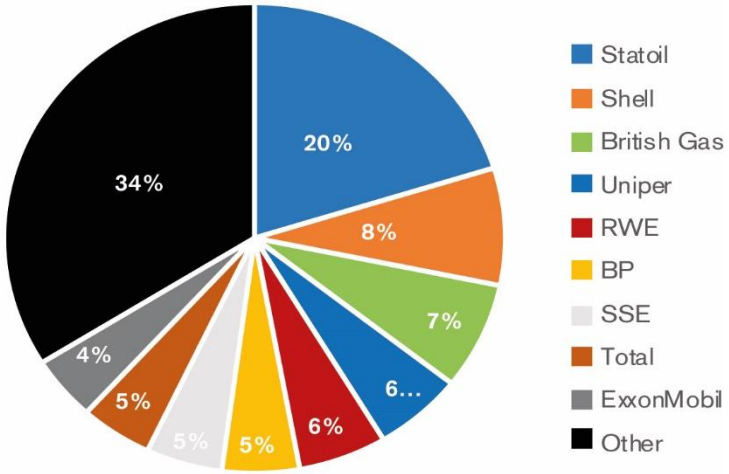
The UK Continental Shelf production in the North Sea is the primary source of supply in the wholesale gas market. Its contribution to UK gas supplies declined substantially from nearly all in 2000 to half in 2010, and met almost 43% of UK annual gas demand in 2017, a 4 percentage points increase compared to 2016.[47] The remainder is from several gas importers delivering gas from a diverse range of sources – by pipelines from Norway and the European gas grid, and via ships in the form of Liquefied Natural Gas (LNG).[48]

The National Balancing Point (NBP) is where shippers submit their buy and sell trades. A shipper licence enables a company to purchase gas from a producer and sell it to a supplier. In 2017, out of 146 licensed entities trading in the NBP market, 125 traded continuously during the period, and around 21 entered and exited the platform over the year, suggesting that there are low barriers to entry and exit in the market.[49]

There is low concentration in the wholesale gas market

There is a low level of concentration in the wholesale gas market, and this is reflected in the large number and diversity of gas producers. The six largest gas suppliers accounted for 52% of the market in 2017/18 compared to 58% in 2016/17 (see Figure 2.22).

Figure 2.22 Share of UK gas supply 2017/2018 [50]



Source: Annual data from National Grid provided to Ofgem.

For total gas supplies, the Herfindahl-Hirschman Index (HHI) of market concentration is down from 814 in 2016 to 744 in 2017.[51] This level of HHI is below the threshold of 1,000, above which the CMA considers the market to be concentrated.[52] This suggests that gas suppliers are unlikely to be able to exercise unilateral market power to increase the price of wholesale gas.

[47] Ofgem data portal: Gas Demand and Supply source by month (GB)
[48] Ofgem data portal: Gas Demand and Supply source by month (GB)
[49] Data provided to Ofgem from National Grid
[50] Calculated using National Grid's Entry Point Daily Quantity Delivered (UDQI, kWh).
[51] Ofgem calculation based on data provided by National Grid.
[52] CMA (2010) Merger Assessment Guidelines.

Vertical integration describes when a company is active in both the retail and generation or wholesale sectors of a market. Vertical integration could potentially improve efficiencies, but in some cases vertically integrated firms can leverage the advantages of operating in both upstream and downstream markets and discourage or prohibit the entry of other firms into the market. Vertical integration does exist in the gas market, but it is not a substantial risk as many of the largest gas shippers don't have integrated supply arms. In its final report in 2016, the CMA concluded that harm can sometimes arise from vertical integration but is not a significant risk in the gas market.[53] We consider that this continues to be the case.

Overall, structural indicators such as HHI and levels of vertical integration show that there is a competitive market structure with low concentration in the wholesale gas market, with limited opportunity for firms to exert excessive market power. We expect the competitive market would encourage suppliers to deliver good outcomes for consumers.

Wholesale gas market outcomes

GB gas prices are largely determined by global conditions

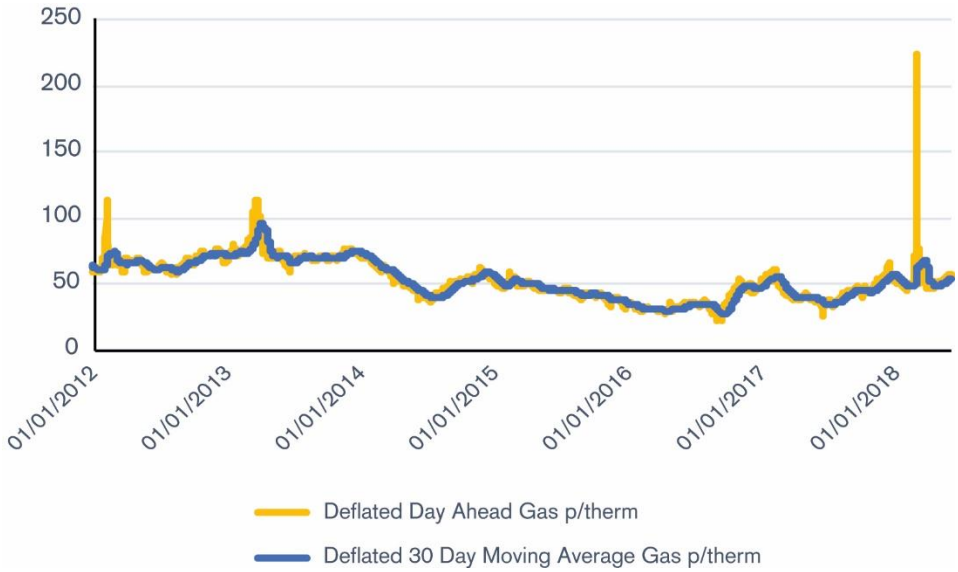
Imported gas remains the marginal source of supply, so GB gas prices are largely determined by global conditions. Gas prices, shown in Figure 3.23, have been rising since mid-2016 and increased significantly during winter 2017-2018, from an average of 46p / therm in October 2017 to 63p / therm in March 2018.[54]

The increasing prices were predominantly caused by the unseasonably cold weather at the beginning of the year that affected countries throughout Europe, and a series of unplanned outages across GB supply infrastructure at the time pushed them upwards further. This caused gas storage supplies to deplete, a gas supply warning to be issued and imports to increase. The spike on 01 March is visible in Figure 2.23, when the price of gas reached 231p / therm. This price did not last long and fell to a third of this value by the next day.

One could interpret this as market mechanisms working efficiently. However, it may also reflect the reduced storage capacity in GB and our increasing reliance on imports and therefore exposure to changes in international gas prices. We consider the gas price spike during the so-called 'Beast from the East' period of heavy snow further in Chapter 6. By April the price fell back below 51p/therm and the UK began to export gas via the IUK – the two-way interconnector that links the UK and Belgium.[55]

[53] CMA (2016). Energy market investigation. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/531157/Energy-final-report-summary.pdf
[54] Bloomberg. Gas prices are NBP day ahead
[55] Bloomberg. Gas prices are NBP day ahead

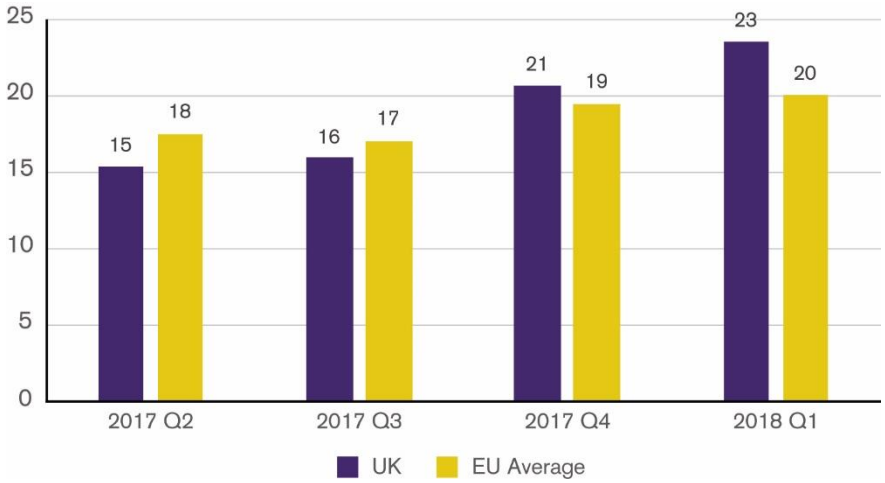
Figure 2.23 Wholesale gas prices: day ahead contracts, UK (April 2017 prices)



Source: Bloomberg. Gas prices are NBP day ahead[56] and 30 days moving average. Prices were adjusted for inflation using RPI.

UK wholesale gas prices vary over time relative to gas prices in other European countries. For example, the price of gas in the UK was below the European average in Q2 and Q3 2017 and above it in Q4 2017 and Q1 2018.[57] Increases in demand in colder months tend to push up prices and imports may rise, while decreases of demand tend to do the opposite. Overall, UK gas prices were around the European average in the year up to Q1 2018 (see Figure 2.24).

Figure 2.24 A comparison of average European wholesale gas prices Quarter 2 2017 to Quarter 1 2018, nominal prices (£/MWh)[58]



Source: EC Quarterly Reports on European Gas Markets, Quarter 2 2017 to Quarter 1 2018.

[56] Day-ahead prices are a good indicator of the short-term price of gas in GB. However, it should be considered that, as suppliers often buy most of their gas in advance of when it will be delivered, the day-ahead prices may not necessarily reflect the price that suppliers will have paid.
[57] European Commission Quarterly Reports on European Gas Markets from Q2 2017 to Q1 2018.
[58] The following European countries have been excluded as they did not have data for all quarters: Ireland, Portugal, Croatia, Cyprus, Luxembourg, Malta, Slovenia.

Gas flows into GB demonstrate an efficient deployment of gas sources

Patterns of gas flows into GB are consistent with competition driving the efficient deployment of gas sources and infrastructure. Injections into storage facilities tend to increase in spring and summer, as demand is low, and are then drawn upon in the winter months when demand increases. A similar pattern is true for interconnectors with GB, which often export in the summer when demand is low and import in the winter when demand is high.

Exports of gas increased by 20% in 2017 compared to 2016, while injections into storage fell in winter 2017 by 7.5% compared to winter 2016.[59] One reason for the increase in exports and reduction in winter storage was the closure of the Rough gas terminal in June 2017, which used to provide around 70% of the storage capacity in the UK (see Chapter 5).[60] This meant that gas that was usually stored in Rough was instead exported to the European continent for storage, and this reduced level of storage may increase reliance on gas imports.

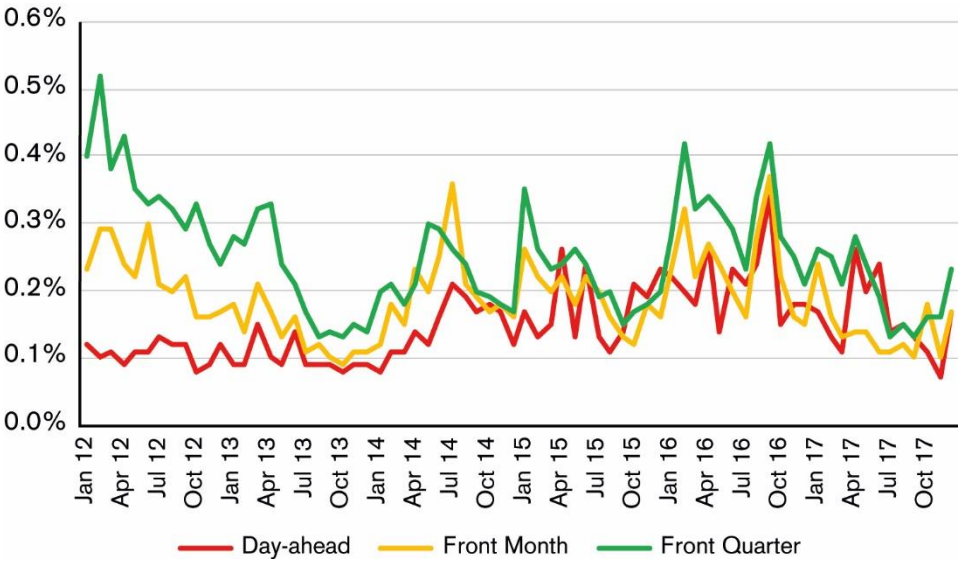
Overall, however, the level of net exports fell by 7% in 2017 compared to the previous year. This suggests that the increase in imports more than offset the rise in the level of exports in 2017.

The market is highly liquid with relatively easy access

The GB gas wholesale market is highly liquid, measured by bid-offer spreads and churn ratios. This means that market participants can be reasonably confident that the market price reflects underlying supply and demand. Bid-offer spreads are the difference between the best (highest) bid to buy and the best (lowest) offer to sell in the market, the tighter (lower) the spread the more liquid the market and hence the relative ease to trade. In GB the spread fell in 2017 compared to 2016 (Figure 2.25), reflecting an increase in the level of liquidity in the market during the year. Another way to measure liquidity is the churn ratio, this is the number of times a unit of gas is traded before it is delivered to the end consumer. It averaged 23 during 2017, up from 22 in 2016.[61] This indicates a high level of forward market trading activity which should support competition in the retail markets by enabling suppliers to smooth purchasing costs.

[59] Ofgem Data Portal: Gas demand and supply source by month
[60] CMA (2017). Notice of Decision to Review the 'Rough' Undertakings
[61] Ofgem Data Portal: Gas trading volumes and monthly churn ratio by platform (GB)

Figure 2.25 Gas bid-offer spreads for selected traded products, 2012-2017



Source: Ofgem Calculations using data from ICIS taken from Ofgem Data Portal.

Note: Data up to December 2017, correct as of: July 2018. The chart shows bid-offer spreads for contracts for gas delivered on the GB gas hub (the National Balancing Point) for day, month and quarter ahead.

Wholesale electricity market structure

There is an increasing number of wholesale electricity market participants

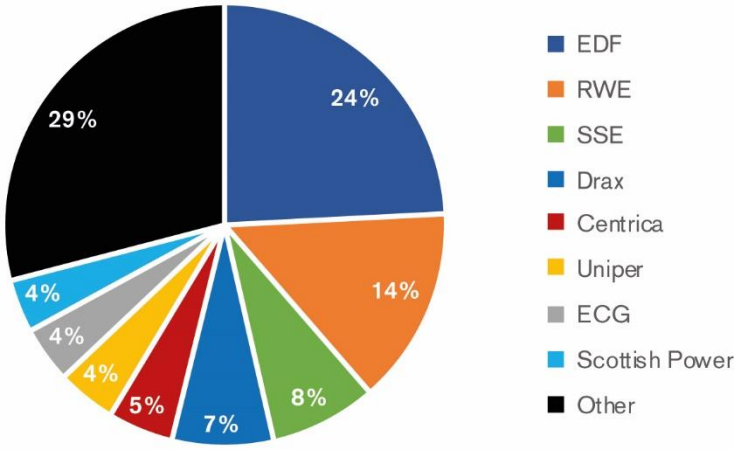
In GB, there are currently 170 firms with a licence to generate electricity, up from 149 in 2016.[62] In addition, numerous small-scale operators generate electricity that is typically run back into the distribution network. There are also four operational interconnectors that allow for the transfer of electricity across national borders and there are plans to construct further links. From January 2017 to July 2018, 21 new generating firms signed up to the Balancing and Settlement Code (BSC) and no firms have exited the market.[63] The new entrants were all renewable technologies, predominantly wind. The higher number of generating firms entering suggests that barriers to entry continue not to be prohibitive.

Market concentration and vertical integration are reducing

The wholesale electricity market is still moderately concentrated, but the degree of concentration has fallen. The eight largest electricity companies provided 71% of the metered volumes in 2017 that are associated with Balancing Mechanism Units (or individual power stations and interconnectors), compared to 77% in 2016. In addition, the recent downward trend in market concentration continues with the HHI index falling from 1,117 in 2016 to 1,034 in 2017. Total installed capacity increased from 99.5 GW in 2016 to 103.5 GW in 2017,[64] with electricity market reform supporting investment in low carbon electricity. This suggests that the structure of the market is not deterring investment in wholesale electricity supply.

[62] Source: Ofgem list of all electricity licences (information correct as at 9 August 2018).
[63] Source: Elexon.
[64] Source: National Grid (2017). "Future Energy Scenarios".

Figure 2.26 Share of GB electricity supply, 2017



Source: Ofgem calculations using data from Elexon and NETA reports

Note: Information correct as of April 2018. This chart shows the market shares of companies who supply electricity to the GB National Transmission System.

In its 2016 energy market investigation, the CMA did not identify any areas where vertical integration in the electricity market was likely to have a detrimental impact on competition for independent suppliers or generators. Since then there has been a series of transactions in the market where the largest six energy suppliers have sold their generating capacity. For example, Centrica divested 2.3 GW of installed CCGT capacity to EPH in 2017 and E.ON sold 47% of its stake in Uniper to Fortum in January 2018. As the degree of vertical integration of the big six energy suppliers is lower than in 2016, we consider that it is still unlikely to be detrimental to market competition.

Limited opportunity for generators to exert market power

We use pivotality analysis to assess whether companies have an opportunity to influence the market. This assesses if power stations owned by a particular company are required to meet demand in a given period. If this is the case, the company could potentially use this leverage to influence wholesale prices in that period. A firm's access to flexible generating capacity, such that output can be easily varied, could prevent other firms from taking advantage of their pivotality.

It follows that a reduction in *overall* flexible generating capacity could make it more likely that *certain* generators become pivotal at clearing demand in limited periods.[65] In particular, flexible coal-fired generation capacity continues to decline with a further fall of 11% between 2016 and 2017.[66] However, our assessment of the GB market as a whole suggests only a small increase in the number of hours of pivotality as compared to the previous year. The length of time that any generating capacity could be pivotal was 2% of the total tested hours in 2017. However, once we account for the flexibility of generating capacity, only one company exhibited some degree of pivotality and this is limited to just less than 0.1% of the total tested hours over the period. The result suggests that there were very short time periods where companies could have exerted market power.

65 Pivotality analysis is focused on transmission generation, but it may be that changes in the distribution network and small-scale generation have, conversely, increased flexibility.

66 Ofgem analysis of Aurora data.

It is possible that increased demand owing to the cold snap in Q1 2018 could have also increased the reliance on the limited number of suppliers that have flexible generating capacity. However, our analysis of the period indicates that there were no concerns over pivotality once we account for the flexibility of generating capacity. Initially the spike in demand was met by coal and gas, but less flexible wind and hydro generation subsequently made strong contributions as they were aided by the inclement weather.

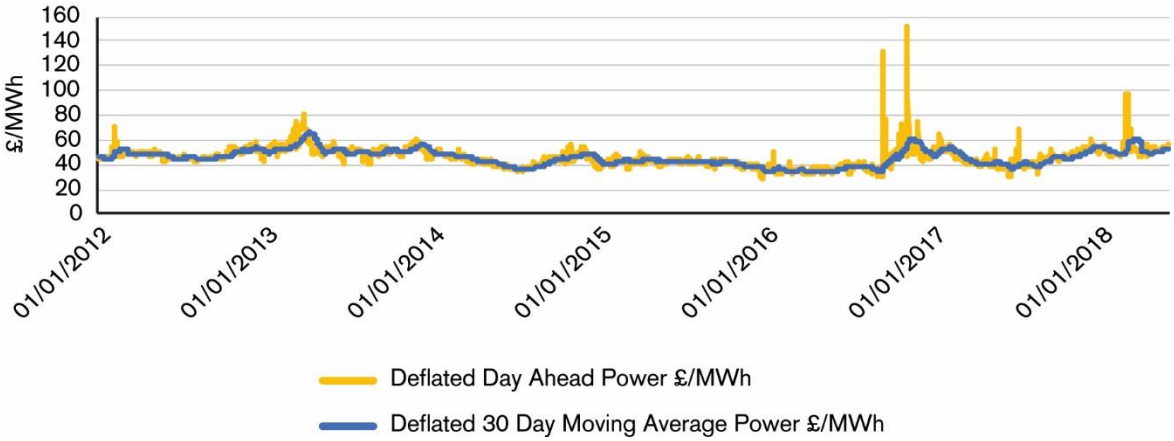
In short, the pivotality modelling suggests that there is a healthy degree of competition in the wholesale electricity market, but we will continue to monitor this, particularly if flexible generation falls.

Wholesale electricity market outcomes

GB electricity prices are closely related to gas prices

Wholesale electricity prices have been trending up since summer 2017, and in spring 2018 they reached the same level as they had in 2013 (see Figure 2.27). During the cold snap in Q1 2018, GB experienced wholesale electricity price spikes in line with other European markets in part due to the surge in demand. We examine the impact of, and market response to, these price spikes in Chapter 5.

Figure 2.27 Wholesale electricity prices: day ahead contracts (April 2017 prices)



Source: Bloomberg. Electricity prices are baseload day ahead. Prices were adjusted for inflation using RPI.

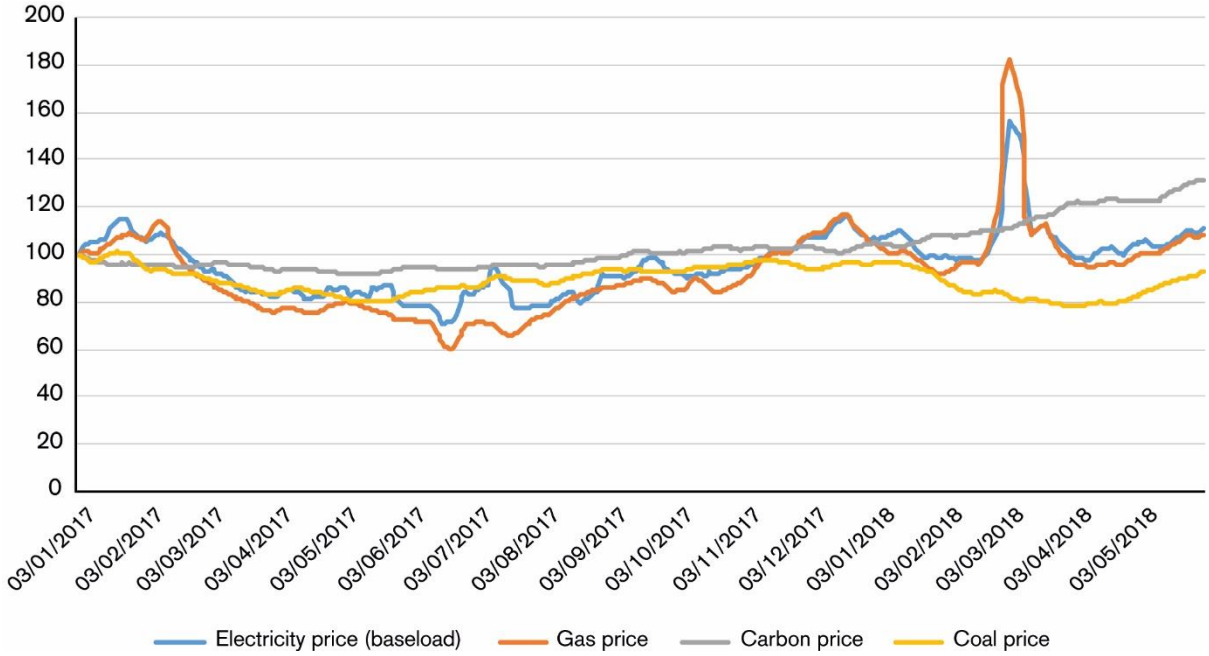
On the supply side, the main driver of electricity prices is the cost of gas. Since the start of this decade, wholesale electricity prices have been closely related to gas prices as evidenced by the correlation coefficient between day ahead gas and electricity (baseload)[67] of 0.71. Further, the movement in electricity prices since 2017 is broadly aligned with changes in the gas price (see Figure 2.28). This is consistent with competition effectively exerting pressure on electricity prices to reflect changes in input costs. Note that coal prices are now only weakly related to electricity prices, as coal accounts for a decreasing share of the generation mix.

The impact of the carbon cost on electricity prices comes via the EU Emissions Trading Scheme (EU ETS) and UK carbon price support (CPS), which is considered in the next

[67] The 'baseload' rate refers to a contract for electricity that is produced continually throughout the day and is distinct from 'peak rates' when electricity is bought/sold for consumption at peak times (7am to 7pm).

section. The CPS is set by the UK government and is only periodically adjusted, explaining its limited correlation with baseload electricity prices.

Figure 2.28 Index of electricity, fuel and carbon prices (3 January 2017 = 100, rolling averages of 10 days)



Source: Electricity and gas prices taken from Bloomberg. Carbon and coal prices taken from Aurora. Prices deflated using RPI.

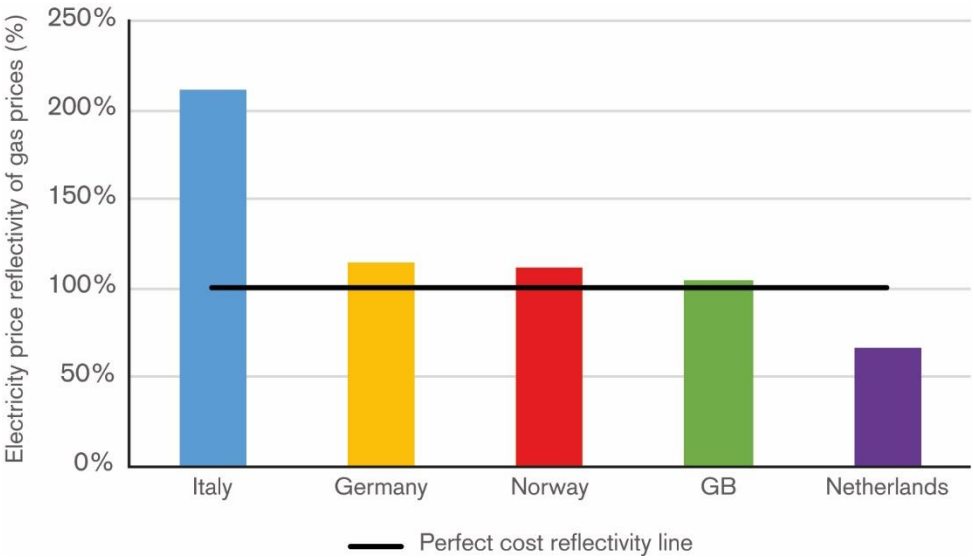
Note: Electricity is the day-ahead baseload prices, gas is the day-ahead NBP, coal is the Rotterdam Coal Futures (ARA) spot price plus transportation cost and carbon is the daily EU ETS price plus the UK CPS.

To examine how generation costs are passed through to electricity prices, we commissioned researchers at UCL to investigate the cost-reflectivity of wholesale electricity prices in GB and a sample of six major European markets. The aim was to understand how the costs borne by generators influence wholesale prices. We can use a pass-through rate of 100% to describe a perfect degree of cost-reflectivity (see Figure 2.29). The researchers found that the GB electricity wholesale market was more cost-reflective than markets in Italy, Germany, Norway or the Netherlands over the period 2012 to 2017.

In 2017, gas-fired power plants had the most substantial wholesale price-setting ability, having been at the margin 65% of the time.[68] GB is increasingly reliant on gas supplies from other countries, with imports via pipelines from Europe and LNG tankers accounting for 56% of the total in 2017. Our analysis shows that movements in exchange rates were the dominant factor in wholesale electricity price rises. Specifically, the depreciation of sterling in mid-2016 against both the Euro and the US dollar coincided with an 18% increase in the mean day-ahead electricity price. This, in turn, corresponded almost exactly with the increase of nearly 6% in retail prices from 2016 to 2017.[69]

[68] This refers to the share of hours in a year in which gas plant sets the electricity wholesale price.
[69] Castagneto Gissey, G., Grubb, M., Staffell, I., Agnolucci, P., Ekins, P., 2018. Wholesale cost reflectivity of GB and European electricity prices. Ofgem: London. 2018.

Figure 2.29 Average annual gas price pass-through rate during 2012–2017



Source: UCL analysis of the wholesale cost reflectivity of European electricity prices.[70]

Note: The UCL researchers were unable to define statistically valid rates for France or Spain. This is likely due to limited use of gas for electricity generation in France, and noisy data for Spain. Therefore, these two countries do not feature in this chart.

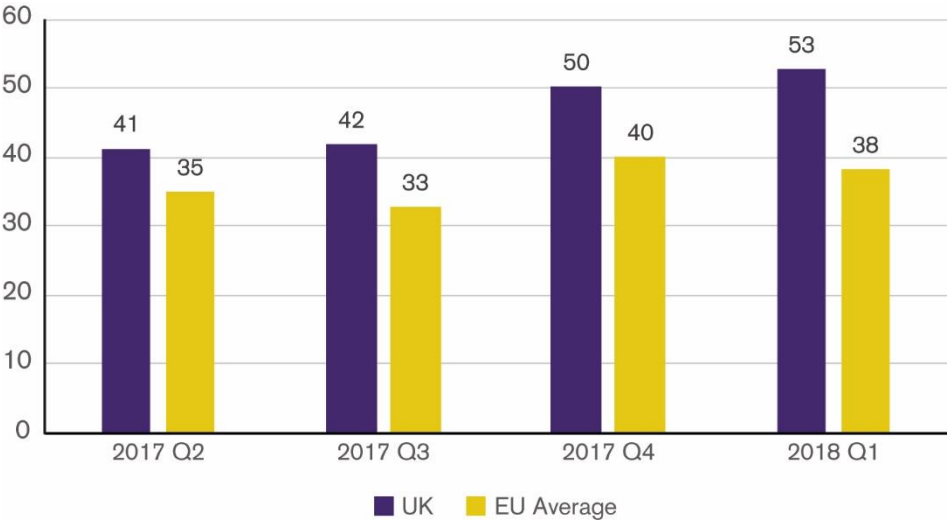
GB electricity prices are higher than the European average

Wholesale electricity prices in Britain were higher than the European average by between 18% and 38% in the four quarters up to 2018 Q1 (see Figure 2.30). This price gap is not driven by the difference in competitiveness of the wholesale electricity markets, but is partially down to policy factors. In particular, we refer to wholesale prices prior to any compensation for industrial users. In GB, many environmental policy costs affect the wholesale price, whereas in Europe policy costs are often levied as consumer charges.[71]

In this section we analyse the impact of recent policies such as the UK carbon price support and network charges, but note that the price differential is also driven by differences in generation mix and interconnector constraints, which limit price convergence.

[70] Castagneto Gissey, G., Grubb, M., Staffell, I., Agnolucci, P., Ekins, P., 2018. Wholesale cost reflectivity of GB and European electricity prices. Ofgem: London. 2018.
[71] Grubb, M., Drummond, P., 2018. UK industrial electricity prices: competitiveness in a low carbon world. UCL Energy Institute, UCL Institute for Sustainable Resources.

Figure 2.30 A comparison of average European wholesale electricity prices Quarter 2 2017 to Quarter 1 2018, nominal prices (£/MWh)

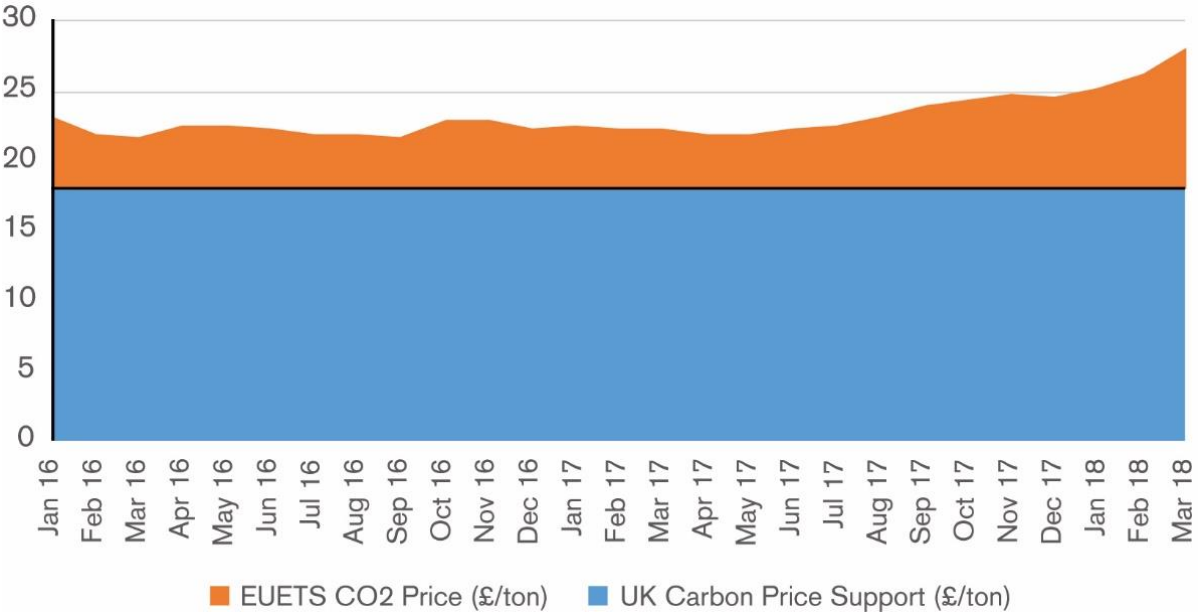


Source: European Commission Quarterly Report on European Electricity Markets Volume 11 Issue 1, 2018.

Carbon price support[72] applies to fossil fuels used in electricity generation, on top of the carbon price in EU ETS. Its objective is to reduce the cost advantage of fossil fuel-based power plants to incentivise investment in low-carbon electricity generation capacity. We estimate that the UK carbon price (including EU ETS and UK CPS) increased the wholesale electricity price by £5.70/MWh, in the four quarters up to 2018 Q1.[73] The introduction of the Market Stability Reserve[74] policy has substantially driven up the EU ETS carbon price, with the anticipation that carbon inventory (or the supply of emission trading) will reduce by more than 60% over 2019-2023. This explains its increasing impact on the GB wholesale electricity price (see Figure 2.32). However, as shown in Chapter 4, carbon pricing is one of the most cost-effective policies for reducing carbon emissions.

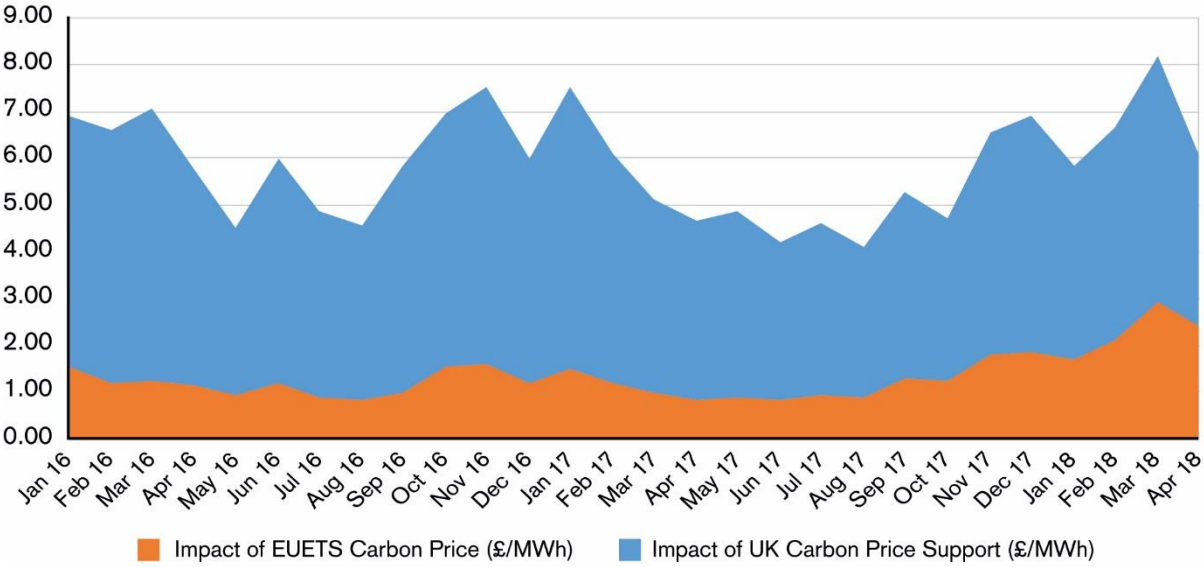
[72] The UK-only element of the carbon price floor is capped at £18 per tonne of carbon dioxide from 2016-17 to 2019-20, freezing the carbon price support rates for each of the individual taxable commodities across this period.
[73] Difference between spark (dark) spread and clean spark (dark) spread gives the carbon emission cost per MWh generated with gas (coal) fuel. These are weighted by percentage of MWh generated from gas and coal respectively, multiplied by a cost pass through factor.
[74] Market stability reserve, which will start operating in January 2019, aims to address the surplus of emission allowances that has built up in the EU ETS since 2009.

Figure 2.31 Breakdown of UK carbon price (£/tonne of CO_2 equivalent)



Source: Aurora.

Figure 2.32 Carbon price impact on wholesale electricity price (£/MWh)



Source: Aurora, Ofgem's analysis.

As for network charges, EU regulation stipulates that average annual transmission charges paid by GB generators must be within the range of €0/MWh to €2.50/MWh.[75] In 2017-2018, National Grid charges for use of the transmission network have added around £1.55 per MWh on average to wholesale prices in GB.

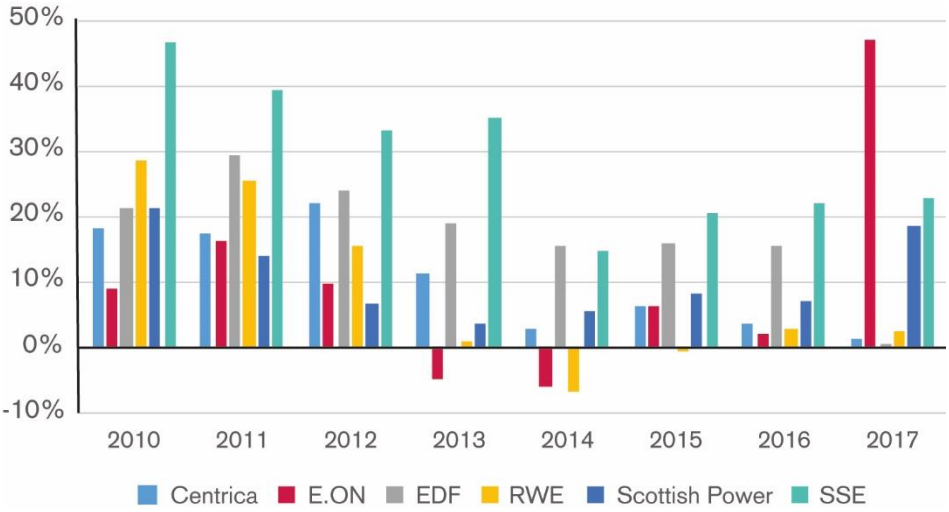
[75] Source: https://www.nationalgrid.com/sites/default/files/documents/Open%20letter_Compliance%20with%20838_2010.pdf

Effective competition helps to constrain excessive profits

GB wholesale electricity prices were higher than the European average, partly due to policy costs, and this could affect generation margins. However, the CMA's energy market investigation in 2016 concluded that generator profitability was not excessive. Figure 2.33 shows the recent evolution of electricity generation profit margins of large suppliers.

Although the margins of E.ON, SSE and ScottishPower were considerably higher, the aggregate profit margin of the six largest generators was 10% in 2017, down from 11% in 2016. Conventional generator profitability has fallen significantly in recent years, while renewable generation profitability has increased and become significantly higher than conventional generation profitability. The variation of margin by technology type suggests that there are incentives for companies to invest in cost-effective capacity that delivers a greater return.

Figure 2.33 Generation profit margins of large suppliers



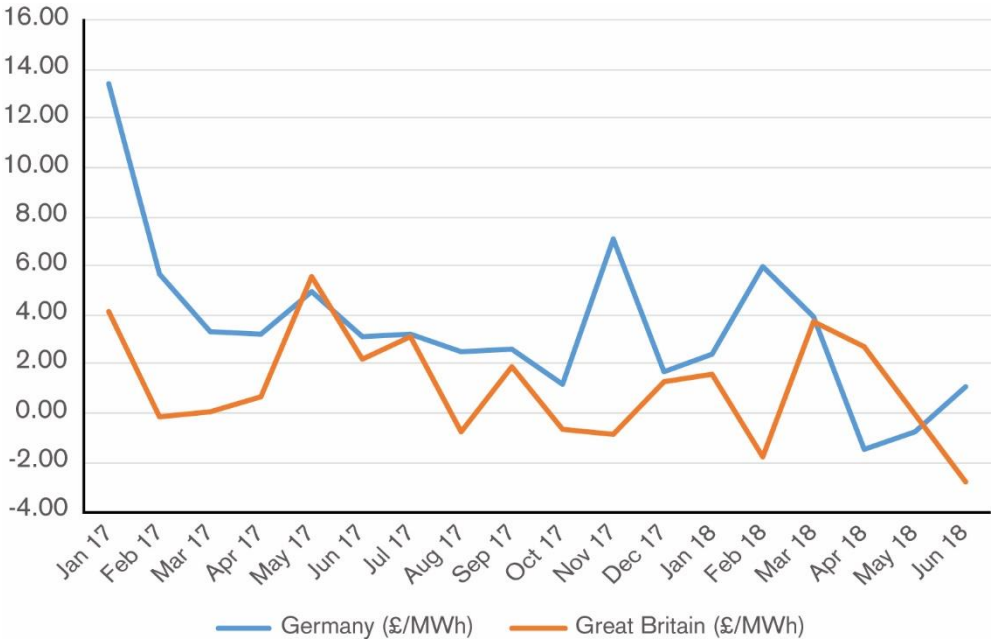
Source: Ofgem analysis of Consolidated Segmented Statements.

Note: Margin is calculated as total earnings before interest and taxes (EBIT) divided by total revenue.

Another indicator of competitiveness in the market is 'average system uplift' of generation units. This is the difference between wholesale electricity prices and system variable costs of the marginal generators.[76] In a more competitive market, there is smaller room for profit margin and thus the average system uplift tends to be lower. Figure 2.34 shows that the average system uplift in Britain was mostly lower than in Germany from January 2017 to June 2018. This is consistent with competition in GB being as or more effective than in Germany.[77]

[76] A marginal generator is the generator in operation on the market which has the highest variable cost and lowest profit margin. The marginal generator can be different from time to time, depending on real time demand and supply conditions.
[77] We take Germany as the comparator to GB markets because, with over 180GW of installed capacity, Germany is the largest electricity market in Europe.

Figure 2.34 Average system uplift (£/MWh) by month, Jan 2017 – Jun 2018



Source: Aurora.

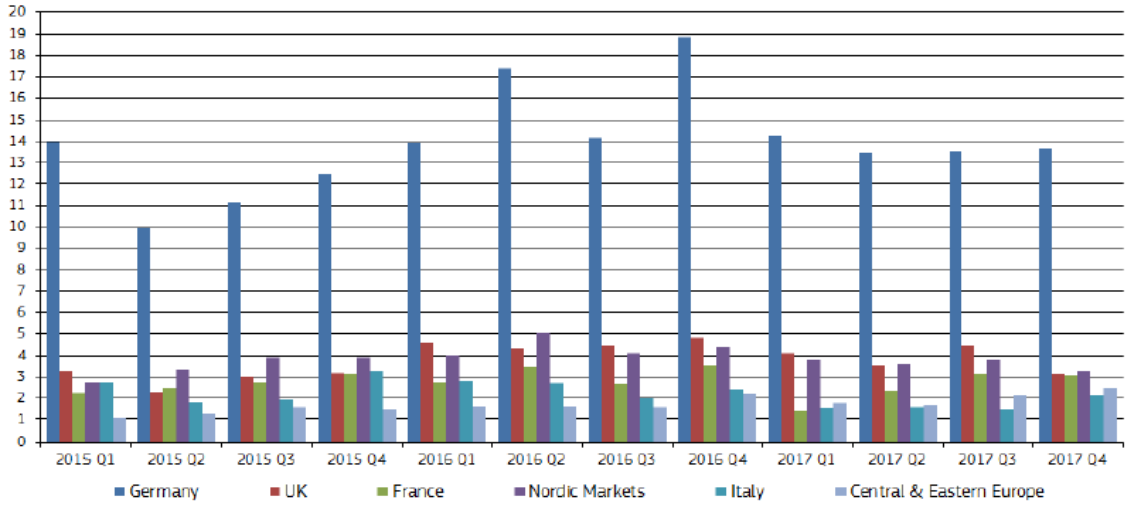
Planned interconnector expansion and integration could provide extra sources of supply and enhance competition. GB's current electricity interconnector capacity is 4 GW. Four new links – to Belgium, France and Norway – are under construction, which should increase our interconnector capacity by 4.4 GW. We have approved projects that could increase this further, up to 15.9 GW in total if all new projects go ahead.[78] In addition, 'market coupling' increases efficiency of interconnector capacity usage.[79] There are plans to integrate GB through day-ahead coupling with the single electricity market across the island of Ireland within 2018. The UK government has stated that it will strive to maintain the single electricity market across the island of Ireland and explore options for the UK's continued participation in the EU's Internal Energy Market.[80]

Market liquidity is better than in many European markets

There are a large number of independent generators, platforms and products to support liquidity. GB electricity markets remain consistently in line with or more liquid – for instance measured by churn ratio – than many European power markets, with the exception of the market leader Germany (see Figure 2.35).

[78] Source: https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors
[79] Coupling is the auctioning process where collected orders on power exchanges are matched and cross-zonal capacity is allocated simultaneously for different bidding zones for a specific market timeframe.
[80] Source: https://www.parliament.uk/documents/lords-committees/eu-energy-environment-subcommittee/Brexit%20energy%20security/Gov-response-Brexit-energy-security-29-March-2018.pdf

Figure 2.35 Churn rates on selected European wholesale electricity markets



Source: EC Quarterly Reports on European Electricity Markets, Quarter 1 2018.

In 2014, we introduced our Secure and Promote policy to help increase liquidity. This included requiring the eight largest generating companies to provide access to hedging products in the wholesale market. There is evidence of a deterioration of liquidity in the market during 2017 measured by the churn ratio – the number of times one unit of electricity is traded – and total traded volume of electricity. Both were down on 2016.[81] However, both indicators are still higher than they were in 2014. In contrast, bid-offer spreads continued to narrow in 2017, indicating that the ability of firms to trade has improved over the period. We have also observed greater traded volumes of products for forward delivery (e.g. months and years ahead of delivery) and this is consistent with some improvement in the availability of products that support hedging.

In 2017, we launched a review of our Secure and Promote policy to determine whether these improvements are being sustained and if there is a possible need to adapt the framework.[82] In August 2018, we published an open letter to seek views on a proposal to suspend the market-making obligation (MMO) licence condition until we complete a further review of the provision.

[81] Source: https://www.ofgem.gov.uk/data-portal/wholesale-market-indicators
[82] Ofgem (2017). Secure and Promote Review: Consultation.

Chapter 3: Affordability and vulnerability in the domestic energy sector

Summary of findings

- Households on average are spending less of their budget on energy bills. Across 2016-17, the latest year for which we have data, energy bills accounted for 4.0% of total expenditure for the average household compared to 4.4% the previous year. However, recent price rises may have reversed this fall.
- Private renters in England are consistently more likely to be in fuel poverty than other types of households. The higher rate of fuel poverty in the private rented sector compared to the social sector is partly driven by the relative energy performance of homes in each market.
- Consumers in vulnerable circumstances are less likely to engage in the market for a better deal. Although there have been improvements in affordability, many vulnerable consumers are still paying more than they need to for their energy.
- Suppliers are doing better in supporting consumers who are in vulnerable situations. Disconnections due to debt are now extremely unusual. In 2017 there were only 17 disconnections in across both fuels, down by around 92% from the previous year, with 13 in England and 4 in Wales.

Our approach

Ofgem's principal statutory objective is to protect the interests of existing and future consumers. We want to see a retail market that works for all consumers, where competition constrains prices, drives efficiency and delivers the range of services and products that customers need. Key to this is delivering a quality customer service and meeting the specific needs of people in vulnerable circumstances. Where the market isn't working for vulnerable consumers, we can take action to protect their interests.

Each year we publish a comprehensive report on how suppliers treat their customers in vulnerable situations, including those who are in debt and at risk of being disconnected.[83] We summarise some of the findings from the 2018 report in this chapter. In the next year we will update our 2013 Consumer Vulnerability Strategy, clarifying our strategy for the next few years as the energy market transitions to smarter technologies and new business models.

In this chapter, we begin by assessing recent trends in the affordability of domestic energy. This includes analysis of the latest data on energy bills, an assessment of fuel poverty rates in England, Scotland and Wales, and a summary of recent trends in negative outcomes such as debt and disconnections. We then consider why the market may not be working well for certain consumers in vulnerable circumstances, and set out the range of support that is currently available to these consumers.

[83] Ofgem, Vulnerable Consumers in the Energy Market: 2018.

Defining affordability and vulnerability

The affordability of domestic energy bills is a product of a number of factors, not all of which can be influenced through regulation of the energy market. We typically identify how many households are struggling to pay their energy bills by assessing the rate of fuel poverty, though this concept is defined differently in England, Scotland and Wales.

We consider a consumer vulnerable if their personal circumstances and characteristics combine with aspects of the market to make them:

- Significantly less able than a typical consumer to protect or represent their interests; or
- Significantly more likely than a typical consumer to suffer detriment (such as higher energy costs or poor service), or that detriment is likely to be more substantial.

The causes of vulnerability can be varied and complex. While some consumers may be temporarily vulnerable due to a sudden change in circumstances, such as becoming unemployed or suffering a bereavement, the causes of vulnerability for others may be longer-lasting (e.g. being in poverty or having a mental or physical illness).

Support for vulnerable consumers

There is a wide range of support for vulnerable consumers coming from government, Ofgem, charities and community groups, and the energy industry itself. These various forms of support are both financial and non-financial:

- Vulnerable consumers are supported financially in several ways. This includes direct financial subsidies, price regulation, and controls to protect consumers from large debts.
- Non-financial support could include help, training, and information on getting a better deal and making energy efficiency improvements, and support with making complaints.

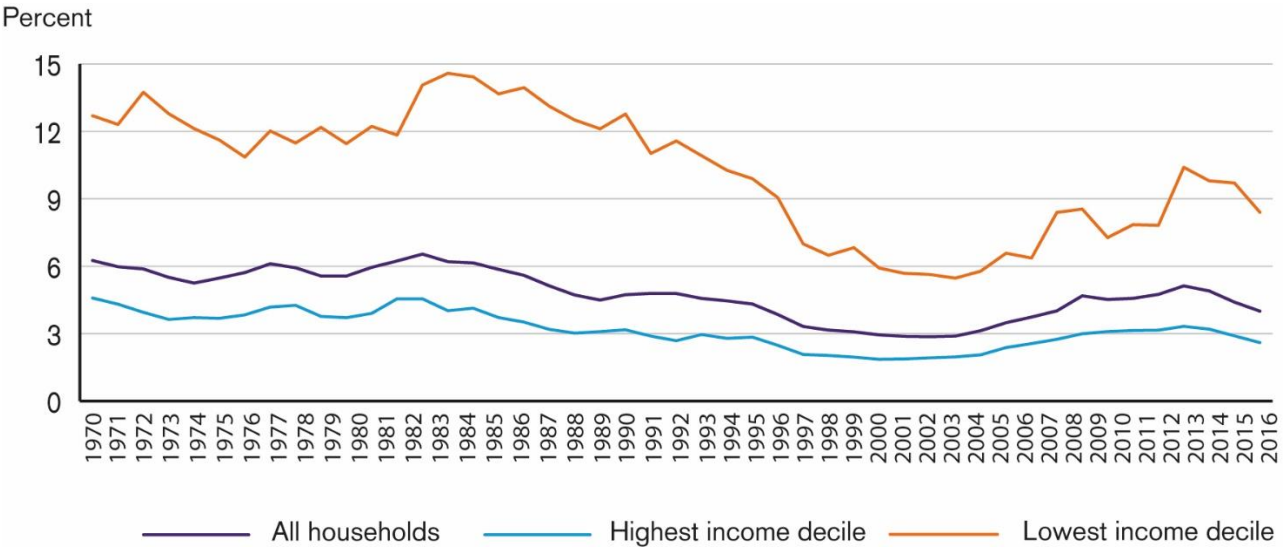
In 2017, we added a broad vulnerability principle to the domestic Standards of Conduct. This states that suppliers need to make an extra effort to identify and respond to the needs of those in vulnerable situations, to uphold their obligation to treat domestic consumers fairly.

Affordability of energy bills

Households on average are spending less of their budget on energy bills

Energy bills have been taking up a decreasing proportion of the household budget over the last few years. Figure 3.1 shows household expenditure on energy as a proportion of total expenditure, with a split for the highest and lowest income deciles. There has been most variation for the lowest income households over the years, but since the recent peak in 2013 the proportion has fallen from just over 10% to just over 8%.

Figure 3.1: Energy costs as a proportion of total household expenditure



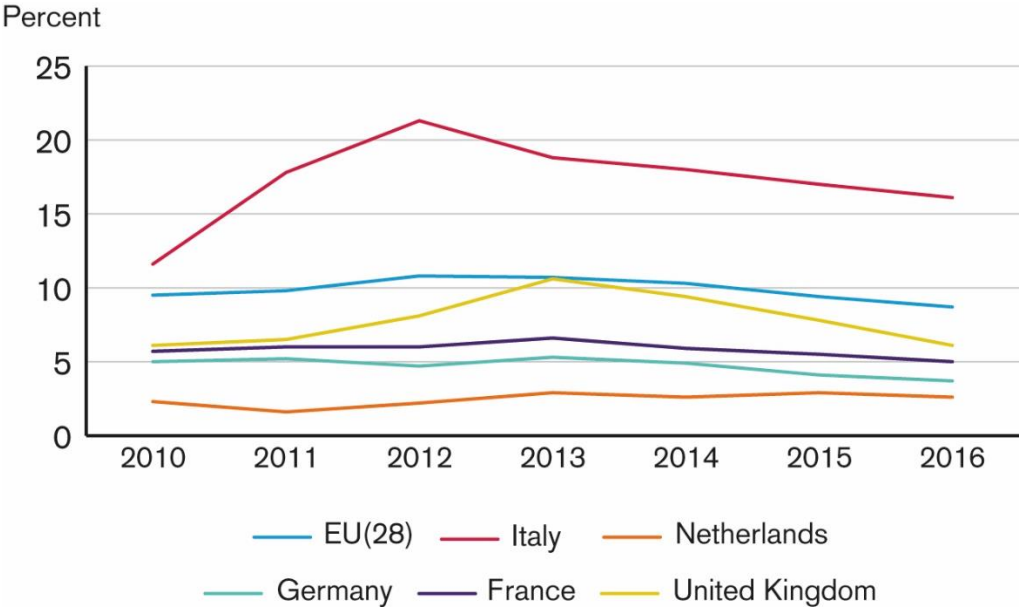
Source: Ofgem analysis of Office of National Statistics, Living Costs and Food Survey.

Average household dual fuel bills fell in real terms by £241 between 2013 and 2016. This trend continued into 2017, when households paid £1,117 on average on a dual fuel energy bill, down £52 from 2016 in real terms.[84] Recent price rises from many of the larger suppliers may have reversed this trend to some extent.

Figure 3.2 shows that over the same period, the proportion of households in the UK reporting difficulty keeping their homes warm has also fallen.[85] In addition to lower energy bills, this improvement is likely to have been affected by environmental factors. The average annual temperature in the UK rose around one degree Celsius between 2013 and 2017, roughly a ten per cent increase.[86]

[84] Based on Ofgem analysis of Consolidated Segmental Statements.
[85] Ofgem analysis of European Union Statistics on Income and Living Conditions (EU-SILC).
[86] National Statistics Energy Trends: Weather, Average temperatures and deviations from the long term mean (ET7.1).

Figure 3.2: Percentage of population reporting being unable to keep their home adequately warm



Source: Ofgem analysis of European Union Statistics on Income and Living Conditions (EU-SILC) - (online data code: sdg_07_60).

The proportion of consumers who said they were worried about paying for their energy bills fell from 59% to 30% between 2013 and March 2017, and stayed at 30% in March 2018. Younger and poorer consumers are more likely to worry than the average, as are those who live in privately-rented accommodation.[87]

Fuel poverty

Fuel poverty is not defined or measured consistently between each of the GB nations, so we analyse them separately:

- In England, a household is classified as fuel poor if: it has higher than typical energy needs, and it would be left with a disposable income below the poverty line if it spent the required money to meet those needs.

- The definition for Scotland and Wales is: a person is living in fuel poverty if, to heat their home to a satisfactory standard, they need to spend more than 10 per cent of their household income on fuel.

The relative nature of the definition for England will tend to result in lower and more stable fuel poverty scores than that of Scotland and Wales.

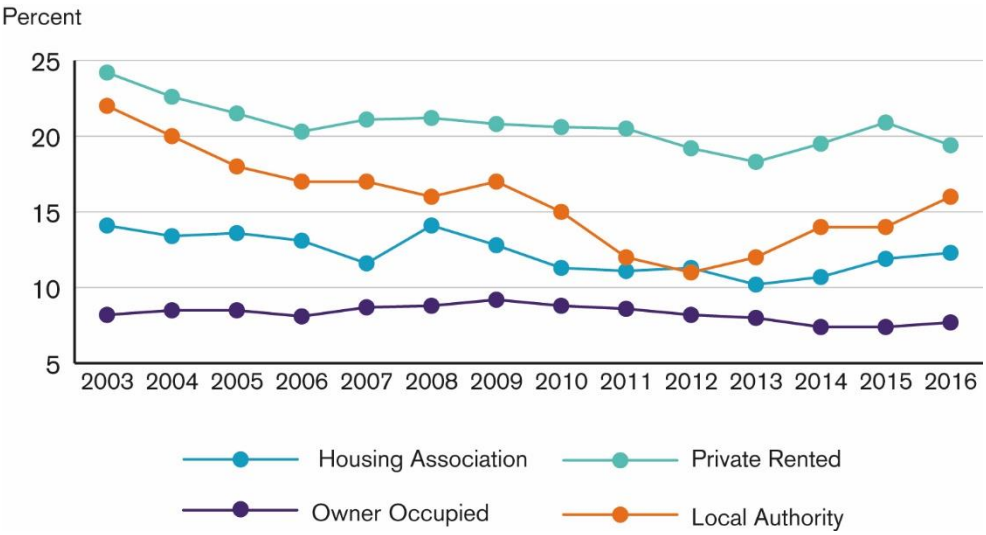
[87] BEIS, Energy and Climate Change Public Attitudes Tracker, Wave 25, April 2018.

England

According to the latest UK Government statistics,[88] 11.1% of households were in fuel poverty in England in 2016, an increase of 0.1 percentage points compared to the previous year. Despite this, the average fuel poverty gap (the additional income that would be needed to bring a household to the point of not being fuel poor) has continued to decline since 2012. In 2016 the average fuel poverty gap closed to £326 in real terms (a 4.4% reduction) compared to the previous year.[89]

The rate of fuel poverty in England has consistently been highest amongst households living in privately rented homes (see Figure 3.3). This trend is down to a combination of private renters having lower incomes than owner-occupiers, and higher energy needs than those in social housing. The latter is driven by the relative energy performance of homes in each market: in 2016, privately rented homes had an average SAP rating of 60, compared to 67 for the social sector.[90] Further, 7% of privately rented homes were rated F or G (i.e. of lowest energy efficiency) in 2016, compared to just 1% in the social sector.[91] Poor energy performance of a building contributes to higher bills, as more energy is required to maintain adequate warmth. The increasing proportion of households living in privately rented accommodation (around one fifth, double the proportion in 2003) makes fuel poverty in privately rented accommodation an increasingly important problem.[92]

Figure 3.3: Rate of fuel poverty in England, by property tenure



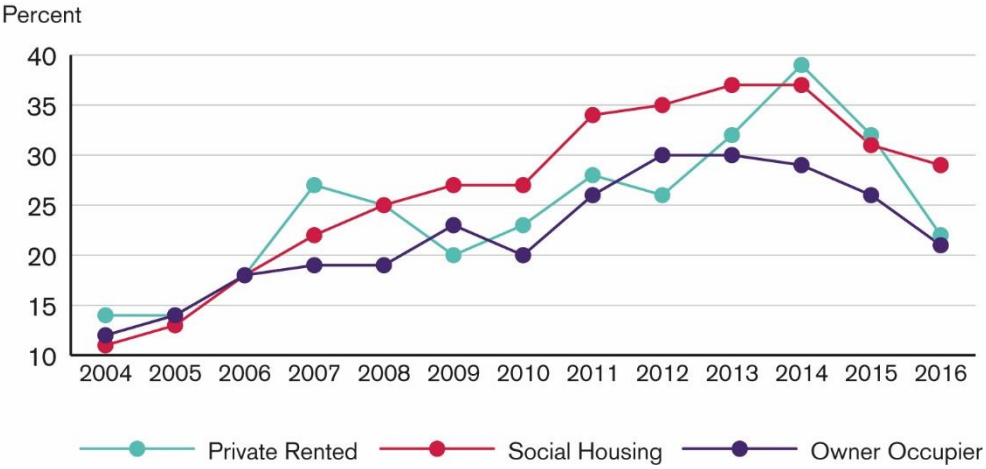
Source: Ofgem analysis of BEIS, Annual Fuel Poverty Statistics, 2018.

[88] BEIS, Annual Fuel Poverty Statistics, 2018.
[89] Ibid.
[90] SAP is the Standard Assessment Procedure for assessing energy efficiency of dwellings.
[91] Ministry of Housing, Communities and Local Government, English Housing Survey, Energy Efficiency, July 2018.
[92] English housing survey headline report 2016 to 2017: Section 1-Household tables, figure 1.1.

Scotland

The Scottish Government estimated that in 2016, 26.5% (649,000) of households in Scotland were living in fuel poverty. This has fallen from 30.7% in 2015, though remains higher than in the mid-2000s.[93]

Figure 3.4: Rate of fuel poverty in Scotland, by property tenure



Source: Ofgem analysis of Scottish housing condition survey (2015-2016, 2013-2014 and 2003/2004 – 2012).

Figure 3.4 shows that, in 2016, fuel poverty rates were more similar across housing tenure types than in England. This could suggest there is less variation in income levels and energy demand between housing tenure types in Scotland. The difference in findings from England is also partly because of differing definitions of fuel poverty.

Wales

The Welsh Government estimated that 23% (291,000) of households in Wales were in fuel poverty in 2016, a reduction of 6 percentage points since 2012.[94] It estimated that severe fuel poverty fell from 5% to 3% over the same period. The rate of fuel poverty in households considered vulnerable (those where any member of the household is over 60, under 25, or has a long-term limiting condition of disability) is slightly higher, at 24%. The Welsh Government is conducting a new Housing Condition Survey that will produce more extensive and up-to-date figures, which we expect to examine in next year's report.

[93] Scottish Government, Scottish House Condition Survey: 2016 Key Findings, available at
[94] Welsh Government, The production of estimated levels of fuel poverty in Wales: 2012 - 2016, July 2016. Data has not been collected on fuel poverty in Wales since 2008. These estimates are based on the 2008 figures, with modelling to adjust for change in income, price, and installation of energy efficiency improvement measures. The figure for 2016 is also projected based on the data available at the time of publication.

Debt and disconnection

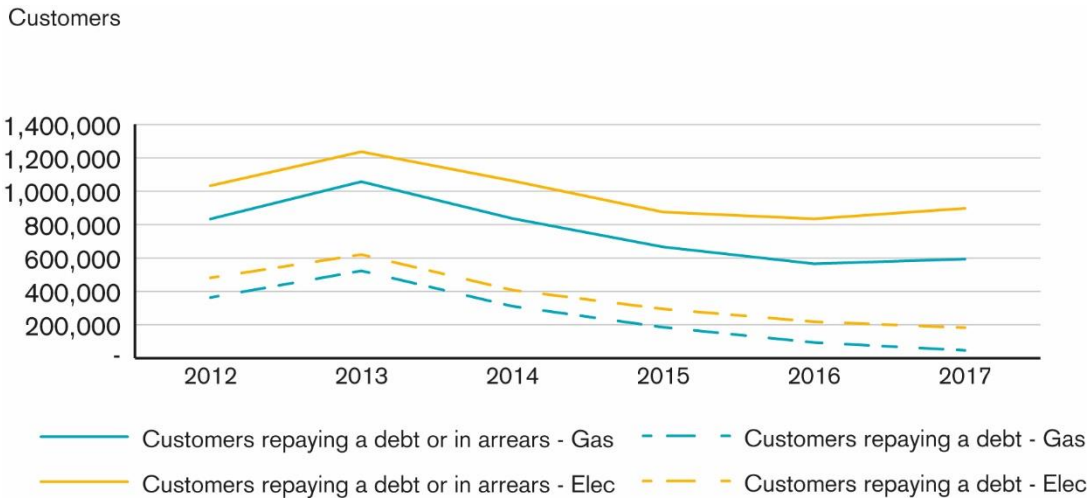
Although affordability is not the only driver of debt, many consumers that struggle to keep up with payments on their energy bills can fall into arrears, potentially further exacerbating the problem.

Numbers of customers in debt has been stable, but the proportion repaying their supplier has fallen

The number of customers in debt to their supplier in 2017 increased slightly from the previous year, with around 1.2 million electricity customers and 1 million gas customers in debt. Of those customers, the proportion that have a repayment plan set up with their supplier has fallen to 53%, from 60% in 2016. This could suggest that suppliers are being less effective at engaging consumers who are falling behind on their bills.[95]

The chance of falling into debt appears to be relatively stable across fuels with just over 2% of customers repaying a debt in England, Scotland and Wales.

Figure 3.5: Number of customers in debt to their supplier



Source: Social Obligations Reporting data.

Outcomes for customers in debt to their supplier are mixed

Overall, pre-payment meter (PPM) usage has stabilised in the last year, with 4.4 million electricity and 3.5 million gas PPMs. The total number of new PPMs installed for debt has fallen by half since 2013, to 114,000 in 2017. However, in 2017 there was a small increase in the number of PPMs installed under warrant, in circumstances where the supplier and customer cannot agree a repayment plan, from 41,000 to 42,000. This is the first annual increase since 2012.

Consumers pay the costs of installing PPMs under warrant. The costs charged vary widely, with over £900 being charged for a dual fuel customer in some cases. This can cause serious distress for consumers already in debt. To ensure that the warrant process

[95] Ofgem analysis of Social Obligations Reporting data.

is used consistently by suppliers as a last resort to avoid disconnection, we introduced new protections that came into effect this year. They include a ban on using warrants for consumers who would find the experience traumatic, a prohibition on warrant-related charges for the most vulnerable consumers and a cap of £150 in all other cases.

More positively, disconnection due to debt is now extremely rare. In 2017, there were only 17 disconnections in total across both fuels, down by around 92% from the previous year (in which there were 210 disconnections). With 13 in England and 4 in Wales, there were no disconnections in Scotland throughout the whole year.

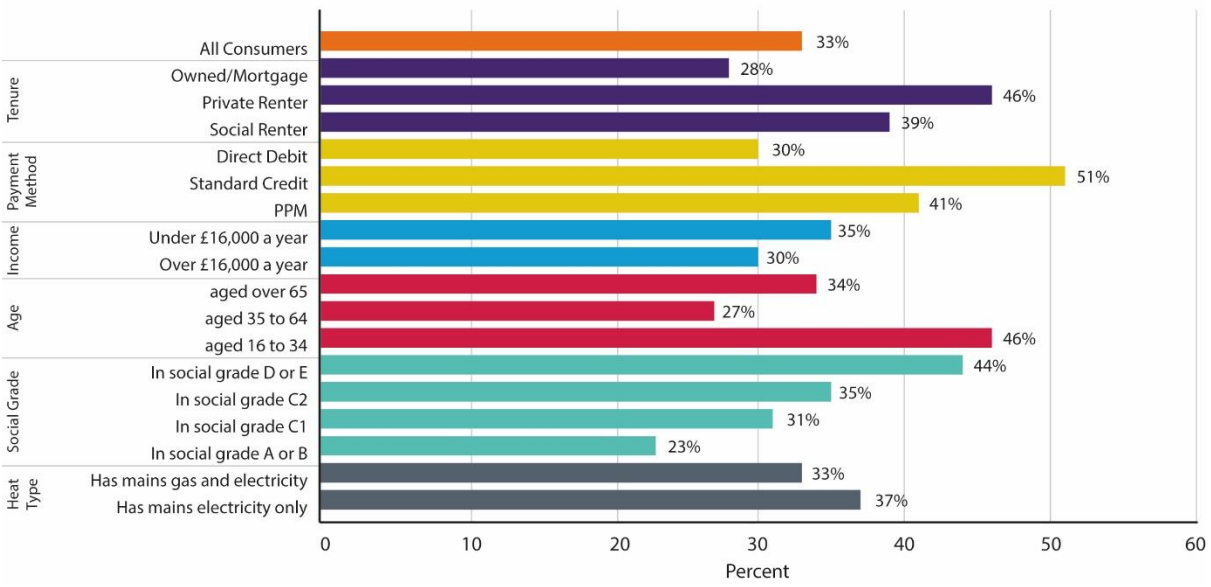
Getting a better deal

The amount consumers pay per unit of energy they use is influenced by the type of tariff they are on, the supplier they are contracted with, their payment method, and their meter type.

Some vulnerable consumers are less likely to make an active choice

Our 2018 consumer engagement survey found that, overall, 41% of respondents had either switched supplier, changed tariff with their existing supplier, or searched for a better deal over the last year. Engagement in the market tends to be lower for some groups of consumers who are at greater risk of being vulnerable. For instance, only 32% of social renters had engaged with the market, as had 32% of households using prepayment meters.[96] This means that consumers in vulnerable circumstances are likely to be paying more for their energy than is necessary.

Figure 3.6: Breakdown of consumers who have never switched



Source: Analysis of Ofgem Consumer Engagement Survey 2018.

[96] Ofgem, Consumer Engagement Survey, 2018.

Figure 3.6 shows that consumers in vulnerable circumstances are more likely to report that they have never switched supplier. Those in the social grades D and E, PPM or standard credit customers, and those living in privately rented accommodation are the most likely to report having never switched supplier.

Some groups face barriers to reducing their bills

PPM usage is associated with vulnerability. More than half of consumers in the lowest income decile have a prepayment meter. Inactive pre-payment customers are now protected from very poor value deals by the safeguard tariff. But the best deals in the market are still not available to these customers. On 28 June 2018, the cheapest PPM deal in the market for a typical dual fuel customer would have an annual cost of £947, around £150 more than the best value offer for an equivalent customer paying by direct debit. Suppliers frequently refuse customer requests to switch from PPM to credit meters, with the stated intention of preventing consumers from returning to debt. To assess these practices, we plan to work with suppliers to understand how frequently consumers that switch to credit meters return to debt.

Although pre-payment consumers that are in debt are unable to switch to a credit meter, they should be able to switch supplier if they owe less than £500. In 2017, successful switches increased from 2,512 to 3,395 for indebted electricity customers and from 2,630 to 2,694 for indebted gas customers. But the success rate of switch requests for indebted consumers remains very low, at 6% and 5% for electricity and gas respectively.

Households that are not connected to the gas grid will generally spend more on their energy bills than an equivalent house with a dual fuel supply. This is because:

- Electric heating is currently generally more expensive than gas heating, both because of fundamental efficiency differences and because most policy costs are assigned to electricity rather than to gas. Consumers that rely solely on electricity therefore contribute considerably more towards these costs than those with gas heating.

- Homes that rely on electric heating often have restricted meters. Customers who are on restricted meters other than Economy 7 have less choice of suppliers and tariffs, which limits their ability to access cheaper prices.

In 2017, there were 3.9 million homes in Great Britain not connected to the gas grid.[97] The Fuel Poor Network Extension Scheme supports fuel poor households by helping towards the costs of connection to the gas network. Between April 2017 and March 2018, this scheme has connected around 9,000 eligible households to the gas grid.

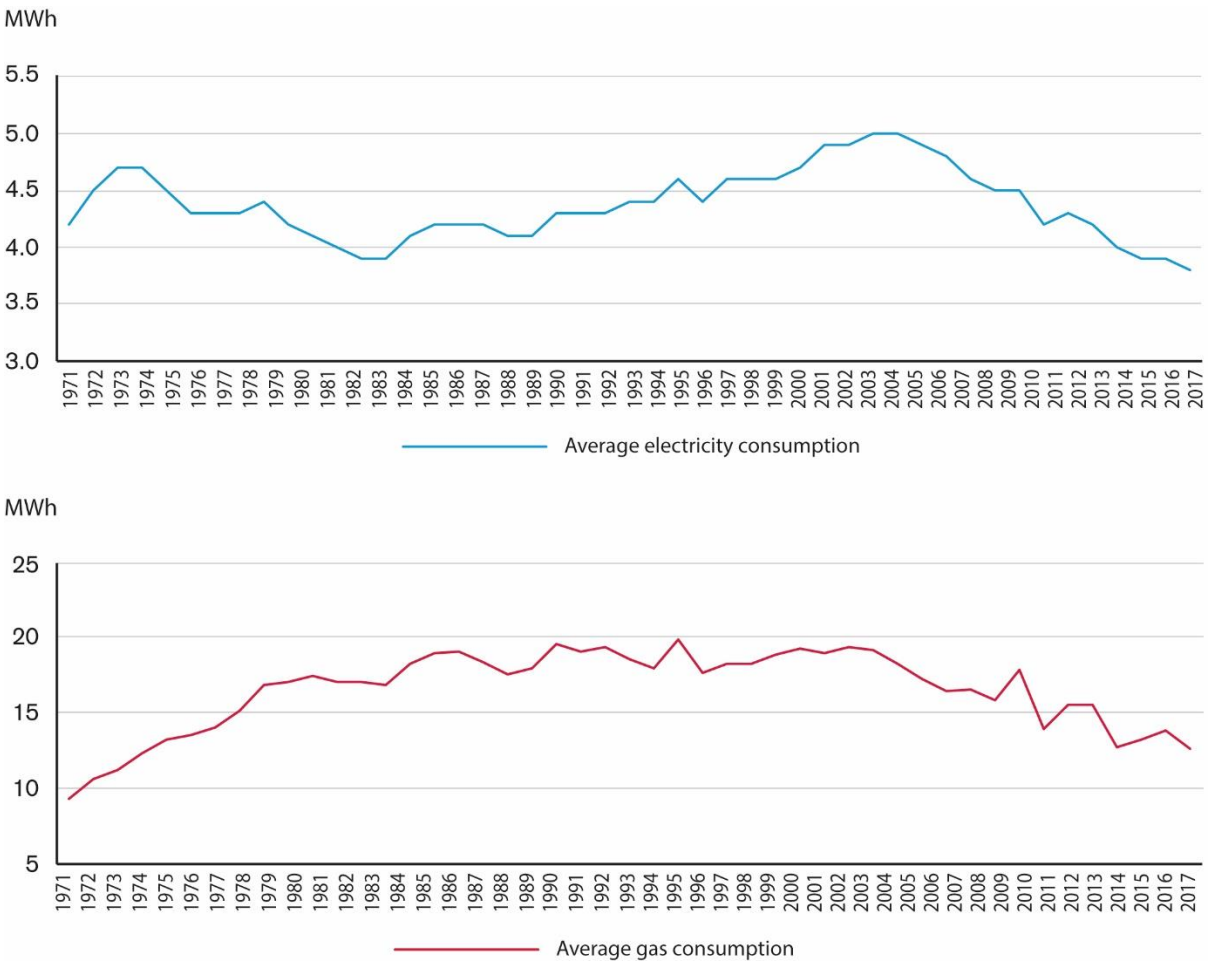
[97] BEIS, Domestic Energy Price Statistics, Annual Domestic Energy Bills, Table 2.3.5.

Consuming less to reduce bills

Domestic consumption is falling

Consumption has been falling over the last 15 years. On a temperature corrected basis,[98] final domestic energy consumption fell by 17% between 2002 and 2017. This is despite increases in the population by 11%, and number of households by 13%, over this time.[99]

Figure 3.7: Annual household consumption of gas and electricity (MWh)



Source: Ofgem analysis of BEIS, Energy consumption statistics in the UK (1970-2017) and BEIS, historical gas data: gas production and consumption and fuel input (1920 to 2016)

Figure 3.7 shows annual final domestic consumption of gas and electricity, without correcting for weather. The short-term fluctuations in gas consumption reflect years with particularly warm or cold winters, leading to changing demand for heat. Electricity, which is less commonly used for domestic heating, presents a much smoother downward trend. Average household consumption continued to fall in 2017, by 5.5% for gas and 3.3% for

[98] Meaning that the data has been adjusted to remove the effects of particularly warm or cold weather.
[99] Ofgem analysis of BEIS Energy Consumption in the UK, 2018, table 3.04 ECUK_table_2018.

electricity. However, BEIS estimates that this fall was driven by warmer winter weather, rather than improved efficiency.[100]

The longer-term downward trend in household energy consumption may reflect a combination of more efficient use of energy, or a decision by households to consume less.

Homes are more energy efficient, but progress with insulation has slowed

The energy efficiency of our homes, and the appliances we use within them, has been improving over the last 15 years. This means that for a given level of comfort or wellbeing, we are consuming less gas and electricity, making energy bills more affordable as a result. In 2016, the average Standard Assessment Procedure (SAP) rating – which indicates household energy and environmental performance – was 61.7. Up from 61.5 in 2015, this represents the smallest annual improvement seen over the last decade.

Improving household energy efficiency is driven by three main areas:[101]

- Insulation improvements: the proportion of the homes known to have cavity walls that have been insulated has increased dramatically since 1976, when just 3.8% were insulated, compared with 69% in 2017. However, as with insulation of lofts, of which the majority are now thought to be insulated, the rate of growth of cavity wall insulation has slowed, with an increase of just 0.5% since 2016.

- More efficient electrical products: regulation and technological improvements have made electrical goods more efficient. This has enabled domestic electricity consumption to fall steadily since 2005, despite the number of appliances such as fridges and washing machines increasing.

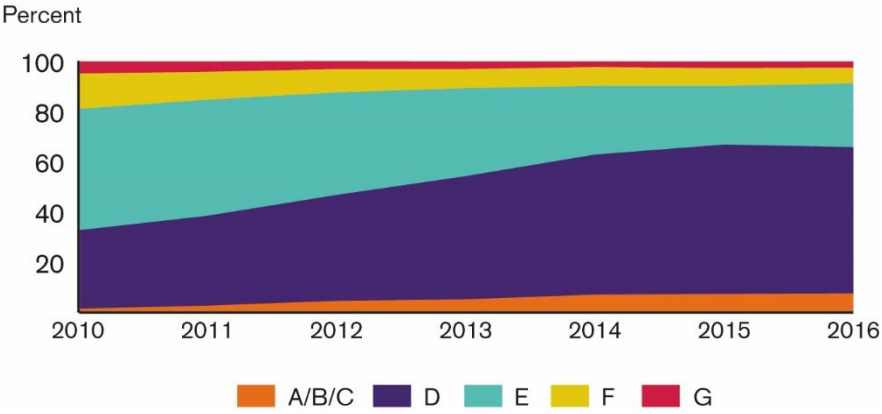
- More efficient boilers: in 2016, 63% of households had either a condensing or condensing-combination boiler, compared with just 6% in 2006. Installing a condensing boiler can reduce consumption by 7.4%.[102]

Figure 3.8 shows the collective impact that energy efficiency schemes, along with the tightening of building regulations for new buildings, have had on the energy efficiency ratings of homes occupied by fuel poor households. There has been a large increase in the percentage of fuel poor households' homes being rated D instead of E. The proportion of fuel poor homes rated D or above rose from 31% in 2010 to 58% in 2016.[103] However, fuel poor households continue to occupy less efficient homes on average: in 2016, 82% of all households lived in homes rated A to D, up from 63% in 2010.

[100] BEIS, Energy Consumption in the UK, July 2018.
[101] BEIS, Energy Consumption in the UK, July 2018.
[102] Ibid.
[103] Ofgem analysis of Department for Business, Energy & Industrial Strategy, Fuel Poverty Trends 2018: Table 2 - Fuel poverty, by fuel poverty energy efficiency rating (FPEER), 2010-2016.

Of the homes that have been assessed for an Energy Performance Certificate since 2008, the households in E-rated homes are estimated to have spent around £170 more on average each year on their energy bills than households in D-rated homes.[104],[105]

Figure 3.8: Energy performance of homes occupied by fuel poor households



Source: Ofgem analysis of BEIS, Annual Fuel Poverty Statistics, 2018.

Some households are at risk of under-consuming energy

Consumers may make active choices to reduce their energy consumption for environmental and financial reasons. However, in some cases, consumers may be reducing their consumption of gas and electricity below desirable levels, reducing their comfort and well-being, and potentially harming their physical or mental health.

Some consumers 'self-disconnect' when using PPMs for supply, because of a lack of credit on the meter. Our 2018 Consumer Engagement Survey found that around one in ten consumers with a PPM meter self-disconnected in the last year. The reported duration of the disconnections suggests most of these cases were related to forgetfulness or not realising the meter was low on credit. Of those consumers that reported having been disconnected from their electricity supply in the last year, 16% said they did not manage to top up and reconnect within three hours. The figure for gas was slightly higher at 22%.[106] These findings suggest that around 70,000 electricity consumers and 80,000 gas consumers self-disconnected for more than three hours over the year.

For consumers who cannot afford to top up their meters, the consequences can be severe. Recent research by Citizens Advice[107] found that 140,000 households in Great Britain had been left without gas or electricity in the past year because they couldn't afford to top up their meter. Of these households, 56% had been left with cold homes,

104 Ofgem analysis of BEIS, National Energy Efficiency Data Framework: Energy Performance Certificate Analysis.

105 Energy efficiency bands are based on Energy Performance Certificate (EPC) data. This data may not be representative of total housing stock in England as EPCs are required only when the property is to be sold or let for rent.

106 Ofgem, Consumer Engagement Survey, 2018.

107 Citizens Advice, Switched on, Improving support for prepayment consumers who've self-disconnected, April 2018.

35% without sufficient light, and more than half cited emotional impacts, such as stress and shame. Vulnerable households appear the most likely to face such problems: 88% of the households that disconnected because they couldn't afford to top up their meter contained either a child or someone with long-term health issues.[108]

Consumers may also self-ration their energy consumption, for example by not turning on their heating when it is cold or limiting use of electrical appliances. The health risks of under-consumption of energy for heating purposes are fairly well understood. Living in a cold home can create or worsen health problems, particularly for young children, older people, or those with existing health conditions. In extreme cases, this can contribute to people's deaths: there were 34,300 excess winter deaths in England and Wales in 2016-17,[109] and the World Health Organisation estimated in 2011 that around 30% of excess winter deaths are related to living in cold homes.[110] There is less information about the impacts on vulnerable households from rationing electricity for other purposes, such as for cooking hot meals, lighting the home, or turning on the television. But rationing such functions and activities could contribute to poor physical and mental health, social exclusion, and poor educational and employment outcomes.

Support for vulnerable consumers

There are several ways in which suppliers, the Government, Ofgem, and charities seek to provide support for vulnerable consumers, to make their bills more affordable, or to help them to engage in the market to protect their own interests. This section summarises the main areas of financial and non-financial support.

Financial support

Direct subsidies

The UK government provides direct financial support to consumers in circumstances that make them vulnerable, with most of the support directed to pensioners. Total financial support is around £2.5 billion per year (Figure 3.9). A low-income pensioner on Pension Credit could receive financial support up to £440 (excluding any cold weather payments), depending on their age. This would cover around 40% of the average dual fuel energy bill in 2017.

Cold Weather Payments are another source of financial support for potentially vulnerable consumers during sustained periods of very cold weather, when heating requirements increase. Payments are made to pensioners and consumers receiving income support or income-based jobseeker's allowance, when the average local temperature is recorded as, or forecast to be, at or below freezing for seven consecutive days. In winter 2016-17, there were just 0.1 million cold weather payments, worth a total of £3 million. In winter 2017-18, this increased to 4.7 million payments totalling £118.7 million. This was largely down to the cold weather in early 2018, when temperatures consistently fell below freezing across much of the UK.

[108] Ibid.
[109] Office for National Statistics, Excess winter mortality in England and Wales: 2016 to 2017 (provisional) and 2015 to 2016 (final).
[110] World Health Organisation, Environmental burden of disease associated with inadequate housing, 2011.

Figure 3.9: Direct financial support for vulnerable consumers

Policy	Eligible	Recipients	Payment to Individuals (£)	Total Cost (£m)	Funding source
Winter Fuel Payment	All pensioners	12.0 million individuals in Winter 2016-17	£100 to £300	£2,045	Central Government
Warm Home Discount: Core group	Low-income pensioners	1.3 million individuals in winter 2016-2017	£140	£182	Energy bill payers
Warm Home Discount: Broader group	Consumers on a low income and vulnerable to fuel poverty	0.9 million individuals in winter 2016-2017	£140	£144.9	Energy bill payers
Cold Weather Payment	3.8 million benefits claimants	4.7 million payments in winter 2017-2018	£25 for each cold week of weather	£118.7	Central Government

Source: Department for Work and Pensions, Winter Fuel Payment Statistics; Ofgem, Warm Home Discount Annual Report: Scheme Year 6, January 2018; and Department for Work and Pensions, Cold Weather Payment Statistics, 2017-2018.

The government announced in June 2018 that it will change the Warm Home Discount scheme from 2018 to 2021, broadening the scope and scale of support. In particular, the threshold for the size of suppliers that must participate, based on the number of customer accounts they hold, will fall over time.[111]

Price protection

Competition does not currently work well for some vulnerable consumers, including those on PPMs. Following a recommendation from the Competition and Markets Authority, we implemented a safeguard tariff on PPM tariffs from April 2017, protecting over 4.5 million households. As a result of this price protection, the market average price for a dual fuel prepayment customer fell by around £60 initially (based on a typical level of household consumption). We analyse the impact of the PPM safeguard tariff in detail in chapter 2 of this report.

In February 2018, we extended protection under the safeguard tariff to over 800,000 additional vulnerable consumers that are in receipt of the Warm Home Discount. We estimated at the time that these eligible vulnerable customers would initially make annualised savings of around £110.

The level of the cap will be £1,136 from October 2018 to March 2019. This is an increase of £85 since April 2017, largely due to wholesale price rises and increases in the costs of social and environmental schemes.[112]

Protections relating to consumer debt

In May 2018, Ofgem introduced new licence requirements on suppliers to protect consumers against large shock bills. These changes limit suppliers' ability to back bill their customers beyond a 12-month period. Our analysis of data provided by Citizens

[111] BEIS, The Government Response to the Warm Home Discount Scheme 2018-19 consultation, June 2018.
[112] More information on how the different cost factors influence the level of the cap can be found in Ofgem's Data Portal, 'Breakdown of the Safeguard Tariff'.

Advice for a sample of back billing cases suggested the median back bill was £1,160, and the median length of the back bills was 24 months for domestic consumers.[113]

Wider non-financial support

Support to engage

There are a number of schemes run to offer vulnerable consumers support to engage with the market and save money:[114]

- The Government funds third sector organisations to support vulnerable consumers to engage through its Big Energy Saving Network, reaching over 500,000 vulnerable consumers since 2013.

- The government has also worked with third party organisations, including Citizens Advice and the Energy Saving Trust, to deliver the Big Energy Saving Week. This campaign raises awareness annually of how consumers can reduce their energy costs ahead of winter.

- Citizens Advice in England and Wales began delivering its Energy Best Deal Programme in 2008, followed by Citizens Advice Scotland in 2011. The Energy Best Deal programme has trained a total of around 72,000 customers in Great Britain in or at risk of fuel poverty on how to engage with the energy market. The service also trained 40,000 frontline workers and volunteers, who cascaded the information and advice to an additional 600,000 customers.

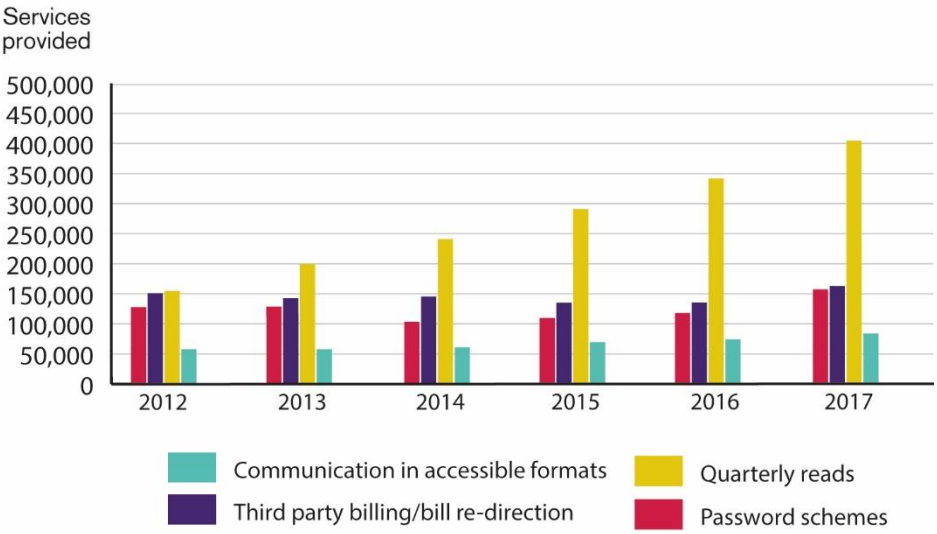
Priority Services Register

Suppliers are required to register vulnerable customers onto their Priority Services Register (PSR), through which they help them manage their energy through a range of services including password schemes to protect against cold calling, and communication services such as bills in braille or large print. There are now around 6 million electricity consumers and 4.8 million gas consumers on a PSR. This represents a 36% increase for electricity and 30% for gas since 2016.

From the start of 2017 we required suppliers to be proactive in identifying customers who would benefit from PSR services. Since then, the total number of services provided has continued to rise, up to over 840,000 services for electricity consumers and 670,000 services for gas consumers in 2017. This represents a 26% increase for electricity customers and 25% increase for gas customers. Figure 3.10 sets out the different services PSR customers have been receiving.

[113] Ofgem, Protecting consumers who receive backbills, November 2017.
[114] Information provided to Ofgem by BEIS and Citizens Advice.

Figure 3.10: The number of PSR services provided to electricity customers on PSRs



Source: Social Obligations Reporting data.

Not all customers on the register receive PSR services, but suppliers are getting better at identifying vulnerability and registering these customers on the PSR. This is important as, even where vulnerable customers do not receive additional services, being on the register should enable their supplier to engage with them appropriately through specially trained staff, and ensure that network companies are aware of their situation so that they can be prioritised in emergency situations.

Complaints

Vulnerable consumers may need help understanding their situation or to make complaints when things go wrong. Citizens Advice Extra Help Unit (EHU) has a specialist team that investigates complaints on behalf of vulnerable domestic consumers. Consumers reported reaching either a beneficial or satisfactory outcome in over 95% of the 6,123 cases that the EHU closed in 2017. The volume of complaints made to the EHU in 2017 was similar to the year before, with the majority of complaints continuing to be about billing (37.1%) and debt / disconnections (21.9%).

Chapter 4: Decarbonisation of energy

Summary of findings

- The UK has made progress towards its carbon reduction targets to 2022, but carbon reductions in 2017 came chiefly from electricity. There was limited or no progress in other sectors.
- Key policies – notably the carbon price and renewable subsidies – have played an important role in reducing emissions in electricity, but had less of an impact elsewhere. Since 2010, these policies have cost about £39 billion and added around £37 to a household's annual electricity bill. The carbon price has provided particularly good value for money in terms of current emissions reductions.
- The Committee on Climate Change (CCC) assesses that gaps remain in the Government's plans to meet decarbonisation commitments. It argues that progress needs to be extended to sectors other than electricity and that the recent lull in low carbon investment, coupled with limits on the amount of coal that there is left to displace, could constrain further improvements in electricity.

Our approach

Ofgem's principal objectives include reduced environmental damage and lower energy bills for consumers, both now and in the future. We therefore care about delivering the UK's commitments to reducing emissions in the most cost-effective way.

Dramatic cuts in annual global carbon dioxide emissions are required to limit temperature rises.[115] In the 2016 Paris Agreement, the EU pledged to reduce its emissions by at least 40% below 1990 levels by 2030, with the aim of limiting the increase in global temperatures to below 2 degrees Celsius above pre-industrial levels. The UK will need to deliver its share of this target.

In this chapter, we focus on emissions from electricity and gas as our duties pertain to these sectors. We examine:

- progress in reducing emissions;
- the extent to which reductions may be attributable to policies; and
- the value for money of policies, by comparing carbon emissions reductions with their costs.

We consider the challenges in meeting our commitments from 2023 onwards, as well as the potential role that different technologies can play in supporting the least cost

[115] We focus on carbon dioxide emissions, noting nevertheless the importance of other sources of greenhouse gases.

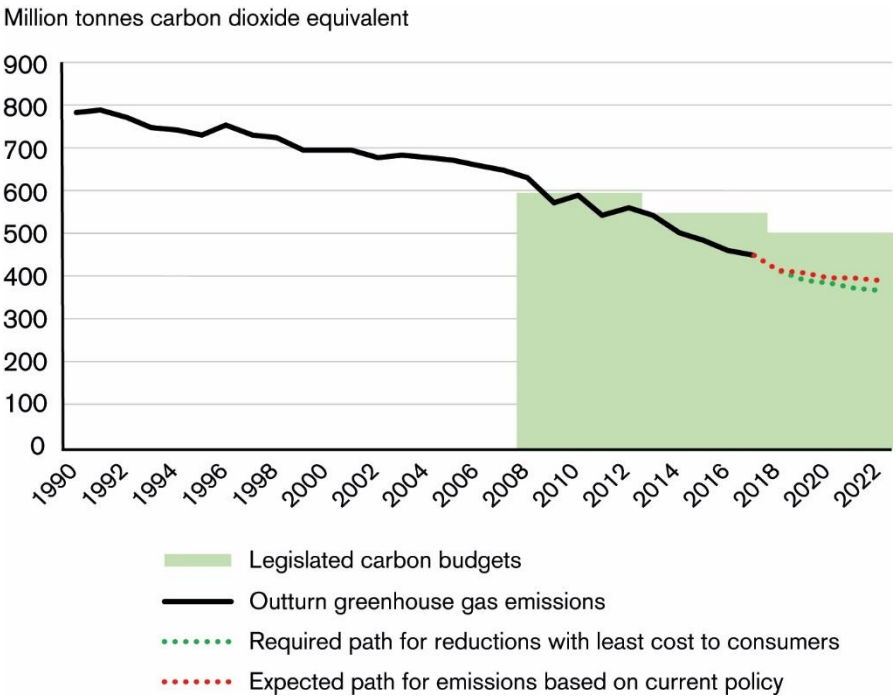
transition to a low carbon energy system.

Progress in reducing emissions

Progress has been made against carbon reduction targets to 2022, but risks remain

Government measures progress in reducing emissions using 'carbon budgets', which are a commitment to cap the amount of greenhouse gases the UK can emit over a five-year period. Between 2018 and 2022, the UK is committed to emitting no more than 2,544 million tonnes of carbon dioxide across all sectors of the economy. The Committee on Climate Change assesses that there are still risks to meeting this commitment. In 2017, provisional figures from BEIS indicate that emissions fell by 3% and that the UK emitted approximately 141 million fewer tonnes of carbon dioxide equivalent than it did in 2010 (see Figure 4.1). The CCC projects that, based on current policy, the path for emissions reduction is currently above the required trajectory.

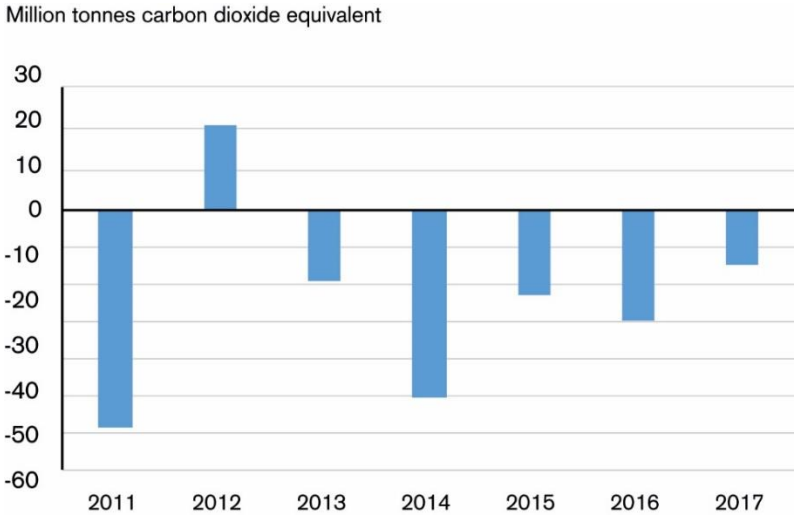
Figure 4.1: Total greenhouse gas emissions, UK



Source: BEIS (2018). 2017 UK Greenhouse Gas Emissions, Provisional Figures; BEIS (2017). Final GHG statistics for 1990-2016); CCC (2018). Reducing UK emissions – 2018 Progress Report to Parliament.

Figure 4.2 shows that the year-on-year reduction in emissions was smaller in 2017 than the previous year and the most modest since 2012.

Figure 4.2: Change in year-on-year greenhouse gas emissions, UK

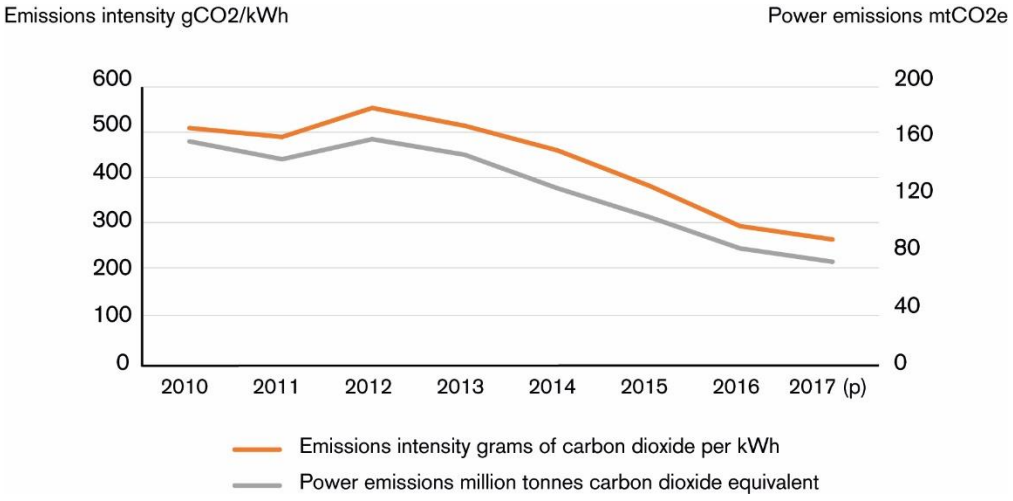


Source: BEIS (2018). 2017 UK Greenhouse Gas Emissions, Provisional Figures; BEIS (2017). Final GHG statistics for 1990-2016); CCC calculations.

Reductions came chiefly from electricity

Estimated emissions from electricity generation fell by 11%, from 81 million tonnes of carbon dioxide equivalent in 2016 to 72 million tonnes in 2017. Electricity therefore accounted for 78% of the total 12 million tonnes of emissions reductions achieved in 2017. While total electricity generation fell by 1% in 2017, the key driver of the emissions reduction from the electricity grid was falling emissions intensity. Figure 4.3 shows the close relationship between the electricity grid's carbon intensity and emissions.

Figure 4.3: Carbon intensity and electricity sector emissions, UK

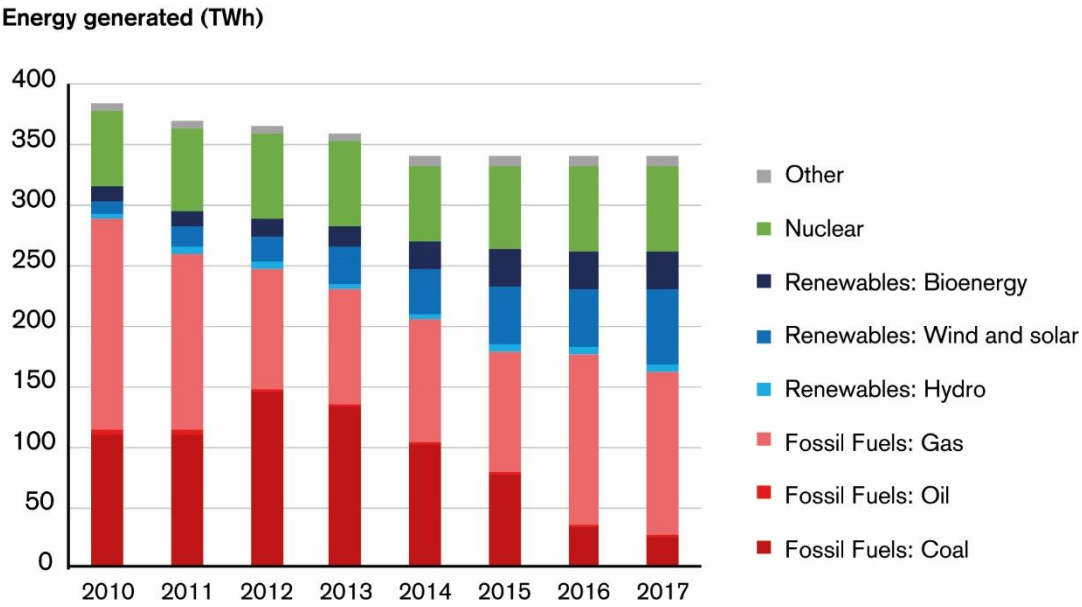


Source: BEIS, 2017 UK Greenhouse Gas Emissions, Provisional Figures (2018); BEIS, 2016 UK Greenhouse Gas Emissions, Final Figures (2018); CCC, Reducing UK emissions – 2018 Progress Report to Parliament (2018).

Note: 2017 is a provisional estimate. Emissions intensity here excludes 'losses' in transmission.

Falling carbon intensity was driven by the record contribution of renewables and a fall in fossil fuel contribution to historic lows (see Figure 4.4). Cumulative duration over the year without any coal generation grew from four days in 2016 to almost a month in 2017.[116] The small absolute levels of coal left in the generation mix suggest there is limited potential for further reducing emissions through its removal.

Figure 4.4: Electricity generation by technology type, UK



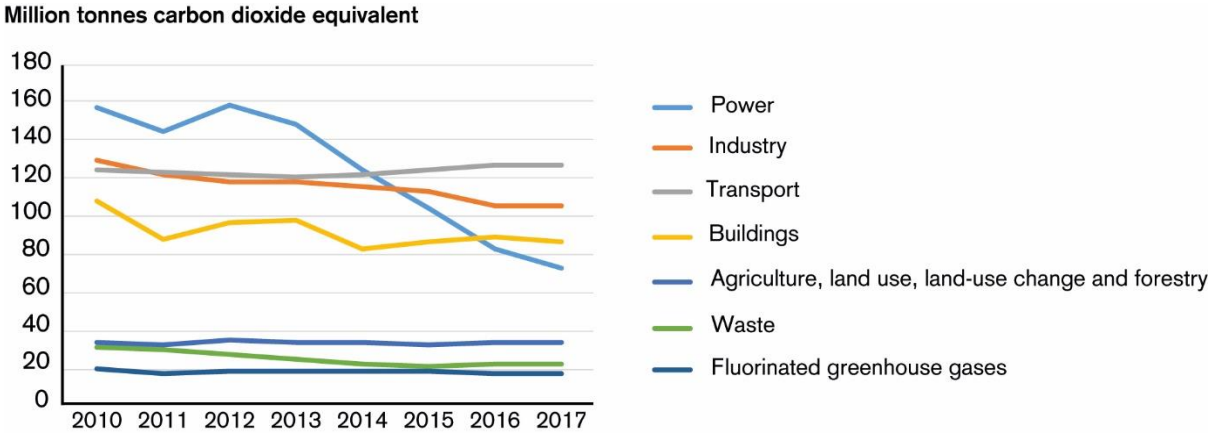
Source: BEIS National Statistics (2018). Energy Trends: Electricity.

There was limited or no progress in other sectors

Progress in other sectors in 2017 was limited. While buildings saw a minor drop in emissions in 2017, which can be attributed to higher winter temperatures, other sectors saw no progress at all (see Figure 4.5). Industry emissions rose by 1% in 2017, but given that output rose by 3% this suggests that energy intensity declined.[117]

[116] Ofgem analysis of Elexon data (generation by fuel type).
[117] CCC, Reducing UK emissions – 2018 Progress Report to Parliament (2018).

Figure 4.5: UK sectoral greenhouse gas emissions



Source: CCC, Reducing UK emissions – 2018 Progress Report to Parliament (2018).

Transport remains the highest single source of emissions

Provisional BEIS estimates for 2017 indicate that emissions from transport remained broadly unchanged at 126 million tonnes of carbon dioxide emissions. Road transport is the most significant source of emissions in this sector. By the end of 2017, there were 460,016 electric and hybrid electric cars on the road in GB.[118] We estimate that, in the market for new cars, the roll-out since 2010 of more efficient petrol and diesel cars, as well as vehicles with alternative fuels, allowed GB emissions to be around 400,000 tonnes of carbon dioxide lower in 2017 than they would have been without these developments.[119]

Contribution of selected decarbonisation policies

This section employs LCP's EnVision model of the GB power sector to estimate the effect of selected policies in terms of emissions saved in tonnes of carbon dioxide, cost (in 2016 prices) and value for money (cost per tonne of emission saved) from 2010 to 2017.[120]

The findings are contingent on a range of assumptions and input data and should be interpreted only as estimates of the impact of these policies (see the technical annex for further information on the modelling approach).

The analysis builds on last year's report by:

- using a more sophisticated model that allows us to simulate 'bottom-up' the decisions of generators, giving us greater confidence in our findings;

[118] DfT (2018). Vehicle Licensing Statistics.
[119] Ofgem analysis of SMMT (2018). New Car CO_2 report and DfT (2018). National Travel Survey. We acknowledge that concerns have been raised, by Which? amongst others, over whether fuel efficiency tests reflect actual vehicle usage.
[120] This truncated timeline has a sizeable impact on the evaluated emissions savings and costs that are attributed to each policy.

- examining a wider range of metrics (outlined below); and
- widening the scope through inclusion of additional policies and coverage of sectors other than just electricity.

Key cost metrics that we consider compare each policy against the observed outcomes from the period 2010 - 2017:

1. Policy cost: the direct transfer of funds by energy consumers or UK taxpayers to pay for capital investment, subsides and other policies. This broad definition of policy cost can be negative if the policy generates tax receipts.
2. Wholesale cost: the impact that a policy has on wholesale energy costs through price effects. For instance, the carbon price adds to wholesale costs whereas renewables policies could potentially lower wholesale costs by displacing more expensive fossil fuel generation.[121]
3. Net consumer cost: the sum of the impact of policy cost and wholesale cost. This can be negative if a policy reduces wholesale electricity cost by more than the policy cost. We use the term consumer to refer more broadly to both energy consumers and UK taxpayers together.
4. System cost: the sum of resource costs including generation, balancing and network costs (but excluding the costs associated with carbon). This metric is neutral as to whether costs are incurred by consumers or producers, and instead focuses on the GB electricity market as a whole.

We focus our discussion on the consumer cost metric as it helps us to understand the impact that the selected decarbonisation policies have had on electricity bills. Nonetheless we also consider the system cost metric as this provides a view of the overall cost implications of each policy for the UK energy market.

Figure 4.6 outlines the decarbonisation policies that we analyse. On the supply-side, the key ones are the carbon price, subsidies for renewables (large and small scale) and air quality directives. These policies are designed to promote the use of cleaner sources of energy, whereas the selected demand-side policies, which typically involve more efficient or cleaner ways of using energy, are intended to reduce overall consumption of electricity and gas.

When comparing the cost-effectiveness of the different policies, it is important to acknowledge that:

- Many of the policies do not have decarbonisation as their sole or even central objective, e.g. small scale renewable schemes aim to raise awareness of low carbon technology and smart metering is designed to allow consumers to manage their energy use better.
- We look only at the effect of policies in 2010-2017. Where policies were in place before this, e.g. the first wave of CERT, we do not assess any sustained effect in 2010-2017. This may mean that we, for example, understate the cost

[121] Note that balancing and network effects do not form part of the scope of this analysis.

effectiveness of demand-side policies as some measures were enacted prior to 2010.

- The policies that feature in our model account for around 40% of the total in-scope electricity energy savings that BEIS estimate for the period 2010-2017. However, other important initiatives, such as the products policy which delivered 23% of the total savings, are excluded from the analysis on challenging cost data collection grounds.

Figure 4.6: Table of selected decarbonisation policies, with a focus on those enacted in 2010-2017

Intervention type	Policy [Years]	Description	Sector
Carbon price	**EU emissions trading scheme (ETS)** [2005-ongoing]	Taxes carbon through a limited number of tradeable permits	Electricity
	Carbon Price Support (CPS) [2013-ongoing]	Tops up the carbon price as determined by the EU ETS	Electricity
Large scale renewable subsidies	**Renewable Obligation Certificate (ROC)** [2002-2017]	Obliged electricity suppliers to source a proportion of the electricity they supply from renewable sources	Electricity
	Levy Exemption Certificates (LECs) [2001-2015]	Granted a rebate to eligible renewable generators	Electricity
	Contracts for difference (CfD) – non competitively procured Final Investment Decision Enabling for Renewables (FiDeR) [2014-ongoing]	Provides low-carbon generators a fixed price, topping up the wholesale price when it is lower than the agreed price (clawing money back otherwise)	Electricity
Small scale renewable subsidies	**Feed-in tariff (FiT)** [2010-ongoing]	Subsidises small-scale low-carbon electricity generators	Electricity
Demand-side policies	**Carbon Emissions Reduction Target (CERT) Extension and +20%)** [2008-2012]	Required larger gas and electricity suppliers to achieve reductions in carbon emissions from domestic premises	Multiple
	Energy Company Obligation (ECO) and Extension [2013-2017]	Obliged energy suppliers to deliver energy efficiency measures to domestic premises	Multiple
	Renewable Heat Incentive (RHI) Domestic and Non-Domestic [2012-ongoing]	Subsidises low carbon heat sources (scope is GB only)	Multiple
	Smart Metering Domestic and Commercial [2011-ongoing]	Mandates suppliers to roll out electricity and gas smart meters to homes and small businesses	Multiple
	Community Energy Saving Programme (CESP) [2009-2012]	Required gas and electricity suppliers / generators to deliver energy saving measures to domestic consumers in specific low income areas	Multiple
Other regulations	**Building regulations** [2010-ongoing]	Regulations to improve the energy efficiency of buildings	Multiple
	Products policy [2010-ongoing]	Product standards that protect the environment	Multiple
Air quality directives (regulations)	**Large Combustion Plants Directive (LCPD)** [2001-ongoing]	Aims to reduce emissions of acidifying pollutants, particles and ozone precusors	Electricity
	Industrial Emissions Directive (IED) [2013-ongoing]	Assigns the cost of plant updates to the polluter	Electricity

For the electricity sector, we worked with LCP to employ its EnVision model to simulate what we saw in dispatch, investment and retirement of generation plants since 2010, as well as accompanying emissions and costs.[122] We then re-ran the model to simulate 'counterfactuals' where key decarbonisation policies enacted from the start of 2010 are 'turned off'.[123] Looking at the change in cost and emissions allows us to assess the effect of policy.[124]

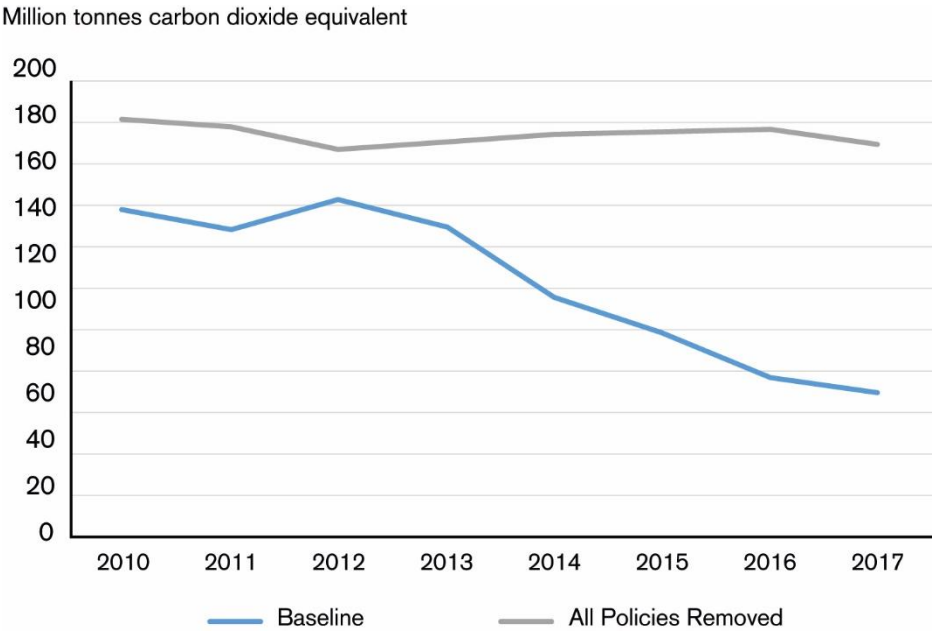
For other sectors[125] our simpler method draws on estimated energy savings from BEIS[126] of selected policies to build estimates by policy of carbon emissions[127], policy cost[128], and value of energy saved.[129] We have not included detailed analysis of the cost effectiveness of individual demand-side policies within this report. There has though been some recent analysis by other external bodies. For example, the National Audit Office estimated in 2018 that, in GB, the Renewable Heat Incentive reduced carbon dioxide equivalent emissions by about 4.5 million tonnes, at a cost per tonne to the UK taxpayer of around £142.[130]

Modelling suggests the carbon price and renewable subsidies have been the main drivers of emissions reductions in electricity

Between 2010 and 2017, without key decarbonisation policies, we estimate that the GB electricity sector would have emitted roughly an additional 520 million tonnes of carbon dioxide more than the baseline (see Figure 4.7), about 65 million tonnes each year on average.

[122] The model accounts for the estimated marginal carbon intensity of imported electricity, assuming that this is provided by gas generation.
[123] For example, for the ROC we only 'turn off' plants commissioned after 2010 – earlier plants still receive subsidies and are assumed to remain in place.
[124] We focus on policy effects at the GB level. Only the EU ETS delivers global effects as progress by one EU member state could in theory allow other members to pollute more.
[125] These include gas and oil energy savings in the agriculture, commerce, domestic, industry and public sectors.
[126] Research by the LSE suggests that estimates of energy savings for energy efficiency policies may be optimistic. See: McCoy & Kotsch. 2018. How well do energy efficiency measures actually perform? LSE: Grantham Research Institute.
[127] Using Defra emission conversion factors of different fuels.
[128] We use the most recent published cost data and apportion costs to electricity and other sectors according to their proportion of emissions savings.
[129] Aligning with the electricity sector analysis we value these savings at the wholesale price.
[130] See: NAO (2018). Low-carbon heating of homes and businesses and the Renewable Heat Incentive.

Figure 4.7: Simulated electricity sector baseline emissions compared with emissions in the absence of selected decarbonisation policies

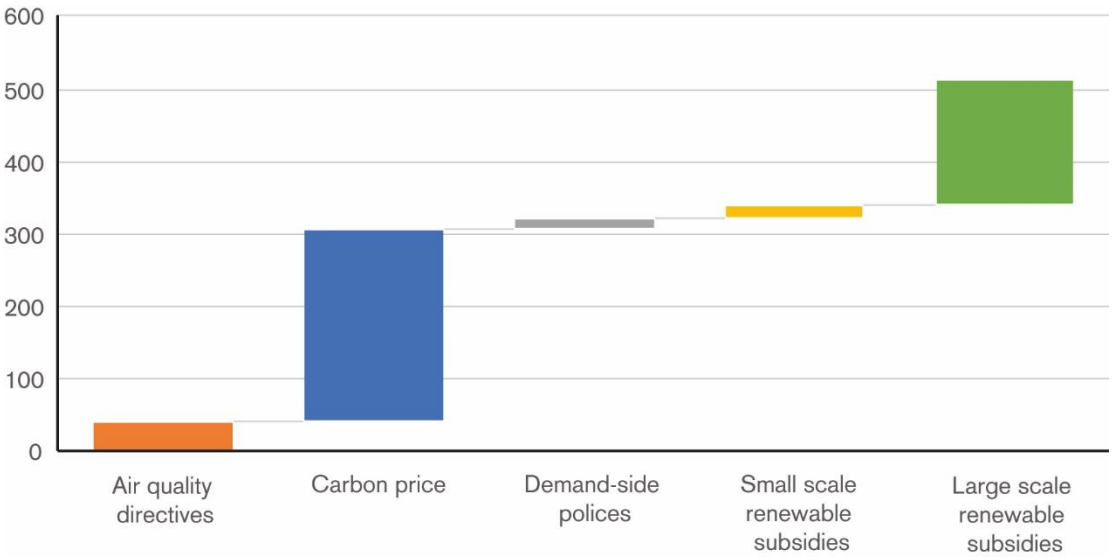


Source: LCP and Ofgem analysis.

We estimate that the most important policy in driving emissions reduction was the carbon price (see Figure 4.8). This is a substantial increase on our estimate in last year's report, confirming the conservative nature of the previous coal dispatch assumption.[131] Large-scale renewables subsidies were the next most significant contributor. The combined effect of all the policies is one-sixth greater than the sum of individual policy contributions, with the model suggesting that there are 'synergies' that augment the effect of each individual policy when they work in tandem.

[131] Last year we assumed that, without carbon prices, coal would have remained profitable between 2013 and 2016 and produced 55% of the combined generation from gas and coal. Our revised modelling suggests the figure would have been over 60%.

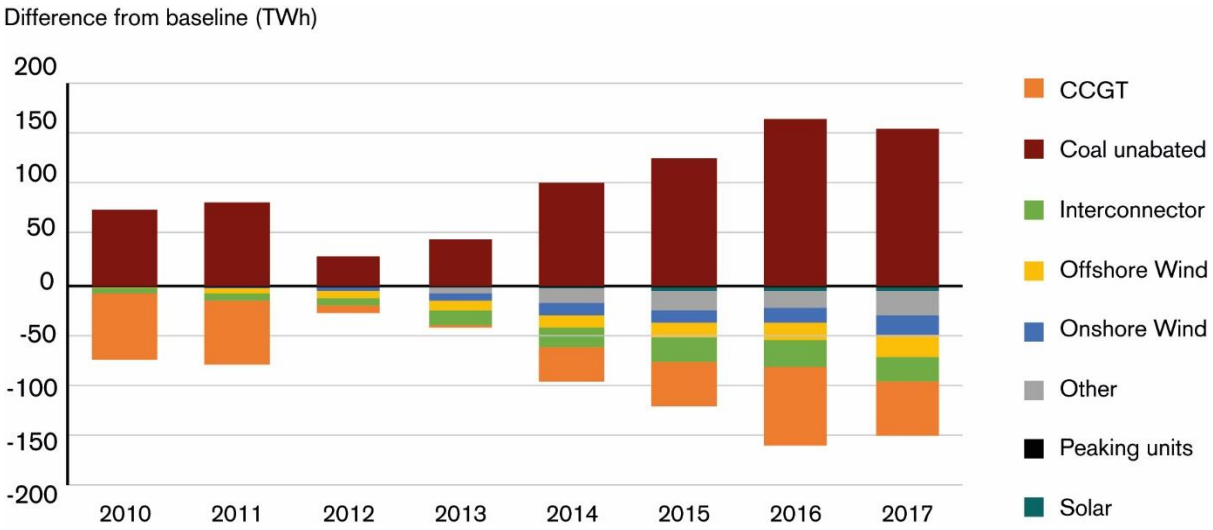
Figure 4.8: Estimated emissions reductions by selected electricity decarbonisation policy, 2010-2017



Source: LCP and Ofgem analysis.

Modelling suggests policies have driven these emissions reductions by removing unabated coal and replacing it with lower carbon content generation, such as gas (CCGT) and carbon-free generation, including wind. Figure 4.9 shows the rate of *decrease* in coal generation (above the x-axis) falling in 2012-2013 as the carbon price collapsed, but picking up with introduction of the CPS. Below the x-axis, the removal of coal spurred an *increase* in gas, wind and solar generation amongst others. While the carbon price is substantially responsible for the switch to gas, renewable subsidies aided the movement to low carbon generation.

Figure 4.9: Estimated effect of selected decarbonisation policies on electricity generation mix



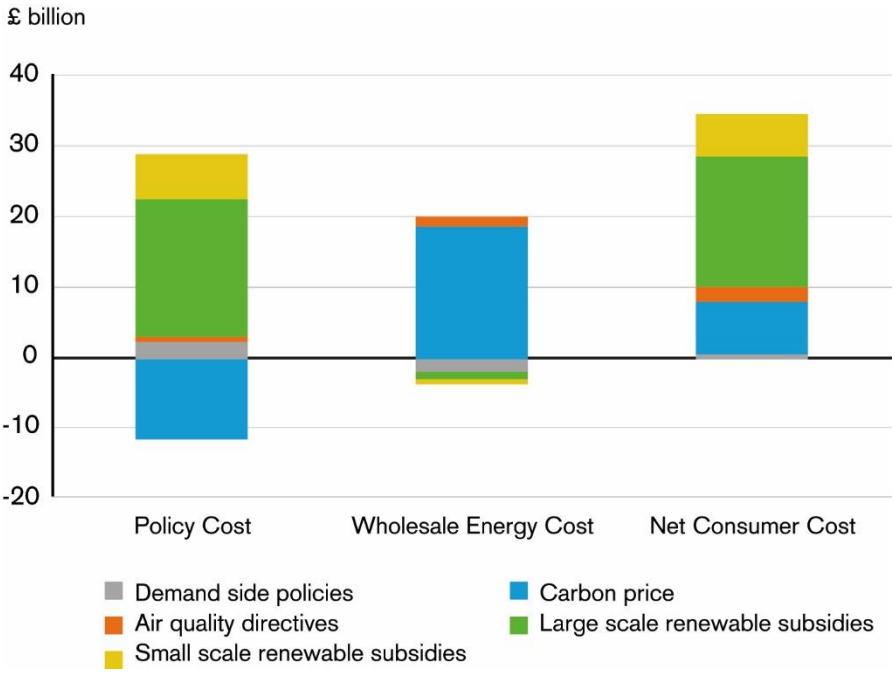
Source: LCP and Ofgem analysis.

Note: This refers to the combination of clean air directives, carbon prices, demand-side policies, small renewables subsidies and large renewables subsidies.

These policies have added an average of £37 per year to a typical household electricity bill

Figure 4.10 shows that over 2010-2017 the estimated net consumer cost is around £33 billion for electricity. Tax receipts from the carbon price (shown as a negative policy cost in the first column) substantially diminished its overall cost. However, the effect of renewable subsidies on lowering wholesale energy costs has been modest so far.[132] The demand side policies also realised considerable wholesale energy savings, but these failed to offset fully the policy costs and, as such, a net consumer cost can be attributed to these policies.

Figure 4.10: Estimated annualised consumer cost (2016 prices) of selected decarbonisation policies in electricity sector, over 2010-2017



Source: LCP and Ofgem analysis.

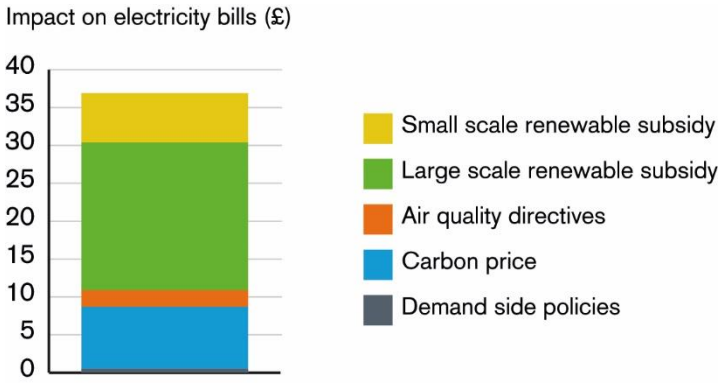
Ofgem calculations using BEIS data[133] for other sectors found that Domestic RHI reduced wholesale costs by around £163 million over 2010–2017. CERT+20% and CERT Extension together had the largest wholesale cost saving of over £1 billion. Overall, our analysis using BEIS estimates of energy savings suggests that the policies saved domestic consumers over £1.3 billion in wholesale energy costs.

Figure 4.11 shows the estimated effect on an annual bill of the selected decarbonisation policies is around £37 per year for electricity. The effect from other sectors is much more modest – we estimate only a £2.50 increase in domestic bills for gas. These findings differ from our analysis of CSS data, which suggest that all policies added around £108

[132] The VAT implications of reduced energy consumption have not been modelled.
[133] This included impact assessments, cost benefit analysis and evaluation documents for policy cost data and estimated TWh savings by policy by fuel type.

to a typical dual fuel household bill in 2017. However, the analysis here is restricted to the impact of *additional* policies that were enacted from 2010 – 2017 and models annualised costs, rather than actual costs incurred in year.

Figure 4.11: Estimated effect on typical annual electricity household bill of key decarbonisation policies, over 2010-2017



Source: LCP and Ofgem analysis.

The carbon price has proven particularly good value for money

The cost of each policy in reducing a tonne of carbon dioxide emissions can be compared against the non-traded carbon value, which averaged around £62 per tonne of carbon emitted over the period 2010-2017.[134] Policies that drive a unit reduction in emissions at less than this price can be considered good value for money. Our analysis is limited insofar as it does not consider that:

- The cost of unaddressed climate change is projected to rise significantly over time and policies that have sustained effects beyond the scope of our analysis would therefore see an increase in their value for money over time.
- Investment in new technologies can result in spill over effects that improve their cost-effectiveness over time.

The net cost to the consumer per tonne of carbon dioxide emissions saved over 2010-2017 varies substantially by selected decarbonisation policy in the electricity sector:

- Per tonne of carbon dioxide saved, the carbon price policy cost around £27.
- Demand-side policies as a group cost around £30, based on BEIS estimates of their impacts.[135] The cost would likely have been lower if earlier phases of initiatives like CERT had fallen within the scope of our analysis.

[134] See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/666406/Data_tables_1-19_supporting_the_toolkit_and_the_guidance_2017.xlsx

[135] Costs are annualised (over twenty years) in order to assist comparison with policies such as large-scale renewable subsidies. We apportion costs of policies in non-electricity sectors according to the portion of carbon dioxide savings attributed to non-electricity sectors.

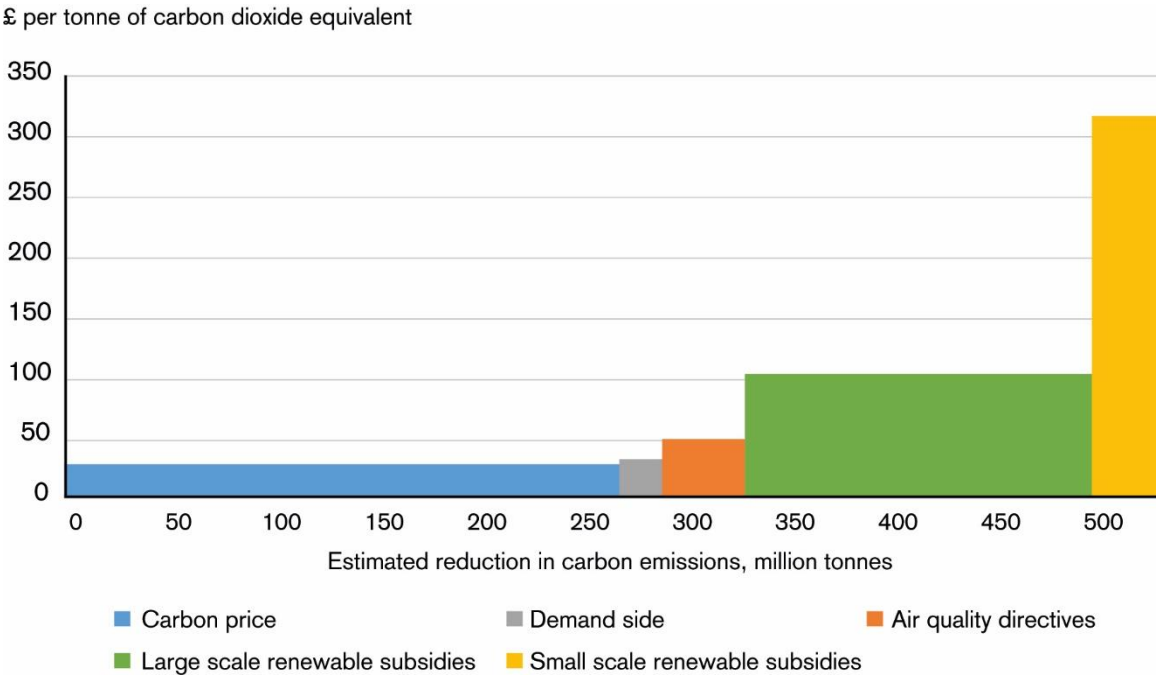
- The subsidies to large scale renewables cost about £101. Note this does not include competitively procured CfD auctions, which are largely too recent for inclusion.

- Small scale renewable subsidies (or FiTs) are estimated to cost around £315 per tonne of carbon dioxide saved.

- Combined, we estimate that the policies cost around £70 per tonne of carbon dioxide saved, slightly above the non-traded carbon value

The positive contribution of the carbon price aligns with expectations from economic theory and global analysis of policies by, for instance, the OECD.[136] However, given that there is limited coal now left in the system, it may be that the cost effectiveness of the carbon price diminishes over time. The renewables finding relates to ROCs, non-competitively tendered FiDeR contracts and FiTs. It does not reflect more competitive CfD policies, which have realised substantial cost reductions.[137]

Figure 4.12: Average net consumer cost (2016 prices) of policies per tonne of carbon dioxide saved, over 2010-2017



Source: LCP and Ofgem analysis.

The system cost metric measures the change in the costs of constructing and operating the power system that result from incorporating a given quantity of a new generation technology. This allows for a more robust comparison of the cost of different policies that accounts for when, where and how electricity is generated.

[136] OECD (2013). Effective Carbon Prices.
[137] The CCC shows that CfD auctions are now delivering greater value for money than both the ROC and the FiDeR contracts. See CCC Prices and Bills report 2017.

Using the alternative metric of system cost we find that:

- Carbon prices delivered substantial emissions reductions at a low cost of around £13 per tonne.
- Large scale renewables subsidies achieve reductions at a similar cost as before (around £124).
- Demand-side policies achieve reductions at a cost of around £68 per tonne.
- Air quality directives are the best value for money compared with the estimated social cost of emissions with a saving of £6 per tonne.[138]
- FiTs are still the most expensive. The scheme is now estimated to cost around £161 per tonne, with the lower cost compared to the consumer metric reflecting a generous transfer to generators.
- The combination of all policies over 2010-2017 saved a tonne of carbon dioxide at a cost of roughly £59, which is less than the non-traded carbon value.

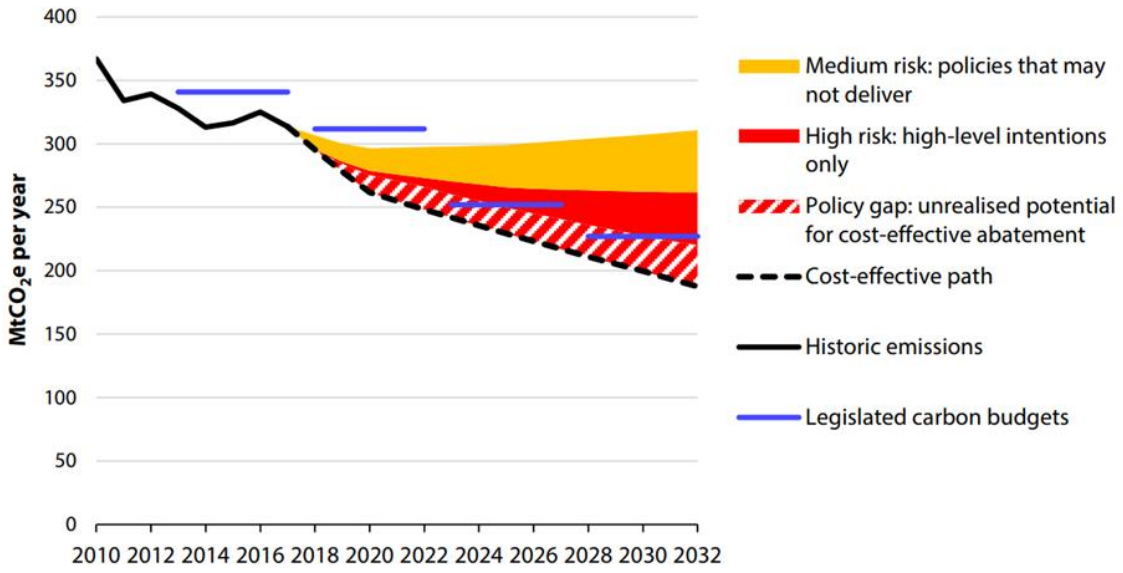
Meeting the challenge of future carbon targets

The UK is not on track to meet its decarbonisation commitments from 2023

The CCC estimates that the UK is not on course to meet its legally binding carbon budgets from 2023 (Figure 4.13). The CCC identifies risks to delivery of existing policy commitments, as well as an absence of detail on how aspirations will meet the ambitions of the government's Clean Growth Strategy.

[138] This saving mostly arises due to avoided operational expenditure costs incurred by out of merit coal plant in later years. Our analysis draws on estimates from BEIS, see: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/65919/6483-running-hours-lcpd-et-article-sep-2012.pdf

Figure 4.13: Delivery of policies to meet the fourth and fifth carbon budgets



Source: CCC (2018). Reducing UK emissions – 2018 Progress Report to Parliament.

The CCC concludes that progress needs to be extended to sectors other than electricity

While a reduction in the carbon intensity of the electricity grid has led to lower emissions, other sectors have made limited progress. With regard to transport, the government's Road to Zero Strategy outlines financial support to expedite the uptake of ultra-low emissions vehicles, but its goal for new vehicles to be 'effectively zero' emission by 2040 may permit a role for hybrid vehicles that are less clean than their electric counterparts (see below).

Implications of the transition to Electric Vehicles

Electric Vehicles represent a small but rapidly growing part of the transport market. While their spread could add to peak electricity demand and require expensive investment in networks, it also provides an opportunity to decarbonise the transport sector and improve the flexibility of the network. In our latest insights paper[139] we highlight that:

- While both Battery Electric Vehicles (BEVs) and Plug-in Hybrids (PHVEs) offer carbon benefits relative to Internal Combustion Engines, BEVs have zero tailpipe carbon emissions and lifetime carbon emissions that are considerably less than those of PHEVs
- Range anxiety is currently a key barrier to uptake, with some consumers concerned that they may not be able to charge their BEV easily away from their homes. Roll-out of charge point infrastructure is important to stimulate adoption, but presents its own challenges given its high costs.
- Flexible charging can complement a system with variable renewable generation by encouraging charging when there is excess generation in the system and by shifting it to times when there is sufficient network capacity

With respect to industry, the CCC believes that policies such as industrial carbon capture and storage need further consideration, especially in their timing and implementation, if they are to contribute to delivering carbon budgets.

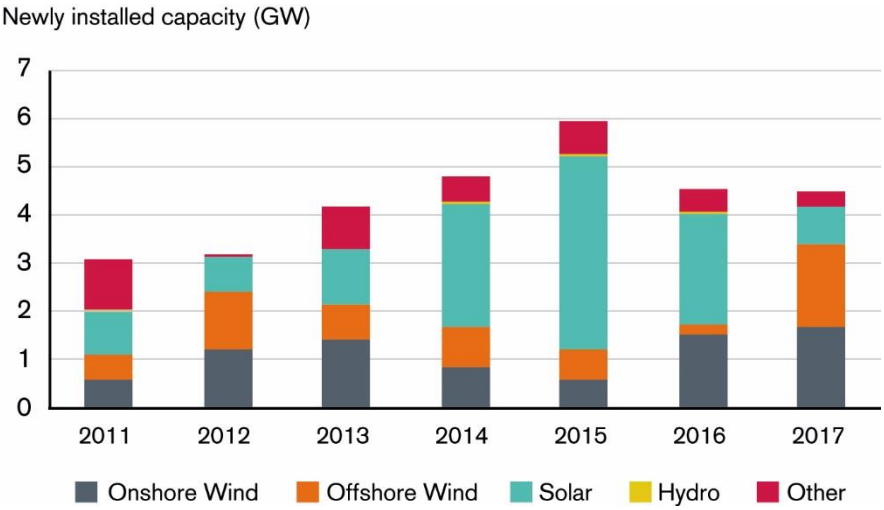
Heating accounts for 32% of total emissions[140] (across a range of sectors). The CCC believes that there is a shortage of initiatives that will enable the cost-effective transition to low-carbon sources of heat, such as heat pumps. Future gas consumption is intimately linked to heat decarbonisation, which may see greater use of alternative fuel sources such as hydrogen.

Delivery of Carbon Budget commitments from 2023 onwards will require further investment in renewables

Achieving the energy transition will continue to require substantial investment in low-carbon energy technologies. Bloomberg New Energy Finance reports that UK low carbon energy investment (in cash terms) declined by 56% in 2017 and has now reached its lowest level since 2008.[141] However, we have not seen substantial reductions in the absolute addition of renewables capacity (see Figure 4.14). The increase in capacity in 2017 was similar to 2016 and the higher portion of wind compared to solar should allow greater renewable generation to be forthcoming from this new capacity. Declining costs of renewable technology enable the generation capacity associated with an investment made in 2017 to be higher than in previous years.

[139] https://www.ofgem.gov.uk/publications-and-updates/ofgem-s-future-insights-paper-5-implications-transition-electric-vehicles
[140] The Clean Growth Strategy (2017)
[141] Bloomberg New Energy Finance (2018). Clean Energy Investment Trends, 2017.

Figure 4.14: Year-on-year growth in renewable electricity capacity, GB

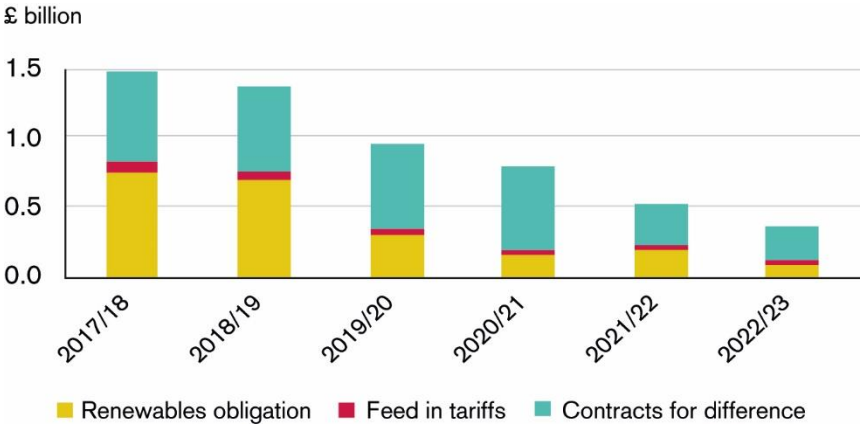


Source: BEIS (2018). Energy Trends March 2018.

Emerging budget constraints and growing payments for legacy projects currently limit support for new renewables capacity (see Figure 4.15).[142] Policy changes and increasing economic uncertainty may also have contributed to the decline in low carbon investment.[143] The Helm Review[144] contends that the most efficient way to deliver emissions reductions targets is to set a universal carbon price to harmonise the multiple interventions that currently exist. The CCC, on the other hand, recommends that a clear route to market be provided for simple, low-cost renewables and that policy changes are minimised to provide clear signals to encourage investment in low carbon technology.[145]

[142] The Levy Control Framework sets an annual budget for the projected costs of low carbon electricity levy-funded schemes (rising to £7.6 billion in 2020/21).
[143] The Environmental Audit Committee (2018). Green finance: mobilising investment in clean energy and sustainable development. Refers for instance to disruption linked with privatisation of the Green Investment Bank.
[144] Helm (2017). Cost of Energy Review.
[145] Committee on Climate Change (2018). Reducing UK emissions 2018 Progress Report to Parliament.

Figure 4.15: Levy Control Framework: forecast year-on-year increase in available funding for investment



Source: Office for Budget Responsibility. Economic and fiscal outlook – March 2018

Note: The Clean Growth Strategy (2017) announced up to £557m for further pot 2 CfD auctions, with the next auction currently planned for spring 2019, but these commitments are not reflected in Figure 4.15.

Chapter 5: Security of Great Britain's energy supply

Summary of findings

- GB continued to benefit from secure energy supplies in 2017/18, with no periods of unmet gas or electricity demand.
- Overall, GB energy security has responded well to the challenges seen in winter 2017/18. The 'Beast from the East' weather front provided the first significant challenges to energy market security of supply since 2010. This weather front resulted in very high energy demand across Europe and in GB.
- On 1 March 2018, National Grid Gas (NGG) issued a gas deficit warning. This was the first gas warning since 2010. There were record 'within day' prices in GB, as well as in Belgium, France, Germany, Italy, the Netherlands and Norway. The market reacted to the gas deficit warning and the System Operator's balancing actions, such that by the end of the day the gas system was in balance.
- This is the first year with the full operation of the capacity market. Electricity margins have remained healthy this winter, despite some cold weather and high demand spells.

Introduction

Security of supply is a cornerstone of government energy policy and forms one of Ofgem's five strategic consumer outcomes; it brings benefits to consumers, the economy and wider society. Since liberalisation, GB has enjoyed secure energy supplies with no gas deficit emergencies and no significant deficits in electricity supply. The transition to clean energy presents challenges for ensuring security of supply, since an increasing proportion of our electricity comes from inflexible sources as coal fired power stations are phased out.

The gas market has faced less significant policy challenges, but has experienced other challenges through increased import dependence and low returns for gas storage sites, particularly seasonal storage sites. Around 38% of GB electricity supply comes from gas-fired power stations, meaning that events in either gas or electricity markets can significantly affect each other.

Three main bodies have a role in ensuring security of supply in GB gas and electricity systems:

- The UK and national governments set the long-term direction for energy policy. The government also has specific roles in areas such as determining levels of capacity to be purchased in the capacity market.

- National Grid as the System Operator for both gas and electricity manages flows on the grid so that supply matches demand. It does this by taking balancing actions and producing demand and supply forecasts.

- Ofgem aims to ensure that gas and electricity markets work properly, to reduce or eliminate any barriers that stop the market functioning effectively, and to regulate and incentivise National Grid.

In this chapter we examine GB security of supply over the past year, with a brief look ahead to the medium and longer term. First, we consider GB gas by looking at overall supply, demand, and storage. We then examine the gas deficit warning on 1 March 2018 in depth. We also consider electricity security of supply, focusing on the capacity market and its impact on capacity margins.[146] Finally, we look at how Ofgem is changing its approach to regulating the System Operator in response to changing market conditions.

[146] The *capacity margin* or *reserve margin* is defined as the excess of installed generation over demand.

Security of Great Britain's gas supply

Overview

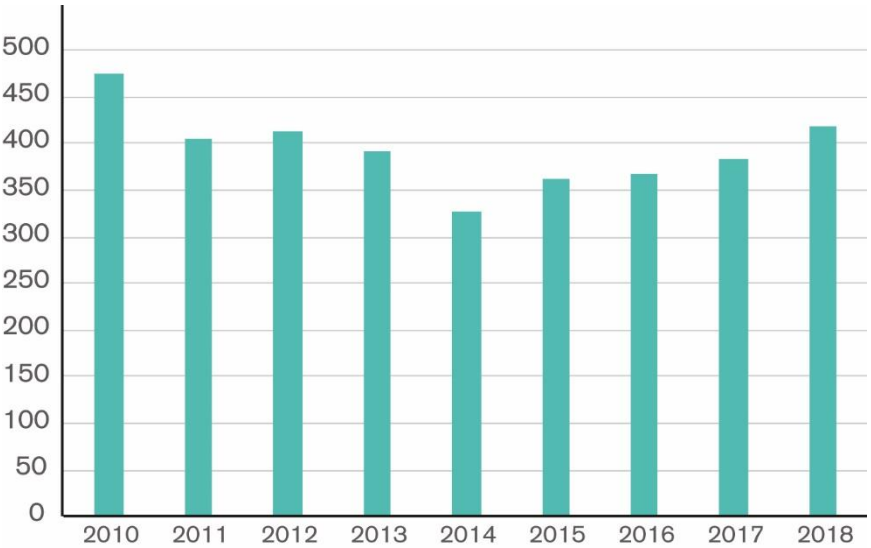
Historically, GB has had a very resilient gas market with no gas deficit emergencies. GB benefits from diverse sources of supply. This diversity gives GB significant flexibility to deal with gas market events. Coupled with price flexibility and strong incentives on shippers to balance their gas supply and demand, this means that GB is well placed to attract gas when there are significant increases in demand or supply outages. After several years with relatively low demand levels, 2017/18 was an eventful year in European gas markets.

Gas demand

Seven year high in gas demand on 1 March 2018

Aggregate gas demand in winter 2017/18 was slightly higher than winter 2016/17. However, peak demand was significantly higher than in the previous years due to the 'Beast from the East' cold weather front increasing domestic heating demand. On 1 March 2018, demand was the highest in over seven years at 417.5 million cubic meters / day, 37% higher than demand on 1 March 2017. This was the first time since 2012 that gas demand was above 400 million cubic meters, but it is still well below GB's record demand of 474 million cubic meters on 8 January 2010. A crucial factor in gas demand is the role played by the power sector, with a significant reduction in demand from gas powered generators on 1 March 2018.

Figure 5.1: Gas Demand for the highest day (million cubic metres/day)



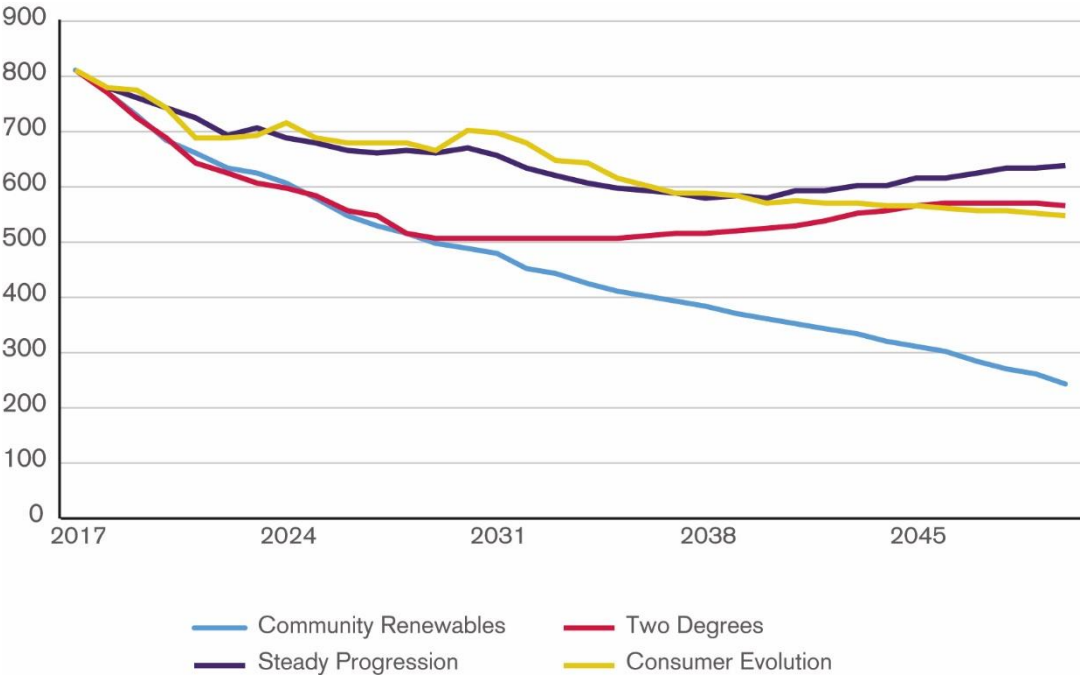
Source: National Grid data item explorer

Gas demand outlook

Overall gas demand expected to fall

The outlook for gas demand is uncertain as it is influenced by developments in technology, consumer preferences and policy. National Grid's Future Energy Scenarios forecast gas demand to fall across all scenarios modelled, as shown in Figure 5.2. While the overall level of demand is expected to fall, there may still be periods of very high peak demand. The overall decline in demand could create challenging economic conditions for the gas network and gas infrastructure.

Figure 5.2: Annual gas demand forecast excluding exports (TWh)



Source: National Grid, Future Energy Scenarios 2018.

Note: The four different scenarios indicate different pathways. Community Renewables and Two Degree both have fast decarbonisation with Community Renewables having more decentralised technologies and Two Degrees less so. Consumer Evolution and Steady Progression have slower decarbonisation with Consumer Evolution having more decentralised technologies and Steady Progression less so.

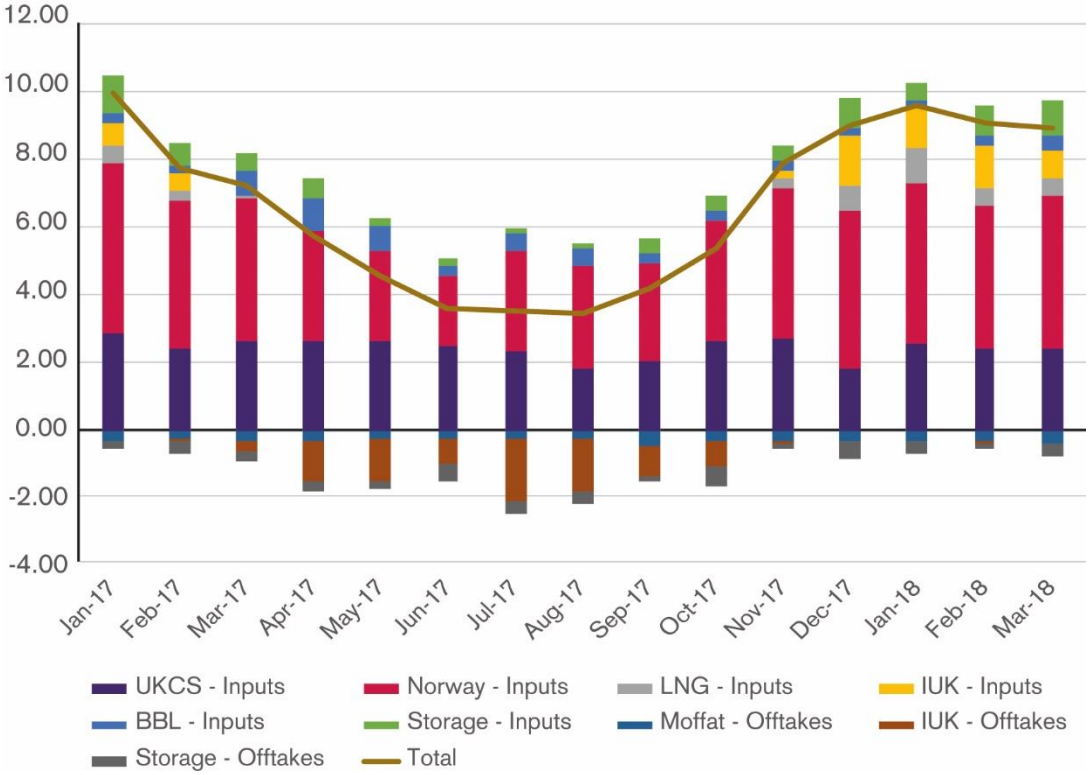
Gas supply

Gas has a diverse range of supplies

GB continues to have diverse sources of gas supply with significant flexibility. GB is not dependent on any one piece of infrastructure for security of supply, with Norwegian imports, UK Continental Shelf, interconnectors, and Liquefied Natural Gas (LNG) all playing a considerable role (see Figure 5.3). LNG imports fell in 2017/18, with increasing

Asian demand for LNG pushing up the price LNG shippers could attract there relative to GB. We expect to see an increase in LNG shipments from the US in future years.

Figure 5.3: Gas supply by source (billion cubic meters/month)



Source: Ofgem calculations, National Grid data item explorer

Winter outages – Maintenance of the Forties pipeline

The Forties pipeline system carries about 40% of North Sea oil and gas. An outage occurred on 12 December 2017 when INEOS shut down the pipeline for emergency maintenance following discovery of a small crack. This outage resulted in a small and relatively short-lived spike in GB gas prices. This price spike was also affected by an explosion at Austria's Baumgarten gas network point on 12 December, which caused concern across Europe about flows over the winter. Flows through interconnectors significantly increased in December 2017 in response and the system remained well supplied. Forties returned to full operation on 30 December 2017. Imports via other pipelines remained high in January and February 2018 to meet high demand.

Closure of the Rough long-range storage facility

The Rough facility was a large gas storage facility under the North Sea, originally with a maximum designed capacity of 3.7 billion cubic metres of gas. Rough was GB's only long-range storage facility which had traditionally injected supplies during summer when prices were low, and then withdrew gas in winter when prices were higher. However, the profitability of the site has reduced in recent years, because of declining spreads between summer and winter gas prices and operational problems. In June 2017, Centrica Storage Limited announced they were ending storage operations permanently.

Alongside its decision to close storage operations, Centrica announced its intention to release the recoverable cushion gas onto the market, changing the facility from a storage site to a production facility. Cushion gas is the minimum volume of gas required in an underground storage reservoir to provide the necessary pressure to deliver working gas volumes to customers. Centrica estimated there to be a maximum of 5.18 billion cubic metres of recoverable cushion gas at the facility.[147] Currently, Centrica is producing a relatively steady flow of cushion gas onto the system of about 5 to 8 million cubic meters per day. This is substantially lower than the 42 million cubic metres potential that Rough could have released per day during winter.

Despite this, GB still has significant infrastructure capacity to receive gas. Ofgem and BEIS have both conducted modelling work and analysis to assess GB gas security of supply. Many studies have concluded that GB should have adequate supplies to meet high demand scenarios even in the absence of Rough.[148] We will continue to monitor, analyse and consider the effectiveness of the market in delivering security of supply.

[147] https://www.centrica.com/news/cessation-storage-operations-rough

[148] See:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/652085/gas-security-of-supply-review.pdf

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651297/gas-security-supply-assessment.pdf

https://www.ofgem.gov.uk/system/files/docs/2017/10/state_of_the_market_report_2017_web_1.pdf

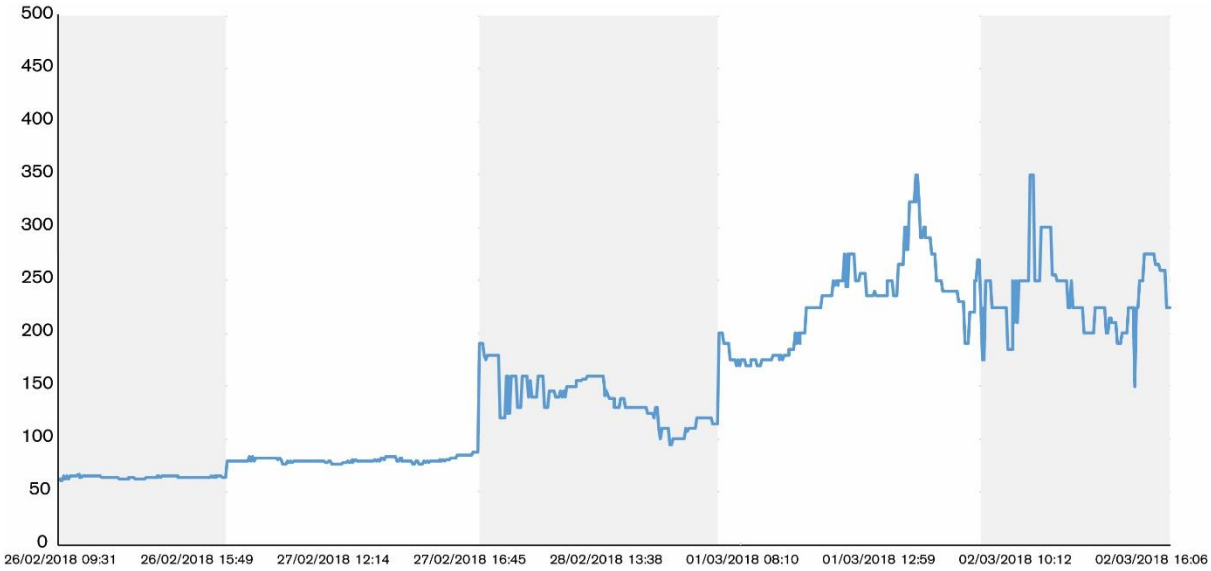
Case Study - gas deficit warning

Overview

Cold weather caused high demand and supply issues on 1 March 2018

In the week beginning 26 February, temperatures across north-west Europe dropped well below seasonal norms. The 'Beast from the East' weather front brought easterly winds, low temperatures, and snowfall from Scandinavia and Russia. This culminated in red weather warnings across the UK. As shown in Figure 5.4, prices remained relatively stable until 28 February before increasing sharply. This was in response to a number of outages, principally on the BBL interconnector which connects GB to the Netherlands and can supply up to 53 million cubic metres per day. Over the course of the day the outages were resolved and prices fell back. Whilst prices softened in GB, high demand across Europe resulted in some notable actions by System Operators. In the Netherlands the Transmission System Operator took a balancing action paying £14 per therm for gas; this is equivalent to the estimated maximum value of how much domestic consumers in GB would be willing to pay for gas prior to disconnection (known as the value of lost load).[149]

Figure 5.4: Week commencing 26 February - within day gas prices (p/therm)



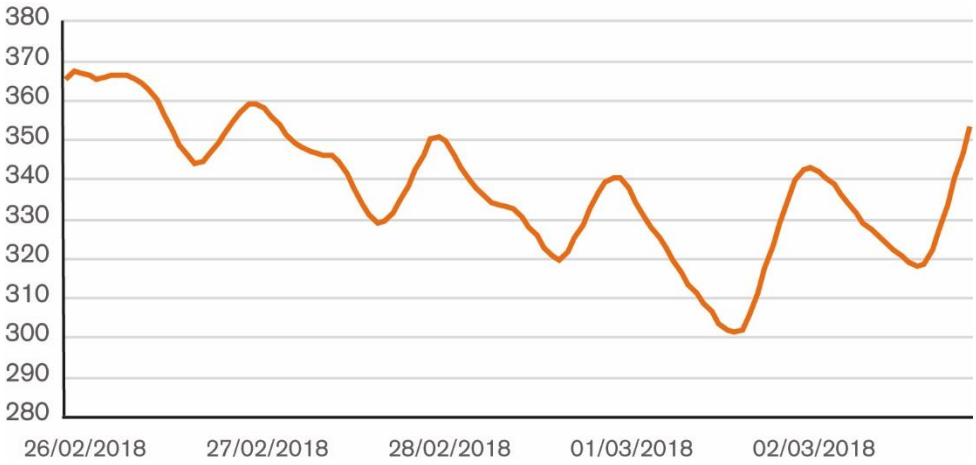
Source: Bloomberg

The level of gas used by NGG to maintain appropriate pressure in the gas system (known as linepack) fell gradually throughout the week of 26 February (see Figure 5.5). With linepack lower than desired levels and some unplanned outages, notably at South Hook LNG terminal, NGG decided to issue a gas deficit warning early on the gas day for

[149] Available at: http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=46&refer=Markets/WhlMkts/CompandEff/G asSCR

1 March.[150] This was the first gas warning since 2010. The intention of the warning is to send a signal to the market participants that more gas is required to balance the system.

Figure 5.5: National Transmission System Linepack Aggregate, million standard cubic meters



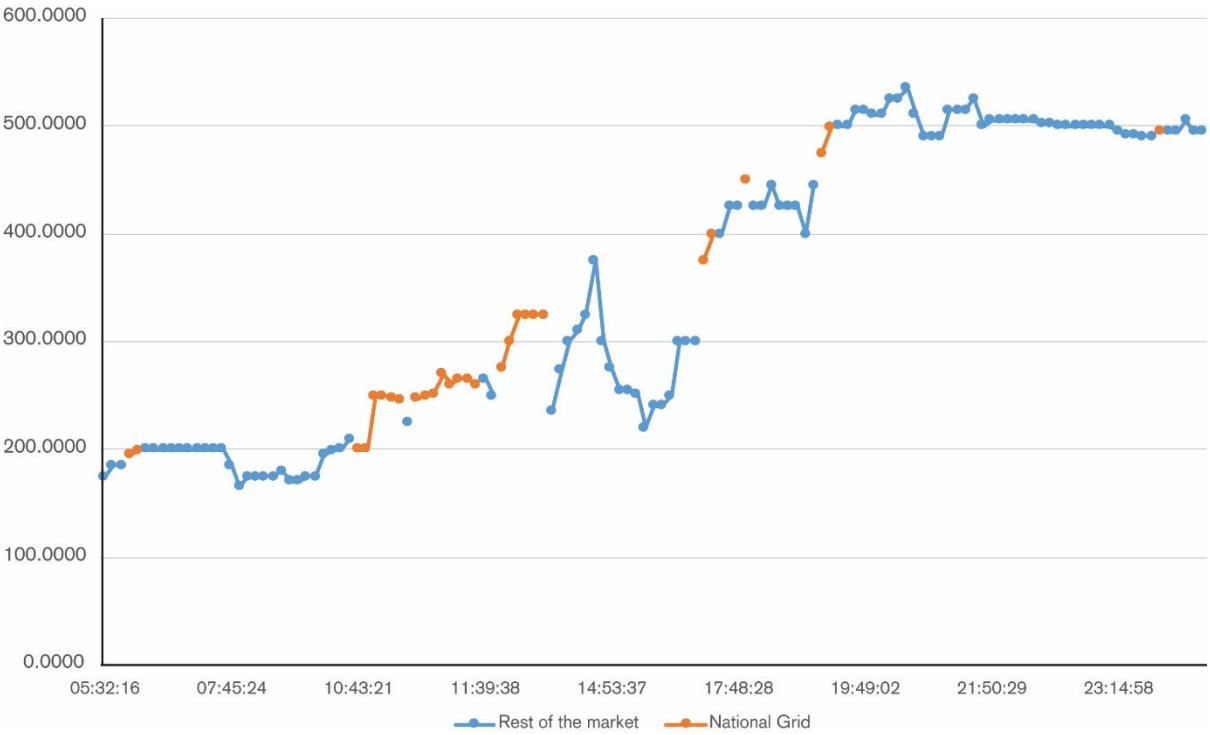
Source: National Grid data item explorer

Note: This is D+1 and so published one day after the event

In addition to issuing a gas deficit warning, NGG also took actions on the On the day Commodity Market (OCM). In purchasing gas on the OCM, NGG is sending a financial incentive to gas shippers (traders) to flow more gas onto the GB system as purchases they make affect the imbalance charges. The initial morning response from the market was slow, and linepack continued to be of concern. As a result of this NGG took further actions on the OCM with supplies responding around midday on 1 March, predominantly from the Grain and Dragon LNG terminals. Demand forecasts kept increasing throughout the day. NGG continued to take actions on the OCM, and at high prices (see Figure 5.6) on the system which ensured that linepack recovered and the system was in a position to meet demand on the following day.

[150] The gas day in GB and EU runs from 5am – 4.59am the following day.

Figure 5.6: Gas day 1 March 2018 - On-the-day Commodity Market (OCM) price (p/therm)

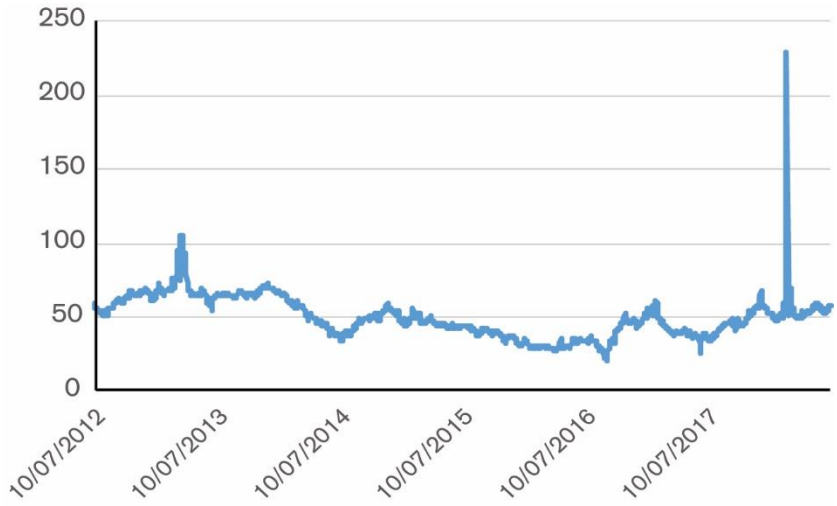


Source: Ofgem calculations, ICE, National Grid data item explorer

Review of the events of 1 March

As a consequence of the forecasted supply and demand imbalance, GB experienced record within day prices on the brokered market. Within day prices rose to highs of 350p/therm, the highest brokered price in GB. The end of day price was 230p/therm, the highest end of day price in many years (see Figure 5.7). There were also record prices in Belgium, France, Germany, Italy, the Netherlands and Norway. Italy, Denmark, and Sweden declared gas market early warnings on 23 February, 27 February, and 1 March respectively.

Figure 5.7: Indicative end of day closing prices (p/therm)



Source: Bloomberg

The market responded to the System Operator's actions and was balanced by the end of the day

Despite the initial slow response, the market responded well to the gas deficit warning and the System Operator's balancing actions, ending the day with a well-supplied gas system and linepack recovering. The gas deficit warning provided a stern test for the GB system, particularly in the absence of the Rough gas storage facility. As the most testing conditions for the GB market since 2010, this provides valuable insights into the efficacy of the GB market.

Following our review of events this winter and engagement with stakeholders, we have identified a number of areas where there could be scope to improve market arrangements. These include information provision between National Grid and market participants, National Grid's processes for Margins Notices and gas deficit warnings, and more general questions about the effectiveness of the current daily balancing regime and whether within day signals and the role of linepack flexibility remain fit for purpose.

We are working closely with BEIS and National Grid to consider these points and to progress work where appropriate.

Gas and electricity system interaction

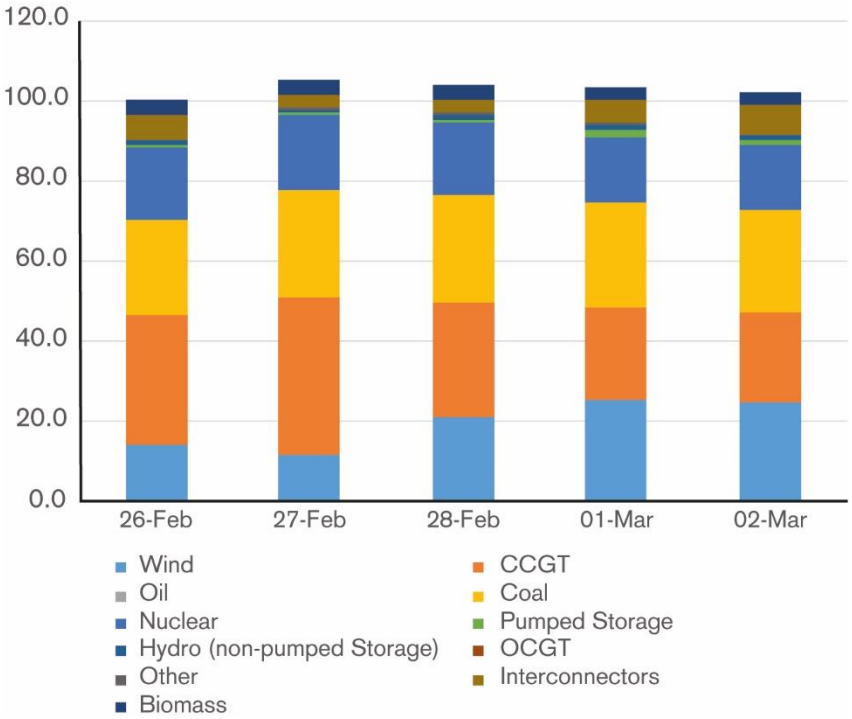
Gas-fired plants responded to the price incentives and reduced their output

Due to the high price of gas, gas-fired plants reduced their output on 1 March. Around 50% of GB's gas-fired fleet did not take gas and instead sold it back onto the network. This demand side response is an efficient response to the conditions faced on the day and helped the gas market to balance.

Plentiful wind supplies of around 10GW on 1 March meant that electricity margins remained comfortable. There was also significant power output from coal plants (see Figure 5.8).

The fact that there was significant wind and coal generation leads to the question - what would have happened had there been little or no wind, and what could happen in future when coal plants are phased out in the early 2020s? While it is impossible to answer with certainty, the most likely scenario if wind generation had been low is that gas prices would have had to increase further to attract gas. Looking further forward to the 2020s, battery storage and interconnectors could help to mitigate the impact of lower coal-fired generation. Moreover, National Grid Electricity Transmission can take account of the intermittency of generation plants, such as wind, when deciding how much electricity generation capacity to procure.

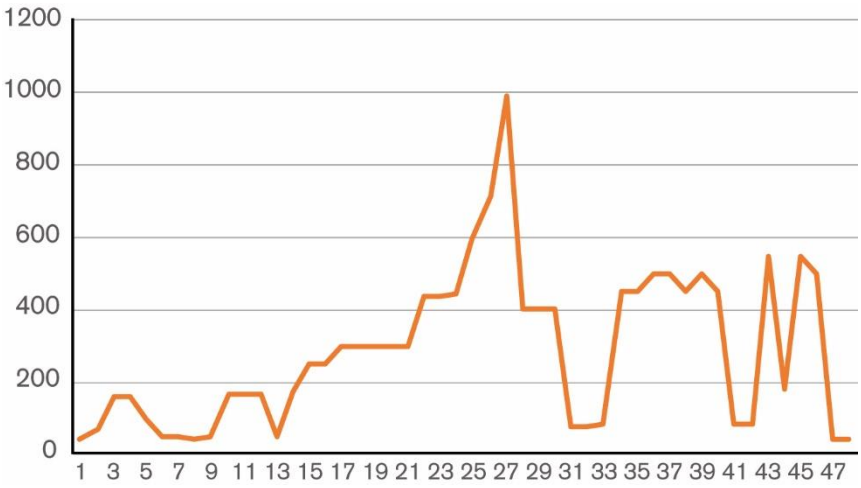
Figure 5.8: Week commencing 26 February – Generation sources (% share of total)



Source: ELEXON

The high prices in the GB gas market led to an increase in power market prices. On 1 March, the day-ahead baseload prices were £99/MWh, with peak load at around £105/MWh. If a market participant generates or consumes more or less electricity than contracted for they face cash-out price for the difference. Cash-out prices hit a high of £990/MWh, the highest price of the winter (see Figure 5.9). But these are well below the high of winter 2016/17 of £1,500/MWh.

Figure 5.9: Cash-out prices by settlement period on 1 March 2018 (£/MWh)



Source: EnAppSys Neta Reports

Security of Great Britain's electricity supply

Overview

2017/18 was the first year with full operation of the capacity market and electricity margins were healthy with no capacity market warnings

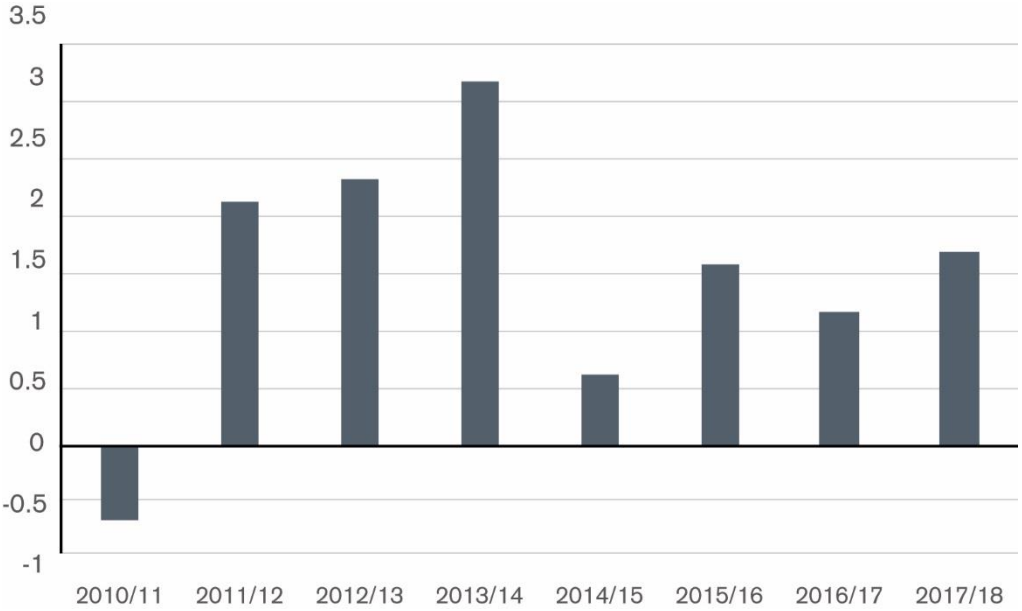
2017/18 was the first year with the full operation of the capacity market. The capacity market was designed to deliver supply or reduce demand in times of stress on the system to ensure security of supply. National Grid forecasts peak demand and then uses modelling to suggest an amount of capacity to procure; the government then decides on the amount to be procured through a capacity market auction process. The modelling is based on achieving a three-hour reliability standard, which implies that the cost of procuring additional capacity is expected to be higher than the cost of deploying three hours of out-of-market mitigation.

For 2017/18, National Grid had a target to procure 53.6 GW of capacity. It then procured 54.4 GW of capacity at a cost of £6.95 per KW per year, which resulted in a total cost of £378 million. There is an auction four years prior to the delivery date which had the much higher price of £19.40 per KW per year,. National Grid procured an amount of capacity above its targeted amount. This was because capacity levels come in indivisible quantities (i.e. you can't procure 1/5 of a power station for example), making it difficult to buy the exact amount, and also because the auction price was significantly lower than anticipated. The Loss of Load Expectation for winter 2017/18 was 0.01 hours. This is below the three-hour reliability standard which indicates that there may have been a risk that security of supply has been maintained at a higher cost to the consumer than necessary. However, it is important to note that the cost of additional capacity was low.

As shown in Figure 5.10, National Grid forecasts of transmission demand have been consistently above out-turns since 2011 by an average of around 1.5GW. Whilst it can be considered prudent for the System Operator to take a conservative approach to forecasting demand, this needs to be balanced against the costs of procuring additional capacity. Over the past year National Grid has made a number of changes to its demand forecasting process, which overall resulted in reductions to its view of underlying demand.[151]

[151] https://www.emrdeliverybody.com/Lists/Latest%20News/Attachments/189/SC%204L13%20Demand%20Incentive%20Letter%202018.pdf

Figure 5.10: Difference between forecast and out-turn demand - One-year ahead normal weather-corrected peak transmission system (GW)



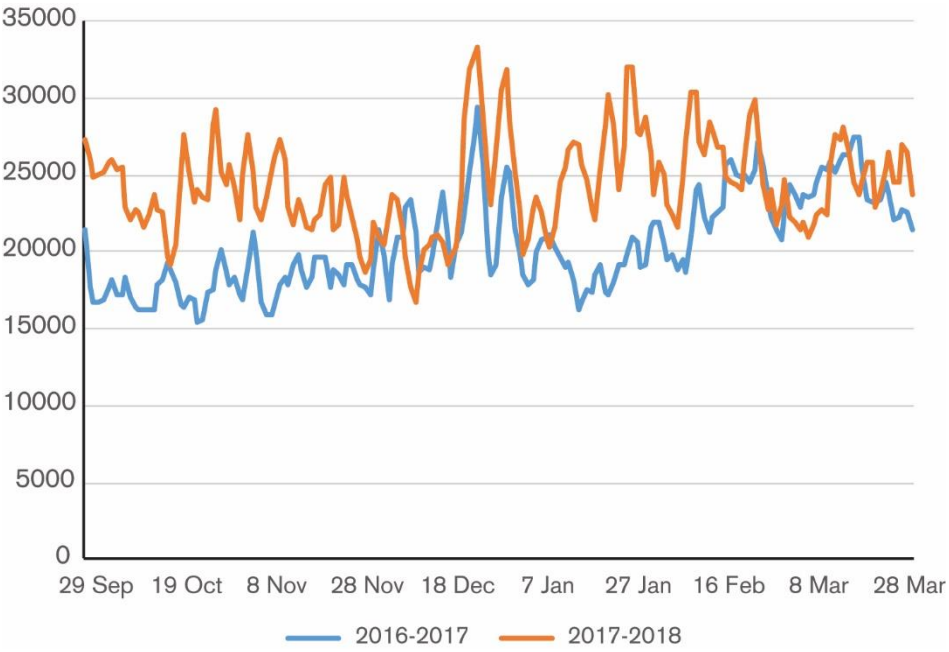
Source: National Grid calculations

The capacity market helped maintain healthy electricity margins over 2017/18, which were procured at a lower-than-expected cost to consumers. There were no capacity market warnings and periods in which demand was not met. This suggests that the capacity market was relatively successful in its first year of full operation, and capacity prices for next year also appear to be lower than initially expected.

Margins were generally higher this winter

Electricity margins – the difference between demand and potential supply - remained healthy in winter 2017/18, and were generally higher than in winter 2016-17 (see Figure 5.11). The average winter margin for 2017/8 was 24.4 GW, compared to an average margin of 20.5 GW in 2016/17. The healthy margins can be attributed, at least in part, to the capacity market. Margins were also helped by the fact that several power plants remained in the wholesale market that did not have capacity market contracts. This meant that potential power generation capacity was even greater than National Grid had procured for, helping to maintain healthy electricity margins.

Figure 5.11: Winter indicated margin daily average (MW)



Source: EnAppSys Neta Reports

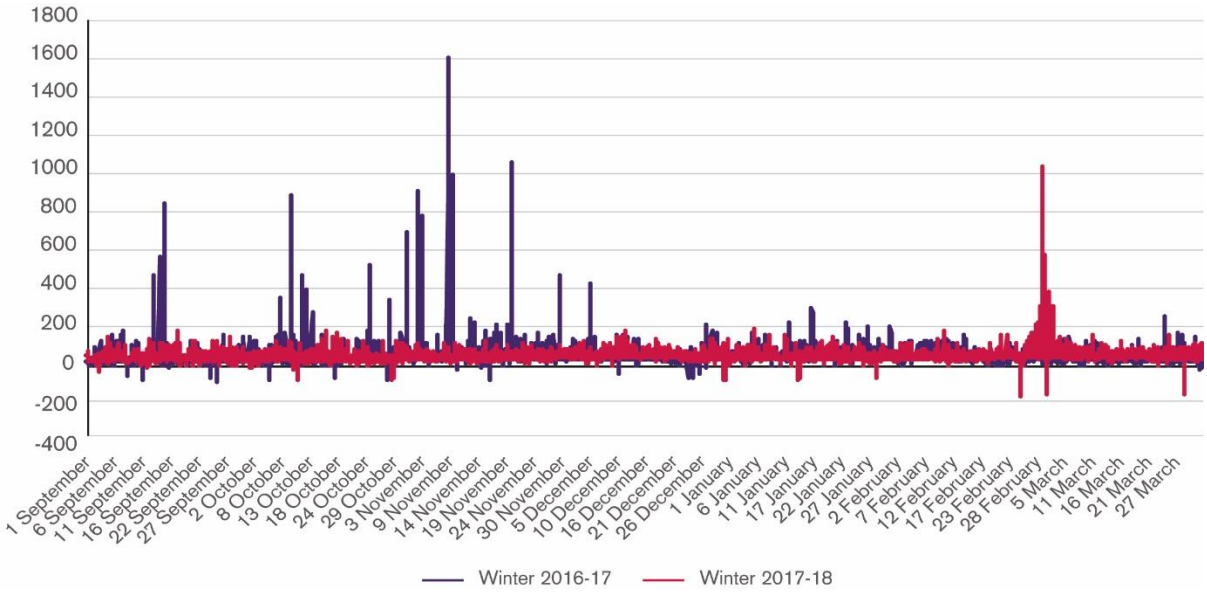
Electricity System Operation

As well as the need to ensure there is enough overall power supply to meet demand, the System Operator (National Grid Electricity Transmission) needs to ensure that the system stays in the desired frequency second by second. It does this by paying generators to either increase or decrease their generation in the Balancing Mechanism. These actions then set the charges faced by companies who have produced too little or too much power relative to their customers' demand; these charges are labelled cash-out.

Cash-out prices were less volatile in winter 2017/18 than in 2016/17

Figure 5.12 shows cash-out prices over the last two winters. Cash-out prices were less volatile this winter than the previous one. The increased overall capacity on the system is the most likely explanation for the drop in volatility. The only real spike in cash-out prices was on 1 March when the 'beast from the east' caused significant increases in gas and electricity demand, with high gas prices feeding through to high electricity prices in both the brokered wholesale market and the Balancing Mechanism.

Figure 5.12: Cash out prices (£/MWh)

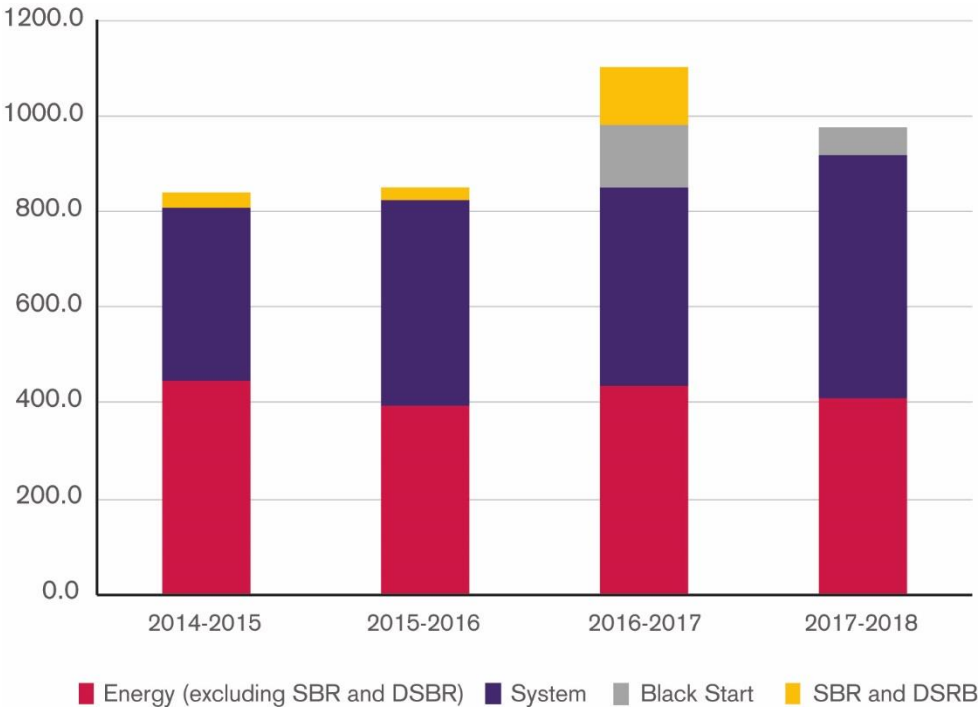


Source: EnAppSys Neta Reports

During 2018, Ofgem reviewed the electricity balancing significant code review (EBSCR) changes implemented in November 2015.[152] We found that there were sharper incentives when the system is under stress due to higher average imbalance prices. The electricity cash-out regime will change further in November 2018, as part of the staggered cash-out reforms stemming from the EBSCR. If a market participant generates or consumes more or less electricity than contracted for they face cash-out price for the difference. Currently, this price is set according to the average of the most expensive 50MWh (PAR 50) of relevant balancing actions taken by the system operator. From November 2018, the price reference will be set only by the last 1MWh (PAR1). This should make prices higher and more volatile in periods of scarcity, encouraging stronger demand and supply responses.

As shown in Figure 5.13, total system balancing costs fell in 2017-18 compared to 2016-17, but are still significantly above the previous two years. The reduction in costs compared to last year was driven by reduced Black Start and Balancing Reserve costs (SBR and DSBR). System costs, which are the costs for dealing with constraints on transmitting electricity around the national system, increased. This is likely to be predominantly because of the continued growth of intermittent generation.

Figure 5.13: System balancing costs between 2014-15 and 2017-18 (millions £)



Note: "Energy" costs relate to balancing supply and demand.
"System" costs refer to managing network flows.
"Supplemental Balancing Reserve (SBR)" is a generation service where a generator is kept on standby, outside the market, should NGET require additional resources to balance the system.
"Demand Side Balancing Reserve (DSBR)" is a demand side response service aimed predominantly at large scale customers and aggregators prepared to shift or shed demand when instructed by NGET.

Source: Ofgem analysis of National Grid Balancing Services Summary Data

The wholesale market is changing, with increased intermittent and inflexible generation presenting new challenges for the Electricity System Operator (ESO). In response to this, Ofgem is changing the way in which it regulates the ESO. The ESO is due to become a separate company within National Grid plc by 1 April 2019. We think a more independent ESO will enable it to achieve benefits for consumers by taking on a more active role in shaping the energy system transformation. In order to facilitate this, we implemented a new regulatory and incentives framework for the ESO in April 2018.